

Economic Analysis of Law and the Function of Environmental and Criminal Law within
– with special Reference to Cases of Corporate Environmental Crime

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Preface

The following marks a journey of learning, of solving a puzzle on questions about the scientific legal field; the attempt to approach these questions from multiple angles, of playing around with scientific concepts and models across different disciplines.

This work is an invitation to go on a journey of curiosity, of trying to understand, of leaving scientific boundaries behind. And I hope that – despite its imperfection or maybe just because of it – it inspires, just as I have been inspired by the great works and thoughts of others.

For me personally, this journey has been exciting and insightful while uncertain and challenging. I often wished for a twin with whom I could debate the wanderings of my thoughts, someone who would challenge them, expand them, question them, falsify or verify them. I didn't get a twin, but I had special ones that accompanied me, who sometimes just listened to my ideas patiently, my excitement, my concerns and doubts, who sometimes expanded them, sometimes challenged them, sometimes denied them – always in a constructive and supportive way, and for this, I want to express my profound gratitude to Alex and Nicolaj.

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To Lucia, who kept pushing when my resources started to vanish.

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List of Abbreviations

APCA. <i>Air Pollution Control Act</i>	EPA. <i>Environmental Protection Agency</i>
Art. <i>Article</i>	EU ETS. <i>European Emissions Trading System</i>
BGB. <i>German Civil Code, German Civil Code (Bürgerliches Gesetzbuch)</i>	fn. <i>footnote</i>
BGBI. <i>Federal Law Gazette (Bundesgesetzblatt)</i>	FWPCA. <i>Federal Water Pollution Control Act</i>
BImSchG. <i>Act on the Prevention of Harmful Effects on the Environment Caused by Air Pollution, Noise, Vibration and Similar Phenomena (Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnliche Vorgänge)</i>	GDP. <i>Gross domestic product</i>
BT-Drs. <i>German Bundestag Printed Matter (Bundestag Drucksache)</i>	GG. <i>Basic Law for the Federal Republic of Germany (Grundgesetz für die Bundesrepublik Deutschland)</i>
BVerfG. <i>Federal Constitutional Court (Bundesverfassungsgericht)</i>	HRC. <i>United Nations Human Rights Council</i>
CBA. <i>Cost-Benefit Analysis</i>	i.e. <i>id est</i>
CEO. <i>Chief Executive Officer</i>	Ibid. <i>Ibidem</i>
cf. <i>confer</i>	JNR. <i>Young sustainability law (Junges Nachhaltigkeitsrecht)</i>
ChemG. <i>Chemicals Act (Chemikaliengesetz)</i>	kg. <i>Kilogram</i>
CO ₂ . <i>Carbon dioxide</i>	km/h. <i>kilometer per hour</i>
CS. <i>Consumer surplus</i>	KSG. <i>Federal Climate Protection Act (Bundes-Klimaschutzgesetz)</i>
CSR. <i>Corporate social responsibility</i>	kt. <i>Kiloton</i>
CSRD. <i>Corporate Sustainability Reporting Directive, Corporate Sustainability Reporting Directive</i>	MAC). <i>Marginal abatement cost</i>
ct. <i>cent</i>	MC. <i>Marginal cost</i>
DE. <i>Delaware</i>	MCDA. <i>Multi-criteria decision aide</i>
EC. <i>European Commission, European Commission</i>	MEC. <i>Marginal external cost</i>
ECL. <i>Environmental criminal law</i>	MHC. <i>Marginal damage cost</i>
	MPC. <i>Marginal private cost</i>
	MR. <i>Marginal revenue</i>
	MSC. <i>Marginal social cost</i>
	N. <i>Nitrogen</i>
	N ₂ O. <i>Nitrous oxide</i>
	NEPA. <i>National Environmental Policy Act</i>

NO _x . <i>Nitrogen oxides</i>	StGB. <i>German Criminal Code</i> (<i>Strafgesetzbuch</i>)
o.v. <i>old version</i>	U. <i>Utility</i>
OECD. <i>Organization for Economic Co- operation and Development</i>	U.S. <i>United States</i>
OWiG. <i>Act on Regulatory Offenses</i> (<i>Ordnungswidrigkeitengesetz</i>)	U.S.C. <i>United States Code</i>
PFC. <i>Petrochemicals</i>	UBA. <i>German Federal Environment Agency</i> (<i>Umweltbundesamt</i>)
PS. <i>Producer surplus</i>	UKG. <i>Law to Combat Environmental Crime</i> (<i>Gesetz zur Bekämpfung der Umweltkriminalität</i>)
Pub. L. No. <i>Public law number</i>	UNEP. <i>United Nations Environment Program</i>
RC. <i>Rational Choice Theory</i>	USA. <i>United States of America</i>
REM. <i>Rational Economic Man</i>	vs. <i>versus</i>
RGBL. <i>Reichsgesetzblatt (Federal Law Gazette of the German Reich)</i>	W. <i>Social welfare</i>
RStGB. <i>Criminal Code for the German Reich (Strafgesetzbuch für das Deutsche Reich)</i>	WTA. <i>Willingness to accept</i>
Stat. <i>Statute</i>	WTP. <i>Willingness to pay</i>
	ZOPA. <i>Zone of possible agreement</i>

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Part 1. Introduction

As rational individuals, managers M1 and M2 try to maximize their benefits. More or less consciously they ask themselves:

“What is the *utility to me* if I order the production of one more diesel-fueled car that emits more than the emission standard of 100 mg/km NO_x?” The social utility has one negative and one positive component:

- 1) The positive component +1 is the manager’s performance payment associated with an increase in sales.
- 2) The negative component – 1 includes the additional air quality loss associated with one more car emitting above the NO_x emissions standard, shared by all individuals, including the managers M1 and M2. However, each manager’s direct negative utility is only a fraction of the summative component – 1.

Thus, any rational manager concludes to order the production of another car, and another, and another; since this conclusion is drawn by a manager who shares the common good air, any pursuit of *his interests* brings *ruin to all*.¹

A. Problem Outline and Actuality

I. The Irrationality and Dimension of (Corporate) Environmental Crimes and the Problem of Sanctioning

Climate change and its social costs probably represent the most salient market failure caused by externalized emissions.² More generally, environmental problems shift the focus to the social costs caused by private and economic activity related to environmental degradation, i.e., the summative negative utility of – 1 mentioned in the NO_x example above. The nature of pollution facilitates the externalization of social costs, allowing corporations and corporate agents (such as managers M1 and M2) to maximize profits. *Prima facie* and, in the short term, this appears rational (efficient); in the long run, however, actions based on an overrepresentation of direct private benefit contribute to the collective irrationality of destroying one’s subsistence. The

¹ The example builds upon Hardin’s description of the tragedy of the commons, cf. Hardin 1968: 1244. For the actual quote, see Part 3.A.II.2.

² Stern 2008: 1.

imbalance between short-term benefits and long-term costs, as well their distribution between the parties who cause and those who are affected, encourages private pursuit of the former to the detriment of common natural resources: Oceans are being overfished, species are disappearing, rainforests are being cut down, and climate change is accelerating. Therein lies the “tragedy of the commons,” portrayed in the NO_x example above.

Environmental degradation highlights the limits of the free market and efficient private action, and thus, the need for regulation based on all members’ welfare to ensure a sustainable society. Environmental crimes (such as violating NO_x emissions standards) disregard these norms in pursuit of private benefits, contributing significantly to the threatening trend of natural degradation. They are “some of the most far-reaching, dangerous, and complex crimes affecting society. They are crimes that may directly affect our health today or the health of untold generations to come. They are crimes that place an immeasurable cost on the public treasury in contending with the still undetermined effects, in cleaning-up existing sites posing substantial endangerments, and in trying to apprehend the violators.”³

Environmental crimes cause harm beyond ordinary crime, depriving future generations of their health, well-being, and prosperity.⁴ In particular, when they are committed within corporate structures, occur systematically, and are large in scale.

In the case of (corporate) environmental crime, however, the problems of modern criminal law are exacerbated: With regards to the agent and act, attributing misconduct and proofing causality is challenged due to modern organizational structures and division of labor.⁵ Evidence gathering is complicated since determining health risks and illegal pollution often requires scientific and technical expertise and must be carried out promptly.⁶ With regard to harm and victim, the perceptibility of being victimized is diminished since the manifestation of harm typically lags in time and is not directly measurable; oftentimes, the agglomeration of acts and related pollution is crucial to its harmfulness.⁷ As a result, victims remain unaware of being victimized, private incentives to sue are undermined, and environmental crimes are partially considered “victimless crimes.”⁸ With regard to the criminal act, the determination of illegal misconduct is challenged since, unlike other crimes, pollution is not *per se* prohibited. Instead, crucial for the illegality of the behavior is typically the violation of an administrative rule, for instance, in terms of a codified

³ Starr 1986: 394.

⁴ Nellesmann et al. 2016: 4.

⁵ Heine 1995: 31 ff. On the experience of practitioners, Gerstetter et al. 2019: 41.

⁶ Gerstetter et al. 2019: 15 f.

⁷ Faure et al. 1996: 554. See also Starr 1986: 383.

⁸ For instance, Sahramäki et al. 2015: 41 f.

emission threshold or a particular duty of care. This (il)legal ambiguity of environmental crimes is captured in the concept of “administrative accessoriness”⁹ or the description as regulatory crimes or *mala prohibita*.¹⁰ For legal enforcement, this means that regulatory control mechanisms are needed to uncover misconduct and that the number of unreported cases is presumably high.¹¹ The consequence is widespread impunity for corporate (environmental) offenders.¹² This seems somewhat contradictory given the increasing social and legal awareness of the relevance of environmental protection¹³ and the related perceived seriousness of environmental crimes.¹⁴

II. Corporate Criminal Liability and the Underrepresentation of Environmental Crimes and a Differentiated Consequential Criminal Law Perspective

The introduction of corporate criminal liability is seen as a partial remedy for the outlined challenges to criminal law enforcement. So far, in Germany, the principle of *societas delinquere non potest* remains and corporations are punished exclusively through the Act on Regulatory Offenses (OWiG). Nevertheless, the demand for corporate criminal liability has never subsided and most recently found its harmony in the draft law of the German Federal Ministry of Justice on an Association Sanctions Act (*Verbandssanktionengesetz*).¹⁵ While the draft did not enter into force and other related legislative procedure are currently missing, the debate on corporate criminal liability is likely to return to the political agenda in the future. Among other things, because of the increase in environmentally related regulatory requirements on corporate behavior, such as the Corporate Sustainability Reporting Directive (CSRD) or the new European Environmental Crime Directive, which entered into force on 20 May 2024.

The latter introduced more severe penalties, including for legal persons, and will assumingly enhance the debate on corporate (criminal) liability and the role of (criminal) law concerning environmentally detrimental behavior. Despite the recognition that environmental damage is linked to economic activity and must, therefore, also be seen in the context of economic criminal

⁹ Concerning German environmental law, Saurer 2017. See generally on the regulatory structure of environmental (criminal) law, Faure & Visser 2004: 57.

¹⁰ On the normative relevance of distinguishing *mala prohibita* and *mala in se* and environmental crimes, M. Parker 2009. Within the context of a climate criminal law, see Haverkamp & Langlet 2023.

¹¹ On the German status quo of the enforcement of environmental crimes, cf. Gerstetter et al. 2019: 15 f., 40.

¹² For instance, on missing criminal claims concerning the Volkswagen scandal, cf. Hotz 2019.

¹³ On the relevance of courts of dealing with climate change, Franzius 2021. On the formation of social environmental movements, Fopp et al. 2021.

¹⁴ In a survey, respondents scored the seriousness at a minimum of 7 out of a 10-point scale, Shelley et al. 2011: 315 f.

¹⁵ Bundesministerium der Justiz und für Verbraucherschutz 2020.

law at the Union level, the discourse in German jurisprudence on economic crimes and corporate criminal liability primarily focuses on legal dogmatic and deontological aspects¹⁶ as well as financial offenses¹⁷. On the international enforcement level, environmental crime is mainly associated with organized crime and illegal trade but less with economic crime as part of everyday business routines.¹⁸ Consequentially, the social function of criminalization (i.e., its goal) as the origin and core of any justifiability and justification – especially in criminal law theory – is largely neglected. The result is a lack of differentiation between the social function of criminal law and sanctions for different crimes and, accordingly, in their design. Indeed, the social goal of criminalizing corporate financial crime may differ from that of criminalizing corporate environmental crime, so the form of regulation, including the design of sanctions, must likewise be different. For corporate criminal liability, this means that corporate criminal liability may be legitimate for the former (financial crime) because it enables the fulfillment of the social function (e.g., monetary compensation) but not for the latter (environmental crime). While dogmatic and normative aspects of corporate criminal liability are relevant, the legal discourse must be expanded by a social, more functional, and consequential perspective, cf. Figure 1. The recourse to corporate criminal liability is purposive. Legislation does not occur randomly but results from and intends to achieve a social goal, cf. Figure 1, box A (punishment) aims to achieve box C (social goal). Namely, in the case of corporate criminal liability, to strengthen compliance by tighter sanctions;¹⁹ in other words, to prevent corporate wrongdoing. Thus, its legitimacy is conditioned by its social consequences, so any analysis of its social and legal reasonability must incorporate a consequential assessment. It must specify the social goal and address whether A serves to achieve C and whether corporate criminal liability serves prevention. This requires knowledge of box B, i.e., the internal structure and logic of incentive processing of the targeted agent.

¹⁶ For instance, cf. Mayr 2022; Sachoulidou 2019. While Sachaoulida's work includes a criminological perspective, it lacks the very contextual and social as well as crime-specific analysis that this work intends to provide.

¹⁷ I.e., while the difficulty of definition is acknowledged, the main approaches in the German debate on the scope of corporate crime refer to the jurisdiction of the Commercial Criminal Division, specified in § 74 c (1) GVG, or the protected legal interest in terms of the functioning of the (financial) market, cf. Brettel & Schneider 2021: 32–34 para 5–10. As a result, the narrative of financial crime is dominating. See on a study on the amount of money involved in corporate and occupational crime, cf. Gottschalk & Glasø 2013.

¹⁸ On a report of Interpol and UNEP and the typical definition of environmental crime, while pointing out its increasing relation to white-collar crimes, cf. Nellemann et al. 2016: 7 f. and 63 ff.

¹⁹ Compare Bundesministerium der Justiz und für Verbraucherschutz 2020: 1; Bundesrat 2013: 1 ff. On the European level, *MEPs support stricter sanctions for environmental crimes* 2023.

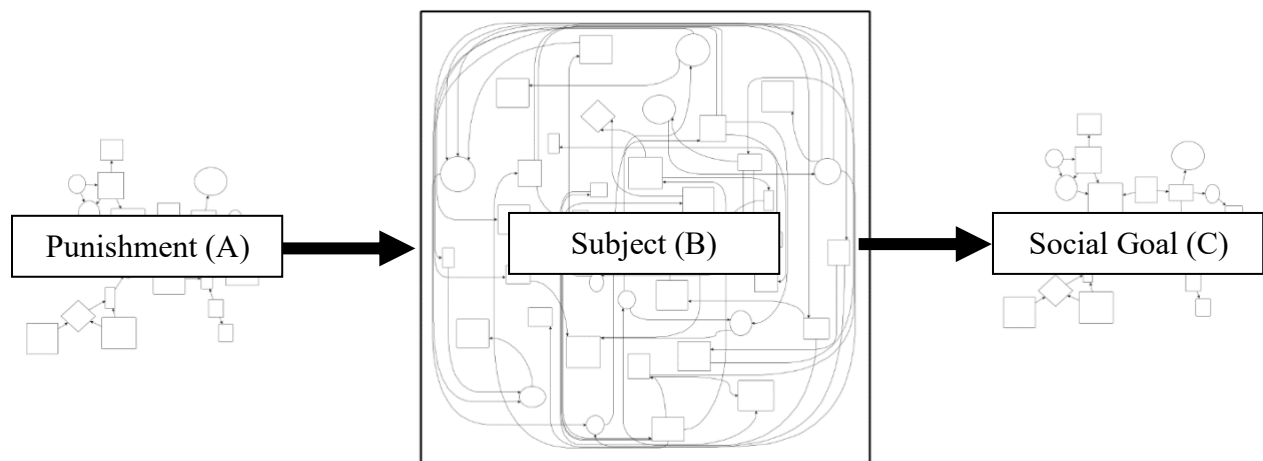


Figure 1 Consequential perspective on criminal punishment

Concerning the former (the specification of the social goal), the focus on monetary crimes also leads to an individualized victim perspective, whose harm can be monetarily compensated. The harm of environmental crimes is, however, collective and societal: Victimization is typically dispersed, widespread, transboundary in scale, and irreversible.

Concerning the latter (assessing whether corporate criminal liability may be appropriate in this regard), it is neglected that knowledge of the meso-micro relationship is essential: If the behavioral incentives, the legal sanctions, apply at the meso level, the company (box B), one needs to know to what extent there is a transfer of the incentives to the micro level, the ultimate actor. However, such insights and empirical evidence of a corporate penalty's more significant preventive effect than a regulatory penalty are lacking.²⁰ Instead, given the political power of corporations and corporate representatives, the question arises whether corporate criminal liability is not more of a convenient shield for managerial liability.²¹ The result is that introducing corporate criminal liability may have unintended social, environmental, and economic effects, distort intended behavioral incentives, and ultimately imply that criminal and environmental law targets are unmet.

B. Research Gap and Intended Contribution

The outlined threat of (corporate) environmental crime, its widespread impunity, and the risk of failure to achieve social, legal, and economic objectives by resorting to corporate criminal

²⁰ Saliger 2015: 24 f.

²¹ See on this, Khanna 2004. Khanna argues that corporate crime legislation allows to satisfy the public demand for increased enforcement while imposing relatively minor costs to corporate interests.

liability can only be investigated through contextual and interdisciplinary analysis. Existing work, however, predominantly focuses on environmental law,²² environmental criminal law,²³ environmental law and economics,²⁴ and corporate or environmental crime while paying less attention to their connectivity. For example, it analyzes how corporate criminal liability can be introduced²⁵ without taking into account the societal goal of criminalization, and thus, the question of whether corporate criminal liability promotes or hinders the achievement of the same. There is a lack of a differentiated criminal law perspective on the respective offense (corporate environmental crime), the social goal of its sanctioning, and its corresponding design and associated behavioral incentive system.

The same applies to the relation between environmental criminal law and environmental law. While there is research on their individual functions and designs, their interplay and structural significance and whether they compose a coherent regulatory system have not yet been explored. The present work aims to close this research gap by providing an overarching perspective, focusing on structural links between environmental and criminal law, criminology, law and economics. The aim is to enable the exploration of intersections between the economic and legal perspectives on crime and criminal behavior. A subsequent case application and analysis give practical meaning to the theoretical content. This holistic analysis may assist policymakers in designing tailored (legal) interventions consistent with underlying social, environmental, and economic objectives and realities (on policy implications, cf. Part 5.C).

The contextual and interdisciplinary analysis implies that the work involves criminological, sociological, legal, and economic domains and focuses on structural relations. By implication, this also means that not all scientific questions will be analyzed in detail and conclusively; rather, the work aims to contribute to a reflective practical understanding through its interdisciplinary and context-sensitive approach.

²² For instance, Vierhaus 2014.

²³ See Saliger 2020.

²⁴ Such as Endres 2007; Faure & Partain 2019; Gerstetter et al. 2019.

²⁵ For instance, Heine 1995.

C. Research Design

I. Method and Rationale: The Economic Analysis of Law

Since the late 19th century, the law and economics movement has gained increasing attention, and the economic analysis of law method has acquired considerable theoretical weight. This holds especially true for the Anglo-American²⁶ and less for the German sphere, where legal scholars remain skeptical.²⁷ A primary contributor to this is its alleged claim to theoretical universality.²⁸ Within this, applying the economic analysis of law, including the theory of rational choice and the efficiency principle, to criminal law is assumingly even more controversial. For the study of the regulation of corporate environmental crimes, the method is though argued as particularly suitable:

On the micro level analysis, the corporate agent appears well suited for applying the economic model of rational utility-maximizing decision-making. On the macro level analysis, the accessoriness of environmental criminal law implies an inherent economic foundation and structuring principle since the illegality of the act concerned is conditioned by its regulatory prohibition. This embeds environmental criminal law in the broader institution of environmental law. Environmental law, in turn, is shaped by environmental economics and policy,²⁹ which builds upon, for a large part, microeconomics. Simplified, the relationship between these scientific and policy areas can be portrayed as:

Microeconomics → Environmental Policy and Economics → Environmental Law →
Environmental Criminal Law

Thus, if we start from the back and conclude that environmental criminal law is an essential part of environmental law and is shaped by regulatory (administrative) environmental law structured by economic policy and principles, then the same applies to environmental criminal law. This means that the recourse to criminal law is part of an instrumental choice of environmental policy.³⁰ Therefore, its function and design cannot be understood in isolation; they can only be

²⁶ Mahlmann 2020: 253 para 1.

²⁷ For an exemplary debate, see Fezer 1986; Hannemann et al. 2013; Ott & Schäfer 1988.

²⁸ “Indeed, I have come to the position that the economic approach is a comprehensive one that is applicable to all human behavior,” see Becker 1976: 8.

²⁹ On the economics of German environmental law, cf. Siems 2005.

³⁰ For instance, Faure & Visser 2004: 73.

understood contextually in relation to environmental policy and economics. In other words, understanding the economic principles and logic underlying environmental law is crucial to investigating the role of criminal law.³¹ On the macro level, the economic analysis of law can thus contribute to investigating the socio-legal function of environmental criminal law. Therefore, “the combination of environmental legal doctrine and law and economics has a huge potential. [...] [so] there is all the more reason to pay more attention to this fascinating area of the law and economics of environmental crime in the future.”³²

This does not mean that criminal law loses or should give up its basic principles and objectives or that the economic analysis of law can explain or should guide in all aspects. Criminal law remains criminal law. Therefore, the inherent morality of criminal law should not be denied since the value of the economic perspective is closely linked to the political and legal framework it applies.³³ However, given the intrusiveness of criminal law to individual freedom, there is a strong need for greater intersubjectivity and specificity in its analysis. In this sense, the economic analysis offers a functional understanding and is especially fruitful if complemented by legal theory so that social values inherent to legal principles can serve as a corrective. Against this background, this work aims to complement the economic analysis of environmental (corporate) crime regulation with legal approaches. The intent is to take a step back, ask, and subsequently analyze contextual and structural questions through legal, criminological, and economic methodological concepts and frameworks. The work further aims to strengthen interdisciplinarity and the legal incorporation of perspectives from other disciplines to foster a dynamic exchange and the openness of German legal scholarship to the international dimensions of law and legal research.³⁴

Interdisciplinary work is particularly challenging because, as an analyst, one is operating in an unfamiliar field, yet it is essential to transcend the boundaries of individual scientific disciplines. And by this, to do justice to the scientific embedment of legal sciences³⁵ and the fact that most modern problems cannot be solved by one discipline alone.³⁶ While each scientific perspective

³¹ As Faure observes correctly that “[i]t is appropriate that a discussion of the fundamental concepts of environmental law includes an analysis of the economic approach to environmental governance. It is well recognized that environmental law [...] is one of the more ‘multi-faceted’ fields of law. They involve not only administrative regulation but also civil liability and criminal liability [...] it is difficult to analyze the function of environmental law without understanding the goals of environmental policy more broadly,” Faure 2016: 111.

³² Faure & Visser 2004: 73.

³³ See Klevorick 1985b: 290. Klevorick argues that the economic theory must acknowledge the legal and political conditions concerned.

³⁴ On this demand, for instance, Wissenschaftsrat 2012: 7 f.

³⁵ Compare Wissenschaftsrat 2012: 33.

³⁶ Brandt 2018: 12.

is valuable in its own, combining them increases their individual value. When ideological notions of disciplines and categorical scientific boundaries are overcome, it is not uncommon to find that two supposedly incompatible disciplines are more in agreement than previously thought. Therefore, this work can be understood as an invitation to use different scientific perspectives to get closer to reality. It can also be understood as an invitation and a mandate to continuously ask and analyze fundamental theoretical questions in the face of ever-changing social factual circumstances.

II. Research Questions and Procedure

Since the economic analysis of law comes from the U.S. (United States) -American legal sphere, much of it will be shaped by it. This work focuses not so much on a specific legal system, a dogmatical question, or specific criminal elements such as guilt or *mens rea* requirements. Instead, the aim is to provide a social perspective based on an economic and institutional analysis of criminal law, its embedment within the regulatory regime of environmental law and harm, and the related question of its objectives and design. The main guiding questions operate on the macro and micro, as well as the normative and positive levels of analysis, cf. Figure 2.

On the macro level, the question is normative and on the function of environmental criminal law (ECL):

1. *What is the function/goal of criminalizing (corporate) environmentally harmful conduct?*³⁷

The next question is positive and penetrates the scope of analysis to the micro level to investigate how this goal can be achieved.³⁸

2. *How must environmental criminal law be designed to realize best the function/goal it is intended to achieve?*

³⁷ Cf. Box C in Figure 1.

³⁸ Cf. Box A in Figure 1.

This question leads the analysis to a sub-question, dealing with the targeted subject and the interplay between the meso and micro level (cf. arrow in Figure 2) if the sanction is imposed on the corporate (meso level) instead of the individual (micro level) actor.

3. *To what extent does corporate criminal liability serve to realize the function/goal of environmental criminal law?*³⁹

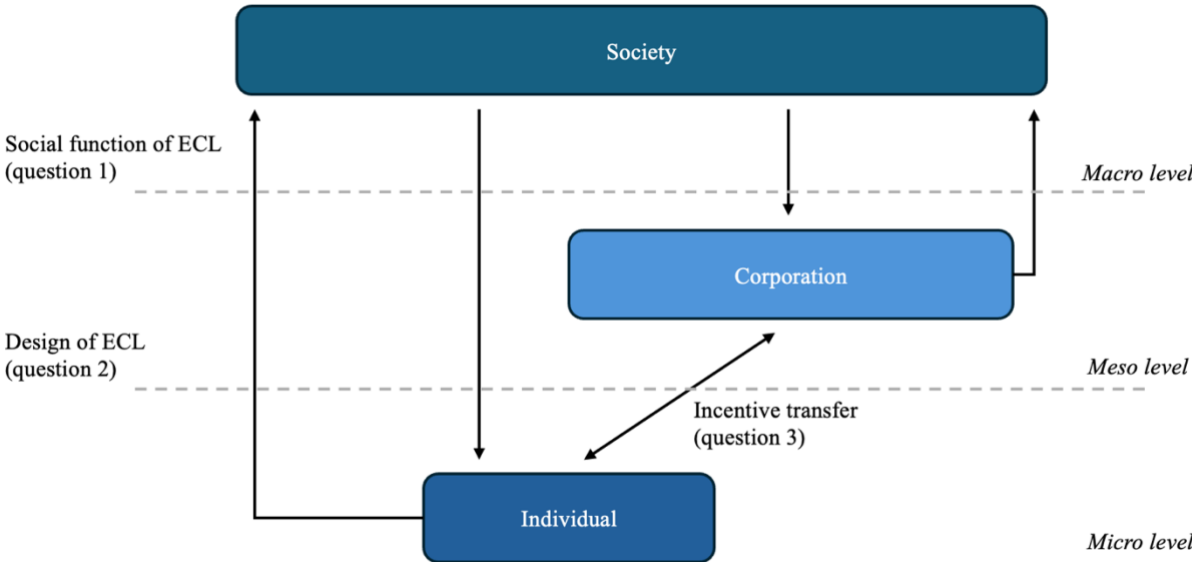


Figure 2 Macro, meso, micro level interplay between the goal and design of ECL

More specifically, the following steps will be taken to penetrate down from research question 1 → research question 2 → research question 3, from the macro to the meso and micro level and their interplay.

This work starts with examining law and economics as scientific disciplines to explore the potential for an interdisciplinary approach, as represented by the economic analysis of law, Part 2.A. The economic analysis of law is presented in its basic features and methodological points of connection to the law. The overview helps to understand possible misunderstandings, points of conflict, and potential collaboration between the two sciences.

After that, the basic concepts, the so-called “economic paradigm,” which form the basis for the analysis and are applied in the subsequent parts, will be investigated together with their limitations, cf. Part 2.B. This knowledge is central to the further investigation of the normative social function of environmental criminal law (question 1) as well as the positive level analysis

³⁹ Cf. Box B in Figure 1.

of how this can be realized, which relates to research questions 2 and 3. In Part 3, the general economic perspective on regulation is the subject of analysis (more specifically, Part 3.A). The aim is to outline the need and function of regulation within the standard market system and its failures. The latter is especially important for the subsequent inquiry since it broadens the economic scope of application for public regulation and its relevance to allocative efficiency. The basic framework of and insights into the need and function of regulation within the standard market system and its failures will then be applied to and assessed for the regulation of inefficiencies related to environmental goods., i.e., market failures in terms of environmental externalities and public goods, cf. Part 3.B. Understanding the need and function of environmental regulation, i.e., environmental law more broadly, allows investigating and determining the function of environmental criminal law within the above-mentioned research question 1 – which leads to Part 4.

In Part 4, the focus will be on the economic analysis of criminal law as a subdiscipline of the economic analysis of law, which applies the economic concepts and methodology of Part 3, more specifically to the legal regulation of crime. The subject of analysis will be the (philosophical) development of the economic analysis of law and its embedment within criminal law theories (Part 4.A). Subsequently, in Part 4.B, the positive economic rational choice model and the normative efficiency principle will be investigated within the area of criminal law in general and then tailored to regulating corporate environmental crimes more specifically. The positive analysis will be complemented by criminology and forms the basis for research question 2. The normative part includes the unique feature that it will be expanded by a legal institutional inquiry, allowing for normative complementation of the economic perspective. In this respect, the aim is to investigate the extent to which the economic and the legal perspectives share commonalities concerning the function of criminal law for regulating corporate environmental crimes, i.e., research question 1. The insights of Part 2, i.e., the function of (criminal) law within the broader environmental law regime, will support the interpretations and conclusions drawn. After the social goal forming the legal target is defined, the analysis will explore the desirable form of regulation (research question 2) based on the positive economic model in general and applied to corporate environmental crimes, more specifically. This leads to question 3, dealing with recourse to corporate criminal liability as part of the design of (environmental) criminal law to achieve the intended social and legal goal (research question 1). Question 1, on criminal law and its objective, starts at the macro level, while the question on corporate criminal liability (question 3) is on the micro (meso) level. The work aims to link these different levels of analysis by using

a structural approach, focusing on connections and contexts. By implication, specificity is partially subordinated, so this work does not claim to analyze all aspects in scientific detail and conclusiveness. Instead, specific central elements are selected to explore and better understand the outlined connections.

The overall structuring principle is that the general framework will be portrayed first and subsequently tailored to the regulation of (corporate) environmental harm and, later, corporate environmental crime, exemplified by case studies and examples. Case examples are constructed throughout the work to make the theoretical models and concepts accessible, using real-life figures where possible and appropriate. For the most part, however, variations and simplifications are used to reduce complexity and illustrate the theoretical aspects, so no claim is made to “real-life” accuracy; instead, the exemplary presentation illustrates the basic principles. The leading case example builds upon the Volkswagen diesel scandal and accompanies the theoretical framework by making it accessible through its case application. It should be noted that appropriate modifications were made to the diesel case for complexity reduction, so the illustrations do not claim to be factual; rather, the modified case serves to underpin the practical relevance of the theoretical aspects. The careful selection of theoretical aspects to evaluate realistic individual cases is one of the most important values of this work since, in science, there is often a tendency to try to find a general theory. However, since crime categories are socially constructed and involve complex variables related to the actor, the behavior, and the victim, it resembles an undesirable attempt to adapt reality to theory rather than *vice versa*. In this respect, the new value of the work lies in the case-specific approach and the correspondingly sensitive selection of the theoretical framework. This reveals that some accepted legal-economic conclusions are not as reasonable and consistent as claimed if the underlying analysis remains abstract and generalized. However, this also means that the conclusions and findings of this work do not claim to be equally applicable to all phenomena or methodologically valuable.

Part 5 ends the analysis with a resumé and theses, (re)addresses the contribution and questions of this work, and provides for a research impetus and outlook.

The language forms male, female, and diverse (m/f/d) are not used concurrently for better readability. Thus, if a gender-specific term is used, it applies equally to all genders. Using abbreviated forms of language has exclusively editorial reasons and does not represent any valuation.

III. Definitions and Respective Scope of Analysis

1. Environmental Crime

Environmental or green crime is a concept that encompasses a broad range of environmentally harmful behavior and definitional dynamic concepts. The development of a criminological and legal interest in environmentally harmful behavior is to be understood in the context of the emergence of a social awareness of the detrimental environmental consequences of industrialization and the emergence of an environmental movement, especially in the 1980s and 1990s.⁴⁰ Since then, a variety of different conceptualizations and research approaches have emerged, of which two main strands can be identified: The narrow approach understands crimes in terms of positive law and accordingly includes in the study the behaviors that are regulated by criminal and regulatory law; the broader approach, examines all environmental behaviors and thus includes social, economic, and political practices, such as commodification or concepts like greed.⁴¹

In this work, the term is understood in the former narrow sense as an act or omission of an act that violates codified law and is subject to criminal law enforcement.⁴² The interest is in behavioral norms that are part of the regulatory instruments of the environmental law regime. In particular, the focus is on environmental standards as command-and-control instruments, understood as (typically administratively) codified rules of conduct for harm prevention,⁴³ whose violation is subject to criminal law. The understanding of standards is not limited to environmental criminal norms with open terms, such as “reasonable care,” but includes norms that directly prescribe or prohibit behavior, such as maximum emission standards. In U.S.-American law, the regulated conduct is specified as crimes in federal laws,⁴⁴ in German law, in the 29th section of the German Criminal Code (StGB).⁴⁵ The perspective on corporate

⁴⁰ Lynch 1990: 3. See also on the development of the legal environmental regime in the 1980s and 1990s, Part 4.C.IV.3.

⁴¹ For an informative overview, Haverkamp 2020: 459 ff. On the broad approach, the “greening of criminology” and “green crimes,” cf. Lynch 1990: 3 f.; 2020: 52–55.

⁴² Situ & Emmons 2000: 3. Which equals the dominant understanding within German sciences, cf. Haverkamp 2020: 461 f.

⁴³ It should be noted that there is a difference between the term “standard” in economics and law. While the economic term standard generally refers to a specific target or quality standard that is relevant for defining optimality conditions for certain environmental components, the legal term generally refers to specific administratively prescribed measures to prevent damage, cf. Faure & Partain 2019: 64.

⁴⁴ Although legal environmental protection also takes place at the state or municipal level, Thaman 1994: 386.

⁴⁵ Environmental criminal law, in the broader sense, includes all norms that sanction environmentally harmful behavior with a criminal penalty, e.g., § 27 Chemicals Act (ChemG), cf. Saliger 2020: 4.

environmental crime regulation is thus external, i.e., from a regulator perspective, and less internal, in terms of corporate compliance strategies.

2. Corporate Crime

The term “white-collar crime” was coined by Edwin Sutherland, who defined white-collar crime as “a crime committed by a person of respectability and high social status in the course of his occupation.”⁴⁶ Since then, the concept has increasingly evolved to address the complexity of involved interests, actors, actions, and external phenotypic harm manifestation. Definitions encompass offense- and offender-based approaches,⁴⁷ and concepts such as occupational⁴⁸ and organizational crime⁴⁹ or individual and organizational deviance⁵⁰ have evolved. The debate on conceptual and theoretical differences and definitions is still ongoing.⁵¹

One main distinguishing characteristic of corporate crime from other types of white-collar crime is assumed to be the reliance on organizational means and resources to reach organizational goals.⁵² Within this, crimes benefiting the agent are described as occupational, and crimes benefiting the organization as corporate crimes.⁵³ While some definitions include the corporation as a potential actor,⁵⁴ the approach in this work focuses on the individual as the agent acting on behalf of the corporation. Thus, while the crime may benefit the corporation, applying the economic model to corporate agents renders conceptualizing corporate crime as exclusively aiming at collective goals unreasonable.⁵⁵ Instead, it must be assumed that the agent is – at least to some extent – engaging in misconduct to derive individual (in)direct benefits, such as an increased salary or status.⁵⁶ The collective goal is not the sole or ultimate, but rather the

⁴⁶ Footnote omitted, cf. Sutherland 1983: 7.

⁴⁷ Benson 2021: 3 f.; Brettel & Schneider 2021: 34 ff. para 11 ff.

⁴⁸ Cf. on this Friedrichs 2002.

⁴⁹ For instance, Reiss & Tonry 1993; van de Bunt & Huisman 2007.

⁵⁰ The term deviance is rather a sociological and criminological concept, used to highlight informal organizational structures to explain the wrongdoing; for a sociological perspective on bribery beyond formal regulation, compare Pohlmann et al. 2016.

⁵¹ On different criminal law and criminological approaches, cf. Brettel & Schneider 2021: 33 ff. para 1 ff.; Simpson et al. 2014: 8 ff., stating that this impedes criminological studies.

⁵² Simpson et al. 2014: 8 f.

⁵³ For instance, on organizational and occupational misconduct, Gottschalk 2018: 111; Krawiec 2005: 598. Distinguishing corporate crime and embezzlement, Simpson 2002: 6 ff.

⁵⁴ Defining corporate crime “as a conduct of a corporation, or of individuals acting on behalf of the corporation, that is proscribed and punishable by law,” (footnote omitted), Braithwaite & Geis 1982: 294. Posner defines “white-collar crime” as “nonviolent crimes typically committed by either (1) well-to-do individuals or (2) associations, such as business corporations and labor unions,” see Posner 1980: 409.

⁵⁵ See further on organizational theory and the idea that “[i]n reality, organizations are collections of individuals who attempt to achieve their own personal objectives through their membership in the organization,” Baysinger 1991: 347.

⁵⁶ Krawiec 2005: 598.

instrumental goal to achieve personal goals and benefits: "Corporate crimes are not committed by corporations; they are committed by agents of the corporation. These agents are rational, self-interested utility maximizers who commit crimes in order to benefit themselves. In pursuit of his self-interest, an agent may commit a crime that incidentally benefits the corporation, but this is not its purpose."⁵⁷ However, aspects of individual and collective criminogenic interests and benefits will be subject to further analysis in this work.

3. Law and Legal Penalties

The term law is understood as including all positive law that governs society, from contract law to constitutional law, etc.⁵⁸ The economic analysis evaluates the various legal enforcement mechanisms from the point of view of efficiency. Since legal sanctions can be imposed through tort or administrative law, which are typically less costly procedures than criminal law, key questions in the economic analysis concern their distinctiveness and the necessity of the latter. While highly normative considerations shape the legal debate over the distinctiveness of regulated behavior and are still ongoing,⁵⁹ the economic answer is much more functional and straightforward and has been discussed in depth.⁶⁰ Thus, this work will focus on public sanctions imposed via criminal law enforcement in terms of imprisonment and fines; questions related to tort law as a private enforcement mechanism are indirectly involved in analyzing the limits of private or market-based legal solutions to environmental externalities.⁶¹

4. Market, Property Rights, and Transaction Costs

The term "market" is broadly understood as a place or arrangement enabling parties to trade and exchange resources. It is not limited to the traditional understanding in terms of consumers and producers and market goods but refers to resources as any means that facilitate the achievement

⁵⁷ Footnote omitted, see Arlen 1994: 834.

⁵⁸ Similar Mercurio & Medema 2006: 28 ff.

⁵⁹ For instance, Coffee 1991; Marshall & Duff 1998.

⁶⁰ Concerning tort law and the economic rationales for relying on public instead of private enforcement, Polinsky & Shavell 2000; Shavell 1984; 1993; 1997. Within environmental economics, Faure & Partain 2019: 145 ff. On the limitation of administrative law and sanctions, compare Svatikova 2012: 140. Especially when insolvency risks arise on behalf of the subject, administrative sanctions reach their efficiency limitations since they do not allow to rely on non-monetary sanctions such as imprisonment, Faure et al. 1996: 559. Cf. also Faure 2020: 82 f. Further, the rather cooperative strategy of administrative agencies may undermine imposing required sanctions and has the inherent risk of conflict of interests, cf. Faure & Visser 2004: 67. On potential advantages of cooperative strategies, cf. Fenn & Veljanovski 1988.

⁶¹ Cf. generally on limitations of private solutions to externalities, Part 3.A.III.5; in cases of environmental externalities, Part 3.B.III.2.c.

of a particular goal and thus includes much more informal ways of organizing the exchange of resources, such as private relationships. The main conditions are the definition of property rights and low transaction costs. The former is understood as a “bundle of rights” specifying the use of a specific resource, including the right to appropriate the yield from the use of a good (*usus fructus*), the right to change the form of a good, to destroy or to divest oneself of the right (*usus abusus*), and the right to sell/transfer the good (*usus abutendi*).⁶² The latter refers to all costs incurred throughout the transaction process that may hinder the negotiation's success, including identifying the party with whom to negotiate, obtaining relevant information, negotiating and monitoring the negotiation, and implementing and monitoring the outcome.⁶³ They are understood broadly, including any aspect hindering the agreement of parties involved,⁶⁴ such as wealth or endowment effects.⁶⁵

⁶² Schäfer & Ott 2020: 76. The term is thus broader than the German concept of “*Eigentum*” (ownership), as recognized in the German Civil Code (BGB) and codified in §§ 903, 929, 985. On this, Schmidtchen 1998: 4 f.

⁶³ Compare Coase 1960: 15.

⁶⁴ Calabresi & Melamed 1972: 1094 f. Information asymmetries and strategic behavior may be portrayed as a form of information costs in terms of transaction costs, Medema 1999: 223 ff.

⁶⁵ Cf. Mathis 2019: 83 ff. This means that the Pareto-optimal solution depends on the initial allocation of wealth, cf. Calabresi & Melamed 1972: 1095 f. Since wealth affects the bargaining outcome by determining an individual's willingness to pay for a good. See further on the relevance of the right and wealth structure, Samuels 1974: 2 ff.

Part 2. Foundations of the Economic Analysis of Law

A. The Relationship between Legal and Economic Sciences and the Classification of the Economic Analysis of Law within

The relationship between law and economics, both disciplines that strive to increase knowledge and understanding, is neither constant nor uncontroversial.⁶⁶ Interdisciplinary work typically encounters obstacles due to, among other things, different methodologies and ways of thinking that complicate communication and foster misunderstanding.⁶⁷ Adequate inclusion and recognition of the findings resulting from a synthesis of the two disciplines must therefore be sensitive to the differences between the two disciplines.⁶⁸ For this, their self-concept and object of research are crucial. They are first examined independently, focusing on the core aspects of the German and the U.S.-American legal spheres to investigate overlaps between law and economics. Subsequently, the main components of the economic analysis of law are examined to explore possibilities of methodological embedding in legal sciences. Herby, the previously discussed self-conception of jurisprudence is central as it defines the scope of application.

I. Research Subject and Mode of Legal Sciences

Generally, the law is seen to be guided by or aiming at realizing social ideas such as justice, freedom, or human dignity.⁶⁹ Thereby, legal science(s) usually proceeds inductively and focuses on a specific case to which established legal principles and doctrines are applied in order to find the “right” answer.⁷⁰ The aim is to understand legal issues in a broader context based on a historical legal order.⁷¹ Contextual and historical legal analysis requires recourse to other

⁶⁶ Compare Behrens 1986: 6 ff.; Drexl 2020: 18 f.; Towfigh & Petersen 2017a: 2 para 1.

⁶⁷ Kirchgässner 2013a: 1 f.

⁶⁸ Mercurio & Medema 2006: 34.

⁶⁹ Wissenschaftsrat 2012: 25. On law as an instrument of social control/technology cf. also, Noll 1973: 33.

⁷⁰ This does not mean that jurisprudence is limited to induction, there are also deductive processes in law; for example, when specific rules and guidelines are derived from higher-level doctrines or principles in order to maintain the systematicity and coherency of the legal system, cf. Mercurio & Medema 2006: 41 f.

⁷¹ Which Larenz and Canaris consider as jurisprudence in a narrow sense, not including other disciplines such as legal sociology, cf. Larenz & Canaris 2013: 7. The understanding of jurisprudence or legal science in this work is broader and also includes subdisciplines, such as legal sociology or history.

scientific fields, such as philosophy, history, sociology, and anthropology, which implies the diversity of law as a science.⁷²

Against this background, the Britannica distinguishes three main branches of jurisprudence, each of which concerns different areas of legal norms,⁷³ cf. Figure 3: The analytical branch, which formulates axioms and defines terms as well as specifies the methodologies that allow the legal system to be most self-consistent and logical; the sociological branch, which studies the actual impact of law in society and how social phenomena shape the substantive and the procedural dimensions of law; the theoretical branch that investigates and criticizes law concerning its postulated aims. While the first branch deals with current law, *de lege lata*, the sociological and theoretical branches are also concerned with prospective law, *de lege ferenda*.⁷⁴

The analytical branch thus starts with the legal rules in place, while the sociological branch deals with its social impact, i.e., studies its behavioral effect. The theoretical branch is concerned with the broader societal goal, cf. Figure 3. The diversity of research interest implies the diversity of sub-disciplines. Therefore, within these three branches, different sub-disciplines exist, such as legal sociology or legislative theory.⁷⁵ The three perspectives are interrelated and, to a certain extent, mutually dependent since the description of current law allows a better study of its social consequences, to which criticism and proposals for reform can then relate.

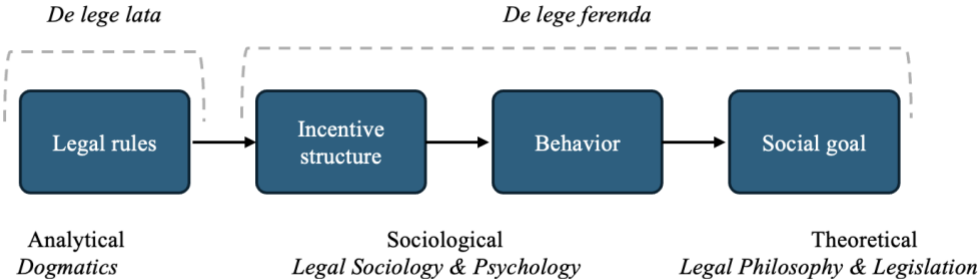


Figure 3 The scientific branches of legal sciences⁷⁶

⁷² Compare the Brockhaus definition of jurisprudence as “the science of law. It is related to the other humanities and social sciences. It relies increasingly on knowledge from the natural sciences (especially medicine, psychology and biology). Legal science includes legal philosophy, history, sociology, theory, ethnology, dogmatics, politics, comparative law, and computer science. The practical core of jurisprudence is legal dogmatics, i.e., the knowledge, interpretation and further development of the applicable law,” (translated by the author), cf. Brockhaus 2021.

⁷³ Encyclopedia Britannica 2021.

⁷⁴ See generally on different perspectives inherent in legal branches, Towfigh & Petersen 2017a: 8–19.

⁷⁵ It should be noted that this numeration is not conclusive and further disciplines, such as legal history or methodology, exist. The focus is limited to the aspects of legal sciences that are most relevant to the analysis of this work and the economic analysis of law as a methodology.

⁷⁶ Figure 3 was inspired by Mercurio & Medema 2006: 32 f.

In the United States, the sociological and theoretical branches are predominant,⁷⁷ cf. Figure 3. Following this, the focus is more on empirical and social legal studies and an understanding of law in relation to social order.⁷⁸ For this, ideas and theories of social sciences are incorporated into legal research, and the social perspective indicates an instrumental understanding of law designed for social objectives.⁷⁹

In contrast, in Germany, the analytical perspective⁸⁰ and the focus on the current law⁸¹ prevail, cf. Figure 3. Its dogmatic doctrine is considered the “brand essence” of German legal sciences.⁸² Legal dogmatics are a judicial manual of positive law.⁸³ The subject of analysis is the content of positive law in the form of cases and doctrines, aiming to derive central principles.⁸⁴ Recourse to these central principles then provides consistency and coherence in the creation and interpretation of the law by structuring the legal order and serving as an axiological basis for legitimizing and rationalizing jurisprudence.⁸⁵ The process of knowledge by studying well-established, permanent, and coherent principles and doctrines ought to lead to the “right” answer and is decisive for the scientific autonomy of law.⁸⁶

The analysis of the legal systems in the two countries shows that the dominance of one aspect of jurisprudence and the associated self-conception is crucial to the scope of research in legal sciences.⁸⁷ This is crucial to the extent to which the economic analysis of law can find application and be fruitful in legal analysis.

⁷⁷ Towfigh & Petersen 2017a: 8 para 15 and page 16 para 40.

⁷⁸ For a comparison in depth, also relating to the historical origins of both legal traditions, see Herget 1996: 104 ff.

⁷⁹ On the historical development from doctrinarism to a more social understanding of legal sciences, Mercurio & Medema 2006: 12 ff.

⁸⁰ Herget 1996: 104 ff.; Towfigh & Petersen 2017a: 8 para 15 and page 16 para. 40. German jurisprudence is characterized by a comprehensive conceptual-systematic approach to law, cf. Wissenschaftsrat 2012: 25.

⁸¹ Petersen 2010: 446. See critically on this and suggesting that legal sciences should begin its analysis before the positive law, with the social conflict that arises and to which the legal norm applies, Steininger 2015: 1074.

⁸² Translated by the author, the German term is “*Markenkern*,” see Jestaedt 2017: 260. Different Bumke, who argues that it is not the “brand essence” but rather the dominating disciplinary branch, Bumke 2014: 650.

⁸³ For an investigation into the essence of legal dogmatics, see Bumke 2014.

⁸⁴ Bumke 2014: 641.

⁸⁵ Mahlmann 2020: 391 ff. para 15 ff.

⁸⁶ Mercurio & Medema 2006: 42.

⁸⁷ Herget argues that American scholars may learn from German scholars in conceptualizing jurisprudential theory and philosophical theory to develop epistemological and ontological underpinnings of legal theory; reversely, German scholars would benefit from incorporating a more empirically informed approach, cf. Herget 1996: 120.

II. Research Subject and Mode of Economic Sciences

Economics is concerned with social welfare and the optimal allocation of resources under the condition of scarcity.⁸⁸ Scarcity means that available resources are limited relative to human wants.⁸⁹ Thus, social welfare is maximized when scarce resources are allocated to achieve the highest satisfaction of human needs.⁹⁰ Two subsystems condition the functioning of the redistributive system in the form of the market: (1) a system in which property rights are formally assigned that determine who is the owner of a good and what opportunities they have to use, dispose of, and suspend it, and (2) a contract system that allows for the trade of goods and services between owners to facilitate the optimal allocation of resources.⁹¹

Traditionally, economics can be distinguished into microeconomics and macroeconomics. While microeconomics deals with the behavior and decision-making processes of individual economic units, such as consumers or firms, and attempts to explain how decisions are made and how they affect changes in prices or income; macroeconomics is concerned with aggregate economic variables, such as the level and growth of unemployment.⁹² In order to study micro- and macroeconomic processes, economics uses a toolbox of theories and models. Abstract concepts and models, often expressed mathematically, are used to make behavioral predictions and specific hypotheses.⁹³ Economic empirics then aims to falsify these hypotheses by empirical testing in real-life scenarios.⁹⁴ Economists deduce conclusions if falsification fails and the model or theory is considered useful.⁹⁵ Economic theory can work positively and normatively. The positive theory aims at explaining and proposing specific developments in the economic field, while normative economics addresses whether those developments are desirable in terms of efficiency.⁹⁶ Based on this, policy recommendations of specific rules or institutions are provided.⁹⁷

⁸⁸ Posner 2014: 7; Salvador Coderch & Terra Ibáñez 2019: 1245. “[M]icroeconomics is also about *ways to make the most of these limits*. More precisely, it is about *the allocation of scarce resources*,” emphasis adopted, cf. Pindyck & Rubinfeld 2013: 4.

⁸⁹ Kolmar 2017: 4; Posner 2014: 3. See also Leschke 2012: 22 ff.

⁹⁰ Schäfer & Ott 2020: XI.

⁹¹ Salvador Coderch & Terra Ibáñez 2019: 1245.

⁹² Pindyck & Rubinfeld 2013: 3.

⁹³ The mathematical expression allegedly complicates interdisciplinary understanding, see Mercurio & Medema 2006: 41 f. See also Towfigh & Petersen 2017a: 23 f. para 57 f.

⁹⁴ Mercurio & Medema 2006: 41 f.; Towfigh & Petersen 2017a: 24 para 59 f.

⁹⁵ This does not mean that *all* modes of reasoning are deductive, but *most*, see Mercurio & Medema 2006: 41 ff. Also Towfigh & Petersen 2017a: 23 f. para 57 f.

⁹⁶ Cf. Steinbach & Aaken 2019: 4 para.11.

⁹⁷ Schäfer & Ott 2020: XI.

During the neoclassical period, the object of research in economics was limited to studying the market as the locus of transactions that enable the redistribution of resources.⁹⁸ The main focus was on market conditions as the most apparent control mechanisms.⁹⁹ Accordingly, concepts and models were tied to the traditional concept of the “market,” which limited their generalizability and thereby the possibilities for transfer to and application in other disciplines.¹⁰⁰ This meant that economics was primarily defined by its research object, not its methods.¹⁰¹ Since the 1960s, however, the *economy* disappeared as a constitutive element of economics and methods and concepts of *economics* became the new economic proprium.¹⁰² From then onwards, the focus was on human behavior and decision-making in social life in general, including family and criminal behavior.¹⁰³ The focus on human decision-making understood as “economic activity,” apart from classical market behavior, facilitated the expansion to research areas that had previously been the subject of other disciplines.¹⁰⁴ The central premise of studying “economic activity” is that collective and individual behavior can be explained as a consequence of scarcity.¹⁰⁵ Based on this, economics can be understood as a general decision theory of purposeful decision-making under given circumstances,¹⁰⁶ i.e., scarcity.¹⁰⁷ In this context, the concept of the “market” experienced an extension or generalization, now understood as a locus or mechanism of resources.¹⁰⁸

In Germany, the distinction between *Ökonomie* and *Ökonomik*¹⁰⁹ captures this development towards a methodological and social science understanding of economics. Whereas the former refers to the traditional subject of economics in the form of micro- and macroeconomics, the latter describes the application of economic concepts and instruments to non-economic

⁹⁸ Behrens 1986: 22; Kirchner 1997: 10; Towfigh & Petersen 2017a: 2 para 1.

⁹⁹ Behrens 1986: 22 f.

¹⁰⁰ Kirchner 1997: 10; Towfigh & Petersen 2017a: 2 para 1.

¹⁰¹ Posner 2014: 30.

¹⁰² See further Kirchner 1997: 11 f.; Towfigh & Petersen 2017a: 2 f. For a detailed portrayal of the historical development of the different branches, see Mercurio & Medema 2006.

¹⁰³ Most prominently Becker, who advocates for a broad approach and application of economic methodologies and concepts, cf. Becker 1976. Becker applied the economic way of thinking to various fields of human life, including family or criminal decision-making.

¹⁰⁴ The extension of economics to “all areas of life” meant that other social sciences started to perceive economics as a competitive discipline with imperialistic tendencies, Kirchner 1997: 11 f.; Towfigh & Petersen 2017a: 2 para 2 and page 3 f. para 5 f.

¹⁰⁵ Kolmar 2017: 4. See further Part 2.B.I.1 on methodological individualism.

¹⁰⁶ Kirstein 2004: 2.

¹⁰⁷ Leschke 2012: 23; Towfigh & Petersen 2017a: 2 f. para 3 f.

¹⁰⁸ Coherent with the understanding in this work, cf. Part 1.C.III.4.

¹⁰⁹ Kirchgässner 2013a: 2 f.

processes, i.e., human or governmental behavior of all areas of life.¹¹⁰ The latter regards itself as a social science¹¹¹ that applies its social sciences methodologies, thereby allowing for a transfer of knowledge.¹¹²

III. The Economic Analysis of Law

1. Development, Branches, and Basic Ideas

The economic analysis of law constitutes an umbrella term, encompassing all economic disciplines with law as their research object and a neoclassical origin.¹¹³ The common feature of the economic approach is the transfer and application of methodological concepts to analyze the market, i.e., (1) methodological individualism, (2) assumption of the scarcity of resources, (3) the goal of using those in a maximizing manner.¹¹⁴

The law and economics movement and the economic analysis of law are part of the development of a methodological understanding of economics. The movement gained attention mainly in the United States, where it was primarily developed at the University of Chicago and Yale University.¹¹⁵ The result was the development of new economic approaches, such as Public Choice or the Principal-Agent Theory, which merged into New Institutional Economics.¹¹⁶ Institutions are viewed as systems of formal and/or informal rules and matter for the economic process.¹¹⁷ Legal norms are formal rules, which means that legal rules matter for the institutional structure.¹¹⁸ The increasing interest in the law resulted, among other things, from the recognition that the conditions of a perfectly competitive market are unrealistic and that, because of existing transaction costs, the formulation of legal norms is of considerable importance for allocative resource efficiency.¹¹⁹ This perspective links law and economics as sciences based on their

¹¹⁰ See on this, Janson 2004: 20 f.; Steinbach & Aaken 2019: 4 para. 10. See also Kirchner 1997: 12; Towfigh & Petersen 2017a: 2 f. para 3.

¹¹¹ Aaken 2003: 27. *Ökonomik*, as a methodology of social sciences, tries to explain human behavior based on the assumption of rationality, cf. Kirchgässner 2013a: 2.

¹¹² Aaken 2003: 27.

¹¹³ Including Public Choice Theory, the New Institutional (Law and) Economics, Steinbach & Aaken 2019: 5 especially fn. 8.

¹¹⁴ Compare in this respect Part 2.B.

¹¹⁵ Aaken 2004: 2 para 4; Behrens 1986: 1 f.

¹¹⁶ Cf. Towfigh & Petersen 2017a: 2 f. para 3 f.

¹¹⁷ Furubotn & Richter 2010: 1, 7.

¹¹⁸ Mercurio & Medema 2006: 241.

¹¹⁹ Schäfer & Ott 2020: XVI f. See on the assumptions of the New Institutional Economics, cf. Furubotn & Richter 2010: 2 ff. The concept of transaction costs was analyzed most famously in the article “The Problem of Social Costs” (1960) by Ronald H. Coase, see further on this Part 3.A.III.

sociological element, namely, human behavior, and the associated interest in its study for social control.¹²⁰

In the legal field, Ronald H. Coase (1937/1960)¹²¹ is commonly seen as the founding father who focused on the economic analysis of civil law and the economics of environmental pollution. Further, James Buchanan and Gordon Tullock (1962)¹²² are known for their analysis of constitutions, Gary Becker (1986)¹²³ for applying the economic perspective to crime, William Landes (1971)¹²⁴ and Richard Posner (1972)¹²⁵ within the branch of civil law, and Guido Calabresi and Douglas Melamed (1972)¹²⁶ for extending Coase's ideas by the protection structure of property rights. While Coase and Becker developed the economic analysis from an economic perspective, Posner, Calabresi, and, in Germany, especially Hans-Bernd Schäfer and Claus Ott,¹²⁷ promoted the economic analysis of law from a legal perspective.¹²⁸

2. Levels of Analysis and Application

a. The Positive and Normative Theory

In general, the economic analysis¹²⁹ of law uses concepts and tools of microeconomic theory to analyze legal rules, policies, and institutions.¹³⁰ While the economic analysis of law comprises a variety of theoretical approaches and research areas, there is coherency in distinguishing between a positive and a normative theory,¹³¹ which both may complement legal sciences but within

¹²⁰ In this sense, both disciplines are “control sciences” (*Steuerungswissenschaften*), cf. Towfigh & Petersen 2017a: 3 para 4.

¹²¹ Coase 1937; 1960.

¹²² Buchanan & Tullock 1962.

¹²³ Becker 1968.

¹²⁴ Landes 1971.

¹²⁵ Posner 1972.

¹²⁶ Calabresi & Melamed 1972.

¹²⁷ Comprehensively on civil law, cf. Schäfer & Ott 2020.

¹²⁸ See also Salvador Coderch & Terra Ibáñez 2019: 1244.

¹²⁹ In German scholarship, the term “analysis” is replaced by “theory” in order to distinguish it from the neoclassical approach or the Chicago School, which are understood as focusing on efficiency and thus provoking conflicts between law and economics. Moreover, the use of the term “theory” makes clear that the economic analysis of law is a sub-discipline of legal theory; compare further Aaken 2003: 17 fn. 6; Behrens 1986; Kirchner 1997: 5 f. This work uses the term “analysis,” referring to the Latin understanding as a “resolution of anything complex into simple elements (opposite of synthesis),” Online Etymology Dictionary n.d. It refers to the investigation of legal issues based on economic instruments, Kirchner 1997: 6. Therefore, the term economic analysis of law – as referred to in this work – covers all approaches that share the application of (micro)economic concepts and instruments to the study and explanation of legal rules and institutions.

¹³⁰ Kirchner 1997: 7; Steinbach & Aaken 2019: 5 para. 13. Salvador Coderch & Terra Ibáñez 2019: 1244.

¹³¹ Sometimes, the distinction between positive and normative is seen as characteristic to the different approaches of the Chicago or Yale School; i.e., the former being more concerned with the positive branch and interested in the incentives of the law and their implication to efficiency, the latter rather focusing on failures of markets and the potential use of legal rules as a remedy, cf. Klick & Parisi 2015: 104 f. Posner, however, argues that the primary

different branches. In the following, the core aspects of the positive and normative theory are portrayed.

i. Positive Theory

Within the positive theory, the law is seen as a social phenomenon that needs to be understood and studied.¹³² It functions as an explanatory momentum – *explanans*¹³³ – of observable facts. Understanding economics as a social science aiming at explaining human behavior is, in principle, judgment-free.¹³⁴ The two main components are the explanation of the content of the law and the analysis of its social impact.¹³⁵ The interest is in providing justifications for existing legal doctrines and institutions¹³⁶ and gaining insights into social behavior and order.¹³⁷ Its focus is thus on the legal rules in place and their behavioral consequences, and it is linked to legal science’s analytical and sociological branches, cf. Figure 3.

Related to this, the level of analysis may be more at a social level, concerned with an *ex post* explanation of the emergence of institutions in general, including legal norms, in terms of the efficiency of resource allocation.¹³⁸ The level of analysis may also be more at the individual level, dealing with the law to explain and anticipate the impact of alternative legal norms on individual behavior.¹³⁹ The *ex post* understanding of human behavior serves to derive *ex ante* statements to “provide a system of generalizations that can be used to make correct predictions about the consequences of any change in circumstance.”¹⁴⁰ More specifically, to predict specific amendments of behavior due to an incentive change associated with a change in legal rules,¹⁴¹ cf. the sociological branch in Figure 3.

interest of the economic analysis is normative or functional in the form of “making things better in a moral sense,” Posner 2015: 5.

¹³² Towfigh & Petersen 2017a: 4 para 6.

¹³³ Contrary to the law as *explanandum*, i.e., for explaining positive law, see Aaken 2003: 17 f.

¹³⁴ Kirchgässner 2013a: 3. Arguing that the positive branch is, in principle, independent from the normative, Friedman 1953: 4.

¹³⁵ Posner 1981a: 776.

¹³⁶ Hylton 2019: 1 f. Posner 1981a: 776.

¹³⁷ Towfigh & Petersen 2017a: 4 para 6.

¹³⁸ Efficiency is used as an explanatory, not a desirable reformative momentum, cf. Janson 2004: 22 f. See also Towfigh & Petersen 2017a: 5 para 7.

¹³⁹ Janson 2004: 22 f.; Salvador Coderch & Terra Ibáñez 2019: 1244. I.e., to describe, explain, and predict human behavior, Towfigh & Petersen 2017a: 4 para 6.

¹⁴⁰ Friedman 1953: 4.

¹⁴¹ Janson 2004: 22 f.; Towfigh & Petersen 2017a: 4 para 6.

The understanding of “law as a system of incentives”¹⁴² is central to the economic analysis of law as its interest is in norms as a means of altering human behavior.¹⁴³ The analysis is thus limited to the effects of law on human decision-making.¹⁴⁴

The positive theory is particularly relevant if the law is understood as an instrument of social control and unites economics and the law in its study of human behavior.¹⁴⁵ When law intervenes and is directed toward a particular goal, knowledge of the consequences of particular rules is required.¹⁴⁶ This involves knowledge of legal incentives and behavioral responses¹⁴⁷ and requires a model of action, a theory of behavior, which legal sciences have not provided so far.¹⁴⁸ The economic analysis of law fills this methodological niche by providing a behavioral model in the form of rational choice/the rational actor to study behavioral changes related to changes in legal rules,¹⁴⁹ cf. RC in Figure 4.

Ex ante prediction and *ex post* evaluation of sociolegal impacts help to ensure that intended legislative goals are achieved and unintended consequences are avoided.¹⁵⁰ The rational choice model and its empirical testing can provide an analytical instrument to approximate the relationship between the legal rule(s) and the targeted social goal. This descriptive perspective allows for rationalizing legal rules and structures.¹⁵¹ Knowing the consequences of specific regulations is especially crucial when they are considered not optimal and, therefore, intervention is desirable.¹⁵² The augmented knowledge of the positive theory can then form an argumentative foundation in normative discourse.¹⁵³

¹⁴² Salvador Coderch & Terra Ibáñez 2019: 1244.

¹⁴³ For an overview on how legal regulation affects individual behavior, see Mercurio & Medema 2006: 307. While the focus of law and economics is generally on formal norms in the form of legislation, there is also a research branch that advocates including social norms in the study of behavioral incentives, cf. Mercurio & Medema 2006: 306 ff.

¹⁴⁴ Kirchner 1997: 7 f.

¹⁴⁵ Schmidtchen 2000: 3 f. Whereas the concept of behavior in law primarily concerns intentionality, it is understood as decision-making between alternatives in economics, Behrens 1986: 27 ff.

¹⁴⁶ Towfigh & Petersen 2017a: 5 para 7. See also Engel 2021: 243; Schmidtchen 2000: 4.

¹⁴⁷ Korobkin & Ulen 2000: 1055; Schmidtchen 2000: 4.

¹⁴⁸ Schmidtchen 2000: 4; Steinbach & Aaken 2019: 4 para.11. See also on the need of a behavioral model in law, Eidenmüller 2005: 217.

¹⁴⁹ Schmidtchen 2000: 4 f.

¹⁵⁰ Kirstein 2004: 4 f.

¹⁵¹ Aaken 2004: 31.

¹⁵² Towfigh & Petersen 2017a: 5 para 7.

¹⁵³ Compare Kirchgässner 2013a: 7.

ii. Normative Theory

While the positive theory is limited to what *there is*, the normative theory claims to answer the question of what *ought to be*.¹⁵⁴ At this point, the economic analysis of law becomes particularly relevant by entering the area of legal policy.¹⁵⁵ Namely, it enters the theoretical branch by defining a social goal to pursue and a benchmark for evaluating legal policy, cf. Figure 4. The guiding benchmark for comparison on legal norms is the economic principle of efficiency, deriving from the principles of welfare economics,¹⁵⁶ cf. efficiency in Figure 4. Based on the efficiency principle, a decision can be made *ex ante* on the preferable alternative of reform or change (*de lege ferenda*).¹⁵⁷ Legal institutions and regulations are thus investigated from a comparative perspective of different control mechanisms.¹⁵⁸ The preferable option is the one that is expected to yield the most efficient results,¹⁵⁹ i.e., the one that provides incentives for socially optimal (allocation-efficient) behavior.¹⁶⁰

Comparing and evaluating alternatives based on expected consequences reveals a consequential perspective.¹⁶¹ Combined with the focus on allocative efficiency to maximize social welfare, the normative analysis of the law relates to the philosophical ideas of utilitarianism.¹⁶² Utilitarianism is a consequentialist moral theory¹⁶³ that aims to achieve the highest sum of a moral good for the greatest number of people.¹⁶⁴ Accordingly, social order seeks to enhance the greatest happiness for the greatest number by which all policies are to be measured.¹⁶⁵ The economic analysis of law replaces the idea of happiness with the economic concept of preferences, so maximizing the

¹⁵⁴ Kirchner 1997: 8 f.; Steinbach & Aaken 2019: 5 para. 13.

¹⁵⁵ Eidenmüller 1998: 56; Mercurio & Medema 2006: 47. Mercurio and Medema observe that “[n]ormative Law and Economics deals with what should be; it is the arena in which legal policy is debated and formulated.”

¹⁵⁶ Eidenmüller 1998: 21.

¹⁵⁷ Kirchner 1997: 9; Salvador Coderch & Terra Ibáñez 2019: 1244. Cf. Kirstein 2004: 6.

¹⁵⁸ Behrens 1986: 81; Schmidtchen 1998: 2 f.

¹⁵⁹ Relating to goals and means, cf. Mercurio & Medema 2006: 47 f. In terms of reducing scarcity, Schäfer & Ott 2020: XII.

¹⁶⁰ See, for instance, Kirchner 1997: 9.

¹⁶¹ Kirstein 2004: 4. Also, cf. Schäfer & Ott 2020: XII f.

¹⁶² I.e., while utilitarianism is concerned with happiness, economics seeks to maximize the satisfaction of preferences – utility, Towfigh & Petersen 2017a: 5 para 8. See further Part 4.A.

¹⁶³ This contrasts with deontological theories, which assume that the morality of an action should be judged by the action itself as being right or wrong. The assumingly best-known example is Kant’s theory of ethics. See on consequential and deontological approaches in criminal law theories, Part 4.A.I. Schäfer and Ott note that the economic analysis of law is not limited to consequentialist notions of justice, but also examines norms that arise spontaneously as a result of uncoordinated social interaction, cf. Schäfer & Ott 2020: XII f.

¹⁶⁴ See further Part 4.A.II and Part 4.A.III. See also for the distinction between two components of the utilitarian theory: (1) welfarism, which examines the state of affairs on the basis of welfare, i.e., the satisfaction of people’s needs, and (2) consequentialism, which determines the preferable action based on its consequences. Utilitarianism combines the two components since it derives the preferred action from its consequences on welfare; it may thus be described as a form of “welfarist consequentialism,” Sen & Williams 1982: 4 f.

¹⁶⁵ Towfigh & Petersen 2017a: 5 para 8. Compare also Part 4.A Philosophical and Legal Theoretical Embedment.

satisfaction of human preferences defines the most efficient social order.¹⁶⁶ By this, the economic analysis likewise enters the arena of legal philosophy, cf. Figure 4.

These normative wanderings of the economic analysis of law face the most resistance among legal scholars and practitioners.¹⁶⁷ The main reason is the divergence between lawyers and economists concerning the value of defining a problem and evaluating alternatives.¹⁶⁸ Related disputes concern the relationship between the efficiency criterion and possible collisions or compromises with normative principles of the legal order¹⁶⁹ and the accusation of the instrumentalization of the law for pursuing economic goals.¹⁷⁰ From a legal point of view, whether or not efficiency can serve as a legitimate goal of legal rules and institutions must be answered by dogmatics, whether or not efficiency can be accepted as the basis of a theory of justice by legal philosophy.¹⁷¹

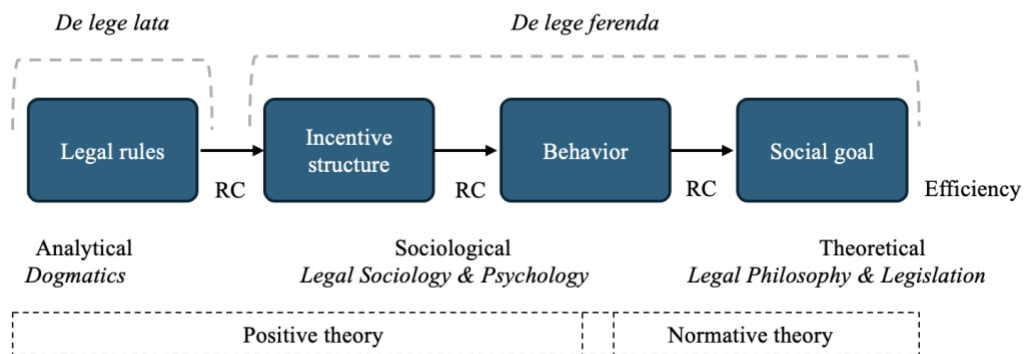


Figure 4 The incorporation of the economic analysis of law in legal sciences

b. Legal Incorporation: De Lege Lata and de Lege Ferenda

Investigating human behavior and evaluating legal alternatives are fundamental to the judiciary and the legislator in reaching informed conclusions.¹⁷² Thus, the normative and the positive theory can theoretically be applied *de lege lata* and *de lege ferenda* (Figure 4); of which the main ways of incorporation are:

De lege lata, the rational choice model can be used in a sociolegal impact analysis as legislators and legal practitioners must be convinced that their basic economic assumptions about the law

¹⁶⁶ Towfigh & Petersen 2017a: 5 para 8. Within the economic analysis of criminal law, cf. Harel 2012: 11.

¹⁶⁷ Drexl 2020: 15 f.; Kirchner 1997: 9; Mercurio & Medema 2006: 46.

¹⁶⁸ Behrens 1986: 26.

¹⁶⁹ Towfigh & Petersen 2017a: 5 para 8. Eidenmüller 1995: 58 f. See further on conflicts between legal and economic principles, Part 2.B.II.4.b.

¹⁷⁰ Fezer 1986: 822 f.

¹⁷¹ Drexl 2020: 18. Cf. On the latter, Mathis 2009; 2019.

¹⁷² Schäfer & Ott 2020: 4 f.

and its effects are correct,¹⁷³ cf. on the left in Figure 4. It may also be employed in the context of jurisprudential legal development and the teleological interpretation of the law.¹⁷⁴ Within the former, the economic analysis can serve as an analytical and empirical tool for legal development in cases where the legislative limits of the judiciary (Article 20 (3) of the Basic Law for the Federal Republic of Germany (GG)) leave room for different possible alternatives.¹⁷⁵ When deciding on an alternative, judges must consider the interests of the parties involved and the legal community and evaluate the consequences of the alternative based on the legal principles in place and the social welfare.¹⁷⁶ Incorporating economic methods and arguments into the law's sociological branch (cf. Figure 4) is probably the least controversial.¹⁷⁷

De lege ferenda, the economic analysis of law can support legal policy in legal reforms, cf. on the right in Figure 4. Legislators must base their decisions on expected consequences.¹⁷⁸ Based on the economic model of human behavior, predictions can be made about behavioral changes associated with legislative reforms that will help ensure that legislative goals are met and unintended consequences are avoided.¹⁷⁹ Its legal incorporation would then allow for an *ex ante* socio-legal impact analysis.

The degree to which the economic analysis of law is incorporated into the legal field varies considerably from one legal system to another and relates to the outlined different self-conceptions of legal science.¹⁸⁰ Within the US-American sphere, the economic analysis of law constitutes a holistic approach and is commonly incorporated into legal policy.¹⁸¹ Still, less advanced was (and is) the reception of the economic analysis of law in Europe.¹⁸² In Germany, the economic analysis of law is often met with skepticism and reservation.¹⁸³ This may relate to the prevailing dogmatic perspective, which limits the scope of jurisprudence to a descriptive and

¹⁷³ Drexl 2020: 18 f.

¹⁷⁴ Drexl 2020: 15 f. See also Towfigh & Petersen 2017a: 9 para 19 ff. Towfigh and Petersen further distinguish between a norm concretizing and a supporting function within the proportionality analysis in the dogmatics of constitutional law.

¹⁷⁵ Schäfer & Ott 2020: 4. See further on the economic analysis of law as a tool for an impact-based legal practice, Aaken 2003: 265 ff.; Eidenmüller 1995: 397 ff.

¹⁷⁶ Schäfer & Ott 2020: 4.

¹⁷⁷ Baumann 2020: 18 f.; Steinbach & Aaken 2019: 5 para. 13.

¹⁷⁸ Kirstein 2004: 5. Cf. also Engel 2021: 243.

¹⁷⁹ If unintended consequences are caused, there is a so called "implementation problem", Kirstein 2004: 4 f.

¹⁸⁰ Cf. Part 2.A.I and Part 2.A.III.

¹⁸¹ Towfigh & Petersen 2017a: 16 para 40.

¹⁸² Cf. Salvador Coderch & Terra Ibáñez 2019: 1244. For an overview of developments and scholars within Europe, cf. Mathis 2014.

¹⁸³ Critically, Fezer 1986. More differentiated on the incorporation of efficiency argumentations, Eidenmüller 1995: 323 ff. See also Hannemann et al. 2013. Further, Part 2.B.II.4.b.

analytical function and leaves the arena of legal policy to external agents.¹⁸⁴ Thus, the incorporation of the economic analysis of law is equally restricted to its descriptive and analytical component, namely, its positive theory, and is mainly applied *de lege lata*, cf. on the left in Figure 4.

IV. Interim Statement

If one understands jurisprudence as an analytical and dogmatic science, there is little room for the economic analysis of law; this changes if one acknowledges jurisprudence as an interdisciplinary and real-life science that studies law as a central instrument of social control to realize social goals. The latter perspective is crucial for the further analysis of this thesis: Legal rules provide an incentive structure to guide human behavior toward a targeted social goal, such as justice or individual freedom, revealing law as a means of social control.¹⁸⁵ The practical relevance of law and its scientific study is due to its direct connection with society by exercising power and claiming rule and authority.¹⁸⁶ Unlike other social control mechanisms, the law is characterized by its claim to validity, which manifests itself in a social obligation guaranteed and enforced by state force.¹⁸⁷ The law claims compliance and legitimacy by instrumentalizing law to enforce public rules and regulations.¹⁸⁸ Legitimacy is based on the notion that law in a liberal democratic state represents and builds upon the democratically legitimated political majority will.¹⁸⁹ However, a source of legitimacy of social representation cannot exist independently of social consequences and thus can only be upheld if it is verified whether the intended social goals are achieved; conversely, whether unintended consequences are avoided. This holds especially true for criminal law, characterized by its severe interference with individual freedom. Therefore, there is a need for knowledge about the social effects of the designed legal regulations.¹⁹⁰ Furthermore, the law as a normative theory must be designed based on empirics; the normative

¹⁸⁴ On the descriptive dominance within German legal sciences, Steininger 2015: 1073. See also Noll 1972: 525. Noll observes that legal practitioners do not dare to make judgments upon the status of society and rather leave such judgments to politics.

¹⁸⁵ Cf. Wissenschaftsrat 2012: 25. The *Wissenschaftsrat* (science council) names law as a central means for social control with the main functions of (1) conflict regulation, (2) guiding behavior, and (3) realizing ideas such as justice, freedom, human dignity, and solidarity. See also Noll 1973: 33.

¹⁸⁶ Mahlmann 2020: 388 para 4.

¹⁸⁷ Wissenschaftsrat 2012: 25.

¹⁸⁸ Bumke 2014: 647.

¹⁸⁹ Bumke 2014: 647. On the idea of law's distinctive moral value in terms of legitimacy, so that its normative claims can be assumed to express the common will, Dorfman & Harel 2021.

¹⁹⁰ On the need for designing legal theories and knowledge of socio-legal consequences, Rittner & Eidenmüller 2005: 670.

is worthless if it cannot be backed up by the positive since the claim of what *ought* to be can only be reasonably made based on what (realistically) *can* be.¹⁹¹

Economics provides instruments to investigate relevant social aspects and can complement legal sciences in this respect. In general, economic empiricism and methodology can be used to pursue an indeterminate goal.¹⁹² Thus, the incorporation of economics within the law can be limited to its positive and descriptive elements to strengthen insights into the relationship between the social and the legal order, while legal sciences set the targeted goal and claim exclusive authority in the normative:¹⁹³ law determines the subject of analysis, economics supports legal research by explaining and investigating the social impact of rules, and legal sciences and practices rely on augmented insights to propose and evaluate legal reforms. Like this, legal science could play an advisory and monitoring role for the legislature¹⁹⁴ and economics can be a fruitful complementation – rather than a substitution.

However, the rational choice model is, like the efficiency principle, contested. Before further assessing the relevance of related concerns to the methodological value of the economic analysis of law, particularly for the analysis of corporate environmental crimes, it is necessary to examine the positive rational choice model and the normative efficiency principle in more detail. This will allow for a better understanding of the efficiency principle and rational choice theory and, thus, a better classification of its critique and validity to define a way of dealing with it. The following will outline the main ideas behind the economic concepts and theories relevant to this work and research interest.

¹⁹¹ Cf. Petersen 2010: 437. On the necessity to ground normative claims in insights of real-science, also Aaken 2003: 157 f. For further criticism on the limitation of jurisprudence to the descriptive, normative aspect of the application of the law, Noll 1973: 66. Noll compares this approach to “a surgeon who is operating without a diagnosis,” (translation by the author).

¹⁹² Homann & Suchanek 2005: 14 f.; Kirchner 1997: 8 f.

¹⁹³ Aaken 2003: 157 f. See also Engel 2021: 243; Towfigh & Petersen 2017a: 5 f. para 8.

¹⁹⁴ See Steininger, advocating a reformation of jurisprudence toward a more structural science with increased incorporation of modeling and pattern investigation by an enhancement of interdisciplinary legal research, Steininger 2015.

B. The Economic Paradigm,¹⁹⁵ its Limitations, and Value

I. The Positive Economic Model and Theory

The economic approach to human behavior has a long history.¹⁹⁶ The first traces can already be found in Bentham's work, where he identified a calculative tendency of human decision-making based on cost-benefit, "*pain and pleasure*,"¹⁹⁷ considerations. The basic economic model is the so-called "homo economicus," which originates from microeconomics and is applied to the economic choices and behavior of consumers and businesses.¹⁹⁸ The model provides for studying, explaining, and predicting human behavior, assumingly in all areas of life.¹⁹⁹ The economic interest is in the decision-making process underlying observable behavior.²⁰⁰ Central to the model is the research perspective of methodological individualism, the premises of scarcity, and the theory of rational choice, whose core aspects will be analyzed in the following.

1. Research Perspective: Methodological Individualism

Methodological individualism is the foundation of modern economics.²⁰¹ It studies human behavior based on an individualistic approach to society historically rooted in Western thought.²⁰² The basic idea is that all collective social outcomes are to be explained based on

¹⁹⁵ The economic research approach, which encompasses a variety of concepts, models, and premises, is in German research commonly referred to as "the economic paradigm," cf. e.g., Janson 2004; Kirchner 1997.

¹⁹⁶ For a historical overview on the model homo economicus within national economics, see Bongard 1965: 24 ff.

¹⁹⁷ "NATURE has placed mankind under the governance of two sovereign masters, *pain and pleasure*. It is for them alone to point out what we ought to do, as well as to determine what we shall do. [...] They govern us in all we do, in all we say, in all we think," emphasis adopted, see Bentham 1988: 1. See further Part 4.A.III.2.b.

¹⁹⁸ Kolmar 2017: 145 ff.; Pindyck & Rubinfeld 2013: 67 ff.

¹⁹⁹ Becker 1976. For instance, Brennan and Buchanan apply the model to political actors herby developing an economic research theory to politics, so-called "Public Choice," cf. Brennan & Buchanan 1988.

²⁰⁰ Kirchgässner 2013a: 12.

²⁰¹ Behrens 1986: 34 ff.; Furubotn & Richter 2010: 3; Schäfer & Ott 2020: XIII. The level of analysis is positive, in contrast to its normative counterpart normative individualism; methodological individualism does not claim that policies and governmental action should only take into account individual preferences and interests while neglecting the collective – which is central to the normative concept, see Kirchner 1997: S. 19. The main idea of normative individualism is that all decisions must ultimately be legitimized by reference to the individual, see further von der Pfordten 2004. Another related, but somewhat "opposite" concept, is "methodological collectivism," cf. Popper 2013: 303. Methodological collectivism sees "the whole" as more than a mere agglomeration of its units and, thus, society as the highest organizational level, Udehn 2002: 38 ff.

²⁰² For instance, Thomas Hobbes (1588–1679) and John Locke (1632–1704), on the social contract as institutions resulting from man-made agreements (treaties); on the idea of the invisible hand and the spontaneous arise of institutions and structures as a result of social action, Friedrich von Hayek (1899 – 1992) and David Hume (1711 – 1776); on the spontaneous formation of social order, arising from a self-interested individual actor, but beneficial to the collective, Adam Smith (1723 – 1790); in German philosophy, Friedrich Hegel (1770 – 1831) on the state as the idea of ethics due to its elements of "spiritual individuals;" on society as a complex to be studied individually, but within the collective context, Auguste Comte (1798 – 1857). Further on the historical background and development, Udehn 2002: 7 ff.

individual behavior.²⁰³ “Society,” “the state,” or “the firm” are not seen as independent collective entities with an inherent logic of a “collective will”²⁰⁴ but as outcomes of individual choices and behaviors.²⁰⁵ This means that the only behavior is that of individuals within systems or institutions; therefore, all collective phenomena are attributable to it and its interaction.²⁰⁶ The relationship between the macro and micro level can be examined using Coleman’s boat (cf. Figure 5 Coleman’s Boat on macro-micro-macro relations):²⁰⁷

Suppose that social state X is the observation of a collective phenomenon, such as a corporate culture of company M that encourages risk-taking. Suppose further that social state Y is that company M commits crime Z in the form of producing diesel vehicles that violate emission limits.²⁰⁸ While arrow 4 appears to represent a macro-level causal relationship between them, it is dashed to show that resorting to X to explain Y is usually incomplete; instead, methodological individualism means that any explanation of Y must proceed to the individual level of analysis, the micro level.

The micro level consists of individual behavior resulting from decisions made in light of opportunities and preferences, with arrow 2 representing the mechanism of action formation (i.e., rational decision-making). For example, when manager M1 decides to order the installation of a defeat device, which only reduces emission when the vehicle is in test mode, this is the result of a rational decision (arrow 2) based on his preferences and opportunities. The fact that arrow 1 represents a situational mechanism suggests that micro level components are insufficient to explain micro level behavior, but that macro level state X and its transfer to the micro level must be considered. This means that the social state X and its situational transformation (arrow 1) are relevant for forming individual aspects (opportunities and preferences). Thus, the corporate culture of risk-taking (social state X) shapes the preferences and possibilities of manager M1 in ordering the installation of a defeat device (observed individual behavior). The micro level behavior is then connected to the macro level by arrow 3. Arrow 3 represents the transformational mechanism that is critical to how individual behavior is aggregated at the macro level in the form of social state Y. Within the example used, how M1’s individual behavior of ordering the defeat

²⁰³ Kolmar 2017: 7.

²⁰⁴ Towfigh 2017: 26 f. para 63.

²⁰⁵ Kolmar 2017: 7; Popper 2013: 309.

²⁰⁶ Kolmar 2017: 7; Popper 2013: 309. Cf. also Furubotn & Richter 2010: 3.

²⁰⁷ The diagram builds upon “Coleman’s boat,” cf. J. S. Coleman 1990.

²⁰⁸ Cf. example in the Introduction.

device is associated with the observation of company M producing diesel vehicles that violate the emission limits.²⁰⁹

For the macro level relationship between social state X and Y, this means that explaining social state Y requires incorporating the “situational logic”²¹⁰ of social state X, the associated situational as well as the transformational mechanism. Thus, any action formation theory (micro level components and arrow 2) is a necessary but not a sufficient condition for explaining social state Y. Therefore, while methodological individualism grounds macroanalysis in microeconomics, it does not equalize it.²¹¹ Rather, the idea is to rely on instruments of microeconomics tailored to “typical behavior” to explain aggregated action.²¹²

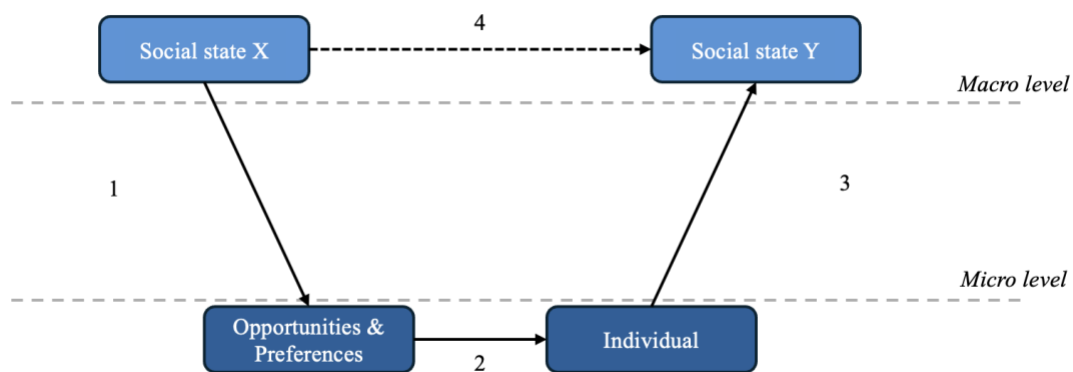


Figure 5 Coleman's Boat on macro-micro-macro relations

2. Research Premises: Scarcity of Resources and Unlimited Wants

The ever-present variable in economics is scarcity.²¹³ Therefore, any explanation of the dynamics of individual behavior and collective outcomes must start from the perspective of scarcity.²¹⁴ “Scarcity refers to situations where the wants exceed the means.”²¹⁵ While human wants are seen

²⁰⁹ For a helpful application in management research, see Cowen et al. 2022.

²¹⁰ “The social situation is hardly reducible to motives and to the general laws of ‘human nature’ [...] we may say that our actions are to a very large extent explicable in terms of the situation in which they occur [...] [t]he analysis of situations, the situational logic, plays a very important part in social life as well as in the social sciences. It is, in fact, the method of economic analysis,” Popper 2013: 308.

²¹¹ Kirchner 1997: 19. As sometimes argued, cf. Schmitt-Leonardy 2017: 87.

²¹² See further on the methodological status of the rational choice model, Part 2.B.I.7.

²¹³ “Much of microeconomics is about *limits*,” emphasis adopted, Pindyck & Rubinfeld 2013: 4. Cf. also Kirchgässner 2013a: 12.

²¹⁴ Kolmar 2017: 4.

²¹⁵ Kolmar 2017: 4.

as unlimited,²¹⁶ the means and resources available to satisfy them are.²¹⁷ Resources can be either objectively scarce, i.e., unable to meet physiological needs essential for human survival (e.g., food or water), or subjectively scarce, i.e., reducible to psychological needs (e.g., fast cars or new clothes).²¹⁸ Limits exist on all resources and are constitutive to the need for allocative efficiency: they may be tangible (e.g., money, food) or intangible (e.g., time or energy) and vary in terms of location (e.g., household or corporation) and time (e.g., today or the future or the next generations).²¹⁹ It follows from the unequal relationship between needs and means that choices must be made.²²⁰ Each choice of one alternative implies a trade-off in the form of opportunity costs, i.e., “going one way necessarily implies that one cannot go another way.”²²¹ In order to maximize the satisfaction of wants, tradeoffs must be optimized.²²² The optimization process of choices in light of scarcity is at the core of the microlevel theory of rational choices. The aim is thus not to study decision-making in general but from the perspective of scarcity.²²³

Resource allocation is crucial to understanding how limited resources can be used in a utility-maximizing way. Legal rules and institutions are essential in that they coordinate the use of scarce resources by establishing property rights and prescribing rules for resource transfer, thereby shaping the situation of scarcity.²²⁴ In the context of rational choice theory, they either constrain or enable alternatives and are therefore context-determining variables crucial for individual decision-making.

3. Research Theory and Model: Rational Choice and the Homo Economicus

The decision theory of rational choice is considered the “basic “workhorse” of economics”²²⁵ and is used to analyze and understand social phenomena from an individual perspective (cf. arrow 2 in Figure 5). The theory functions as a structuring concept for explaining, reconstructing, and

²¹⁶ Pindyck & Rubinfeld 2013: 70. Cf. also Leschke 2012: 24; Schäfer & Ott 2020: 50.

²¹⁷ Jensen & Meckling 1994: 5; Schäfer & Ott 2020: 50. Becker considers time to be the main constraint that is crucial to why unmet needs still exist in rich countries where sufficient goods and services are available, cf. Becker 1993: 386.

²¹⁸ Kolmar 2017: 4.

²¹⁹ Cf. Schäfer & Ott 2020: 50. See also Leschke 2012: 24.

²²⁰ Kirchgässner 2013a: 12.

²²¹ Kolmar 2017: 5.

²²² Leschke 2012: 24; Pindyck & Rubinfeld 2013: 4.

²²³ Leschke 2012: 23.

²²⁴ On this Kirstein 2004: 2 and 7 ff.

²²⁵ Within consumer choice theory, cf. Pindyck & Rubinfeld 2013: 69. This does not mean that any economic theory of human behavior must be based on the rationality principle, as “any coherent theory of reactions to the stimuli appropriate in an economic context [...] could in principle lead to a theory of the economy,” cf. Arrow 1986: 386. However, the theory of rational choice is regarded as the “most promising basis,” Becker 1993: 403.

predicting human behavior according to situational logic.²²⁶ It is generally considered a formal model²²⁷ that allows for individual and subjective concepts of utility to be included.²²⁸ Utility is “measured” in terms of ordinal preference ordering.²²⁹ Combined with contextual variables, it allows the explanation of human behavior in different, allegedly, all areas of life.²³⁰

In general terms, rationality is the instrumental use of available means to achieve a particular goal.²³¹ Rational use of resources means maximizing the degree of goal achievement for a given resource budget or achieving a given goal with a minimum of resources, which thus refers to goals or means.²³² Individuals are assumed to rank alternatives according to their associated costs and benefits and to choose the alternative with the highest utility, i.e., the first-order alternative.²³³

The corresponding model of human behavior is the rational actor, the homo economicus, or the “Rational Economic Man” (REM). The “Resourceful, Evaluative, Maximizing Model“ (REMM) is one main development in the Anglo-American sphere.²³⁴ The extension by “resourceful” emphasizes that available alternatives are not given but result from individual creativity and adaption.²³⁵ The homo economicus and the REMM build on the basic assumptions of the consumer-choice theory, which are the following and illustrated in Figure 6 Elements of rational decision-making:²³⁶

²²⁶ Aaken 2004: 71 f.; Kirstein 2004: 3.

²²⁷ See further on the debate about the methodological status of the rationality principle, Part 2.B.I.7.

²²⁸ Janson 2004: 33 f.

²²⁹ Kolmar 2017: 154 ff.; Pindyck & Rubinfeld 2013: 79 ff. In contrast, cardinal utility attributes a real value to alternatives and thus also gives insight into their relative relationship, i.e., how much one alternative is preferred to the other. The attribution of cardinal utilities is problematic to the extent that it allows for interpersonal utility comparison and is thus commonly rejected within modern economics, cf. on this Schäfer & Ott 2020: 29 ff. The criticism of cardinal utility comparison and the focus on ordinal utility is mainly associated with Lionel Robbins 1932.

²³⁰ Most prominently, Becker 1976: 8. Who assumes that the economic model is applicable to all areas of life and to all individuals, i.e., “rich or poor persons, men or women, adults or children, brilliant or stupid persons, patients or therapists, businessmen or politicians, teachers or students.”

²³¹ Aaken 2004: 71 f.; Schäfer & Ott 2020: 108.

²³² Schäfer & Ott 2020: 108.

²³³ Schmidtchen 1998: 2.

²³⁴ Jensen & Meckling 1994: 4. See on other models of human behavior and their limitations that are used within the science of economics, Jensen & Meckling 1994. Including the Economic Model (or Money Maximizing Model), a reduction of the REMM model to money as the only “want”; the Sociological Model (or Social Victim Model), assuming that individuals are the result of their environment which ultimately determines their behavior (i.e., shaped by their cultural and social environment), further Brunner & Meckling 1977: 73.); the Psychological Model (or Hierarchy of Needs Model), assuming that individuals are resourceful and have absolute needs (besides wants); the Political Model (or Perfect Agent Model), assuming that the individual aims at maximizing the principal’s welfare (the public good), not his own. After investigating the explanatory value of all models, Jensen and Meckling conclude that the REMM “dominates that of all the other models,” Jensen & Meckling 1994: 18.

²³⁵ Brunner & Meckling 1977: 72; Jensen & Meckling 1994: 5 f.

²³⁶ Cf. Perloff 2020: 63. Also Pindyck & Rubinfeld 2013: 68.

- 1) Preferences are constant and subjective and determine the utility an individual derives from consuming a specific resource.
- 2) Constraints and objectives shape the alternative options and thereby the individual's choices.
- 3) Choices are made based on preferences and constraints in a utility-maximizing manner.

Figure 6 reveals that preferences and constraints are the two main elements of decision-making and define the individual's "leeway for action" (*Handlungsfeld*).²³⁷ Preferences are assumed as stable²³⁸ and constraints as unstable; this means that knowledge of these two elements enables modeling and predicting individual choices, i.e., behavior.²³⁹

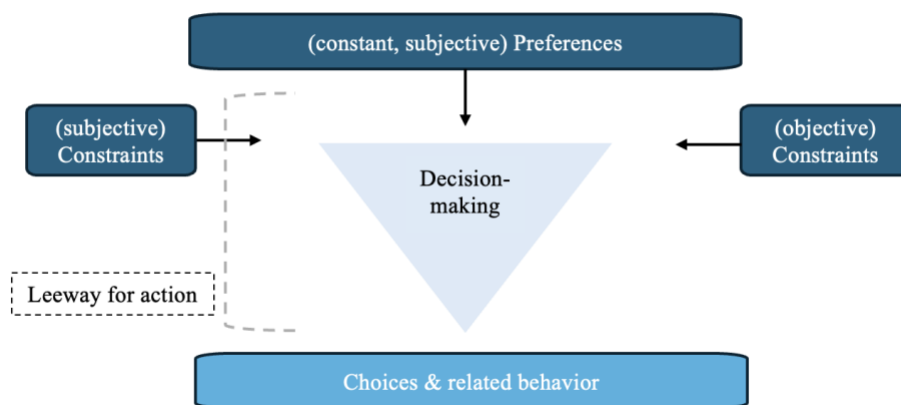


Figure 6 Elements of rational decision-making

a. Stable Preferences

Preferences derive from intentions and reflect the underlying values that an individual ascribes to a particular alternative.²⁴⁰ Values develop through socialization, concern fundamental

²³⁷ Kirchgässner 2013a: 13; 2013b: 4. Cf. Homann & Suchanek 2005: 28 f.

²³⁸ Cf. Steinbach & Aaken 2019: 6 para. 15 f. Which means that alternatives are – *ceteris paribus* – valued uniformly, see Steinbach & Aaken 2019: 7 para 19.

²³⁹ Kirstein 2004: 3; Schmidtchen 1998: 2 f.

²⁴⁰ Cf. Kirchgässner 2013a: 14. Kirchgässner 2013b: 5. “[U]nderlying preferences are defined over fundamental aspects of life, such as health, prestige, sensual pleasure, benevolence, or envy,” Becker 1976: 5. They are “a set of likes and dislikes, desires, and tastes,” see Barreto 2020: 15. Harsanyi 1977: 635. Harsanyi distinguishes between moral preferences and personal preferences. While the former primarily considers one’s own interests, moral preferences weigh the interests of all equally. He believes that moral preferences do not influence the individual in his everyday behavior, but in those unique moments when the individual is forced to adopt an impersonal and neutral perspective and attitude.

components of personal life, such as health, pleasure, or envy, and are, in principle, independent.²⁴¹ They are subjective and vary between different individuals.²⁴² Based on values and context, the individual classifies states of daily life in measurable units,²⁴³ which enables comparison and the choice of the preferred alternative.²⁴⁴

The subjectivity of preferences makes scientific analysis difficult. To nevertheless be able to determine individual preferences externally, the economist Paul A. Samuelson proposed the so-called “revealed preference approach” or “theory.”²⁴⁵ The idea is that, under the assumption of stable preferences, any (change in) behavior is necessarily triggered by a change in environmental conditions; this allows inferring the individual’s preferences from his (market) behavior.²⁴⁶ In other words, people reveal what they want through their systematic (re)actions.²⁴⁷ The approach is problematic because it can lead to a tautology since every action appears utility-maximizing.²⁴⁸

b. Changing Environmental Constraints

Constraints or restrictions are relevant to the available alternative actions.²⁴⁹ Optimal decision-making is therefore relative to these constraints.²⁵⁰ Constraints can be tangible, e.g., money or a specific good, or intangible, e.g., time, computing capacity, or knowledge.²⁵¹ The environment that determines constraints is dynamic due to the changing behavior of others (e.g., politics) or

²⁴¹ Kirchgässner 2013a: 14. Kirchgässner 2013b: 5.

²⁴² Cooter & Ulen 2012: 19.

²⁴³ Brunner & Meckling 1977: 71 f.

²⁴⁴ The comparison can lead to two different outcomes: (1) strictly preferred, which means that the person prefers this bundle of goods to the alternative bundles, and (2) indifferent, which means that the person is equally satisfied with both bundles of goods and therefore has no preference, cf. Barreto 2020: 15. Economic methods are limited to defining and comparing preference order, not preference strength, Cooter & Ulen 2012: 19. The focus on preference order is due to the restriction of modern economics to ordinal utility attributions, cf. fn. 229.

²⁴⁵ The revealed preference approach goes back to Samuelson 1938; 1948. He observed that “the individual guinea-pig, by his market behaviour, reveals his preference pattern,” see Samuelson 1948: 243.

²⁴⁶ Kirchgässner 2013a: 27. See also Sen 1977: 322.

²⁴⁷ It basically means that “[i]f a consumer chooses one market basket over another, and if the chosen market basket is more expensive than the alternative, then the consumer must prefer the chosen market basket,” see Pindyck & Rubinfeld 2013: 93.

²⁴⁸ Cf. Janson 2004: 28; Sen 1977: 322. Since it means that individuals always chose the “right” alternative and is thereby normative, Kolmar 2017: 94 f. A further criticism is, *inter alia*, that individuals in disadvantaged circumstances may adapt their preferences to the disadvantages they face, and the satisfaction of these preferences is therefore not welfare-enhancing. On adaptive preferences of women in deprived conditions, Nussbaum 2001: 119 ff.

²⁴⁹ Kirchgässner 2013a: 17 f.

²⁵⁰ “A constrained maximum, or any other economic optimum, can be described as a point where marginal cost equals marginal benefit,” Cooter & Ulen 2012: 22.

²⁵¹ Cf. also Jensen & Meckling 1994: 5. Time constitutes assumingly the most fundamental restriction, ultimately reflected in the fact of death, see Becker 1993: 386.

natural changes,²⁵² creating a system of incentives for a particular change in behavior.²⁵³ Markets, non-market regulation, and institutional frameworks are analyzed from the perspective that they form a system that generates specific incentive structures.²⁵⁴ Rationality means that individuals respond to these incentives of environmental changes and adjust their behavior to increase satisfaction.²⁵⁵ This adjustment is assumed to be systematic and predictable, guided by the underlying goal (preferences).²⁵⁶ The individual's responsiveness to exogenous variables is captured by the elasticity of demand and linked to available substitutes.²⁵⁷

In contrast to preferences, restrictions are objective and external and thus accessible.²⁵⁸ Combined with the assumption of stable preferences, the systematic nature of behavioral adaptation to these environmental incentives, i.e., to constraints, allows the prediction of behavioral changes.²⁵⁹ However, the explanatory power is limited to relative observations so that a systematic change in decision behavior can only be predicted relatively (concerning the person's past behavior or to others) and not absolutely.²⁶⁰

c. Self-Interest

The assumption of self-interest is sometimes referred to as the "character" of the homo economicus.²⁶¹ From a methodological perspective, self-interest means that the individual's utility function only includes his utilities, not those of third parties.²⁶² However, self-interest is not synonymous with egoism or selfishness since the latter refers to the content of preferences, while the former expresses that the preferences are of the individual.²⁶³ Therefore, self-interest does not *per se* exclude aspects such as empathy or love.²⁶⁴ It may well be that the happiness of

²⁵² Kirchgässner 2013a: 18. See also Becker and Simon observing the environmental relevance of social action of others, Becker 1993: 386; Simon 1957: 196.

²⁵³ Steinbach & Aaken 2019: 6 para. 15 f.

²⁵⁴ Brunner & Meckling 1977: 72.

²⁵⁵ Posner 2014: 4 f.

²⁵⁶ Kirchgässner 2013b: 6.

²⁵⁷ On elasticity in consumer choice theory, cf. Pindyck & Rubinfeld 2013: 33 ff.

²⁵⁸ Kirchgässner 2013a: 27.

²⁵⁹ Eidenmüller 1995: 32 f.; Kirchgässner 2013b: 6. See also Becker 1976: 7.

²⁶⁰ Kirchgässner 2013a: 28. For example, by decreasing the price of apples from \$1 to 50 ct, one may predict that an individual will buy 50% more apples but not be able to determine the absolute number of apples. On ordinal utility also fn. 278.

²⁶¹ Kirchgässner 2013a: 47.

²⁶² Kirchgässner 2013a: 47; Kirchner 1997: 13. Also see Kirchgässner 2013a: 16.

²⁶³ Brennan 2007: 110. This is mainly reasoned by the interpretation that selfishness or egoism relate to the individual's motives, however, the rational choice model initially arose from the intent to eliminate any assumptions on behavioral motives, see Kolmar 2017: 8. Also see Becker 1993: 385. Becker reiterates that the economic approach to behavior is not about motives but about being a method of analysis. Therefore, self-interest is assumed to not involve any moral judgment, Kirchner 1997: 13.

²⁶⁴ Kirchgässner 2013a: 47 ff.; Schäfer & Ott 2020: 113. On the REMM model, cf. Brunner & Meckling 1977: 72.

a third person constitutes part of the satisfaction, happiness, or utility of the homo economicus.²⁶⁵ What constitutes self-interest (maximizing satisfaction) ultimately depends on the individual's preferences.²⁶⁶

As early as Adam Smith (1822), in “The Theory of Moral Sentiments,” described that the individual's well-being is related to that of others. Smith acknowledged that “[h]ow selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure seeing it.”²⁶⁷ This is not to say that Smith assumed an altruistic human nature,²⁶⁸ which is especially evident in his later work “The Wealth of Nations” and probably his most frequently quoted phrase that “[i]t is not the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest.”²⁶⁹ Altruism is therefore generally not considered a “typical” human behavior in economic analysis.²⁷⁰

d. Rational Decision-Making/Maximization

The primary economic assumption about human behavior is that of rational maximization.²⁷¹ People are seen as rational agents who seek to increase their happiness, satisfaction, or utility based on a stable set of preferences.²⁷² Maximization is not a goal in itself but a means to achieve a higher goal in the form of utility.²⁷³ “Utility” is an open term, not limited to a monetary meaning.²⁷⁴ It may also be referred to as “benefit” or “well-being”²⁷⁵ and includes material as

²⁶⁵ Cooter & Ulen 2012: 12; Kirchner 1997: 13; Posner 2014: 3. Referred to as “meddlesome preferences [or] other regarding preferences,” Schäfer & Ott 2020: 113. Kirchgässner argues that, from a methodological perspective, it may be reasonable to assume selfishness as it commonly does provide the main motivation in aspects that are relevant to the economic analysis of law, cf. Kirchgässner 2013a: 47 ff.

²⁶⁶ Eidenmüller 1995: 31 f.

²⁶⁷ First published 1759, cf. Smith 1822: 1.

²⁶⁸ For instance, cf. Smith 1822: 357.

²⁶⁹ Smith & Wight 2007: 9 f.

²⁷⁰ Compare Kirchgässner 2013a: 63 ff.

²⁷¹ Posner 2014: 3. See also Furubotn & Richter 2010: 3.

²⁷² “The heart of my argument is that human behavior [...] can be viewed as involving participants who maximize their utility from a stable set of preferences,” Becker 1976: 13. Cf. Posner 2014: 3. They “*maximize the satisfaction they can achieve, given the limited budget available to them,*” emphasis adopted, see Pindyck & Rubinfeld 2013: 86.

²⁷³ Kirchgässner 2013a: 15.

²⁷⁴ Homann & Suchanek 2005: 27; Janson 2004: 31 f. As part of the development from classical to neoclassical economics, cf. Kolmar 2017: 21. However, the limitation of utility to monetary units is still commonly used in order to reduce complexity, see Janson 2004: 34 f. See further on the methodological need of reduction Part 2.B.I.7.a.

²⁷⁵ Kolmar observes that all concepts are somehow related to the individual's “well-being,” Kolmar 2017: 156.

well as immaterial aspects or interdependent preferences such as altruism or grief.²⁷⁶ However, to make utility measurable, its components must be quantifiable numerically.²⁷⁷ To this end, a particular bundle of goods is assigned a numerical value based on individual preferences, from which an ordinal utility function is derived.²⁷⁸ Broadly outlined, this looks as follows:

Consider a consumer who decides to invest in water and air purification initiatives, with the related bundle of goods as clean air and clean water. His investment is subject to a budget restriction, represented in Figure 7 by the blue straight line. The indifference curves represent the combination of the bundle of goods, clean air and clean water, that leave him indifferent. Utility maximization means that the consumer seeks the combination between the bundle of goods that enables him to achieve the highest indifference curve considering his budget constraint. This is where the indifference curve is tangent to the budget line, in the example of Figure 7, at the combination of clean air and clean water at point B. While C provides higher utility, it is above the budget constraint. E and D are within budget but do not use all of the available budget and provide lower utility. G and F provide the same utility as B but are also above the budget. Therefore, B is the preferred option, given the consumer's budget constraint.

²⁷⁶ Compare Homann & Suchanek 2005: 27; Janson 2004: 32. However, the inclusion of interdependent utilities derived from interdependent preferences again carries a tautological danger since any behavior can be explained retrospectively, see Eidenmüller 1995: 148 f.

²⁷⁷ Posner tries to distinguish the philosophical term utility as used in utilitarianism from the economic concept by limiting the latter to monetary units and "value measured by willingness to pay for what is not yours already, or willingness to accept payment for what is yours," Posner 1985d: 1196 fn. 9. He thus relies on the term "value", Posner 2014: 13. See further on Posner's idea of wealth maximization, Part 2.B.II.3.

²⁷⁸ Pindyck & Rubinfeld 2013: 78 ff. An ordinal utility function of an individual is a ranking of possible states. Thus, an ordinal function indicates that the individual prefers possible stage X to Y, but it does not indicate by how much it does.

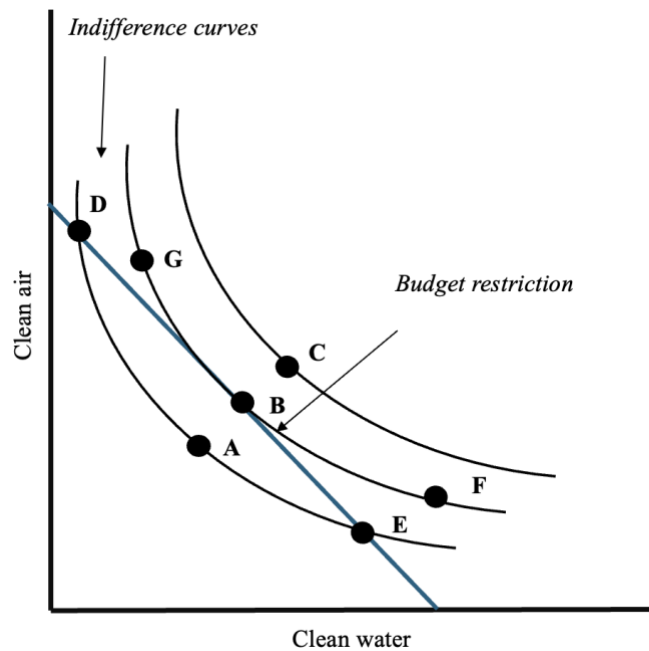


Figure 7 Hypothetical utility maximization under restriction²⁷⁹

Oskar Morgenstern and John von Neumann (1944)²⁸⁰ specified the idea of “rational decision-making” by developing axioms of rationality that served as the basis for a decision theory based on a cardinal utility function.²⁸¹ Rational behavior is the result when preferences meet the requirements of the axioms.²⁸² The axioms of Morgenstern and von Neumann have been further developed,²⁸³ and the specific formulation varies.²⁸⁴ The following illustration goes beyond the most basic versions and illustrates axioms of rationality of stricter rationality versions.

1. *Completeness*: Completeness means that an individual compares available alternative and their combination and orders them according to the preferred alternative.²⁸⁵ For example, the individual can decide whether alternative *A* is better, worse, or equally good to alternative *B*. If the system of preferences is complete, the individual can always state a preference for each

²⁷⁹ On indifference curves, compare, for instance, Kolmar 2017: 150 ff.; Perloff 2020: 67 ff.

²⁸⁰ The work “Theory of Games and Decision and Economic Behavior” was first published in 1944. Their work was motivated by concretizing the commonly used term “rational,” Neumann & Morgenstern 1953: 9.

²⁸¹ Harsanyi 1977: 642 f.; Perloff 2020: 580 f.

²⁸² They function as a minimum standard or benchmark for rational behavior, cf. Schäfer & Ott 2020: 108 f.

²⁸³ For a reformulation of the axioms under risk, cf. Marschak 1950. See also Friedman & Savage 1948.

²⁸⁴ In consumer choice theory: completeness, reflexivity, transitivity, Barreto 2020: 15 f. Or completeness, transitivity, and the more is better, Pindyck & Rubinfeld 2013: 70.

²⁸⁵ Cf. Kolmar 2017: 147. See also Aaken 2003: 76; Schäfer & Ott 2020: 110.

pair of alternative actions.²⁸⁶ This allows for a complete ranking of alternatives and the choice of one alternative.²⁸⁷

2. *Transitivity*: Transitivity of preferences states that if alternative A is preferred to alternative B and B is preferred to alternative C , then A must be preferred to alternative C .²⁸⁸ Transitivity prevents a circle of preference ordering and thus, combined with completeness, leads to maximization.²⁸⁹ Thus, completeness and transitivity are sometimes regarded as the central axioms of rationality.²⁹⁰
3. *Continuity*: The axiom of continuity allows preferences to be represented in numbers and ensures that there is no alternative whose expected value is irreplaceable: If there is a preference ordering of $A_1 \geq A_2 \geq A_3$, it may be likely (p_j) that there is a combination of A_1, A_2, A_3 , and p_j that leaves the individual indifferent between the three alternatives.²⁹¹ That is, the axiom of continuity implies that for any middle alternative A_2 , there exists a combination of A_1 and A_3 that is at least as good as A_2 .²⁹²
4. *Independence*: According to the independence axiom, a decision maker's preference order of two alternatives is independent of whether he evaluates them in isolation or the context of other alternatives.²⁹³ This means that scenario 1 is the choice between A and B , with A being preferred. Scenario 2 is the choice between A , realized with a probability of p , and C , realized with a probability of $(p-1)$, or B , realized with a probability of p , and C , realized with a probability of $(p-1)$. The axiom of independence requires that A is equally preferred in scenario 2.²⁹⁴
5. *(Time)consistency*: Time consistency requires that the preference order is stable over a sufficient period.²⁹⁵ This means that if someone prefers A over B , preferring B over A is irrational or indicative of a change in preferences, which is often difficult to distinguish

²⁸⁶ E.g., $A_1 \leq A_2, A_2 \geq A_1$ or $A_2, \sim A_1$. See Eisenführ et al. 2010: 240. See also Barreto 2020: 15; Kolmar 2017: 8.; Neumann & Morgenstern 1953: 26 f. Schäfer and Ott further name the axiom of dominance, meaning that there is always one preferred option, Schäfer & Ott 2020: 110.

²⁸⁷ Kolmar 2017: 147. Also see Aaken 2003: 76; Schäfer & Ott 2020: 110.

²⁸⁸ E.g., $A_1 \geq A_2, A_2 \geq A_3$ then $A_1 \geq A_3$. See also Aaken 2003: 77; Eisenführ et al. 2010: 240; Kolmar 2017: 8; Schäfer & Ott 2020: 110.

²⁸⁹ Schäfer & Ott 2020: 110.

²⁹⁰ It may therefore be argued that they already capture (at least a thin) version of rationality, Kolmar 2017: 8.

²⁹¹ E.g., $A_2 \sim p_1 * A_1 + (1 - p_1) * A_3$. See Eisenführ et al. 2010: 240 f.; Neumann & Morgenstern 1953: 27.

²⁹² See Eisenführ et al. 2010: 241.

²⁹³ See also Aaken 2003: 77 f.; Eisenführ et al. 2010: 243; Schäfer & Ott 2020: 110 f. Note that the axiom of independence is not explicitly mentioned by von Neumann and Morgenstern.

²⁹⁴ Scenario 1 is $A_1 \geq A_2$, scenario 2 is $p_j * A_1 + (1 - p_j) * A_3 \geq p_j * A_2 + (1 - p_j) * A_3$. See further, Schäfer & Ott 2020: 110 f.

²⁹⁵ Aaken 2003: 76; Kolmar 2017: 8.

empirically.²⁹⁶ The stability of preferences conditions the empirical value of the rational choice theory as the investigation of the relationship between a dependent and an independent variable, for instance, a change in behavior due to a change in incentives by legal regulation can only be done *ceteris paribus*.²⁹⁷ Thus, the minimum requirement for the stability of preferences is that they are more stable than environmental constraints and incentives, so changes in behavior are due to a change in options (alternatives) rather than individual values (preferences).²⁹⁸ Otherwise, there is a danger of a tautology whereby human behavior always changes when preferences change.²⁹⁹

6. *Dominance*: Dominance means that if *A* is preferred over *B*, then *A* must always be preferred over *B* if *A* is preferred over *B* at least in one of the possible scenarios, while the decision maker is indifferent between *A* or *B* in all other scenarios.³⁰⁰ For instance, the decision maker prefers drinking coffee over water as he desires a hot drink. Dominance requires that he still prefers coffee, even if served cold, as he is indifferent to drinking cold coffee or water.
7. *Reflexive*: Reflexive means that the value of a bundle of goods reflects its content, i.e., the same bundle of goods has the same value.³⁰¹

e. (Expected) Utility Maximization

Rational maximization or decision-making is costly and uncertain.³⁰² The utility is thus an *expected* utility, i.e., the sum of the utilities of the individual's alternatives weighted by their probability of occurrence.³⁰³ The mathematical equation commonly portrays it:

$EU = \sum u_i(x_i)p_i$, which means that the expected utility (*EU*) of a given decision is the sum of the cardinal utility values (u_i) of all alternative consequences (x_i) multiplied by their respective probabilities of occurrence (p_i).

For example, suppose two different lotteries, lottery A and lottery B, each with three different alternative outcomes.

²⁹⁶ Schäfer & Ott 2020: 111.

²⁹⁷ Kirchner 1997: 8.

²⁹⁸ Kirchgässner 2013a: 40. See also Janson 2004: 28 f. Janson notes that, in the case of legal regulation, it can only be assumed that a change in the law will encounter a nearly constant set of individual preferences over a short or medium period of time. Consequently, the effects of legislative changes on individual behavior cannot be determined in the long run, since a change in preferences can either strengthen or weaken the triggered behavioral change.

²⁹⁹ Which relates to the revealed preference approach, cf. Part 2.B.I.3.a. See also Aaken 2003: 76 f. Or Eidenmüller 1995: 32 f.; Kirchgässner 2013a: 40 f.

³⁰⁰ Schäfer & Ott 2020: 109.

³⁰¹ Mentioned by, e.g., Aaken 2003: 16; Barreto 2020: 15.

³⁰² Uncertainty may be equally displayed as a cost.

³⁰³ Pindyck & Rubinfeld 2013: 165. Cf. also Homann & Suchanek 2005: 27.

Lottery A has the following outcomes:

- a) x_1 of winning \$50 (u_1) with a probability of $p_1 = 0.01$
- b) x_2 of winning \$50 (u_2) with a probability of $p_2 = 0.10$
- c) x_3 of winning \$50 (u_3) with a probability of $p_3 = 0.89$

$$EU_{\text{lottery A}} = (\$50 * 0.01) + (\$50 * 0.1) + (\$50 * 0.89) = \$50$$

Lottery B has the following outcomes:

- a) x_1 of winning \$0 (u_1) with a probability of $p_1 = 0.01$
- b) x_2 of winning \$250 (u_2) with a probability of $p_2 = 0.10$
- c) x_3 of winning \$50 (u_3) with a probability of $p_3 = 0.89$

$$EU_{\text{lottery B}} = (\$0 * 0.01) + (\$250 * 0.1) + (\$50 * 0.89) = \$69,5$$

A rational expected utility maximizer would choose lottery B since $EU_{\text{lottery A}} < EU_{\text{lottery B}}$.

4. Interim Statement

The analysis of the core aspects of the rational choice model and the corresponding homo economicus model reveal their strict assumptions regarding stable preferences and rational utility maximization. The mathematical representation of the expected utility theory shows this impressively, but yields doubt about its closeness to reality: “The complexity of the world is not limited to thousands or even tens of thousands of variables and constraints, nor does it always preserve the linearities and convexities that facilitate computation.”³⁰⁴

Furthermore, while the assumption of stable preferences is methodologically necessary in order to investigate systematic reactions to environmental conditions, the subjectivity of preferences and the generally open concept of utility complicate the external assessment and modeling. While the axioms of rationality lead to a welcome concretization of the concept of rationality, they also set high requirements for rational decision-making. Accordingly, it is not unsurprising that the “real” behavior of humans shows numerous deviations. In detail, this is irrelevant to the meaningfulness of the model since, for the approximation of an explanation of social phenomena, the model does not claim absoluteness in any form but a representational claim over human

³⁰⁴ Simon 2017: 2.

behavior.³⁰⁵ Yet, this claim to representation has been questioned. In order to assess the value of the model and rational choice theory for further analysis, it is necessary to address the main aspects of criticism. The focus will be on Herbert A. Simon and the idea of bounded rationality, as well as the criticism on behalf of behavioral law and economics, mostly associated with the work of Daniel Kahneman and Amos Tversky.

5. Limitations, Criticism, and Developments of the Homo Economicus

a. Strategic and Complex Decision-Making in Reality

One criticism of the rationality principle is that it neglects the typical presence of uncertainty since the classical idea of utility maximization is based on precise knowledge of relevant variables. Decision-making under uncertainty though implies that there is more than one optimal alternative.³⁰⁶ Even if uncertainty is acknowledged in terms of expected utility values, the model still assumes complete information by relying on specific probabilities.³⁰⁷ Furthermore, perfect anticipation of empirical facts and full rationality based on complete information is practically impossible for at least three reasons: First, individual decisions and actions occur in interaction with other actors in a complex and changing environment. Thus, the decision and the rationality of one actor are intertwined with and conditioned by the actions of other actors, impeding complete information,³⁰⁸ the so-called Morgenstern Paradox.³⁰⁹ Second, foresight is only one element relevant to expectation; other dynamic criteria, such as mood or risk perception, are usually involved.³¹⁰ Last, complete rationality based on complete information is logically impossible as it is conditioned by omniscient science as the information base.³¹¹

³⁰⁵ Cf. Part 2.B.I.1.

³⁰⁶ Tietzel 1981: 123.

³⁰⁷ Cf. similar, Janson 2004: 39. Janson notes that the calculation of expected utility continues to be a decision under perfect information since the individual knows all probabilities, hence, the expected utility theory is a strict rationality theory.

³⁰⁸ It is this interdependency between different decision-making of actor which is central to game theory, which analyzes decision-making from a strategical perspective, see Neumann & Morgenstern 1953: 46 ff.

³⁰⁹ Morgenstern criticizes the premise of perfect foresight of the market partners actions since it implies that there is an infinite chain of mutually dependent reactions and counter-reactions when one market actor tries to anticipate the behavior of the other market partners and incorporate it in his own rational decision, cf. Morgenstern 1935: 343 f.

³¹⁰ Morgenstern 1935: 351 f. While risk preferences can be incorporated in terms of cost or benefit hereby influencing the expected utility, Englerth & Towfigh 2017: 244 para 495.

³¹¹ Tietzel 1981: 128 f.

b. Bounded Rationality and Bounded Optimum – Herbert A. Simon

Another criticism comes from Herbert A. Simon. Simon observed several substantive limitations to rational optimization, which led him to propose an alternative understanding of individual decision-making based on “bounded rationality.” Today, bounded rationality is mainly referred to when a lack of time or information (external variables) or cognitive abilities (internal variables) causes an individual’s decision-making to deviate from ideal rational outcomes.³¹²

i. Altering the Nature of Conditions and Constraints

Bounded rationality recognizes limitations within the environment and the actor himself in the form of information-processing capacities.³¹³ The latter relates to the observation that the individual’s cognitive abilities are limited.³¹⁴ The concept also acknowledges that the definition of the situation and constraints are not given but are the consequence of psychological and sociological processes, including the actions of the decision-maker and the people surrounding him.³¹⁵ The inferiority of human capabilities to the complexity of most problems implies that rational utility maximizers can no longer seek optimal but rather satisfactory decisions in complex situations.³¹⁶

ii. Altering the Nature of the Goal: Satisficing

In addition to cognitive and environmental constraints, the costs of optimizing decision-making, including information acquisition, constrain optimization; at any point in time, the individual must decide to terminate the optimization process without knowing the optimal time to do so.³¹⁷ In theory, this is when marginal utility equals marginal costs. This leads the individual to strive not for optimal but for “good enough” decisions.³¹⁸ For this, the individual defines specific criteria, and the first alternative that meets these criteria is chosen.³¹⁹ The result is that more than one “satisficing optima” or “good enough” alternative exists.³²⁰ Therefore, the “satisficing man” is guided by self-imposed aspiration levels defined and amended according to the situation.³²¹

³¹² Leschke 2012: 30. See also Tsaoussi 2019: 147.

³¹³ Simon 1972: 162.

³¹⁴ Jolls et al. 1998: 1477.

³¹⁵ March & Simon 1976: 131.

³¹⁶ Tsaoussi 2019: 147.

³¹⁷ Cf. Simon 2017: 2.

³¹⁸ Simon 1957: 261, 204 f. To choose a “satisfactory alternative,” Simon 2017: 2.

³¹⁹ March & Simon 1976: 132. See also Simon 1957: 241 ff.

³²⁰ Simon 1957: 241 ff.

³²¹ March & Simon 1976: 132 ff.

The search and decision process can be minimal and simplified in certain circumstances, such as routine behavior.³²² Routine behavior occurs when a particular response to environmental stimuli has been proven appropriate.³²³ Thus, unlike rational optimization, satisficing does not require estimations of expected probabilities of alternatives nor complete and consistent preference ordering.³²⁴ It also allows dispensing with the requirement of complete and specific knowledge of all alternatives and their consequences.³²⁵ Instead, satisficing acknowledges uncertainty about the future and informational and cognitive limitations, forcing individuals to adjust their behavior and make satisficing choices.³²⁶ In economics, the importance of satisficing has remained relatively minor because optimization or other limiting costs can be modeled in terms of restriction in conventional economic theory,³²⁷ which further developed models have taken into account.³²⁸

c. Behavioral Law and Economics

Other criticism has been raised from a psychological approach incorporating empirical laboratory research, so-called “behavioral economics.” The criticism is most famously related to the work of Daniel Kahneman and Amos Tversky. In several experiments, behavioral economics demonstrated deviations from the rational choice theory, such as the “sunk cost fallacy”³²⁹ (the observation that humans value past events, contradicting the idea that behavior is based on expected utilities) or the “bandwagon effect”³³⁰ (the tendency to do or believe things only because other people do so). The interest of behavioral economics is not to replace the standard economic

³²² March & Simon 1976: 131 ff.

³²³ March & Simon 1976: 131 f.

³²⁴ Simon 1957: 205.

³²⁵ See further on decision theory and the idea of maximization under conditions of certainty, uncertainty, and risk, Watkins 1978: 44 ff.

³²⁶ Schäfer & Ott 2020: 117.

³²⁷ I.e., it can be argued that satisficing is optimization with the incorporation of optimization costs, cf. Kolmar 2017: 187. Homann and Suchanek thus argue that satisficing is maximization by incorporating the “search costs” as restrictions, cf. Homann & Suchanek 2005: 364 ff.

³²⁸ Compare Schäfer & Ott 2020: 117. For an amended model incorporating the costs of information acquisition, Stigler 1961.

³²⁹ Posner 2014: 8. Contrary, sunk cost “*has no alternative use, its opportunity cost is zero*” (emphasis adopted) and since it cannot be recovered, it should not influence the individual’s decision-making process, cf. Pindyck & Rubinfeld 2013: 232. Thus, the phenomena of „Sunk Cost Fallacy,“ in which an individual makes his decision based on past investments (sunk costs), is seen as an error in reasoning; more on this and on other human errors in reasoning, Dobelli 2015: 21–24.

³³⁰ See Kiss & Simonovits 2014. Kiss and Simonovits identify the “bandwagon effect” in Hungarian elections, which showed a 10% increase in the votes of the two largest parties between the first and second rounds of voting.

model but to detect systematic deviations, allowing to amend the theory on decision-making to gain a better understanding of human behavior.³³¹

i. Bounded Self-Interest

Various experiments have challenged the assumption of self-interest, which is best illustrated by the ultimatum game. The basic version is as follows: Player 1 can decide how much money he is willing to give Player 2 on the condition that Player 2 accepts the offer. If the offer is rejected, no one receives anything, so Player 1 must anticipate the reaction of Player 2. The basic economic prediction is that Player 1 will propose the smallest available amount, and Player 2 will accept any amount because it benefits him.³³² However, the outcome often differs from the prediction because Player 2 is generally only willing to accept an approximate minimum of 20-30% and rejects the offer at any amount below.³³³ The standard explanation is that Player 2 perceives any lower amount as unfair and is willing to sacrifice his potential profit to “punish” Player 1.³³⁴ Such behavior is “irrational” because any amount would benefit Player 2, and aspects of unfairness or “punishment” should not influence the decision in so far as they imply financial costs to Player 2.³³⁵ Deviations from rationality are also observed in the behavior of Player 1, who generally offers around 40-50% and thus more than the minimum.³³⁶ One explanation may be that Player 1 anticipates the “punishment” considerations of Player 2.³³⁷ The experiment contradicts the strict rationality assumption by showing aspects of fairness³³⁸ and equity as guiding principles of decision-making that are superior to utility maximization.³³⁹ However, their methodological incorporation is challenging as their specification and weight in decision-making are hard to access externally. Furthermore, notions of fairness are often not absolute but relative to a

³³¹ Jolls et al. 1998: 1473. The following analysis is not conclusive but focuses on the main limitations of rationality as subject to behavioral economics.

³³² Jolls et al. 1998: 1490.

³³³ 1/3 as noted by Towfigh 2017: 36 para 82. And 20% stated in Houser & McCabe 2014: 28. The first experiments were conducted by Güth et al. 1982.

³³⁴ “If Player 1 left a fair amount to me, I will accept. If not and if I do not sacrifice too much, I will punish him by choosing conflict,” Güth et al. 1982: 384.

³³⁵ Jolls et al. 1998: 1490.

³³⁶ A division ratio of 63:37 is mentioned by Towfigh 2017: 36 para 82. And 40-50% is mentioned by Houser & McCabe 2014: 28.

³³⁷ Güth et al. 1982: 384; Jolls et al. 1998: 1490.

³³⁸ Different, Kirchsteiger 1994: 384 ff. Kirchsteiger argues that Player 1 is willing to offer more than close to zero not due to reasons of fairness, but rather due to the fear of rejection by Player 2 caused by envy.

³³⁹ Experiments have also found gender differences: Women are more generous when it comes to making an offer and are also more likely to accept it, cf. Eckel & Grossman 2001: 176 ff. For an application of the ultimatum game to analyze the gender pay gap by differences in bargaining between the two genders, cf. Solnick 2001.

reference point and biased by what is beneficial to oneself, i.e., what is considered fair is influenced by associated benefits.³⁴⁰

ii. Bounded Rationality

Judgment-Process

Heuristics

Heuristics are cognitive shortcuts that have proven helpful in past experiences to cope with specific situations, especially when information is hard or costly to obtain.³⁴¹ They are “rules-of-thumb” that help individuals act appropriately in a given situation.³⁴² One of the most common “shortcuts” is the availability heuristic, which states that the availability of a specific event, “the ease” with which the specific event comes into one’s mind, is crucial to judging its probability and frequency.³⁴³ In order to determine the frequency or probability of an event, the individual constructs scenarios that could cause that particular event, and the plausibility or difficulty of constructing them determines estimates of its probability.³⁴⁴ If the individual can easily think of multiple or particularly impressive scenarios, the event seems very likely and *vice versa*.³⁴⁵

For example, to determine the likelihood of a flooding after ten days of rain, the individual searches for memories of a flooding after ten days of rain. The more memories or compelling ones that come to mind, the higher the person estimates the probability of occurrence.³⁴⁶ The estimate of subjective probabilities is unrelated to actual probabilities and may lead to over- or underestimations.³⁴⁷ Rational decisions based on maximizing expected utility are thus affected by subjectively biased probability estimates.

While the risk of biased decision-making may seem detrimental, heuristics are beneficial strategies for managing everyday decisions based on limited information.³⁴⁸ In many cases, they enable individuals to deal efficiently with environmental conditions.

³⁴⁰ For instance, cf. Babcock & Loewenstein 2000: 355.

³⁴¹ Tsaoussi 2019: 148. “[T]he human mind makes many decisions by drawing on an adaptive toolbox of simple heuristics, not because it is forced to by cognitive constraints, but rather because these fast and information-frugal heuristics are well matched to the challenges of the (past) environment,” cf. Todd 2002: 52.

³⁴² Tsaoussi 2019: 148.

³⁴³ “A person is said to employ the availability heuristic whenever he estimates frequency or probability by the ease with which instances or associations could be brought to mind,” Tversky & Kahneman 1973: 208.

³⁴⁴ Tversky & Kahneman 1973: 228 f.

³⁴⁵ Tversky & Kahneman 1973: 229.

³⁴⁶ See for another example, Tversky & Kahneman 1973: 228 f.

³⁴⁷ Tversky & Kahneman 1973: 231.

³⁴⁸ E.g., on the stock market, when selecting portfolio formation heuristic decision-making may even lead to better outcomes than a fully trained and informed one, cf. Todd 2002: 57.

Hindsight Bias

Hindsight bias was first described by Baruch Fischhoff (1975).³⁴⁹ It refers to the idea of “I knew it all along,” that individuals believe they could have foreseen a particular event after its reporting.³⁵⁰ People tend to overestimate the likelihood and possibility of foreseeing an event without being aware of the benefit of knowing what happened after the fact.³⁵¹ This occurs unconsciously, leading to overestimating what the individual would have known.³⁵² Indirectly, hindsight encourages the tendency to judge the quality of a decision according to its outcome rather than by the quality of the information available at the time the decision was made.³⁵³ This violates the rationality assumption because a rational decision about whether or not a decision was “right” is based on the available information and the decision maker’s calculative abilities at the time of the decision, not on the information available in hindsight.³⁵⁴

Hindsight bias is related to the availability bias heuristic in that knowledge about the event can increase the probability estimate; for instance, judges tend to overestimate the likelihood of an event after knowledge of its occurrence.³⁵⁵

Over-Confidence and Self-Serving Bias

Over-confidence describes how people tend to judge themselves as “above average” in various areas of life, such as their productivity. The result is that the sum of each individual’s productivity estimate for a joint event is commonly above 100%.³⁵⁶ Furthermore, over-confidence entails that a person’s subjective confidence in the accuracy of his judgment exceeds its factual accuracy.³⁵⁷ External factors or personality traits may influence overconfidence.³⁵⁸

Closely related is the self-attribution bias, in which the extent to which internal aspects (ability and level of effort) versus external aspects (luck and difficulty) contribute to better performance is overestimated.³⁵⁹

³⁴⁹ Fischhoff 1975: 292. Fischhoff observes that “[r]eporting an outcome’s occurrence consistently increases its perceived likelihood and alters the judged relevance of data describing the situation preceding the event.”

³⁵⁰ Roese & Vohs 2012: 412.

³⁵¹ In litigation, this can lead judges and juries to set liability for punitive damages much higher from an *ex post* perspective than from an *ex ante* perspective, see on this Hastie et al. 1999.

³⁵² Fischhoff 1975: 293 ff.

³⁵³ Schäfer & Ott 2020: 124.

³⁵⁴ Schäfer & Ott 2020: 124.

³⁵⁵ Fischhoff 1975: 297 f.

³⁵⁶ E.g., when couples are asked to estimate their contribution to household labor, Ross & Sicoly 1979: 325 ff. Note that Ross and Sicoly use the term “egocentric bias.”

³⁵⁷ Pallier et al. 2002: 258.

³⁵⁸ Cf. Libby & Rennekamp 2012: 222; Pallier et al. 2002: 295. Though much more research is needed in this respect.

³⁵⁹ Libby & Rennekamp 2012: 200.

The self-serving bias refers to the observation that individuals judge their own ability systematically as above average and the related observation that judgments about fairness or what is “right” are biased toward their own interests:³⁶⁰

For example, in an experiment that simulated a court case, participants were asked to take the role of either the plaintiff or the defendant and negotiate a settlement. Both parties received the same amount of information about an accident, such as witness accounts. The experiment revealed a large discrepancy between the plaintiff’s and defendant’s estimates of the amount the judge would set and what was considered fair, with each one overestimating in his favor.³⁶¹ Furthermore, participants considered evidence favoring their side more robust and arguments more persuasive.³⁶²

Self-serving bias may be caused by selective information processing, as individuals tend to find rational justification for desired conclusions by searching their memory in a way that explicitly looks for information that favors the conclusion reached while maintaining the illusion of objectivity.³⁶³ Terminologies and causes are still unclear.³⁶⁴ For the legal system, both biases have implications, for instance, in terms of explaining and justifying safety regulation (e.g., seat belt enforcement),³⁶⁵ precautionary rules of environmental policy or courtroom bargaining.³⁶⁶

Decision-Process

Allais Paradox

The Allais Paradox goes back to Maurice Allais (1953)³⁶⁷ and can be illustrated by expanding the earlier lottery simulation (Part 2.B.I.3.e), graphically portrayed in Figure 8:³⁶⁸

Suppose participants take part in two rounds of a lottery. In the first round (lottery round 1), they can choose between lottery A, where they can win \$50 with 100% certainty so that the expected value is \$50, and lottery B, where the expected value is \$69.5. Most participants choose lottery A, with a lower but certain expected utility. Choosing an option with an objectively lower

³⁶⁰ Babcock & Loewenstein 2000: 356 f. See also Towfigh & Petersen 2017a: 252 f. para 514 ff.

³⁶¹ The plaintiffs’ predictions of the amount the judge would grant were, on average, \$14,527 higher than the defendant’s, and the amount considered fair was \$17,709 higher than the defendant’s, Babcock & Loewenstein 2000: 358.

³⁶² Babcock & Loewenstein 2000: 361.

³⁶³ Babcock & Loewenstein 2000: 360.

³⁶⁴ Englerth & Towfigh 2017: 253 para 517.

³⁶⁵ Schäfer & Ott 2020: 123.

³⁶⁶ See Babcock & Loewenstein 2000: 258 ff.

³⁶⁷ Allais 1979. See also Camerer 2020: 622 ff.

³⁶⁸ The following example and explanation was guided by Betsch et al. 2011: 83 ff.

expected utility is not *per se* irrational since expected utility is subjective, allowing for the incorporation of values other than purely material and objective ones.

In the second round (lottery round 2), participants can choose between lottery A' and B'. The only difference between A and B is that the payoff with a probability of 89% is now \$0 instead of \$50. The other options remain the same. The changed utilities with an 89% probability theoretically cancel each other out so that both lotteries, 1 and 2, are equivalent. Most people now choose B' with an expected value of \$25 compared to A' with an expected value of \$5.5. Thus, participants preferred A > B in the first lottery round (1) and B' > A' in the second lottery round (2). This violates the independence axiom, which requires that the order of preferences for two alternatives is independent of whether they are evaluated with other alternatives or in isolation. It further indicates that participants' risk preferences have changed: In the first option, the prospect of a certain win causes participants to decide risk-averse and prefer a certain outcome with a lower expected value to an uncertain outcome with a higher expected value. This changes in lottery round 2, where people choose lottery B' with a higher expected value.

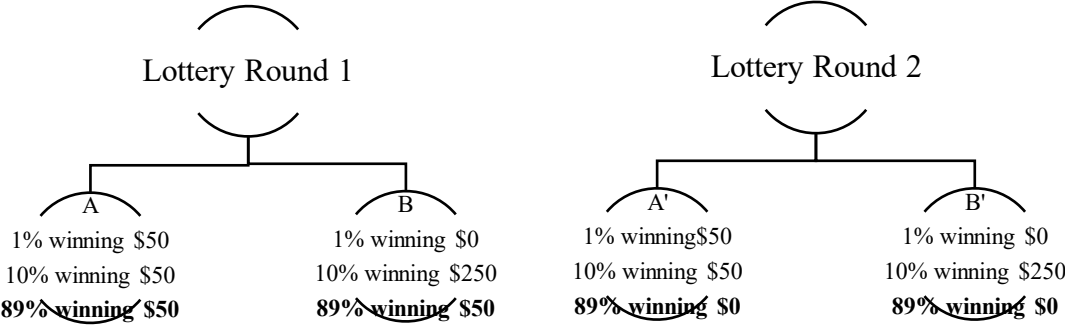


Figure 8 Allais paradox – lottery simulation

The Allais paradox encouraged scientific search for explanations and an alternative theory, of which the prospect theory is most known. The prospect theory aims to systematize deviations and develop an alternative decision-making theory under uncertainty.³⁶⁹ The theory differentiates choice processes into a processing phase in which a preliminary investigation of values (prospect) is conducted, further refined in a phase of evaluation and subsequent choice of the prospect that

³⁶⁹ Kahneman & Tversky 1979: 263.

brings the greatest value.³⁷⁰ Therefore, the theory incorporates two additional components into the model of individual decision-making: the value function (Figure 9) and the weighting function (Figure 10). The basic ideas are outlined in the following.

Prospect Theory

Value function: S-shaped function

The value function, cf. Figure 9, describes the individual's value of any occurrence and introduces three main aspects central to the ultimate value: a reference point, a decreasing marginal loss sensitivity, and loss aversion.

(1) Reference point

Reference point orientation refers to the observation that individuals value outcomes based on relative change concerning the original reference point, i.e., “carriers of value are changes in wealth or welfare, rather than final states.”³⁷¹ Therefore, the utility of value evaluation based on gains and losses associated with a decision or occurrence is not absolute but relative to the original reference point. The individual's perception is thus influenced by the difference rather than the absolute magnitude of the outcome.³⁷² For example, whether a salary is considered high depends on one's previous salary (if it is the reference point) or on the salary of one's colleague (if it is considered the reference point). Thus, Kahneman and Tversky propose that “value should be treated as a function in two arguments: the asset position that serves as reference point, and the magnitude of the change (positive or negative) from that reference point.”³⁷³ Formally, this means that the utility function must not only include the utility of an action (a) at a specific time (t) but also concern a specific reference point (r_p): $U(a_t)(r_p)$.³⁷⁴ Orientation to a reference point causes the objectively same perspective to be valued differently, potentially producing different outcomes by different decisions.³⁷⁵ This deviates from the von Neumann and Morgenstern expected utility model theorem modeling utility in terms of a final stage.

³⁷⁰ Kahneman & Tversky 1979: 263.

³⁷¹ Kahneman & Tversky 1979: 277.

³⁷² Kahneman & Tversky 1979: 277.

³⁷³ Kahneman & Tversky 1979: 277.

³⁷⁴ Compare Aiken 2003: 88.

³⁷⁵ Tversky & Kahneman 1986: 258 ff.

(2) Decreasing marginal loss sensitivity

Decreasing marginal loss sensitivity describes that risk aversion differs as the disutility of a loss decreases marginally, e.g., in a gamble, losing the first \$10 generates a larger disutility than losing the second \$10. This is seen by the convex utility function related to losses,³⁷⁶ cf. Figure 9.

(3) Loss aversion

Loss aversion refers to the observation that negative deviations from the reference point are weighted more heavily than positive, i.e., individuals are more affected by losses than gains. Accordingly, the S-shaped value function is steeper concerning losses than gains, cf. Figure 9; the subjective utility of losses of a potential good outweighs that of gaining it.³⁷⁷ Loss aversion influences risk behavior in decision-making situations and leads to risk-averse behavior in the case of significant gains and small losses. In contrast, small gains and large losses encourage risk-seeking behavior.³⁷⁸

Loss aversion and decreasing marginal loss sensitivity violate expected utility theory, which assumes that expected utility is the sum of the utility of different alternatives multiplied by their probability, regardless of whether they represent gains or losses.

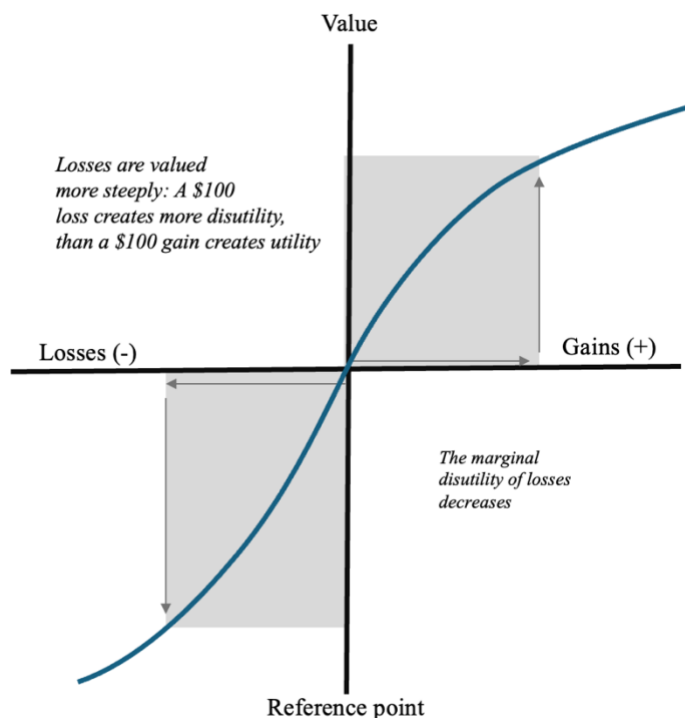


Figure 9 Hypothetical value function in the prospect theory³⁷⁹

³⁷⁶ Kahneman & Tversky 1979: 280.

³⁷⁷ Kahneman & Tversky 1979: 280.

³⁷⁸ Kahneman & Tversky 1979: 285 f.

³⁷⁹ Compare Kahneman & Tversky 1979: 279.

Weighting function of gains and losses

Individuals tend to overestimate lower probabilities and underestimate higher ones. This can be seen by the graph below Figure 10: the weighting curve deviates from the theoretical diagonal. In small probabilities, the weight function is convex, even crossing the diagonal of the objective weight function. This implies that small probabilities have a more substantial weight subjectively than they should.³⁸⁰

For example, consider the following situation: Participants can pay for a 50% reduction in the risk of a plane and a car accident. The probability of a flooding is 0.1, and that of a menacing heat is 0.8. Most participants would be willing to pay more for a risk reduction of the flooding from 0.1 (10/100) to 0.05 (5/100) than for a risk reduction of a menacing heat from 0.8 (80/100) to 0.40 (40/100), apart from the fact that has a larger absolute risk reduction.³⁸¹ Misperception of the (low) probability is exacerbated when combined with the availability bias, for instance, the event involves high emotional associations.³⁸² Furthermore, the certainty effect implies that the value of a certain outcome exceeds an uncertain value to a greater extent, even if the latter has numerically a higher value.³⁸³ For instance, most people would prefer a risk reduction from a 0.1 risk of a flooding to zero than a reduction from a 0.8 risk of a menacing heat to 0.7.

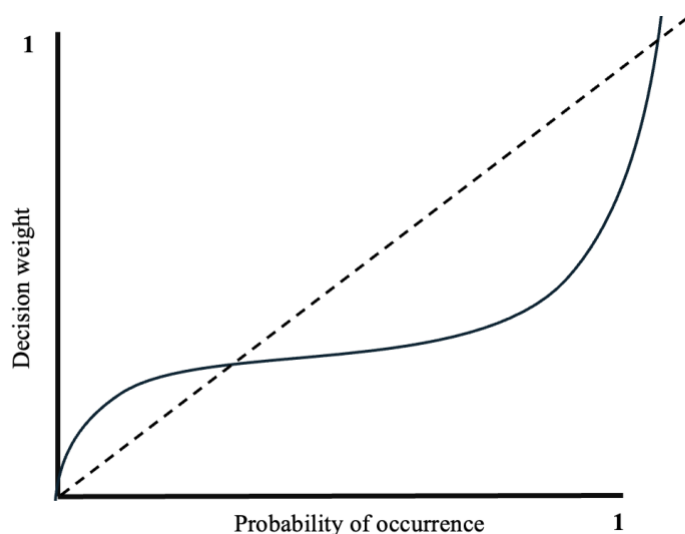


Figure 10 Hypothetical weighting function in the prospect theory³⁸⁴

The value and weighting functions allow explaining the Allais paradox and the choice of alternative A in lottery 1, cf. Figure 8: The latter indicates that the value of a certain outcome is

³⁸⁰ Kahneman & Tversky 1979: 282 ff.

³⁸¹ Compare, Kahneman & Tversky 1979: 283.

³⁸² See further Tversky & Kahneman 1974: 1127 f.

³⁸³ Cf. Betsch et al. 2011: 91; Kahneman & Tversky 1979: 283.

³⁸⁴ See Kahneman & Tversky 1979: 283.

overvalued compared to a medium- or high-probability outcome, while the value function illustrates a decreasing marginal utility. Thus, both deviations must be compensated for a riskier but objectively higher value to have the same subjective value as a certain outcome.³⁸⁵

Endowment Effect

The endowment effect refers to a valuation bias in that a good owned by the individual has a greater value than the same good not owned.³⁸⁶ As a result, individuals are reluctant to part with goods that belong to their endowment, meaning that the disutility of giving up a good outweighs the utility of receiving it (i.e., the purchase price of a good is lower than the sale price of the same good).³⁸⁷ The endowment effect correlates to loss aversion and indicates a status quo bias: Individuals generally prefer the current situation and strong incentives are needed to change it.³⁸⁸ This contradicts the assumption of stable preferences and order from which indifference curves are derived without incorporating aspects of endowments.³⁸⁹ For example, if A prefers car 1 to car 2, a stable preference implies that he still prefers car 1 to car 2 even though he now owns car 2. However, if car 2 is part of his endowment, A prefers car 2. Thus, the endowment effect means that the preference order can be changed, even reversed, by a specific allocation of resources (entitlements).

Anchoring

Anchoring describes how subjects make their estimates from an initial point that is unrelated with the actual estimate and that subsequent adjustments are usually inadequate.³⁹⁰ In one experiment, subjects were asked to estimate the product of $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$ within 5 seconds. A control group was asked to estimate the product of $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$. The median estimation for the former, the ascending sequence, was 512, whereas the median for the latter, the descending sequence, was 2,250.³⁹¹ The results indicate that the first numbers, 8 or 1, were used as an anchor:³⁹²

³⁸⁵ Betsch et al. 2011: 91.

³⁸⁶ Kahneman et al. 2000: 225 f.; Posner 2014: 18 ff.

³⁸⁷ Kahneman et al. 2000: 226.

³⁸⁸ Englerth & Towfigh 2017: 259 para 531 ff.; Schäfer & Ott 2020: 121 f.

³⁸⁹ Englerth & Towfigh 2017: 258 para 529 ff.; Kahneman et al. 2000: 211, 225 f.

³⁹⁰ Anchoring refers to prospect theory and the idea of a reference point in the sense that it describes the observation that the reference point is externally influenced, which is not necessarily the case with the reference point in prospect theory.

³⁹¹ The correct answer was 40,320, see further Tversky & Kahneman 1974: 1128.

³⁹² Tversky & Kahneman 1974: 1128 f. Cf. also Betsch et al. 2011: 39.

The idea is that in the descending version, people use the first numbers to estimate their final answer (they start with 8×7 and get the product 56) and pay less attention to the later numbers (multiply the product by 6 and then by 5, and so on). In contrast, in the ascending version, they most likely multiply $1 \times 2 = 2$ and then 2×3 and think the smaller numbers go on, paying less attention to the larger numbers, 7 and 8. The two identical equations are valued differently because the first number influences the subsequent decision process.

The anchoring effect is observed in judgment and decision-making and refers to probabilities and values of potential goods.³⁹³ This violates the notion of stable preferences defined before decision-making and instead states that preferences are formulated within the specific situation, shaped by non-rational, contextual circumstances.³⁹⁴ The bias has been confirmed within legal situations, such as sentencing in the courtroom, in which the sentencing demand of the prosecutor may influence (anchor) the judge's sentencing decision.³⁹⁵

Framing

Framing shows how easily external factors can manipulate decision-making.³⁹⁶ Framing effects refer to situations where the same instance can be perceived as a win or a loss based solely on how it is presented.³⁹⁷

The Asian disease scenario illustrates the framing effect:³⁹⁸ Participants had to choose between two anti-epidemic programs in a fictitious situation following an epidemic outbreak. The description of the programs was systematically altered so that one description, which suggested two programs (but with the same percentage of people saved and died), spoke only of people who “will be saved,” while a second program spoke of persons who “will die.”

- Problem 1: “If Program A is adopted, 200 people will be saved. [72 percent]
If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved. [28 percent]”³⁹⁹
- Problem 2: “If Program C is adopted 400 people will die. [22 percent]
If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die. [78 percent]”⁴⁰⁰

³⁹³ Englerth & Towfigh 2017: 255 para 522.

³⁹⁴ Englerth & Towfigh 2017: 255 para 522.

³⁹⁵ For instance, cf. Enough & Mussweiler 2001.

³⁹⁶ Englerth & Towfigh 2017: 260 para 535; Schäfer & Ott 2020: 122 f.

³⁹⁷ Compare McCaffery et al. 2000: 262.

³⁹⁸ See Tversky & Kahneman 1981: 453.

³⁹⁹ Tversky & Kahneman 1981: 453.

⁴⁰⁰ Tversky & Kahneman 1981: 453.

Program A and Program C, as well as Program B and Program D, are identical. In problem 1, however, with the positive frame of saving lives, most respondents preferred Program A and thus behaved risk-averse. This observation reversed in problem 2 with the negative frame “will die,” in which Program D was preferred, indicating risk-taking.⁴⁰¹ Risk-seeking in decisions involving costs and *vice versa* corresponds to the pattern of loss aversion.⁴⁰² Considering loss aversion, a frame of losses is likely to have a higher impact on decision-making and thus, to be able to change behavior.⁴⁰³ This means that framing effects may lead to a violation of the axiom of invariance, which states that the preference order of alternatives depends solely on their content, not on how the alternatives are presented (representative independence).⁴⁰⁴ Framing implies that decision-making is influenced by rationally non-relevant information that should accordingly not influence the (expected) utility calculus and thus impedes utility maximization. Framing effects have been confirmed in the courtroom, in which gain and loss frames influenced judges in their decision-making.⁴⁰⁵

d. Bounded Willpower

Bounded willpower refers to the observation that people frequently engage in actions knowing they conflict with their long-term interests.⁴⁰⁶ When there are opportunities for conflict between short-term and long-term preferences, the former usually prevails, which can lead to a reversal of preferences.⁴⁰⁷ For example, while the individual may decide on one day to abstain from alcohol to improve his health (the short-term preference for addiction satisfaction is inferior to the long-term preference for health), this preference may be reversed by the offer of a glass of wine while eating pizza in a restaurant. While the frame of reference may trigger the change in preferences in the Asian disease scenario, the preference reversal in bounded willpower is triggered by the passage of time or other contextual aspects.⁴⁰⁸ Moreover, the predominance of short-term preferences suggests discounting future costs (and benefits) compared to immediate (costs and) benefits induced by a bias towards the present.

⁴⁰¹ Tversky & Kahneman 1981: 453.

⁴⁰² Cf. Tversky & Kahneman 1981: 453. Compare loss aversion, outlined above.

⁴⁰³ McCaffery et al. 2000: 262.

⁴⁰⁴ Compare Camerer 2020: 652 f.; Schäfer & Ott 2020: 122.

⁴⁰⁵ For a comprehensive study of framing effects and other biases, such as loss aversion, in the courtroom, cf. Rachlinski & Wistrich 2018.

⁴⁰⁶ Jolls et al. 1998: 1479.

⁴⁰⁷ Englerth & Towfigh 2017: 263 para 539.

⁴⁰⁸ Englerth & Towfigh 2017: 263 para 539.

For example, most individuals would rather receive \$20 today than \$25 in two weeks but would rather receive \$25 in a year and two weeks than \$20 in a year. The relative marginal cost of awaiting benefits seems to fall when the time required to wait rises.⁴⁰⁹ In addition, discounting is affected by a size effect: as the benefit size increases, the discount rate decreases.⁴¹⁰ This means that waiting for a small amount has a higher discount rate than waiting for a larger amount; in other words, it is more profitable to wait for a larger amount than a small amount. Moreover, studies have shown that losses are discounted at a lower rate than gains.⁴¹¹ The explanation is that opportunity costs are not considered the same as out-of-pocket costs and are generally underweighted.⁴¹²

Generally, standard economic theory acknowledges discounting costs and benefits at a constant, exponential discount rate, i.e., declining marginal (dis)utility.⁴¹³ It is thus generally compatible with the rational choice theory – given that the rationality axioms are respected. However, individuals commonly exhibit a hyperbolic discount rate, which means that events in the long future are discounted at a higher rate.⁴¹⁴

6. Interim Resumé

What is the value of a scientific theory or model if the underlying assumptions are falsified or the variables are understood to be so open that they defy falsification?

Overall, the behavioral (law and) economics movement has falsified the constitutive basis of the rational choice theory (self-interest, (rational) expected-utility maximization, and underlying axioms), disproving its partially argued universality.⁴¹⁵ Deviations have also been observed in various legal situations. Against this background, modern economics mainly incorporates the idea of imperfect rationality. Incomplete or limited information and limitations in information acquisition and human cognitive abilities are – to some extent or the other – considered.⁴¹⁶ In contrast, the economic analysis of law still largely relies on the neoclassical assumption of full

⁴⁰⁹ Thaler 1981: 205.

⁴¹⁰ Thaler 1981: 205.

⁴¹¹ Thaler 1980; 1981: 206.

⁴¹² Thaler 1980; 1981: 206.

⁴¹³ On the law of diminishing marginal returns, Pindyck & Rubinfeld 2013: 209 f. See critical on this and arguing that it lacks empirical foundation, Frederick et al. 2002.

⁴¹⁴ See further on hyperbolic discounting, Frederick et al. 2002: 360 ff.; Laibson 1997: 449 f. See also with regard to prison sentence, Jolls et al. 1998: 1540 f.

⁴¹⁵ As most prominently argued by Becker, cf. fn. 28.

⁴¹⁶ Janson 2004: 39 ff. However, the neoclassical model of full rationality is still commonly present in the principal-agent theory, the economic analysis of law, and public choice theory, cf. Furubotn & Richter 2010: 4.

rationality,⁴¹⁷ self-interest in its basic version, and utility measured monetarily. This has been (or is) strongly criticized by legal scholars, who question the utility of a model based on “unrealistic” assumptions.⁴¹⁸

The extent to which this criticism is justified relates to the conceptualization of rationality, the methodological status of the rational choice theory and model, and thus, more broadly, to the role of models and theories in social sciences. What can we expect from a scientific model or theory? What is crucial to its methodological value? When is it falsified, or is it even falsifiable?

To this end, the development and function of social science models and theories and the associated claims on their value are first analyzed. Subsequently, the different conceptualizations of rational choice theory and the views on the characteristics or requirements that determine its scientific value will be presented. The analysis will present the rationality versions’ most important features and distinctions. This will be done based on the work of Gebhard Kirchgässner, Karl Popper, Friedrich von Hayek, and Milton Friedman, who hold different views on the theoretical understanding of rational choice and its scientific value as a theory. It will be seen that the understanding of the requirements of a model/theory is crucial for its falsifiability and, thus, for the extent to which the critique of behavioral economics undermines its methodological value. Afterward, the requirements needed to make the model useful for application in legal sciences will be reviewed.

7. Methodological Understandings and Conceptualizations of the Rationality Principle

a. Explanations, Models, and Theories in Social Sciences: The Necessity of Reduction and Abstraction

The rational choice theory constitutes an attempt to explain a particular event. It relies on an “ideal type” of human decision-making, which is assumed to encompass the essential features of the problem at hand.⁴¹⁹ The “ideal type” is the heuristic model of the fully rational actor based on a set of assumptions (statement of the rule) to predict or explain a certain outcome (*explanandum*) derived from the analytical statements (*explanans*).⁴²⁰ Generally, the more

⁴¹⁷ See Furubotn & Richter 2010: 4. Hylton 2005a: 99 f. E.g., Gary Becker or Richard Posner most prominently.

⁴¹⁸ Compare Fezer 1986: 822. “[T]he rational expectations models made an important contribution to economics; the rigour which its supporters imposed on economic thinking helped expose the weaknesses underlying many hypotheses. Good science recognises its limitations, but the prophets of rational expectations have usually shown no such modesty,” cf. Stiglitz 2002. The main aspects of criticism are its triviality, incorrectness, and redundancy, see further elaborating on this, Watkins 1978: 35 ff. For a relativization of the criticism, cf. Lüdemann: 6 ff.

⁴¹⁹ Hedström & Swedberg 1996: 129 f.

⁴²⁰ On the structure of explanation and statements within social sciences, Opp 2014: 52 ff.; Tietzel 1981: 131 f.

detailed the model, the more plausible its assumption and the more precise its predictions.⁴²¹ Legal rules, however, apply to a great variety of subjects and situations. The complexity of human decision-making necessitates abstraction to develop a scientifically valuable model.⁴²² Over-specification would render the model useless.⁴²³ Thus, the central question in forming a theory or model is which aspects to reduce and which to include to allow for the most accurate examination of the situation under inquiry. Guidance in this regard is provided by focusing on the central behavioral features of “typical behavior”⁴²⁴ or an “ideal type”⁴²⁵ that can then be (more or less precisely) empirically falsified. The representative characteristics depend on the specific situation and problem being studied. Thus, the object and interest of analysis are the basis for an informed reduction of complexity, as exemplified by Figure 11.

Figure 11 represents the process of developing a model of a complex phenomenon (in this case, the bull). The process involves searching for and extracting similarities and patterns (legs, tail) critical to studying the problem at hand (whether the bull can move or remain in balance). These structural patterns may vary in their specific design in each individual but are somewhat representative of the average bull. Features negligible for the present analysis can be removed (hair, eyes, etc.).⁴²⁶



Figure 11 *Le Taureau*, Pablo Picasso⁴²⁷ - © Succession Picasso / VG Bild-Kunst, Bonn 2026

⁴²¹ For a good illustration, cf. Koppl & Whitman 2004: 304 f.

⁴²² Schmidtchen 2000: 4. Cf. on the abstraction in scientific models, Strotebeck 2020: 7 f.

⁴²³ Schmidtchen 2000: 4 f.

⁴²⁴ Cf. Leschke 2012: 24; Tietzel 1981: 132. See also Kirstein 2004: 3.

⁴²⁵ Cf. Hedström & Swedberg 1996: 129; Koppl & Whitman 2004: 304.

⁴²⁶ If the problem would be investigating whether the bull is able to see, the central features would be different, namely, the eyes.

⁴²⁷ *The Bull* or *Le Taureau* is a series of eleven lithographs by Pablo Picasso from 1945. It represents the stages of abstraction, beginning with a realistic drawing of the bull and its physiological complexity, ending with a few lines that allow recognizing the bull.

The prediction is then *deduced* from the specification of the rules in conjunction with the facts of the situation, cf. Figure 12. The *explanandum* (the bull can move and stay in balance) follows from the statement of the rule (four legs and one tail allow an animal to move and to balance) and the given conditions (the bull is an animal with four legs and one tail), cf. Figure 12. The relationship between the two components is “if explanans then explanandum follows.”⁴²⁸ While the rationality principle makes “universal statements,” the *explanans* consists of “singular statements, which apply to the specific event in question and which I shall call ‘initial conditions’”. It is from universal statements in conjunction with initial conditions that we *deduce* the singular statement.⁴²⁹ These statements can only be falsified since absolute verification is impossible, as the probability of a disapproving scenario always remains. Furthermore, predictions are always relative because of the problem of induction⁴³⁰ and causality. This implies that legs and tails do not ensure but increase the likelihood that the bull can move and remain in balance.⁴³¹

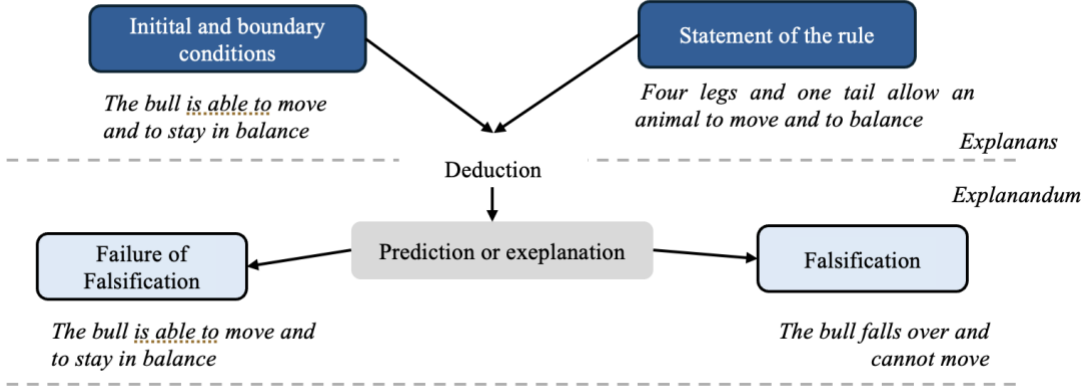


Figure 12 Deductive reasoning in the theory of social sciences

b. Different Conceptualizations: Rationality on a Spectrum

The rational choice model is used in various ways and often in very different specifications, making it difficult to determine *the* concept of rationality.⁴³² The various conceptualizations go

⁴²⁸ Cf. Opp 2014: 53. Scientific hypotheses imply a structure of sufficient conditions, i.e., from a specific observation (a), the conclusion (b) is derived. For example, if it snows today (a), there will be snow on the mountains (b). If a is true, then the b is necessarily also true. However, a conclusion backward may be false, in other words, the observation of snow on the mountain does not necessarily imply that it snowed today, see Schäfer & Ott 2020: 116 fn. 15.
⁴²⁹ Emphasis adopted, see Popper 2005: 38.
⁴³⁰ Kirchgässner 2013a: 7.
⁴³¹ Statements are probabilistic in nature, such as, “in general, XYZ,” cf. Leschke 2012: 24 f.; Towfigh & Petersen 2017a: 7 para 13.
⁴³² Sen 1977: 343. For an overview of different concepts, see Korobkin & Ulen 2000: 1060 ff.

back to the long history of its scientific development.⁴³³ Generally, one can distinguish between “thin” and “thick” versions, cf. Figure 13, which differ in their degree of specification of theoretical variables. The following outline is limited to a rudimentary outline of four variants of rationality relevant to this work and to show that the rationality principle is definable on a spectrum:

The formal (definitional) version understands rational decision-making as purely formal without further specifying the decision variables.⁴³⁴ Instead, it reduces the theory to a means-end relation to investigating an inherent logic of a specific course of action without empirically accessible content, i.e., without specified goals, action maxims, or environmental restrictions.⁴³⁵ Thus, in principle, any behavior is rational based on an *ex post* definition of the decision elements.⁴³⁶ The expected utility version is “thicker” in that it defines specific axioms that must be met to assume rationality, acknowledging the maximization principle.⁴³⁷ The self-interest version builds upon the expected utility version but adds self-interest to the content of the actor’s utility function; however, when altruism or other people’s preferences are incorporated as components of the actor’s utility, the distinction between the expected utility and the self-interest version dissolves.⁴³⁸ The wealth maximization version is the most substantive version of rationality because it defines the underlying values of the actor’s utility function in terms of financial or monetary goals.⁴³⁹

⁴³³ See further on the historical development and the various forms of the homo economicus within economics, Tietzel 1981.

⁴³⁴ Aaken 2003: 93 f.; Korobkin & Ulen 2000: 1060 f.; Tietzel 1981: 121 f.

⁴³⁵ Tietzel 1981: 121.

⁴³⁶ Korobkin & Ulen 2000: 1061 f.

⁴³⁷ Korobkin & Ulen 2000: 1062–1064. See on expected rational (utility) maximization, Part 2.B.I.3.d and e.

⁴³⁸ Korobkin & Ulen 2000: 1064–1066.

⁴³⁹ Korobkin & Ulen 2000: 1066.

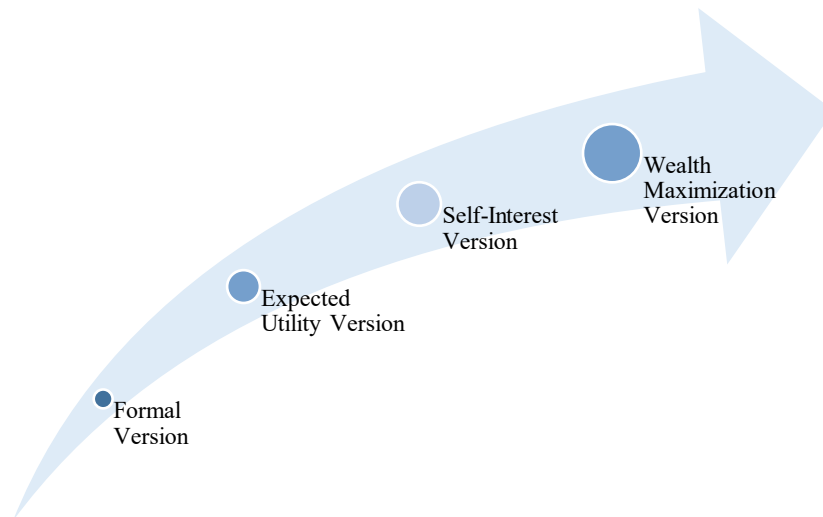


Figure 13 Thick and thin versions of rationality⁴⁴⁰

Overall, the more substantiated the understanding of rationality, the more it is open to empirical investigation and thus to falsification and criticism. Associated with this are various methodological classifications of the principle, each of which is closely intertwined with the understanding of science in general and the associated requirements for the falsifiability of its elements. The following will outline some of the main understandings⁴⁴¹ to address the demands on the model for making it usable in the legal sciences.

c. Kirchgässner: Rational Choice as a Metaphysical Statement

Kirchgässner advocates a “weak” or formal version of rationality, rather understood as “a methodological advice than an empirical statement.”⁴⁴² In this regard, rationality refers to a goal-orientated utility-maximizing behavior as a systematic response to changing environmental incentives while acknowledging that there are information and time constraints.⁴⁴³ The result is that every action can be explained with rationality, even if only *ex post*.⁴⁴⁴ Such “metaphysical” statements based on the rationality principle exclude the possibility of falsification.⁴⁴⁵ The rationality principle aims not to approximate reality but to provide “methodological guidance for the way we are conducting research in the social sciences. It tells us that whenever we want to explain human behavior, we should try to explain it as the rational actions of individuals or as

⁴⁴⁰ Compare Korobkin & Ulen 2000: 1061.

⁴⁴¹ See also on the methodological classification of the rationality principle, Schäfer & Ott 2020: 114–117. Schäfer and Ott further name Machlup and the understanding of the rationality principle as one of the main paradigmatic elements of economics.

⁴⁴² Kirchgässner 2013b: 4. With further reference to Brennan 2007.

⁴⁴³ Kirchgässner 2013b: 6. Kirchgässner 2013a: 29.

⁴⁴⁴ Kirchgässner 2013b: 8.

⁴⁴⁵ And not be verified either, cf. Kirchgässner 2013b: 8.

the result of rational decisions, respectively.”⁴⁴⁶ The weak rationality principle provides a framework consisting of preferences, restrictions, goals, and means incorporated into the economic behavioral model, thereby allowing for a coherent approach.⁴⁴⁷ The reduction to the instrumental conceptualization allows for structural assumptions (i.e., regarding the structure of the utility function) on a general basis but not about content (i.e., the specific utilities).⁴⁴⁸ Yet, the lack of *ex ante* specification of the model’s variables, such as preferences or utility, limits its methodological value as an instrument for behavioral predictions.

d. Popper and Hayek: Sciences as Pattern Prediction and Explanation in Principle

i. Popper

Popper regards theories of science, and thus also the theory of rational choice, as a “lucky oversimplification,” which cannot be true in all detail.⁴⁴⁹ In his view, science is not “a ‘body of knowledge’, but rather [...] a system of hypotheses [...] of guesses or anticipations which in principle cannot be justified, but with which we work as long as they stand up to test.”⁴⁵⁰ It only allows an “*approximation to the truth*.”⁴⁵¹ In this sense, the rationality principle is an “*almost empty principle*”⁴⁵² that cannot be empirically tested. Instead, its scientific value lies in its methodological guidance for investigating human behavior by incorporating situational elements.⁴⁵³ The situational specification of the principle then allows for predictions and explanations about the course of action according to the “logic of the situation” and within events that are similar in structure.⁴⁵⁴ The scientific value of these predictions and explanations remains until they are falsified⁴⁵⁵ and replaced by a more approximate alternative.⁴⁵⁶ Consequently, the rationality model specified situationally is responsible for empirical falsification, and if it is falsified, the faulty element in the situational specification must be determined – but not the rationality principle as such.⁴⁵⁷

⁴⁴⁶ Footnote omitted, Kirchgässner 2013b: 8.

⁴⁴⁷ Kirchgässner 2013b: 7.

⁴⁴⁸ Brennan 2007: 111 f.

⁴⁴⁹ Popper 1994: 172 f.

⁴⁵⁰ Popper 2005: 318.

⁴⁵¹ Emphasis adopted, see Popper 1994: 176.

⁴⁵² Emphasis adopted, Popper 1994: 169.

⁴⁵³ Compare, Popper 1994: 169.

⁴⁵⁴ Popper 1994: 166 ff.

⁴⁵⁵ Popper 2005: 318.

⁴⁵⁶ For instance, cf. Popper 2005: 66 f. fn. 1.

⁴⁵⁷ Popper 1994: 177.

ii. Hayek

Hayek somewhat provided the basis for Popper's understanding of social sciences as "explanation in principle," not "in detail."⁴⁵⁸ The reason is that social sciences deal with "phenomena of organized complexity"⁴⁵⁹ that are caused and influenced by many individual variables, and their interdependencies are beyond the comprehension capacity of human mind.⁴⁶⁰ This means that the economic challenge is to design an economic order based on dispersed knowledge, not actual knowledge of individual instances, such as different objectives.⁴⁶¹ Science can only allow for understanding their interconnection but not for complete knowledge of all instances relevant to the observed phenomena.⁴⁶² The generated knowledge is thus abstract, as it is reduced to interrelationships and dependencies rather than to the content of elements of individual processes.⁴⁶³ This means that knowledge of the principle of generating these phenomena rarely allows accurate predictions of particular outcomes.⁴⁶⁴ Instead, social science's predictive and explanatory power is limited to "pattern predictions" and "explanation in principle" for classes of events that relate to selected properties of the observed phenomenon.⁴⁶⁵ While these predictions and explanations have empirical significance and are falsifiable, there will always be some instances that are not theoretically accounted for.

To some extent, predictions will only be negative so that specific scenarios can be ruled out, but not a sufficiently large enough number for only one scenario to remain.⁴⁶⁶ Therefore, a conclusive theory of science can never be established by induction, only by falsification through possible negative cases.⁴⁶⁷ The rationality principle therefore only allows a generalized investigation of human tendencies and statements that cannot be verified but are naturally falsified by individual instances.

e. Friedman: The Predictive Power as the Value of a Theory

Friedman held that it is not the realism of the general rule statements that define the value of a theory but its predictive power for a category of phenomena.⁴⁶⁸ The complexity of reality makes

⁴⁵⁸ Compare Popper 1994; von Hayek 1955.

⁴⁵⁹ von Hayek 1978: 26 f.

⁴⁶⁰ von Hayek 1979: 42.

⁴⁶¹ von Hayek 1945: 519 f.

⁴⁶² von Hayek 1978: 12. See also von Hayek 1979: 83.

⁴⁶³ Science is limited to providing a "theoretical understanding of the interconnections," von Hayek 1978: 12.

⁴⁶⁴ Cf. von Hayek 1955: 215.

⁴⁶⁵ See generally on degrees of scientific explanation von Hayek 1955. Also cf. von Hayek 1978: 26 f.

⁴⁶⁶ von Hayek 1979: 42. Also von Hayek 1955: 223.

⁴⁶⁷ In this sense, Hayek adopts Poppers "falsificationism," von Hayek 1955: 210.

⁴⁶⁸ Friedman 1953: 8 f. Also Friedman 1953: 15.

theoretical abstraction central.⁴⁶⁹ This means that realism can never be the aim of a theory but a sufficiently good approximation to the specific purpose that is empirically accessible.⁴⁷⁰ A model or theory is adequate as long as it allows for analyzing a class of instances.⁴⁷¹ Thus, the prediction test indirectly tests whether the assumptions are sufficiently close to reality.⁴⁷² If the predictions are disproved more frequently than the predictions of an alternative hypothesis, the hypothesis of the theory is rejected.⁴⁷³ In line with Popper and Hayek, Friedman limits the power of scientific knowledge to falsification. Falsification fails when “the hypothesis has been “confirmed” by experience.”⁴⁷⁴ Therefore, as long as the rational choice theory allows for better predictions than an alternative theory, the realism of its assumptions is secondary.

8. The Value of the Homo Economicus in Legal Sciences

a. Predictive Power and the Need for a Substantiated Version of Rationality

Understanding the rationality principle in a thin version makes it possible to study and explain observable behavior from an *ex post* perspective by specifying “revealed” decision variables of observable behavior.⁴⁷⁵ However, interpreting decision variables from an *ex post* perspective and reasoning backward runs the risk of being tautological since any behavior is “rational” if decision variables are defined accordingly.⁴⁷⁶ The tautology problem is most evident in the revealed preference approach, which allows behavior to be always interpreted as utility maximizing.⁴⁷⁷ Therefore, a thin or formal understanding of rationality reduces its value in providing a methodological framework and analysis perspective with no further empirical force.⁴⁷⁸ While this may be valuable from a sociological perspective for gaining an instrumental understanding of human decision-making, it is not sufficient for legal analysis: Legal policymakers require a concrete idea of future behavior, considering different legal alternatives and choosing among

⁴⁶⁹ Friedman 1953: 7.

⁴⁷⁰ “[T]he relevant question to ask about the “assumptions” of a theory is not whether they are descriptively “realistic,” for they never are, but whether they are sufficiently good approximations for the purpose in hand. And this question can be answered only by seeing whether the theory works, which means whether it yields sufficiently accurate predictions,” Friedman 1953: 15.

⁴⁷¹ Friedman 1953: 7 f.

⁴⁷² Mäki 2009: 95.

⁴⁷³ Friedman 1953: 8 f.

⁴⁷⁴ Friedman 1953: 9.

⁴⁷⁵ See on the idea of the “revealed preference approach,” Part 2.B.I.3.a. See also critical, Korobkin & Ulen 2000: 1067 f.

⁴⁷⁶ Eidenmüller 1995: 32 f. Any kind of behavior is rational only by existence, cf. Korobkin & Ulen 2000: 1061 f.

⁴⁷⁷ Sen notes that it implies that “you can hardly escape maximizing your own utility, except through inconsistency,” Sen 1977: 322.

⁴⁷⁸ See on this, Kirchgässner 2013b: 3 f. 8. Also Part 2.B.I.7.b and Part 2.B.I.7.c 2.

concurrent norms.⁴⁷⁹ The coercive nature of law requires legislation to be based on empirical socio-legal *ex ante* impact analysis that rationalizes legal rules and institutions in light of social goals. The value of the rational choice model for legal science and legal policy lies primarily in its predictive power: to supplement the information base on which decisions are made about supposedly the most appropriate legal norms for societal goal attainment. Hence, a more substantiated, thicker version of rational choice theory is needed.⁴⁸⁰

The problem here lies in the external precision of subjective decision variables, which is scientifically demanding. The common result is that the economic analysis of law uses the traditional monetary(materially)-oriented, strictly self-interested, fully rational actor.⁴⁸¹ This is partially defended by arguing, among other things, that legal rules apply to situations of a structural dilemma;⁴⁸² that they are typically relevant in cases of conflict that require outside intervention and less when parties act altruistically.⁴⁸³ Therefore, the preferences of others as part of the individual's utility function are mostly excluded from the analysis, and the individual's preferences are reduced to material or monetary components.⁴⁸⁴

The assumption of stable preferences is seen as justified relative to the change in environmental restrictions by legal rules: Since changes in legislation are immediate, it seems realistic to assume stable preferences for the study period.⁴⁸⁵ In addition, it is argued that most parts of our lives, including the law, typically assume rationality.⁴⁸⁶ Thus, "some minimal degree of rationality must be accepted [...]. For if men are completely or always irrational, laws are pointless."⁴⁸⁷

Moreover, the general integration of the insights of behavioral economics is complicated since relevant aspects differ individually and situationally. For example, the reference point within prospect theory is crucial for evaluating an event as a loss or benefit or the availability heuristic. Both aspects are, among other things, shaped by the individual's situation or experience. A proposal for an alternative theory of a general nature is therefore lacking.⁴⁸⁸ Consequently, the

⁴⁷⁹ Compare, for instance, Korobkin & Ulen 2000: 1067.

⁴⁸⁰ On the demand for a consequential perspective on (criminal) law, cf. Part 2.A.IV and Figure 1 and its application *de lege ferenda*, cf. Part 2.A.III.2.b.

⁴⁸¹ Compare Part 2.B.I.6.

⁴⁸² For example, as argued by Homann & Suchanek 2005: 31 ff. and 355 ff.

⁴⁸³ For instance, in the case of rental agreements. If both, the landlord and the tenant, act altruistically, a conflict scenario is hardly imaginable. The rules of the legal contract thus only become relevant in cases where both assert their own interest and thereby provoke a conflict of interest. See also Kirchgässner 2013a: 63 ff.

⁴⁸⁴ Which is reasonable if they at least dominate immaterial components to allow for predictions, cf. Janson 2004: 49.

⁴⁸⁵ Janson 2004: 28 f.

⁴⁸⁶ Cf. Hylton 2005a: 102. Or Eidenmüller 1995: 37.

⁴⁸⁷ Hylton 2005a: 97.

⁴⁸⁸ Cf. Becker 1993: 403. See also Garoupa 2003: 12 f.; Lüdemann: 13. On the contradiction between the demand for a general model and its empirical and individual differentiation, e.g. Englerth 2010: 378.

classical rational model is still considered the most developed model of human behavior, suitable as a general framework for analysis, but needs to be differentiated accordingly and applied sensitively to its limitations.⁴⁸⁹

b. Interim Statement

In this work, the rational choice theory is applied to the analysis of criminal law. At first glance, criminal law deals with rather irrational behavior, calling into question the scientific appropriateness of the rational model in a particular way.⁴⁹⁰ For example, the classical conception of rationality is poorly suited for analyzing cases of drug abuse or domestic violence. While incompleteness does not *per se* reveal a theory or model invalid,⁴⁹¹ there are crimes, such as tax evasion, for which the rationality principle may allow for better predictions than for other crimes. In order to do justice to the need for differentiation in its suitability, the applicability of the model of the classical homo economicus and the extent to which limits of self-interest, rationality, and willpower apply will be examined based on the situation and actor studied, i.e., environmental crimes committed in a corporate context by a corporate actor.⁴⁹²

II. The Normative Efficiency Principle

The examined positive level of analysis deals with the incentive structure of legal norms and behavioral responses, assuming that individuals respond systematically, which allows for predictions.⁴⁹³ Based on these predictions, legal rules can be designed to encourage socially desirable behavior. But what is socially desirable; how to define and measure it?

The normative theory addresses these normative concerns by defining socially desirable behavior in light of a social goal. The perspective is that of a social or collective choice theory with the central question of justifying collective decisions over individual autonomy and preferences.⁴⁹⁴ In this context, the efficiency principle becomes the normative criterion to guide the design of incentives at the micro level. Generally, efficiency refers to maximizing social welfare by a non-

⁴⁸⁹ Similar, cf. Aaken 2003: 86; Eidenmüller 1995: 40; Schäfer & Ott 2020: 158.

⁴⁹⁰ See on aspects that may prevent rational decision-making on behalf of the criminal, such as lack of information on risks of apprehension and punishment, or use of drugs, Anderson 2002. As well as Fischer 2014: 40. Fisher argues that its application to criminal law is generally controversial due to, *inter alia*, applying ideas on rationality, efficiency, and criminal law's concern with moral culpability or fairness.

⁴⁹¹ On models and theories within social sciences, Part 2.B.I.7.a. Further, Engel: 27; Lüdemann: 21 ff.

⁴⁹² Part 4.B.II. On integrating the findings of behavioral law and behavioral economics, Englerth 2010: 363 ff.

⁴⁹³ Cf. Part 2.A.III.2.a.i.

⁴⁹⁴ Cf. Schäfer & Ott 2020: 11 ff.

wasteful use of resources (minimum/maximum principle).⁴⁹⁵ From a welfare economics perspective, efficiency represents a goal in itself against which all other social goals must be measured.⁴⁹⁶ Reference to it allows for comparing and rationalizing legal policy choices.⁴⁹⁷ At this point, economic analysts become social policy makers, proposing policy measures.⁴⁹⁸ Three main concepts have emerged for its operationalization, which will be analyzed with their main features in the following.

1. Pareto Efficiency

The original welfare principle was the Pareto efficiency principle introduced by Vilfredo Pareto (1896). Pareto's underlying motive was to develop a value-free and consensus-based collective decision-making principle to guide public policy.⁴⁹⁹ Furthermore, the aim was to dispense with cardinal utility measurement and interpersonal comparison and to measure utility ordinal.⁵⁰⁰ Pareto-efficient or Pareto-optimal refers to a status quo at which no one can be made better off without making someone else worse off.⁵⁰¹ It refers to resource allocation and is achieved through free trade in a competitive market where actors will trade until all beneficial transactions are realized.⁵⁰² No other trade option makes one party better off without making another party worse off; social welfare is maximized because no resource reallocation can increase social welfare.⁵⁰³ Accordingly, a status quo in which there is a possible beneficial resource transfer is Pareto-inferior, and the stage reached by reallocation is Pareto-superior.⁵⁰⁴

Consider the following example of a society of two members, Y and X:⁵⁰⁵ Y has shorts of size M that no longer fit him. X has size M and is looking for new shorts. The utility of Y is portrayed on the Y-axis, while the utility of X is displayed on the X-axis (cf. Figure 14). Y and X meet at a garage sale and bargain on the transfer of the shorts. Social welfare and the utility of X and Y are at stage 0. After bargaining and the transfer of the shorts from Y to X, the utility of Y and X

⁴⁹⁵ Kirstein 2004: 6 f.

⁴⁹⁶ Eidenmüller 1998: 56.

⁴⁹⁷ Behrens 1986; Schmidtchen 1998: 3. On the demand for the legitimation of governmental action, Schäfer & Ott 2020: 3 f.

⁴⁹⁸ Cf. Part 2.A.III.2.a.ii and Figure 4.

⁴⁹⁹ Compare Schäfer & Ott 2020: 12 f.

⁵⁰⁰ Janson 2004: 90 f.

⁵⁰¹ Cf. J. L. Coleman 1980: 513; Miceli 2004: 4; Posner 2014: 14; Strotebeck 2020: 54.

⁵⁰² Strotebeck 2020: 54. Sometimes referred to as allocative efficiency, Cooter & Ulen 2012: 14. Or specified as referring to production, consumption, Kolmar 2017: 86. And production structure, cf. Mathis 2019: 55 f.

⁵⁰³ Strotebeck 2020: 54. For a graphical display of a Pareto-efficient market, Mercurio & Medema 2006: 22–25.

⁵⁰⁴ Thus, Pareto-optimality compares one stage to all possible stages, whereas Pareto-superiority is limited to a bilateral comparison, J. L. Coleman 1980: 513.

⁵⁰⁵ See also for a helpful comparison between Pareto- and Kaldor-Hicks efficiency, cf. Mathis 2019: 63 ff.

is at point 1, representing an increase to both. Thus, any transfer of the shorts that reaches a utility point in box B increases the utility of X and Y and is thus Pareto-(superior)efficient.

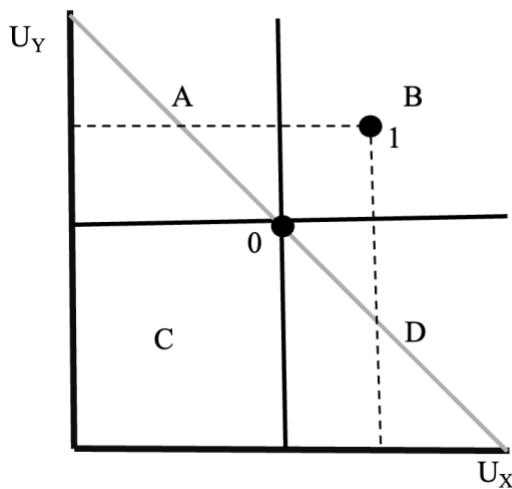


Figure 14 Pareto efficiency

The example shows that only the affected parties can decide on the Pareto superiority of an alternative,⁵⁰⁶ which grants them the theoretical authority to prevent the transfer.⁵⁰⁷ As rational X and Y will only engage in a transfer if the *ex post* stage is preferred, there is no need to attribute numerical values to utility; interpersonal utility comparison can be avoided.⁵⁰⁸ Furthermore, the fact that only generally beneficial transfers are allowed justifies assuming collective social consensus on Pareto-superior changes.⁵⁰⁹

However, unanimity means that each individual preference must be considered,⁵¹⁰ which limits its practicality to collective decision-making.⁵¹¹ The obstacle of unanimity is exacerbated in the context of political and legal actions, which usually involve a significant and unspecific number of parties.⁵¹² Moreover, legal or policy changes that do not disadvantage a single individual are rare, so relying on the Pareto criterion would significantly hinder any social reform or legal change.⁵¹³ Another limitation is its restriction on private commodities and reallocation through

⁵⁰⁶ Behrens 1986: 85.

⁵⁰⁷ Since full unanimity is required, cf. Schäfer & Ott 2020: 12 f. Also Miceli 2004: 4.

⁵⁰⁸ Concerning the avoidance of interpersonal utility comparison, Polinsky 1972: 407. Different, J. L. Coleman 1980: 515. Coleman argues that, if Pareto-superiority is supposed to be a total utility index, then it requires a standard for interpersonal-utility comparison to know about the other status quo's superiority.

⁵⁰⁹ Schäfer & Ott 2020: 12 f.

⁵¹⁰ Mathis 2019: 54; Schäfer & Ott 2020: 13.

⁵¹¹ Schäfer & Ott 2020: 12 f. For further criticism, see Mathis 2009: 35 f.

⁵¹² Eidenmüller 1998: 49 f. Schäfer & Ott 2020: 13.

⁵¹³ Mercurio & Medema 2006: 26. Cf. Polinsky 1972: 407.

free market transactions.⁵¹⁴ However, legal policy decisions typically concern public commodities,⁵¹⁵ which renders the principle for legal decision-making largely impractical.⁵¹⁶

2. Kaldor-Hicks Efficiency

The Kaldor-Hicks efficiency principle goes back to Nicholas Kaldor and John Richard Hicks, who attempted to find a solution to situations in which one party's improvement puts another party at a disadvantage by introducing "a perfectly objective test which enables us to discriminate between those reorganizations which improve productive efficiency, and those which do not."⁵¹⁷ Kaldor-Hicks efficiency addresses the problem of noncomparability and non-ordering by allowing and incorporating the possibility of disadvantages for parties.⁵¹⁸ A change in the status quo is Kaldor-Hicks efficient if one party's benefits exceed the other party's costs; if the benefiter could compensate the loser and still has a positive net gain.⁵¹⁹ The principle, thus, rests upon an overall cost-benefit calculus (of marginal changes) considering the transaction's summative welfare effects.⁵²⁰

The summative welfare perspective on the desirability of policy or legal measures resembles utilitarianism.⁵²¹ However, contrary to utilitarianism, changes in welfare and benefits and costs are typically measured monetarily.⁵²² Furthermore, the compensation is hypothetical and must not necessarily be awarded.⁵²³ Kaldor reasoned this by the fact that the government can always decide whether or not to provide compensation, which would ensure that everyone is better off;

⁵¹⁴ Deyneli 2019: 673.

⁵¹⁵ Deyneli 2019: 673.

⁵¹⁶ For instance, cf. Mercurio & Medema 2006: 26. Cf. Polinsky 1972: 407. Or Miceli 2004: 5; Schäfer & Ott 2020: 12 f.

⁵¹⁷ Hicks 1941: 111. He observed that "[m]an in society raises additional difficulties, because he is sometimes able to achieve his own individual ends more fully, not by increasing the efficiency of production, but at the expense of his neighbours. How are we to say whether a reorganisation of production, which makes *A* better off, but *B* worse off, marks an improvement in efficiency?," emphasis adopted, Hicks 1941: 111. The concept arose in the context of the introduction of Corn Laws in England, which restricted the importation of foreign grains into the country and protected the profits of landowners and farmers; while also artificially inflated the price of bread and thereby negatively affected the consumers. Nicholas Kaldor argued that, repealing the Corn Laws would mean an increase in social welfare if the beneficiaries, i.e., consumers, were able to compensate the losers, i.e., landowners and farmers, see Kaldor 1939. See also Mercurio & Medema 2006: 26 f.

⁵¹⁸ Compare Eidenmüller 1998: 51; Miceli 2004: 5 f. Thus, it is also called the "compensation principle," see further Mercurio & Medema 2006: 26 ff.

⁵¹⁹ "If *A* is made so much better off by the change that he could compensate *B* for his loss, and still have something left over, then the reorganisation is an unequivocal improvement," emphasis adopted, see Hicks 1941: 111. Cf. also Mercurio & Medema 2006: 26 f.

⁵²⁰ Eidenmüller 1998: 51; Miceli 2004: 6.

⁵²¹ Eidenmüller 1998: 52; Mathis 2009: 39.

⁵²² What de Geest refers to the "narrow definition," while the broader version includes other value units, such as utility, welfare, or happiness, de Geest 2015: 184 f.

⁵²³ Compensation "ought to be possible," Hicks 1941: 111. Also Mercurio & Medema 2006: 26 f.; Miceli 2004: 6.

whether compensation remains hypothetical or occurs in practice, he considered a political question.⁵²⁴ If it does, the change is Pareto-efficient.⁵²⁵

Consider the example above and Figure 15;⁵²⁶ but now assume that Y and X live in different cities, so a public official must decide on transferring the shorts and whether it will increase social welfare. For this, he asks Y how much he would be willing to pay (measured as the willingness to pay (WTP)) for a transfer of the shorts that would lead to a utility to him at stage 1; his answer is $\$Y$, cf. Figure 15. The public official then proceeds to ask X how much he would demand (measured as the willingness to accept the offer (WTA)) a change to stage 1; his answer is $\$X$. the transfer is Kaldor-Hicks efficient as long as $\$Y \geq \X . Since costs and benefits are measured monetarily, the main criterion is that monetary winners of a measure could potentially compensate monetary losers; not how much utility winners and losers receive from the money received or lost, thereby avoiding interpersonal utility comparison.

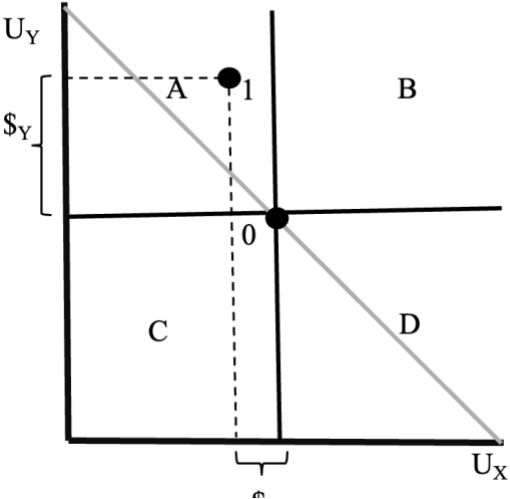


Figure 15 Kaldor-Hicks efficiency

By focusing on the summative welfare effects and the hypothetical compensation, Kaldor-Hicks efficiency neglects distributional aspects since these are considered as being in the domain of politics rather than economics.⁵²⁷ A collective consensus is constructed on a stochastic balancing of disadvantages and advantages, a “general compensation” after an infinite number of Kaldor-Hicks efficient measures.⁵²⁸ The idea of general compensation is critical in so far as it requires

⁵²⁴ Kaldor 1939: 550.

⁵²⁵ Mercuro & Medema 2006: 27; Miceli 2004: 6.

⁵²⁶ For a helpful illustration, Mathis 2019: 63 ff.

⁵²⁷ Mercuro & Medema 2006: 27.

⁵²⁸ “[A]lthough we could not say that all the inhabitants of that community would be necessarily better off than they would have been if the community had been organised on some different principle, nevertheless there would be a strong probability that almost all of them would be better off after the lapse of a sufficient length of time,” Hicks 1941: 111.

that all social classes are represented and that the distribution of advantages and disadvantages is equal.⁵²⁹ Moreover, avoiding interpersonal utility comparison is challenged in practice: If the parties cannot bargain, an outside observer must decide on the efficiency of a resource transfer, and for this, he must know that the winners gained more than the losers lost⁵³⁰ and that this equally counts for related utility. This is challenging in cases where no actual compensation has occurred, indirectly proving the transfer's efficiency,⁵³¹ and without a standard of assessing related utility.⁵³² Since monetary units are measured equally, an equal attributed individual utility is implicitly assumed.⁵³³ And thus, by accepting the status quo, the principle indirectly assumes an increase in social welfare.⁵³⁴ Instead, however, in cases in which the willingness to pay and to accept correlate differently across individuals, for instance, Y's \$1 measures 1 utility unit, while X's \$1 measures 3 (dis)utility units, transferring the pants and moving to stage 1 may well reduce welfare.⁵³⁵

The analysis shows that the Kaldor-Hicks efficiency rationale for fictionalizing a social consensus based on hypothetical compensation is rather vague.⁵³⁶ Still, since the Kaldor-Hicks criterion offers a specified analysis framework⁵³⁷ for evaluating policy changes that affect many parties, it is primarily used in economic and legal policy.⁵³⁸

⁵²⁹ See critical on this, Eidenmüller 1995: 243 ff. The empirical basis for the idea of “general compensation” is debated. Schäfer and Ott consider the hypothesis partially confirmed and argue that the most disadvantaged are better off in societies that pursue economic development through the introduction of legal concepts, such as contracts and property rights, Schäfer & Ott 2020: 25 f.

⁵³⁰ J. L. Coleman 1980: 519.

⁵³¹ Posner 1981b: 91.

⁵³² J. L. Coleman 1980: 519 f., 543.

⁵³³ Mathis 2019: 69. See also Perloff, arguing that measuring consumer and producer surplus equally involves and implicit interpersonal comparison, Perloff 2020: 351.

⁵³⁴ Mercurio & Medema 2006: 27.

⁵³⁵ For a similar example, Posner 1981b: 91 fn. 11.

⁵³⁶ Especially when assuming self-interested and utility-maximizing actors, consensus to unfavorable policies seems unreasonable, cf. Eidenmüller 1995: 235 f. Another criticism is the so-called “Scitovsky Paradox.” In 1941, Tibor Scitovsky uncovered in contradiction of the Kaldor-Hicks criterion by showing that it can also work reversly; to eliminate this contradiction, he proposed to introduce a double criterion, cf. Scitovsky 1941. For an explanation and example, Schäfer & Ott 2020: 21 f.

⁵³⁷ De Geest argues that Kaldor-Hicks efficiency allows for full transparency of analysis by laying down related costs/benefits, the criterion for balancing them, and the underlying empirics and assumptions of any normative decision, cf. de Geest 2015.

⁵³⁸ Cf. Posner 2014: 15. Also Eidenmüller 1998: 52. For instance, in American common law tradition the calculus of negligence (“learned hand formula”) stipulates that only if the expected damage exceeds the precautionary costs of the tortfeasor, a duty of care existed and was breached, see Mathis 2009: 153. For a more in-depth analysis with a revision of relevant case law see, Kim 2013.

3. Wealth Maximization

The wealth maximization principle goes back to Richard A. Posner (1979).⁵³⁹ Posner sought to detach the wealth maximization principle from utilitarianism to make it the normative basis of the economic analysis of law.⁵⁴⁰ Wealth maximization implies that a resource transfer is socially desirable if it increases the social value measured in wealth.⁵⁴¹ The wealth of a good or service is its monetary equivalent and is measured by the willingness to pay for it (WTP), conversely, by the willingness to accept to sell it (WTA).⁵⁴² Only preferences "backed up by money"⁵⁴³ are included in the social welfare calculation. Wealth is restricted to the economic meaning and thus differs from the non-monetary utilitarian utility.⁵⁴⁴ It also differs from the gross national product as it includes non-material values of implicit or hypothetical markets.⁵⁴⁵ Hypothetical markets are relevant in cases of prohibitive transaction costs, such as in the event of an accident, in which courts subsequently determine the amount of compensation.⁵⁴⁶ They are less efficient than "actual" markets because the value determined is only an approximation and should be limited to cases with prohibitive transaction costs.⁵⁴⁷ The main reason why Posner considers the wealth maximization principle ethically superior to utilitarianism is that, in a well-regulated market, any increase in wealth must stem from lawful behavior that has benefited someone else, thereby assuring its social value. To the contrary, utilitarianism encompasses a wide range of social values, including those related to antisocial behavior, such as sadism, which may therefore also be considered socially valuable.⁵⁴⁸ Through its restriction to consensual market transfers, the wealth maximization principle "encourages and rewards the traditional 'Calvinist' or 'Protestant' virtues and capacities associated with economic progress"⁵⁴⁹ and protects the market system. Consider the following example,⁵⁵⁰ illustrated in Table 1: Suppose the indigent man A steals a tent from the wealthy man B. A's willingness to pay for the tent is \$0 since he has no wealth, and

⁵³⁹ His ideas were first published in Posner 1979. And later incorporated in his comprehensive work "The Economics of Justice," cf. Posner 1981b.

⁵⁴⁰ Posner 1979: 105, 119 ff.

⁵⁴¹ Posner 1979: 119, 132.

⁵⁴² Posner 1979: 119. Willingness to pay is measured marginally, as according to the Gossen's first law, the marginal utility decreases as the number of units increases. This means that, normally, the WTP equally diminishes; thus, it must be investigated for each unit of utility separately and *de novo*, cf. Mathis 2009: 146; 2019: 186 f.

⁵⁴³ Posner 1979: 119.

⁵⁴⁴ Posner 1981b: 60 f.

⁵⁴⁵ Mathis 2019: 187 f.; Posner 1979: 120; 2014: 16.

⁵⁴⁶ Compare Posner 1979: 120.

⁵⁴⁷ Posner 1979: 120. See further on the efficiency inferiority of coercive transactions in hypothetical markets, Posner 1981b: 63 f.

⁵⁴⁸ Cf. Posner 1979: 132.

⁵⁴⁹ Posner 1979: 124.

⁵⁵⁰ For another example, see Posner 1979: 121.

B is willing to accept any offer for the tent of at least \$100. A coercive resource transfer from B to A decreases social welfare measured in wealth by \$100. Measuring utility, let us assume that the utility that A would derive from the tent is 500 U, while B derives 100 U from the tent. Thus, a (coercive) transfer from B to A would increase social utility by 400 U.

Table 1 Resource transfer measured in terms of wealth and utility maximization⁵⁵¹

	Indigent thief A	Wealthy man B	Welfare effect
WTP/WTA	\$0	\$100	- \$100
Utility	500 U	100 U	+ 400 U

The utilitarian perspective on the social desirability of transfer differs from the wealth maximization perspective. Since transaction costs are not prohibitive, the hypothetical market approach and coercive transfer are negated in the latter.⁵⁵² Instead, the idea is to promote efficiency through ethical Calvinistic behavior in line with market logic and to encourage resource transfer through voluntary market transactions by limiting hypothetical market transfers to cases of prohibitive transaction costs.⁵⁵³

Compare indigent thief A with indigent man C, both wanting to own B's tent. Instead of stealing, C decides to work as a bus driver to earn money and buy B's tent for \$110. Wealth increases in two ways: by \$10 due to the transfer from B to C and an unknown amount due to C's work as a bus driver. C is morally superior to A because he intends to increase his wealth while also increasing B's wealth through his payment and that of society through the accumulation of money through his work.⁵⁵⁴

Posner further argues that wealth maximization creates incentives for principles such as "keeping promises," "telling the truth," and altruism, which reduces costly forms of market protection such as contracts or litigation and facilitates transfers.⁵⁵⁵ The principle also offers a theory of distributive and compensatory justice:⁵⁵⁶ The initial distribution of rights shall correspond to where they are valued most, i.e., where those rights would be allocated if traded on a market.⁵⁵⁷

⁵⁵¹ Note that the relation between monetary units (\$) and utility (U) is fictitious.

⁵⁵² Posner 1979: 121.

⁵⁵³ Cf. Posner 1979: 121 ff.

⁵⁵⁴ Compare Posner 1979: 122 f. Posner 1981b: 66.

⁵⁵⁵ Posner 1979: 123.

⁵⁵⁶ Posner 1979: 125 ff.; 1981b: 71 ff.

⁵⁵⁷ Posner 1979: 125.

This avoids transaction costs related to redistribution and maximizes social welfare.⁵⁵⁸ Deriving rights from wealth is justified in a market-based society because wealth reflects the individual's social productivity.⁵⁵⁹ Corrective justice is realized through tort law compensation in case of rights violation.⁵⁶⁰

Within the wealth maximization principle, the economic idea of rights is much more exclusive than utilitarianism.⁵⁶¹ Redistribution is limited as it is said to impair the autonomy of those from whom resources are taken.⁵⁶² Since those in need generally lack the money to make their preferences valuable, they matter only "if they are part of the utility function of someone who has wealth."⁵⁶³ This means that redistribution can only be justified based on the principle of wealth maximization if it increases social welfare because its marginal wealth benefits outweigh its marginal wealth costs; for instance, if it leads to a significant decrease in the crime rate or if it is part of a wealthy individual's utility function because of altruism or beneficence.⁵⁶⁴ Posner deduces collective consent to wealth maximization measures from the idea of *ex ante* compensation: Typically, (uncompensated) losses result from the realization of risks taken in the expectation of a positive outcome; the individual experiences losses within a system of which he is a consensual part because it also promises the prospect of gain. In this respect, losses can be assumed to result from acceptance of a risk in the expectation of a gain. For example, someone who trades on the stock exchange or buys a lottery knows and accepts the risk of loss in light of an anticipated gain. Therefore, *ex ante*, losers are expectedly better off; *ex post*, in the case of risk realization, they are not.⁵⁶⁵ In addition, consent can be purchased⁵⁶⁶ or constructed by asking whether the parties involved would have consented if the transaction costs were zero.⁵⁶⁷

⁵⁵⁸ By legally allocating resources where they are most valuable, the problem of transaction costs that might impede allocative efficiency can be avoided. The idea is that the allocation of rights "simulates" the outcome of an efficient market, Posner 1979: 127. "[T]he specific distribution of *wealth* is a mere by-product of the distribution of *rights* that is itself derived from the wealth maximization principle. A just distribution of wealth need not be posited," emphasis adopted, cf. Posner 1981b: 81. See on the problem of taking wealth maximization as a starting point for allocating rights, Calabresi 1980: 554 f. Calabresi argues that wealth itself is too abstract and depends on the desires and characteristics of the individual. Therefore, in order to assume that the maximization of wealth is desirable, it is necessary to specify what is considered wealth and give meaning to its maximization.

⁵⁵⁹ "Productive people put more into society than they take out of it. Hence so long as the additional population is productive, the existing population will benefit," footnote omitted, cf. Posner 1979: 128 f.

⁵⁶⁰ Posner 1979: 127.

⁵⁶¹ Posner 1979: 125.

⁵⁶² Posner 1979: 128.

⁵⁶³ Posner 1979: 128.

⁵⁶⁴ Posner 1979: 131.

⁵⁶⁵ Mathis 2019: 218; Posner 1981b: 94 f.

⁵⁶⁶ Posner 1979: 131 f.

⁵⁶⁷ Posner 2014: 96.

The welfare maximization principle resembles the Kaldor-Hicks efficiency principle by including hypothetical *ex ante* compensation.⁵⁶⁸ The idea of measuring the welfare effect of a transfer based on the willingness to pay and to accept corresponds to the standard economic approach of cost-benefit analysis (CBA) as an advisory tool for political decision-making.⁵⁶⁹ In what follows, therefore, the aim is to take a closer look at the normative legal critique of such a summative efficiency approach.

4. Limitations and Criticism of the Wealth Maximization Principle

Normative limitation and criticism of the wealth maximization principle are related to controversies on the relationship between “internal” legal principles and the “external”⁵⁷⁰ efficiency principle, captured in the notions of efficiency *vs* equity or efficiency *vs* justice, and the associated question on what role the former should play to legal practitioners, mostly, judiciaries and legislators. More broadly, the debate concerns the inclusion of “nontraditional” legal, or reversly, economic values into the respective analysis. Since welfare analysis and the values included – like society itself – are constantly evolving, so is the associated discourse.⁵⁷¹ A detailed account is beyond the scope of this work, and it is needless to say that the following does not illustrate the debate in its entirety. Though it intends to outline main controversies on “competitive” legal and economic principles by using the principle of welfare maximization and the discourse between Guido Calabresi and Ronald Dworkin as an exemplary basis.⁵⁷²

a. Wealth Maximization and Distribution

Typically, the economic approach as a consequential normative theory and its utilitarian roots are challenged by arguments similar to those raised against classical utilitarianism, such as

⁵⁶⁸ Thus, it is often regarded as the equivalent to the Kaldor-Hicks efficiency, Eidenmüller 1995: 54; Mercurio & Medema 2006: 26. As noted by Mathis, Posner puts the principle of wealth maximization into perspective and, in his later works, refers to the Kaldor-Hicks efficiency criterion as the main operating concept in economics, Mathis 2019: 184 ff. also 194. “In the less austere concept of efficiency mainly used in this book – called the Kaldor-Hicks concept of efficiency, or wealth maximization,” Posner 2014: 14.

⁵⁶⁹ On CBA within environmental law and economics, Part 3.B.II.1.

⁵⁷⁰ So far, in German law, efficiency does not constitute an autonomous legal principle or goal; instead, efficiency – from a legal perspective – relates to the means and instruments available to reach a specific goal, cf. Eidenmüller 1998: 55 f. According to Radbruch, the concepts of justice, expediency, and legal certainty are the three most important guiding principles of the law, see Radbruch 1999: 73 ff.

⁵⁷¹ On a recent collection of elaborations on, among other things, “non-efficiency” values within law and economics, cf. Arisitides & Mercurio 2015.

⁵⁷² For a comprehensive analysis, for instance, Kaplow & Shavell 2009; Mathis 2009; 2019. A more detailed account of the social value compartments of welfare analysis relevant to the economic analysis of (criminal) law and the research focus of this work will be given in Part 4.C.

interpersonal comparison of utility or the lack of a moral basis.⁵⁷³ With this in mind, Posner tried to devalue this sort of criticism by limiting social value to wealth and grounding its maximization in libertarian morality.⁵⁷⁴ Furthermore, substituting utilitarian utility for wealth intends to avoid interpersonal utility comparison.⁵⁷⁵ The initial distribution of rights and resources corresponds to the distribution of wealth (willingness to pay) and reflects the highest valued resource allocation justified by allocative efficiency and the productivity of the entitlement recipients.⁵⁷⁶ Since value measured in wealth is independent of its relative accumulation, redistribution based on interpersonal utility comparison and the law of diminishing marginal utility is generally not applicable.⁵⁷⁷

The following example in Table 2 illustrates how the non-consideration of marginal utility in the wealth maximization principle leads to a different optimal distribution than a traditional utilitarian approach. Suppose the wealth of the population is divided into two groups. At stage X, there is a wealthy group A, where everyone owns \$100,000 and has a utility of 100 U, and a non-wealthy group with no wealth and no associated utility, cf. Table 2. The government introduces a redistribution tax of 50%, resulting in an equal distribution of wealth of \$50,000 for each group (stage Y). Group A has a utility of 70 U from the \$50,000, and group B receives a utility of 100 U. From a utilitarian point of view, the law of diminishing marginal utility implies that in stage Y, social utility is greater than in stage X; from an economic wealth maximization point of view, stage X and Y are indifferent in terms of social welfare, measured in wealth. The example shows that distribution aspects are of no further concern, and wealth maximization is compatible with inequitable distribution.⁵⁷⁸

⁵⁷³ For instance, cf. J. L. Coleman 1980.

⁵⁷⁴ Compare, for instance, Posner 2015: 9 ff.

⁵⁷⁵ Units of wealth – not of utility in a utilitarian hedonistic sense (i.e., happiness) – are compared. While a correlation between them is acknowledged, they remain distinctive, cf. Posner 1985c: 87 f. See also in this respect on differences between Kaldor-Hicks and utilitarianism, cf. Schäfer & Ott 2020: 28 f.

⁵⁷⁶ Posner 1979: 127 ff.

⁵⁷⁷ Grant 1988: 844; Posner 1979: 130 f.

⁵⁷⁸ On the basic relationship between efficiency and distribution, cf. Schäfer & Ott 2020: XVIII f.

Table 2 Redistribution and wealth and utility maximization⁵⁷⁹

	Stage X	Stage Y
Group A	\$100,000 ~ 100 U	\$50,000 ~ 70 U
Group B	\$0 ~ 0 U	\$50,000 ~ 100 U
Social wealth	\$100,000	\$100,000
Social utility	100 U	170 U

The limited grounds for justifying redistribution based on the wealth maximization principle become most apparent if transaction costs of redistribution are included.⁵⁸⁰ Assume the scenario above in Table 2, but add tax transaction costs of \$10,000 split between the two parties, cf. Table 3. While the superiority of stage Y in terms of social welfare measured in utility remains, the social welfare in terms of the wealth of stage X is greater.

Table 3 Redistribution and wealth and utility maximization in the case of transaction costs⁵⁸¹

	Stage X	Stage Y
Group A	\$100,000 ~ 100 U	\$45,000 ~ 65 U
Group B	\$0 ~ 0 U	\$45,000 ~ 97 U
Social wealth	\$100,000	\$90,000
Social utility	100 U	162 U

Furthermore, Posner himself already observed that “[i]f that distribution is unjust, the pattern of economic activities derived from it will not have a strong claim to be regarded as just either.”⁵⁸²

The reason is that wealth is decisive for consumptive and productive behavior alternatives, so a market system based on it reinforces unequal distribution. In the long run, this can lead to the undesirable elimination of the structural and constitutive market element in the form of competition by favoring monopolies, which the following example can illustrate:

Suppose tractor Z is to be distributed between potato farmers A and B. A already has a tractor, but he would be happy to have the slightly bigger tractor Z to cultivate his land faster and increase his crops. A is willing to pay \$200 for the tractor, which gives him a utility of 2 U; smaller farmer

⁵⁷⁹ Note that the relation between monetary units (\$) and utility (U) is fictitious.

⁵⁸⁰ For instance, cf. Pindyck & Rubinfeld 2013: 612 f. Pindyck and Rubinfeld acknowledge a trade-off between efficiency and equity due to the cost of transactions, i.e., policies of redistribution.

⁵⁸¹ Note that the relation between monetary units (\$) and utility (U) is fictitious.

⁵⁸² Posner 2014: 15.

B can only pay \$20. However, the utility he would get from the tractor is 100 U since he does not yet have a tractor and could use it to farm his first potato field and sell potatoes at the farmer's market. From a utilitarian point of view, a transfer to B would be preferable since his utility is greater than A's ($100 U > 2 U$); from a wealth maximization point of view, a transfer to A is preferable since his willingness to pay (WTP), and thus his counted value is greater ($\$200 > \20). Consequently, the tractor is distributed to A. The result is that B cannot cultivate his field, and since he lacks the money for the necessary machinery, he eventually sells his farm to A and starts working in a supermarket to feed his family. Within the logic of wealth maximization, the argument for the desirability of such an outcome would presumably be the following: since the transaction costs between A and B are not prohibitive, B could earn the required funds by working at the supermarket and eventually buy back the tractor and his land from A.

However, if one accepts that the monopolization of production and consumption activities in A will likely enable him to acquire relatively more wealth and his willingness to accept (WTA) an offer of B will increase relatively more than B's WTP, defining the initial distribution of rights and resources based on an individual's WTP may solidify resource allocation and, hence, the rationale of the market system: The initial allocation of resources (tractor Z to A) is already Pareto-efficient, and if no improved (Pareto-superior) resource allocation is left, there is no need for free market bargaining and transfer, "[i]ronically, efficient markets, in theory, thus, eventually self-destruct."⁵⁸³

The outlined examples illustrate how wealth maximization may maintain and/or encourage unequal distribution. This does not mean that economists negate the need for redistribution but rather consider it the realm of politics.⁵⁸⁴ The role of economics is "growing the pie," and the role of politics is sharing it. Increasing the pie is considered economically and socially desirable because it increases the absolute size of an individual's piece of the pie. Sharing the pie is desirable when it increases social welfare. For the pursuit of wealth within the legal system this means that it ought to be qualified by other social values, such as equality.⁵⁸⁵ Ultimately, the desirability of wealth maximization is defined by its relation to other social values that are part of social welfare analysis. This will be investigated more closely in Part 4.C and, exemplary, in the following.

⁵⁸³ As observed by Grant, footnote omitted, cf. Grant 1988: 821.

⁵⁸⁴ Cf. Mercurio & Medema 2006: 27.

⁵⁸⁵ Ng 2019: 2152 ff.

b. Wealth Maximization and Justice

Any in-depth assessment of the debate on wealth maximization vs justice and the value of wealth within the legal system is beyond the scope of this work. To illustrate its basic features nonetheless, the following analysis will make use of the landmark discourse between Guido Calabresi and Ronald Dworkin. The discourse originated from Calabresi's assertion in "The Costs of Accidents: A Legal and Economic Analysis" that social cost reduction and justice are the two main and independent goals of accident law.⁵⁸⁶ His statement sparked a debate on the socio-legal value of wealth and justice and potential conflicts and trade-offs between them.⁵⁸⁷ Dworkin challenged the social value of wealth from a value-critique perspective.⁵⁸⁸ In his view, wealth is neither a social value in itself nor an instrument for pursuing other social goals.⁵⁸⁹ He contended that social value questions require a moral philosophical answer.⁵⁹⁰ The normative economic analysis, however, would "lack [...] any defensible philosophical foundation."⁵⁹¹ He reasons that, by departing wealth from utility, "it loses all plausibility as a component of value"⁵⁹² since there is no reason to assume that wealth maximization makes a society better off. Instead, the utility and the satisfaction of preferences is central. If justice is part of this, wealth is irrelevant since justice is nothing an individual would ever trade-off.⁵⁹³ Dworkin also denies any instrumental value of wealth maximization, arguing that this would require an independent definition of distribution, utility, and rights goals and an empirical basis showing how wealth maximization supports achieving them.⁵⁹⁴ Unless an instrumental conception of wealth is supported by a theory of justice, it is groundless.⁵⁹⁵ Therefore, wealth neither has an instrumental nor intrinsic social value and is irrelevant to law and legal practitioners.⁵⁹⁶ Calabresi responded to Dworkin's critique by conceding that the rationale for the social desirability of wealth maximization cannot come from wealth maximization itself; instead, the abstract concept of wealth depends on individual desires and characteristics that must be specified to give meaning to its maximization.⁵⁹⁷ He also agrees that assessing instrumental value

⁵⁸⁶ Calabresi 1970: 24 ff.

⁵⁸⁷ Cf. Sheinman 2005: 253, 255. Also involved in the broader academic debate, *inter alia*, J. L. Coleman 1980; Kornhauser 1980.

⁵⁸⁸ Dworkin 1980b: 211. See also Dworkin 1980a.

⁵⁸⁹ Dworkin 1980b: 194 ff., 207 ff.

⁵⁹⁰ Dworkin 1980b: 196.

⁵⁹¹ Dworkin 1985: 4.

⁵⁹² Dworkin 1980b: 200.

⁵⁹³ Dworkin 1980b: 201 ff.

⁵⁹⁴ Dworkin 1980b: 205 ff.

⁵⁹⁵ Dworkin 1980b: 219.

⁵⁹⁶ Dworkin 1980b: 220.

⁵⁹⁷ Calabresi 1980: 554 f.

requires a prior specification of the social goal sought.⁵⁹⁸ Nevertheless, Calabresi assumes that wealth maximization has instrumental value because it helps achieve “an unspecified complex of goals [...] in justice-value terms”⁵⁹⁹ and a just society.⁶⁰⁰ Wealth and distribution are, thus, both components of justice, with the former being “a totally different order of goal”⁶⁰¹ that cannot be traded off.⁶⁰² The trade-off debate is limited to wealth efficiency and wealth distribution.⁶⁰³ Within this, justice is the final test of any efficiency approach,⁶⁰⁴ limiting the role of the economic approach in legal sciences to providing “road signs.”⁶⁰⁵

The attempt to take a broader perspective on social values is characteristic of Calabresi’s ideas and his later work. In particular, he drew attention to the flawed nature of the neoclassical equation of choice and consent and the limited informational value of economics with respect to the latter. Thereby, he limits the role of the economic analysis of law to provide “a framework, which needs to be normatively qualified by judges and the legal system,”⁶⁰⁶ implying a move away from an instrumental perspective on law toward an “egalitarian” discursive understanding of the law and economics’ relationship.⁶⁰⁷

5. Interim Statement

Efficiency concepts emerged from efforts to find a neutral principle to guide collective decision-making. The guiding benchmark is a free and voluntary market transaction, which ensures consent by leaving decision-making authority upon the parties involved, knowing best their attributed values. Generally, the greater the party’s authority in decision-making, the less controversial the assumption of consent and, thus, the efficiency of reallocation. However, the partially claimed exclusivity and universality of the classic understanding of the efficiency principle make the economic analysis of law vulnerable to criticism from legal practitioners and scholars.⁶⁰⁸ As observed by Amartya K. Sen, even the strictest efficiency principle of Pareto

⁵⁹⁸ Calabresi 1980: 556.

⁵⁹⁹ Calabresi 1980: 557.

⁶⁰⁰ “[A]n appropriate blend of efficiency and distribution is highly instrumental toward, and closely correlated with, achieving what many would view as a just society,” Calabresi 1980: 558.

⁶⁰¹ Calabresi 1970: 25.

⁶⁰² Compare Calabresi 1980: 559.

⁶⁰³ Calabresi 1980: 558 f.

⁶⁰⁴ Calabresi 1980: 557 f. Calabresi 1970: 24.

⁶⁰⁵ Calabresi 1980: 560.

⁶⁰⁶ Marciano & Ramello 2014: 101.

⁶⁰⁷ Compare Kalman 2014: 35. More generally on Calabresi’s “distinctive” approach to law and economics, Marciano & Ramello 2014.

⁶⁰⁸ For instance, arguing that the economic reduction of complexity of the law would neglect its multifunctionality and thereby violate liberal legal thinking, cf. Fezer 1986: 823.

efficiency in terms of consent may lead to questionable social conclusions by neglecting distributive concerns so that “[a] state in which some people are starving and suffering from acute deprivation while others are tasting the good life can still be Pareto-optimal if the poor cannot be made better off without cutting into the pleasures of the rich – no matter by how small an amount.”⁶⁰⁹ Restricting efficiency to wealth maximization means that the aggregated level of wealth or welfare of society only represents the satisfaction of those possessing wealth.⁶¹⁰ This undesirably limits the idea of social welfare and ignores its utilitarian roots and relationship to well-being⁶¹¹ or happiness.⁶¹² The restriction to prices further narrows the space for grounding social welfare maximization in the libertarian idea of consensual and free exchange since, in this respect, only the reallocation of priced property is counted.⁶¹³ The above analysis shows that the rigorous application of the efficiency principle, as reduced to wealth, in legal contexts can lead to socially undesirable outcomes and thus cannot provide a reasonable basis for an ethical and legal system⁶¹⁴ – as Posner later acknowledges himself.⁶¹⁵ While the economic analysis of law opens up a new perspective on the desirability and social legitimacy of regulation, the efficiency principle must be treated in a differentiated manner.

In contrast to the economic market, the legal system is geared toward realizing values that cannot be easily included in a cost-benefit analysis, e.g., constitutional rights such as freedom of speech or personal liberty.⁶¹⁶ Even if one recognizes a market society, efficiency cannot replace other legal values, such as the rule of law or liberty.⁶¹⁷ Thus, efficiency and related cost-benefit analysis are legitimate tools for rationalizing policy decisions, but it must be complemented by other social values, such as justice and distribution, in order to be valuable for legal analysis. Since Adam Smith,⁶¹⁸ economists have acknowledged the relevance of social values, but also the limitations of economics as guidance within.⁶¹⁹ Thus, “[m]any, and perhaps most, practitioners

⁶⁰⁹ Sen 1998: 95.

⁶¹⁰ Rahmsdorf 1987: 495 ff.

⁶¹¹ Cf. Kolmar 2017: 156. Kolmar states that, “[w]hat unifies all interpretations [of utility] is the assumption that individual behavior is somehow related to individual well-being.” See also Mercurio & Medema 2006: 21.

⁶¹² “If buying three copies of this textbook makes you happier than buying one shirt, then we say that the three books give you more utility than the shirt,” Pindyck & Rubinfeld 2013: 78.

⁶¹³ For instance, J. L. Coleman 1980: 521,523.

⁶¹⁴ For instance, cf. Lüdemann: 4. As Mathis observes on the wealth maximization principle that “the logic of the efficiency mindset – excruciating though this can be, at times! – whilst also demonstrating the limitations of economic analysis of law,” cf. Mathis 2009: 143.

⁶¹⁵ Cf. Posner 1985b: 1194 f. Compare also, Mathis 2009: 177 ff.

⁶¹⁶ For instance, Kelman 1981: 35 f.

⁶¹⁷ Lüdemann: 4. For an alternative framework relying on the notion of fairness, cf. Rawls 1999.

⁶¹⁸ See Hutchinson 2015: 93.

⁶¹⁹ Ulen 2015: 204 f.

of Law and Economics would not argue that it is the *only* approach, but they would insist that it should be *one* of the perspectives brought to bear on legal-economic questions.”⁶²⁰

Especially in recent years, the relevance of social and environmental values for social welfare analysis has been increasingly recognized, and attempts have been made to incorporate them. Among other things, qualifying the wealth maximization principle through equality considerations,⁶²¹ broadening the efficiency concept to include *prima facie* noneconomic values, such as social justice or sustainability, so-called “social efficiency,”⁶²² or drawing out deontological boundaries to social welfare considerations.⁶²³

For the law and economics’ relationship, the extent to which legal and economic thinking converge, and the role that the economic analysis of law can play in legal methodology, the ultimate determinant is what is considered part of social welfare (analysis) and the form of its measurement. However, the role of social (and legal) values in welfare analysis is highly normative, qualitatively, and quantitatively. The extent to which social and environmental values can (and should) be included, and the extent to which law can be used as a guide in this regard will be explored later and tailored to the research interest.⁶²⁴ To this end, any general assumption that the idea of social welfare maximization and the efficiency principle *per se* counter or promote *prima facie* non-economic goals is misplaced. The same is true for the unreflective and conclusive pursuit of economic efficiency or any other social goal. Like the concept of justice,⁶²⁵ if the restriction to traditional bilateral priced market relations and goods is removed, the concept of efficiency is not as clear and measurable as assumed. The relationship between the two is even less clear, indicating the need for further research.⁶²⁶

⁶²⁰ Emphasis adopted, cf. Mercurio & Medema 2006: 47.

⁶²¹ Ng 2019. Ng proposes to reduce the pursuit of wealth maximization to judiciaries, while equality considerations ought to be considered in legislative decisions.

⁶²² Compare ter Bogt 2019: 675 ff. Henk ter Bogt names another efficiency type in the form of political efficiency, which refers to the maximization of electoral support. What is required for that may vary situationally and encompass aspects of traditional economic as well as social efficiency.

⁶²³ For instance, Ulen 2015.

⁶²⁴ On a legal normative extension of social-welfare analysis, Part 4.C.

⁶²⁵ Cf. Calabresi 1970: 24 f. Calabresi observed that it is much easier to define its absence than reverse, with reference to Cahn 1964.

⁶²⁶ Calabresi 1980: 559 f. For a recent collection of works in this respect, Arisitides & Mercurio 2015.

Part 3. The Economic Perspective on Regulation

A. The Function of Law

The principles of Pareto, Kaldor-Hicks, and wealth maximization rest on the idea that a consensual and voluntary exchange of resources is a guarantee of efficiency and try to find solutions for (collective) decision-making where both are unfeasible. Free market trade is thus the analytical starting point of any efficiency principle. The consequence is that the main neoclassical reason for “interference” by legal regulation is its failure.⁶²⁷ But when do markets fail? What is the role of law in terms of efficiency? How should it be designed accordingly? To understand when markets fail, one must understand when they do not, i.e., one must look at the economic ideal of the market system. This requires an examination of the concept of general equilibrium, its drivers, and essential conditions. Together, they serve as a benchmark for evaluating markets, detecting and understanding market failures, and then evaluating and determining the role and design of legal regulation. The following will illustrate the core idea of and elements of markets, their efficiency, and failure. The analysis is limited to the aspects that are central to the research interest of this work, namely, the role of the (environmental (criminal)) law for markets and their (efficient) allocation of resources.

I. The Economic Default Mode

1. The Invisible Hand and Allocative Efficiency

a. The Competitive Market and General Equilibrium

The theory of welfare economics defines the conditions that allow achieving allocative efficiency by free and voluntary trade, of which the main ones are: (1) a lack of market power of one party, (2) a symmetric distribution of and access to information, (3) a lack of transaction costs, (4) and that all resources are tradable at all time, i.e., a market is always present.⁶²⁸ These restrictive requirements are “[t]he intellectual construct that depicts the ideal workings of the *economy*”⁶²⁹

⁶²⁷ Posner 1979: 130. The central question is then when markets are assumed to fail, which Posner considers rather an empirical than a normative question.

⁶²⁸ Baumann 2020: 44. See also Fritsch 2018: 25 ff.

⁶²⁹ Emphasis adopted, see Mercurio & Medema 2006: 20.

and constitutive to the perfectly competitive market.⁶³⁰ In a market with perfect competition, cf. Figure 16, all marginal costs and benefits of market activity are internalized.⁶³¹ The market price is the result of the activities of all actors since no actor can influence it.⁶³² It functions as the decentralized mechanism for resource allocation, revealing the individual's preferences and the value of resources.⁶³³ Symmetric and accessible information allows actors to maximize their utility rationally.⁶³⁴ The voluntary and free exchange allows all mutually beneficial trades to be realized, and the market reaches a Pareto-efficient equilibrium stage.⁶³⁵ Allocative efficiency is assured since the factors of production are used where they are most productive and to the extent that consumers demand them.⁶³⁶ Producers produce just enough at a price consumers demand and are willing to pay (equilibrium price, see Figure 16),⁶³⁷ so all services and goods are sold or bought.⁶³⁸ Whoever produces or consumes a good will be compensated for his costs. Any "overcompensation" of production costs generates the producer surplus (*PS*), which is the difference between the minimum price that producers demand (minimum WTA) and the price at which they can sell the good; reversely, any price below the consumer's willingness to pay (WTP) generates the consumer surplus (*CS*), which is the difference between what consumers are willing to pay and the price they have to pay for a good, cf. Figure 16. The sum of the producer and consumer surplus accumulates to social welfare (*W*), $W = CS + PS$.⁶³⁹

⁶³⁰ See further, Mercurio & Medema 2006: 20; Pindyck & Rubinfeld 2013: 595 ff.; Schäfer & Ott 2020: 63 f.

⁶³¹ Baumann 2020: 44; Homann & Suchanek 2005: 186.

⁶³² Thus, any time a seller wants to sell for a higher price than the market equilibrium price, there is no buyer, and *vice versa*, Morrel 2017: 69 para 148.

⁶³³ Microeconomics is thus also referred to as "price theory" since it highlights the role of prices in determining the ultimate allocative stage, Perloff 2020: 1. On the price mechanism as being central to allocation, Deimer et al. 2017: 8 f.

⁶³⁴ On the conditions of a perfectly competitive market, Baumann 2020: 44.

⁶³⁵ Which is the first theorem of welfare economics, cf. Pindyck & Rubinfeld 2013: 609. See also Mercurio & Medema 2006: 24.

⁶³⁶ Deimer et al. 2017: 8 f.; Mercurio & Medema 2006: 20 f.

⁶³⁷ Kolmar 2017: 69.

⁶³⁸ Mercurio & Medema 2006: 21; Schäfer & Ott 2020: 63 f.

⁶³⁹ Perloff 2020: 298 ff. For a graphical display see also Schäfer & Ott 2020: 64.

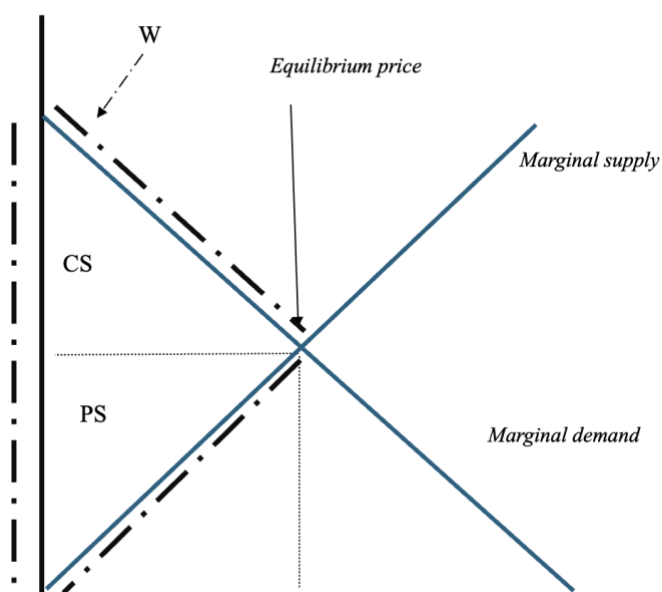


Figure 16 Market equilibrium and welfare maximization in a competitive market

If the equilibrium stage is reached at all markets simultaneously, i.e., within the whole economy, it is called general equilibrium.⁶⁴⁰ Governmental intervention and regulation are then unnecessary for allocative efficiency.⁶⁴¹

General equilibrium as a collective outcome of spontaneous utility-maximizing behavior at the individual level and is mostly associated with Adam Smith’s idea of the “invisible hand” described in his work “The Wealth of Nations” (1776): The “unseen market force”⁶⁴² guides individual behavior so that “[b]y pursuing his own interest [the individual] frequently promotes that of the society more effectually than when he really intends to promote it.”⁶⁴³ The observation was that in a complex economy based on the division of labor, independent behavior at the micro level in the form of rational utility maximization proved to be the most efficient mechanism for resource allocation at the societal macro level. However, it must be noted that Smith used the term once and in a specific case, namely, in the context of trade and import restrictions under conditions of “the existence of social capital (trust), competitive markets, and a workable system of justice.”⁶⁴⁴

⁶⁴⁰ Cooter & Ulen 2012: 38; Kolmar 2017: 69 f.; Pindyck & Rubinfeld 2013: 595 f.

⁶⁴¹ Pindyck & Rubinfeld 2013: 609.

⁶⁴² Perloff 2020: 23.

⁶⁴³ Smith & Wight 2007: 293.

⁶⁴⁴ Smith & Wight 2007: XV. See also on Adam Smith’s acknowledgement of the essentiality of the government to the functioning of the market system, Hutchinson 2015: 92 ff.

b. Free Trade, Division of Labor, and Property Rights

In a market system, free trade is the driving force of social efficiency because it enables a division of labor through specialization that promotes individual productivity.⁶⁴⁵ Specialization means goods are produced by those who can do so most easily or cheaply. It allows the individual worker to produce more of a good and society to produce more different goods.⁶⁴⁶ Because specialization requires investment in, for example, machinery or training, market participants limit their production to a particular good or bundle of goods.⁶⁴⁷ This leads to interdependence among the market actors and the need for a distributive free trade mechanism.⁶⁴⁸ Distributed resources are not necessarily material goods in a strict sense, they include the authority to use specific resources conceived as property rights.⁶⁴⁹ Property rights add a legal to the physical side of transacting and, thus a contractual component that regulates the conditions and requirements of market transfer.⁶⁵⁰ Free exchange is only possible if actors trust that the entitlement structure is complied with and that their losses are compensated, i.e., public regulation is needed to prevent the right of the strongest from prevailing.⁶⁵¹ Thus, there is a need for an enforcement- and monitoring system, formal or informal (e.g., social or legal norms).⁶⁵² This indicates the limits of the regulatory independence of the “invisible hand” and the essentiality of public (legal) regulation, even in *laissez-faire* economies.⁶⁵³ While these constitutive elements to the functioning of the market system seem to be largely ignored by “modern marketeers,”⁶⁵⁴ a consequential economic perspective advocates a minimum role of public intervention, limited to enforcing and sustaining the rules and institutions essential for market functioning, the so-called night-watchman state (*Nachtwächterstaat*).⁶⁵⁵

⁶⁴⁵ Smith & Wight 2007: bk. 1.

⁶⁴⁶ Kirstein 2004: 6 f.

⁶⁴⁷ Kirstein 2004: 6 f.

⁶⁴⁸ Kirstein 2004: 6 f.

⁶⁴⁹ See further on property rights, Part 1.C.III.4. Mathis broadly defines them “as any legal norms which regulate the allocation of powers over resource use,” emphasis adopted, Mathis 2009: 52.

⁶⁵⁰ Kolmar 2017: 45 f.

⁶⁵¹ Calabresi & Melamed 1972: 1090 ff. The assumption that regulation is needed to prevent the law of the strongest to prevail reveals the perception of human nature inherent in economic thinking, grounded in Hobbesian thinking: Namely, without regulation there is *bellum omnium contra omnes*.

⁶⁵² Compare Furubotn & Richter 2010: 7. Cf. also Kirstein 2004: 7.

⁶⁵³ In a sense, the regulatory function of public institutions is thus the “*sine qua non* of a free market’s operation,” (emphasis adopted), cf. Hutchinson 2015: 97. Bonefeld argues that even *laissez faire* is a political practice and that the economy’s existence is conditioned by governmental practice: “[F]or Smith, the state is the political form of the invisible hand. That is, the economic has no independent existence,” cf. Bonefeld 2013: 234.

⁶⁵⁴ Compare Hutchinson 2015: 93.

⁶⁵⁵ Kolmar 2017: 100. See also on the role of regulation in terms of guaranteeing the functioning of the market, Baumann 2020: 45. Fritsch 2018: 70 f.

The following will explore the relationship between allocative efficiency and entitlement distribution in a perfectly competitive market system as well as the role of public regulation to the extent necessary for the analysis of this work. This will be done by using the analytical framework developed by Calabresi and Melamed (1972).⁶⁵⁶

2. The Minimum Function of Public Regulation

a. The Efficiency Function

i. Regulation and Allocative Efficiency: Property Rights Perspective

The relationship between allocative efficiency and distribution of entitlements, i.e., property rights (for the concept, see further Part 1.C.III.4), can be illustrated by the following:

Suppose a bike is to be distributed by law between A and B. A values the bike at \$10 and B at \$20. The bike is located where it is colored black.

Scenario 1, Figure 17: the law determines that the bike is located with A, valuing it less than B. The allocation (the law) is inefficient.

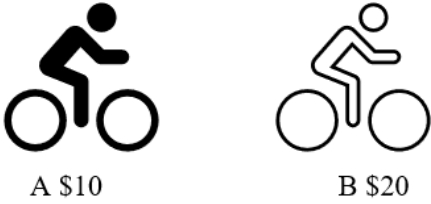


Figure 17 Inefficient allocation resource allocation based on individual values

The law further defines that A’s property right of the bike is comprehensive and includes the right to sell it. The individual values of A and B mean that the minimum WTA of A is \$10 and the maximum WTP of B is \$20, under ideal market conditions, A and B will thus enter negotiations and reallocate the bike for a price between \$10 and \$20, specifying the zone of possible agreement (ZOPA) of \$10, cf. Figure 18.

⁶⁵⁶ Calabresi & Melamed 1972. It should be noted that the framework represents an abstraction, so that in individual cases there are deviations and distinctions may be less “clear” in practice.

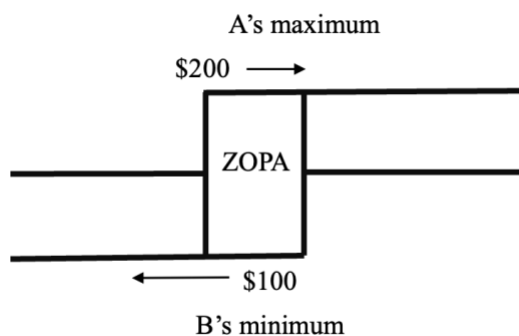


Figure 18 ZOPA without transaction costs

Scenario 2, Figure 19: the bike is located where colored black, in this case with B. B bought the bike for a price of \$15. Since the bike is now with B, who values the bike more than A, welfare increased by \$10 and the allocation is efficient.

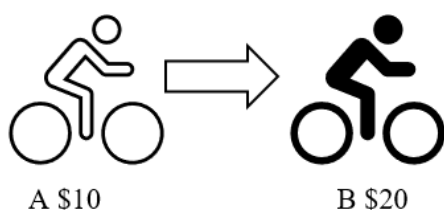


Figure 19 Efficient resource allocation based on individual values

The ultimate allocation of entitlements determines allocative efficiency since it is decisive to the resource's use.⁶⁵⁷ The example illustrates that the transfer between A and B was central to achieve allocative efficiency. Since the initial allocation was inefficient (Figure 17), it was relevant that A was legally allowed to sell the bike and to determine its price and that A and B could enter free and costless negotiations. Thus, by determining the initial owner of the bike and the conditions under which he may be allowed to transfer it, the law matters to allocative efficiency. Initially, it defined an inefficient allocation of the resource bike, but the condition of the ideal market and the specified right to sell the bike allowed it to overcome. The example illustrates the main aspects by which legal regulation matters to allocative efficiency, and which must therefore be addressed by (an efficiency targeting) legal policy: (1) the allocation of the entitlement and (2) its protection, i.e., whether and under which conditions it may be traded and sold (transferred).⁶⁵⁸

⁶⁵⁷ Schäfer & Ott 2020: 78 f.

⁶⁵⁸ See also Calabresi & Melamed 1972: 1090, 1092.

ii. Definition and Enforcement of Entitlements: Property Rights

From an economic perspective, the first relevant legal decision made by the policymaker thus concerns the definition and allocation of entitlements, i.e., property rights.⁶⁵⁹ Property rights have a conflict-reducing function by defining the owner of the resource and the subsequent rights to use the resource.⁶⁶⁰ The scope of rights is central to the value of the good:⁶⁶¹ A plot of land on which the owner is not allowed to build or sell a house is worth much less than if the right of use was comprehensive; applied to the above example, if A had not been allowed to sell the bicycle, he would lack the opportunity to increase his benefit (social welfare) by transferring it to an owner attributing higher value (B). The good as a bundle of rights is the product that enters the market mechanism of exchange and trade.⁶⁶² Property rights define the relationship between resource and market participants and establish duties of interaction between market actors,⁶⁶³ such as excluding use.⁶⁶⁴ In this way, they provide a reward and punishment structure critical to market participants' decision-making so that changing them can lead to changes in behavior.⁶⁶⁵ The structure of property rights is thus related to the efficiency of resource allocation and use.⁶⁶⁶ However, any good or bundle of rights and its allocation is valuable only to the extent that it can be realized, including how others respect it. The importance of third-party observance of the property rights structure gives rise to the second efficiency function of public regulation.

iii. Protection and Transfer Modalities of Entitlements: Property Rules

After defining entitlement structures, the regulatory task is to define their protection.⁶⁶⁷ Under idealized market conditions with low transaction costs and free and voluntary bargaining and trade, the entitlement should be protected by a property rule.⁶⁶⁸ Property rules promote voluntary

⁶⁵⁹ Calabresi & Melamed 1972: 1090.

⁶⁶⁰ Kirstein 2004: 7. On the definition of property rights, see Part 1.C.III.4.

⁶⁶¹ Schmidtchen 1998: 5. I.e., the value decreases if the right to use the yield from a good (*usus fructus*) is legally restricted. "The value of any good exchanged depends, *ceteris paribus*, on the bundle of property rights that is conveyed in the transaction," emphasis adopted, see Furubotn & Pejovich 1972: 1139.

⁶⁶² On property rights, also Part 1.C.III.4. Property rights are constitutive to the transfer of goods, cf. Kolmar 2017: 45; Schäfer & Ott 2020: 76. Schäfer and Ott, therefore, argue that the central aspect of property rights is that they imply understanding goods as bundles of rights and thus their transaction as an exchange of bundles of rights.

⁶⁶³ As they not only specify rights but also duties and potential sanctions in cases of violation, cf. Furubotn & Pejovich 1972: 1138 f.

⁶⁶⁴ Posner 2014: 49–51. There may also be communal property rights which then ascribe control over a resource to the members of the group or governmental property rights, Schmidtchen 1998: 4 f.

⁶⁶⁵ See Furubotn & Pejovich 1972: 1138 f.

⁶⁶⁶ Furubotn & Pejovich 1972: 1139; Schmidtchen 1998: 7.

⁶⁶⁷ Calabresi & Melamed 1972: 1092. See also Kirstein 2004: 10 ff.

⁶⁶⁸ Calabresi & Melamed 1972: 1092, 1106 f. While the two other options are relevant when free and voluntary transactions are prevented; with regard to environmental pollution, cf. Part 3.B.III.2.c.

exchange in the market by discouraging nonconsensual use and sanctioning violations of the entitlement structure (absolute right).⁶⁶⁹ They are most efficient since they allow the parties involved to determine the value of traded goods, ensuring that only Pareto-efficient transfers occur while allowing maximum individual autonomy.⁶⁷⁰ In this case, public regulation is minimal and restricted to the initial entitlement allocation and its subsequent protection.⁶⁷¹

b. The Equity and Distributional Function

Efficiency and equity are not necessarily proportional, and an efficiency-guided policy is, in principle, non-informative on equity or distributional grounds.⁶⁷² Nonetheless, some efficiency reasons argue in favor of redistributive measures or at least point to the inefficiency of significant social wealth inequality. While a more comprehensive analysis of the relation between equity and efficiency is beyond the scope of this work, there are indications that severe wealth discrepancy in society may impede economic progress and lead to political instabilities.⁶⁷³ For instance, an analysis of household disposable income in OECD countries found that while “[a] certain degree of income inequality is a characteristic of market economies, which are based on trust, property rights, enterprise and the rule of law [...] higher levels of inequality can reduce GDP per capita.”⁶⁷⁴ Besides that, Calabresi and Melamed also indicated that social goals, such as distribution, may well be reasonable public policy targets.⁶⁷⁵ This holds especially true when efficiency is understood “more broadly” so that *prima facie* noneconomic goals are given greater weight in social welfare analysis.⁶⁷⁶

⁶⁶⁹ For instance, either by an injunction or a criminal sanction, cf., Ott & Schäfer 2008: 42. Thus, for instance, in the case of theft, the thief is not only charged equally to the value of the specific good but with an “undefinable kicker,” see Calabresi & Melamed 1972: 1126.

⁶⁷⁰ Protection by a property rule is thus fully consistent with a legal theory approach that builds on autonomy as the guiding principle of the (civil) law. Protection of rights is considered a natural consequence of individual autonomy, see Ott & Schäfer 2008: 43.

⁶⁷¹ Calabresi & Melamed 1972: 1092.

⁶⁷² Cf. Part 2.B.II.4.

⁶⁷³ Cf. further van Treeck 2018.

⁶⁷⁴ Orsetta et al. 2014: 29.

⁶⁷⁵ Calabresi & Melamed 1972: 1097 f.

⁶⁷⁶ See also, Part 2.B.II.5, and for a legal normative extension of social welfare analysis, Part 4.C.

3. Limitations and Methodological Relevance of the Competitive Market

The restrictive conditions of a perfectly competitive market (Part 3.A.I.1.a) imply that “[g]eneral equilibrium exists in the mind of the economist and not in the real world,”⁶⁷⁷ so does the omnipotence of the invisible hand.⁶⁷⁸ The consequence is that an imperfectly functioning market is the realistic standard, reducing the competitive market ideal to its methodological and analytical value,⁶⁷⁹ to being a “conceptual apparatus that assists us in organizing our thoughts.”⁶⁸⁰ Within this, general equilibrium and the conditions of the ideal market can help to explain some (parts of) markets and serve as a benchmark for evaluating the efficiency of public policy decisions and markets.⁶⁸¹ The practical relevance of the limits of the idealized market and its conditions, and thus the more realistic prevalence of its inefficiency, indicates that “we ought to concentrate on ways of dealing with market failures.”⁶⁸²

II. Market Failures

Market failure refers to the observation when a market on its own is unable to allocate resources efficiently.⁶⁸³ Resource allocation is inefficient because there is a divergence between rational utility maximization at the individual and welfare maximization at the collective level. While the “invisible hand” is often used to justify *laissez-faire* policies, Smith already pointed to areas of public policy where “[a]ccording to the system of natural liberty, the sovereign has [...] the duty of erecting and maintaining certain public works, and certain public institutions, which it can never be for the interest of any individual, or small number of individuals to erect and maintain; because the profit could never repay the expense to any individual, or small number of individuals, though it may frequently do much more than repay it to a great society.”⁶⁸⁴

⁶⁷⁷ Rizzo 1979: 82. Cf. For instance, also Pindyck & Rubinfeld 2013: 625. See different, Cooter & Ulen 2012: 38. Cooter and Ulen argue that many markets exhibit the conditions of perfect competition while acknowledging that *general* equilibrium is unrealistic.

⁶⁷⁸ Stiglitz 2002.

⁶⁷⁹ The ideal market is to be understood as a methodological reference, Baumann 2020: 44; Cooter & Ulen 2012: 38. Fritsch 2018: 58 f.

⁶⁸⁰ Rizzo 1979: 82.

⁶⁸¹ For instance, cf. Cooter & Ulen 2012: 38. See also Schäfer & Ott 2020: 64. Schäfer and Ott name the concept a reference system.

⁶⁸² Pindyck & Rubinfeld 2013: 625.

⁶⁸³ Morrel 2017: 72 para 153. It should be noted that there are no defined criteria that would allow to precisely determine the occurrence of market failure so any judgment of market failure has an inherently normative notion that requires a rationalization, Fritsch 2018: 76.

⁶⁸⁴ Smith & Wight 2007: 444.

The main causes of market failure are market power, incomplete or asymmetric information, externalities, and public goods.⁶⁸⁵ It is associated with insufficiently defined property rights, lack of rivalry or exclusion of a good or service consumption, or high transaction costs. Each hinders the emergence of a functioning market and, thus, allocative efficiency based on free and voluntary transfer coordinated by a decentralized price mechanism.⁶⁸⁶ To nevertheless achieve (approximate) efficiency and welfare maximization, the government must intervene through public regulation.⁶⁸⁷ The following analysis focuses on externalities and public goods as market failures, which are most relevant to this work.

1. Externalities

Externalities or external effects are costs or benefits to third parties that result from activities of another actor.⁶⁸⁸ Many negative externalities are byproducts of production (e.g., air or water pollution from a factory) and consumption (e.g., air and water pollution from showering or driving a car).⁶⁸⁹ They justify governmental intervention by trespassing the limits of private ownership and freedom by interfering with other people's rights.⁶⁹⁰

The detrimental effect of externalities on social welfare in a free market equilibrium can be portrayed in the following, cf. Figure 20 and Table 4:⁶⁹¹

In a competitive market scenario, a firm's production level is incentivized by considering the marginal private cost (*MPC*), and its production is reflected by the supply curve (grey line). The competitive equilibrium is where the supply and demand curve intersect, i.e., at a price (P_2) with a quantity of production, respectively, demand (Q_2). The consumer surplus is the area between the market price and the demand curve, $A + B + F + G$; reverse, the producer surplus is the area between the market price and the marginal private cost (supply) curve, $C + D + H$, cf. Table 4.

However, in cases of negative externalities, the competitive equilibrium is non-optimal since it is restricted to private welfare maximization, neglecting the actual social costs of the activity

⁶⁸⁵ For instance, cf. Cooter & Ulen 2012: 38 ff.; Pindyck & Rubinfeld 2013: 625 ff.; Strotebeck 2020: chap. 9. Further examples of market failure are information or adaptation deficiencies, Fritsch 2018: 76.

⁶⁸⁶ Cf. on the ideal of a competitive market, Part 3.A.I.1.a.

⁶⁸⁷ Homann & Suchanek 2005: 186; Perloff 2020: 611; Strotebeck 2020: 417.

⁶⁸⁸ It may also be the case that a particular measure produces positive externalities for some and negative externalities for others, see Perloff 2020: 611 f. Externalities arise within the relationship between individuals as non-internalized "interdependencies," cf. Kolmar 2017: 104.

⁶⁸⁹ On pollution as an externality, cf. Faure & Partain 2019: 13 f.; Perloff 2020: 611.

⁶⁹⁰ On the idea of property and maximum individual liberty conditioned by non-interference with other people's rights, cf. Cooter & Ulen 2012: 105.

⁶⁹¹ The following analysis and illustrations are based on the effect of externalities as displayed by Perloff 2020: 612–615. See also Pindyck & Rubinfeld 2013: 662–664. For a helpful explanation, Barreto 2020: 627–629.

concerned. I.e., the price (P_2) and quantity of production, respectively, demand (Q_2), represents the competitive equilibrium of private marginal costs. The actual marginal social costs (MSC), represented by the bolded black line, is the sum of the marginal external costs (MEC) and the MPC of each production unit ($MSC = MPC + MEC$). Since the MEC is not entirely attributed to the producer and is reflected in the market's price mechanism, it is neglected in his private decision-making. MSC incorporates the full extent of MEC and intersects with the demand curve at a much greater price (P_1), so the quantity demanded is correspondingly lower (Q_1). The competitive equilibrium equals the social optimum (Q^*). The consumer surplus is the area between the market price and the demand curve, A ; the producer surplus is the area between the market price and the MPC supply curve $B + C + F + D$.

If one looks at the total external cost, the area below the marginal external cost (MEC) curve, one finds that it is greater at the competitive equilibrium ($D + F + G + H + E$) than at the social optimum ($F + D$). In this respect, E represents the non-internalized social costs of the activity not reflected in the equilibrium price of P_2 and the corresponding consumer's demand (and attributed value) of Q_2 . E represents the social costs of each unit above the optimal level and a deadweight loss since their social costs are not neutralized by a higher consumer surplus (as is the case for G and H).

For the further analysis of negative externalities and their regulation, the illustration leads to two main insights: (1) An unregulated competitive market equalizes marginal private costs and marginal social benefits, as represented by the demand function. In the case of non-internalized negative externalities, this leads to high marginal social costs since the marginal private costs of the companies are lower than the marginal social costs of society, which include the marginal costs of the last unit that the externality imposes on society. The result is that the equilibrium price does not reflect the true social value of the activity in question, leading to excessive output and corresponding consumer demand. Since behavioral incentives on the micro level are incomplete, private rational individual behavior leads to non-optimal outcomes on an aggregated macro (social) level. (2) While the external costs are positive, the elaboration further shows that the optimal level is greater than zero because its benefits potentially offset the costs of each unit.

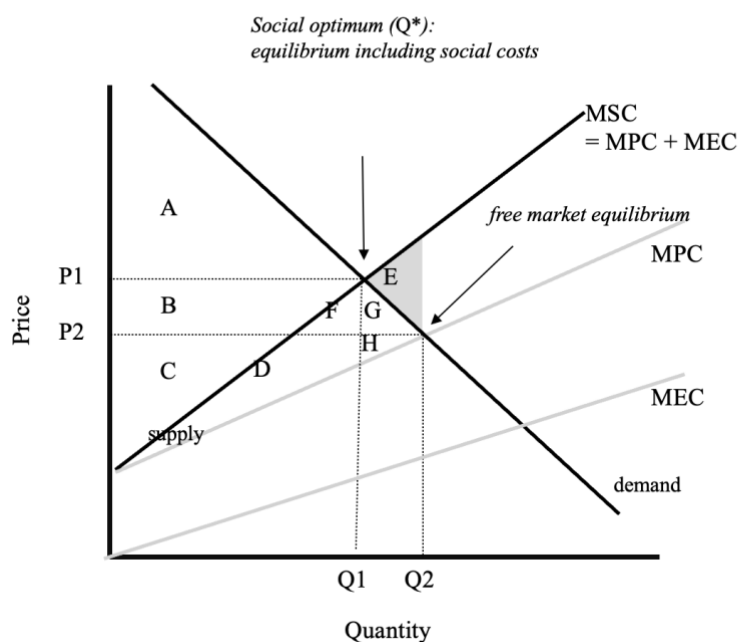


Figure 20 Welfare effects of externalities in a non-optimal free market equilibrium

Table 4 Welfare effects of externalities in a non-optimal free market equilibrium

	Free market equilibrium (Q_2/P_2)	Socially optimal equilibrium (Q_1/P_1)
Consumer surplus (CS)	A + B + F + G	A
Producers' surplus (CP)	C + D + H	B + C + F + D
Externality cost (MEC)	D + F + G + H + E	F + D
Social welfare	A + B + F + G + C + D + H – (D + F + G + H + E) = A + B + C – E	A + B + C + F + D – (D + F) = A + B + C

2. Public Goods

Public goods represent a particular type of externality⁶⁹² and seem to escape the economic lens since models and theories are typically based on private goods.⁶⁹³ Private goods are (1) exclusive,

⁶⁹² Perloff 2020: 632. The lack of exclusion provokes external effects either in the form of additional costs or benefits related to its consumption, cf. also Fritsch 2018: 81.

⁶⁹³ “In many economic models private goods are the only ones around, and this is typically the case when the “invisible hand” is given the task of doing visible good,” cf. Sen 1977: 330.

meaning that nonpaying or otherwise undesirable consumers can be excluded from consumption, and (2) rival, meaning that they can be consumed only once.⁶⁹⁴ For private goods, the price mechanism ensures that each consumer of a good bears its production costs,⁶⁹⁵ incentivizing efficient behavior. In contrast, public goods are non-rival and/or non-exclusive,⁶⁹⁶ compare Table 5. This means efficient resource allocation through the price system and private bargaining is impeded.

Table 5 Classification of goods: rivalry and excludability

	Excludable	Non-excludable
Rival	Private good: bike	Open-access common property: fishery, clean air ⁶⁹⁷
Non-rival	Club good: internet	Public good: national defense, lighthouse

Non-rivalry means that one person's consumption of a (public) good does not prevent (constrain) the consumption of another.⁶⁹⁸ The marginal costs of providing the good to an additional consumer are close to zero, preventing the emergence of a regulatory price mechanism.⁶⁹⁹ This means that no price-usage relation regulates the efficiency of the consumption of the good and its allocation. Consequently, the resource cannot be allocated to consumers with the greatest utility, expressed in their willingness to pay.⁷⁰⁰ While resource access to public goods is communal, derived benefits are private.⁷⁰¹

⁶⁹⁴ Perloff 2020: 629.

⁶⁹⁵ Kirchgässner 2013a: 56.

⁶⁹⁶ Pindyck & Rubinfeld 2013: 690. If both conditions are met (non-rivalry and non-exclusivity), Perloff refers to the good as open-access common property, cf. Perloff 2020: 629. Notice that there is no coherent definition of public goods, the absence of non-rivalry and/or non-exclusivity is thus the common conceptualization; see Fritsch 2018: 81. Moreover, it is argued that it is not the inherent nature of the good itself that determines its definition as a public good, but rather the specific way in which it is socially regulated, i.e., the structure of property rights that makes a good a public good. Thus, Fritsch refrains from using the term "public good" since it can be more accurately described by referring to the precise social arrangement that is crucial to its character as a public good, cf. Fritsch 2018: 82. In this work, the term is used nevertheless because it provides the common conceptualization in economics and is particularly useful in analyzing market failures in the context of environmental goods. See also Faure & Partain 2019: 38 Table 1.

⁶⁹⁷ Commonly, clean air is regarded as a public good, meaning that it is non-rivalry. Compare e.g., Perloff 2020: 629. However, given the finite nature of natural clean resources, for instance, as reflected in the problem of climate change, it seems more appropriate to consider all natural resources as rivalry. See similar on air as rival due to the fact of pollution, Pindyck & Rubinfeld 2013: 691.

⁶⁹⁸ Cooter & Ulen 2012: 40; Faure & Partain 2019: 38; Fritsch 2018: 81; Pindyck & Rubinfeld 2013: 690.

⁶⁹⁹ Perloff 2020: 629; Pindyck & Rubinfeld 2013: 690.

⁷⁰⁰ If asked for their WTP, rational utility-maximizer would have an interest to understate their benefits. Sen criticizes this assumption concerning communal goods by noticing that other values also guide human behavior, such as, commitment. He refers to voting as an example, which may entail costs while private benefits are low, Sen 1977: 330 ff.

⁷⁰¹ Faure & Partain 2019: 38.

Non-exclusive means that deriving consumption benefits cannot be linked to costs,⁷⁰² i.e., the cost of excluding non-paying private beneficiaries, “free riders,” is too high.⁷⁰³ Exclusion costs are prohibitive, for example, because of the difficulty distinguishing paying from non-paying users.⁷⁰⁴ This means that consumption of the good without paying the costs cannot be prevented and encourages (over-)consumption.⁷⁰⁵ Non-exclusion of non-payers impedes profitable private production, so the good is commonly not produced or produced below the optimum level.⁷⁰⁶ The result is that public goods are typically subsidized or provided by the government in return for a fixed price.⁷⁰⁷

From a game theory perspective, public goods and free riding represent a prisoner’s dilemma with (a lot) more than two “prisoners” (parties): Non-exclusion makes it rational for the individual not to cooperate but to withhold contribution to the good’s production (e.g., payment).⁷⁰⁸ Rational private behavior leads to collectively irrational outcomes.⁷⁰⁹ In the rational pursuit of private benefits to the detriment of the collective lies the “tragedy of the commons” indicated in the introduction of this work and originally described by Garrett Hardin (1968):⁷¹⁰

“As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, “What is the utility *to me* of adding one more animal to my herd?” This utility has one negative and one positive component.

- 1) The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1.
- 2) The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of – 1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another... But this is the conclusion reached by each and every rational herdsman sharing a commons.

⁷⁰² Pindyck & Rubinfeld 2013: 629.

⁷⁰³ Cooter & Ulen 2012: 40.

⁷⁰⁴ Cooter & Ulen 2012: 40 f. See also on exclusion costs, Kolmar 2017: 130.

⁷⁰⁵ Pindyck & Rubinfeld 2013: 687 f.

⁷⁰⁶ Cooter & Ulen 2012: 40 f.; Perloff 2020: 632. The optimal amount of a public good lies at the tangency of the marginal benefits of all users (not only one user) and the marginal cost of the producer, Feess 2007: 38 f.

⁷⁰⁷ For instance, national defense cf. Cooter & Ulen 2012: 41.

⁷⁰⁸ On the pay-off structure of a two-person non-cooperative game, Cornes & Sandler 1996: 305 f.

⁷⁰⁹ See further on the dilemma structure and incentive, Kolmar 2017: 270.

⁷¹⁰ The tragedy of the commons is primarily associated with “open-access common property,” which is rival but non-exclusive, cf., Perloff 2020: 629 f.

Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit--in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.⁷¹¹

III. Private Solution to Externalities – The Coase Theorem

In his essay “The Problem of Social Cost,” Ronald H. Coase (1960)⁷¹² addressed the issue of remedying market failures and advanced the idea of solving environmental externalities through private market forces. Coase proposed that under certain conditions, private bargaining between the polluter and the affected third parties allows for correcting environmental externalities, i.e., achieving the optimal pollution level.⁷¹³ His work has received unparalleled recognition in legal scholarship and is considered (one of) the origin of the economic analysis of law.⁷¹⁴ While its content is partially debated, the following analysis will outline its main features.

1. The Premise of Non-Intervention

Until Coase, the general approach to externalities was shaped by Arthur Cecil Pigou (1920).⁷¹⁵ The approach was to impose a tax equal to the marginal cost of the externality to encourage internalization and efficient behavior – the so-called “Pigouvian tax.”⁷¹⁶ Coase’s solution to the externality was non-interventionist and decentralized, relying on the forces of private bargaining at the micro level to solve the social costs associated with market failure at the macro level.⁷¹⁷ This would allow for a reduction in the role and function of the state to a minimum.⁷¹⁸ His approach drew attention to the incentive structure of regulation at the micro level, i.e., how individuals respond to the applicable law and its effects on allocative efficiency.

⁷¹¹ Emphasis adopted, Hardin 1968: 1244.

⁷¹² Coase 1960.

⁷¹³ Perloff 2020: 626.

⁷¹⁴ In general, economists are used to abstract thinking and mathematical formulas, while lawyers usually face and work with concrete cases. The fact that Coase presented his ideas in various case studies made his ideas assumingly more accessible to legal scholars and may thus have been one of the reasons why his work gained so much attention in the legal field, cf. Eidenmüller 1995: 59.

⁷¹⁵ Pigou 1920.

⁷¹⁶ Eidenmüller 1998: 59 f.; Faure & Partain 2019: 107.

⁷¹⁷ Compare further, Eidenmüller 1998: 59 f.

⁷¹⁸ The function of the state would then be analogous to a competitive market scenario, namely, limited to regulatory policy, cf. Endres 2007: 36.

2. The Reciprocity of Harm

The initial premise of Coase's analysis was that the harm of a conflict of interest is reciprocal; i.e., any resolution in favor of one person's interests implies a detriment to the other person's interests.⁷¹⁹ While traditional legal solutions to conflicts of interest, such as taxes, compensation, or injunctions, directly burden the polluter with the amount of damages, Coase recognized their one-sidedness. Instead, he drew attention to the inherent trade-off of regulation: "The problem which we face in dealing with actions which have harmful effects is not simply one of restraining those responsible for them. What has to be decided is whether the gain from preventing the harm is greater than the loss which would be suffered elsewhere as a result of stopping the action which produces the harm."⁷²⁰ Simply making the "polluter pay" is not *per se* efficient but normative.⁷²¹

3. The Invariance and Efficiency Theses

Through a series of case studies, Coase developed what is commonly referred to as the "Coase Theorem."⁷²² He proposed that in a world of zero transaction costs and clearly defined property rights, "the ultimate result (which maximizes the value of production) is independent of the legal position."⁷²³ The market provides opportunities for trade and property rights exchange that lead to an internalization of externalities.⁷²⁴ Bargaining between the polluter and the affected third parties will most efficiently resolve harmful externalities,⁷²⁵ making governmental intervention in the form of taxes or injunctions obsolete. The theorem thus includes two theses on the efficiency effect of the initial legal assignment of property rights in a world of zero transaction costs and clearly defined property rights: (1) that the initial allocation of entitlement is irrelevant for the ultimate allocation and use of the property (*invariance* thesis) and (2) that these outcomes

⁷¹⁹ In the case of emissions, it would be the one who has to stop his activity to prevent the damage or reverse, the one who is initially harmed, cf. Coase 1960: 2. Conflicts of interest are thus characterized by the fact that any activity that generates profit for one party incurs costs for the other party and *vice versa*. The latter can also consist of pure opportunity costs that arise from not performing an activity, cf. Baumann 2020: 49.

⁷²⁰ Coase 1960: 27.

⁷²¹ For instance, cf. Feess 2007: 140 f. Also Baumann 2020: 49 ff.; Faure & Partain 2019: 94 f. The difficulty of determining the actual cause of the externality (the damage) can be illustrated by the following example: Suppose A builds a house exactly in the flight path of an airport. The associated noise that he experiences represents a negative externality; but if A had not build his house into the flight path, there would not be a negative externality, cf. Fritsch 2018: 93 f.

⁷²² The term "Coase theorem" was never mentioned by Coase himself but emerged from subsequent interpretations by other scholars, cf. Coase 1960. The term mainly goes back to Stigler 1966: 113.

⁷²³ Coase 1960: 8.

⁷²⁴ Samuels 1974: 1.

⁷²⁵ Cooter 1989: 69; Medema 1999: 209; Veljanovski 1982: 54.

are equally efficient (*efficiency thesis*).⁷²⁶ This means a free and voluntary market mechanism will overcome inefficient legal rights allocation.⁷²⁷

4. Case Example: Cattle Farmer A and Potato Farmer B

The following example illustrates the thesis. Let us assume that there are a cattle farmer A and a potato farmer B. Both use communal plot Z, farmer A for his cows, and farmer B for growing potatoes. However, farmer A's free-grazing cows trample farmer B's potatoes, destroying his crop worth \$400. In this respect, there is an external effect. Suppose farmer A could prevent the damage by building a fence for his cows, which costs \$200, while B could build a fence around his potatoes for \$100. B and A both claim their right to use land Z according to their interest. After unsuccessful bargaining for days about whether A or B must build the fence, they approach the mayor to resolve the matter. The mayor has two options for granting the right to use land Z:

1. Right of the cattle farmer A: he can decide that A has the right to let his cows graze freely.
2. Right of potato farmer B: he can decide that B has the right to grow his potatoes free from interference by A's cows.

The Coase theorem now states that as long as the mayor makes a decision and A and B are free to negotiate afterward, whether he grants the right to A or B is irrelevant. It further states that B will always build the fence since this is most efficient.

1. Let us suppose that the mayor decides in favor of A:

Right of the cattle farmer A: A has the right to use the land Z. B now has three options:

- a) He can accept his crop loss of \$400
- b) He can pay A to build the fence for \$200
- c) He can build a fence himself for \$100

The result is that a rational B will build the fence, thereby avoiding the \$400 damage most efficiently at a cost of \$100.

⁷²⁶ Emphasis added, cf. Eidenmüller 1998: 61; Mathis 2019: 77 f. While the former is also known as "*the allocative neutrality of rights*," emphasis adopted, see Samuels 1974: 1 f. Or the "*liability neutrality theorem*," emphasis adopted, Veljanovski 1982: 54. It should be noted that there are various interpretations of the theorem, and its core arguments are contested; the interpretation in this work represents the most common one.

⁷²⁷ Compare the example in Calabresi & Melamed 1972: 1118. See also the example of the bike referenced under the scenario of idealized market conditions, Part 3.A.I.2.a.i. This does, however, not hold for the distribution of the resource, cf. Rodi 2014: 249. See on distributional aspects and wealth (resource) accumulation, Part 2.B.II.4.a.

2. Suppose the mayor decides in favor of B:

Right of potato farmer B: B has the right to use the land Z. A now has three options:

- a) He can pay B's damages in the amount of \$400
- b) He can build a fence for \$200
- c) He can pay A to build a fence for \$100

The result is that a rational A will pay B to build the fence, avoiding the \$400 damage most efficiently at a cost of \$100.

The example shows that the outcome is *invariant* and equally *efficient* regardless of the mayor's allocative decision: The fence is always built, and always by B, since he can avoid the damage at the lowest cost, i.e., \$100. It further illustrates that the result is conditioned on (1) well-defined property rights, i.e., that the mayor determines whether A has the right to let his cows graze or B has the right to have his potato plot free of them, and (2) zero transaction costs, so that A and B can negotiate after the fact; the latter include information costs, in the sense that the parties know about the relevant costs. The outcome in option 2 (potato farmer B's right) would not have occurred if A and B lived in different cities and the cost for A to get to B and pay him the \$100 was \$110, since in such case, it would have been cheaper for A to build the fence for \$200; or if A did not know that B could build a fence for \$100. Moreover, the example shows that the mayor could have determined the most efficient allocation of claims only if he had known A's and B's prevention costs (and B's damage costs).

5. Deficiencies of the Theorem: When Legal Rules Matter to Allocative Efficiency

By specifying the necessary conditions for the efficiency irrelevance of the initial legal allocation of entitlements, namely, well-defined property rights and zero transaction costs, Coase simultaneously specified the much more likely conditions under which the initial entitlement allocation is crucial for allocative efficiency: when the conditions of zero transaction costs and specified property rights are not met (applied to the example, the scenarios that A and B would live in different cities, or the mayor would not decide). The value of the Coase theorem is thus similar to the general equilibrium theorem, as both serve as analytical benchmarks for examining and addressing cases of suboptimal market solutions, particularly market failures.

a. Undefined or Unclear Property Rights

The first condition of the Coase theorem is that property rights are clearly defined. Clearly defined property rights are crucial since they determine the scarcity of the resource and increase its value (by implying a bundle of rights), thereby promoting its efficient use.⁷²⁸ Most importantly, they make the good(s) tradable in the market, so the price system allows an allocation to the owner who values it most. Protection via property rules and related sanctioning of rights violations can prevent uncompensated use by third parties.⁷²⁹ In practice, however, property rights may be lacking, unclear, or hard to enforce. This is especially true in “externality-prone” areas of common goods such as water or air.⁷³⁰

b. Presence of Transaction Costs

The second condition is that transaction costs are zero. Rational parties will only engage in a resource transfer if the expected benefits at least offset the transaction costs.⁷³¹ Transaction costs are incurred throughout the transaction process and include the costs to “discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on.”⁷³² They are understood broadly, including all aspects that prevent a successful negotiation.⁷³³ If transaction costs are greater than the ZOPA, they eliminate potential benefits of transfer and impede reallocation.⁷³⁴ In practice, transaction costs are usually high, so the assumption of zero transaction costs is no longer realistic.⁷³⁵ This is especially the case when more than two parties are involved;⁷³⁶ the Coase example thus focusses on a bilateral transaction perspective, rather present in cases of private not public goods.⁷³⁷ The presence of significant transaction costs means that the initial allocation of legal rights matters for the efficiency of resource allocation.⁷³⁸ In this respect, the

⁷²⁸ Which is the general economic assumption on the incentives of ownership (or property rights, which are the decisive part, but in practice are often associated with ownership), cf. Furubotn & Richter 2010: 89.

⁷²⁹ Further on the relevance of property rights and the protection of the entitlement structure for the emergence of a market, cf. Part 3.A.I.2.a.

⁷³⁰ See Mathis 2009: 58; 2019: 83.

⁷³¹ Cf. Coase 1960: 15 f.

⁷³² Coase 1960: 15. Further also Part 1.C.III.4.

⁷³³ Cf. Part 1.C.III.4.

⁷³⁴ Coase 1960: 15 f.

⁷³⁵ As Coase himself observed, cf. Coase 1960: 15. See also Behrens 1986: 106; Mathis 2019: 83.

⁷³⁶ For instance, as it is the case for most environmental externalities, cf. Faure & Partain 2019: 23.

⁷³⁷ Compare, e.g., Revesz & Stavins 2007: 503.

⁷³⁸ Coase 1960: 15 f. Also, Posner 1981b: 71. See further, Part 3.A.III.4.

Endowment effect can be subsumed likewise under transaction costs since it hinders the invariant allocation of resources toward allocation efficiency through free bargaining and exchange.⁷³⁹ Other relevant forms of transaction costs related to information asymmetry and/or strategic behavior will be outlined broadly in the following..

i. Information Asymmetry

Transaction costs may arise from information asymmetries. Asymmetric or incomplete knowledge about relevant properties between the parties can prevent successful negotiation⁷⁴⁰ and leave room for opportunistic behavior. Opportunistic behavior can destroy relevant properties of a well-functioning and sound market and cause market failure.⁷⁴¹

Opportunistic behavior includes adverse selection, describing a situation in which one party possesses information about a hidden characteristic relevant to the market transaction and exploits it (*hidden information*).⁷⁴² For example, if the policyholder conceals a significant risk relevant to the insurance fee when taking out an insurance policy.⁷⁴³

Another form of opportunistic behavior is moral hazard. Moral hazard is when the informed party engages in an unobservable but paid service to the other, less-informed party (*hidden action*).⁷⁴⁴ In the insurance example, when the better-informed policyholder engages in riskier behavior because he knows the insurance will protect him from adverse consequences. The policyholder can then externalize the risk of the costs associated with his behavior.⁷⁴⁵ In this context, adverse selection refers to a situation prior to the transaction, while moral hazard refers to a change in informational advantage caused by a particular action.⁷⁴⁶

A more general information problem is not its asymmetry but its absence. Only when both parties are aware of the costs and benefits of a particular activity or resource, and thus of the possibilities

⁷³⁹ Compare, rke Endowment Effect.

⁷⁴⁰ This does not relate to the idea of bounded rationality (cf. Part 2.B.I.5.b and Part 2.B.I.5.c) of one actor, but rather to the discrepancy in the level of information between two (or more) transacting actors who engage in transactions, see Fritsch 2018: 249 ff.

⁷⁴¹ Perloff 2020: 646.

⁷⁴² Feess 2007: 285; Fritsch 2018: 260 ff.; Perloff 2020: 646 ff.

⁷⁴³ Or, for example, if the car seller conceals the fact that the car was previously involved in an accident and the buyer therefore buys it at a higher price than its actual value.

⁷⁴⁴ For example, in cases where an electrician is paid to fix the electricity at home even though the resident himself is not at home, resulting in the electrician charging for excessive labor hours. See in more detail on the issue of asymmetric information in market transactions, Perloff 2020: 646 ff.

⁷⁴⁵ Thus, insurance companies commonly try to combat this issue by requiring the insured person to still provide for a specific level of care, see Cooter & Ulen 2012: 238.

⁷⁴⁶ Feess 2007: 285; Fritsch 2018: 260.

of an increase in value from transacting (the ZOPA), can they make a reasonable offer and a reasonable acceptance.⁷⁴⁷

ii. Strategic Behavior

Adverse selection and moral hazard are strategic behaviors that generally describe the actions of one person, taking into account the capabilities and actions of the other party. In a free and competitive market, strategic behavior is common practice because the consequences of the decisions of the parties involved depend, to a large extent, on the decisions of others.⁷⁴⁸ In contrast, Coase's examples represent bilateral monopolies because producers and buyers are equally powerful and operate in an isolated market.⁷⁴⁹ The price directly results from bargaining between the two parties, considering both interests equally. In practice, however, the bargaining power and positions of the parties are decisive to the ultimate agreement⁷⁵⁰ – less their assigned values. Market power distorts perfect competition, and some market participants can influence the outcome to a relatively large degree.⁷⁵¹ In addition, efficient bargaining may be distorted if actors are not entirely rational; for instance, if parties consider aspects other than the good's market value in their decision-making process,⁷⁵² such as fairness or endowment.⁷⁵³

IV. The Efficiency Function of Public Regulation when Private Solutions Fail

1. Initial Allocation of Entitlements

When transaction costs are high and/or property rights are poorly defined, the initial legal allocation of entitlement is relevant to allocative efficiency. Then, the question for the law is how to arrange situations with (prohibitive) transaction costs that impede private and decentralized bargaining.⁷⁵⁴ The efficiency dogma dictates that the law should “simulate” the efficient solution.⁷⁵⁵ Namely, the resource or right should be awarded to the party with the highest value,

⁷⁴⁷ Similar, Perloff 2020: 627. Information conditions that “the two parties are supposed to agree that joint-profit maximization is the most advantageous policy for them to follow,” cf. Furubotn 1995: 101.

⁷⁴⁸ See, Part 2.B.I.5.a

⁷⁴⁹ Eidenmüller 1995: 84. Problems of strategic behavior and decision-making dilemma (e.g., the prisoners dilemma) are commonly intensified in scenarios involving more than two parties, cf. Endres 2007: 47; Rodi 2014: 249.

⁷⁵⁰ For instance, cf. Faure & Partain 2019: 22; Rodi 2014: 248.

⁷⁵¹ Which encourages strategic behavior, Eidenmüller 1995: 83.

⁷⁵² On rationality of actors as a condition of the theorem, cf. Furubotn 1995: 105 ff.

⁷⁵³ Compare more generally on irrationalities within the decision-making process, Part 2.B.I.5.c.ii.

⁷⁵⁴ Eidenmüller 1995: 95. See also Faure & Partain 2019: 24., stating that the Coasean relevance is to provide insights into less interventionist policy approaches.

⁷⁵⁵ Eidenmüller 1995: 63. Or “‘mimic’ the market,” Faure & Partain 2019: 24.

which would obtain the resource or right in a free negotiation process in a market with perfect competition.⁷⁵⁶ After establishing the efficient entitlement structure, the next question for the law is the form of protection and transfer modalities,⁷⁵⁷ which includes aspects of compensation.⁷⁵⁸ The idea of arranging transfer modalities acknowledges the error rate when the policymaker arranges the resource allocation rather than the parties themselves.⁷⁵⁹

2. Protection and Transfer Modalities of Entitlements: Liability and Inalienability Rules

As outlined, property rules are based on a free transfer and individual value determination and are superior in efficiency.⁷⁶⁰ However, in cases of prohibitive transaction costs, property rules are inapplicable. This leads to the relevance of two additional entitlement protection structures of Calabresi's and Melamed's framework: liability and inalienability rules, both characterized by stronger state intervention.

a. High Transaction Costs while Potentially Desirable Transfer: Liability Rules

The rules with the second least state intervention are liability rules. Liability rules apply when transaction costs are prohibitive, but the activity in question (and the associated exchange of rights and resources) may still be socially desirable.⁷⁶¹

Typical examples concern eminent domains: Suppose a government hospital is to be built with a value of \$100 for each individual of a population of 1000 citizens, i.e., the sum of WTP is \$100,000. The construction of the hospital requires the expropriation of 10 garden owners who value their garden at \$1000; the sum WTA is \$10,000. In principle, a transfer would be Kaldor-Hicks efficient. However, three garden owners take advantage of the situation and overstate their values so that no transfer occurs (holdout problem); conversely, some citizens may overstate their WTP (freeloader or rider problem).⁷⁶² Protecting the entitlement (the property right to the garden) through a property rule would give the victim (garden owner) a veto right and exclude the

⁷⁵⁶ Which reflects the ratio of the initial allocation of rights in terms of the wealth maximization principle, cf. Posner 1981b: 71. Also, Part 2.B.II.3; in other words, who would be the highest cost avoider, cf. Calabresi & Melamed 1972: 1118.

⁷⁵⁷ Calabresi & Melamed 1972: 1092.

⁷⁵⁸ The crucial questions for law and economics are therefore not only who has the initial right, but also whether and, if so, to what extent losses should be compensated, cf. Mercurio & Medema 2006: 40.

⁷⁵⁹ Cf. example of the bike in Figure 17, in which the initial entitlement was inefficient.

⁷⁶⁰ Part 3.A.I.2.a.iii and Calabresi & Melamed 1972: 1092.

⁷⁶¹ Calabresi & Melamed 1972: 1106 ff. Also Ott & Schäfer 2008: 44.

⁷⁶² Calabresi & Melamed 1972: 1106 ff.

possibility of expropriation.⁷⁶³ In such scenarios, the market transaction would either not occur or not lead to the most efficient result. Liability rules then, to a certain extent, allow the social interest to “overrule” individual autonomy.⁷⁶⁴

Recourse to liability rules is also observable in regulating public goods, where prohibitive transaction costs due to the large number of parties involved hinder the determination of individual values; instead, the government determines an equal and general tax (price).⁷⁶⁵ A typical example is (industrial) pollution.⁷⁶⁶ Another example is tort rules for accidents: Pre-accident bargaining would be too costly and impractical (and post-accident bargaining is deemed fail), but the behavior causing the damage should generally continue; the state, therefore, “permits” violations (accidents) in exchange for compensation (awarding damages).⁷⁶⁷

Liability rules are preferable because they allow socially beneficial activity while ensuring *ex post* compensation of the disadvantaged party.⁷⁶⁸ Instead of the parties deciding the resource’s value, the state determines an “objective” value, i.e., the amount of compensation, which can be based on how much the original claimant would have asked for to give up for it (WTA).⁷⁶⁹ Liability rules typically realize Kaldor-Hicks or wealth maximization efficiency but with the occurrence of compensation. This means that they may generally achieve Pareto efficiency if compensation is determined “correctly” as it (at least) compensates the loss of the affected party. However, since the resource’s value is determined by the state, not by the disadvantaged party, it is only an “approximation of value” and thus an approximation of transfer efficiency.⁷⁷⁰ Therefore, property rules that guarantee Pareto efficiency based on voluntary transactions should apply whenever possible.⁷⁷¹

⁷⁶³ Ott & Schäfer 2008: 44.

⁷⁶⁴ Applicable to “a nuisance with sufficient public utility to avoid injunction has, in effect, the right to take property with compensation,” see Calabresi & Melamed 1972: 1105. Thus, “under high transaction costs, however, a discrepancy arises between the economic welfarist and the autonomist concept of law,” Ott & Schäfer 2008: 43.

⁷⁶⁵ Calabresi & Melamed 1972: 1108. See further on liability rules within environmental law and economics and the regulation of polluting activities based on standards, Part 3.B.III.

⁷⁶⁶ Calabresi & Melamed 1972: 1115 ff. See also Kaplow & Shavell 1996: 748 ff. Kaplow and Shavell argue in favor of liability rules since firms have an informational advantage concerning costs and benefits of the polluting activity. See further on this Part 3.B.III.3.b.ii.

⁷⁶⁷ Calabresi & Melamed 1972: 1108 f.

⁷⁶⁸ Compare, Ott & Schäfer 2008: 43 f.

⁷⁶⁹ Calabresi & Melamed 1972: 1092.

⁷⁷⁰ Calabresi & Melamed 1972: 1125.

⁷⁷¹ In a sense, the component of *ex post* market-value compensation represents a private, libertarian perspective on liability rules. However, Calabresi (2014) in his later work elaborated further on the “social” or “collectivist” element of liability rules, employed to express the “polity’s view of the desirability of certain entitlement shifts” by deviating from the market value in either direction. For instance, in cases of eminent domains when the awarded price was based on the value in use and not the market value, cf. Calabresi 2014: 6.

b. High Transaction Costs while Undesirable Transfer: Inalienability Rules

The greatest degree of state intervention exhibit inalienability rules, the “stepchild of law and economics [...] to be justified by appeals to paternalism and moralism.”⁷⁷² Inalienability rules prohibit any transfer of resources or rights, regardless of the parties’ willingness.⁷⁷³ The state intervenes by determining the initial entitlement holder and forbids its reallocation.⁷⁷⁴ The reasons for inalienability rules and the prohibition on transfer include the fact that the harm potentially caused is substantial, non-compensable, or monetarily not measurable, so efficiency is best served if no transfer occurs.⁷⁷⁵ As the damage is usually irreversible and goes far beyond the private damage suffered by the direct victim, no financial loss can be compensated by a fine tailored to the individual case.⁷⁷⁶ These aspects indicate non-material and non-monetizable concerns about inalienable rules and protected resources.⁷⁷⁷ The external state cannot objectively quantify the actor’s values and thus cannot approximate hypothetical private bargaining outcomes.⁷⁷⁸

In this respect, inalienability rules are relevant in areas regulating “rights,” less “entitlements,” belonging to each individual equally.⁷⁷⁹ They are therefore commonly assumed in the context of rights of citizenship,⁷⁸⁰ human rights, or rights to bodily integrity.⁷⁸¹ For example, the sale of organs is prohibited in most jurisdictions because it can lead to externalities in the form of black markets for illegal organ trafficking or forced organ harvesting. Another example is constitutional rights, which are not transferable. Concerning pollution, inalienability rules may be preferable when the external damage is widespread or nonquantifiable, so objective monetization and compensation are impossible.⁷⁸²

⁷⁷² Footnote omitted, cf. Rose-Ackerman 1985: 931.

⁷⁷³ Cf. Calabresi & Melamed 1972: 1092 f.

⁷⁷⁴ See Calabresi & Melamed 1972: 1092 f.

⁷⁷⁵ Calabresi & Melamed 1972: 1111 f.

⁷⁷⁶ They are, thus, typically found in criminal law, Prescott 2019: 499. Further, with respect to environmental standards, Part 3.B.III.3.

⁷⁷⁷ As commonly found in situations in which moral aspects or other non-efficiency goals, such as distribution, come into play, cf. Calabresi & Melamed 1972: 1111 ff.

⁷⁷⁸ Cf. Calabresi & Melamed 1972: 1112.

⁷⁷⁹ See on different action structures of rights Schäfer & Ott 2020: 40 f.

⁷⁸⁰ See on this, Rose-Ackerman 1985: 966 f.

⁷⁸¹ What Calabresi and Melamed call areas “where economic efficiency enters in, if at all, in a more complex way,” cf. Calabresi & Melamed 1972: 1125 f.

⁷⁸² Calabresi & Melamed 1972: 1111 f.

c. Incentive Perspective on Property, Liability, and Inalienability Rules

Methodological individualism implies that collective outcomes must be explained and amended on the individual level.⁷⁸³ As Coase illustrated,⁷⁸⁴ the economic interest in entitlement regulation is their incentive structure since this is crucial to the individual's behavioral responses and, thus, to whether or not the specific regulatory framework can adjust the market failure on the collective level.⁷⁸⁵ Different liability schemes imply different incentive structures:⁷⁸⁶

- Property rules aim to discourage violations of legal entitlements through (overcompensatory) sanctions.⁷⁸⁷ They aim at deterring involuntary and forced exchange, to encourage parties to transfer the resource based on associated values, and by recourse to voluntary and free bargaining.⁷⁸⁸
- Liability rules accept harm conditioned by subsequent compensation.⁷⁸⁹ The goal is not to deter behavior but to create incentives for a certain level of care.
- Inalienability rules, like property rules, aim to discourage from resource transfers entirely. They come into play when non-individual goods or non-objectifiable monetizable damages are at stake, or other reasons indicate the *prima facie* inefficiency of transfer.

While the mere design of entitlement protection rules may already create behavioral incentives, enforcing the law and the associated sanctions ultimately alter individual cost-benefit structures, thereby operationalizing the law as an instrument of social control.⁷⁹⁰ Generally, the higher the sanctions and the costs imposed by the law, the greater the behavioral restriction.⁷⁹¹ Based on this, the following protecting and incentive structure of property, liability, and inalienability rules can be concluded:

⁷⁸³ On methodological individualism, cf. Part 2.B.I.1.

⁷⁸⁴ See Part 3.A.III.

⁷⁸⁵ See further on the incentive-based perspective of the economic analysis of law, Part 2.B.I.3.b; also Part 2.A.III.2.a.i.

⁷⁸⁶ Compare, Hylton 2019: 7, 9 Table 2. Also Faure 2009a: 249.

⁷⁸⁷ Calabresi & Melamed 1972: 1125 ff. table

⁷⁸⁸ Compare Ott & Schäfer 2008: 42 f. Also Posner 1985b.; Part 3.A.I.2.a.iii.

⁷⁸⁹ Hylton 2019: 7. See different, Faure 2009a: 249. Faure argues that, commonly, environmental lawyers consider the function of tort law in terms of compensation, while economists stress its deterrence effect.

⁷⁹⁰ Among others, by taxes, tolls, or criminal sanctions, for instance, Becker 1976: 6; Eidenmüller 1995: 34 f.; Kirchgässner 2013a: 27 f.

⁷⁹¹ Eidenmüller 1995: 27.

Table 6 Incentive perspective on the entitlement protection structure⁷⁹²

Condition of transfer	Protection structure	Incentive structure	Compliance mechanism
Voluntary transfer	Property rules	Deterrence	Criminal law
Compensated transfer	Liability rules	Internalization	Tort law
Prohibited transfer	Inalienability rules	Deterrence	Criminal law ⁷⁹³

By creating behavioral incentives on behalf of the regulated, protection structures create behavioral expectations on behalf of the public. “And these private expectations come to have a value of their own that cannot, at any given moment in the law’s time be ignored without significant harm. [...] As a result, it is in some sense wrong and perhaps even immoral not to do so.”⁷⁹⁴ The counterpart to the incentive side is thus the social expectation that arises on behalf of the regulated parties toward the regulator concerning government responses to violations.⁷⁹⁵

V. Interim Statement

The analysis focused on the market system’s core elements, its failures, the role of the law within, and its meaning to allocative efficiency. It revealed that “a minimum of state intervention is always necessary”⁷⁹⁶ since even a free competitive market depends on the legal definition and protection of property rights. The role of the state and the law is limited to regulating and ensuring the features essential to market functioning. The parties involved know their preferences and values best, while property rules ensure maximum individual autonomy and Pareto-efficient outcomes by encouraging free and voluntary exchange.

Market failures, such as common goods and externalities, reveal the limits of the ideal market system. Government regulation can still ensure, or at least approximate, allocative efficiency. In this context, the Coase theorem provides a theoretical thought experiment to examine the conditions under which private solutions can solve externalities. Most importantly, by specifying the conditions under which the allocation of the entitlement does not matter to allocative efficiency, Coase has drawn attention to the converse, i.e., the conditions under which the

⁷⁹² Compare also Hylton 2019: 9 Table 2.

⁷⁹³ See further on this, Part 3.B.III.3.b.ii.

⁷⁹⁴ Calabresi 2014: 2.

⁷⁹⁵ On this, Calabresi 2014: 2 f.

⁷⁹⁶ Footnote omitted, Calabresi & Melamed 1972: 1090.

definition of entitlements matters, namely, when transaction costs are prohibitive and/or property rules are unspecified – which is typically the case for public goods.

If prohibitive transaction costs prevent a potentially efficient transfer, the state can resort to liability rules that allow involuntary transfers in exchange for determined *ex post* compensation. The state intervenes most when an inalienability rule protects the entitlement and its allocation. The state determines the right holder and prohibits reallocation since it is assumed inefficient. In this respect, the protection by inalienability rules marks the limitations of a purely economic perspective by determining rights outside the scope of transfer considerations.

The economic principles and perspectives on the function of law in general serve as the basis of analysis and will be applied in the next part, while accompanied by alternative and expanding (normative) perspectives: the regulation of environmental goods and pollution and the function of environmental (criminal) law more specifically. In fact, environmental goods are particularly affected by the previously analyzed efficiency and practicability constraints of the private market system as a decentralized mechanism for resource allocation, which increases the scope for government regulation and underscores its relevance.

B. The Function of Environmental Law

Environmental economics is a subdiscipline of economics that applies the methodological tools of macroeconomics and microeconomics to analyze the efficient allocation of environmental resources.⁷⁹⁷ It is probably one of the most important economic areas shaping the law.⁷⁹⁸ In the following, microeconomic insights into the appropriateness and function of legal regulation, i.e., why and when markets fail and the efficiency function of the legal system, are applied to environmental pollution. The analysis focuses on why markets typically fail for natural goods such as air, and how more direct regulation enables or approximates efficiency, thereby maximizing welfare. The focus is on the normative component of environmental regulation in terms of Kaldor-Hicks efficiency and the associated cost-benefit analysis as a tool of economic policy. The analysis will illustrate the general idea of the traditional cost-benefit approach by using a case study. Next, some of its main criticism and alternatives will be outlined to give insights into its most criticized features. After addressing the normative level of analysis and the question of the socially desirable regulatory goal, the analysis shifts to the choice and efficiency

⁷⁹⁷ *environmental economics* n.d.

⁷⁹⁸ See on the relation between microeconomics and environmental (criminal) law and the rationale for the choice of the economic analysis in this work, Part 1.C.II Research Questions and Procedure.

justification of specific policy instruments, focusing on market-based and/or command-and-control instruments for dealing with environmental pollution.

I. Market Failure for Environmental Goods

Market failures related to environmental harm are primarily associated with the lack of or undefined property rights and prohibitive transaction costs. There are many reasons for unspecified property rights: First, environmental resources and goods have not been scarce for most of human history.⁷⁹⁹ Without scarcity, the need and incentives for efficient use through allocating property rights to environmental goods are obsolete.⁸⁰⁰ Moreover, the lack of technology prevented the exploitation of various environmental goods, such as the deep sea, rendering regulation of their use irrelevant.⁸⁰¹ In addition, most environmental goods and associated harm are transboundary and volatile; this means that many parties are typically affected, preventing private bargaining solutions through prohibitive transaction costs.⁸⁰² Efficient private bargaining is further challenged due to the unclarity of causation of environmental harm⁸⁰³ and related difficulties in the supervision of contract compliance.⁸⁰⁴

1. Environmental Externalities

Natural resources and their inefficient use are classic examples of negative externalities as forms of market failure. Industrial pollution is the side effect of an activity that is potentially beneficial to the buyer and seller in terms of production and consumption but which causes harm to third parties.⁸⁰⁵ Negative environmental externalities are the uncompensated effects of pollutants and waste as costs of industrial production on the health and well-being of consumers and, more generally, of society.⁸⁰⁶ They are uncompensated or unintended because the negotiation process involves fewer parties than are affected by the outcome, so their values are not taken into

⁷⁹⁹ Kolmar 2017: 105.

⁸⁰⁰ Kolmar 2017: 105.

⁸⁰¹ On ambitions on regulating marine biological diversity of areas beyond national jurisdiction, United Nations n.d. See also Kolmar 2017: 105.

⁸⁰² Kolmar 2017: 105 f. See also Faure & Partain 2019: 23 ff.

⁸⁰³ Faure & Partain 2019: 25.

⁸⁰⁴ Kolmar 2017: 105.

⁸⁰⁵ Faure et al. 1996: 549; Revesz & Stavins 2007: 502. Cf. Faure & Partain 2019: 13; Perloff 2020: 615. A positive externality would be, for example, the invention of a new technology that enables more efficient production, which is patent-free and can therefore be used by third parties without compensation, Rodi 2014: 246.

⁸⁰⁶ Cf. Bartelmus 2014: 54 ff. In the case of the “tragedy of the commons,” externalities are the *uncompensated* resource extraction.

account;⁸⁰⁷ i.e., the costs are not attributed to the polluter and thus not included in his decision-making process. From a social perspective, the decision-making processes (of consumers and producers) are incomplete,⁸⁰⁸ and the resulting choices are irrational (compare in this respect, Part 3.A.II.1). The volatile and transboundary nature of environmental goods encourages externalization.⁸⁰⁹ The transnational dimension of environmental damage means causes and consequences are decoupled and distributed across the globe, so the cost advantages of environmental damage in one place can lead to damage elsewhere.⁸¹⁰

Climate change forcefully reveals the downsides of transboundary externalization of damage, e.g., the environmental damage caused by high Western living standards and industrialization being externalized to less developed countries.⁸¹¹ From a public choice perspective,⁸¹² the possibility of exporting pollution, and thus exporting damage, is critical to understanding why effective environmental regulation is complex. Assuming that policymakers seek reelection, they tend to focus on national consequences, whereby exporting pollution reduces costs to voters while increasing satisfaction with existing policies.⁸¹³ In fact, however, natural resource interdependencies and interactions prevent absolute externalization in the long run.⁸¹⁴

The absence of pricing for externalized harm means that the private costs of the polluter do not reflect the actual social costs of his activity. As a rational actor, the producer has no interest in optimally changing his behavior because of the lack of incentives to reduce pollution by reducing production or installing pollution-reducing devices. On the consumer side, the resource price does not reflect the full social cost and is, therefore, too low, so demand is too high.⁸¹⁵

⁸⁰⁷ Faure & Partain 2019: 13 f.

⁸⁰⁸ The information is either missing or ignored, cf. Faure & Partain 2019: 14.

⁸⁰⁹ Faure & Partain 2019: 14. Cf. also on the transboundary nature of environmental damage, Hecker 2004: 880 f.

⁸¹⁰ Cf. Hecker 2004: 880 f. For a comprehensive investigation into transboundary waste crime, cf. Hecker et al. 2008. For a criminological perspective, Giardi 2015.

⁸¹¹ See, for example, the case of Peruvian farmer *Sául Luciano Lliuya vs RWE*. On November 24, 2015, Sául Luciano Lliuya filed a lawsuit against the energy company RWE in a German civil court. He claims that RWE, one of the largest CO₂ emitters in Europe, is partly responsible for the climate crisis and the risk of a tsunami in his hometown of Huaraz due to the melting of a glacial lake. Climate change and its associated social costs are seen as presumably the most serious case of market failure caused by externalized emissions, Stern 2008: 1. See further on the externalization of harm associated with Western living standards, Lessenich 2016.

⁸¹² Public Choice Theory represents an attempt to analyze the behavior of political decision-makers by applying the economic model of human behavior, i.e., by assuming self-interest and utility maximization even in the case of individuals who, according to their role, should decide in the interest of citizens rather than their own interests. The theory attempts to explain “irrational” political action based on an inherent conflict between individual and collective rationality that is assumed to be present in political agents. See on this, Towfigh & Petersen 2017b.

⁸¹³ Faure & Partain 2019: 15.

⁸¹⁴ Cf. Sommerer 2021: 125. Sommerer notes that environmental sustainability is not an end in itself, but a question of system preservation to prevent irreversible loss of economic and livelihood resources and, thus, is in the interest of businesses and society as a whole.

⁸¹⁵ On the market inefficiency of externalities Part 3.A.II.1.

2. Environmental Public Goods

Most natural goods are public or lack one of the characteristics of private goods in the form of exclusion and rivalry.⁸¹⁶ The example of breathing air or consuming water shows that, from today's point of view, there are only a few purely public goods that are non-rivalry. Ultimately, the notion of infinite resources is illusory, for instance, emissions reduce air quality. This means that at least in densely populated regions, air and water resources can also be seen as rivalrous and the increasing commodification of water resources likewise calls into question the aspect of their non-exclusivity.

In the absence of opportunities for exclusion, the problem of overconsumption and overuse by "free riders" arises, ultimately threatening the welfare of all users.⁸¹⁷ Concerning pollution, the problem of free-riding does not refer to typical consumption in the form of "taking something out of the commons, but of putting something in."⁸¹⁸ Environmental assets are damaged by, among other things, the release of CO₂ emissions into the air, plastic waste into the water, or chemical fertilizers into the soil. The transboundary and volatile nature of environmental resources further aggravates the exclusion of consumption when access to a resource exists for more than one nation, such as fishery and problems of overfishing.

II. The Efficiency Function of Environmental Regulation: Determining the Target

Market failures in the form of public goods and externalities related to environmental goods give rise to the need for public regulation to encourage efficient use. The threats and costs associated with market failures on a global scale, such as climate change and global warming, necessitate policies and actions that change individual behavior.⁸¹⁹ However, while environmental pollution of production and consumption behavior is harmful, it is equally socially beneficial.⁸²⁰ This implies that complete elimination is neither socially desirable nor realistic; in economic terms, "*the optimal amount of pollution is greater than zero.*"⁸²¹ Thus, from an environmental economics perspective, the primary goal of environmental regulation is to correct market

⁸¹⁶ Compare Table 5 Classification of goods: rivalry and excludability.

⁸¹⁷ See Part 3.A.II.2.

⁸¹⁸ See Hardin 1968: 1245.

⁸¹⁹ IPCC 2019: chaps. 2, 4., mentioning that in order to achieve a 1.5°C-consistent pathway, substantial behavioral changes are necessary.

⁸²⁰ Faure & Partain 2019: 13. Which is essentially the characteristic of pollution as an externality, cf. Part 3.A.II.1.

⁸²¹ Emphasis adopted, cf. Perloff 2020: 615.

inefficiencies while allowing economic progress and environmental preservation.⁸²² The question is how to determine and implement efficient environmental regulation to maximize social welfare. What is the specific goal of regulation in terms of environmental quality? How can the optimal level of environmental degradation or, conversely, conservation be determined? How to determine and measure relevant societal values? What is the desirable regulatory instrument? How should it be designed and implemented to incentivize desired individual behavior most efficiently?

Since public regulation means that private parties do not directly define attributed values, Pareto efficiency is unsuitable, so the issue of consent becomes critical. An objective, or at least approximately objective, measurement tool is needed to answer how to intervene and determine the overarching societal goal being pursued, i.e., the desired status quo. The standard environmental economic tool is the cost-benefit analysis (CBA),⁸²³ which applies Kaldor-Hicks efficiency and will be analyzed below.

1. A Cost-Benefit Approach to Environmental Regulation

The cost-benefit analysis (CBA) comes from (neo-)classical welfare economics and is the predominant approach used in environmental policy decisions to evaluate alternative environmental regulatory instruments.⁸²⁴ Its basic idea is to take into account the costs and benefits of a (public) action from a societal, typically national, perspective by including external effects in addition to economic variables.⁸²⁵ The resulting environmental statutes then seek to balance industrialization and economic progress with other social goals, such as human health and ecological preservation.⁸²⁶ The main steps include defining the problem and objectives, assessing societal benefits, i.e., increases in well-being, and costs, i.e., decreases in well-being, measured in transferred monetary units, and defining potential discount rates and finalizing the decision, cf. Figure 21.⁸²⁷

⁸²² Ringel 2021: 8 f.

⁸²³ Cf. Rodi 2014: 250.

⁸²⁴ Revesz & Stavins 2007: 505 ff.; Rodi 2014: 250 f. For a contrast of neoclassical and ecological economics, cf. Gowdy & Erickson 2005: 212 ff. On the cost-benefit analysis concerning environmental regulation, OECD 2018. On its use on the European level, Faure & Partain 2019: 113 ff.

⁸²⁵ Oehlmann et al. 2021: 83 f. While the scope may also be transnational, such as, the EU clean air strategy with impacts within Europe and on third countries, Amann et al. 2013.

⁸²⁶ See on different types of standards etc. of environmental law, balancing social costs and benefits, Faure & Partain 2019: 63 ff.

⁸²⁷ Compare on the three-step approach, Rodi 2014: 250 f. As well as on the theoretical foundations of the CBA, OECD 2018: 16 f. See also Faure & Partain 2019: 108.

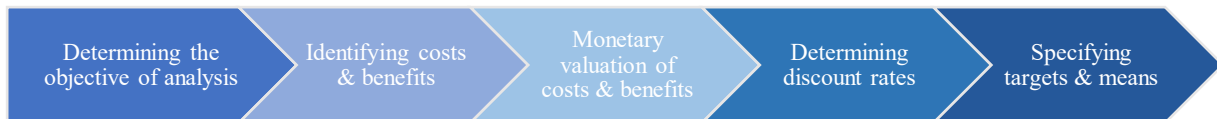


Figure 21 Steps of a cost-benefit analysis

The inclusion of discount rates indicates the appraisal of social and environmental costs at different points in time. The aim is to comprehensively examine the effects on the parties involved and illustrate potential trade-offs.⁸²⁸ The costs of trade-offs are typically conceptualized as opportunity costs, which refer to the foregone social benefits of any environmental policy,⁸²⁹ including individual, governmental, and social costs.⁸³⁰ The fact that reducing environmental costs entails opportunity costs means that environmental and social goals are not pursued in absolute terms but rather optimally; i.e., “until the incremental benefits from regulation are just offset by the incremental costs.”⁸³¹ This paradigm is used when choosing the target and defining the instruments to achieve it. For instance, the most efficient measures to reduce nitrogen are those at which their marginal costs of implementation (*inter alia*, higher production or administrative costs) equals their marginal benefits (*inter alia*, reduction of health or biodiversity damages), and the target in the form of a maximum level of nitrogen oxides (NO_x) lies at the intersection between the marginal costs of emission reduction and its marginal benefits in terms of related social benefits.⁸³²

Trade-offs commonly arise, among others, between different environmental regulations, e.g., choosing one instrument implies that another may not be chosen, or social values, e.g., banning Sunday driving in favor of the social value of clean air means limiting the social value of freedom of movement by vehicle or between different social/environmental values, e.g., producing lithium batteries for electric vehicles to reduce emissions while lithium extraction causes severe damage on water resources. While the cost-benefit approach aims to represent a rational, objective, and understandable policy approach to different alternatives, its operationalization raises practical limitations and methodological and normative questions.⁸³³

⁸²⁸ Revesz & Stavins 2007: 505 ff.; Rodi 2014: 250 ff. See also OECD 2018: 3–10.

⁸²⁹ Revesz & Stavins 2007: 511.

⁸³⁰ Rodi 2014: 250 f.

⁸³¹ Arrow et al. 1997: 198.

⁸³² See further Part 3.B.II.1.c.

⁸³³ It should be noted that the analysis only highlights the basic idea and criticism of the cost-benefit analysis of environmental regulation, while anything beyond is not within the scope of this work.

a. Measurement and Monetization of Environmental Values

Evaluating and comparing alternative policies on a broad social, environmental, and temporal scale requires standardizing the various forms of resources, most of whose values are not represented in the marketplace (cf. step three, Figure 21). Economic approaches to determining environmental value differ among the various schools of economic thought.⁸³⁴

From a neoclassical perspective, market failures are assumed to be caused by the misrepresentation of environmental goods in the price mechanism; protection and preservation of the environment are then “a secondary outcome of ‘getting the prices right.’”⁸³⁵ Consequently, a crucial step is to price environmental values appropriately to make them tradable through the market pricing system.⁸³⁶ This is done by converting the relevant resources and their values into the monetary market unit.⁸³⁷ The standard economic perspective in environmental policy decisions⁸³⁸ is hereby anthropocentric.⁸³⁹ The values of environmental goods matter insofar as they are part of the individual’s utility function, thus, due to their human utility, defined by scarcity or unavailability.⁸⁴⁰ Welfare or utility is measured by the standard method of preference satisfaction expressed in the willingness to pay (WTP) and the willingness to accept (WTA).⁸⁴¹ The benefits of environmental protection may be related to human health and ecological or economic concerns and may be direct (use value, such as clean air) or indirect (non-use value, such as preservation due to ecological or intergenerational concerns).⁸⁴²

Because environmental goods are typically unrepresented or underrepresented in the market, the direct measurement of values in terms of revealed preferences (i.e., deriving an individual’s preferences and valuing a resource from the market supply) must be complemented by other methods, such as surveys or behavioral observation.⁸⁴³ For instance, using surveys, Kaldor-Hicks

⁸³⁴ Further on different schools of thought, Bartelmus 2014: 5–7; Ringel 2021: 6–8.

⁸³⁵ Gowdy & Erickson 2005: 209.

⁸³⁶ Ringel 2021: 8 f.

⁸³⁷ OECD 2018: 3; Rodi 2014: 251 f. Gowdy and Erickson call the idea that “all objects of utility have some common characteristic that allows them to be compared,” “value monism,” cf. Gowdy & Erickson 2005: 212.

⁸³⁸ Gowdy & Erickson 2005: 211. In this context, Gowdy and Erickson mention the Nordhaus model of climate change mitigation, which uses a damage function, an abatement function, and equations to link GDP growth to increases in CO₂ levels and their effects on global average temperature. Since then, the model has been updated to align the carbon cycle, climate science, and projected impacts; the model though grounds in classic economic concepts and theories and, thus, defines internalization as the means to correct market failure through appropriate pricing of environmental damage. For an overview, Nordhaus 2018. For a modification, aligning the model with the 1.5 °C target of the Paris Agreement, Hänsel et al. 2020.

⁸³⁹ Compare (neo)classical economics and environmental economics, Ringel 2021: 6 f.

⁸⁴⁰ Cf. Ringel 2021: 5 f. Also. Revesz & Stavins 2007: 510.

⁸⁴¹ Cf. Rodi 2014: 254. Also Sagoff 2012: 97 f. For an application on reducing nitrogen, Oehlmann et al. 2021: 84.

⁸⁴² Revesz & Stavins 2007: 511.

⁸⁴³ Bartelmus 2014: 57; Rodi 2014: 253–255. Also Oehlmann et al. 2021: 84.

efficiency can be determined by asking how much a person would be willing to pay for a given environmental condition and for what minimum amount they would be willing to accept a degradation of environmental quality.⁸⁴⁴ Associated problems are, among others, wealth effects or lack of information, which may bias an individual's decision.⁸⁴⁵ More general problems in adequately reflecting individual preferences and values arise due to the complexity and uncertainty of environmental and social systems and developments, the general limits of individual rationality, or moral aspects.⁸⁴⁶ Overall, the informative grounds for inferring utility are much more critical⁸⁴⁷ than in the case of classical private market goods.

b. Discount Rates and Values of Future Generations

Determining environmental values becomes even more complex when the time frame of included utility values is extended to incorporating future interests. Uncertainty about future rewards or costs makes examining environmental regulation's long-term social consequences difficult.⁸⁴⁸ Furthermore, the costs and benefits of environmental regulation are not constant over time but dynamic.⁸⁴⁹ While the costs, e.g., of being unable to drive to the sports club due to not using the car on Sundays, are immediate, the benefits of cleaner air from CO₂ reduction only become experienceable in the longer term. The latter is thus typically underrepresented in the current cost-benefit analysis.⁸⁵⁰ The general human tendency to focus on satisfying short-term needs, the so-called "presence bias," reinforces the underestimation of long-term costs.⁸⁵¹ Economics recognizes this tendency by assuming diminishing marginal utility and applying a constant discount rate to determine the value of future utility.⁸⁵² In contrast, behavioral economics assumes a hyperbolic discount rate.⁸⁵³ Applying discount rates to designing environmental

⁸⁴⁴ Rodi 2014: 254.

⁸⁴⁵ Rodi 2014: 254. See further (critical) on the revealed preference approach, Part 2.B.I.3.a.

⁸⁴⁶ For instance, cf. Gowdy & Erickson 2005: 211 f.; Rodi 2014: 252 f.

⁸⁴⁷ See Rodi 2014: 253., arguing that recourse on preferences faces limitations in cases of environmental goods. For more elaborated criticism of the (neo)classical approach, Gowdy & Erickson 2005; Sagoff 2012.

⁸⁴⁸ Rodi 2014: 246 f.

⁸⁴⁹ Rodi 2014: 253.

⁸⁵⁰ Uncertainty on potential advantages implies that in cases of policies that incentivize preventative behavior, the cost-risk is employed by the state; examples are subventions during the Covid-19 pandemic to foster inventions and research on vaccines *ex ante*, regardless of the ultimate outcome. Uncertainty may also reveal *ex post* that the cost-benefit analysis of the policymaker was erroneous, further, Rodi 2014: 254.

⁸⁵¹ See in this regard on bounded willpower, Part 2.B.I.5.d.

⁸⁵² See Perloff 2020: 552 f., 559 f., on economic discounting and time-variation in costs and benefits. Within environmental CBA, cf. Revesz & Stavins 2007: 508 f.; Rodi 2014: 253.

⁸⁵³ Part 2.B.I.5.d.

regulation devalues long-term environmental damage⁸⁵⁴ and discourages preventive environmental regulation.

Even more challenging is the aspect of utilities of future generations and ideas of intergenerational justice.⁸⁵⁵ Methods for determining preferences and values, such as surveys, fail – future generations cannot be consulted. Moreover, trade-offs arise with the utilities of the current generation: From a Pareto perspective, a sustainable lifestyle of the current generation that preserves environmental resources for future generations is only superior to a detrimental one if it comes without costs.⁸⁵⁶ Kaldor-Hicks efficiency also has shortcomings from an intergenerational perspective since the longer the time lag between disadvantage and potential compensation, the more uncertain the hypothetical compensation becomes.⁸⁵⁷ Another question is the discount rate, which is particularly important when dealing with long-term impacts such as climate change.⁸⁵⁸

c. Case Study: A Cost-Benefit Approach to Nitrogen Emissions Reduction Measures

A published guidance document and report from the German Federal Environment Agency (UBA) is used to illustrate how the cost-benefit approach to policy measures can be deployed to inform the legislative process in terms of long and short-term social, environmental, and “original” economic consequences. Methodological limitations persist, for instance, e.g., due to geographic (by being limited to national emissions), technical (by focusing on direct impacts on technical processes while ignoring indirect impacts on upstream processes), temporal (by focusing on a specific value by 2030), and complexity limitations (by neglecting interactions with and accompanying measures).⁸⁵⁹

Since the beginning of the 20th century, anthropogenic nitrogen inputs have increased, especially within the agricultural, industrial, and traffic sectors, affecting the natural nitrogen cycle.⁸⁶⁰ Nitrogen emissions such as ammonia and nitrous oxide impact the environmental compartments

⁸⁵⁴ Gowdy & Erickson 2005: 215.

⁸⁵⁵ Critical, Gronemann & Döring 2001. Gronemann and Döring argue that discounting is a short-sighted behavior and thus doubtful from a rationality point of view and cannot serve as a normative basis. See also on criticism, Revesz 1999: 987 ff.

⁸⁵⁶ Therefore, the causation of externalities for future generations is Pareto-efficient, showing the inherent shortcomings of the concept with respect to long-term benefits, Kolmar 2017: 121.

⁸⁵⁷ Compensation for the disadvantages caused by the current generations for future generations may become impossible in practice, for example, if climate change leads to impairments that cannot be compensated, Gronemann & Döring 2001: 249.

⁸⁵⁸ Revesz & Stavins 2007: 509. With reference to Revesz 1999.

⁸⁵⁹ Oehlmann et al. 2021: 47–49.

⁸⁶⁰ Oehlmann et al. 2021: 20.

of air, water, and soil and have a damaging effect on their quality (e.g., by reducing water quality due to an excess of water-soluble nitrate), as well as on human health (e.g., through inflammatory reactions in the respiratory tract), and material damage, (e.g., nitrogen compounds contribute to the corrosion of building materials).⁸⁶¹ The report develops national and cross-sectoral measures for nitrogen emissions reduction based on national averages and a target scenario.⁸⁶² The set of developed measures is to close the gap in nitrogen reduction between the current regulatory system, and a target scenario was defined for specified protected goods, including the terrestrial ecosystem (biodiversity and eutrophication), surface and ground, the climate, and human health.⁸⁶³ The protected assets are particularly at risk from nitrogenous substances entering the environment and for which a defined target exists under environmental legislation or another binding government document.⁸⁶⁴ For instance, the target for compound nitrous oxide (N₂O) emission is derived from the National Climate Protection Plan 2050.⁸⁶⁵ The Climate Protection Plan is a policy document embedded in the Paris Climate Agreement and associated national greenhouse gas targets and derives concrete measures, taking into account impact and cost analyses.⁸⁶⁶

The target of nitrogen reduction in terms of emission reduction gap is defined by the difference between a reference scenario on the state of the nitrogen pollutant loads without measures by 2030 and the target scenario for the protected good.⁸⁶⁷ For example, concerning climate, the load of N₂O for 2030 without measures is 78 kt for the current scenario 2030 while the target scenario is 66 kt, resulting in a target gap of 22 kt.⁸⁶⁸ The study then assesses the shortcomings in the regulatory framework relevant to the protected good, such as emission control legislation,⁸⁶⁹ based on which reforms are proposed to implement the derived mitigation measures. Subsequently, 100 measures are collected and evaluated according to the criteria of efficiency, effectiveness, acceptability, and legal and technical feasibility, from which 19 prioritized measures are selected.⁸⁷⁰ Efficiency is measured as the ratio of economic costs (€)/effectiveness

⁸⁶¹ Oehlmann et al. 2021: 33–38. Also UNEP 2023.

⁸⁶² Oehlmann et al. 2021: 19.

⁸⁶³ Heldstab et al. 2020: tbl. 3.

⁸⁶⁴ Heldstab et al. 2020: 30.

⁸⁶⁵ Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMUB) 2022; Heldstab et al. 2020: 64 ff.

⁸⁶⁶ Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMUB) 2022: 15.

⁸⁶⁷ Oehlmann et al. 2021: 47–52.

⁸⁶⁸ It should be noted that nitrous oxide makes only a minor contribution to climate change and that the nitrogen cycle can even have a cooling effect, so that a reduction does not lead to the achievement of climate targets, cf. Oehlmann et al. 2021: 38,52.

⁸⁶⁹ Oehlmann et al. 2021: 53–82.

⁸⁷⁰ Oehlmann et al. 2021: 39–44.

(kg/N), i.e., the annual implementation and abatement cost incurred by households, businesses, and the government, and the economic benefits of the measure, e.g., reduction in health costs or crop damage, relative to the savings potential of the measure.⁸⁷¹ Economic benefits refer to reductions in externalities, i.e., environmental damage associated with nitrogen emissions. Since these are not necessarily of a direct economic nature, their economic value is defined by the monetized categories of costs and benefits specified in the methodological convention published by the UBA.⁸⁷² The convention defines the total costs of nitrogen oxides for specific impact categories related to health, biodiversity, crop failure, and buildings/materials for 2020 as a total cost of 62,3 €₂₀₂₀/kg N, cf. Table 7:⁸⁷³

Table 7 The social costs of nitrogen oxides

Impact category	Costs € ₂₀₂₀ /kg N
Health	49,9
Biodiversity	9,1
Crop precipitation	2,8
Buildings/material	0,5
Total	
	62,3

Against this background, the cost-benefit perspective (efficiency) compares each measure's benefits in reducing nitrogen inputs and associated externalities with the implementation and abatement cost of the measures incurred by farms, households, or the public sector. For example, the efficiency evaluation of the regulatory measure of introducing obligatory slurry storage, represented in Table 8, leads to a medium efficiency based on high avoidance costs incurred in the ammonia emission reduction (2,5 €/kg N). In addition, 10% of farms would reportedly have to invest in replacing a slurry storage system, which would cost about 80.000 € with a lifespan of 30 years. While implementation costs would be low because existing regulations could be used and would only need to be adapted. Effectiveness then includes the possible mitigation potential of external negative effects, estimated to be medium (minus 1.5 – 5 kt N), e.g., by covering slurry stores, which would reduce ammonia emissions.⁸⁷⁴

⁸⁷¹ Oehlmann et al. 2021: 43 f.

⁸⁷² Porsch et al. 2015: 27.

⁸⁷³ Matthey & Bünger 2020: tbl. 23.

⁸⁷⁴ Compare further Oehlmann et al. 2021: fig. 10.5 p. 240 ff.

Table 8 Efficiency of introducing mandatory slurry storage

Effectiveness	
Medium (minus 1.5 – 5 kt N)	Reduction potentials of external negative effects, e.g., by covering slurry storage facilities, leading to the reduction of ammonia emission
Reduction costs	Cost efficiency
High: avoidance costs of ammonia emission reduction (2,5 €/kg N), renewal costs of a slurry store (80.000 €)	> 1000 million €
Implementation costs	
Low: adaptation of existing legal framework	0 – 1 million €
Efficiency	
	50 – 50 €/kg N

Based on an assessment of the efficiency of various nitrogen reduction measures, including the expansion of truck tolls and the alignment of tax rates for diesel fuel, a package of 19 measures is determined that can most efficiently achieve the defined goal (closing the nitrogen reduction gap).⁸⁷⁵ The package of measures results in an overall economic cost-benefit balance of – 7.000 million € per year and a nitrogen reduction (effectiveness) with economic efficiency of just under – 35 € per kg N. This makes a net benefit per kg nitrogen reduction of approximately 35 € per kt N.⁸⁷⁶ As a result, the associated external damage costs can be reduced by approximately 5 billion € more per year compared to the reference scenario.⁸⁷⁷

2. Alternative Perspectives on the Social Desirability of Environmental Regulation

Whether environmental damage and goods should be assigned a monetary and economic value is controversial.⁸⁷⁸ The following elaborates on alternative approaches to illustrate core criticisms and problems of classic environmental welfare economics.

a. Ecological Economics and Merit Goods: Rejecting Value Monism

Ecological economics advocates a more comprehensive approach by replacing an instrumental value of natural goods with an ecocentric perspective that recognizes their intrinsic value.⁸⁷⁹ The economy is viewed as a subsystem of a broader physical-natural system, economic development

⁸⁷⁵ Oehlmann et al. 2021: 119 ff.

⁸⁷⁶ Oehlmann et al. 2021: 132.

⁸⁷⁷ The reference scenario would have led to a reduction of external costs from 30-70 billion € per year in 2015 to around 25-45 billion € per year in 2030, cf. Oehlmann et al. 2021: 109.

⁸⁷⁸ Kolmar 2017: 123 f.; Rodi 2014: 251 f.

⁸⁷⁹ Ringel 2021: 10.

can then only occur within its biophysical limits and carrying capacity.⁸⁸⁰ The former define the extent of acceptable disruption to the system's self-preservation.⁸⁸¹ The 1.5°C target of the Paris Agreement – intended to represent the tolerable level of global warming⁸⁸² – may be considered as such an “acceptable level of disruption,” whose transgression risks irrevocable destruction of economic and livelihood bases, of humanity as a whole.⁸⁸³

Ecological economics seeks to consider economic, environmental, and social aspects and their interrelationships.⁸⁸⁴ The conversion of environmental resources into market goods by deriving their values from economic models and theories, such as rationality and consumer choice theory, is rejected because they are considered scientifically untenable.⁸⁸⁵ It is argued that, in practice, individual preferences for many environmental goods are not subject to trade-offs and that ethical considerations are crucial to environmental policy.⁸⁸⁶ Thus, ecological economics rejects monetizing environmental goods and replaces the cost-benefit analysis with multicriteria approaches.⁸⁸⁷

The exclusion of certain goods from market logic evokes the notion of merit goods of Richard Musgrave (1957, 1959). Musgrave described merit goods as goods with long-term societal benefits that exceed private short-term benefits. Related individual preferences are somewhat “distorted” so that these goods are under-consumed and should be made available on a mandatory basis, regardless of whether individuals are willing to pay or deviate from them; examples are health care or education.⁸⁸⁸ Although the idea is critical in terms of consumer sovereignty, it enhanced the debate on the standards of social value within welfare economics.⁸⁸⁹

⁸⁸⁰ Ringel 2021: 9 f. See also Sagoff 1995: 610; 2012.

⁸⁸¹ Sommerer 2021: 124.

⁸⁸² Cf. Art. 2a Paris Agreement.

⁸⁸³ Sommerer 2021: 125. An increase of more than 1.5 °C would lead to significant, unpredictable climate consequences because of the risk of crossing “tipping points”. Tipping point processes pose a particular threat to ecological stability since the involved elements undergo sudden and typically irreversible qualitative changes, even if the relevant environmental parameters change only slightly; examples are the permafrost soils in North America and Siberia or the ice masses in the polar regions. In addition, interactions between the tipping elements can trigger a cascading change in the earth system, cf. on this BVerfG, *Beschluss*, 1 BvR 2656/18, March 24, 2021: para. 21. Thus, the indispensability of the 1.5 °C target is consensus within the scientific community, IPCC 2019: chap. 3.

⁸⁸⁴ Ringel 2021: 9 f.

⁸⁸⁵ For example, findings of behavioral economics and psychology on existing biases in human decision-making, such as endowment effects or loss aversion, challenge the idea of rational utility maximization, cf. Gowdy & Erickson 2005: 212 f.

⁸⁸⁶ Gowdy & Erickson 2005: 211 f. While standard environmental economics would assume that moral considerations can be equally displayed in an individual's WTP or WTA since utility is an open concept, see Part 2.B.I.3.

⁸⁸⁷ Such as the multi-criteria decision aide (MCDA), allowing to incorporate criteria such as efficiency, equity, or ethical considerations thereby extending the analysis by qualitative values, Gowdy & Erickson 2005: 213, 215 f.

⁸⁸⁸ Musgrave 1959: 57 f., 460 f.

⁸⁸⁹ For an overview on the concept, its development, and relevance, cf. Clément & Moureau 2019.

Calabresi extended the argument on merit goods and their exclusion from market logic. He argues that individuals disregard their monetization and inclusion in the cost-benefit framework since no price may adequately reflect their utility but risks undesirable trade-offs; i.e., their commodification itself either implies somewhat moral costs or their allocation through the price mechanism may trigger an undesirable distribution to a significant number of individuals, who are particularly vulnerable and/or unable to afford the price.⁸⁹⁰ For instance, higher emission levels would allow people to drive their cars with the same frequency while neglecting the rights of weaker people (e.g., asthmatics) and their value for healthy living.⁸⁹¹ Thus, “cost-benefit questions may, within wide ranges, become irrelevant to the outcome of moral judgment.”⁸⁹²

b. Intergenerational Justice and Sustainability

Most economists acknowledge that a “pure” cost-benefit approach to environmental regulation is socially undesirable.⁸⁹³ This holds especially true when other social values, such as intergenerational or distributive justice, are disregarded. Accordingly, public policies and institutions often also refer to notions of equity and distribution.⁸⁹⁴ Following the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, the concept of sustainability gained particular attention and became an integral part of international political discourse. Sustainable development dispenses with an efficiency focus and aims to integrate and balance “the three dimensions of sustainable development: the economic, social and environmental.”⁸⁹⁵ The Brundtland Commission’s (1987) definition of sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”⁸⁹⁶ clarifies intergenerational justice as a core concept of sustainability. In this regard, the “climate ruling” of the German Federal Constitutional Court (BVerfG) is groundbreaking. The court viewed the hesitant climate policy based on the Federal Climate Protection Act (KSG),⁸⁹⁷ the accompanying extensive use of the CO₂ budget until 2030,

⁸⁹⁰ Calabresi 2016: 26 ff.

⁸⁹¹ Kelman 1981: 36.

⁸⁹² Kelman 1981: 36. Further on the idea of the normative order of the law as guidance on relevant social values to economic welfare analysis, Part 4.C.III.

⁸⁹³ Cf. Arrow et al. 1997: 198. Sagoff proposes that public policy decisions be extended by alternative decision frameworks, cf. Sagoff 2012: 102 f. This, in principle, resembles the general limitations of the efficiency approach in terms of acknowledgment of a priori non-economic values and, thus, relates to the debate on efficiency versus justice (Part 2.B.II.4.b) and the normative limitations of the economic analysis of law, see on this Part 4.C.

⁸⁹⁴ For instance, United Nations General Assembly 2015.

⁸⁹⁵ United Nations General Assembly 2015. Further on the three pillars of sustainable development, Purvis et al. 2019.

⁸⁹⁶ United Nations General Assembly 1987: 24.

⁸⁹⁷ Version in force before 31.08.2021.

and the irreversible postponement of emission reduction burdens as a threat to the freedom of future generations.⁸⁹⁸ The Court based its ruling on an intergenerational duty enshrined in Article 2 (2) sentence 1 of the Basic Law for the Federal Republic of Germany (GG), which obliges the Federal Republic of Germany to protect the fundamental rights of its citizens endangered by climate change, including those of future generations.⁸⁹⁹ The court extended this duty transnationally by emphasizing the global dimension of climate change and the corresponding need for an internationally oriented policy.⁹⁰⁰

c. Aligning Economic Efficiency and Environmental Preservation: Greening the Economy

The finite nature of natural resources and the related need to recognize the natural limits to economic growth, as advocated by ecological economics, are increasingly coming to the fore of economics. The risk of severe consequences when neglecting these limits forces economic actors to “focus on sustainability not because [they are] environmentalists, but because [they] are capitalists and fiduciaries to [their] clients.”⁹⁰¹ Environmental regulation is no longer reduced to a corrective and limiting function but viewed as a proactive tool that may encourage mutual benefits for economics and ecology.⁹⁰² Accordingly, the assumed “inherent” trade-off between societal and private benefits is relativized.⁹⁰³ The idea of a “win-win situation” between economics and ecology is associated with Michael E. Porter and Claas van der Linde (1995) and the so-called “Porter Hypothesis,” challenging the standard view that environmental regulation is detrimental to a firm’s global competitiveness. Instead, Porter and van der Linde showed that environmental regulation can enhance a firm’s productivity and competitiveness and offset compliance costs by stimulating innovation, i.e., “firms can actually benefit from properly crafted environmental regulations that are more stringent.”⁹⁰⁴ Since then, numerous empirical studies

⁸⁹⁸ BVerfG, *Beschluss*, 1 BvR 2656/18, March 24, 2021: para. 153 ff., 243 ff.

⁸⁹⁹ “The state’s duty of protection arising from Art. 2(2) first sentence GG also includes the duty to protect life and health against the risks posed by climate change [...] the state is obliged to afford this protection to the current population and also, in light of objective legal requirements, to future generations,” BVerfG, *Beschluss*, 1 BvR 2656/18, March 24, 2021: para. 148.

⁹⁰⁰ “[T]he state must involve the international level in seeking to resolve the climate problem. Insofar as the duty of protection arising from Art. 2(2) first sentence GG is directed at the risks posed by climate change, it compels the state to engage in internationally oriented activities to tackle climate change at the global level and requires it to promote climate action within the international framework,” BVerfG, *Beschluss*, 1 BvR 2656/18, March 24, 2021: para. 149.

⁹⁰¹ A notable commitment to environmental protection as a prerequisite for a sustainable economic development comes from Gary Fink, CEO of the asset managing company Black Rock, cf. Fink 2022.

⁹⁰² Which constitutes the basis of the idea of “green growth” or a “green economy,” Ringel 2021: 9.

⁹⁰³ Porter & van der Linde 1995: 97 f.

⁹⁰⁴ Porter & van der Linde 1995: 98.

have tested and refined the hypothesis.⁹⁰⁵ Although the relationship between productivity, competitiveness, and environmental regulations may not be as straightforward as argued by Porter and van der Linde and is highly interdependent,⁹⁰⁶ a positive correlation between environmental regulations and certain types of innovation has generally been confirmed.⁹⁰⁷

3. Interim Statement

For most of human history, environmental resources, such as water or air, have been considered infinite and their use costless. The result is that the absence of perceptible scarcity has allowed them to escape the demand for rationalization and (economic) perspective of efficient regulation. The underrepresentation and undervaluation of environmental values in a market system based on production and consumption have led to widespread inefficiencies. While the lack of adequate attribution of reflected social costs at the individual level makes environmentally damaging actions appear *prima facie* rational, this is less the case from a societal perspective. Since behavior in a complex world of multiple interconnections always entails external consequences, dispensing with acts that cause environmental damage and imposing comprehensive legal prohibitions is inconceivable. Instead, at the regulatory level, the challenge lies in the identification of values, measures for their measurement and evaluation, and strategies for establishing a balance between them.

Environmental economics approaches the question of desirable environmental regulation typically based on a cost-benefit analysis as an advisory tool for policy. However, quantifying environmental values is challenging. Among other things, environmental goods lack values revealed through market behavior, differences in the nature of relevant values complicate measurement (e.g., comparing air quality with driving a car), and irrational human tendencies encourage biased discounting of long-term consequences. The measurement of environmental values becomes even more complicated when the time frame is extended to future generations, and questions about discount rates for benefits enter the realm of ethics, making a purely economic answer unsatisfactory.

⁹⁰⁵ For a meta-analysis, cf. Y. Li et al. 2022. Finding a moderately positive correlation between environmental regulation and competitiveness, Y. Li et al. 2022: 9.

⁹⁰⁶ On a schematic representation of the Porter Hypothesis, Ambec et al. 2013: 4. For example, the relationship between environmental policy, environmental performance, and competitiveness may vary depending on the origin of the regulation, its design, and the environmental commodities protected, cf. Iraldo et al. 2011: 218. See also OECD 2021: 22 ff. The study found that such positive effect was most evident in industrialized and technologically developed countries where companies subject to environmental regulations have access to higher technologies.

⁹⁰⁷ Which refers to the “weak” version, while the “strong” version, namely, that stricter regulation enhances business performance, is still unclear, cf. Ambec et al. 2013: 16; Lanoie et al. 2011: 837 f.

Given the controversies around standard CBA, alternative approaches have emerged, including ecological economics, ideas about sustainability, or excluding certain goods, such as merit goods, from the cost-benefit analysis. Moreover, there is a trend in economics acknowledging the need for aligning environmental conservation and economic development.

Although the criticisms are valid and alternative perspectives enrich the debate on the design of sound environmental legislation, there is a need for measurement and comparison tools to justify public decisions. Comparison requires standardization of values, so the coexistence of value systems, such as excluding environmental goods from the cost-benefit perspective, hinders operationalizing policy decision-making. Therefore, criticism is valuable to the extent that it is constructive by providing practical and prompt alternatives. In this sense, the work takes upon the perspective that environmental protection seems to be better served by using the available tools to shape regulation in light of societal welfare and adequate valuation of environmental goods and pricing of related costs. While uncertainty concerning values persists and defined values may only be an approximation, a cost-benefit analysis may still be a valuable tool for providing an informative basis for environmental policy decisions. Against this background, the analysis of this work will proceed with the standard approach to environmental regulation based on environmental economics and a cost-benefit analysis perspective and reflect, expand, and try to reconcile it with alternative approaches. Next is to address how market failure in cases of environmental goods can best be solved by regulation, i.e., the role of environmental law within social welfare analysis and maximization.

III. Instruments of Environmental Regulation: Reaching the Target

1. Indirect vs Direct Regulation: Choosing the Efficient Instrument

The inefficient allocation of resources in market failure justifies public intervention to improve social welfare.⁹⁰⁸ Next is thus to decide on the form of regulation. While there is consensus that internalization is the primary goal of regulation,⁹⁰⁹ there is debate about its scale and design. The two predominant strategies are:⁹¹⁰

(1) market-based instruments (passive or indirect approach), in which the regulator sets a goal but leaves out how this goal is achieved to market actors. (2) Command-and-control instruments

⁹⁰⁸ Compare, for instance, Perloff 2020: 611; Ringel 2021: 37 ff. On market failures, generally, Part 3.A.II, in cases of environmental goods, Part 3.B.I.

⁹⁰⁹ Cf. Endres 2007: 35 ff.; Faure & Partain 2019: 14; Fritsch 2018: 105 ff.; Ringel 2021: 7 f.

⁹¹⁰ Faure & Partain 2019: 30 f.; Feess 2007: 48 f.; Revesz & Stavins 2007: 536 f.

((pro)active or direct approach), where the regulator sets behavioral standards. Within this, the main criteria for choosing the preferable instrument are:⁹¹¹

- Static (economic) efficiency refers to the ability of the instrument to reach the target (optimum) *ceteris paribus*;
- Dynamic (economic) efficiency refers to the incentive structure of the instrument and its promotion of efficient behavior over time;
- Information costs refer to the transaction costs of obtaining relevant cost-benefit information;
- Accuracy (or ecological effectiveness) refers to the extent to which the instrument can achieve the objective, i.e., allocative efficiency.

2. Market-Based Instruments: Emission Trading and Markets in Pollution Rights

a. The Coasean Approach to Externalities: Property Rights and Transaction Costs

Market-based instruments are a form of “semi-private” regulation to the extent that they rely upon the competitive market ideal and attempt to approximate its necessary conditions to encourage the emergence of market forces. If the competitive market naturally leads to efficient allocation, realizing its necessary conditions can trigger the relevant market forces to achieve allocation efficiency.⁹¹² The market ideal provides a benchmark for environmental regulation, enabling the correction of inadequate market conditions and addressing market failures through decentralized coordination and an effective price mechanism.⁹¹³

One main market-based instrument is pollution permits and associated emission trading regimes. The idea of “markets in pollution rights” goes back to John Dales (1968),⁹¹⁴ who offered an alternative to the Pigouvian Tax.⁹¹⁵ Tradable pollution regimes involve key elements of the Coase theorem: the good in the form of emission permits or licenses becomes a private, tradable good, allowing decentralized private bargaining coordinated by a price mechanism.⁹¹⁶ The price is an indicator of the scarcity and value of the resource and creates incentives for the polluters to adjust

⁹¹¹ Compare Fritsch 2018: 103 f. Cf. Feess 2007: 49 f. Additional criteria are, *inter alia*, distributive concerns and political feasibility, Revesz & Stavins 2007: 535. See for a practical example of alternative policy decisions for decreasing nitrogen, Oehlmann et al. 2021: 231 ff.

⁹¹² See on the efficiency of the idealized market, Part 3.A.I.1.a.

⁹¹³ Compare Fritsch 2018: 72; Ringel 2021: 15.

⁹¹⁴ Dales 1968.

⁹¹⁵ Faure & Partain 2019: 119.

⁹¹⁶ Perloff 2020: 628. See also Weber 2017: 356 f. Or Ringel 2021: 82. Also On Private Solution to Externalities – The Coase Theorem, Part 3.A.III.

their behavior efficiently and according to their marginal abatement cost (*MAC*) (dynamic efficiency). Meanwhile, free trade ensures allocative efficiency, i.e., that the right to emit is located where it is worth the most (the polluter with the highest abatement cost and thus the highest WTP).⁹¹⁷ In other words, polluters with the highest abatement cost will buy pollution licenses from those who can reduce their emissions at lower costs, thereby internalizing emission costs; reduction occurs by the “cheapest cost avoider” at the lowest marginal costs.⁹¹⁸ The final allocation of the entitlement is independent of the initial allocation and most efficient (invariance and efficiency theses⁹¹⁹), which reduces information costs in terms of the efficiency of policymakers.⁹²⁰ Since emission trading regimes allocate the decision to the most informed parties, they require less information on behalf of the regulator than command-and-control instruments.⁹²¹ The regulator defines the overall pollution level by the number of tradable emissions permits,⁹²² while leaving the specific form of behavioral adjustment and resource allocation to the parties.

Property rules represent the preferred protection structure for pollution permits, limiting the property right to one entitlement holder.⁹²³ Property rules define absolute rights in that any violation of the entitlement structure is legally sanctioned, e.g., by an injunction or a criminal sanction.⁹²⁴ That is, if the polluter emits more than what is covered by his permits, he is sanctioned.⁹²⁵

One efficiency-inhibiting factor of the trading system is the so-called “grandfathering.” Grandfathering means that the initial allocation of licenses is made free of charge and based on past emissions, thus distributing rights to the largest polluters.⁹²⁶ This inhibits incentives to reduce emissions since a high level of emissions is beneficial by implying a greater number of licenses.⁹²⁷ It also creates disadvantages for companies that have invested in emission-reducing

⁹¹⁷ For instance, see Faure & Partain 2019: 124 f.; Feess 2007: 123 ff.; Perloff 2020: 628; Ringel 2021: 77 ff.

⁹¹⁸ Revesz & Stavins 2007: 538. Also Ringel 2021: 82. On emission permit trading and the idea of the “cheapest-cost” avoider, see Faure & Partain 2019: 124 f.

⁹¹⁹ See Part 3.A.III.3

⁹²⁰ For an empirical test of the Coase theorem applied to the EU-ETS, generally conforming the independence of the ultimate from the initial allocation, Zaklan 2020: 24.

⁹²¹ What matters is not the total amount of information but its relative distribution among the regulators and the regulated, Feess 2007: 49 f. See on taxes vs standards under uncertainty and the problem of governmental knowledge on private marginal costs and benefits, cf. Perloff 2020: 621 f.

⁹²² Faure & Partain 2019: 125.

⁹²³ On property rights in the context of emission trading, cf. Weber 2017: 356 f.

⁹²⁴ On property rules, cf. Part 3.A.I.2.a.iii. Ott & Schäfer 2008: 42.

⁹²⁵ In the context of emission trading, cf. Weber 2017: 356 f.

⁹²⁶ Faure & Partain 2019: 125; Ringel 2021: 78.

⁹²⁷ Faure & Partain 2019: 125; Feess 2007: 124 f.

research or technologies.⁹²⁸ Another downside is regional “hot spots.” If geographical distribution is ignored, emissions can disproportionately affect certain regions.⁹²⁹ Furthermore, by leaving great authority to private market forces, the outcome of market-based approaches is less certain. They may thus be inadequate when prompt and certain behavioral changes are essential to remedy the environmental problem.

The European Union Emissions Trading System (EU ETS)⁹³⁰ for greenhouse gas emissions, mostly carbon dioxide (CO₂) and partially nitrous oxide (N₂O) and Petrochemicals (PFC)⁹³¹ constitutes a market-based instrument of environmental regulation. Most emission trading regimes, such as the EU ETS, rely on a so-called “cap and trade” approach.⁹³² I.e., the Commission defines an overall cap that is reduced linearly, providing for the certainty of the defined target and the flexibility advantages of trading by ensuring that costs are most efficiently avoided.⁹³³ Initially, in phases 1 and 2, the allocation of entitlements relied on the grandfathering approach by issuing permits for free, while in phase 3, this mainly changed to auctions providing a source of revenues for participating countries.⁹³⁴

b. Case Example: Industrial CO₂-Emissions and the Efficiency of Emission Trading Regimes

The following fictitious example can illustrate the efficiency rationale of emission trading regimes:

Suppose that refinery A and paper mill B emit 2000 tons of CO₂ annually; together, they emit 4000 tons of CO₂ annually. An applicable regulatory cap of 3000 tons of CO₂ is defined, where each ton of CO₂ corresponds to one permit, and emitting without a permit is sanctioned with 100 € per ton of CO₂. Paper mill B can introduce a technology that reduces the emission for 10 € per ton of CO₂. For refinery A, the reduction cost would amount to 40 € per ton of CO₂. Initially, the regulator distributes permits equally among A and B, and both receive 1500 permits. B could now halve its emissions for 10.000 € and offer the remaining 500 certificates on the market.

⁹²⁸ Faure & Partain 2019: 125; Feess 2007: 124 f.

⁹²⁹ Rodi 2014: 272.

⁹³⁰ European Commission n.d. While there are also tradable permit systems in place on national levels, locating such a system on a supranational level does justice to the global and transboundary character of (most) environmental pollution, Faure & Partain 2019: 25 f.

⁹³¹ N₂O inclusion was voluntary in phase 1, while N₂O and PFC is covered in phase 3, cf. European Commission 2015: 18 f.

⁹³² On the EU-ETS, Wilke 2022.

⁹³³ European Commission 2015: 5, 18 f.

⁹³⁴ European Commission 2015: 5, 24.

In contrast, A could reduce its emissions for 40 €, pay a penalty of 100 € per ton of CO₂, or buy the permits of B. Assuming a market reduced to B and A, B could sell his permits at any price between 10 € and 40 € (ZOPA), thereby at least recovering reduction expenditures. Any transfer within the ZOPA between A and B on this secondary market would make both firms better off. On a societal level, this allows for the most efficient emission reduction. The cap was met and emissions were reduced by the “cheapest costs avoider” (B). The necessary regulatory conditions were the definition of property rights in the form of CO₂ emission allowances and a market where stakeholders could freely negotiate to reallocate abatement costs where most efficient; the only information required by the regulator was the overall emission target, while information on private abatement costs was not needed as the decision was delegated to stakeholders themselves.

c. Limits to Private Solutions for Environmental Pollution

Market-based instruments based on property rights and decentralized private market interaction seem to be able to overcome the causes of market failures for environmental goods. “*In theory*, if properly designed and implemented, market-based instruments allow any desired level of pollution cleanup to be realized at the lowest overall cost to society.”⁹³⁵ However, they are only a partial remedy since various aspects of pollution make it difficult, impossible, or too costly to ensure competitive market conditions for all natural resources.⁹³⁶ In most cases of industrial environmental damage, transaction costs and/or unclearly defined property rights persist.

i. Persisting Transaction Costs

Most modern environmental harm is not local but widescale: Widescale systematic pollution may harm an entire nation and cause damage beyond national boundaries, affecting a highly dispersed and great number of parties.⁹³⁷ This means that the costs of bringing involved parties and interests together are too high and prevent private negotiations.⁹³⁸ Prohibitive transaction costs also apply

⁹³⁵ Emphasis added, cf. Revesz & Stavins 2007: 538.

⁹³⁶ It should be noted that the question of whether commodification of all natural resources is desirable in normative aspects, such as distribution, is not given further consideration; on the wealth principle and distribution, Part 2.B.II.4.a.

⁹³⁷ Faure et al. 1996: 550. For example, in the event of another catastrophic nuclear accident like Chernobyl (1986). Victimhood is not only geographically dispersed but also temporal since damage may only become apparent after a longer delay; damage and victimization are thus manifold. For a geographical portrayal of radiation effects, see Møller & Mousseau 2006: 201.

⁹³⁸ Faure & Partain 2019: 23. Also Faure et al. 1996: 550. Or Endres 2007: 54; Feess 2007: 149.

to emission trading regimes, which work best when the number of parties is limited; for instance, only large emission sources participate.⁹³⁹

In addition, environmental damage may not be visible at first glance or delayed in time.⁹⁴⁰ It may also not be claimable but legally allowed and/or already priced. The partial legality of environmental harm and difficulties in its perceptibility limit determining whether the other party complies with the contractual terms⁹⁴¹ and, thus, reliance on private enforcement capability. When bargaining occurs, information asymmetry may encourage opportunistic behavior, such as moral hazard⁹⁴² or adverse selection, since the polluter is incentivized to strategically overstate reduction costs to negotiate a higher emission level or compensation.⁹⁴³

Information and surveillance difficulties, and the associated costs, arise equally within the emission trading regime, but on behalf of the public authority.⁹⁴⁴

Another challenge is determining the actual polluter to start negotiations, as the final damage may be caused by multiple polluters, each of whom contributed only a minor portion.⁹⁴⁵ Alternatively, obtaining other relevant information for successful negotiations may be too costly, such as information on damage or preventative measures.⁹⁴⁶ Within an emission trading regime, costs related to finding a trading partner persist, which may primarily prevent small parties from engaging.⁹⁴⁷ The risk of negotiation costs may further inhibit less affluent parties.⁹⁴⁸ Combined with low chances of success and only minor personal harm, it may be rational for private parties not to negotiate.⁹⁴⁹ The diversity of interests and parties can also lead to “free riders” who try to profit from other’s negotiations and agreements.⁹⁵⁰

ii. Insufficient Property Rights

A market-based solution presupposes comprehensive and clearly defined, verifiable property rights. Consequently, this means the privatization and commodification of basically all natural

⁹³⁹ Pedersen 1994: 10175. See also Weber 2017: 357. Weber argues that privatization may be suitable if the damage is direct and visible and transaction costs are low. Cf. also Faure et al. 1996: 550., stating that a “Coasean solution” is most appropriate when only a few informed parties are involved.

⁹⁴⁰ See also on environmental harm in general, Starr 1986: 383.

⁹⁴¹ On the latter aspect, Kolmar 2017: 105.

⁹⁴² Feess 2007: 285 f.

⁹⁴³ On information asymmetry and adverse selection in agricultural regulation, cf. Karl 1997: 398–400.

⁹⁴⁴ See on transaction costs in cases of emission trading regimes, Weber 2017: 363 f.

⁹⁴⁵ Faure et al. 1996: 550. On general factors undermining private incentives to sue, cf. Shavell 1984: 36.

⁹⁴⁶ Faure & Partain 2019: 23.

⁹⁴⁷ Weber 2017: 368.

⁹⁴⁸ Endres 2007: 55.

⁹⁴⁹ The harm is not individual but a common good, showing a divergence between private and public benefits and incentives to engage in bargaining (to sue). On the divergence between private and public interests, Shavell 1982.

⁹⁵⁰ Endres 2007: 47; Rodi 2014: 249.

goods.⁹⁵¹ However, the nature of natural goods often makes commodification impossible or too costly. For example, seawater or air's fluid and volatile structures make it difficult to establish clear rights of use to measurable units.⁹⁵² Granting units of pollution can provide partial relief but requires quantification and tracking of pollution causes and amounts.⁹⁵³ This can be too complicated and/or costly in practice, for instance, due to the variety of different sources.⁹⁵⁴ Depending on their particular legal status and natural resource concerned, permits may also limit the possibility of reduction, i.e., if they are understood as property rights in the form of exclusive private property, questions arise about permissible restrictions.⁹⁵⁵ In addition, different interests, degrees of affectedness, and attributed values hinder determining objective values and impede negotiations.⁹⁵⁶ Thus, if the cost of creating property rights to make a good tradable is too high, public use or more direct regulation may be more efficient overall.⁹⁵⁷

d. Case Example:⁹⁵⁸ NO_x Emissions of Diesel Vehicles

The limits of reliance on private bargaining to remedy environmental pollution may be exemplified by the following fictitious example, expanding the “tragedy of the commons” example of the introduction.⁹⁵⁹

Suppose A has purchased a diesel-fueled car manufactured by M that emits NO_x emissions. NO_x emissions can travel long distances through the air and seriously affect the environment, including loss of biodiversity, deterioration of air, soil, water quality, and human health.⁹⁶⁰ A lives in Cologne and works in Maastricht, where he travels daily by car. In his vacations, he spends his time either in Innsbruck for skiing or in Bordeaux for surfing, where he also travels by car. B lives in Maastricht and is A's work colleague. B has recently started to suffer from breathing problems since he lives closer to the city, where the traffic-related air pollution is stronger. He visits a hotel residence in the countryside on weekends to relieve his lungs and

⁹⁵¹ For example, the property rights approach to regulating access to wildlife, cf. Faure & Partain 2019: 43 ff. Critical on the privatization of fresh water from a criminological and human rights perspective, Johnson et al. 2016.

⁹⁵² Oxygen in the air is, thus, an inherently non-excludable good, cf. Kolmar 2017: 132. For soil this can be argued differently. However, the permanence of soil pollution is also doubtful, since, among other things, pollutants introduced into the soil can be washed out and ultimately lead to water pollution.

⁹⁵³ On air pollution, cf. Pedersen 1994: 1074 f.

⁹⁵⁴ Pedersen 1994: 1074 f.

⁹⁵⁵ Revesz & Stavins 2007: 559.

⁹⁵⁶ On problems of value determination as a transaction cost, cf. Faure & Partain 2019: 23. Difficulties of value attribution equally apply to more direct regulation, cf. on defining optimal levels, Part 3.B.II.

⁹⁵⁷ On limits of ownership to open access resources, Cooter & Ulen 2012: 147 ff.

⁹⁵⁸ Although the example exhibits parallels to the Volkswagen diesel scandal, no claim is made to its representation.

⁹⁵⁹ Cf. Introduction.

⁹⁶⁰ See in this respect, Part 3.B.II.1.c, Case Study: A Cost-Benefit Approach to Nitrogen Emissions Reduction Measures.

wonders what might be causing his increasing discomfort. Residents in Bordeaux, Innsbruck, and Cologne have reported similar health problems. Since his frequent hotel stays in the countryside are becoming expensive, he wonders: Are the NO_x emissions of A's car responsible for his breathing problems? Does A have the right to emit, or does he himself have the right to be free from emissions and associated health effects? How can he find out who and what is responsible for his health problems and seek legal relief?

He conducts research and contacts A because he believes NO_x emissions from diesel vehicles are causing his breathing problems. As a vehicle owner, he asks A to compensate for his visits to the countryside or to take the train instead of the car. A denies that his car is causing B's health problems and thinks that other gasoline cars or industrial air pollution could be the source; he is also not the only diesel car driver, so why should *he* be held liable? He bought a car manufactured by M and does not see himself under any obligation. Hence, he refuses to compensate B for his countryside visits or to take the train and continues using his diesel vehicle.

B decides to forego further efforts to find relief for his health problems due to a lack of time and finances, and he continues his weekend visits in less expensive accommodations. When he next arrives at a country accommodation, it is springtime, and the owner of the shelter laments the loss of flowers in the garden due to a lack of bees. He fears that there will be no more bees or flowers in five years and that his country shelter will become less attractive.

The example – despite its fictitiousness – intends to illustrate the previously outlined characteristics that prevent private solutions to externalities:

1. The costs of assessing adverse effects and associated costs of environmentally harmful behavior relevant to obtaining an agreement are prohibitive: Neither A nor B has the resources, e.g., knowledge or finances, to find out about A's car's exact emission level and verify whether A's car complies with applicable regulations. Transaction costs in terms of information costs are thus prohibitive. The same applies to B's health problems, their actual link to diesel emissions, and problems related to identifying the bargaining partner.
2. It is often the cumulative adverse effect of environmentally harmful behavior that cause the specific damage, meaning that eliminating one cause does not remedy the situation: Although A's car causes emissions, A is not the only polluter. This also means that he is unable to grant relief to B by, for instance, taking the train. Rather, the manufacturing variables are decisive for the emissions, which apply to and are within the authority of manufacturer M. Since M produces more than A's car, other cars of the same production

cycle emit equal shares of emissions. Thus, even if B reached an agreement with A, his health problems would not be resolved. Instead, B would have to measure emissions, negotiate with each car driver or manufacturer, and sue them in case of illegality.

3. Missing and/or asymmetrical information between the polluter and the victim impedes successful bargaining: Concerning the relationship between B and manufacturer M, information is missing and/or asymmetrical, opening opportunities for opportunistic behavior on behalf of M while increasing the information costs to B.
4. Private interests to sue are not representative of the extent of societal damage and thus insufficient to achieve comprehensive internalization: Assuming B would sue, the externality in terms of emission would still not be solved since B's primary interest is his health and associated compensatory damages; his interest is less in other social and environmental harm from NO_x emissions, such as the threat to bees or health detriments to other European citizens. This means that any bilateral agreement between B and A, or B and M, is not fully representative of the actual scope of damage and, thus, insufficient to ensure full internalization of uncompensated emissions related to diesel vehicles. Instead, each affected party would have to engage in negotiations, or all affected parties would have to be brought to the table to negotiate collectively; both would be too costly and prohibitive transaction costs apply. Likewise, not all private interests, such as environmental preservation for the sake of future generations, are represented, meaning that the social optimality of any negotiation agreement is uncertain.

3. Command-and-Control Instruments: Environmental Standards and Direct Regulation

a. Environmental Standards

If market-based instruments and private solutions are not feasible, direct government regulation can still provide an optimal allocation of resources, i.e., an optimal level of environmental protection. Since then, the initial definition of entitlements is important for allocative efficiency, the first question to address by the legislature is which interests and activities of the parties involved should be restricted; conversely, to whom the initial entitlement should be granted.⁹⁶¹

⁹⁶¹ Faure 2009a: 250 f. The general rule is that the cheapest cost avoider should *not* be granted the entitlement. See also on the idea of the cheapest cost avoider, Calabresi & Melamed 1972: 1119 f. Also in the context of market-based instruments, Part 3.B.III.2.b.

Granting the entitlement to pollute to the polluter will commonly lead to pollution; granting the right to be free from pollution to the affected parties will not.⁹⁶² This means that the allocation of property rights directly affects the pollution level⁹⁶³ and is thus related to the question of the optimal emission level.

In command-and-control approaches to externalities, the government sets and enforces environmental standards and -regulations by issuing licenses and setting standards.⁹⁶⁴ Standards usually relate to emissions- or products, such as maximum emission levels or defined production components, or to the production process itself, such as specific production technologies.⁹⁶⁵ Standards define specific rules of conduct (*Gebote und Verbote*) whose violation is subject to public (monetary) sanction to incentivize compliance.⁹⁶⁶ They are typically specified in administrative regulation, which then has a binding effect on the public and is supervised by administrative agents.⁹⁶⁷ Underlying environmental economic principles are the “polluter pays” principle and preventative behavioral control.⁹⁶⁸ For instance, § 5 (1) and (2) of the Federal Immission Control Act (BImSchG) defines a production or product standard, requiring precautionary protection against harmful effects on the environment and significant nuisance by appropriate measures following the state of the art, e.g., the installation of certain ventilation or purification systems.

i. Environmental Emission Standards: Defining Efficient Pollution Levels

Just as with most environmental regulations, the goal of emission avoidance by standards is not absolute but relative to its costs.⁹⁶⁹ Societal welfare is maximized when the costs of harm and its avoidance are balanced, cf. on the optimal level of emissions Figure 22:⁹⁷⁰

The marginal abatement cost (*MAC*) line⁹⁷¹ represents the costs to the firm of reducing an additional unit of emission. Reading the curve reversely, i.e., from the right to the left, represents its inverse relation to the level of emission: The greater the current level of emissions, the simpler

⁹⁶² Feess 2007: 141.

⁹⁶³ Perloff 2020: 627.

⁹⁶⁴ Cf. Endres 2007: 107 f.; Faure & Partain 2019: 30; Ringel 2021: 57 f.

⁹⁶⁵ Feess 2007: 60 f.; Fritsch 2018: 110 f.; Ringel 2021: 58.

⁹⁶⁶ Faure & Partain 2019: 64. Or other forms of sanctions, such as closing the factory, cf. Ringel 2021: 58.

⁹⁶⁷ Rodi 2014: 258. See also Faure & Partain 2019: 64.

⁹⁶⁸ Ringel 2021: 58.

⁹⁶⁹ Cf. Faure 2016: 116.

⁹⁷⁰ Cf. Perloff 2020: 615 ff. Also on optimal standard setting, Faure & Partain 2019: 63 ff.

⁹⁷¹ For simplicity, both lines are represented linear, while they are typically curve-shaped due to decreasing marginal costs or benefits; with regard to environmental costs (or benefits of reduction), tipping elements and synergetic processes are supposedly causing a far more complex relationship between emission levels and reduction benefits.

or cheaper the marginal emission reduction. The idea is that initial reduction efforts can rely on simpler/cheaper measures. As emission reduction progresses, the cost of the reduction of an additional emission unit increases to the point where further reduction is socially undesirable since its cost outweighs its marginal benefit of reduction. For example, reducing food production to a level where another unit of emissions can be saved, but starvation is provoked. The same applies to the marginal damage cost line (or marginal benefit of reducing emissions, i.e., damages saved) (MDC), which may rather be read reverse and decreases to the left with greater emission reduction, based on the same idea: Initial reduction units produce relatively much greater benefits compared to emission units reduced at an already comparatively low level of emissions. For example, the benefits initially consist of the reduction of severe health costs, such as lung cancer, while the reduction of emissions at an already low level leads to the reduction of comparatively lower health costs, such as allergic reactions or the like. The socially optimal level of emission is where costs and benefits intersect at $MAC(E) = MDC(E)$, represented by E^* . Suppose that the MAC is lower than the MDC of the emission unit. In this case, reducing an additional emission unit is socially desirable (i.e., efficient). The unit should be emitted if the reverse applies ($MAC > MDC$). E^* , therefore, represents the socially desirable emission standard of an efficiency-oriented environmental policy. All firms' aggregate emissions then allow for reaching the overarching social optimum level of emissions.⁹⁷²

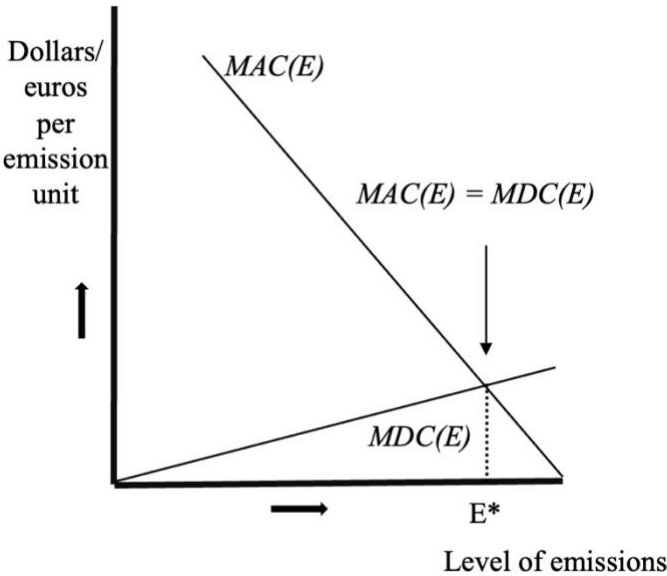


Figure 22 Optimal level of emissions

⁹⁷² Faure & Partain 2019: 68. Cf. Part 3.B.II.1.

ii. Case Example: Efficient Standards of NO_x Emissions of Diesel Vehicles

To continue with the previous example (Part 3.B.III.2.d): Suppose the European Union decides to regulate NO_x emissions from diesel vehicles to alleviate the health problems of B and the other EU citizens. Introducing a trading system for NO_x emissions was too costly, partly due to the large number of European diesel car manufacturers and the administrative costs required for monitoring. Therefore, EU Regulation No. 1/1 is introduced, laying down a NO_x emissions value of 100 mg/km for diesel cars, cf. Figure 23, which is directly binding on Member States. The requirements are to be reviewed at the time of vehicle approval, so they can also be seen as a type or product standard. However, since a maximum emission limit is specified, the rest of this work will treat the NO_x emissions value of 100 mg/km as an emissions (performance) standard. The value of 100 mg/km is assumed to balance the costs (private business costs, *MAC* (marginal abatement cost)) and social benefits (including reduction of health problems and harm to biodiversity) of reducing NO_x emissions (represented by *MDC* (marginal damage cost)), compare Figure 23, taking into account the current state of technology and the scientific evidence on the harmfulness of NO_x emissions to the environment and human health.

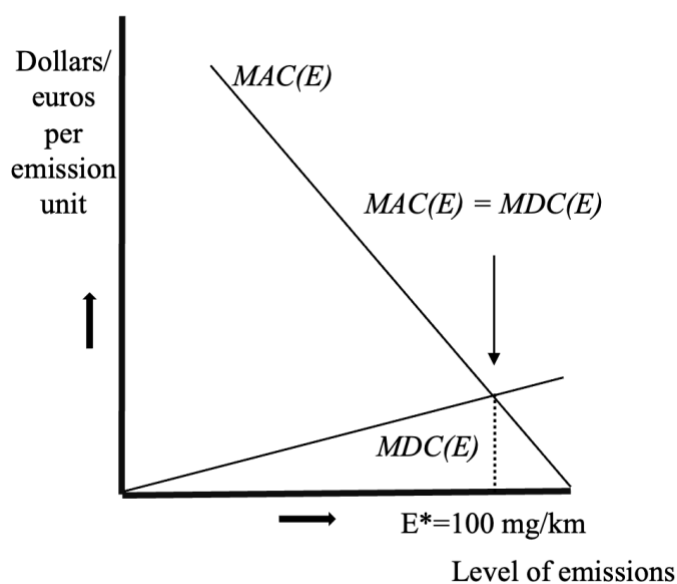


Figure 23 Optimal level of nitrogen oxides of diesel vehicles

iii. Pros and Cons of Standards

Direct public regulation is usually preferable when a large number of parties is involved, as it reduces transaction costs through the representative function of the state for the parties

concerned.⁹⁷³ The property right of the environmental good is somewhat collectivized, with the state as the representative right holder. Compared to private individuals, public agencies typically have greater access to expert knowledge about technological and scientific aspects relevant to regulation.⁹⁷⁴ Compared to polluters, the disadvantage of standards is seen in that the government lacks knowledge about individual marginal abatement costs and, thus, about the “cheapest cost avoider,” so standards are general and apply equally.⁹⁷⁵ The informational superiority of regulated subjects may also encourage strategic decision-making by downplaying abatement costs to achieve higher agreed emission levels or to emit illegally and conceal emissions after implementation (moral hazard), making monitoring and control essential.⁹⁷⁶ The static nature of standards further means that there is no differentiation concerning the extent of violation. Namely, the legal question is reduced to whether E^* has been violated and not to what extent.⁹⁷⁷ The lack of differentiation eliminates incentives for polluters to reduce further below the permitted level (E^*), for instance, by investing in technologies.⁹⁷⁸ In addition, uniformly codified standards are more difficult to amend in light of technological or environmental developments (e.g., new knowledge on the harmful level of a specific emission) as re- or new drafting comprises transaction costs to legal and administrative agencies.⁹⁷⁹ Difficulties of their reformulation in light of environmental changes may ultimately prevent achieving defined objectives.⁹⁸⁰ Thus, the static nature of standards makes their accuracy the all-important efficiency question.⁹⁸¹ When accuracy is secured, clearly defined and monitored standards can allow for rapid goal achievement and are thus practical for avoiding risky situations.⁹⁸² Uncertainty is also reduced

⁹⁷³ Feess 2007: 54. Insofar, the administrative law empowers public agents to pursue the interest of the general public, cf. see Napolitana 2019: 34.

⁹⁷⁴ Which is an argument in favor of regulation compared to liability norms, cf. Faure et al. 1996: 553 f. However, since liability norms equally rely on private engagement, arguments against them partially also apply to the limits of the Coase theorem and market-based instruments.

⁹⁷⁵ Otherwise, one would have to know the utility function of each individual company and set individual emission standards, which does not seem practically feasible, for instance, cf. Fritsch 2018: 111; Ringel 2021: 62. Also Feess 2007: 62 f. However, it can also be argued that the emission level automatically select the cheapest cost avoiders (possibly due to advanced technology), whereas firms with unprofitable reduction costs are forced out of the market, allowing new and more advanced firms to enter. In this sense, it seems reasonable to assume that an emission level can promote (ecologically) efficient innovation, cf. also Porter Hypothesis, Part 3.B.II.2.c.

⁹⁷⁶ Feess 2007: 283 ff. For an overview on how errors on abatement costs affect the desired level of emissions, Feess 2007: 291. See on moral hazard with regard to agricultural policies in Germany, Karl 1997: 401–403.

⁹⁷⁷ Ringel 2021: 61.

⁹⁷⁸ Compare Fritsch 2018: 111. Also Feess 2007: 63; Ringel 2021: 61.

⁹⁷⁹ Faure & Partain 2019: 30. In Germany, thus, commonly the legal statues is concretized by administrative rules, considering technological developments, cf. Ringel 2021: 62.

⁹⁸⁰ Fritsch 2018: 111.

⁹⁸¹ Fritsch 2018: 111.

⁹⁸² Ringel 2021: 61.

with regard to distributional effects⁹⁸³ and compliance costs since, contrary to market-based approaches, they are not the result of decentralized market bargaining. Standards are also easier to codify and, when clearly defined, provide specific behavioral incentives, making them the primary approach in international⁹⁸⁴ and most national legal systems.⁹⁸⁵

b. The Entitlement and Incentive Structure of Standards

i. The Utility-Function of Environmental Standards

Environmental regulation, including standards, is introduced to correct inefficient market behavior that underlies environmental externalities. This means that the efficiency of the regulation depends on the efficiency of the behavior it induces and, thus, on its underlying incentive structure through the allocation and protection of entitlements. The behavioral incentive of standards can be illustrated by considering its effect on the utility function of the standard bearer:⁹⁸⁶

$U(E)$ represents the firm's total profit if it produces and emits unregulated. The emission level is E^{\max} .⁹⁸⁷ A legal pollution standard restricts emissions to the private emission level E^* . Each violation is subject to a sanction S , which raises disproportionately with the emission level and is imposed with a probability of p . Assuming that a higher level of illegal emissions is easier to detect, p increases with E . The effect of the environmental regulation on the producer's utility function can be seen in the divergence in $G(E)$.⁹⁸⁸ In the case of compliance, i.e., when $E \leq E^*$, $G(E)$ is $U(E)$; in the case of violation, i.e., when $E > E^*$, the firm's utility function $G(E)$ is reduced by the imposed penalty S , i.e., $U(E) - p(E)S$.

⁹⁸³ Revesz & Stavins 2007: 560.

⁹⁸⁴ Ringel 2021: 58 ff.

⁹⁸⁵ See on the historical dominance of command-and-control instruments, Revesz & Stavins 2007: 558 ff. With regard to Germany, Rodi 2014: 258.

⁹⁸⁶ The following illustration is based on Feess 2007: 60 ff.

⁹⁸⁷ While there are no regulatory costs associated with corporate production, other costs associated with production constrain the level of production to some extent, meaning that there is a certain maximum level of emissions.

⁹⁸⁸ Which is the general "utility function" of the firm at the section of E^* .

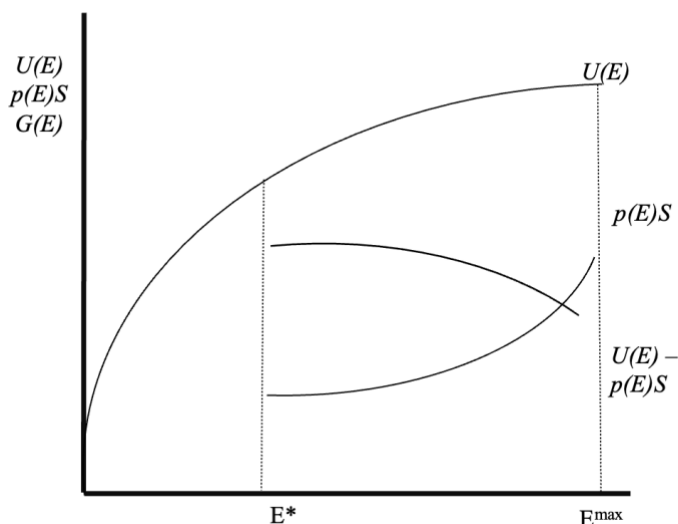


Figure 24 A firm's utility function of emission standards⁹⁸⁹

ii. The Allocation and Protection of Entitlements by Standards

Allocation

Emission standards allocate entitlements to pollute or, conversely, to be free from pollution. The definition of an optimal level of E^* means that any emission below ($E \leq E^*$) is free of charge, i.e., the resource environment is costless.⁹⁹⁰ The firm holds the entitlement to pollute and is incentivized to increase production until E^* .⁹⁹¹ The public must tolerate associated harm and lacks the right to restrict the polluter's activity since it is considered efficient, i.e., socially desirable. Efficiency considerations change at E^* , and any emission beyond E^* is seen as socially undesirable. The entitlement structure is reversed:⁹⁹² The resource environment is "priced" by a sanction S , and the public has the right to be free from emissions above E^* and to enforce compliance. The subdivided entitlement structure of emission standards:

⁹⁸⁹ See Feess 2007: 60 ff.

⁹⁹⁰ Feess 2007: 61.

⁹⁹¹ See Table 9. Assuming that a higher activity level means higher emissions and – conditioned by the first Gossen's law (of diminishing marginal utility) – utility level. The production and emission level will increase until the defined level of emissions, assuming a utility-maximizing actor on behalf of the production firm.

⁹⁹² Cf. Kaplow & Shavell 1996: 749 f. Kaplow and Shavell observe that most regulation of industrial pollution has a divided entitlement structure while arguing for a greater use of liability rules. If natural resources themselves are considered potential "rights holders," the questions of alienability and optimal level must be reconsidered.

Table 9 Entitlement protection structure of environmental standards

Emission level	Entitlement
$E \leq E^*$	The firm has the right to pollute
$E > E^*$	The public has the right to clean air

Next, the entitlements protection structure implied by emission standards will be analyzed.

Protection by Liability Rules

In cases of polluting behavior, liability rules are typically argued as favorable due to the ambiguity of the behavior's social welfare effects.⁹⁹³ While property rules or inalienability rules mean that polluting above the limit is prohibited, liability rules allow the firm to pollute in return for harm compensation⁹⁹⁴ (compare the related incentives to entitlement protection rules illustrated in Table 6). This is considered more efficient due to prohibitive transaction costs and the potential efficiency of the behavior, allowing the company to optimize its actions based on information about costs and benefits: "The primary advantage of liability rules, recall, is that firms facing liability are allowed to decide for themselves whether and how much to pollute, based on their knowledge of the costs of pollution prevention and of the extra profits they can make by expanding production."⁹⁹⁵ Liability rules extend the general internalization aim of environmental regulation to behavior above the defined maximum target. Internalization is achieved when the level of penalties compensates for the social costs, creating incentives for optimal reduction of polluting activity (until the marginal social costs intersect with the marginal benefits of pollution).

Adopting compensatory liability rules above E^* implies an approach to regulating emission levels above E^* via a price system, e.g., with a paid license, permit, or taxation. Thus, liability rules may apply to emission levels regulated below E^* , applying to "a nuisance *with sufficient public utility* to avoid injunction."⁹⁹⁶ Instead, maximum emission levels are social optima, so emitted emission units in violation cannot be considered socially util. Their social undesirability is underlined by the fact that the regulator does not rely on compensatory prices at any $E > E^*$ but on sanctions to influence the firm's utility function to incentivize compliance and discourage any (production) activity causing emissions above E^* .⁹⁹⁷ The associated penalty aims to affect

⁹⁹³ Calabresi & Melamed 1972: 1115 ff.; Hylton 2019: 8; Kaplow & Shavell 1996. Cf. Part 3.A.IV.2.a.

⁹⁹⁴ On liability rules, cf. Calabresi & Melamed 1972: 1105 ff., in the case of pollution cf. 1115 ff.

⁹⁹⁵ Kaplow & Shavell 1996: 750.

⁹⁹⁶ Emphasis added, cf. Calabresi & Melamed 1972: 1105.

⁹⁹⁷ Compare, Ringel 2021: 60. Cf. Part 3.B.III.3.b.i.

the utility function so that it is less costly for the polluter to use legal transaction structures, such as reducing emissions by investing in new technologies or reducing activities.

The question of the protective structure and feasibility of liability regimes for industrial environmental damage is related to the economic distinction between tort and criminal law (sanctions). Liability rules are typically found in tort law and, in the context of regulating environmental behavior, can be defined as market-based instruments designed to reduce market friction.⁹⁹⁸ They are in place when private engagement allows remedying the harm that occurred and an appropriate and reflective price can be set by an external party, i.e., the civil court, allowing to compensate damage *ex post*.⁹⁹⁹

Shavell studied the choice between safety regulations and liability rules in more detail.¹⁰⁰⁰ Since liability rules rely primarily on private enforcement, applicable limitations are similar to those of private enforcement described above,¹⁰⁰¹ namely, prohibitive transaction costs and undefined property rights associated with widespread victimization, difficulties in identifying the tortfeasor, the long latency of damage periods, and the stochastic nature of damages.¹⁰⁰²

Protection by Property Rules

The knowledge that any emission above E^* is not permitted – so the role of the penalty (S) is not conditional but absolute and subject to criminal penalties – indicates the conclusion that a property rule protects the public's right to clean air since those are often found in criminal law, to deter interference from individual resources,¹⁰⁰³ cf. Table 6. However, property rules are based on the parties to determine relevant values and their authority of transfer; such an assumption may be appropriate in traditional areas of criminal law that govern private resources, associated rights, and imposed private and individualizable harms. In contrast, the environmental damage resulting from violating environmental standards is typically not limited to a single victim or compensable by subjectively awarded damages but is typically irreversible and much greater, affecting various individuals with different values.¹⁰⁰⁴ Environmental criminal statutes protect

⁹⁹⁸ Compare, Stavins 2003: 361.

⁹⁹⁹ See on liability rules, Part 3.A.IV.2.a; for a distinction between criminal and civil sanctions, Prescott 2019: 498 f.

¹⁰⁰⁰ Shavell names information asymmetries to the detriment of the injured party, e.g., regarding the existence, extent, and source of damage, risking that the polluter cannot be held liable as well as insolvency limitations as the main criteria, cf. Shavell 1984.

¹⁰⁰¹ See Part 3.B.III.2.c.

¹⁰⁰² Cf. Revesz & Stavins 2007: 549.

¹⁰⁰³ As such, Harel discusses liability and property rules concerning criminal sanctions, cf. Harel 2012: 17 ff.

¹⁰⁰⁴ On this characteristic of inalienability rules and criminal penalties, Prescott 2019: 499. As well as Part 3.A.IV.2.b.

interests that belong to the public (or even no one, assuming nature as a right holder), making the assumption of property rules and individual authority of transfer unreasonable.

Taking the bike example used earlier (Part 3.A.I.2.a.i): A's bicycle can be understood as a resource protected by property rules. A holds the authority to dispose of it and thus to transfer it since the damage in the form of loss is limited to him, so he may equally decide upon the conditions of acceptance of losing it. In contrast, B, from the NO_x example case (Part 3.B.III.2.d), cannot be assumed to have the right to dispose of his unit of clean air since any transfer would also affect other individuals (European citizens of, for instance, Cologne). While in the first case, Pareto efficiency is ensured by limiting the decision-making power to the involved parties, especially the one experiencing a loss, this is not the case in the second case. The non-participation of affected persons and interests may lead to socially undesirable agreements and outcomes.

Protection by Inalienability Rules

The limitations and functional specificities of liability and property rules set forth lead to the arguments that the inalienability rules apply in the realm of environmental criminal law and the public's right to be free from pollution above E^* : “[b]y assessing very high extra damages [...] the collectivity seeks to make that entitlement approach *inalienability*.”¹⁰⁰⁵ This conclusion aligns with the underlying incentive structure of entitlement protection rules argued previously.¹⁰⁰⁶

Calabresi (2014) discusses this shift toward inalienability in the context of punitive damages, arguing that they aim to prevent entitlement transfers without resorting to criminal law.¹⁰⁰⁷ The concept of punitive damages does not exist in German law; rather, the sanction imposed for exceeding emission levels is administrative or criminal, of which the latter is the subject of further analysis.¹⁰⁰⁸ The argument though remains that “extracompensatory damages may reflect a collective decision to approach inalienability.”¹⁰⁰⁹ In the case of criminal penalties, the state acts as the representative of the collective, and in the context of environmental harm, “the enactment

¹⁰⁰⁵ Emphasis adopted, footnote omitted, cf. Calabresi 2014: 8.

¹⁰⁰⁶ Table 6 Incentive perspective on the entitlement protection structure.

¹⁰⁰⁷ Calabresi 2014: 8 f. Calabresi deepens this idea by arguing that the liability rule (of collectively determined price) serves to achieve goals that are neither purely libertarian nor collectivist, but represents a collective decision that may deviate from the market value, depending on the social desirability of the transfer concerned.

¹⁰⁰⁸ On the definition of legal sanctions within the focus of this work and referenced scholars on administrative penalties, Part 1.C.III.3.

¹⁰⁰⁹ Calabresi 2014: 9.

of a criminal prohibition can be viewed as the granting of an inalienable right to potential victims by the government.”¹⁰¹⁰

The notion of inalienability is underlined by the fact that the boundaries to the free exercise of rights are where this is associated with harm to third parties, and a consensus cannot be obtained. In the case of environmental resources, the exercise of the right over the same causes harm to third parties and, especially in the case of transnational harm, consent cannot be obtained; and, if it were, it is likely to lead to inefficient social outcomes, for instance, due to information deficits on the extent of harm or power asymmetries between the parties. For example, when a global corporation fully retains rights to drinking water supplies in developing countries. The fact that such trends can be observed should not be understood as indicating their efficiency or social desirability. High costs associated with a transfer of the entitlement mean that efficiency is best achieved when there is no transfer.¹⁰¹¹ Regulation through criminal law implies specific behavioral expectations of the public toward the regulated and the regulator: compliance with norms and punishment for their violations, expectations whose non-fulfillment is not without harm.¹⁰¹² The social normative notion inherent in this idea will be the subject of further analysis in Part 4.C.

Another argument for inalienability rules when regulating environmental damage is difficulties in the determination of objective values due to moralism and high social costs.¹⁰¹³ Moralism can imply that the harm caused is not quantifiable and lacks an objective and transparent form of measurement.¹⁰¹⁴ This indicates that the costs of violating legal rules are likely to have an additional than pure economic component.¹⁰¹⁵ The public representative in charge, i.e., the court, lacks the means to approximate the values of those affected.¹⁰¹⁶ It may also be that the values concerned are nothing an individual would be willing to trade.¹⁰¹⁷ In other words, parties would not be willing to give up their right to any market price.¹⁰¹⁸ In this sense, inalienability rules incorporate economic and non-economic rationale, thereby marking the limitations of the former.

¹⁰¹⁰ Prescott 2019: 499.

¹⁰¹¹ Compare, for instance, Calabresi & Melamed 1972: 1111 f.

¹⁰¹² Compare on this idea Calabresi 2014: 2.

¹⁰¹³ On the efficiency of inalienability rules Calabresi & Melamed 1972: 1123 f.

¹⁰¹⁴ Cf. Calabresi & Melamed 1972: 1111 f.

¹⁰¹⁵ Which will be the subject of further analysis, cf. Part 4.C.

¹⁰¹⁶ On this, cf. Calabresi & Melamed 1972: 1112.

¹⁰¹⁷ Which resembles the idea of merit goods, cf. Part 3.B.II.2.a. As well as the idea of certain values, for instance, fairness or justice, that are of another dimension than efficiency; on this debate Part 2.B.II.4.b.

¹⁰¹⁸ Cf. on this Calabresi 2014: 8.

The argument in favor of inalienability is even stronger if natural resources are considered as rights-holders themselves.

The following claim does not concern the entitlement protection structure of all interests subject to criminal law or environmental regulation more generally. In practice, entitlement protection structures are often-times mixed and time- and context-dependent.¹⁰¹⁹ The argument, though, applies to the legal protection structure of entitlements allocated by emission standards, codified as maximum levels, and allows for first insights into research question 1 on the function of environmental criminal law (in cases of corporate crime)¹⁰²⁰:

Table 10 Entitlement and protection structure of standards

Emission level	Entitlement	Protection structure	
$E \leq E^*$	The firm has the right to pollute	Property rule ¹⁰²¹ / Liability rule (in case of a paid permit, license, etc.)	
$E > E^*$	The public has the right to clean air	Inalienability rule (right)	Liability Rule Property rule

Case Example: The Entitlement and Protection Structure of Standards for NO_x Emissions of Diesel Vehicles

The emission standard defined on European level of 100 mg/km¹⁰²² leads to the following entitlement and protection structure:

¹⁰¹⁹ Calabresi illustrates the time-dependency by the example of a watch: property rules apply, when the entitlement can be shifted via contract, while in the case of an accident, it is transferred via tort law, Calabresi 2014: 4 fn. 16.

¹⁰²⁰ On the definition of corporate crime, Part 1.C.III, and the analytical level of research question 1, Figure 2.

¹⁰²¹ However, the polluter's property right is not absolute but limited to the right to use (*usus*) and the right to its revenues (*usus fructus*), but does not involve the right to change the form or substance (*usus abusus*) and the right to sell or transfer (*usus abutendi*); to the contrary, the latter would be included in case of a market-based approach based on emission permits, cf. Part 3.B.III.2.b.

¹⁰²² Figure 23 Optimal level of nitrogen oxides of diesel vehicles.

Table 11 Entitlement and protection structure for NO_x emission standards

Emission level	Entitlement structure	Protection structure
$E \leq 100$ mg/km	A has the right to emit the emissions using his car M has the license to produce the vehicle	Property rule: A may sell his vehicle/M may sell the vehicles produced Liability rule: M holds a paid production permit/ A is paying taxes for using his car/ for fuel, etc.
$E > 100$ mg/km	B/other European citizens have the right to clean air free from diesel vehicle NO _x emissions	Inalienability rule: B/other European citizens cannot dispense from their right to clean air free from diesel vehicle NO _x emissions

IV. Interim Statement and Theses

Market-based approaches to environmental regulation draw on the idea of the Pareto efficiency of consensual and free market transactions and limit the role of the state and public regulation to a regulatory minimum, i.e., to ensure the functioning of the market while defining efficiency targets. Thus, the objective of regulation is to correct the shortcomings of the market system that have prevented the emergence of a competitive market and caused market failure. The main elements for this are the definition of property rights and accessible transfer structures with low transaction costs. Entitlements are protected by property rules to allow free and consensual transfer based on the value defined by the parties.

In regulating environmental damage, market-based approaches are common in the form of emission markets with pollution permits, where the property right is not so much related to the resource in question but rather to its degradation, i.e., the pollution permit. Dynamic flexibility, information advantages, and reliance on the coordinated market pricing mechanism allow for avoiding pollution costs at the lowest costs. For the most part, however, they have been used in the economic sector, with legal entities as the stakeholders.

For most cases of environmental harm, private-based solutions to externalities are inappropriate. Reasons for this include the nature of environmental resources and damage, making it difficult to define property rights, and prohibitive transaction costs in cases of large-scale environmental damage, transcending national boundaries and jurisdictions. Furthermore, information asymmetries between injured parties and industrial polluters are common. As a result, command-and-control systems are the traditional approach to regulating environmental damage. They allow for clear behavioral guidelines and are particularly valuable in cases where the social optimum is known and immediate risk avoidance is required.

Emission standards exhibit a divided entitlement structure: While the right to pollute below the emission level is granted to the polluter, this changes at the maximum emission level of E^* . The individual, represented by the state, has the right to be free from any emission above E^* . Any transfer must be prevented since emissions in violation of E^* are considered inefficient. Noneconomic aspects, such as moralism, further underline their social undesirability. The public penalty thus aims to reduce the benefits of the violator disproportionately and prevent the entitlement transfer, suggesting that inalienability considerations protect the right to be free of emissions above E^* .¹⁰²³

The following central theses concerning the efficiency considerations of environmental law, which are decisive for research question 1 on the function of environmental criminal (in cases of corporate crime),¹⁰²⁴ and further analysis are:

1. The specific environmental policy instrument and its design are derived from a societal cost-benefit analysis that aims at socially optimal emission levels.
2. Within this, market-based approaches, such as emission trading regimes, rely on private market forces to optimize resource allocation regarding reduction costs and pollution rights.
3. Private solutions, including market-based approaches, are unfeasible for much of the environmental (industrial) damage, and direct command-and-control regulation is required.
4. Direct environmental regulation, including (emission) standards, are specified norms of conduct based on social cost and benefit considerations and are – in theory – designed to represent socially optimal activity levels.
5. Standards are preferable when efficiency accuracy is guaranteed and allow for certain and prompt behavioral guidance.
6. Public penalties for environmental regulation violations aim to prevent resource transfers and may indicate inalienability rules.
7. Efficiency and non-economic rationales are the reasons for the absolute undesirability of resource transfer in violation of environmental standards.

¹⁰²³ See also on the human right to a clean, healthy, and sustainable environment, recognized in October 2021 by the United Nations Human Rights Council (HRC) for the first time, cf. United Nations 2021.

¹⁰²⁴ Compare Part 1.C.II and Figure 2.

The argument here is not about claims of absoluteness with respect to environmental regulation; in reality, a mixed structure can often be found.¹⁰²⁵ Rather, the framework used serves as an analytical tool to explain different regulatory modalities, focusing on maximum emission levels, and to gain insights and derive rationales for the next analysis concerning environmental criminal law.

Against the background of the incentive structure and efficiency rationale of environmental law, the question is now about the role of (environmental) criminal law. How do the economic analysis of criminal law and its approach to its function and design integrate into the regulatory order of environmental law? Does the analysis reveal a functional coherence with the role that environmental economics ascribes to (environmental) criminal law? Are the provisions of environmental law constitutive to it, or does criminal law claim and/or fulfill functional autonomy? In the case of the latter, to what extent can criminal law theory be used as a normative guide from an economic perspective?

This indicates that if the function of (environmental) criminal law as advanced by the economic analysis of criminal law can be determined, it is necessary to examine the extent to which this corresponds to the function of criminal law as assumed in environmental economics and regulation, as presented. Namely, does the economic analysis of criminal law equally assume that environmental criminal law protects inalienable interests and that, therefore, the function of criminal penalties is to avoid any interference (violation/transfer)?

Next, it is necessary to address how any such function can be achieved most efficiently, i.e., how it can be designed most desirably, and, in the case of corporate environmental crimes, the role of corporate criminal liability within. Both aspects will be the subject of the following part. The analysis will start with giving an insight into the philosophical roots and the theoretical embedment of the economic analysis of criminal law within criminal law theory. This intends to illustrate the extent to which the core elements of the modern economic analysis of law were already present in early thinkers and are echoed in criminal law theories. It also allows for identifying initial similarities and potential points of synergy, on which a more comprehensive legal analysis can follow.

¹⁰²⁵ Calabresi & Melamed 1972: 1093.

Part 4. The Economic Analysis of Criminal Law

A. Philosophical and Legal Theoretical Embedment

The economic analysis of criminal law constitutes a subfield of the economic analysis of law¹⁰²⁶ and applies economic concepts and models to criminal law regulations and institutions.¹⁰²⁷ Social sciences methods, such as behavioral economics and sociology, are used to evaluate the societal function of criminal law, the nature of criminal penalties, and their optimal size.¹⁰²⁸ Like the general economic approach to law, the economic analysis of criminal law has a positive and a normative branch. While the former is concerned with criminal rules as micro level incentives governing individual behavior, the latter is interested in social welfare and efficiency on the macro level and deals with enforcement policies or procedural aspects.¹⁰²⁹ The perspective is functional to gain a more objective understanding of criminal rules and institutions.¹⁰³⁰ Since the economic analysis of law deals with traditional topics of criminal law theories, such as the function of criminal punishment, the concept of crime, and the limits of criminal law, in the next step, it will be broadly classified in criminal law theory based on its two main theoretical strands. It goes without saying that the following does not provide a comprehensive illustration of the discussion on criminal law theories, but highlights its main features and distinctiveness.¹⁰³¹

I. Traditional Criminal Law Theories: Deontological and Consequential Approaches to Criminal Law and Punishment

The main distinguishing feature of criminal law from other legal areas is its instrument of criminal punishment. Punishment inflicts harm on another person¹⁰³² and represents a coercive reaction imposed by the state to respond to misconduct.¹⁰³³ Criminal punishment interferes most intensively with the fundamentally protected freedom of citizens compared to other state

¹⁰²⁶ Kirstein 2004: 1.

¹⁰²⁷ Fischer 2014: 40.

¹⁰²⁸ Harel 2012: 10. See also Figure 4 The incorporation of the economic analysis of law in legal sciences.

¹⁰²⁹ For instance, cf. Harel 2012: 12. On the rational offender assumption and the analysis of the optimal enforcement policy, cf. Miceli 2019: 25 ff.

¹⁰³⁰ Hylton 2005b: 175.

¹⁰³¹ The debate on the role of criminal law and the instrument of punishment is ever ongoing, so that any in-depth analysis is beyond the scope of this work. For an insightful elaboration on the criminal law debate and Feuerbach and his *Zwangstheorie*, see Greco 2009.

¹⁰³² Greco 2009: 303; Kaspar 2019: § 1 para. 2.

¹⁰³³ Farmer 2016: 13.

interventions. It must thus be justified *vis-à-vis* society and those punished¹⁰³⁴ and used as an *ultima ratio*.¹⁰³⁵ Criminal law theories respond to the justification demand by attempting to answer why punishment should be inflicted and distinguishing between just and unjust punishment.¹⁰³⁶

Within the debate on the function of punishment and the scope of criminal law, two main strands¹⁰³⁷ can be defined: (1) deontological approaches that theorize the moral wrongfulness of criminal behavior, and (2) consequential approaches that focus on harm prevention (through deterrence).¹⁰³⁸ The question of the purposes of punishment relates to the perception of the act that ought to be punished.¹⁰³⁹

On the one hand, the act can be perceived as a violation of law by an autonomous, morally responsible agent, which cannot be tolerated and thus requires symbolic condemnation.¹⁰⁴⁰ The perspective is *ex post*, and the necessity of punishment is independent of the risk that the same person will re-offend or that another person will commit a similar act.¹⁰⁴¹ Based on this perspective, the aim is reprobation¹⁰⁴² or retribution.¹⁰⁴³ The legal reason for punishment is the act of a culpable agent – an evil that demands compensation so that the magnitude of sanction corresponds to the talion principle, i.e., the sanction is just and legitimate if the perpetrator experiences the same evil as committed.¹⁰⁴⁴ The two main criteria are the act's wrongfulness and the individual's responsibility.¹⁰⁴⁵ The philosophical basis of retributive theories is German

¹⁰³⁴ The justification *vis-à-vis* the punished is to some extent deontological, while the justification *vis-à-vis* the society is consequential, Roxin & Greco 2020: 128 § 3 para 1b. Different Hörnle, who assumes three addressees: the society, perpetrator, and victim. Hörnle, thus, introduces an expressive theory of criminal law, which consists of different messages to be addressed at different addresses, see Hörnle 2011: 32 ff.

¹⁰³⁵ Cf. Otto 2004: § 1 para 49. On the *ultima ratio* function of criminal law, see Großmann 2017: 59 ff. See also Farmer 2016: 13., arguing that reliance on criminal law must be well considered to prevent undermining its legitimacy by overuse.

¹⁰³⁶ Pawlik 2004: 10.

¹⁰³⁷ In German scholarship, Gropp and Sinn distinguish four main purposes: just compensation (retribution), prevention by deterring potential offenders (general prevention), correction of the offender (special prevention), communication to address past behavior (expression), cf. Gropp & Sinn 2020: 45 § 1 para. 169. Or Otto, who distinguishes between a warning function, i.e., motivation to behave in accordance with the law, legal probation (general prevention), i.e., deterrence of others by expressing the inadmissibility of the punished act, security function, i.e., imprisoning the potentially dangerous offender, and resocialization (special prevention) of the offender by correcting his misconduct, Otto 2004: 14 § 1 para. 66 ff. See also prominently on purposiveness of criminal sanction in terms of, inter alia, prevention and rehabilitation, Liszt 1882.

¹⁰³⁸ Farmer 2016: 13 ff.; Kaspar 2019: 24 §1 para 8 ff.; Roxin & Greco 2020: 128 § 3.

¹⁰³⁹ Walther 1999: 128 ff.

¹⁰⁴⁰ Walther 1999: 129.

¹⁰⁴¹ A perspective predominantly associated with Kant or Hegel. Walther 1999: 129. Cf. Roxin & Greco 2020: 129 f. § 3 para 3 f.

¹⁰⁴² “Reprobation” seems the more commonly used term in the Anglo-American sphere, but like the retributive approaches, it includes the notion of social condemnation, Walther 1999: 129 ff.

¹⁰⁴³ Roxin & Greco 2020: 129 f. § 3 para 2 ff.

¹⁰⁴⁴ Roxin & Greco 2020: 128 § 3 para 2.

¹⁰⁴⁵ Nozick 1981: 363 f.

idealism, advocated most prominently by Immanuel Kant and Georg Wilhelm Friedrich Hegel.¹⁰⁴⁶ They are absolute theories (Latin: *absolutus* = unconditional) since they separate the aim of punishment from its societal effect and consider compensation for wrongfulness as a sufficient reason.¹⁰⁴⁷ The punishment is legitimate if a culpable wrong has been committed¹⁰⁴⁸ and fulfills the imperative of justice.¹⁰⁴⁹

On the other hand, the behavior may be perceived as a social threat with an inherent risk of recidivism of the same person or some other person engaging in a similar offense, changing the perspective to *ex ante*.¹⁰⁵⁰ Punishment aims to prevent harm¹⁰⁵¹ and deter crimes by demonstrating the unprofitability of criminal activity.¹⁰⁵² Theories of prevention relate the function of punishment to its social consequences and are thus considered relative¹⁰⁵³ (Latin: *relatus* = related to) or consequential theories. The positive version goes beyond deterrence and regards the purpose of punishment in stabilizing societal norms, hence, a peaceful society.¹⁰⁵⁴

II. Utilitarian Roots and Classical Deterrence

The economic analysis of criminal law examines criminal law and institutions and their role in social welfare analysis and maximization from the traditional economic cost-benefit perspective. This consequential approach indicates its relation to deterrence theories, which apply utilitarian thought and philosophy to criminal law and punishment. Utilitarianism¹⁰⁵⁵ can be defined as a consequentialist moral theory with an outcome perspective that aims at achieving the highest sum of a moral good for the greatest number of people.¹⁰⁵⁶ The value of a specific decision or act

¹⁰⁴⁶ Gropp & Sinn 2020: 46 § 1 para. 173; Roxin & Greco 2020: 129 § 3 para. 3 f. According to Kant, the purpose of punishment is the enforcement of justice, see Kindhäuser & Zimmermann 2020: § 1 para. 10. For Kant, any other justification contradicts the categorical imperative and the personality of men by treating the criminal as a “thing” or “means:” “Judicial punishment can never be used merely as a means to promote some other good for the criminal himself or for civil society, but instead it must be in all cases be imposed on him only on the ground that he has committed a crime; for a human being can never be manipulated merely as a means to the purposes of someone else and can never be included among objects of the Law of things [*Sachenrecht*],” emphasis adopted, see Kant 1999: 138.

¹⁰⁴⁷ Pawlik 2004: 47; Roxin & Greco 2020: 129 § 3 para. 2.

¹⁰⁴⁸ Farmer 2016: 14 f.

¹⁰⁴⁹ As such, absolute theories are also regarded as theories of justice, see Gropp & Sinn 2020: 45 f. § 1 para 171.

¹⁰⁵⁰ Walther 1999: 130.

¹⁰⁵¹ Walther 1999: 129 ff.

¹⁰⁵² Pawlik 2004: 22. The deterrent effect is threefold: (1) by the threat of punishment as a warning, (2) by its imposition as an expression of social condemnation and stigmatization, (3) by its prosecution, Müller 1996: 10 ff.

¹⁰⁵³ Kaspar 2019: 24 § para 8.

¹⁰⁵⁴ Kaspar 2019: 24 § 1 para 9. I.e., conforming societal values, cf. Pawlik 2004: 22.

¹⁰⁵⁵ Note that there are various versions of utilitarianism, see on this M. H. Werner 2021: 126 ff. The work refers to the basic principles of utilitarianism based on the utility principle as formulated by Bentham.

¹⁰⁵⁶ Most famously “*it is the greatest happiness of the greatest number that is the measure of right and wrong*,” emphasis adopted, Bentham 1891: 93, preface. See further on utilitarianism, Mathis 2019: 142 ff.

is derived from its social consequences, measured in terms of satisfaction or happiness.¹⁰⁵⁷ The consequential perspective means that there is no right or wrong *per se* but that it is defined by its consequences.¹⁰⁵⁸ Since punishment in itself is evil for the punished, it is justified if its social benefits outweigh it.¹⁰⁵⁹

At the societal level, criminal law and punishment should be designed to increase overall happiness/satisfaction. At the individual level, it is assumed that the decision to commit a crime is equally the result of a consequential perspective on the criminal act and its cost-benefit trade-off. The idea that criminals weigh the costs and benefits of their actions and decide based on an expected utility means that punishment can be used to alter the cost-benefit analysis in favor of refraining from crime. Punishment can then serve to maximize societal happiness (or utility) by deterring criminal conduct.¹⁰⁶⁰

The idea of punishment as an instrument for deterrence to promote social happiness/utility goes back to the so-called classical school of criminology.¹⁰⁶¹ Cesare Beccaria (1738–1794) and Jeremy Bentham (1748–1832) are arguably the two most influential thinkers whose ideas will be explored next.

III. Early Thinkers: Beccaria’s and Bentham’s Approaches to Criminal Law and Punishment

1. Cesare Beccaria

The Italian Philosopher Cesare Beccaria was one of the first to apply utilitarian thinking to the criminal justice system. Beccaria’s ideas inspired the English jurist, philosopher, and economist Jeremy Bentham, whose work laid the most important foundations for developing utilitarianism as a moral theory.¹⁰⁶² In his essay “On Crime and Punishment,”¹⁰⁶³ published in 1764, Beccaria introduced a novel and contemporary perspective on punishment, bringing Enlightenment thinking to criminal justice policy and abandoning traditional normative ideas based on religion.¹⁰⁶⁴ His ideas were motivated by dissatisfaction with the existing legal system, which he

¹⁰⁵⁷ Cf. H.-G. Schmitz 2001: 47. This social perspective is the part that Sen and Williams refer to as the welfarism part of utilitarianism, cf. Sen & Williams 1982: 4 f.

¹⁰⁵⁸ Mathis 2009: 104; M. H. Werner 2021: 113 f.

¹⁰⁵⁹ H.-G. Schmitz 2001: 47.

¹⁰⁶⁰ On the main utilitarian and economic principles of the economic analysis of criminal law, Fischer 2014: 40 f.

¹⁰⁶¹ Meier 2021: § 2 para 2-4.

¹⁰⁶² Hylton 1998: 425.

¹⁰⁶³ The original title was “Trattato Dei Delitti e delle Pene.”

¹⁰⁶⁴ Hylton 2018: 2519.

saw as serving only a few and neglecting the contractual nature of law to serve public welfare.¹⁰⁶⁵ Based on a social perspective of institutions and their role in terms of aligning individual and social interests, Beccaria contributed to modern reforms.¹⁰⁶⁶

a. On the Function of the (Criminal) Law: To Increase Public Utility and Secure the Social Contract

Beccaria considered the harm of criminal acts and, thus, the social desirability of their regulation crucial for preserving the social contract. The social contract builds upon a reciprocal relationship between giving up individual freedom in return for security and peace by being protected from attacks on personal freedom by others.¹⁰⁶⁷ The task of the sovereignty of the nation is to prevent individuals from taking back their share and claiming that of others.¹⁰⁶⁸ Within this, “LAWS are the conditions under which men, naturally independent, united themselves in society.”¹⁰⁶⁹ They constitute general rules developed by common sense, which promote the benefit of the greatest number of subjects.¹⁰⁷⁰ Public utility is the foundation of justice, resulting from the need to oppose private interests.¹⁰⁷¹ However, the driving force of individual self-interest indicates that compliance must be ensured by rules, which include punishment for their violations.¹⁰⁷² Although punishment may be necessary to secure public peace, it is exceptional and limited, and the freedom of individuals to do what is lawful without fear of punishment is the dogma that must be enshrined in the laws of any lawful society.¹⁰⁷³

b. On the Nature of Human Decision-Making: Pain and Pleasure

Beccaria considered pain and pleasure as “the only springs of action,”¹⁰⁷⁴ with self-interest as the driving force, which, if not opposed, can lead to social harm.¹⁰⁷⁵ He considered that “[m]en do not, in general, commit great crimes deliberately, but rather in a sudden gust of passion”¹⁰⁷⁶ and

¹⁰⁶⁵ Beccaria 1905: 66.

¹⁰⁶⁶ Ramello & Marciano 2018: 271 f.

¹⁰⁶⁷ Beccaria 1905: 69. Beccaria 1819: 18. “Every individual be bound to society, society is equally bound to him, by a contract which, from its nature equally binds both parties,” Beccaria 1819: 20.

¹⁰⁶⁸ Beccaria 1819: 15 f.; 1905: 69.

¹⁰⁶⁹ Beccaria 1819: 15.

¹⁰⁷⁰ Beccaria 1819: 89.

¹⁰⁷¹ Beccaria 1819: 34.

¹⁰⁷² Beccaria 1819: 15 f.; 1905: 69.

¹⁰⁷³ Beccaria 1819: 37; 1905: 132.

¹⁰⁷⁴ Beccaria 1819: 31.

¹⁰⁷⁵ Beccaria 1819: 28–30.

¹⁰⁷⁶ Beccaria 1819: 77.

regulate their behavior following advantages and disadvantages.¹⁰⁷⁷ Reward and punishment and their specific apportionment constitute the legislator's means to ensure that the latter prevails in cases of crime.¹⁰⁷⁸ Punishment constitutes a "political obstacle, prevent[ing] the fatal effects of private interest"¹⁰⁷⁹ and securing the social contract and peace.

c. On the Scope and Function of Criminal Law and Punishment: Focus on Social Harm

In line with utilitarian thinking, Beccaria refrains from determining the degree of the wrongfulness of a crime based on intentions or will.¹⁰⁸⁰ Instead, he argued to focus on "*the injury done to the society*."¹⁰⁸¹ Beccaria saw the purpose of punishment in preventing the reoccurrence of harm by preventing the reoccurrence of the offense:¹⁰⁸² "IT is better to prevent crimes than to punish them. This is the fundamental principle of good legislation, which is the art of conducting men to *maximum* happiness, and to the *minimum* of misery, if we apply this mathematical expression of the good and evil of life."¹⁰⁸³ Any punishment that does not serve the public good or the ultimate aim of crime prevention is contrary to good virtues, justice, and the nature of the social contract as such.¹⁰⁸⁴ The greater the harm, the greater the need for its prevention through punishment.¹⁰⁸⁵

d. On the Design of Sanctions: Level, Proportionality, and Form

The preferred form of punishment is one that leaves "the strongest and most lasting impressions on the minds."¹⁰⁸⁶ While the pain must outweigh the offense's benefit, anything beyond is tyrannical:¹⁰⁸⁷

*"The degree of the punishment, and the consequences of the crime, ought to be so contrived as to have the greatest possible effect on others, with the least possible pain to the delinquent."*¹⁰⁸⁸

¹⁰⁷⁷ Beccaria 1819: 94.

¹⁰⁷⁸ Compare Beccaria 1819: 31 f.

¹⁰⁷⁹ Beccaria 1819: 29.

¹⁰⁸⁰ Beccaria considered reliance on will or intention impractical as "[m]en often with the best intention, do the greatest injury to society, and, with the worst, do it the most essential services," Beccaria 1819: 33.

¹⁰⁸¹ Emphasis adopted, cf. Beccaria 1819: 35, 33–35.

¹⁰⁸² Beccaria 1819: 47; 1905: 102 f.

¹⁰⁸³ Emphasis adopted, cf. Beccaria 1819: 148.

¹⁰⁸⁴ Beccaria 1819: 21; 1905: 71.

¹⁰⁸⁵ Compare, Beccaria 1819: 28.

¹⁰⁸⁶ Beccaria 1819: 47.

¹⁰⁸⁷ Beccaria 1905: 103.

¹⁰⁸⁸ Emphasis adopted, see Beccaria 1819: 75.

This principle must be upheld as tyrannic punishment does not lead to a greater deterrent effect but hardens the minds of the individuals and encourages the offender to invest more to escape¹⁰⁸⁹ or to commit a more severe crime.¹⁰⁹⁰ Thus, for punishment to have a preventative effect, “it is sufficient that the *evil* it occasions should exceed the *good* expected from the crime, including the calculation of the certainty of the punishment, and the privation of the expected advantage.”¹⁰⁹¹

In addition, the timelier and more closely related to the offense the punishment is, the more just and effective it is. If punishment occurs promptly, the offense is perceived as its origin, and the tempting notion of the gain of a crime also triggers the pain of the associated punishment:¹⁰⁹² “[T]he association of ideas is the cement which unites the fabric of human intellect, without which pleasure and pain would be simple and ineffectual sanctions.”¹⁰⁹³ In this regard, Beccaria outlines that “[c]rimes are more effectually prevented by the *certainty* than by the *severity* of punishment.”¹⁰⁹⁴ The certainty of a relatively small punishment outweighs the fear stemming from a severe but unlikely punishment.¹⁰⁹⁵

Concerning the form of sanction, Beccaria assumed that the causal association between the crime and the pain of the sanction is strengthened if the punishment’s nature reflects the crime’s nature, thereby eliminating its meaning, i.e., the criminal gain.¹⁰⁹⁶ He criticized pecuniary sanctions, as during his time, fines benefited the crown and made the criminal a debtor.¹⁰⁹⁷ Furthermore, Beccaria advocated public punishment for all levels of crimes as this would “make a greater impression, and, by deterring men from the smaller, will effectually prevent the greater.”¹⁰⁹⁸

2. Jeremy Bentham

Jeremy Bentham’s work provided the first systematic application of economic ideas and concepts to the analysis of the (criminal) law and brought the principle of utility to its forefront in the early

¹⁰⁸⁹ Beccaria 1905: 104. Beccaria 1819: 94.

¹⁰⁹⁰ Beccaria 1819: 93. Indicating aspects of marginal deterrence, cf. on this Part 4.D.II.2.

¹⁰⁹¹ Emphasis adopted, Beccaria 1819: 94. Which relates to the idea of gain elimination as advocated by Posner, Part 4.B.III.2.b.

¹⁰⁹² Beccaria 1819: 74 ff.; 1905: 118 ff.

¹⁰⁹³ Beccaria 1819: 75.

¹⁰⁹⁴ Emphasis adopted, cf. Beccaria 1819: 93. Beccaria’s assumption that certainty has a greater deterrent effect than the severity of the sanction was empirically confirmed and is now accepted as consensus among criminologists, cf. Part 4.D.II.4.b.

¹⁰⁹⁵ Beccaria 1905: 121.

¹⁰⁹⁶ Beccaria 1819: 75 f.; 1905: 120.

¹⁰⁹⁷ Beccaria 1819: 69 f.

¹⁰⁹⁸ Beccaria 1819: 77.

19th century in England.¹⁰⁹⁹ At the micro level, he took up Beccaria's ideas, which state that pain and pleasure are the main driving forces of human action and which punishment, if considered an instrument of behavior control, must influence.¹¹⁰⁰ At the societal level, Bentham considered preserving individual security and welfare as the primary function of legislation¹¹⁰¹ and aimed at introducing a verifiable ethical principle to judge any action.¹¹⁰² Namely, "*it is the greatest happiness of the greatest number that is the measure of right and wrong.*"¹¹⁰³

a. On the Function of the (Criminal) Law: The Principle of Utility

Bentham held that the government's goal and law's function is to prevent or reduce mischief at the least cost, i.e., increase society's happiness, which consists of the various individuals experiencing pleasure and avoiding pain.¹¹⁰⁴ In this respect, the principle of utility is the benchmark against which any sound policy ought to be measured, the principle that permits or rejects action in light of its effect on individual happiness: "Sum up all the values of all the *pleasures* on the one side, and those of all the pains on the other. The balance, if it be on the side of pleasures, will give the *good* tendency of the act upon the whole, with respect to the interests of that *individual* person; if on the side of the pain, the *bad* tendency of it upon the whole."¹¹⁰⁵

Based on this, he developed a systematic utilitarian theory of punishment by applying the principle of utility to the criminal system.¹¹⁰⁶ Within the utility task of the law, punishment functions as the last resort to prevent mischief.¹¹⁰⁷

b. On the Nature of Human Decision-Making: Pain, Pleasure, and Motives

"NATURE has placed mankind under the governance of two sovereign masters, *pain* and *pleasure*. It is for them alone to point out what we ought to do, as well as to determine what we shall do. [...] They govern us in all we do, in all we say, in all we think."¹¹⁰⁸ In any instance of

¹⁰⁹⁹ See Stigler 1950: 308 f. Combined with further ideas on measures of utility of wealth, Bentham "planted the tree of utility" in economic academia, cf. Stigler 1950: 311.

¹¹⁰⁰ Hylton states that Bentham is thus commonly seen as the "source of instrumentalism in legal theory," Hylton 2005a: 87 f. Hylton, however, assumes that the starting point was Hobbes, who first argued that the law should be drafted from the perspective of a "social planner."

¹¹⁰¹ Draper 2002: 2.

¹¹⁰² Geis 1955: 162.

¹¹⁰³ Bentham 1891: 93, preface.

¹¹⁰⁴ Bentham 1988: 24, 70, 170.

¹¹⁰⁵ Emphasis adopted, Bentham 1988: 31.

¹¹⁰⁶ Schofield 2019: 66.

¹¹⁰⁷ "[T]he general object of all laws is to prevent mischief; [...] where there are no other means of doing this than punishment," see Bentham 1988: 178.

¹¹⁰⁸ Emphasis adopted, see Bentham 1988: 1.

pain or pleasure, and thus, in every action, “[m]en calculate, some with less exactness, indeed, some with more: but all men calculate.”¹¹⁰⁹ The calculation may vary according to personal aspects, such as disposition, but in general, all men are driven by the same calculative passion, which corresponds to monetary motives.¹¹¹⁰

Pain and pleasure are the legislator’s goals, but they are also his working instruments and understanding their power means understanding their value.¹¹¹¹ Since they can bind an individual’s conduct, they can be considered a sanction.¹¹¹² Within this, punishment is a particular sort of pain produced by the fact that an individual committed an offense.¹¹¹³

Furthermore, understanding motives and their sources is central to defining means to address the crime at its source.¹¹¹⁴ Motives are “any thing that can contribute to give birth to, or even to prevent, any kind of action.”¹¹¹⁵ Concerning the commission of a crime, two crucial categories of motives can be distinguished: (1) seductive or corruptive motives, which are of such a nature as to encourage a person to commit a mischievous act, and (2) tutelary motives, which are opposite in that they restrain or prevent it.¹¹¹⁶ While both are present in each person at all times, the balance between them determines the strength of temptation and thus whether a crime is committed.¹¹¹⁷

c. On the Nature of Crime: Crime as Mischief

Whether an act constitutes a crime depends on its tendency to diminish pleasure or to inflict pain, that is, on its influence on happiness.¹¹¹⁸ The tendency of mischief is defined by its consequences, which may be primary, i.e., related to a determinable number of individuals, or secondary, i.e., related to the public as a whole or an undeterminable number of individuals.¹¹¹⁹ The latter

¹¹⁰⁹ Bentham 1988: 188.

¹¹¹⁰ “I would not say, that even a madman does not calculate. Passion calculates, more or less, in every man: in different men, according to the warmth or coolness of their dispositions: according to the firmness or irritability of their minds: according to the nature of the motives by which they are acted upon. Happily, of all passions, that is the most given to calculation, from the excesses of which, by reason of its strength, constancy, and universality, society has most to apprehend: I mean that which corresponds to the motive of pecuniary interest: so that these niceties, if such they are to be called, have the best chance of being efficacious, where efficacy is of the most importance,” footnote omitted, Bentham 1988: 188.

¹¹¹¹ Bentham 1988: 29.

¹¹¹² Bentham 1988: 24. In this respect, Bentham refers to the Latin origin of sanction, *sanctio*, which signifies “an act of binding [...] any thing which serves to bind a man,” Bentham 1988: 24 fn. 1.

¹¹¹³ Draper 2002: 8.

¹¹¹⁴ Bentham 1988: 130.

¹¹¹⁵ Bentham 1988: 97.

¹¹¹⁶ Bentham 1988: 142.,

¹¹¹⁷ Bentham 1988: 147.

¹¹¹⁸ Bentham 1988: 41.

¹¹¹⁹ Bentham 1988: 152 f.

consists of the alarm caused by the mischievous act and the resulting sense of danger “[b]y suggesting to a person exposed to the temptation, the idea of committing such another” or “[b]y weakening the force of the tutelary motives which tend to restrain him from such action, and thereby adding to the strength of the temptation.”¹¹²⁰

d. On the Scope and Function of Criminal Law and Punishment: To Prevent Mischief

The subordinated functions of punishment are to prevent all mischief, to prevent the worst, to keep down the mischief, and to prevent it at the lowest costs.¹¹²¹ Punishment is (a source of) pain, a source of suffering inflicted by law, that acts as a binding force.¹¹²² This suggests that the superior direct aim of punishment is behavioral control.¹¹²³ The controlled action may be that of the offender by correcting or stopping his action (the real punishment) or that of others by setting an example (the apparent punishment).¹¹²⁴ “But all punishment is mischief: all punishment in itself is evil.”¹¹²⁵ Consequently, the principle of utility dictates that causing mischief (punishment) to prevent mischief (crime) is only justified if the latter prevails.¹¹²⁶ Namely, punishment is justified if its secondary consequences, i.e., the alert and danger it signals to those tempted to commit a crime, are beneficial and outweigh the direct, primary harm it inflicts on the punished.¹¹²⁷ This means that, among other things, punishment is groundless if there is no harm to prevent or if it causes more harm than it prevents.¹¹²⁸

e. On the Design of Sanctions: Level, Proportionality, and Form

Bentham introduced thirteen rules on the proportionality between punishment and crime,¹¹²⁹ of which the most applicable to his work will be illustrated:

¹¹²⁰ Footnote omitted, Bentham 1988: 155.

¹¹²¹ Bentham 1988: 178.

¹¹²² Cf. fn. 1112. Also Bentham 1988: 26.

¹¹²³ “The immediate principal end of punishment is to control action,” Bentham 1988: 170 fn. 1.

¹¹²⁴ Bentham 1988: 193.

¹¹²⁵ Bentham 1988: 170. Thus, punishment itself constitutes a specific category of pain and is only justified if it leads to an increase in happiness, Fischer 2014: 44.

¹¹²⁶ Bentham 1988: 170.

¹¹²⁷ Bentham 1988: 157 f. Since punishment is pain, it, Fischer 2014: 44.

¹¹²⁸ Bentham 1988: 171. And it is groundless, when there is certain and equal (adequate) compensation, cf. Bentham 1988: 172.

¹¹²⁹ Bentham 1988: chap. XIV. The idea of determining a set of rules to promote a more adequate proportion between punishment and the offense can be regarded as one of the main contributions to the enlightenment project in order to provide for a rational basis of regulation and practice, Draper 2002: 12.

(1) “The value of the punishment must not be less in any case than what is sufficient to outweigh that of the profit of the offence”.¹¹³⁰

(2) “The greater the mischief of the offence, the greater is the expense, which it may be worth while to be at, in the way of punishment.”¹¹³¹

(3) “Where two offences come in competition, the punishment for the greater offence must be sufficient to induce a man to prefer the less.”¹¹³²

(5) “The punishment ought in no case be more than what is necessary to bring it into conformity with the rules here given.”¹¹³³

Since the gain from the crime is usually more certain and proximate than the punishment, the sentence must be increased to compensate for the inferiority in terms of certainty and proximity.¹¹³⁴

(7) “To enable the value of punishment to outweigh that if the profit of the offence, it must be increased, in point of magnitude, in proportion as it falls short in point of certainty.”¹¹³⁵

(8) “Punishment must be further increased in point of magnitude, in proportion as it falls short in point of proximity.”¹¹³⁶

The preferred type of punishment changed throughout Bentham’s works. While he initially favored corporal punishment, in his later work, his interest turned to penitentiary punishment and later to monetary sanctions.¹¹³⁷ The main rule to determine the form of sanction is that it must outweigh the benefits of the crime.

Like Beccaria,¹¹³⁸ Bentham considered the analogy between the (characteristics of the) offense and the punishment crucial, as it provides a more substantial example and deters the most.¹¹³⁹

The analogy also makes the punishment more frugal since it inflicts only as much pain on the offender as necessary.¹¹⁴⁰ In this regard, pecuniary penalties are adequate since they can be accurately scaled and transferred.¹¹⁴¹

¹¹³⁰ Footnote omitted, see Bentham 1988: 179. With reference to Beccaria cf. Beccaria 1905: 103. On the idea of gain elimination in the economic analysis as advocated by Posner, cf. Part 4.B.III.2.b.

¹¹³¹ Footnote omitted, Bentham 1988: 181. See on the notion of reliance on harm for determining the desirability and level of punishment, Part 4.B.III.1.b.

¹¹³² Footnote omitted, Bentham 1988: 181. Which indicates ideas of marginal deterrence, cf. Part 4.D.IV.1.b.ii.

¹¹³³ Bentham 1988: 182.

¹¹³⁴ Bentham 1988: 183.

¹¹³⁵ Bentham 1988: 184. On the idea of compensating a low level in certainty by a higher penalty level, Part 4.D.I.

¹¹³⁶ Bentham 1988: 184.

¹¹³⁷ For instance, in his earlier and famous work on the Panopticon, see Draper 2002: 14.

¹¹³⁸ Beccaria 1819: 75 f.; 1905: 120.

¹¹³⁹ Bentham 1988: 194.

¹¹⁴⁰ Bentham 1988: 194.

¹¹⁴¹ Bentham 1988: 194.

IV. Interim Resumé

The economic analysis of criminal law belongs to the relative or deterrence theories of criminal law, which reject retributive punishment ideas. Early ideas go back to Beccaria and Bentham, who substantiated the normative and positive levels of analysis. On the social level, Beccaria held that (criminal) law is meant for the good of all by protecting social peace and individual liberty. Bentham then introduced a detailed conceptualization of the utility principle as a moral theory in general and the central decision-making principle for lawmaking. That is, the value of an action is defined by its tendency to increase pleasure and avoid pain. In this context, the legal objective of criminal punishment is to prevent harm by deterring the same or other offenders from (re)committing. The scope of criminal law corresponds to the consequential perspective of deterrence theories, which assume that crimes are defined by their tendency to cause harm. Both theorists indicated direct and indirect harm of crime, such as challenging the idea of social security and the rule of law.

According to the general utility principle, punishment is justified only to the extent that it serves to reduce harm, i.e., maximize happiness. The punishment must not be excessive but proportionate to the seriousness of the crime and limited to what is necessary to prevent its reoccurrence; namely, to the elimination of its profits and thereby of the underlying motivation of the same or likely offender(s). The profit elimination approach is consistent with classical deterrence theory, and the differentiation regarding the deterrent effect on the concerned offender and possibly other offenders points to notions of specific and general deterrence.¹¹⁴² The broad understanding of harm, including aspects, such as the fear of reoccurrence, indicates a positive notion of deterrence – to maintain the stability of norms and social peace. In addition, both theorists underlined the importance of certainty and proximity for the effectiveness of deterrence. Thus, the value of punishment is defined by three aspects: certainty, swiftness, and severity.

On the individual and positive level, Beccaria and Bentham abandoned the notion that criminal behavior is inherent in individuals but shifted the focus to the circumstances that influence the decision to commit a crime. While Beccaria already pointed to a calculating human mind and considered pain and pleasure as driving factors in individual decision-making, Bentham's elaboration on the human mind, including motives, intentions, and dispositions, was of far greater precision. Starting with the notion that all individuals make decisions based on calculative considerations, Bentham made "explicit what had been only implicit in Beccaria and Blackstone

¹¹⁴² Compare concerning the latter, cf. Fischer 2014: 45.

– that punishment is a method of imposing costs on criminal activity and thereby altering the incentives to engage in it – [and hereby] laid the foundation for the modern economic analysis of crime and punishment.”¹¹⁴³

The assumption of the rational and autonomous agent originated in the Enlightenment and formed the premise of all theories of classical deterrence theories. All people are capable of criminal behavior, and crime results from cost-benefit analysis in pursuit of personal interests. Consequently, a crime is prevented if the likely offender’s cost-benefit analysis is negative, i.e., if the consequences of the criminal act (punishment) outweigh its expected benefits (the presumed aim).

B. The Economic Model, Theory, and Principle of Criminal Law

I. Research Model and Theory: Crime as a Rational Choice

Consistent with the utilitarian perspective, the economic analysis of law views criminal law as a legal incentive instrument to guide human behavior toward social desirability, that is, to deter crime.¹¹⁴⁴ The standard economic approach to criminal behavior is based on the model of the rational utility-maximizing actor: The main assumptions are that individuals (1) choose among alternatives, (2) are guided by the principle of opportunity costs (cost-benefit analysis), and (3) seek to maximize benefits and reduce costs (principle of optimization).¹¹⁴⁵ Criminals and noncriminals are thus equally guided by cost-benefit considerations, and crime is a rational choice when related benefits predominate.¹¹⁴⁶ The goal of governmental regulation through criminal sanctions is to provide disincentives, i.e., to deter individuals (potential criminals) from engaging in socially undesirable (i.e., welfare-reducing) behavior.¹¹⁴⁷

The economic approach embeds crime in the general economic theory of consumption by relying on the price mechanism as a structuring principle for behavioral choices.¹¹⁴⁸ Within this framework, punishment represents the social price of misbehavior levied by the representative

¹¹⁴³ Footnote omitted, cf. Posner 1981b: 41.

¹¹⁴⁴ Harel 2012: 10.

¹¹⁴⁵ On the standard economic rational actor, Part 2.B.I.3; concerning criminal law, Part 4.B.I.1, and criminology Part 4.B.I.2. For an insightful overview, also Fischer 2014.

¹¹⁴⁶ Harel 2012: 13. Hylton 2018: 2519. See also Fischer 2014: 40.

¹¹⁴⁷ Fischer 2014: 40 f.; Hylton 2018: 2519.

¹¹⁴⁸ Cf. on the general economic consumer choice theory, Part 2.B.I.

state.¹¹⁴⁹ The structuring principle of (changes in) behavior is the systematic response to (changes in) environmental conditions, including legal regulation. Since any instance of crime goes back to rational incentives,¹¹⁵⁰ the rational choice model allows to explain and predict the criminal law's behavioral consequences. Based on the law of demand (which states an inverse relationship between cost and demand) for crime, the economic approach predicts that increasing its (expected) costs in terms of severity or likelihood of punishment will reduce crime and encourage substitutive, less costly alternative actions.¹¹⁵¹

1. The Beckersche Model of Rational Decision-Making

The economic approach to crime is mainly associated with Gary S. Becker, who developed a theory on criminal decision-making and policy in his work "Crime and Punishment: An Economic Approach" (1986).¹¹⁵² His work is based on utilitarian ideas of criminal law as an instrument for deterring future crimes and increasing social welfare. Using neo-classical economic models and concepts, he developed a mathematical economic model of human decision-making¹¹⁵³ and operationalized Bentham's and Beccaria's ideas. He replaced the hedonistic concepts of "pain and pleasure" with the microeconomic concepts of preferences,¹¹⁵⁴ i.e., utility as summarized preferences reduced to numerical monetary values.¹¹⁵⁵ Becker assumed that his theory of criminal behavior is part of a universal theory of human behavior that portrays individual decision-making as guided by utility maximization based on stable preferences.¹¹⁵⁶ If utility maximization is the driving force of all human decisions, then the motivational basis of criminals and the choice of crime is the same as that of noncriminals and compliance.¹¹⁵⁷ Consequently, a preventive crime policy aims to alter the cost-benefit analysis of crime by increasing its opportunity costs, i.e., making noncriminal conduct more beneficial and criminal conduct more costly.

¹¹⁴⁹ I.e., criminal sanctions are illustrated as the debt the convicted is charged by the society, cf. Posner 2014: 5. Non-monetary prices, such as imprisonment, are then somewhat "shadow prices," Posner 2014: 6.

¹¹⁵⁰ Hylton 2018: 2519.

¹¹⁵¹ See Posner 2014: 5 f. I.e., sanctions are prices for norm violation, cf. Follert 2018: 421. See also Garoupa 2014: 1280.

¹¹⁵² Becker 1968.

¹¹⁵³ Antony & Entorf 2003: 169.

¹¹⁵⁴ Harel 2012: 10 f.

¹¹⁵⁵ Cf. Part 2.B.I.3. Also Entorf 1999: 5. On utility in microeconomics, Perloff 2020: 69.

¹¹⁵⁶ Becker 1976: 8, 14.

¹¹⁵⁷ "Some persons become "criminals," therefore, not because their basic motivation differs from that of other persons, but because their benefits and costs differ," cf. Becker 1968: 176.

The model of human decision-making is based on the expected utility theorem.¹¹⁵⁸ The expected utility (EU_j) of getting caught is the sum of the probability of getting caught (p_j) and the expected utility of the crime, which is its income Y_j reduced by the sanction f_j . Income may be material and/or immaterial and thus includes psychological components, such as excitement, which are converted into their monetary equivalent.

$$EU_j = p_j U_j (Y_j - f_j)^{1159}$$

U_j = utility function

Y_j = monetary equivalent of income: material/monetary and immaterial/psychological¹¹⁶⁰

f_j = monetary equivalent of punishment, including nonmaterial costs¹¹⁶¹

p_j = probability of detection, apprehension, punishment

j = in a specific time.

The expected utility, if not being caught, is

$$EU_j = (1 - p_j) U_j (Y_j)^{1162}$$

The expected utility, including both possible outcomes, is

$$EU_j = p_j U_j (Y_j - f_j) + EU_j = (1 - p_j) U_j (Y_j)^{1163}$$

¹¹⁵⁸ Cf. Part 2.B.I.3.e. Becker's model has been developed subsequently but remains the basic approach to models of crime deterrence.

¹¹⁵⁹ Becker 1968: 177 fn. 16. Cf. also Garoupa 2014: 1280. Note that the model, like the expected utility model, assumes that the potential offender knows the relevant variables, here, in the form of p and f . Extensions of the model have incorporated the idea that individuals may misperceive, in particular, the probability of sanctions, see Bebchuk & Kaplow 1992. As well as Part 4.D.II.3.

¹¹⁶⁰ Cf. Becker 1968: 177 fn. 16. See also Garoupa 2014: 1280; Greenberg 1979: 309.

¹¹⁶¹ For instance, social stigma or other psychological costs, Garoupa 2014: 1280.

¹¹⁶² Entorf 1999: 5.

¹¹⁶³ Becker 1968: 177 fn. 16.

Modeling the expected punishment as a product of p and f assumes that offenders are risk-neutral.¹¹⁶⁴ A rational, risk-neutral actor engages in crime if the expected utility¹¹⁶⁵ of the criminal activity outweighs the utility (known) of a legal activity¹¹⁶⁶

$$EU_{illegal} > U_{legal}$$

This means that crime is committed if the difference between the two alternatives is positive

$$EU_{illegal} - U_{legal} > 0$$

Whereas the utility of the legal activity U_{legal} remains independent from any changes in p and f , the utility of $EU_{illegal}$ increases or decreases correspondingly. Thus, the trade-off between U_{legal} and $EU_{illegal}$ can be influenced by the value of $EU_{illegal}$, which depends on p and f and is modifiable by public policy.¹¹⁶⁷ Illustrated separately, a crime is committed if the expected utility outweighs the expected costs

$$EU_{illegal} > p * f$$

The number of offenses an individual may commit is

$$O_j = O_j(p_j, f_j, u_j)$$

O_j = Number of offenses a person commits in a specific time j

f_j = monetary equivalent of punishment, including nonmaterial costs

p_j = probability of detection, apprehension, punishment

j = in a specific time

u_j = portmanteau variable representing other influences, e.g., changes in income or general willingness to commit a crime.¹¹⁶⁸

¹¹⁶⁴ Becker 1968: 183.

¹¹⁶⁵ Assuming that U is strictly positive, meaning that an increase in income increases utility, cf. Greenberg 1979: 310.

¹¹⁶⁶ Entorf 1999: 5.

¹¹⁶⁷ Entorf 1999: 5.

¹¹⁶⁸ Becker 1968: 177.

The portmanteau variable acknowledges that other individual variables than f_j or p_j can affect the number of offenses.¹¹⁶⁹

2. Criminological Rational Choice Theory

Becker's work laid the foundation for the criminological theory of rational choice.¹¹⁷⁰ His model of human decision-making, grounded in the economic theory of rational choice and the (expected) utility-maximizing actor, provided insights into the decision-making process of – at least some – criminals.¹¹⁷¹ The theory mainly goes back to Derek B. Cornish and Ronald V. Clarke and their work “The Reasoning Criminal: Rational Choice Perspectives on Offending” of 1986.¹¹⁷² Like Becker, Cornish and Clarke rejected any motivational or biological differences between criminals and noncriminals, but assumed “the desires, preferences and motives of offenders and potential offenders as similar to those of the rest of us – in continual interaction with immediate opportunities and constraints to produce, reinforce and sometimes reduce both criminal and non-criminal behaviours.”¹¹⁷³ The perspective highlights the centrality of environmental aspects to the decision-making process and its outcome.¹¹⁷⁴ The main assumptions of the criminological rational choice perspective are that

“1 Criminal behaviour is purposive.

2 Criminal behaviour is rational.

3 Criminal decision-making is crime-specific.

4 Criminal choices fall into two broad groups: ‘involvement’ and ‘event’ decisions.

5 There are separate stages of involvement.

6 Criminal events unfold in a sequence of stages and decisions.”¹¹⁷⁵

¹¹⁶⁹ This suggests that, even within the rational choice theory of crime, there is room for alternative preventative approaches, such as education, which can be a crucial aspect in reducing crime. For an analysis of the crime-reducing potential of education based on legislation changing the compulsory school-leaving age in Wales and England, Machin et al. 2011.

¹¹⁷⁰ Meier 2021: § 3 para. 16. See also Akers 1990: 653 fn. 1.

¹¹⁷¹ Greenberg 1979: 309.

¹¹⁷² Cornish & Clarke 1986a.

¹¹⁷³ Cornish & Clarke 2017: 29.

¹¹⁷⁴ Cf. Cornish & Clarke 2017: 32.

¹¹⁷⁵ Cornish & Clarke 2017: 32.

While the first three ideas correspond primarily to the economic approach, the last three relate to situational crime prevention theory (using crime script analysis). Therefore, the first three components will be discussed next.

a. Purposiveness and Rationality

The idea of purposiveness reflects the relationship between an individual's action and his intention to satisfy his needs and desires, meaning that an action is chosen because of its satisficing potential.¹¹⁷⁶ These actions serve self-interests or benefits,¹¹⁷⁷ more specified in terms of immaterial needs and desires, such as excitement, or material desires, such as money.¹¹⁷⁸ The guiding principle of decision-making is rational utility maximization,¹¹⁷⁹ which means that the alternative with the greatest expected benefit prevails. Rational decision-making is not understood as making perfectly informed choices but incorporates Simon's ideas on environmental and individual constraints.¹¹⁸⁰ Correspondingly, rationality and utility maximization are relativized to "bounded rationality" and "satisficing."¹¹⁸¹ Optimal decision-making is understood subjectively, considering individual experiences and capacities.¹¹⁸² It is acknowledged that different (levels of) rationalities exist¹¹⁸³ and that rationality is to be understood as conforming to the "logic of the situation."¹¹⁸⁴ A "reasoning decision maker" is then someone who exhibits a certain degree of planning, forethought, and behavioral changes according to contingencies.¹¹⁸⁵

b. Crime-Specification: Environmental Aspects and Situational Crime Prevention

The environment determines the cost and benefits of alternative actions and thus sets relevant incentives for the decision to engage in crime. While past experiences produce needs, desires, and underlying motives, the current context defines whether an individual becomes a

¹¹⁷⁶ Cornish & Clarke 2017: 32 f.

¹¹⁷⁷ Cornish & Clarke 1986b: 1.

¹¹⁷⁸ Money is inherently central as a means to achieve other goals, cf. Cornish & Clarke 2017: 32 f.

¹¹⁷⁹ That "given their motives and goals, individuals will try to select the best available means to achieve them," cf. Cornish & Clarke 2017: 33.

¹¹⁸⁰ Cf. Part 2.B.I.5.b.

¹¹⁸¹ Cornish & Clarke 2017: 33. Cf. Akers 1990: 661 ff.; Cornish & Clarke 1986b: 1.

¹¹⁸² Cf. Part 2.B.I.5.b. Cf. Cornish & Clarke 2017: 33.

¹¹⁸³ Akers 1990: 665.

¹¹⁸⁴ Cornish & Clarke 2017: 49. Cf. on rationality related to "logic of the situation" as outlined by Popper, Part 2.B.I.7.d.i.

¹¹⁸⁵ I.e., that there are elements of reasoning in the decision-making, which Cornish and Clarke see as generally empirically confirmed, cf. Cornish & Clarke 1986b: 13.

criminal.¹¹⁸⁶ Needs, desires, and contexts differ depending on the type of offense, so a crime-specific approach is required.¹¹⁸⁷ Crime specification primarily relates to differentiating between different offenses. However, the same offense also differs in stages and its factors and outcomes.¹¹⁸⁸ The focus on different stages of the same criminal act combines the rational choice perspective with situational crime prevention, i.e., the differential study of contextual variables that influence the decision-making process of the same criminal behavior, usually divided into initiation, habituation, and desistance.¹¹⁸⁹ This time- and context-specific perspective makes it possible to identify decision points at which prevention is most likely through changes in environmental factors.¹¹⁹⁰

c. Methodological Status: Rational Choice as a Metatheory

Criminological rational choice theory is not a conclusive theory that can explain all criminal behavior equally well.¹¹⁹¹ Instead, just like the economic rationality principle, it is understood as a heuristic principle,¹¹⁹² “a framework of some basic assumptions to guide thinking. Its focus is on the role of opportunity in offending, and on the practical task of preventing specific crimes by reducing opportunities for them to happen.”¹¹⁹³ A “good enough theory,” a perspective in progress that can provide helpful insights for crime policy and situational crime prevention by identifying the critical decision-making elements for criminal behavior.¹¹⁹⁴ As with the homo economicus or any other theory or model, simplification is necessary to make the approach operationalizable. The necessary under-complexity of any methodological approach to human behavior implies the desirability of theoretical pluralism. In line with this, Cornish and Clarke welcome integrating other theories, such as routine activity theory, into the rational choice framework.¹¹⁹⁵

¹¹⁸⁶ Cornish & Clarke 2017: 46 f.

¹¹⁸⁷ Cf. Cornish & Clarke 2017: 34.

¹¹⁸⁸ For an overview of the stages involved in the commitment of burglary, see Cornish & Clarke 1986b: 3 f.

¹¹⁸⁹ Cornish & Clarke 2017: 35 ff.

¹¹⁹⁰ Cornish & Clarke 2017: 45.

¹¹⁹¹ Akers 1990: 655. See also Cornish & Clarke 1986b: 11.

¹¹⁹² Cornish & Clarke 2017: 32. See Methodological Understandings and Conceptualizations of the Rationality Principle, at Part 2.B.I.7.

¹¹⁹³ Compare Cornish & Clarke 2017: 53.

¹¹⁹⁴ Compare, Cornish & Clarke 2017: 45 f., 56, 13.

¹¹⁹⁵ Cornish & Clarke 1986b: 10 f. Cornish and Clarke consider rational choice thus a metatheory, Cornish & Clarke 2017: 53.

3. Model Limitations – Behavioral Law and Economics

Behavioral law and economics' critique of the rational economic model of human behavior also applies to the rational criminal actor and other actors relevant to law enforcement, such as judges, policymakers, and legislators.¹¹⁹⁶ However, transferring general findings to the legal context runs the risk of neglecting the importance of the legal context, which behavioral law and economics tries to take into account empirically.¹¹⁹⁷

a. Bounded Self-Interest

Bounded self-interest refers to behavioral deviations in terms of incorporating aspects other than self-interest, e.g., fairness or equality, into the decision-making process. For legal rules, fairness is seen as crucial for compliance, meaning that compliance is much more likely if norms are perceived as fair and *vice versa*.¹¹⁹⁸

b. Bounded Rationality

i. Deficits in Judgment

Overoptimism and Overconfidence

Concerning criminal activity, overoptimism and overconfidence may lead to underestimating arrest rates.¹¹⁹⁹ Criminals seem to believe themselves safer from sanctions than they are, leading to a distorted perception of the costs involved and reducing the deterrent effect.¹²⁰⁰ However, this is likely due to the simple selection process that individuals engage in crime if the perceived probability of arrest is low and continues if this is revealed to be true, leading to systematic distortion downwards.¹²⁰¹ In addition, excessive optimism may lead individuals to overestimate

¹¹⁹⁶ The analysis in this work is limited to the offender's perspective. For findings on the behavior of judges, see, for example, Teichman & Zamir 2014. For a profound overview on model limitations, Englerth 2010: 149 ff.

¹¹⁹⁷ Harel 2014a: 37 f.

¹¹⁹⁸ On how fairness mediates the deterrence effect of severe sanctions, Verboon & van Dijke 2011. Verboon and van Dijke find that procedural fairness mediates the effect of the severity of sanctions while perceived unfairness may even function in a decreasing manner. This means that the absolute influence of sanctions can only be partially explained instrumentally in terms of sanction severity. Thus, aspects of fairness ought to be considered in law enforcement, Verboon & van Dijke 2011: 127 ff. See also on the norm-strengthening effect due to trust in the police, analyzed within the framework of the Procedural Justice Theory, Haverkamp & Hecker 2018.

¹¹⁹⁹ Garoupa 2003: 9; Jolls 2004: 8.

¹²⁰⁰ Garoupa 2003: 9. See also Lochner 2001: 12 f., see also Figure 4; 2007: 448.

¹²⁰¹ And reversely, those who overestimate arrest rates either remain or drop out of crime (especially when having been arrested), cf. Lochner 2001: 12 f.; 2007: 446.

the benefits of crime.¹²⁰² Combining underestimating costs with overestimating benefits may lead to a double “over-incentive” to criminal behavior.¹²⁰³

Criminal behavior may also be encouraged by a projection bias (“just-like-me bias”), which refers to overestimating the number of individuals who act just like oneself.¹²⁰⁴ When criminals overestimate the number of others who commit crimes, the perceived gain and the number of wrongdoings increase.¹²⁰⁵ In addition, offenders have been found to exhibit the so-called “others-are-bad” bias, which refers to the tendency to mistrust the norm conformity of others and leads to a decrease in perceived costs.¹²⁰⁶ Thus, if both biases are present, wrongdoing tends to persist.¹²⁰⁷ If the individual is a noncriminal, wrongdoing is encouraged if the “others-are-bad” bias dominates.¹²⁰⁸

Refined policy recommendations are to disclose the actual number of wrongdoings¹²⁰⁹ and potentially impose higher sanctions.¹²¹⁰ However, given the uncertain or lack of knowledge of most offenders¹²¹¹ and variance in the actual level of sanction, the efficiency of harsher penalties is doubtful.¹²¹² Moreover, a more holistic perspective shows that biases may “balance out:” While overoptimism and overconfidence may encourage wrongdoing, they also tend to reduce care and concealment, increasing the probability detection.¹²¹³

Availability Heuristics

The availability heuristic states that the factual information about the likelihood and magnitude of the sanction is less relevant for decision-making; instead, it is the “ease” with which the information comes to mind.¹²¹⁴ For this, the salience and frequency of an event, i.e., of arrest, are crucial, suggesting that the degree (absolute number) and the vividness of enforcement are

¹²⁰² Excessive optimism may also apply to victims who, for example, invest less in precaution, and to judges, who may be inclined to impose higher sentences if they overestimate the deterrent effect, cf. McAdams & Ulen 2009: 418.

¹²⁰³ McAdams & Ulen 2009: 417.

¹²⁰⁴ Cf., Cooter et al. 2008: 889 f.

¹²⁰⁵ Cooter et al. 2008: 906, 908.

¹²⁰⁶ Cooter et al. 2008: 889 f., 904.

¹²⁰⁷ Cooter et al. 2008: 906.

¹²⁰⁸ As the two biases undermine each other: the “others are bad” bias decreases perceived costs, i.e., increases perceived net gain, while the “just-like-me bias,” for noncriminals, decreases the gain; thus, a person will decide to switch to wrongdoing if the former prevails, Cooter et al. 2008: 906 f.

¹²⁰⁹ Cooter et al. 2008: 907 f.

¹²¹⁰ McAdams & Ulen 2009: 417.

¹²¹¹ For instance, cf. Robinson & Darley 2004. With regard to *p*, see Part 4.D.II.3.

¹²¹² For instance, cf. also Harel 2014a: 49.

¹²¹³ Garoupa 2003: 9.

¹²¹⁴ Compare on heuristics Part 2.B.I.5.c.ii.

crucial.¹²¹⁵ Salience and frequency are also influenced by direct and indirect communication,¹²¹⁶ which varies according to the individual's environment. For example, the perceived probability of arrest differs across communities, family backgrounds, or age groups.¹²¹⁷

Relevant information may not only be biased but also absent. It has been found that citizens, including potential offenders, are unaware of applicable legal rules and rely on their moral judgments to form an opinion about the rules in place.¹²¹⁸ The policy goal would be to update false beliefs and perceptions by making the information that should be shared more salient and frequent.¹²¹⁹ Moreover, the importance of moral judgments means that any deterrence policy would be well advised to incorporate societal morals and attitudes.¹²²⁰

ii. Deficits in Decision-Making

Prospect Theory

Prospect theory assumes that individuals encode the costs and benefits of a criminal activity relative to a reference point and evaluate utility changes as gains or losses accordingly.¹²²¹ As for the economic approach to crime, prospect theory challenges reliance on the objective expected utility function as the underlying decision equation for the decision to commit a crime.¹²²² Instead, the individual's status quo prior to offending is central in determining whether a change in utility is perceived as a gain or loss. The individual risk attitude is related to the perception of gains and losses: Individuals tend to be risk-seeking for losses but risk-averse for gains. Thus, knowing the reference point also allows for conclusions on risk attitudes that influence decision-making.¹²²³ Furthermore, prospect theory states that individuals systematically underestimate

¹²¹⁵ Jolls 2004: 10 ff.

¹²¹⁶ For instance, through the news, friends, or neighbors, cf. Harel 2014a: 47.

¹²¹⁷ For example, see the study on the perception of the criminal justice system of young males by Lochner 2001; 2007. One of the findings was that perceptions vary across age groups, ethnic groups, and neighborhoods; with hispanic and black men more likely to be arrested than white men, and men in rural areas having higher rates than those in urban areas, cf. Lochner 2007: 450 ff.

¹²¹⁸ Darley et al. 2001: 173 ff. On the lack of knowledge on behalf of potential offenders and moral judgments, Robinson & Darley 2004: 176 f.

¹²¹⁹ See Jolls et al. 1998: 1538. Jolls et al. thus propose to stick large, colorful parking tickets with the words "VIOLATION" on driver's windows for parking violations. Deterrent communication can be used to exploit biases, such as heuristics, by overstating the likelihood of arrest and thereby manipulating the perception of potential offenders in favor of compliance, see on this Pickett 2018.

¹²²⁰ When legal rules differ from the attitudes and beliefs, it requires more effort to ensure that they are known; which in turn, requires resources, cf. Robinson & Darley 2004: 177. Consistent with this is the general finding of social norms theory that the discrepancy between legal norms and social norms should be minimized to promote compliance with legal norms, cf. Feldman & Harel 2008: 85.

¹²²¹ On prospect theory Part 2.B.I.5.c.ii

¹²²² Garoupa 2003: 8.

¹²²³ Cf. Part 2.B.I.5.c.ii. From a methodological perspective, the importance of a reference point is problematic as it differs individually and contextually, Harel 2014a: 43 f.

probabilities, except at lower scales, and thus overestimate the likelihood of rare events.¹²²⁴ This means that a probability of conviction below a critical threshold may be systematically underestimated, whereas after passing that threshold, potential offenders may either correct their beliefs or update them incorrectly by overestimating the probability.¹²²⁵

Framing

Reference points also influence the frame of an alternative and can produce substitution effects. Suppose there are two alternatives: option A is to sell marihuana sanctioned by a fine, while option B is to comply with the law. B is the “cheaper” alternative since the expected utility of selling marihuana is negative. Hence, the individual chooses B and complies with the law. Now option C, to sell heroin, is introduced, subject to imprisonment. The reference point for evaluating the cost of A may shift to C, making A appear relatively “cheaper.” The individual chooses option A, selling marihuana, and violates the law.¹²²⁶

Framing is also crucial for risk attitudes as it changes whether the sanction is perceived as a loss or gain.¹²²⁷ It may also be relevant for moral intuitions, and a justifying frame of a knowingly wrongful act may reduce feelings of responsibility and guilt thereby encouraging “cognitive dissonance.”¹²²⁸ As a result, the expected costs in terms of feelings of guilt or regret may decrease.

Moreover, social norms, especially when legal rules are less specific and leave room for interpretation, are crucial for (non)compliance.¹²²⁹ Social norms may substitute the legal for an alternative frame of (mis)behavior. Policy implications are to design sufficiently specified legal norms.¹²³⁰

c. Bounded Willpower

The third bond, lack of willpower, is mostly used to explain crime. For instance, Jolls et al. (1998) indicate that diminished self-control and overestimating short-term consequences encourage criminals to act contrary to conventional economic behavioral predictions.¹²³¹ The structure of

¹²²⁴ Garoupa 2003: 9; Kahneman & Tversky 1979.

¹²²⁵ McAdams & Ulen 2009: 418.

¹²²⁶ Meares et al. 2004: 1180 f.

¹²²⁷ Harel 2014a: 44.

¹²²⁸ Garoupa 2003: 9.

¹²²⁹ Cf. generally on the relevance of social norms, Feldman & Harel 2008: 97 ff.

¹²³⁰ Which also speaks in favor of precise rules instead of more openly formulated standards of conduct, Feldman & Harel 2008: 108 ff.

¹²³¹ Jolls et al. 1998: 1538.

criminal activity – instant benefits combined with long-rung and time-lagged costs – seems to encourage (hyperbolic) discounting of future costs.¹²³² For instance, the costs of the first years of imprisonment are greater than those of the last. This imbalance in perception encourages “overconsumption” of the activity in question,¹²³³ namely, of crime.

4. Interim Resumé

The economic analysis of criminal law applies the economic approach to human behavior based on the economic utility maximizer and rational choice theory. In order to operationalize the economic approach to legal policy, Becker relied on the theorem of expected utility to analyze the decision to commit a crime, thereby specifying earlier thoughts of utilitarian thinkers such as Bentham and Beccaria. The key insight is that the decision to commit a crime is equivalent to any other behavioral choice and results from a positive cost-benefit analysis, i.e., an individual commits a crime if the expected costs outweigh the expected benefits.

Cornish and Clarke have developed the economic model into an extended criminological theory by including aspects of situational crime prevention and bounded rationality. Crime is a self-interested, goal-directed decision based on a rational utility calculus, and its outcome depends on relevant environmental aspects. The latter points to the contextual interdependence of rationality and the possible connecting factors of situational crime prevention.

Despite being enriched by criminology, the rational choice theory of crime is subject to inherent limitations and boundaries of rationality that also apply to criminals. Perceptual deficits regarding the likelihood of being convicted, coupled with or fostered by over-optimism and overconfidence, can hinder deterrence measures. In addition, an individual’s frame and reference point are central to defining the values of alternatives.

Assuming a certain degree of rationality, on which behavioral predictions depend, is a prerequisite for justifying (legal) rules.¹²³⁴ In this context, utility is usually reduced to material and monetary values.¹²³⁵ Reducing utility to economic values and the assumption of a calculating actor is not equally feasible for all offenders or offenses. In addition, the applicability of general findings from behavioral economics to criminal decision-making processes and the accuracy of

¹²³² Garoupa 2003: 7; Harel 2014a: 40 f.; Jolls et al. 1998: 1538 f. See also Garoupa 2003: 7. Cf. on the application of economics insights to explain substance abuse, Caulkins & Nicosia 2010. On an experiment indicating that longer sanctions not necessarily increase the level of fear and that the sensitivity to the severity of sanctions declines, cf. Pickett 2018: 1650 ff. On corporate offending, cf. Utset 2012: 269.

¹²³³ Compare Utset 2012: 269.

¹²³⁴ Cf. on this, Part 2.B.I.8.

¹²³⁵ Janson 2004: 34 ff. See Part 2.B.I.6.

behavioral predictions may vary. A person who chooses to use drugs may be prone to different behavioral biases than someone who chooses to evade taxes. The variety of applicable biases implies the need to distinguish between noncriminal and criminal behavioral contexts as well as those of different criminal behavior.¹²³⁶ The following section will examine the applicability of a specified rational choice theory and its limitations concerning the analysis of corporate (environmental) crime and criminals.

II. Application to Corporate (Environmental) Criminals

1. The Corporation and Corporate Actors as Profit-Maximizers

Corporations seem to be monetary profit-maximizing economic actors *par excellence*. The idea is mainly related to U.S. jurisprudence and the so-called “shareholder primacy.” Shareholder primacy states that corporations are obliged to maximize shareholders’ profits.¹²³⁷ Based on this narrative, corporate (environmental) crimes are portrayed as a consequence of prioritizing corporate profits over human health and life.¹²³⁸ The externalization of risks and uncertainties allows for securing short-term profits and economic expansion.¹²³⁹ If crime pays, its costs are added to the corporate balance sheet and become “part of doing business.”¹²⁴⁰ Correspondingly, the observance of corporate environmental crimes means that corporate environmental crimes “pay.” The legal policy approach to controlling and preventing corporate environmental crimes seeks to reverse this cost-benefit analysis by making corporate crimes unprofitable.¹²⁴¹

¹²³⁶ Cf. on “differential deterrence,” Hirtenlehner 2020. See further on models within social sciences Part 2.B.I.7.a.

¹²³⁷ “The bedrock principle of U.S. corporate law remains that maximization of shareholder value is the polestar for managerial decisionmaking,” Davis 1988: 8. Cf. also Friedman 1970. See also Hansmann & Kraakman 2001: 440 f.

¹²³⁸ Lee & Ermann 1999: 31.

¹²³⁹ Clinard & Quinney 1973: 216.

¹²⁴⁰ Starr 1986: 382.

¹²⁴¹ On the EPA’s approach to corporate environmental crime, cf. Starr 1986: 381 ff. On the German legal draft on corporate criminal liability, cf. Bundesministerium der Justiz und für Verbraucherschutz 2020: 1.

However, the doctrine of “shareholders primacy” mostly rests upon case law¹²⁴² and that its relevance varies across different legal systems.¹²⁴³ In fact, the corporation has broad discretion in defining its charter and purpose.¹²⁴⁴ Ideas such as corporate social responsibility (CSR) and sustainability are observable economic trends that are redefining the corporate purpose and contest the assumption of the corporation as a profit maximizer.¹²⁴⁵

Even if corporate objectives are changing, this work assumes a profit-maximizing corporate actor: The economic embedding of the company in a market regulated by a monetary price system and a state system based on state tax coercion¹²⁴⁶ subjects every company to a certain economic and profit-maximizing logic. Therefore, even alternative *a priori* non-economic approaches to corporate governance cannot entirely dispense with profit considerations.¹²⁴⁷ A reasonable corporate pursuit for revenue – at least to an economically self-sustaining extent – generally remains. It is further assumed that the incentive to maximize profits also applies to corporate decision-makers. The reason is that increasing corporate profit through violations of environmental regulation indirectly benefits the decision-maker through, for example, promotions or an increase in stock value if managers themselves are shareholders.¹²⁴⁸ Without

¹²⁴² See Michigan Supreme Court, *Dodge vs Ford Motor Company*, 204 Mich. 459, 170 N.W. 668, February 7, 1919. The case involved a decision by Henry Ford, who stated that the company’s primary interest was not to provide the highest return to shareholders but to focus more on charitable grounds, such as consumers through lowering product prices, or improving the lives of employees and society as a whole by creating jobs and raising wages. The court ruling, *obiter dicta*, included that a corporation is organized primarily for shareholder profit. For a more recent example, see Delaware Court of Chancery, *Domestic Holdings, Inc. vs Newmark*, 16 A.3d 1, September 9, 2010. The case likewise concerned the question of whether a corporation can be run primarily for communal interests, subordinating stockholder wealth maximization – which the court denied. See further critical, cf. Guenther 2017.

¹²⁴³ Roe argues that is dominating especially in the United States, while in Europe, shareholder values are viewed with greater skepticism in light of other societal values, Roe 2000: 2073 f. Different, Hansmann and Kraakman who argue that a shareholder-orientated model of corporation prevails in Europe, see Hansmann & Kraakman 2001: 468.

¹²⁴⁴ For instance, see the Delaware Code on Commerce and Trade on the nature of business: “Any limited liability company may carry on any lawful business, purpose or activity, whether or not for profit,” 6 DE Code § 18-106 (2016). Further, Guenther 2017: 456 ff.; Stout 2012: 4 ff. Stout argues that the conventional primacy of the shareholder can even be counterproductive when it comes to protecting the interests of all shareholders in the longer term. For example, the pursuit of profit maximization in a particular investment can lead to negative externalities, which in turn affects the value of another investment made by the same investor. For a revised view of corporate purpose that emphasizes leveraging the firm’s business model to create shared value for people and the planet, Rohr 2024.

¹²⁴⁵ The European Commission’s published a proposal for a directive on corporate sustainability obligations could provide an initial basis for a legal obligation with respect to sustainability for managing a corporation, cf. European Commission 2022. See also Henderson 2021: chap. 1. Henderson argues that the mindset within the corporate world is changing towards incorporating ideas of, among others, the public good and sustainability.

¹²⁴⁶ See on the role of taxes as a means for securing money as the main currency, Ehnts & Paetz 2019: 80.

¹²⁴⁷ Cf. on a Pareto-optimal conceptualization of CSR, aiming at increasing corporate profits and the welfare of additional stakeholders, cf. Hediger 2010.

¹²⁴⁸ Compare on private benefits, Piquero & Connolly 2014: 583. Also Alexander & Cohen 1999: 31 f. Alexander and Cohen find that corporate crime is less frequent where ownership and management are more strongly aligned.

any reasonable private profit in offending, there would not be an incentive to engage in crime and corporate crimes would not exist.¹²⁴⁹ Whether the reverse also applies, i.e., that corporate costs entail private costs, will be addressed in the context of corporate criminal liability.¹²⁵⁰

2. Corporate Actors as Rational Decision-Makers

Applying the rational choice theory to analyze corporate decision-making presupposes some “rational” incentive processing by corporate actors. Generally, one may say that corporate criminals are individuals of high status in economic and social terms.¹²⁵¹ The economic context requires informed, unemotional decisions and consideration of long-term consequences to secure reputation and profit.¹²⁵² It encourages goal-orientated thinking and behavior, indicating a reasonable rationality of corporate decision-makers.¹²⁵³ In addition, the instrumental and calculative context limits the risks of impaired cognitive abilities by high states of arousal, as typical for other crimes;¹²⁵⁴ while the corporate structure facilitates information-gathering on relevant costs and benefits.¹²⁵⁵ Corporate crime thus typically results from an instrumental and informed cost-benefit consideration and represents a “conscious choice;”¹²⁵⁶ it is not an end but a means to achieve a different goal, such as avoiding costly environmental regulation.¹²⁵⁷ Accordingly, corporate environmental crimes are arguably conscious business decisions since

¹²⁴⁹ See Part 1.C.III.2 on the definition of corporate crime of this work.

¹²⁵⁰ Part 4.E.III.3 and Part 4.E.III.4

¹²⁵¹ Braithwaite & Geis 1982: 302; Kadish 1963: 426.

¹²⁵² With regard to corporations, Braithwaite & Geis 1982: 302.

¹²⁵³ Starr argues that corporate crimes are “willful, deliberate, rational, premeditated and [...] with some forethought over a long period of time,” Starr 1986: 382. See also on a sufficient degree of rationality of human behavior in economic areas, Harsanyi 1977: 628. Cf. on the instrumental context and character of corporate crime, Braithwaite & Geis 1982: 302; Chambliss 1967: 712 f.; Kadish 1963: 426. Differently, Lee and Ermann, who analyzed the Ford Pinto case, in which gasoline tank safety regulation was disregarded and resulted in deaths and injuries. Based on internal documents and interviews, they argue that the incident was due to an organizational and institutional logic rather than a deliberate and intentional decision, Lee & Ermann 1999. The collective context is undeniably important, but may be included in a rational choice perspective; Part 4.B.II.4.b on bounded rationality.

¹²⁵⁴ Cf. the Yerkes-Dodson law, which states a U-shaped relationship between arousal and individual performance, suggesting that high emotional arousal impairs cognitive abilities and thus rational decision-making. See also Katyal, who therefore argues that crimes of passion may be harder to deter, Katyal 1997: 2428 f. For a typology of crimes based on their “deterrence potential” with “expressive” crimes being less deterrable, cf. Chambliss 1967: 712 f.

¹²⁵⁵ Braithwaite & Geis 1982: 302.

¹²⁵⁶ Cf. on corporate environmental crimes, cf. Starr 1986: 382 f.

¹²⁵⁷ Almer & Goeschl 2010: 708 fn. 1; Starr 1986: 382 f. See also Simpson et al. 2013: 261. Simpson et al. state that the decision to violate the law in cases of environmental corporate crimes was based on instrumental considerations.

the expected costs of violations are lower than those of compliance.¹²⁵⁸ The primary aim is thus monetary,¹²⁵⁹ allowing external specification of the rational choice model.

The assumption of a rational decision-maker justifies the use of rational choice theory to explain corporate crime and to align prevention measures accordingly.¹²⁶⁰ Increasing costs through more severe penalties can then reverse the cost-benefit analysis and encourage compliance.¹²⁶¹ The high status of the actor further increases the costs and efficiency of sanctions by risking substantial, additional intangible losses, e.g., social status, employment, or social relationships.¹²⁶² Informed and instrumental decision-making implies that corporate actors can also accurately adapt to a change in the cost-benefit structure associated with regulation by choosing a substitutive, less costly alternative for goal achievement. Substitution is more likely if the crime is not committed as a way of living.¹²⁶³ The profit-maximizing and calculative context of corporate (environmental) crimes, therefore, indicates that corporate (environmental) criminals are particularly amenable to deterrence and provide the basis for a legal deterrence policy.

3. Case Example: A Rational Choice Perspective on Violating Standards for NO_x Emissions of Diesel Vehicles

The economic assumption of a rational choice approach to crime can be illustrated based on the previous NO_x emissions example (Part 3.B.III.2.d):

Assume risk-neutral Managers M1 and M2 of car manufacturer M are informed about the NO_x emissions standard of 100 mg/km for diesel vehicles, specified in Regulation EC No. 1/1. Previously, manufactured vehicles emitted 500 mg/km. M1 and M2 inform engineers E1 and E2

¹²⁵⁸ Starr describes corporate environmental crimes as a “conscious choice to violate anti-pollution laws, rather than to comply with the law, simple because it is cheaper to pay a fine as a mere cost of doing business. Often the crime is exacerbated by a cover-up and concealment which was planned, prepared, and agreed to in a business-like fashion after a cost/benefit analysis was done,” Starr 1986: 382 f.

¹²⁵⁹ Kadish 1963: 426; Starr 1986: 382. Thus, the rational choice model is more plausible for white-collar crime than, for instance, for violent and emotional crime that involve mental impairment, cf. Miceli 2019: 25 f.

¹²⁶⁰ Piquero and Connolly observe that the rational choice perspective has been frequently applied to corporate crime, Piquero & Connolly 2014: 581. See on a classification of crimes in relation to their deterrence amenability; corporate crimes belong to the most deterrable, Chambliss 1967: 712–713.

¹²⁶¹ Cf. Almer & Goeschl 2010: 708. In 2010, Almer and Goeschl analyzed existing empirical data from a dataset of listed environmental crimes, prosecutions, court cases, and associated criminal sanctions in Germany (1995–2005) to examine whether the data confirm the hypothesis that criminal sanctions are an effective means of deterring environmental crime. The conclusion was that there is “clear evidence that the “calculus of deterrence” is indeed operational in the domain of environmental crime,” Almer & Goeschl 2010: 721. Cf. Part 4.B.I.1

¹²⁶² Punishment is most effective on individuals who are future-oriented and have more to lose within the social system, cf. Geerken & Gove 1975: 509. This implies a higher social status to lose, see Braithwaite & Geis 1982: 302.

¹²⁶³ I.e., deterrence is more efficient when the crime does not constitute a way of living, Chambliss 1967: 712–713.

and say they expect them to design a diesel vehicle that meets the new European NO_x emissions standard of 100 mg/km while remaining price attractive to a sufficient number of customers.¹²⁶⁴ This would make it possible to keep the company's profits high and increase their executive salaries, which include a fixed and a variable performance-related compensation based on business performance.¹²⁶⁵ E1 and E2 believe that installing costly emission control systems at 100 € per car is the only option. However, this would increase production costs and market prices and reduce the vehicle's price attractiveness to consumers.¹²⁶⁶ Thus, they propose to install a cheaper defeat device of 10 € per car instead. The software detects whether the vehicle is in test mode and lowers emissions, including NO_x levels. In everyday road use, the software activates a different mode in which exhaust gas recirculation only occurs to a lesser extent, leading to an emission level of approximately three times the codified maximum, i.e., 300 mg/km N. They inform the board managers M1 and M2 of their idea, who wonder about its legality. M1 starts calculating the expected utility¹²⁶⁷ of the two options for him and company M, simplified based on an assumed sales figure of 1 million cars.

Option 1: Compliance with emission standards.

The expected costs for M are the costs of the emission control systems of 100 € per sold car, occurring with a probability of 1. Since this corresponds to the expected business performance, M1 would not receive additional payments based on variable benefits.

$$EU_{legal} M = 0 \text{ €}$$

$$EU_{legal} M1 = 0 \text{ €}$$

Option 2: Violation of emission standards, with two possible outcomes.

a) Not getting caught

¹²⁶⁴ For comparison in the context of the diesel scandal, cf. United States District Court for the Eastern District of Michigan, *United States vs Volkswagen*, 16-CR-20394, December 18, 2018: para. 31 ff.

¹²⁶⁵ The latter includes customer satisfaction, employee satisfaction and sales growth (growth index), and return on investment, cf. Volkswagen Aktiengesellschaft 2016: 67 f. In 2015, Winterkorn's performance-related variable was 5.876.689 € and thus the highest among all members of the Board of Management, with a total compensation of 7.313.030 €, Volkswagen Aktiengesellschaft 2016: 69.

¹²⁶⁶ Exhaust gas purification measures increase production costs and consumption and thus CO₂ emissions, which influences fixed costs and thus the purchase price on the one hand, and maintenance costs (taxes, tank filling, etc.) on the other, cf. Klauer 2016.

¹²⁶⁷ Simplified utility assumption in terms of the expected profit; on expected utility maximization also Part 2.B.I.3.e.

The expected benefits of installing the defeat device for company M are M's profits from avoiding the more expensive emission control option, which is 90 € per car; thus, 90 million € for 1 million cars.

The expected benefits to manager M1 are 10% of the additional profit, which is 9 million €. M1 expects the probability of not being caught at 0.95, which leads to the following options:

$$EU_{illegal} M = 90 \text{ million €} * 0.95 = 85.5 \text{ million €}$$

$$EU_{illegal} M1 = 9 \text{ million €} * 0.95 = 8.5 \text{ million €}$$

b) Getting caught

If authorities detect the evasion of emission standards, M1 expects a corporate penalty of 10 million €, of which he would be charged 10%; the probability of being caught he assumes at 5%.

$$EU_{illegal} M = (90 - 10 \text{ million €}) * 0.05 = - 4 \text{ million €}$$

$$EU_{illegal} M1 = (9 - 1 \text{ million €}) * 0.05 = - 0,4 \text{ million €}$$

Combined, total expected utility of the option of circumventing the emission norms for M1 is

$$EU_{illegal} \text{ of M1} = 8.5 - 0,4 \text{ million €} = 8.1 \text{ million €}$$

This means that the expected utility to M1 of compliance is less than that of violating emission standards, i.e., $EU_{legal} < EU_{illegal}$; hence, M1, as a rational utility maximizer, decides in favor of violation, namely, to install the defeat device.

4. Bounds on the Rational Choice Model for Corporate Crime

Besides the reasonable assumption of a certain degree of rationality, corporate actors may also exhibit perceptual errors and other cognitive impairments.¹²⁶⁸ The extent to which these impairments apply will be addressed in order to investigate whether and how the rationality assumption of corporate offenders must be modified. The focus is on the individual corporate actor, understood as the main representative(s) in charge of decisions and actions.

¹²⁶⁸ For an analysis of the Enron case in this regard, Moohr 2003: 957 ff.

a. Bounded Self-Interest

The first bound to rationality concerns the assumption of self-interest. Economic actors embedded in competitive market structures are generally assumed to act in self-interest.¹²⁶⁹ However, in cases of corporate crimes, the (at least) dual agency structure implies a dual interest structure that deserves further consideration: Theoretically, the agency structure is defined by a self-interested agent embedded in a self-interested corporate principal, see Figure 25. Since the principal, representing the collective interest, cannot act for himself, he employs an equally self-interested agent who, at best, decides and acts on behalf of the collective. However, assuming that both – principal and agent – are self-interested utility maximizers, interest divergence and information asymmetry due to the externalization of action may encourage the agent to decide to the detriment of the corporate interest, the so-called “principal-agent problem” (cf. flashes in Figure 25).¹²⁷⁰

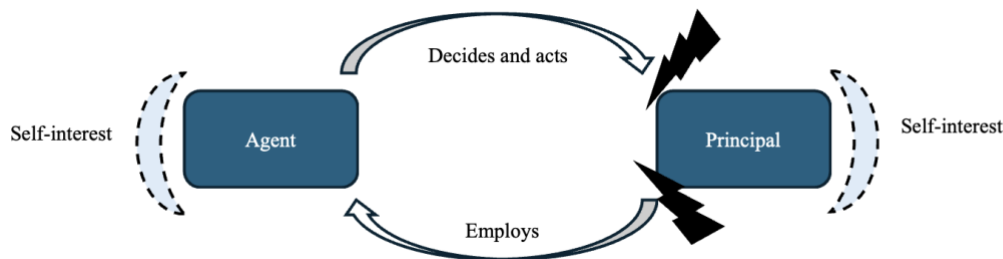


Figure 25 Principal-Agent Problem

The dual (or multiple) agent structure of corporate crimes complicates determining the interest that ultimately triggers the deviance,¹²⁷¹ and to what extent bounded self-interest plays a role. Thus, explanations of corporate (environmental) crime and its causal interest structure vary: One explanation is that the predominance of collective interest is core to corporate crimes.¹²⁷² From this perspective, corporate crime results from some degree of bounded self-interest on behalf of the agent. In contrast, another explanation posits that corporate crimes are agency costs, resulting from incomplete incentive alignment and the agent’s diverging and dominating self-interest.¹²⁷³ This would imply that bounded self-interest, if understood as the subordination of self-interest to

¹²⁶⁹ Janson 2004: 33; Kirchgässner 2013a: 48 f.

¹²⁷⁰ Bosse & Phillips 2014: 278. See further, Jensen & Meckling 1976. Also cf. Part 4.E.III.4.

¹²⁷¹ “How can corporate interest and self-interest be so easily distinguished?,” Paternoster 2016: 385.

¹²⁷² Clinard & Quinney 1973: 206 ff.; Gottschalk 2018: 111; Simpson et al. 2014: 8 f. Gottschalk, therefore, uses the term “occupational crime” to describe crime in pursuit of private interest. Van Erp notes that white-collar crime is generally used to describe crime committed for personal gain within a corporate structure, cf. van Erp 2018: 1 f.

¹²⁷³ For instance, see Alexander & Cohen 1999. See also Part 4.E.III.4.

the interest of the principal (subsidiary self-interest¹²⁷⁴), reduces corporate crimes as an agency cost. Bounded self-interest then matters if the agent considers aspects such as fairness or equality, which increase or decrease agency costs: if internal structures, such as monitoring, are perceived as fair, the agent may be more likely to act in the company's interest.¹²⁷⁵

Ultimately, specifying the interests of the actors involved requires, among other things, knowledge of the incentive structure and the associated costs and benefits of the action. In this respect, the specific corporate legal form as well as the agent burdened by the criminal sanction is central; while the former is beyond the scope of this work, the latter will be addressed.¹²⁷⁶

b. Bounded Rationality

Generally, the organizational context mediates the incentive structure and can lead to conditions that make rational decision-making less likely. Criminogenic organizational cultures and beliefs are thought to inhibit moral intuitions and normalize deviance.¹²⁷⁷ Subcultures and social norms combined with a detachment from external and law-abiding influences may foster divergence between external and internal social reality.¹²⁷⁸ Within this, intrinsic social normative structures can promote the learning of rationalization, neutralization, and justification techniques.¹²⁷⁹ For instance, narratives such as "everyone is doing it"¹²⁸⁰ can positively frame wrongdoing, especially when communicated from the top of the company.¹²⁸¹

In addition, if optimism, self-confidence, or extreme risk-taking are part of the corporate culture, rational decision-making is further inhibited, and "irrational" behavior, e.g., engaging in or perpetuating costly criminal acts, may be observed.¹²⁸² "Irrational" wrongdoing can also be encouraged if the corporate environment distorts risk perception or information processing.¹²⁸³ Group dynamics and social norms are thus crucial for compliance. This can mean that internal

¹²⁷⁴ See more profoundly on the relevance of different effects, such as culture or the institutional environment, and how they may relate to bounded rationality and self-interest, cf. Kostova et al. 2018.

¹²⁷⁵ Bosse & Phillips 2014: 285 ff.

¹²⁷⁶ Cf. Part 4.E.III.4.

¹²⁷⁷ Piquero & Connolly 2014: 581 f. For instance, on informal norms and criminogenic values and managerial propensity for corruption.

¹²⁷⁸ Simpson & Koper 1992: 367. Cf. on the Enron case, Moohr 2003: 963 ff.

¹²⁷⁹ Finding that neutralization technique had a significant impact on corporate offending, cf. Piquero et al. 2005: 181. For an elaborated study on different neutralization techniques, while not finding a significant difference between white-collar and other offenders, Stadler & Benson 2012.

¹²⁸⁰ Or "Obviously, we're all oil industry," cf. on state-corporate crime and the criminogenic industry structure of oil related to the 2010 BP Gulf of Mexico oil spill, cf. Bradshaw 2015.

¹²⁸¹ Piquero et al. 2005: 182 f.

¹²⁸² On the irrationality of corporate agents due to cognitive biases associated with traits such as narcissism, and applied to the Enron case, cf. Moohr 2003: 957 ff. and 965 ff.

¹²⁸³ Finding that legal sanctions did not entail any deterrent effect in a criminogenic organizational structure, see Piquero et al. 2005: 182.

subcultures generate and/or perpetuate a willingness to deviate even in companies with strong crime prevention structures.¹²⁸⁴

Another aspect of corporate (environmental) crime that impedes rational behavior is the abstraction of harm. The victims of corporate crimes are typically diffuse and less visible.¹²⁸⁵ Blurred causality of complex environmental processes¹²⁸⁶ and a time lag in the realization and perceptibility of harm¹²⁸⁷ encourage harm-abstraction. Abstraction of harm reduces awareness¹²⁸⁸ and inhibits moral intuitions.¹²⁸⁹ Abstraction may also be due to the complex corporate structure. Especially in larger corporations, detachment and distance between different working units may inhibit a sense of responsibility.¹²⁹⁰

The likelihood of limited rational decision-making may also be increased by “typical” characteristics of corporate offenders, such as narcissism, high self-confidence, and goal orientation.¹²⁹¹ Character traits, such as narcissism, may distort the perception of one’s performance in favor of a positive self-image¹²⁹² and promote risky¹²⁹³ and potentially criminal decision-making. Fear of failure and loss aversion can further encourage an irrational continuation of costly deviance.¹²⁹⁴

Limited rationality may also result from the principal-agent structure; for example, nonspecific instructions from the principal and limited information processing on behalf of the agent can foster misunderstandings.¹²⁹⁵

¹²⁸⁴ For instance, with respect to managerial corruption propensity, Hermann et al. 2019.

¹²⁸⁵ Arlen 2012: 163. As Braithwaite and Geis observe: “A million one-dollar victimizations will not generate the kind of public visibility that a single million-dollar victimization will,” cf. Braithwaite & Geis 1982: 295.

¹²⁸⁶ Related with synergetic and additive effects, Starr 1986: 383. As well as the general fact that sciences is expressed in probabilities, not in certainty, cf. Braithwaite & Geis 1982: 299.

¹²⁸⁷ Faure et al. 1996: 554. Cf. also Starr 1986: 383.

¹²⁸⁸ Corporate criminals commonly contest that they did not know about the detriment caused, Clinard & Quinney 1973: 213. Whether this is merely a defense strategy or whether it reflects their actual level of awareness will not be discussed further and assumingly varies from case to case.

¹²⁸⁹ Behavioral and neuroscientific evidence suggests that the abstract and elusive nature of climate change complicates emotional responses and prevents the formation of moral intuitions, Markowitz & Shariff 2012: 243 f.

¹²⁹⁰ Compare van Erp 2018: 3.

¹²⁹¹ For example, the meta-analysis on narcissism at the top management level conducted by Cragun et al. 2020.

¹²⁹² Guedes 2017: 184.

¹²⁹³ Chatterjee & Hambrick 2007: 357 f.

¹²⁹⁴ When mistakes are made, such loss aversion may lead to increased efforts to cover up the same mistake thereby exacerbating the associated negative utility effects, Schulman 1989: 35 ff. See also the Madoff case, which shows that fear of negative consequences, such as a bad reputation and the admission of economic failure, encouraged irrational behavior, van de Bunt 2010: 446 ff.

¹²⁹⁵ This gives an alternative explanation for agency costs that goes beyond the assumption of self-interest, cf. Hendry 2002: 100 ff.

c. Bounded Willpower

Bounded willpower or low self-control are common approaches to explaining street crimes and other forms of deviance. The corporate criminal typically does not fit this picture. Nevertheless, bounded willpower and the imbalance of short and long-term consequences of criminal conduct are equally crucial to corporate criminal decision-making in two ways: while the gains from the violation are immediately tangible through circumvention of direct regulatory compliance costs, any benefits from compliance, such as a long-term competitive advantage, are distant. Concerning crime-reducing compliance measures, directly perceptible compliance costs associated with distant benefits may lead to the postponement of compliance measures (“compliance procrastination”).¹²⁹⁶ Counterintuitively, if the short-term costs of initiating the criminal activity exceed its expected long-term benefits, hyperbolic discounting may also lead to its deferral.¹²⁹⁷

d. Case Study: Bounded Volkswagen Corporate Rationality?

The example of Volkswagen’s diesel scandal can be used to deepen some of the theoretical aspects outlined. Within the company, the corporate culture and structure are said to be central to the decision to engage in misconduct: The tone from the top of Ferdinand Piëch and Martin Winterkorn is described as criminogenic, placing high expectations and demands on subordinate managers and engineers, which may have led to performance pressure and encourage deviations from legal standards.¹²⁹⁸ In addition, strict hierarchical principles and a rudimentary compliance system assumingly contributed to the misconduct.¹²⁹⁹

Volkswagen’s elaborations on the diesel instance in the Annual Report 2015 indicate limited rationality in the form of underestimation of the expected costs in some parts of the company: Initially, the board members, dealing with the notification of illegality of the defeat device by the Environmental Protection Agency (EPA), considered the handling and resulting costs (such recall, launch payment, retrofitting costs) to be manageable. Accordingly, the EPA’s “Notice of Violation” of September 18, 2015, is said to have come as a surprise and to have unexpectedly changed the scope of the case and the associated cost risks.¹³⁰⁰

¹²⁹⁶ On the temporal divergence of benefits and costs associated with corporate crime and compliance expenditures, Utset 2012.

¹²⁹⁷ Utset 2012: 312 f.

¹²⁹⁸ Spapens 2018: 100–102.

¹²⁹⁹ Spapens 2018: 102–105. See also United States District Court for the Eastern District of Michigan, *United States vs Volkswagen*, 16-CR-20394, December 18, 2018: para. 31 ff.

¹³⁰⁰ Volkswagen Aktiengesellschaft 2016: 52, 173.

Concerning the interest and benefit structures, the pursuit of profit through market dominance appears to serve both – the agent’s (management) and the principal’s (stakeholders) interests – by increasing share value¹³⁰¹ and performance remuneration.¹³⁰² The latter can be seen as a means of interest alignment between the principal and the agent.¹³⁰³ In this respect, performance remuneration may also encourage unethical behavior and risk-taking, which increases the likelihood of corporate misconduct;¹³⁰⁴ and if the illegality is discovered and publicly announced, it may ultimately be detrimental to the long-term principal’s interest through a loss in share value and reputation.¹³⁰⁵ The moment of publication thus somewhat changes the interest structure by changing related costs and benefits.¹³⁰⁶

5. Interim Statement

The economic context of corporate agents indicates a certain profit orientation that guides utility-maximizing behavioral choices. Goal-orientated, instrumental, and informed decision-making on behalf of the corporate agents speaks in favor of the feasibility of the rationality assumption. Accordingly, corporate criminals seem especially amenable to deterrence policies based on increased costs by legal sanctioning.

However, like other actors, corporate actors may suffer from cognitive biases and limitations, potentially distorting intended legal incentives. The organizational context creates a complex environment that mediates incentives and is thus central to individual decision-making and performance. Within this, bounded rationality may be encouraged by a criminogenic corporate culture, the abstraction of harm related to the corporate embedment, or the general diffuse victimization in environmental crime cases. Furthermore, bounded self-interest is a notable element as it may encourage corporate crime if understood as resulting from an overriding collective interest. Reversely, it may also discourage crime if the agent’s divergent and overriding self-interest is seen as causal to corporate crime. Difficulties in determining whose interests are

¹³⁰¹ Cf. especially the increase in stock value in 2009 and 2010, *Volkswagen Vz Aktie* n.d.

¹³⁰² Volkswagen Aktiengesellschaft 2016: 69 ff.

¹³⁰³ See further on the interest structure inherent in the principal-agent-relationship and the use of payments to align potential interest divergencies, Part 4.B.II.4.a and Part 4.E.III.2.

¹³⁰⁴ See on a study, finding that corporate fraud is more likely when executives are paid with significant variable pay components which can incentivize risky business conduct and short-term orientation, L. Li et al. 2018.

¹³⁰⁵ Bouzzine & Lueg 2020. While the aspect of reputational losses is particularly debated in cases of corporate environmental wrongdoing, cf. fn. 1861.

¹³⁰⁶ Cf. Bouzzine & Lueg 2020: tpls. 1, 2. Especially the announcement of the scandal through the notice of violation by the EPA had a detrimental effect on the cumulative abnormal return, which is the sum total of abnormal returns and allows to measure the effect of lawsuits and other events on the stock value. For further elaborations on corporate internal interest alignment, Part 4.E.III.2.

ultimately criminogenic complicate clarification and are related to difficulties in determining who bears costs and benefits, as well as the debate over the definition of corporate crime.¹³⁰⁷ However, corporate interests may only be served in the short term; in the long term, corporate misconduct appears to harm the company as a collective entity, while private interests and profits remain unaffected. Analytical limitations persist due to the difficulties concerning the determination of interests and incentive structures when a larger number of actors is involved – as it is typical for corporate offenses.

Ultimately, whether or not the economic model of human behavior and its methodological value can be sustained, and if so, to what extent, is an empirical question. While the importance of behavioral law and economics cannot be denied, incorporating their frameworks and ideas requires knowledge of highly individual and time- and context-independent factors – such as, the corporate culture, the individual’s personality traits or reference points. Given the need for abstraction and generality in legal rules, such highly individualized approaches to legal rule design are rather impractical. The analysis proceeds with the classical rationality framework and the assumption of predominantly material and monetary utility maximization of corporate actors – as “even though suffering from some weak aspects which we have identified, is still the best approach to law enforcement.”¹³⁰⁸ The rational choice theory provides the decision-theoretic basis for the next part of the analysis, the normative level of the economic analysis of criminal law, which deals with the function of an optimal enforcement policy and its subsequent design.

III. The Normative Efficiency Function of Criminal Law: Preventing Crime as (In)Efficient Activity

From an economic perspective, the desirability of regulating crime results from its inefficiency by causing undesirable social costs. These social costs arise from non-consensual harm to individuals and/or society.¹³⁰⁹ They can be divided into direct costs to the victim(s) (minus benefits to the offender)¹³¹⁰ and indirect costs in terms of resources invested in protection and enforcement by the victim and the state. The normative level of the economic approach to law

¹³⁰⁷ See on conceptualizing corporate crime, Part I.C.III.2.

¹³⁰⁸ Garoupa 2003: 12.

¹³⁰⁹ Bowles et al. 2008: 396 f. For instance, beyond direct harm to victims, crime causes costs in terms of preventative costs, Harel 2014b: 301. And on secondary mischief, Bentham 1988: 153 ff.

¹³¹⁰ The net value is the lost not redistributed, see Cooter & Ulen 2012: 474. The traditional approach incorporates the gain of the offender positively into the social welfare function, see further on this in Part 4.C.

analyzes these costs from a social welfare perspective guided by the efficiency principle.¹³¹¹ Accordingly, criminal law and law enforcement ought to be designed to minimize crime's social costs.¹³¹² The related normative questions of analysis include (1) which acts constitute crimes, i.e., whether the activity in question causes social harm and requires regulation, (2) what is the optimal level of regulation/deterrence, (3) how enforcement can be most efficiently implemented, i.e., what regulatory instrument should be used and how should it be structured.¹³¹³ The focus on reducing aggravated social loss stems from a classic utilitarian public policy approach.¹³¹⁴ An attempt is made to rationalize deterrence based on economic considerations by providing an efficiency argument for harm reduction.¹³¹⁵

The operationalization of the economic approach mainly goes back to Becker and has been developed and amended since then. An entire account of the economic approach to criminal law is beyond the scope of this work. Rather, the focus will be on the main approaches that serve the research interest of this work; namely, the ideas of Becker, providing the basis of the economic approach, and the work of Posner, who proposed a different perspective on crime and the corresponding function of criminal law and punishment. Keith Hylton aligned the two assumingly opposing approaches of Becker and Posner and will complement the two-perspective analysis.

In the following, the economic perspective on the characteristics of a crime (what behavior should be criminalized?) is examined. This leads to the function (question 1) and design of criminal punishment (relating to question 2, what is the aim of criminal law and sanctions, and how may this be realized?), cf. Figure 2 and Figure 1, as well as Part 1.C.II. It will be seen that Becker's and Posner's approaches differ and that the superiority of either framework raises normative questions, questions to which economics cannot provide a satisfactory answer and which require supplementation by legal analysis. For this, the institutional perspective of criminal law will be applied to gain a broader understanding of the relation between the normative social order and criminal law, i.e., of the social function of criminalizing (corporate) harmful environmental activity. Subsequently, Becker's and Posner's approaches will be applied to corporate environmental crime and interpreted based on the entitlement and protection structure

¹³¹¹ "The general problem of public law enforcement may be viewed as one of maximizing social welfare," Polinsky & Shavell 2007: 406. See also Ehrlich 1982: 3.

¹³¹² Cf. Harel 2012: 12. Compare also Fischer 2014: 39 f.

¹³¹³ See Raskolnikov 2020: 27. I.e., which acts to criminalize and how, cf. Bowles et al. 2008: 390. How to criminalize may also include aspects such as the required mental state for conviction, cf. Harel 2012: 12.

¹³¹⁴ Ehrlich 1982: 3.

¹³¹⁵ S. Werner 1992: 437. Cf. also Hylton 2018: 2517. Hylton states that the economic approach provides for a "comprehensive account of rational punishment theories."

of environmental regulation as developed through environmental economics (compare specifically on standards, Part 3.B.III.3) and the legal institutional analysis. This allows for tailoring the general economic analysis of (environmental) regulation to (corporate) environmental crime and, with this, to the research questions of interest.¹³¹⁶ The theoretical analysis will be supplemented by and applied to the NO_x Case Example, exemplifying its practical meaning.

1. (In)Efficient Crimes and Optimal Deterrence – Gary S. Becker

Becker is the assumingly most influential thinker in economic approaches to criminal law and criminal behavior. Becker made an efficiency-oriented criminal policy measurable by translating relevant variables into monetary units and establishing their mathematical relationships within a social welfare function. Becker understood criminal behavior as a “subset of the class of activities that cause diseconomies”¹³¹⁷ in the form of externalities.¹³¹⁸ Crimes are not different from other economic activities that cause external social harm.¹³¹⁹ The social harm of crime is defined by its direct and indirect costs, and an efficiency-guided crime policy aims to minimize them.

a. The Scope of Criminal Law: Crimes as Externalities and Optimal Crime Levels

i. Direct Costs: Social Net Damage $D(O)$

The net damage D is the direct harm of the crime related to the number of offenses $H(O)$ ¹³²⁰ less the gain to the offender per number of offenses $G(O)$:¹³²¹

$$D(O) = H(O) - G(O)$$

The offender’s gain is incorporated positively into the social welfare function as Becker assumes an equal social value of the criminal’s gain.¹³²² This implies that crimes in which the criminal’s

¹³¹⁶ Figure 2 and Figure 1, Part 1.C.II.

¹³¹⁷ Becker 1968: 173.

¹³¹⁸ Understanding crime from an externality perspective is by far the most represented approach, see, *inter alia*, Faure & Visser 2004; Fischer 2014: 50 f.; Harel 2012; Miceli 2019: 23 ff.

¹³¹⁹ Becker 1968: 201.

¹³²⁰ Harm can be material or immaterial, cf. Greenberg 1979: 304.

¹³²¹ Harm and gain are depending on and assumingly positively related to the number of offenses (O), Becker 1968: 173; Greenberg 1979: 304.

¹³²² Cf. Becker 1968: 173. See further on a legal perspective and the normative limitations of the economic approach in this respect, Part 4.C. The indifference approach to utility is based on strictly utilitarian thinking, which aims to increase the utility of all members of society without making further normative distinctions, Miceli 2019: 29.

gain exceeds the victim's losses ($G(O) > H(O)$) are socially beneficial and ought not to be regulated.¹³²³ However, when the expected harm of the action is greater than the expected gain and enforcement costs are not too high, the action should be deterred.¹³²⁴ The associated indirect social costs of enforcement and punishment then define the desirability of deterrence.

ii. Indirect Costs of Crime: Enforcement and Punishment

The Costs of Enforcement: Apprehension and Prosecution $C(p, O)$

The costs of apprehension and prosecution (C) are positively related to the activity level of law enforcement and include personal resources, such as police, and prosecutors, and material resources, for instance, surveillance supplies.¹³²⁵ They generally increase with the probability of punishment (p) and the number of offenses (O). In turn, an increase in p assumingly leads to a decrease in O , decreasing C .¹³²⁶

The Costs of Punishment ($bpfO$)

The social costs of punishment are the sum of the costs to the offender (f) and the costs, respectively the gain, to other members of society (f^s). In the case of fines, assuming zero collection costs, the social costs are zero as fines constitute a mere transfer of value from the offender to society.¹³²⁷

In the case of non-monetary punishment, e.g., imprisonment or parole, private costs to the offender are commonly much greater, measured by the loss of earnings and the constraints on freedom and consumption.¹³²⁸ Both variables vary between different punishment forms, duration, and subjects and generally increase with imprisonment duration.¹³²⁹ They are assumingly inversely related to the offender's age:¹³³⁰ The younger the offender, the greater the attached values and, thus, personal imprisonment costs.

¹³²³ Harel 2014b: 301; Miceli 2019: 32. See also Raskolnikov 2020: 17. This changes when the offender's investment in committing the crime and the victim's investment in preventing it are incorporated since such investments mean that criminal behavior can cause social harm even when the immediate criminal gain exceeds the immediate harm to the victim, Harel 2014b: 301.

¹³²⁴ Harel 2014b: 301.

¹³²⁵ Becker 1968: 174. For methodological reasons, Becker reduced the costs of enforcement to the variable p .

¹³²⁶ See further Entorf 1999: 7. Entorf consequently assumes a positive relationship between C and p , meaning that the increase in the cost of enforcement due to an increase in enforcement expenditures outweighs the costs saved by a decrease in the number of offenses.

¹³²⁷ Becker 1968: 193 f.

¹³²⁸ Becker 1968: 179.

¹³²⁹ Becker 1968: 179 f.

¹³³⁰ Becker 1968: 180.

In addition, non-monetary punishment means significant social costs relating to, *inter alia*, the costs of prison maintenance or the temporary loss of a potentially productive workforce. The social costs of non-monetary punishment commonly exceed its costs to the offender and are represented by the coefficient b , transforming the costs to the offender (f) into social costs (f^s). In the case of fines, $b \cong 0$; otherwise, $b > 1$.¹³³¹

$$f^s = bf$$

The social costs of non-monetary punishment increase with the number and probability of punishment ($bpfO$).¹³³²

iii. Social Loss Function

The social loss components aggregate into a social loss function (L):

$$L = D(O) + C(p, O) + bpfO$$

An efficient crime policy aims to minimize L . The policymaker can do this by reducing the enforcement costs (C), the offender's direct cost (f), and the form of punishment (b).¹³³³ Among others, for reasons of analytical reduction, Becker assumes b to be zero and concentrates on p and f .¹³³⁴ The number of offenses (O) is the paramount variable, increasing all social loss components in the form of damage, enforcement, and punishment costs. Assuming a negative correlation between the number of offenses (O) and the level of sanctions (f) and probability of punishment (p), the policymaker can indirectly regulate O , and thus all three cost components, by regulating p and f . However, an increase in p also increases C , and an increase in f increases $bpfO$.¹³³⁵

Therefore, the costs saved must be considered relative to the costs caused. The general economic rule on production specifies that the relationship between the cost reduction effect of each increasing unit of p and f , the marginal revenue (MR , and its cost-increasing effect, the marginal

¹³³¹ Becker 1968: 179 ff.

¹³³² Becker 1968: 180. See also Greenberg 1979: 305.

¹³³³ Becker 1968: 181.

¹³³⁴ Becker 1968: 181.

¹³³⁵ For a helpful overview on the relation of the enforcement variables, Entorf 1999.

cost (MC) – portrayed in Figure 26 – defines the optimal level of p and f . Optimality is where the marginal costs and revenue intersect,¹³³⁶ represented by the dotted line, see Figure 26. At any level below, the marginal revenue increases disproportionately to the marginal costs and *vice versa*.¹³³⁷

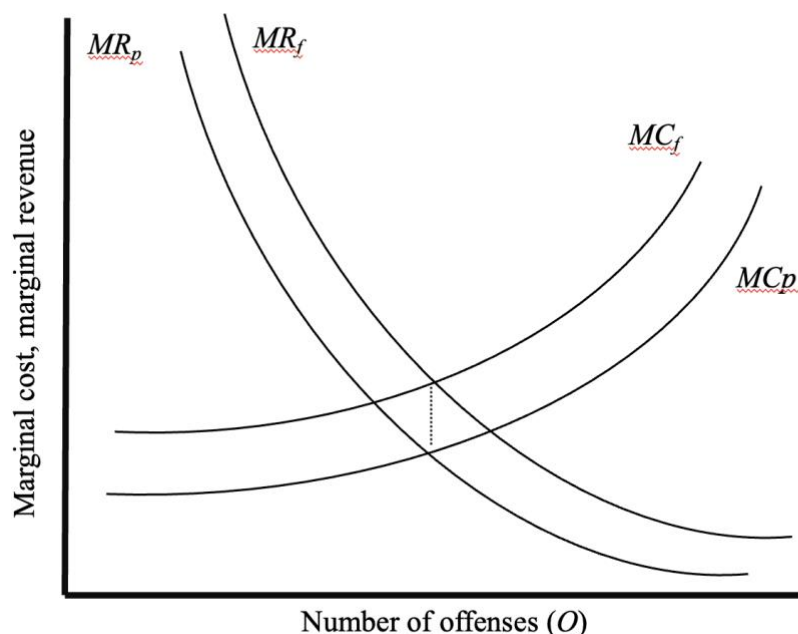


Figure 26 Optimal crime enforcement¹³³⁸

b. The Function of Criminal Law: Optimal Deterrence of Externalities by Internalization

Understanding crime as a subcategory of social activities that generate externalities implies that the economic approach to their regulation is the same the approach to regulating externalities, i.e., correcting behavioral inefficiencies by internalization.¹³³⁹ Welfare is maximized since internalization assures “that a criminal offender takes an offensive action only when the gain he experiences is greater than the harm he imposes on society.”¹³⁴⁰ In line with this, Becker considered the primary function of criminal sanctions to optimize the crime and criminal activity level by pricing the behavior at the level of social harm.¹³⁴¹ A rational offender will engage in the “priced” conduct – crime – if the (expected) benefits exceed the (expected) costs. The

¹³³⁶ Becker 1968: 181, 183; Entorf & Spengler 2005: 13 f.; Greenberg 1979: 303.

¹³³⁷ Entorf 1999: 7 f.

¹³³⁸ The figure is based on Becker 1968: 182.

¹³³⁹ Miceli 2019: 23 f.

¹³⁴⁰ Hylton 2019: 6.

¹³⁴¹ The level of sanction is the quotient of the level of harm and the probability of detection, $S = H/p$, cf. Hylton 2019: 6. See also Miceli 2019: 24, 32. Miceli calls this approach the “punishment-as-price paradigm.”

internalization approach dispenses with complete deterrence by providing incentives for assumed welfare-enhancing crimes to continue, i.e., when private benefits exceed social losses.¹³⁴²

Taking the previous bike example (Part 3.A.I.2.a.i) and supposing a probability of conviction of 1: A has a bicycle he values at \$10, and B values the bicycle at \$20. The theft would be efficient because B values the bicycle more than A, and social welfare increases by \$100. The penalty amount should be set at the amount of the loss, which is \$10. A rational B will commit the crime. If the values are reversed and A values the bicycle at \$20, the theft is inefficient (decreases social welfare by \$10), and a sanction of \$10 discourages B. Setting the penalty at the level of social harm is to deter only “low valuing” thieves and inefficient transfers (thefts).¹³⁴³

As outlined above,¹³⁴⁴ the social crime costs include indirect costs associated with their enforcement. Complete internalization requires the offender to be charged with these indirect costs. Then, the amount of an optimal sanction equals the direct damage plus the indirect enforcement costs. The sanction fully compensates harm to direct victims and society – if optimally scaled.¹³⁴⁵

For example, suppose A has a bicycle that he values at \$10, and B values the bicycle at \$20. The enforcement cost is \$5 with a conviction probability of 1. Complete internalization is achieved at a sanction level of \$15, and the theft is efficient because it creates a social surplus of \$5. When the costs of enforcement and punishment are \$15, and the sanction level is \$25, B is deterred, and a deadweight loss of \$5 is prevented. Thus, while in both examples, B’s theft causes external harm (to the victim and society), the internalization approach means that causing a deadweight loss determines the desirability of prevention.¹³⁴⁶ The aim of deterrence is not abandoned but follows in cases of inefficient crimes, i.e., when social costs outweigh (private) benefits.

2. (In)Efficient Crimes and Complete Deterrence – Richard A. Posner

a. The Scope of Criminal Law: Crimes as Market-Bypassing

Posner’s approach to crime also applied economic concepts and thinking to criminal law but differs in terms of the economic rationale for the inefficiency of crime, which then affects the scope of its regulation. Posner justified the desirability of criminalization based on the free

¹³⁴² Becker 1968: e.g. 204. Hylton 2019: 6.

¹³⁴³ Hylton 2005b: 178.

¹³⁴⁴ Part 4.B.III.1.a.ii.

¹³⁴⁵ Compare Becker 1968: 192.

¹³⁴⁶ Whether the behavior is “anti-social,” cf. Harel 2012: 14; 2014b: 301.

market ideal as the most efficient allocation mechanism when transaction costs are low;¹³⁴⁷ cf. on wealth maximization Part 2.B.II.3. Within the market system, crimes represent coerced transfers of resources (of wealth) and bypass market structures.¹³⁴⁸ Markets can be either explicit, as in the case of theft and “acquisitive” crimes, or implicit, such as rape and crimes of passion.¹³⁴⁹ Both types of crimes are coercive transfers and, in general, unproductive. Posner provided several reasons for their inefficiency. First, the victim’s disutility of crime usually exceeds the offender’s utility, resulting in negative net social utility.¹³⁵⁰ Moreover, the offender derives his utility from the disutility of others, so welfare measured in wealth does not increase – at least not in a Pareto-efficient manner.¹³⁵¹ Second, crimes bypass “the source of the ethical appeal of market systems”¹³⁵² based on voluntary losses by compensating those who depart from something. Assuming rational actors, voluntary market transfers guarantee Pareto efficiency to the extent that market actors realize only beneficial transfers.¹³⁵³ The bypassed voluntary transfer must not necessarily be between the victim and the perpetrator. For instance, in the case of theft, the bypassed market exchange is commonly not between the victim and the thief because the thief is usually not interested in the good itself.¹³⁵⁴ Instead, he is interested in exchanging the stolen good(s) for money as an alternative source of income,¹³⁵⁵ thereby circumventing the labor market.¹³⁵⁶ Another reason for the inefficiency of crime is that allowing coercive transfers encourages welfare-detrimental investments in self-protection by potential victims (e.g., bicycle lock) and in overcoming measures by likely offenders (e.g., bolt cutter).¹³⁵⁷ Moreover, certain crimes of passion, such as murder, are inefficient as they circumvent legal ways to achieve the same goal at lower social costs, such as suing the victim.¹³⁵⁸ Overall, the main reason for the inefficiency of crime is its circumvention of the efficiency-guaranteeing market mechanism based on free and voluntary exchange. From this line of

¹³⁴⁷ Posner 1985b: 1192.

¹³⁴⁸ Posner 1985a: 311.

¹³⁴⁹ Posner 1985b: 1196 ff.

¹³⁵⁰ While Posner admits that comparing the utilities of the victim and the offender exceeds the boundaries of economics, Posner 1985b: 1197.

¹³⁵¹ “If *A* kills *B* because the resulting disutility to *B* confers utility on *A*, the wealth of the society is not increased even in the unlikely event that the total amount of human happiness is increased,” emphasis adopted, cf. Posner 1985b: 1197.

¹³⁵² Posner 1985b: 1197.

¹³⁵³ On Pareto efficiency Part 2.B.II.1 and the ethics of wealth maximization, Part 2.B.II.3.

¹³⁵⁴ Posner 1985b: 1197.

¹³⁵⁵ Posner 1985b: 1196.

¹³⁵⁶ Posner 1985b: 1196.

¹³⁵⁷ Posner 1985b: 1196, 1198.

¹³⁵⁸ Posner 1985b: 1198.

reasoning, criminal law and punishment function to prevent market circumvention and direct transactions into the market system to ensure the Pareto-efficient exchange of resources.¹³⁵⁹

b. The Function of Criminal Law: Complete Deterrence of Market-Bypassing by Gain-Elimination

In order to deter market evasion, the criminal must be made worse off. The ideal sanction is gain-based and must be greater than the actual gain to ensure the inefficiency of the evasion and make compliance with existing market structures a more advantageous alternative.¹³⁶⁰

Take previous example of theft as classic market avoidance (Part 3.A.I.2.a.i): A has a bicycle that he values at \$10, and B values the bicycle at \$20. Under free negotiation, the highest price A could demand is \$20, and the ZOPA would be \$10 (A demands at least \$10, and B pays at most \$20). A transfer from A to B can increase social welfare by a maximum of \$10, compare Part 3.A.I.2.a.i and Figure 18. B now decides to steal the bicycle, thereby circumventing the voluntary and compensated transfer with A. Punishing B with a fine of \$10 (equal to A's harm) with a probability of 1 would imply an expected benefit of \$10 and encourage B to steal the bicycle. With a fine of \$20, B would be indifferent between stealing and buying the bicycle. Thus, the fine must be greater than B's gain.¹³⁶¹

Now assume that B values the bike at \$10. In theory, a fine of \$11 would suffice to deter B from stealing. In practice, however, it is difficult to define subjective values and sanctions at the level of personal gain or loss. Therefore, to prevent B from stealing the bicycle to obtain market revenue from selling the bicycle, the penalty must also be higher than the market value.¹³⁶²

Posner did not deny the efficiency of crimes altogether but related their inefficiency to the availability of market transfers with low transaction costs.¹³⁶³ For example, suppose A is in a

¹³⁵⁹ See Posner 1985b: 1202. "The major function of criminal law in a capitalist society is to prevent people from bypassing the system of voluntary, compensated exchange," cf. Posner 1985b: 1195. Raskolnikov calls acts causing a non-consensual transfer and additional transaction costs as *per se* inefficient acts, namely "irredeemable inefficient acts," Raskolnikov 2014: 1151. See in this regard on the economic (in)efficiency of tax avoidance techniques, which are – in the first instance – a zero-sum game but cause inefficiencies due to e.g., additional (transaction) costs, cf. Osterloh-Konrad 2019: 545 f.

¹³⁶⁰ Cf. Posner 1985b: 1201 f. Also Posner 2014: 259. Similar to Beccaria and Bentham, see Beccaria 1819: 94. As well as Bentham referring to Beccaria, cf. Bentham 1988: 179.

¹³⁶¹ Posner 1985b: 1202. A similar approach can be found in the work of Calabresi and Melamed, who argue that relying solely on profit would transform the protection of the entitlement "the bicycle" from a property rule into a liability rule. Since, in most cases, the efficiency of the theft cannot be determined because individual values are unknown (not disclosed in the market), there must be "an undefinable kicker" added to the gain, cf. Calabresi & Melamed 1972: 1126.

¹³⁶² Posner 1985b: 1202. Also, the punishment of deliberate crimes should be higher than that of impulsive crimes as they are more easily to be deterred, cf. Posner 2014: 276.

¹³⁶³ Posner 1985b: 1205 f.

desert and is on the verge of dying of thirst. He is willing to pay \$200 for a bottle of water. He passes by the house of B, who has a well in his backyard, and B is willing to sell A a water bottle for \$20. The transfer of the bottle from B to A would increase social welfare tenfold. However, B is not at home, and the transaction costs are prohibitive. A steals the bottle. From a social welfare perspective, a transfer is still (Kaldor-Hicks) efficient. Legal exceptions may provide relief in such cases of prohibitive transaction costs and efficiency-enhancing crimes.¹³⁶⁴

Other situations in which full deterrence is undesirable are when generally efficient behavior is at risk of an accidental violation of criminal law or a mistake of law. Excessively high sanctions could discourage people from engaging in potentially socially desirable behavior. Sanction levels and legal approaches need to consider such scenarios, and optimal sanction levels may be lower than deterrent sanctions.¹³⁶⁵

3. Modern-Synthesis – Keith N. Hylton

The internalization approach of Becker and the deterrence approach of Posner seem contradictory at first glance. Keith Hylton synthesized and extended them by incorporating Calabresi and Melamed's ideas of entitlement structures and different modes of regulation in different areas of law.¹³⁶⁶ Hylton (2005/2019)¹³⁶⁷ evaluated deterrence and internalization as goals of criminal law under two different scenarios: (1) the market is unavailable, understood as transaction costs are prohibitive; (2) the market is available, i.e., transaction costs are low.¹³⁶⁸ He showed that the two approaches could work in a complementary way while defining conditions in favor of complete deterrence.

a. Market Unavailable: Internalization and Optimal Deterrence

Assume that the victim owns a car that he values at \$1000. Thieves are willing to steal the vehicle; some value the car at \$1200, while others at \$800. Further, suppose that the state will enforce theft at \$100. Becker's optimal penalty suggests setting the sanction level at the level of social costs, which is the harm to the victim of \$1000 plus the harm to society in the form of enforcement costs of \$100, i.e., \$1100. Assuming a probability of conviction of 1, the

¹³⁶⁴ Posner 1985b: 1205 f.; 2014: 259 f.

¹³⁶⁵ Posner 1985b: 1206.

¹³⁶⁶ Calabresi & Melamed 1972. Cf. on property rules Part 3.A.I.2.a.iii and on liability and inalienability rules, cf. Part 3.A.IV.2.

¹³⁶⁷ Hylton 2005b; 2019.

¹³⁶⁸ See also on the concepts market, transaction cost, and property rights relevant in this respect, Part 1.C.III.4.

internalization approach incentivizes the high-valuing thieves (\$1200) to steal the car while deterring low-valuing thieves (\$800).¹³⁶⁹

The change in social welfare by either theft can be seen in Table 12:

Table 12 Change in social welfare by theft of low- and high-valuing thieves

Value of thief	\$1200	\$800
Social costs (Victims loss + enforcement costs)	- \$1100 (\$1000+\$100)	- \$1100 (\$1000+\$100)
Change in social welfare	+ \$100	- \$300

From an economic point of view, theft may thus be a socially desirable activity. In cases of prohibitive transaction costs, legal protection of entitlements is best served by liability rules. Liability rules do not generally prohibit a behavior but make its allowance conditional on subsequent compensation to the victim.¹³⁷⁰ In the example above, an \$1100 enforced penalty would allow compensation for the victim and enforcement costs. If only low-valuing thieves exist, any transfer is socially undesirable, and complete deterrence is preferable. The preferred protection structure is a second form of property rules (type 2), taking effect when transaction costs are high and the direct private benefit is less than the victim’s direct harm, so the goal is to stop the activity.¹³⁷¹

b. Market Available:¹³⁷² Complete Deterrence

Suppose the same scenario but under market availability. Now there are two main arguments for the efficiency superiority of a policy of full deterrence. The first relates to the social surplus created by a voluntary market transfer and supports Posner’s argumentation for the welfare superiority of market transfers.¹³⁷³

Assume that the victim and potential thieves can bargain at the cost of \$10 to each party (including contract paper, paying to get to the bargaining location, etc.). The victim’s minimum WTA is \$1010 (value attributed plus transaction costs). Thus, only high-valuing thieves would engage in the transfer with a maximum WTP of \$1190 (attributed value minus transaction costs). The social surplus generated by a market transaction is \$180, the gain to the buyer (\$1200) less

¹³⁶⁹ Hylton 2005b: 177 f.
¹³⁷⁰ Table 6 Incentive perspective on the entitlement protection structure.
¹³⁷¹ Hylton 2019: 9 Table 2. Which, contrary to property rule 1 as introduced by Calabresi and Melamed, applies in cases of high transaction costs.
¹³⁷² Hylton 2005b: 178 f.
¹³⁷³ Cf. Part 4.B.III.2.b.

the loss to the seller (\$1000), and the transaction costs to both parties (\$20) (left column in Table 13). Suppose the transfer is by theft, and the penalty is set at an internalization level of \$1100 (\$100 enforcement cost plus \$1000 losses to the victim). Again, only efficient theft occurs. However, the surplus is \$100 (the thief’s profit (\$1200) minus the victim’s loss (\$1000) and the enforcement cost to the state (\$100). The surplus generated by theft is, therefore, less than in the case of a consensual market transaction (right column Table 13). In addition, theft can lead to welfare losses relating to protection measures for potential victims. This means that whenever private transaction costs are lower than public enforcement costs – as it is usually the case – the welfare surplus of a market transaction outweighs that of a coercive transfer, also when the offender’s gain exceeds the victim’s losses.¹³⁷⁴

Table 13 Social welfare effects of market transaction and theft

	Market transaction	Theft
Value of thief/buyer	\$1200	\$1200
Social/private costs (Loss victim/ seller + transaction costs)	– (\$1000+\$20)	– \$1100 (\$1000+\$100)
Change in social welfare	+ \$180	+ \$100

An additional welfare argument for full deterrence and a sanction level that targets profit elimination is that it allows for a greater ZOPA, making successful bargaining more likely.¹³⁷⁵ In the case of profit elimination, Figure 27, the ZOPA equals the social surplus of \$180. The victim’s WTA is \$1010, which is the sum of his value attributed to the good (\$1000) plus his transaction costs (\$10); the thief’s WTP is \$1190, which is the sum of his value (\$1200) minus his transaction costs (\$10).

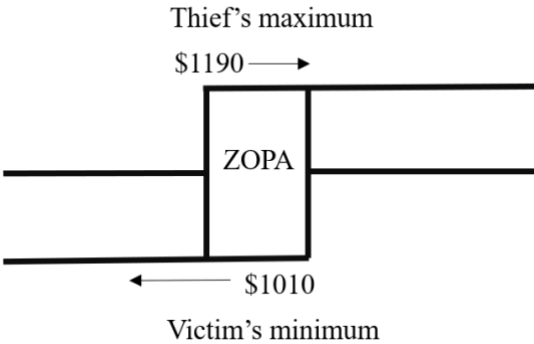


Figure 27 ZOPA in case of a gain-elimination penalty

¹³⁷⁴ Hylton 2005b: 178 f.
¹³⁷⁵ Hylton 2005b: 179. With reference to Kaplow & Shavell 1996.

In contrast, if the penalty is set at an internalization level, Figure 28, the ZOPA shrinks to \$80, and successful bargaining is less likely. The thief is willing to steal the item whenever the expected value of bargaining is less than the expected value of stealing, which is \$100 (his value of \$1200 minus the sanction of \$1100 (the sum of the social harm of \$1000 plus the enforcement costs of \$100)). The thief's willingness to pay is reduced to \$1090 (plus \$10 transaction costs) by another potentially "cheaper" alternative, as any price above \$1090 would mean a benefit below the benefit of stealing (\$100). For instance, the victim demands \$1091. The thief's benefit is his value of \$1200 reduced by the price of \$1091 and the transaction costs of \$10, i.e., \$99.¹³⁷⁶

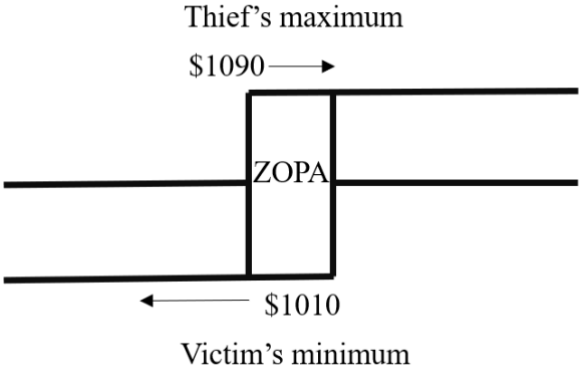


Figure 28 ZOPA in case of a harm-based penalty

c. Secondary Harm and Information Costs

Further reasons for the superiority of the profit-elimination approach lie in the uncertainty about the extent of the damage caused by indirect consequences. Setting optimal sanctions at an internalization level requires precise knowledge of all social costs caused by the crime. While this may be reasonable in theory, it is complicated in practice by indirect, consequential, and secondary harms. Consequential harm describes indirect but generally determinable harm and victimization, typically *vis-à-vis* the victim or relatives; secondary harm is indirect and indeterminable. For example, the consequential harm of burglary is the victim's investment in a new door, while the secondary harm is the neighbor's and other citizens' fear and the reduction in life quality and installed protective measures caused by the crime. Determining the neighbor's fear and the reduction in life quality requires knowledge of the subjective value components, including risk perception. The difficulties and the high administrative costs of such governmental assessment become apparent. Thus, if the secondary loss is relatively significant compared to the

¹³⁷⁶ Compare for a similar example, Hylton 2005b: 179 f.

direct loss, there is a risk that the loss will be underestimated and that deterrence will be too low.¹³⁷⁷

For example, suppose a thief steals a bicycle that he values at \$50 from a victim who rides the bicycle to work and values the bicycle at \$20, which is also the market price. Assume that the victim's psychological damage can be quantified as \$10, the probability of punishment is 1, and the enforcement costs are \$10. The court decides to punish the thief with an internalizing sanction equal to the victim's material plus psychological harm plus enforcement costs, i.e., $\$20 + \$10 + \$10 = \40 . The thief steals the bicycle, and *prima facie* realizes a welfare surplus of \$10. However, the victim's neighbors also suffer a psychological loss, as they fear losing their bicycles and decide to drive to work from that day forward. The monthly costs associated with driving are \$50 for fuel, \$50 for loss of quality of life due to reduced mobility, and \$50 for environmental damage from emissions. Thus, the monthly indirect harm of \$150 per neighbor shows that the internalization of direct harm significantly underestimates the true extent of harm, and the penalty level is correspondingly understated. Given that the thief could purchase the bicycle from the victim and given the magnitude and uncertainty of the full extent of the actual damage, the costs of overdeterrence are negligible compared to those of underdeterrence.¹³⁷⁸ Therefore, administrative costs and uncertainty, with the inherent risk of underestimating actual harm, argue for the superiority of a complete deterrence approach.¹³⁷⁹

4. Interim Resumé and Statement

Becker's internalization approach equates the function of criminal law with the function of any other regulation of externalities. He revolutionized the traditional profit-based approach of classical deterrence theory by advocating that deterrence is not *per se* socially desirable because certain crimes (level of crimes) may increase social welfare. To ensure that only "efficient" crimes are committed and that the level of crime is socially optimal, the sanction should be set at the level of social cost. Becker reconsidered the classical gain-based deterrence for reasons of an expanding modern criminal law, which goes beyond classical crimes against persons and property (e.g., murder or burglary) and more and more criminalizes original business activities and other market transactions.¹³⁸⁰ The value and social welfare effect of the criminalized behavior is characterized by much greater ambiguity since the costs associated with crime are

¹³⁷⁷ Hylton 1998: 435 ff.

¹³⁷⁸ Hylton 1998: 437 f.

¹³⁷⁹ Hylton 1998: 438; 2005b: 181 f.

¹³⁸⁰ Becker 1968: 169.

usually a byproduct of an efficient act. Generally, an act is socially undesirable and should be deterred if external harm exceeds private gain. The desirability of deterrence is, thus, conditioned by efficiency considerations. The positive incorporation of the criminal's gain into the social welfare analysis and the assumption that crimes may be efficient evoked strong normative concerns and (legal) criticism.

Posner's approach reintroduced the traditional deterrence and gain-elimination policy advocated by Bentham and Beccaria. The level of sanction focuses on gain elimination as “[t]he value of the punishment must not be less in any case than what is sufficient to outweigh that of the profit of the offence.”¹³⁸¹ He bases the economic inefficiency of criminal acts primarily on bypassing the efficiency-ensuring market mechanism. Crimes, such as theft, constitute non-consensual coercive transfer and – though they may, in the first instance, constitute a zero-sum game by providing a mere transfer in resources – they indirectly lead to an increase in transaction costs on behalf of the criminal, the victim, and the public.¹³⁸² The function of criminal law is to prevent this market evasion and to channel transactions into the market system.

As for the question of the social value of criminal utility, Posner doubts the (Pareto) efficiency of criminal utility as it results from the disutility of victims. Further, he indicated controversy over the assumption of the social value of offender gain and the limitations of the economic approach to answering this question.¹³⁸³ Nevertheless, Posner includes the offender's gain in the social welfare function in individual cases and accepts the Kaldor-Hicks efficiency of some crimes, e.g., in cases of unavailable market structures. This implies that in cases where markets are available, the question of the social value of criminal utility is irrelevant since the inefficiency of crimes is due to their bypassing of Pareto efficiency guaranteeing market structures. However, in cases where markets are unavailable, the criminal's utility is crucial to deciding on the social value of the criminal behavior.

Hylton adapted and developed Posner and Becker's ideas, using Calabresi's and Melamed's concepts of legal protection structures. Protection structures, such as property, liability, and inalienability rules can be seen as different legal policies and inherent incentive structures to regulate conduct most efficiently. To analyze the efficiency superiority of either Becker's or Posner's framework, he distinguished between scenarios with available and unavailable market

¹³⁸¹ Emphasis adopted, see Bentham 1988: 179. Often so-called “classical deterrence”, J. S. Parker 1989: 555.

¹³⁸² Further on the inefficiency of coercive transfers, interfering with the property rights of the individual affected while causing additional (transaction) costs, Raskolnikov 2014. See also on the disregarded secondary costs of *prima facie* mere transfers and thus, assumingly welfare-neutral acts, Tullock 1967.

¹³⁸³ Posner 2014: 261 fn. 6.

systems. In cases where the market is unavailable (i.e., high transaction costs so that the parties involved (citizen and potential offender) cannot negotiate) but the behavior in question (the crime) is socially ambivalent (the offender's value is potentially greater than the victim's value), liability rules are generally preferable. Liability rules are consistent with Becker's sanction model in terms of the goal of internalizing and compensating for the harm caused. When transaction costs are prohibitive, but the behavior is socially undesirable (the offender's value is less than the victim's), Hylton introduced a new legal protection structure to prevent transfers called property rules of type 2. When a market is available, Hylton supported Posner's argument for the efficiency superiority of a full deterrence policy through a threefold rationale: (1) achieving greater surplus, (2) increasing the likelihood of successful bargaining, and (3) lowering the risk of underdeterrence due to an underestimation of the actual extent of harm.

To implement a policy of total prevention to provide legal incentives for deterrence, the legislator can make use of property or inalienability rules, depending on their costs and feasibility. Focusing on indirect victimization and costs is particularly important in cases where secondary harm is relatively large but less determinable than primary harm, which is typical for corporate environmental crimes; the risk of underreporting and administrative costs then argue for a full deterrence approach.

The analysis shows that economic efficiency determines the optimal scope of criminal law, i.e., the decision on which acts to criminalize and the socially optimal level of criminality (reverse, of criminal law enforcement). This means that the social value of an act and the consequent desirable prevention are determined by its impact on social welfare. The central question is, therefore, on the measurement of social welfare, including whose benefits to count and to what extent. The traditional deterrence framework treats the origin of utility indifferently, i.e., the utility of a criminal has the same social value as that of a victim. An act is socially undesirable and should be deterred if the external harm exceeds the private benefit. A theft, for instance, ought not to be prevented if it is "efficient" as the criminal's gain exceeds the victim's losses.¹³⁸⁴ The private criminal gain is assumed to be equal to the direct social benefits of the behavior, so the social desirability of the crime is based primarily on the direct harm defined by the ratio of the criminal's gain to the victim's losses.¹³⁸⁵ The result is that, if the social value of the criminal gain/benefit is denied in the context of social welfare analysis, the idea of potentially "efficient"

¹³⁸⁴ Excluding enforcement costs.

¹³⁸⁵ Cf. social net damage, Part 4.B.III.1.a.i.

crimes and an internalization function of criminal law no longer holds.¹³⁸⁶ Crime is then undesirable in the first place since it leads to negative net harm, so the optimal level of crime is lower, theoretically zero, and the optimal level of law enforcement is higher.¹³⁸⁷ This makes the question of the social value of criminal gain (utility) a cornerstone for any welfare-maximizing design of criminal punishment.¹³⁸⁸

C. Limitations of the Economic Analysis: Legal (Institutional) Extension of Welfare Analysis and the Social Value of Crimes

I. Institutional Boundaries and Social Welfare Spaces

Already Becker was aware of the sensitivity of assuming equal social value of all individual activities and acknowledged that the values and benefits of a particular activity might vary individually.¹³⁸⁹ George Stigler was one of the first ones contesting the social value of criminal gain by asking, “what evidence [there is] that society sets a positive value upon the utility derived from a murder, rape, or arson?”¹³⁹⁰ He reasons his doubts by the fact of criminalization, noting that “[i]n fact, the society has branded the utility derived from such activities as illicit.”¹³⁹¹ This points to the restrictive economic perspective on social welfare analysis if it focuses primarily on basic economic variables such as inputs and outputs of production resources but neglects social rules, values, and institutions.¹³⁹²

In his book “What Money Can’t Buy: The Moral Limits of Markets” (2012), political philosopher Michael J. Sandel presents a critique of the expanding role of markets in various aspects of society; he argues, among other things, that the subjection of a resource to market logic alters its nature and thus advocates the exclusion of certain “goods or services.”¹³⁹³ Sandel’s ideas

¹³⁸⁶ Note that there may still be socially desirable crimes if private and social benefits are allowed to diverge, namely, when the gain-independent social benefits of the act are greater than the social harm. See further on the issue of differentiating between private and social benefits of a criminal act, Part 4.C. Also Shavell 1985: 1234.

¹³⁸⁷ See Miceli 2019: 29 f. Lewin and Trumbull, name two implications when the offender’s gain is acknowledged. First, acknowledging the utility/disutility of the offender leads to lower enforcement levels; second, that the grounds for reducing crime vanish in the case when the crime is a mere transfer of wealth, for instance, property crime, cf. Lewin & Trumbull 1990: 273.

¹³⁸⁸ The debate about social value is no longer merely “academic,” as it is relevant to the design of the punishment and thus to the severity of the punishment, cf. Miceli 2019: 29.

¹³⁸⁹ Becker 1968: 209.

¹³⁹⁰ Stigler 1974: 56.

¹³⁹¹ Stigler 1974: 56 f.

¹³⁹² Cf. Part 2.B.II.5. See further, Buchanan 1962: 341; Roberts 1973: 386 f.

¹³⁹³ Sandel 2012.

resemble the limits on the permissibility of transactions and the moral component inherent in some resources (rights) subject to the rules of inalienability as established by Calabresi and Melamed.¹³⁹⁴

Several other economists provided approaches to refine economic analysis in terms of social values and to elaborate possible normative boundaries.¹³⁹⁵ For instance, James M. Buchanan proposes that existing regulatory boundaries determine the scope for (Pareto-) optimal behavior.¹³⁹⁶ Boundaries, which he calls “the “rules of the game” within which individuals of the group make decisions and organize activity [...] considered as standards of conduct applicable to all the members of the social group.”¹³⁹⁷ In a free society, these norms of behavior are chosen collectively to organize and constrain individual private behavior within a social setting and are subsequently monitored and enforced by a central authority or respected informally.¹³⁹⁸ Although a specific rule may produce single outcomes that are traditionally classified as “non-optimal,” the general optimality of the rule may still apply since the benefits of the scenarios in which the rule provides optimal outcomes outweigh.¹³⁹⁹ Communal norms between private individuals provide information about socially desirable behavior.¹⁴⁰⁰ It is thus argued that economists ought to respect the exclusion of values (behavior) based on (formalized) social institutional boundaries in the context of cost-benefit analysis – if only to ensure the (social) acceptability of proposed economic policy decisions.¹⁴⁰¹

For the economic analysis of criminal law, Jeff L. Lewin and William N. Trumbull thus reject the social value of criminal gain by virtue of its legal prohibition: “We believe that the exclusion of criminal gains is mandated by the fundamental premises underlying welfare economics and cost-benefit analysis, which require that economists respect the constraints imposed by political and social institutions. Treating criminal gains as a contribution to social welfare ignores the reality that acts are not permitted but are expressly prohibited by criminal legislation.”¹⁴⁰² Crimes

¹³⁹⁴ On inalienability rules, Part 3.A.IV.2.b.

¹³⁹⁵ On Calabresi’s ideas more specifically, Part 2.B.II.4.b. Further, see also Brennan & Buchanan 1985; Buchanan 1962; Roberts 1973; Ulen 2015.

¹³⁹⁶ Buchanan 1962: 341 f. Buchanan starts his idea with reference to Frisch’s differentiation between obligatory, i.e., physical and facultative conditions, i.e., social, and institutional boundaries, Frisch 1959.

¹³⁹⁷ Buchanan 1962: 342.

¹³⁹⁸ Buchanan 1962: 342.

¹³⁹⁹ Buchanan 1962: 347 ff. Buchanan refers to Coase to illustrate the underlying idea; using the example of the rule of stopping at red traffic lights, which may produce “non-optimal” results, for instance, when in the middle of the night an individual stops while crossing the red light would not making anyone worse off.

¹⁴⁰⁰ See on the idea of lawmakers to be informed by communal standards on the social desirability and form of regulation of concerned activities, cf. Cooter 1984: 1533.

¹⁴⁰¹ Trumbull 1990: 204. Cf. also Buchanan 1962: 354. Buchanan argues that economists should limit themselves to present hypotheses within the institutional domains but abstain from making “social value judgments.”

¹⁴⁰² Footnote omitted, cf. Lewin & Trumbull 1990: 278.

can then be argued as acts outside these rules of conduct, outside the defined welfare space, so their social value would have to be negated in welfare analysis.¹⁴⁰³

The limited informative power of economics with respect to such normative questions increases the value and indispensability of a legal component in the economic analysis of law. In fact, in contrast to economics, these questions have traditionally been the focus of legal analysis. The question of (institutionalized) social rules and boundaries corresponds to classical questions of criminal law theory concerning the crime category and the scope of criminal law in general; this means that a theory on crime can provide rationales for rejecting the positive incorporation of the criminal's gain into social welfare analysis.¹⁴⁰⁴

What makes a crime a crime? Does a crime differ from other harmful private activities? To what extent do criminalization and social values relate? Can a crime be efficient, i.e., socially valuable? Are sanctions just prices?

From a legal perspective, the economic assumption of criminal punishment as an instrument, *inter alia*, for “internalization” or “channeling behavior into market transactions” is said to miss the conceptual difference of criminal law due to its moral foundation.¹⁴⁰⁵ Legal scholars assume an inherent moral load of criminal law by virtue of the stigma of criminal punishment¹⁴⁰⁶ and represents and influences social morality.¹⁴⁰⁷ As the economic approach presupposes answers to contingent political, legal, and moral issues, conclusions are always conditional.¹⁴⁰⁸ “[U]nderstanding of this intrinsic constraint on the economists’ approach to crime will make possible a better appreciation of the kinds of contributions and the scope of the contributions economists can make in this area. Strengths sometimes appear more clearly when inherent limitations are recognized.”¹⁴⁰⁹ Therefore, appreciating the methodological value of Becker’s and Posner’s approaches for analyzing the socially desirable regulation of (corporate) environmental crimes requires analyzing the extent to which they are coherent with legal social (normative) realities. Thus, a complementary legal perspective on the concept of crime, the corresponding function of criminal law and punishment, and underlying social values is required.

¹⁴⁰³ Arguing that “the term ‘criminal’ represents an implicit societal judgment that the conduct has no social value,” Lewin & Trumbull 1990: 280.

¹⁴⁰⁴ Compare, for instance, Klevorick 1985b: 299.

¹⁴⁰⁵ Lewin & Trumbull 1990: 280 ff.

¹⁴⁰⁶ Cf. MacCormick 2007: 207, 211.

¹⁴⁰⁷ Lewin & Trumbull 1990: 281.

¹⁴⁰⁸ Klevorick 1985a: 909 f.

¹⁴⁰⁹ Klevorick 1985b: 290.

II. (Traditional) Legal Perspectives: The Social Value of Crime and the Scope of Criminal Law

The standard legal approach to determine the function and scope of criminal law is argued with the goal of punishment¹⁴¹⁰ and builds upon criminal law theories of punishment.¹⁴¹¹ Consequentialist approaches rely on the traditional harm principle, which centers around preventing harm.¹⁴¹² However, it is argued that the focus on harm is too broad and leads to an undesirable expansion of criminal law.¹⁴¹³ Thus, Joel Feinberg, for example, suggests complementary limiting maxims, such as the extent of risk or the value of conduct or moral quality.¹⁴¹⁴ In German law, the concept of *Rechtsgut* or “legal good” is used to specify the scope.¹⁴¹⁵ It is further referred to for arguing a distinctive task of criminal law to criminal punishment in terms of protecting legal interests (*Rechtsgüterschutz*).¹⁴¹⁶ This, however, relocates the indeterminacy of harm to “legal goods,” which is particularly controversial in the case of ecological goods.¹⁴¹⁷ Moreover, the term conceptually focuses on private interests,¹⁴¹⁸ which makes it challenging to incorporate common goods.¹⁴¹⁹

The idea of “public wrongs” attempts to move away from an individualized perspective to allow for a more “holistic view of individuals as finding their identities and their goods within their relationship to others.”¹⁴²⁰ The assumption is that criminal wrongs are distinguished not by their magnitude but by their character since they affect the community as a whole.¹⁴²¹ The

¹⁴¹⁰ As argued by, for instance, Farmer 2020: 4.

¹⁴¹¹ Cf. Part 4.A.I.

¹⁴¹² Compare in this respect, Part 4.A.I.

¹⁴¹³ Feinberg 1987: 187. Critical on the expansion of the criminal law based on preventative grounds, for instance, Braum 2003; Hassemer 1992.

¹⁴¹⁴ Feinberg 1987: 214 ff.

¹⁴¹⁵ Dubber 2005: 683. See profoundly on the debate concerning the term, Roxin & Greco 2020: 24 ff. § 2 C.

¹⁴¹⁶ Roxin & Greco 2020: 128 § 3 para 1 ff. However, in the case that retributive aims of punishment are denied, the boundaries between the goal of criminal law and punishment are blurred, as both, the protection of legal goods and the preventative function of punishment only differ in time. I.e., prevention through punishment follows more promptly after the occurrence, while the prevention of legal goods proceeds, cf. Kaspar 2019: 24 § 1 para 6 ff. especially p. 26 § 3 para 16 f.

¹⁴¹⁷ The two main approaches are the ecological approach, which advocates the protection of environmental resources for their own sake, and the anthropocentric approach, which views humans as the central object of protection and, thus, environmental protection as a means of ensuring the survival of present and future generations, cf. Sammüller-Gradl 2014: 54 ff. See generally on the debate about the concept *Rechtsgut* in environmental criminal law, Sammüller-Gradl 2014.

¹⁴¹⁸ Marshall & Duff 1998: 8 f.

¹⁴¹⁹ This means that the scope of criminal law is just as debated, for instance, Roxin & Greco 2020: § 2 para 10 f.

¹⁴²⁰ Marshall & Duff 1998: 21.

¹⁴²¹ Marshall & Duff 1998: 8, 18 ff.

specification requires determining public values,¹⁴²² which implies an *a priori* identification of the interests involved.¹⁴²³

In contrast, the deontological perspective focuses on the moral wrongfulness and the culpability of the actor and action in question.¹⁴²⁴ It resembles the common law distinction between *malum in se* and *malum prohibitum*.¹⁴²⁵ In this respect, morality, in the sense of a collective consciousness defining independent rules of morality, must precede and be autonomous from the codified criminal law.¹⁴²⁶ However, such a collective consciousness is questionable, especially in secular societies and given the transnationality of modern crimes, such as environmental crimes. To further specify boundaries of the moral wrong worth criminalizing, deontological approaches also recognize harm as a crucial component.¹⁴²⁷ The result is that they face the same challenge as relative theories in terms of determining the limits of *criminal* harm.¹⁴²⁸

For the most part, traditional approaches reflect a notion of criminal law being somewhat “exceptional” to other legal areas, for instance, by its seriousness of conduct or social condemnation function,¹⁴²⁹ or its degree of harm (consequential approaches) or moral wrongfulness (deontological approaches). References to somewhat “metaphysical” and philosophical concepts based on human reason and logic are made. Such references are difficult given the inherent power and coercive nature of criminal law and negate the contingency and variability of criminal law.¹⁴³⁰ Law is a social construct representing social structures, which “cannot be ignored by being taken as either given or without a historical basis.”¹⁴³¹

Moreover, arguing about normative limits from the perspective of the status quo and existing principles runs the risk of subjectivism and an is-ought fallacy. In order to reduce individualism

¹⁴²² Duff 2007: 143.

¹⁴²³ Farmer 2016: 16.

¹⁴²⁴ Dubber & Hörnle 2014: 7 ff.; Farmer 2016: 14 f. Cf. also Part 4.A.I. On the idea of guilt as a normative construct with a negative intention to set indispensable limits to the state’s criminal power, i.e., to limit the scope of application of criminal law, cf. Braum 2003: 27 ff.

¹⁴²⁵ The term can be traced back to the late 14th century in England, where it was used to distinguish between offenses for which the Crown could grant remission and those for which it could not. Today, the authority to categorize the offense accordingly rests with the judiciary. On the origins of the term and arguments in favor of transferring the authority of categorization to the legislature, Gray 1995: 1374 ff.

¹⁴²⁶ I.e., in cases of *malum in se*, it requires a community to which both, the penalizing and the penalized belong, cf. Duff 2011: 126 f. And in cases of a *malum prohibitum*, a collective consensus on which acts to criminalize, cf. Donini 2017: 358 f. See further with respect to climate criminal law, Haverkamp & Langlet 2023.

¹⁴²⁷ Dubber & Hörnle 2014: 8 f.; Pawlik 2004: 58 ff.

¹⁴²⁸ Compare, Farmer 2016: 15 ff.

¹⁴²⁹ Cf. Matravers 2021: 3 ff. See critical Burchard 2021: 4. Burchard argues that attempts to define the exceptionalism of criminal law ends in an ideology narrative, ultimately claiming “the exceptionality of the liberal criminal law per se.” Also critical, Ristroph 2021.

¹⁴³⁰ See similar Farmer 2016: 16 ff.; Ristroph 2021: 6 ff.

¹⁴³¹ Roberts 1973: 399.

when approaching the scope of criminal law and underlying social value, it is helpful to conduct a descriptive examination of the emergence of criminal norms, their social function, and their relationship to the normative social order.¹⁴³²

Why has society chosen these norms of behavior? Furthermore, can a social consensus on these norms be examined and justified more “objectively,” independent of the existing normativity of the law itself? If the existing normative order of law can be grounded in a social consensus expressed in a normative social order, then the latter may be viewed as a formalized institutional expression of social values. This would allow the social value of individual behavior, including criminal behavior, to be derived from the law and to decide whether the benefits of crime should be included or excluded in social welfare analysis.

The institutional approach to (criminal) law constitutes one attempt to investigate the law’s social normative order more independently, based on observation of social reality. Next is to explore the institutional approach to law in its main features, tailored to the research interest, i.e., whether it allows for deriving insights into the social value of the behavior concerned, namely, the criminal act,¹⁴³³ and, subsequently, the emergence of the institution of environmental criminal law more specifically.

III. An Institutional Perspective on (Environmental (Criminal)) Law: An Inquiry into its Social Normative Order

The institutional analysis of the law understands the law as an “institutional normative order”¹⁴³⁴ and applies institutional theory to the analysis and understanding of its emergence and function from a broader social perspective. Norm users shape the perspective and its reflection on the voluntary order created by adherence to shared social norms.¹⁴³⁵ Social norms exist insofar as their behavioral determinants relate to a social and/or personal context of effects, i.e., they relate to observable processes, which can be described as raw facts.¹⁴³⁶ Institutions emerge from these

¹⁴³² Cf. Klevorick 1995: 353. Klevorick claims that there is a need for “a positive, descriptive inquiry concerned with the actual moral, political and legal commitments of the particular society.” He thus argues in favor of a political theory of rights. Further, see Farmer 2016. Farmer advocates an institutional approach to the function of criminal law in order to gain a more social, less individual, understanding of criminal law.

¹⁴³³ Note that the analysis is limited to the central aspects of the institutional approach and any in-depth account is beyond the scope of this work. See comprehensively on the institutional approach to law, e.g., Farmer 2016; MacCormick 2007; Weinberger 1985.

¹⁴³⁴ MacCormick 2007: 11.

¹⁴³⁵ See MacCormick 2007: 286 f., observing that humans are able to reflect upon their normative practice.

¹⁴³⁶ Weinberger 1985: 17.

social interactions and reproductions of values, preferences, and normative rules.¹⁴³⁷ The simultaneous and opposite arrows in Figure 29 indicate that this process is not linear but reciprocal: Individual behavior shapes social behavioral patterns and *vice versa*. Institutions are abstract and partial representations of social reality,¹⁴³⁸ composed of “institutional facts.” Institutional facts are interpretive (legal) social concepts facilitating interaction, such as contract, property, or legal responsibility.¹⁴³⁹ The focus of analysis is not on the institution but on its structural relation by defining a normative order of possibilities, requirements, and goals for action.¹⁴⁴⁰ The structural action relation is embedded in the institution’s purpose and values,¹⁴⁴¹ cf. remarks at the margin of Figure 29.

1. Formalizing Social Order: Institutional Normative Order

Institutions emerge from the social order. Order is understood as the contrast to randomness observable to an external speculator.¹⁴⁴² It arises primarily from unconstrained interpersonal behavior patterns reproduced through individual adaptive behavior to the prevailing structures,¹⁴⁴³ cf. Figure 29. The possibility of orderliness depends on their systematic quality in the form of rationality and coherence.¹⁴⁴⁴ The order is normative to the extent that behavioral decisions are made by referencing an “ought to do.”¹⁴⁴⁵ Such an “action-guiding ‘ought’” points toward the existence of a common social opinion that is embedded in some form of a norm¹⁴⁴⁶ and of which there is mutual social awareness.¹⁴⁴⁷ There is a coherent opinion on the “ought” and coherency concerning the individual aim pursued.¹⁴⁴⁸ Adapting one’s behavior to the collective normative practice facilitates achieving one’s own goal in “mutual civility rather than through open conflict.”¹⁴⁴⁹ In this respect, the reciprocal influence structure illustrated by the dual arrows

¹⁴³⁷ Weinberger 1985: 17.

¹⁴³⁸ MacCormick 2007: 11 f.; Torre 2010: 98f.

¹⁴³⁹ Farmer 2020: 6; MacCormick 2007: 11 ff.; 2007: 98 ff.

¹⁴⁴⁰ Weinberger 1985: 25, 37.

¹⁴⁴¹ Weinberger 1985: 37.

¹⁴⁴² MacCormick 2007: 16.

¹⁴⁴³ MacCormick 2007: 11.

¹⁴⁴⁴ MacCormick 2007: 11.

¹⁴⁴⁵ MacCormick 2007: 16.

¹⁴⁴⁶ Cf. MacCormick 2007: 15. Norms are normative to the extent that they all incorporate an explicit or implicit “ought,” MacCormick 1998: 303, 306 f.

¹⁴⁴⁷ MacCormick 1998: 306 f.

¹⁴⁴⁸ MacCormick 2007: 15. Referring to the example of queuing as a “socio-moral institution,” MacCormick 2007: 14 ff.

¹⁴⁴⁹ MacCormick 2007: 15.

in Figure 29 becomes apparent. The institutional purpose on the collective level then results from the convergence of individual aims operationalized within social normative practice.

An implicit social practice is formalized when informal norms turn into explicit rules that are, to some or lesser extent, supervised by an authorized agent.¹⁴⁵⁰ In a restrictive way, formalization and supervision mean that any violation of the established rules of conduct implies a sanction by the supervisor.¹⁴⁵¹ Rules become coercive, and “institutional facts become hard realities, facts that constrain us, not merely norms that guide our autonomous judgment.”¹⁴⁵² In an action-expanding way, the formalization of norms means that compliant individuals can create legal facts peacefully through their actions.¹⁴⁵³ The unification of actions for a higher collective goal facilitates the achievement of own individual goals.¹⁴⁵⁴ By defining domains of action and directing individual action into a socially congruent pattern, institutionalization reduces conflict and creates social trust in the observance of norms. The social order becomes a civil order characterized by voluntary (economic) interactions between free, autonomous moral actors.¹⁴⁵⁵ The predominant formal institutional order in modern society is state law, which is formalized and supervised by the state.¹⁴⁵⁶ The legal system is a set of explicitly formulated rules governing interpersonal rights and duties, etc.,¹⁴⁵⁷ ideologically based on the constitution (“constitutional principles or values”).¹⁴⁵⁸ The need for the institution of state law resulted from the process of civilization, which meant an expansion of social interaction and interdependence between strangers through, among others, the division of labor and distribution of property.¹⁴⁵⁹ Maintaining civil order in a complex modern society requires the coordination of individuals and their interests without conflict.¹⁴⁶⁰ Legal rules provide a framework within which individuals can pursue their goals in an orderly manner.¹⁴⁶¹ Supervision and enforcement ensure mutual trust in

¹⁴⁵⁰ Farmer 2020: 5; MacCormick 2007: 32. The social practice has a “two-tier” structure, compare Farmer 2020: 6 f.; MacCormick 1998: 32, 312 f.

¹⁴⁵¹ MacCormick 1998: 310 ff.; 2007: 32 f.

¹⁴⁵² MacCormick 2007: 33.

¹⁴⁵³ MacCormick 2007: 92 f.

¹⁴⁵⁴ MacCormick 2007: 32. Farmer 2016: 48 ff.

¹⁴⁵⁵ MacCormick 2007: 58.

¹⁴⁵⁶ Farmer 2020: 6; MacCormick 2007: 288.

¹⁴⁵⁷ MacCormick 2007: 58.

¹⁴⁵⁸ Which is to be observed by all public agents, i.e., the rule of law, “*Rechtsstaat*,” see MacCormick 2007: 35, 45 ff.

¹⁴⁵⁹ Farmer 2016: 48 ff.

¹⁴⁶⁰ Farmer 2016: 299.

¹⁴⁶¹ Farmer 2020: 6.

compliance.¹⁴⁶² Therefore, recourse to the law must be understood as a purposive decision to secure civil order in light of social problems that have arisen through civilization.¹⁴⁶³

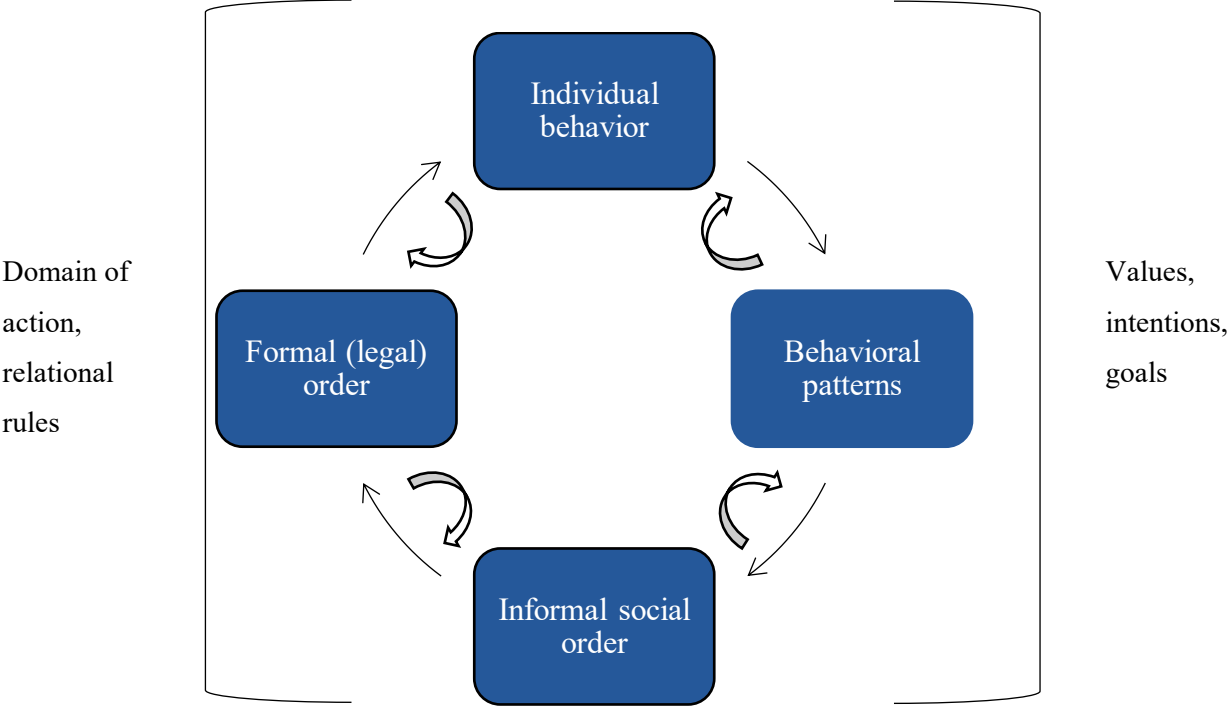


Figure 29 Process of formalizing social (normative) order

2. The Institution of Criminal Law

Criminal law is a “sub-institution” embedded in the institutional normative order of state law.¹⁴⁶⁴ This means that its function and scope are related to the purpose of the institution of state law in terms of safeguarding the civil order.¹⁴⁶⁵ Any general theory of criminal law (and criminal punishment) must start from its contribution to securing the conditions of civility, i.e., securing civil order.¹⁴⁶⁶

¹⁴⁶² MacCormick 2007: 266.

¹⁴⁶³ Farmer 2020: 6. With reference to Oakeshott 1975.

¹⁴⁶⁴ Farmer 2020: 10.

¹⁴⁶⁵ Cf. Farmer 2020: 10 ff.

¹⁴⁶⁶ MacCormick 2007: 216.

Civility builds upon a collective striving for social solidarity, security, and social peace.¹⁴⁶⁷ This requires mutual trust between strangers in norm compliance.¹⁴⁶⁸ Criminal law secures social trust by providing the state with a monopoly of violence to enforce rules of social interaction.¹⁴⁶⁹ The decisive element of criminal law's instrumental value and assertiveness is the punishment of crimes. Crimes are the most severe wrongs.¹⁴⁷⁰ They are the "ought not to do" at the edge of the normative social code of right and wrong. The wrongfulness of crimes lies in their disrespect and threat to social peace by contesting social awareness and mutual trust in each other's norm compliance.¹⁴⁷¹ Criminal punishment stigmatizes the transgressor and signifies the public enforcement of the prevailing social morality underlying the rules of conduct.¹⁴⁷² It is thus an inherently moral practice.¹⁴⁷³ While moral wrongfulness is allegedly more prominent in cases such as rape or assault, it is less so in regulatory offenses.¹⁴⁷⁴ The wrongfulness of regulatory offenses lies in their disregard and weakening of the social code of conduct, i.e., "[e]ach act of wilful non-compliance weakens a scheme from which all, including the violator, draw benefit."¹⁴⁷⁵ The criminalization of regulatory offenses is necessary to secure and maintain the social transaction structure established by the legislature to regulate social interdependencies.¹⁴⁷⁶ Punishment expresses the seriousness of the offense, the responsibility, and the guilt of the actor and encourages compliance.¹⁴⁷⁷ By this, mutual trust between individuals in law compliance is (re)established – *ex ante* and *ex post* – and civil order is safeguarded by securing social peace and civility.¹⁴⁷⁸ Moreover, binding criminal law and procedure and established principles and rules strengthen trust in the order of law in general.¹⁴⁷⁹

¹⁴⁶⁷ MacCormick 2007: 207 f.

¹⁴⁶⁸ "Peaceful relations among persons who can trust relative strangers to avoid violating their persons or their property are the fundamental conditions of civility," see MacCormick 2007: 216.

¹⁴⁶⁹ Farmer 2020: 9. "[A] fairly administered body of criminal law within a satisfactory criminal justice system, is one essential underpinning of civility, or social peace, in this sense," MacCormick 2007: 4.

¹⁴⁷⁰ MacCormick 2007: 209 ff.

¹⁴⁷¹ MacCormick 2007: 216 f.

¹⁴⁷² MacCormick 2007: 211. This means that criminal law is inevitably morally loaded and that the only way to exclude morality is to exclude criminal punishment, MacCormick 2007: 215.

¹⁴⁷³ MacCormick 2007: 207.

¹⁴⁷⁴ MacCormick 2007: 212.

¹⁴⁷⁵ MacCormick 2007: 214.

¹⁴⁷⁶ MacCormick 2007: 212 ff.

¹⁴⁷⁷ Cf. MacCormick 2007: 209. As far as criminal procedural law is concerned, it strengthens confidence in the legal system itself, since substantive criminal law and criminal procedural law are bound by established principles and rules determined by the overriding principle of legality, see Farmer 2016: 301.

¹⁴⁷⁸ MacCormick 2007: 221. This idea on the function of punishment resembles the traditional German theory of positive general prevention, which considers the purpose of punishment in the stabilization of (societal) norms, Kaspar 2019: 24 § 1 para 9.

¹⁴⁷⁹ Farmer 2016: 301.

3. Methodological Implication

Understanding law as an institution implies that the meaning of a norm cannot be determined by reference to a particular set of facts but is linked to the development of the welfare state and its social practices and values.¹⁴⁸⁰ Since these are dynamic, so is the (criminal) law. This means there are no “pre-existing” or constant characteristics of crimes as socially harmful behavior; instead, crimes are “socially constructed through some aggregation of individual preferences and beliefs.”¹⁴⁸¹ Just as human behavior is normative and purposive, so is the law as a result of its formalization.¹⁴⁸² This rational momentum can be inferred from the historical account, which provides insight into the problems of collective decision-making and action that gave rise to the need for regulation to secure civil order.

Moreover, the sociological perspective on their emergence allows for exploring the underlying social normativity. In this context, crimes challenge the conditions of civil order. This means that the scope of criminal law is related to the socially agreed upon and legally codified social transaction structures, which in turn are interrelated to the domains of social interdependencies. Normatively, criminalization means that the behavior violates the social code of conduct.

IV. A Legal Institutional Analysis of the Development of the Institution of Environmental Criminal Law in the United States and Germany

Next, the development of environmental criminal law will be examined to gain insight into the social interdependencies and problems that have given rise to the need for explicit rules of conduct articulated and enforced through environmental criminal law and their relationship to an underlying social normative order. The analysis is conducted through a binational comparison of the emergence of environmental criminal law and related social developments in the United States and Germany, beginning in the 19th century, focusing on air pollution. Although it is not possible to provide a complete analysis of all social events and legal regimes, characteristic points in time are described to understand the social problems of civil development that led to the need of environmental criminal law to secure the conditions of civil order.

¹⁴⁸⁰ Farmer 2020: 6. Farmer 2016: 45 f.

¹⁴⁸¹ Cf. Prescott 2019: 499.

¹⁴⁸² Farmer 2020: 6 f.

1. The 19th and 20th Century – Environmental Offenses as a Private Nuisance

In the 19th century, there were few (administrative) regulations for environmental protection in the United States, and the legal remedies for environmental damage were based on the polluter pays principle found in tort law in the form of nuisance.¹⁴⁸³ The standard legal consequence was a prohibition or compensatory damages in cases of private nuisances¹⁴⁸⁴ as well as first penalization as misdemeanors in cases of public nuisances.¹⁴⁸⁵ In the second half of the 19th century, the idea of precaution came to the fore in the wake of disease outbreaks and epidemics, mainly caused by waste-related drinking water contamination.¹⁴⁸⁶ The first federal environmental law, including penalties, was enacted in 1899 to protect national navigable waters with the Rivers and Harbors Act.¹⁴⁸⁷ The act primarily targeted economic interests¹⁴⁸⁸ and violations were punished as misdemeanors.¹⁴⁸⁹ In the early 20th century, the Industrial Revolution brought population growth, increasing prosperity, and significant pollution.¹⁴⁹⁰ Phenomena such as the “Dust Bowl,”¹⁴⁹¹ crowded cities, hazy skies, and unlimited noise began to worry the population.¹⁴⁹² The legislature responded with the Federal Water Pollution Control Act (FWPCA)¹⁴⁹³ in 1948 and the Air Pollution Control Act (APCA)¹⁴⁹⁴ in 1955. However, the laws primarily aimed at promoting federal environmental protection programs and research and did not include criminal provisions.¹⁴⁹⁵

In Germany, the German Criminal Code of 1871 (RStGB)¹⁴⁹⁶ contributed little to environmental protection.¹⁴⁹⁷ Instead, legal action against emissions was mainly taken under civil law; however, the codification of emissions from operations as socially acceptable impeded compensatory claims.¹⁴⁹⁸ As industrialization progressed, selective regulation was replaced by so-called “management principles” (*Bewirtschaftungsgrundsätze*) in the early 19th century.¹⁴⁹⁹ They

¹⁴⁸³ Meinel 1988: 49 f.

¹⁴⁸⁴ See Rychlak on public and private nuisances, Rychlak 1989: 658 ff.; Thaman 1994: 378 f.

¹⁴⁸⁵ Meinel 1988: 15.

¹⁴⁸⁶ Thaman 1994: 380.

¹⁴⁸⁷ The Rivers and Harbors Act 1899, 30 Stat. 1151 (33 U.S.C. §§ 407 ff.; cf. e.g., Situ & Emmons 2000: 22.

¹⁴⁸⁸ Uhlmann 2009: 1223.

¹⁴⁸⁹ Situ & Emmons 2000: 22; Uhlmann 2009: 1223 fn. 1.

¹⁴⁹⁰ For instance, cf. Flippen 2012: 1–4; Spezio 2018: 1. Also cf. Dunlap & Mertig 2014: 1 f.

¹⁴⁹¹ Dunlap & Mertig 2014: 2.

¹⁴⁹² Bachmann 2007: 655.

¹⁴⁹³ Water Pollution Control Act 1948, Pub. L. No. 80-845, 62 Stat. 1155 (33 U.S.C. §§ 1251 ff.).

¹⁴⁹⁴ Air Pollution Control Act 1955, Pub. L. No. 84-159, 69 Stat. 322 (42 U.S.C. §§ 7401 ff.).

¹⁴⁹⁵ Compare the Preamble of the Air Pollution Control Act.

¹⁴⁹⁶ Criminal Code for the German Reich (*Strafgesetzbuch für das Deutsche Reich*), RGBl 127, 15.05.1871.

¹⁴⁹⁷ For instance, cf. Backes 1973: 337; Triffterer 1980: 42 f.

¹⁴⁹⁸ Emissions were considered as customary local pollution (*ortsübliche Belastung*), cf. § 906 BGB old version.; Heine 1989: 128.

¹⁴⁹⁹ Eser 1992: 3 f.

applied primarily to water and immission protection, where the first environmental problems emerged due to increased population and consumption.¹⁵⁰⁰ In the course of modern industrial society, the consequences of the increase in goods production and population required more comprehensive regulations.¹⁵⁰¹ Formerly, geographically limited environmental problems developed into transnational issues that increasingly impact the quality of life and (human) life itself.¹⁵⁰² Consequently, the first significant water law reform began in 1960, which, among other things, introduced criminal penalties for water pollution.¹⁵⁰³

2. The 1960s and 1970s – Environmental Offenses as Minor Offenses

In the United States, the 1960s were marked by environmentalist movements formed in light of the increasing complexity and scope of environmental concerns, such as the health consequences of pesticides.¹⁵⁰⁴ Social sensitization and politicization were reinforced by environmental catastrophes such as the Santa Barbara oil spill,¹⁵⁰⁵ and the first Earth Day on April 22, 1970, marked an international cornerstone.¹⁵⁰⁶ Established laws were insufficient to deal with the environmental problems of industrial society, and the inevitability of contemporary legal measures to curb pollution became apparent.¹⁵⁰⁷ In 1969, Congress reacted by creating an initial general legal framework to address emerging environmental problems with the National Environmental Policy Act (NEPA)¹⁵⁰⁸ and the Environmental Protection Agency (EPA) as the central environmental agency to conduct impact research on pollutants, set limits, and monitor and enforce regulations.¹⁵⁰⁹ At the same time, legislative amendments were passed, sanctioning violations of environmental laws as misdemeanors.¹⁵¹⁰ The CAA (Clean Air Act) was renewed on December 31, 1970,¹⁵¹¹ authorizing the EPA to establish federal standards of air quality and

¹⁵⁰⁰ Triffterer 1980: 27.

¹⁵⁰¹ Heine 1989: 116 f.

¹⁵⁰² Eser 1992: 5.

¹⁵⁰³ Eser 1992: 6. BT-Drs. II/2072: 13 ff.

¹⁵⁰⁴ As thematized by Rachel Carson in her book “Silent Spring” (1962). Carson analyzed the consequences of pesticides on nature and human health and draw public attention to the environmental consequences associated with modern prosperity, cf. Flippen 2012: 4 f. See also Dunlap & Mertig 2014: 2.

¹⁵⁰⁵ Cf. Flippen 2012: 25 ff.

¹⁵⁰⁶ Flippen 2012: 1.

¹⁵⁰⁷ Environment and Natural Resources Division 2015.

¹⁵⁰⁸ National Environmental Policy Act 1969, Pub. L. No. 91-190, 83 Stat. 85 (42 U.S.C. §§ 4321 ff.).

¹⁵⁰⁹ Habicht 1987: 10478. Compare US EPA 2013.

¹⁵¹⁰ Bennett 2019: 3.

¹⁵¹¹ The Clean Air Act of 1970, Pub. L. No. 91-604, 84 Stat. 1676 (codified as amended at 42 U.S.C. §§ 7401 ff. (2018)).

air pollutants and to monitor and enforce emission reduction programs from industrial and mobile sources.¹⁵¹²

Similarly, in Germany in the 1960s/1970s, the first social environmental awareness emerged amid environmental scandals¹⁵¹³ – such as the first major oil spill from an oil tanker chartered by BP off the coast of southern England in 1967.¹⁵¹⁴ Environmental awareness among the general public was heightened when byproducts of industrialization, such as noise, air pollution, and (hazardous) waste, became noticeable.¹⁵¹⁵ In light of this, numerous administrative laws were passed or renewed as part of the federal government’s environmental program of 1971,¹⁵¹⁶ including the Federal Immission Control Act or Act on the Prevention of Harmful Effects on the Environment Caused by Air Pollution, Noise, Vibration and Similar Phenomena (BImSchG) of 1974.¹⁵¹⁷ However, besides the legal development in both countries, actual prosecutions remained low, among other things, as resources and expertise were lacking, and enforcement agencies underprioritized environmental crimes.¹⁵¹⁸

3. The 1980s and 1990s – Environmental Offenses as Crimes

In the 1980s and 1990s, social awareness of the destructiveness of technological progress increased in both countries. In the USA, scientific research revealed new phenomena such as radionuclides¹⁵¹⁹ and environmental disasters such as the “Love Canal”¹⁵²⁰ demonstrated the scale and harm related to industrial pollution. In addition, there was a growing awareness of the failure of previous prosecution regimes.¹⁵²¹ As a result, (civil) prosecution was particularly strengthened for hazardous waste,¹⁵²² and misdemeanors were amended to felony offenses to increase deterrence.¹⁵²³ On November 15, 1990, an amendment to the CAA resulted in harsher

¹⁵¹² Ibid. §§ 109–114.

¹⁵¹³ Saliger 2020: para. 19.

¹⁵¹⁴ Kaiser 2010.

¹⁵¹⁵ Herrmann 1979: 283.

¹⁵¹⁶ BT-Drs. 6/2710.

¹⁵¹⁷ Federal Law Gazette BGBI I 1973: 721. More than 600 environmental administrative regulations were codified or amended in the 1970s, illustrating the pervasive need for regulation, cf. Heine & Meinberg 1988: D 18.

¹⁵¹⁸ In the US, criminal law enforcement agencies commonly concentrated on felonies, cf. Glenn 1972: 847–848. See critically on the criminalization of minor offenses and the lack of personal and material resources in Germany, Huembs-Krusche & Krusche 1983: 285.

¹⁵¹⁹ Situ & Emmons 2000: 23.

¹⁵²⁰ The Hooker Chemical Company used a sewer trench for years to store hazardous waste, Fisher 2017.

¹⁵²¹ On the lack of a systematic regime to enforce environmental crimes previous to the development in the 1980s, cf. Starr 1986: 380. See also McMurry & Ramsey 1986: 1134 ff.

¹⁵²² Cf. McMurry & Ramsey n.d.: 1138 f.

¹⁵²³ Bennett 2019: 3. See also Uhlmann 2009: 1223 f.

penalties for knowingly violating the law¹⁵²⁴ and codified an endangerment offense.¹⁵²⁵ Prosecutions increased, especially against high-ranking individuals in corporate crime.¹⁵²⁶ Likewise, in Germany, new environmental scandals and phenomena such as the *Waldsterben* raised environmental concerns among the population and led to community initiatives demanding legislative action.¹⁵²⁷ Moreover, enforcement shortcomings were criticized,¹⁵²⁸ partly because administrative authorities resorted to known informal and consensual solutions.¹⁵²⁹ In 1980, the 1st Law to Combat Environmental Crime (UKG) introduced environmental criminal provisions as part of the core criminal law in an independent 29th section as “Offences against environment” (§§ 324 – 330d StGB o.v.). Environmental elements and their appearances were recognized as legal goods¹⁵³⁰ and included in the discourse of criminal law theories.¹⁵³¹ The 1st UKG aimed to counteract the enforcement deficit, strengthen environmental protection through endangerment offenses, and express the criminal wrongfulness of environmental crimes.¹⁵³² Soon, the number of environmental offenses registered and sanctioned increased.¹⁵³³ However, criminalization primarily targeted minor offenses,¹⁵³⁴ and levels of sanction remained low.¹⁵³⁵ Criticism of the 1st UKG and further environmental catastrophes, such as the large fire at the Sandoz AG warehouse near Basel in 1986 or the Chernobyl reactor accident in April 1986, led to the 2nd UKG in 1994.¹⁵³⁶ The range of punishment was consistently raised to attach a “stigma of real criminality” to environmental offenses.¹⁵³⁷ Regarding air pollution (§ 325 StGB o.v.), an independent offense was introduced, criminalizing certain behaviors as abstract endangering offenses.¹⁵³⁸ Nevertheless, the criticism of the 1st UKG largely remained.¹⁵³⁹

¹⁵²⁴ A fine of up to \$250,000 and/or 15 years in prison for first-time offenders, doubled in cases of repeat offenders. Or \$1,000,000 for a corporation. Clean Air Act Amendments 1990, Pub. L. No. 101-549, §§ 709, 104 Stat. 2399.

¹⁵²⁵ For knowingly releasing air pollutants that are capable of endangering another person’s life or causing serious bodily harm, cf. *Ibid.* § 113(c)(5).

¹⁵²⁶ Starr 1986: 382. Thornburgh 1990: 778 f. Different Adler & Lord 1991: 782 ff. Adler and Lord stated a “scapegoat” approach and reluctance of the federal government to prosecute the major firm executives.

¹⁵²⁷ Compare Krüger 1995.

¹⁵²⁸ Der Rat von Sachverständigen für Umweltfragen 1974: 180 f.

¹⁵²⁹ Cf. Herrmann 1979: 290 ff.

¹⁵³⁰ BT-Drs. 8/2382: 9 f.

¹⁵³¹ For instance, concerning the question of the protected *Rechtsgut*, cf. on this debate Bloy 1988: 487 ff.; Sammüller-Gradl 2014; Schünemann 1997: 181 ff.

¹⁵³² BT-Dr 8/2382: 1, 11, 19.

¹⁵³³ On the number of convicted crimes, cf. Pfohl 2012: 307, 312. On the rising number registered by the police, Müller-Tuckfeld 1995: 71.

¹⁵³⁴ Müller-Tuckfeld 1995: 71 f.; Pfohl 2012: 307.

¹⁵³⁵ For example, the majority of sentences were 5–30 day sentences and only 2.5% were custodial sentences, cf. Albrecht 1993: 561.

¹⁵³⁶ Criminal Code Amendment Act, 27.6.1994, BGBl. 1980 I: 1440. See also Pfohl 2012: 307.

¹⁵³⁷ Breuer 1994: 1080.

¹⁵³⁸ BT-Drs. 12/7300: 6 f.; BT-Drs. 12/192: 43.

¹⁵³⁹ For instance, cf. Müller-Tuckfeld 1995: 90. See also Breuer 1994: 1080.

4. The 2000s – The Threat of Climate Change

Ambivalences regarding the social, political, and legal relevance of environmental regulation have marked the 2000s. On the socio-political level, the Paris Climate Agreement's declaration of an indispensable upper limit of 1.5°C above preindustrial levels¹⁵⁴⁰ gave rise to vital, globally networked citizen initiatives. For instance, "Fridays for Future," an international social movement of mainly pupils and students, or "Extinction Rebellion," which uses civil disobedience to force government action against the mass extinction of animals, plants, and habitats and the possible extinction of humanity because of the climate crisis.¹⁵⁴¹ However, the emergence of other crises, such as the Covid 19 pandemic or the Ukraine war, which are more directly perceived in their threatening nature, seem to take precedence in social and political attention.

At the political level, a denigration of science, a downplaying of climate change, and an accompanying climate-damaging policy began to emerge under the Bush administration,¹⁵⁴² which is culminating under the Trump Administrations and is characterized by a rolling back of environmental policies and regulation and a substantial undermining of values and institutions of environmental protection on organizational, policy, and ideational level.¹⁵⁴³

In Germany, the European Council Directive 2008/99/EC of November 19, 2008, on the protection of the environment through criminal law,¹⁵⁴⁴ led to the Europeanization of environmental criminal law, criminalizing violations of foreign administrative regulations.¹⁵⁴⁵ Deficiencies of existing frameworks in ensuring environmental protection can be seen by German litigations concerning the VW scandal, which primarily concerned claims for damages under civil law (§§ 826 in conjunction with 31 German Civil Code (BGB) or §§ 823 (2) and 31 BGB in conjunction with § 263 StGB),¹⁵⁴⁶ while neglecting potential environmental criminal

¹⁵⁴⁰ Cf. Article 2(1)a Paris Agreement. Cf. IPCC 2019: chap. 1. An increase of more than 1.5 °C would lead to considerable imponderable climate consequences, especially due to the probability of crossing so-called tipping points. See further on this, McKay et al. 2022.

¹⁵⁴¹ See on their development, Fopp et al. 2021. Another topical movement, at least in Germany, is the "Last Generation" (*Letzte Generation*), which intends to persuade politicians to act on the climate crisis through civil resistance.

¹⁵⁴² Cf. Turner & Isenberg 2018: 168.

¹⁵⁴³ Bomberg 2021.

¹⁵⁴⁴ Directive 2008/99/EC, Official Journal of the European Union 2008 L 328: 28.

¹⁵⁴⁵ Criminal Code Amendment Act, 06.12.2011, BGBl. 2011 I: 2557; see also § 330d (2) StGB, BT-Drs. 17/5391: 6.

¹⁵⁴⁶ LG Bamberg, *Urteil*, 42 O 269/18, May 2, 2019; Witt 2017.

charges such as air pollution under § 325 StGB.¹⁵⁴⁷ Insufficient national action against climate change formed the basis for a ruling of the German Federal Constitutional Court (BVerfG) on a lawsuit filed by, amongst others, activists of the Fridays for Future movement. In its ruling, the Constitutional Court declared the need for a more decisive policy to meet the climate targets and saw the hesitant climate policy by the current Federal Climate Protection Act as a threat to the freedom of future generations.¹⁵⁴⁸ The regulation irreversibly shifts emission reduction burdens to periods after 2030, and extensive exhaustion of the CO₂ budget already by 2030 exacerbates the risk of a severe loss of freedom by shortening the window of opportunity for technological and social progress.¹⁵⁴⁹ Under Article 2 (2) sentence 1 of the Basic Law, the Federal Republic is obliged to protect the fundamental rights of its citizens (including future generations), which are at risk from climate change.¹⁵⁵⁰ Furthermore, the court emphasized the global dimension of the duty to protect.¹⁵⁵¹ The ruling of the BVerfG is part of a general development in the judiciary within so-called “climate lawsuits.”¹⁵⁵² An increase in the importance of environmental preservation and the state’s preventive duty to protect can likewise be observed on European level.¹⁵⁵³ On legislative level, the new European Environmental Crime Directive,¹⁵⁵⁴ the debate on an international crime of ecocide or the policy paper by the Office of the Prosecutor on “Addressing Environmental Damage through the Rome Statute”¹⁵⁵⁵ are central steps toward strengthening environmental protection on international level.

¹⁵⁴⁷ Claims related with §325 were partially brought by the plaintiffs but remained mainly unaddressed by the courts, see OLG Hamm, *Urteil*, 30 U 192/19, September 2, 2020. Which is related to the exemption of § 325 (1) StGB for vehicles, Heine & Schnittenhelm 2019a: para. 20.

¹⁵⁴⁸ BVerfG, *Beschluss*, 1 BvR 2656/18, March 24, 2021: para. 153 ff. and 243 ff.

¹⁵⁴⁹ BVerfG, *Beschluss*, 1 BvR 2656/18, March 24, 2021: para. 142.

¹⁵⁵⁰ BVerfG, *Beschluss*, 1 BvR 2656/18, March 24, 2021: para. 148.

¹⁵⁵¹ BVerfG, *Beschluss*, 1 BvR 2656/18, March 24, 2021: para. 149.

¹⁵⁵² Which include, in a broader sense, all climate change-related lawsuits, and, in a narrower sense, cases that involve procedural or substantive issues core to climate change, cf. Franzius 2021: 3 fn. 1. Other examples are the judgment of the Hoge Raad Netherlands, cf. Hoge Raad, *The State of the Netherlands vs Stichting Urgenda*, Number 19/00135, December 20, 2019: para. 4.2-4.4. Or of the Irish Supreme Court, The Supreme Court, *Friends of the Irish Environment CLG vs The Government of Ireland*, Appeal No:205/19, July 31, 2020: para. 3.7.

¹⁵⁵³ E.g., in *Tătar v Romania* the ECtHR ruled that Article 8 (1) imposes a positive obligation on states to take all reasonable and appropriate measures to protect rights, as well as a primary duty on states to establish a legal and administrative framework aimed at the effective prevention of harm to the environment and human health, cf. ECtHR, *Tătar v Romania*, Application no. 67021/01, January 27, 2009.

¹⁵⁵⁴ By, among others, introducing new environmental offenses and fostering transnational cooperation, cf. Directive (EU) 2024/1203 of the European Parliament and of the Council of 11 April 2024 on the protection of the environment through criminal law and replacing Directives 2008/99/EC and 2009/123/EC.

¹⁵⁵⁵ *Policy on Addressing Environmental Damage Through the Rome Statute* | *International Criminal Court* n.d.

5. Comparing Resumé

In both countries, the first claims against environmental damage to individual property were enshrined in civil law. Pollution was socially, politically, and legally accepted as part of industrial progress. This began to change, especially in the 20th century, when industrial pollution, notably water pollution, increasingly affected society. Environmental disasters and the increasing pollution caused by general industrial production greatly impacted human life and revealed new social interdependencies that needed to be regulated. The result were the first administrative norms with the possibility of sanctions. Their inadequacy to encounter modern environmental problems together with specific environmental catastrophes, encouraged the emergence of social environmental awareness and the foundation of citizens' initiatives that provided a direct impetus for legislative action in the 1960s/1970s. In both countries, the 1960s/1970s marked an era of systematic protection of the environment under criminal law. This meant formalizing specific rules of conduct, i.e., duties of care and precaution, and the scope of industrial activity, including emission levels. Violations of the same were punished by criminal law to ensure observance of the rules and express their wrongfulness. The regulatory starting point of environmental criminal law is thus the administrative law, enshrined in its so-called "accessoriness."¹⁵⁵⁶ Accordingly, the function of criminal law and sanctions must be understood contextually to environmental administrative law.

The numerous environmental disasters in the 1980s/1990s highlighted the inadequacy of the previous regulation of industrial activity and the increasing extent of environmental damage. Environmental crimes were no longer viewed as minor offenses but as morally wrongful acts – as illustrated by their codification as criminal offenses in the central German Criminal Code (StGB) or their "upgrade" from misdemeanors to felony offenses in US law. Furthermore, the codifications of endangerment offenses underscore that infringement offenses cannot achieve effective environmental protection but that the sensitivity of protected values and the irreversibility of their damage require a preventative policy approach. The trend toward tightening environmental criminal laws in both countries shows that, theoretically, the extent of environmental crime and the social-normative importance of its prevention have been recognized. The increasing threat of irreversible environmental degradation and the finite nature of environmental resources reinforced the need for precaution through codifying endangerment offenses. In the 2000s, given the acute and global threat of climate change, the understanding of

¹⁵⁵⁶ For instance, for German environmental criminal law, Saurer 2017. See generally on the regulatory structure of environmental (criminal) law, Faure & Visser 2004: 57.

(social) injustice increasingly shifted to the international level. This has found legal expression in international climate change litigations, the discourse on climate criminal law, or the introduction of an international crime of ecocide.

6. Case Example: NO_x Emissions Standards

The theoretical, institutional understanding of criminal law can be illustrated by reference to the case example used previously; suppose the following background of the NO_x emissions standards (cf. Part 3.B.III.3.a.ii):

More and more people in European cities, including Cologne, Maastricht, Bordeaux, and Innsbruck, report breathing problems and cardiac arrhythmias. The medical profession is alarmed, and researchers look for possible causes and connections. As the number of cars, especially diesel vehicles, in cities has more than doubled in the last five years, it is suspected that car traffic and the nitrogen oxides emitted are contributing to health problems. While it was scientifically assumed that nitrogen oxides were locally persistent in the past, this has changed partly due to new findings about their cascading effects and partly because the mobility of cars, and thus their emissions, has increased. Furthermore, the emission of nitrogen oxides leads to the formation of nitrous oxide (N₂O) and ozone (O₃), which are greenhouse gases and contribute to climate warming.¹⁵⁵⁷ Therefore, the annual loss of biodiversity related to climate change, such as the number of bees, is studied in parallel.

Initial studies indicate that diesel exhaust from motor vehicles is a major contributor to health problems. After initial deaths due to cardiac arrhythmias were reported, protests erupted in numerous European cities such as Maastricht and Cologne, calling for stricter regulation of diesel vehicle emission limits. Given their transnational nature, politicians agree that European regulation is necessary to achieve a nationwide reduction. Meanwhile, the European Commission is launching numerous studies on the social costs and benefits of nitrogen oxides, taking into account economic, social, and environmental aspects. Based on the results of these studies, EU Regulation No. 1/1 is codified, specifying a limit value of 100 mg/km for NO_x emissions. The limit value is intended, among other things, to reconcile the interests of the vehicle industry and concerns about rising costs with the public interest in a clean environment and affordable transportation. To ensure compliance, Member States must set norms for effective penalties. They are to be codified as abstract endangerment offenses since incalculable and irreversible

¹⁵⁵⁷ Oehlmann et al. 2021: 48.

damage chains are likely due to synergistic and cumulative effects of various nitrogen oxides. The regulation is intended to create further economic benefits in the form of the emergence of new emission abatement technologies that will contribute to the transition to a sustainable economy.

7. Institutional Interpretation and Statement

The historical perspective reveals the need for legislative reforms to respond adequately to new environmental challenges posed by social interdependence, arising from advancing technological progress and globalization. Generally, legislative measures respond to the social development of environmental awareness and political commitment due to the increased exposure to industrial pollution, enhanced by environmental disasters such as the Chernobyl accident 1986. The initial absolute social and legal tolerance of environmentally harmful behavior reveals that the wrongfulness of environmental crimes did not preexist but is contingent on regulatory demands of societal progress.¹⁵⁵⁸ With the development of the modern state and the accompanying environmental degradation, the social understanding of environmentally damaging behavior has shifted from social appropriateness as an indispensable component of social and economic progress to an understanding as a threat to health and livelihoods. This is accompanied by or apparent in the shifting from regulation by civil to criminal law, i.e., from liability or property towards inalienability rules, expressing the social undesirability of the behavior concerned.¹⁵⁵⁹ Against this background, the climate ruling of the BVerfG anchors environmental protection in constitutional rights and undermines the shift toward the inalienability of environmental rights. Social movements point(ed) to an underlying value system reflected in a political and legislative demand for increasing regulation of environmentally damaging behavior. Protection of the environment became an essential feature to secure peaceful social coexistence.

Environmental criminal law is part of a broader regulatory framework designed to protect the environment. The regulatory starting point of environmental criminal law lies in public (administrative) environmental law. Public (administrative) environmental law formalizes the socially desirable transaction structures for coordinating (arising) social interdependencies related to environmental problems caused by civil progress. These transaction structures are typically defined as positive rules of conduct, “oughts,” in the form of standards and regulations. They are purposive and – assuming an ideal democratic emergence of these regulations –

¹⁵⁵⁸ On the contingency of wrongfulness, cf. Farmer 2010: 230, 233.

¹⁵⁵⁹ Compare on the entitlement protection structure and associated behavioral incentives, Part 3.A.IV.2.c.

represent consensual social choices. Consensual does not equal unanimity but means that they result from a rule of the conclusion of agreements that the social group has imposed on itself.¹⁵⁶⁰ These rules are designed to facilitate achieving personal goals within a collective context in a peaceful, civil manner. Each *wilful* violation, i.e., each intentional environmental crime, coercively disrespects them and contests the foundations of civility in the form of social solidarity, security, and mutual trust in norm compliance.¹⁵⁶¹ It challenges behavioral rules from which all individuals benefit and forces society to deal with an unfavored transaction structure.¹⁵⁶² Environmental criminal law typically defines norms of a negative nature, the “oughts not to.” Public punishment applies to behavior outside the legally defined social welfare space and attaches a social stigma, thereby enforcing the underlying social normative order. Criminal environmental law is thus an “absolute institution” that defines limits to an activity, the violation of which leads to exclusion from the group.¹⁵⁶³ The criminalization of environmental offenses is necessary to ensure compliance with and mutual trust in these social transaction structures. Every offense and every failure of the state of its punishment disregard the social behavioral expectations that come along with the regulation in the form of criminal law – expectations that have their own intrinsic value and whose non-fulfillment is not without harm.¹⁵⁶⁴

Environmental compliance becomes indispensable considering the increasing threat to human health, life quality, and potential existence; such as, the threat to respiratory health or biodiversity due to excessive nitrogen levels, destabilizing balanced natural systems. This means that social normative rules are, to a certain extent, imposed by ecological necessities and planetary boundaries. They must be sustained to preserve the earth’s ecosystem, which is the only viable environment for humankind so far. It may, therefore, be argued that, in the case of environmental crimes, “society has a purpose when it labels certain acts criminal; the label communicates that these acts will not be tolerated or counted in the social weal.”¹⁵⁶⁵

¹⁵⁶⁰ In a democratic society, the rule of the majority is the chosen societal approach to collective decision-making, since the requirement of unanimity is too costly to pursue in routinized collective choices, Buchanan 1962: 352.

¹⁵⁶¹ “Each act of wilful non-compliance weakens a scheme from which all, including the violator, draw benefit,” McCormick 2007: 214.

¹⁵⁶² On this conception of crimes, cf. Klevorick 1985b: 303. However, Klevorick does not argue in favor of excluding all utility outside of these transaction structures from welfare analysis; but he assumes that the moral structure of society is relevant for any such differentiation, cf. Klevorick 1985a: 918 f.

¹⁵⁶³ On absolute institutions, cf. Roberts 1973: 391 f.

¹⁵⁶⁴ Compare on the incentive perspective of the entitlement structure, Part 3.A.IV.2.c.

¹⁵⁶⁵ Trumbull 1990: 212.

Environmental criminal law and the instrument of punishment are part of an institution that expresses and enforces a social normative order to guide private behavior into desirable transaction structures. These transaction structures were consensually designed to achieve societal goals. Therefore, the assumption of socially valuable environmental crimes and, thus, the reasonability of their optimal deterrence must be denied from a legal-institutional perspective. Since congruence between rules and the societal normative order is crucial for their acceptance,¹⁵⁶⁶ Becker's optimal deterrence framework for analyzing the regulation of corporate environmental crimes must be reconsidered.

The next step is to examine the extent to which Becker's and Posner's frameworks are consistent with the functional order of environmental economics and environmental (administrative) law as outlined in Part 3.B, particularly on standards (Part 3.B.III.3.b). This will further provide further insight into research question 1 (cf. Figure 2 and Part 1.C.II), and the extent to which the social normative order is consistent with the economic order of public (administrative) environmental law, i.e., whether, from an environmental law perspective, the idea of socially valuable (corporate) environmental crimes can be upheld or must be negated.

V. Application to (Corporate) Environmental Crime: On the Social Value of (Corporate) Environmental Crimes and Optimal and Complete Deterrence

1. Corporate Environmental Crime as (In)Efficient Behavior: Optimal Deterrence – Becker

Becker transferred the standard economic approach to (potentially) harmful activity in terms of producing negative externalities to that of criminal behavior. Accordingly, social optimality of the same can be secured if its social costs are attributed and internalized by the agent. The reasonableness of the internalization approach is based on two main premises (1) that the welfare effect of the behavior is ambiguous, i.e., that activity levels exist at which the action concerned increases social welfare, and (2) that the level of harm can be determined, attributed, and the agent be forced to internalize.

¹⁵⁶⁶ Cf. on this Trumbull 1990: 204.

a. The Social Welfare Effects of Corporate Environmental Crime: Environmental Economics and Law Perspective

Corporate environmental crimes are often seen as potentially socially desirable because they are typically part of efficient legal production routines.¹⁵⁶⁷ This ambiguity of social welfare effects relates to their “regulatory nature,” codified in their administrative accessoriness.¹⁵⁶⁸ Administrative environmental law clarifies that most environmental harm of corporate production is legally tolerated since a certain activity level is welfare-enhancing. They, therefore, fall under the category of activity for which the inclusion of the criminal’s gain is most comfortably argued.¹⁵⁶⁹

The particularity of (corporate) environmental crimes is that their regulatory structure *prima facie* allows for an additional efficiency argument independent of the private criminal benefit but based solely on the inclusion of social benefits. For example, suppose that a factory that violates an emissions level produces goods that create a social benefit of \$13, a social cost of \$10, and a private benefit of \$12. Even if we exclude the \$12 criminal benefit of the social welfare function, the activity is efficient because it creates a \$3 social surplus.

However, taking a closer look at the economic rationale underlying environmental law challenges this argument: Environmental law aims at defining norms that balance societal (economic, environmental, social) interests and induce socially optimal activity levels.¹⁵⁷⁰ This is to be done based on a comprehensive CBA, assessing costs and benefits at an aggregated societal level, which then serves as an advisory tool and information basis for environmental economic policy and regulation. This means it is within the realm of environmental law to balance the interest of economic progress and other social goals and values, including human and environmental health.¹⁵⁷¹

¹⁵⁶⁷ Cohen 2000: 10245.

¹⁵⁶⁸ On environmental crimes as “regulatory crimes,” Sahramäki et al. 2015: 42. Which relates to the concept of *malum prohibitum*, meaning that the wrongfulness of the act is conditioned by its legal prohibition. See on environmental crimes in this respect, M. Parker 2009.

¹⁵⁶⁹ With respect to regulatory offenses, cf. Lewin & Trumbull 1990: 282. In contrast to other crimes, e.g., tax evasion or property crimes, where the crime can more easily be presented as a mere transfer of wealth, cf. Raskolnikov 2020: 19. Or minor offenses such as speeding, which can seem reasonable to tolerate if there is a “good” reason for doing so: for instance, to drive an urgently injured person to the hospital, cf. Harel 2012: 18.

¹⁵⁷⁰ On the efficiency of standards Part 3.B.III.3.a; on social CBA Part 3.B.II.1.

¹⁵⁷¹ Cf. on the CBA for determining environmental standards, cf. Part 3.B.II.1. On the balancing process of social costs and benefits of environmental legislation, cf. Faure & Partain 2019: 63 ff. On the functional division between environmental criminal and administrative law, Saliger 2021: para. 2.

In contrast, the function of environmental criminal law is subsidiary but not formative.¹⁵⁷² Standards clarify that at any emission unit above the maximum level, the marginal social benefits are lower than the marginal social costs. Accordingly, any activity (level) that causes emissions exceeding it must be reduced.¹⁵⁷³ The instrument of punishment is intended to ensure this reduction by disproportionately reducing the utility function of the polluter when the specified target (E^*) is exceeded, i.e., ensuring compliance with the target ($E \leq E^*$).¹⁵⁷⁴ The primary function is preventing the violation, i.e., in the negative conceptualization as deterrence¹⁵⁷⁵ and in the positive notion of reinforcing the social normative order and trust in it. Criminal sanctions are “not simply a price that is paid for the right to pollute past the limit. The right does not exist – the firm must pay the penalty *and* cease its illegal activity. Punishment does not imply retrospective consent.”¹⁵⁷⁶ This is the distinguishing feature of penalties from prices, as described by Robert D. Cooter: While sanctions lead to an abrupt increase in private costs for rule violations, prices lack this disproportionate adverse effect on an individual’s utility functions, so the incentive to behave is more elastic.¹⁵⁷⁷ “A sanction is a detriment imposed for doing what is *forbidden* [...] a price is payment of money which is required in order to do what is *permitted*.”¹⁵⁷⁸ This private utility effect and economic argument for a prohibitive function of environmental criminal law correspond to the social effect of “absolute institutions” whose violations lead to social condemnation (exclusion).¹⁵⁷⁹

While informational superiority of concerned actors favors market-based approaches to regulate pollution, direct regulation, as in the form of standards, is chosen when the former proves insufficient to, nevertheless, address market failures. For example, when transaction costs are prohibitive and/or impossibilities or high costs related to defining property rights persist. Command-and-control instruments are then expected to best approximate social welfare.¹⁵⁸⁰ The

¹⁵⁷² On administrative accessoriness as the central structural principle of environmental criminal law, cf. BT-Drs. 126/90: 28. Environmental criminal law thus only has an accompanying function, cf. BT-Drs. 12/192: 11. Saliger 2021: para. 2.

¹⁵⁷³ Cf. Part 3.B.III.3.a.i and Figure 22 Optimal level of emissions.

¹⁵⁷⁴ Cf. Part 3.B.III.3.b.i and Figure 24 A firm’s utility function of emission standards. Also see Figure 3.1. in Ringel 2021: 59 f.

¹⁵⁷⁵ Starr 1986: 382.

¹⁵⁷⁶ Emphasis adopted, cf. Trumbull 1990: 212.

¹⁵⁷⁷ Cooter 1984: 1523 f.

¹⁵⁷⁸ Emphasis adopted, cf. Cooter 1984: 1524 f.

¹⁵⁷⁹ Unlike violations of, what Roberts calls “tolerant institutions,” such as over-parking, where the individual remains part of the group in exchange for engaging in another activity, i.e., paying the fine, cf. Roberts 1973: 391 f.

¹⁵⁸⁰ Compare Part 3.B.III.3.a.i. Of course, one may question whether direct regulation and the defined targets are indeed efficient, given regulatory information costs and the arguments listed in favor of market-based instruments, respectively command-and-control instruments. The regulatory trend toward the introduction of markets for carbon emissions suggests that market-based approaches may be feasible in areas traditionally regulated by direct

regulatory interplay between environmental administrative law and environmental criminal law represents a functional division; environmental criminal law's task is to secure the status quo.¹⁵⁸¹ This functional division is purposive and must be maintained to prevent inefficiencies.

b. The Efficiency of Harm-Based Sanctions for Corporate Environmental Crime

An optimal internalizing penalty at the level of social harm requires that judiciaries adequately investigate the social costs of the act. However, in (corporate) environmental crime cases, the harm is usually dispersed and time-lagged, affecting a large and indeterminate number of (direct and indirect) victims.¹⁵⁸² This makes it challenging to make an informed assessment of victimhood at the time in the courtroom.¹⁵⁸³ Moreover, cumulative and synergistic effects challenge establishing causality and quantifying harm.¹⁵⁸⁴ While one single actions may not be detrimental to social health and welfare, this changes when they accumulate.¹⁵⁸⁵ The harm caused by corporate environmental crime usually results from systematic rather than single acts.¹⁵⁸⁶ The systematic nature of corporate environmental crimes implies its severity and accumulation of environmental damage, potentially threatening human health or national economies.¹⁵⁸⁷ The irreversible and tremendous effects of pollution reveal environmental crimes of a systematic nature as one of the most severe crimes.¹⁵⁸⁸ Concerning ecological tipping points, there is a risk of destabilizing the entire natural system and severe irreversible damage.

As the indirect harm of (corporate) environmental crimes is typically more significant than the direct harm, there is a risk that the former will be undervalued, resulting in underdeterrence.¹⁵⁸⁹ The adequate assessment of the actual scale of social harm is further aggravated by questions on

regulation. Furthermore, one may generally question the CBA and monetary quantification of environmental damage and associated social benefits and costs. However, legislative decisions on broader societal regulations must be made and legal coherency implies that, for now, it is assumed that the defined social optima and refined regulation represent the closest possible approximation to social welfare. See also Saliger 2021: para. 2. Salinger underlines this secondary, maintaining function of environmental criminal law. See on the utility function of standards, Part 3.B.III.3.b.i.

¹⁵⁸¹ Saliger 2021: para. 2.

¹⁵⁸² Faure & Partain 2019: 212; Starr 1986: 383, 394. What Bentham refers to as "distant mischief," while he, however, primarily refers to the notion of fear of third parties, cf. Bentham 1988: 207. Which resembles the main reason for public enforcement as elaborated by Shavell 1982; 1984.

¹⁵⁸³ On questions of victimhood in the BP Oil spill case, Garrett 2014: 163 f.

¹⁵⁸⁴ For instance, cf. Starr 1986: 383.

¹⁵⁸⁵ Starr 1986: 383.

¹⁵⁸⁶ For instance, the diesel scandal. Or the BP Oil Spill, in which repeated violation lead to severe and disperse environmental and human harm, including several deaths, cf. Garrett 2014: 130 ff.

¹⁵⁸⁷ On organizational crime more generally, cf. Shover & Hochstetler 2002: 2. On environmental corporate crime, see Starr 1986: 383, 394.

¹⁵⁸⁸ Starr 1986: 379.

¹⁵⁸⁹ See on this Part 4.B.III.3.c. See on problems of estimating harm as reported by practitioners as one reason for the sparse recourse to or low level of sanctions in Germany, Gerstetter et al. 2019: 117.

estimating harm in monetary values and units: Judges are confronted with the general challenge of incorporating environmental values into the economic logic, i.e., quantifying and assigning a monetary value to environmental interest and associated damage.¹⁵⁹⁰ The risk of undervaluation is further enhanced as, in contrast to environmental economists and (legal) policymakers, the judge's perspective is much narrower since the perspective of criminal law is much narrower. The (traditional) focus of criminal law is on the specific individual case and its direct consequences.¹⁵⁹¹ Legal principles such as the principle of *lex certa* require a high degree of precision in criminal law and sanctions. The conditions of criminal liability in terms of the scope and application of the elements of the offense must be sufficiently defined so that the offender can know in advance the legal consequences of his conduct,¹⁵⁹² including the level of punishment.¹⁵⁹³ Reliance on social harm to define the sanction level is further complicated since environmental criminal law often deals with probabilistic damage.¹⁵⁹⁴ Accordingly, in the United States and Germany, environmental crimes are partially codified as (abstract) endangerment offenses and sanction the mere violation of a norm independent of harm realization.¹⁵⁹⁵ This practically impedes the judge's ability to tailor the sanction to the harm level adequately.¹⁵⁹⁶ In light of this, it can be argued that outsourcing the correction of market failure through internalizing sanctions to criminal justice practitioners risks reencouraging, respectively, encouraging the originally targeted market failure.

This does not mean that the level of harm cannot be considered in sentencing. Indeed, the level of harm does play a role in practice.¹⁵⁹⁷ So does the surpassing question of guilt and

¹⁵⁹⁰ On the general question of attributing monetary values in case of ecological goods, cf. Kolmar 2017: 123 f. See also Cohen 1992: 1089. Cohen states that evaluation of monetary environmental harm is seldomly available. See also Part 3.B.II.1.a.

¹⁵⁹¹ Cf. Saliger 2021: para. 2. See also the United States Sentencing Commission 2021: chap. 5 § 5 E 1.2. on fines for individual defendants, mentioning that the seriousness of the offense to be taken into consideration includes "the harm or loss to the *victim*," emphasis added.

¹⁵⁹² BVerfG, *Beschluss*, 2 BvL 11/85, May 6, 1987: para. 56; Faure & Visser 1995: 322.

¹⁵⁹³ BVerfG, *Beschluss*, 2 BvL 11/85, May 6, 1987: para. 60. Satzger 2021: para. 19 ff.

¹⁵⁹⁴ Cf. on this, Braithwaite & Geis 1982: 299.

¹⁵⁹⁵ For instance, cf. Clean Air Act Amendments 1990, Pub. L. No. 101-549, 104 Stat. 2399 (42 U.S.C. §§ 7401 ff.), § 113(c)(5) or § 325 (2) StGB. Within German criminal law, cf. R. Schmitz 2019: para. 28. Generally, on environmental criminal law and its application independent from the realization of harm, Faure & Partain 2019: 217 f. See critical on the criminalization of endangerment offenses, in particular, in light of culpability and guilt, Hassemer 1992: 381 f.; Müller-Tuckfeld 1995: 74 ff.

¹⁵⁹⁶ The criminalization of attempts further underlines the practical limitations of a harm-based sanction.

¹⁵⁹⁷ United States District Court for the Western District of Kentucky, *United States vs Distler*, Crim No. 77-00108, September 14, 1979. See also § 46 (a) StGB, that "the consequences caused by the offence" may be taken into consideration in sentencing.

culpability.¹⁵⁹⁸ However, it is argued that including harm in sentencing ought to be done by consulting expert knowledge and not be the prime variable for determining the level of sanction. Overall, the assumption of an internalization and pricing function of environmental criminal law contradicts a consensus based on welfare considerations of environmental law, economics, and sciences and an associated normative social order. An internalization approach to environmental criminal law would convert rules of inalienability into rules of liability (the offender as a “debtor” of society who is allowed to cause damage under the condition of compensation), transforming the legal structure designed to achieve social welfare. It must, therefore, be concluded that the “punishment-as-price paradigm”¹⁵⁹⁹ of Becker’s internalization framework is incongruent with the social, legal, and economic order. The next step is to examine the extent to which this likewise applies to Posner’s approach of absolute deterrence.

2. Corporate Environmental Crime as Market Bypassing: Absolute Deterrence – Posner

Contrary to Becker, Posner portrays crimes as inefficient market bypassing and focuses on deterrence by gain eliminating sanctions. The according aim of punishment is to channel transactions into an efficiency-superior market structure. The social undesirability of the behavior can be assumed when a (1) market transaction structure is available; the question of the value of crime is then secondary. In addition, for a complete deterrence approach to be superior, it requires that (2) the gain can be determined and eliminated, which has a deterrent effect.

a. The Availability of Market Transaction Structures: Environmental Economics and Law Perspective

Bypassing a market presupposes the existence of a market. Only if the former is present the efficiency superiority of a market transaction is reasonable, and channeling the resource into the market system becomes a meaningful goal of an efficiency-oriented criminal law. The main explanation for market failures in environmental goods is the unavailability of market structures due to undefined property rights and prohibitive transaction costs,¹⁶⁰⁰ which *prima facie* seems to equally apply to corporate environmental crimes. However, Posner’s concept of market

¹⁵⁹⁸ For instance, § 46 (1) StGB, “[t]he offender’s guilt provides the basis on which the penalty is fixed.” This is, however, not the subject to further analysis since the focus is on the economic approach.

¹⁵⁹⁹ Miceli 2019: 24.

¹⁶⁰⁰ On this Part 3.B.I.

structures and their circumvention is broader than the relationship between victim and polluter and includes third parties. Here, one may distinguish between two forms of violations, i.e., market bypassing.

The first scenario is that the company emits below the emission limits but does not obtain a permit. The bypassed market is secondary as a semi-private market between the state and the polluter. The state or public authority, such as the administrative agency, is the representative agent for those whose rights are affected, reducing transaction costs.¹⁶⁰¹ Direct government regulation leads to the emergence of derivatives markets whose commodities and tradable quantities are determined by the government. The state defines relevant market conditions based on welfare considerations, such as available quantity and market price. Therefore, the firm's behavior of emitting without permission bypasses the permit market, which is superior in efficiency.

The second scenario is that the company emits above the maximum level of emissions. The market between the state and the polluter is somewhat empty. Prohibiting a resource transfer above the emission level indicates an absolute protection structure of the affected natural good by inalienability rules to prevent transactions.¹⁶⁰² However, this does not necessarily mean that an efficient-superior market structure is unavailable. If the company violates the emission limits, it avoids investing in pollution-reducing technologies, among others, rather than illegally polluting. The bypassed market is secondary in the form of the labor market, where transfers would be more efficient.¹⁶⁰³

In both cases, a market that defines the conditions of alternative legal, consensual, and voluntary resource transfers is available. Although the transaction costs are not zero, they are probably lower than the enforcement costs in the case of bypassing. Since both variables are social costs, the social welfare generated by the former is greater than that by the latter.¹⁶⁰⁴

In addition, corporate environmental crimes and a related increase in environmental harm and risks can distort competitive market structures and result in costly preventive actions for individuals or the state. For example, the state may take disaster response measures, or private parties may invest in insurance for extreme weather events. All these costs come at the expense of societal welfare and underscore the social undesirability of the behavior. Therefore, corporate

¹⁶⁰¹ Compare Endres 2007: 54.

¹⁶⁰² Cf. Part 3.B.III.3.b.ii.

¹⁶⁰³ Posner refers to this idea when he states that the bypassed market is usually not the market that governs the relationship between the victim (in this case, affected third party or administrative agency) and the perpetrator, but another available market, cf. Part 4.B.III.2.a.

¹⁶⁰⁴ See on this, Part 4.B.III.3.b.

environmental crimes are socially undesirable, and social welfare is best served when they are prevented and channeled into efficiency-enhancing market mechanisms. This conceptualizes environmental criminal norms in line with the environmental, economic, and legal understanding of prohibition. The firm is not prevented from its potentially beneficial activity of producing *per se*; it is prevented from producing in a socially undesirable manner to direct production activity into welfare-enhancing legal alternatives.

b. The Efficiency of Gain-Based Sanctions for Corporate Environmental Crime

A full deterrence policy requires that the offender is worse off when bypassing available market structures by eliminating at least the expected gain.¹⁶⁰⁵ In contrast to the dispersion of harm in corporate environmental crimes, the gain is usually much more concrete.¹⁶⁰⁶ It can be quantified, for example, by the value of the circumvented license or emission-reducing technologies. In addition, corporate costs and revenues are usually recorded in accounting sheets, which allows for accurate monetary and numerical determination of derived benefits. Monetary gain elimination avoids controversy over quantifying environmental goods and damages.

Moreover, unlike harm-based sanctions, the offender knows *ex ante* what sanctions to expect because the illegal gain motivated committing the crime. The elimination of profits arguably also deters as corporate crimes are usually assumed to be financially motivated.¹⁶⁰⁷ Depriving the illegal profit links the penalty to the act criminal act and strengthens deterrence;¹⁶⁰⁸ a gain-based sanction assures that “crime does not pay” and impedes that the norm violator is better off than by compliance.¹⁶⁰⁹

Difficulties may arise from the fact that multiple actors are involved and the conceptual controversies about the definition of corporate crime and the ultimate beneficiary.¹⁶¹⁰ For example, evading a costly license is inherently a corporate benefit in the first instance, while an associated salary increase for the responsible manager is private. The difficulty in determining

¹⁶⁰⁵ Part 4.B.III.2.b. See Calabresi & Melamed 1972: 1126; Posner 1985b: 1201. Starr argues that the sanctions aim to “remove the competitive advantage and economic incentive realized when defendant disregards the requirements of environmental statutes,” cf. Starr 1986: 382.

¹⁶⁰⁶ Different, cf. Coffee 2020: 63 f. Coffee argues that it is difficult to know the expected gain in cases of corporate crimes. See also on practical reports of difficulties of estimating the gain, Gerstetter et al. 2019: 17. However, if the expected gain would be unknown, the criminal would not engage in the conduct.

¹⁶⁰⁷ On the economic and instrumental motivation of corporate crime, cf. Part 4.B.II.1 and Part 4.B.II.2.

¹⁶⁰⁸ I.e., the tempting imagination is eliminated by the direct association with the punishment, Beccaria 1819: 76; 1905: 120. See also Starr, arguing that the aim of sanctions is removing the financial gain that motivated the act, cf. Starr 1986: 382 f.

¹⁶⁰⁹ This principle has just recently been confirmed in the BVerfG ruling on the Cum-Ex scandal, cf. BVerfG, *Beschluss*, BvR 2194/21, April 7, 2022: para. 83.

¹⁶¹⁰ See, for instance, Part 1.C.III.2.

the ultimate beneficiary aggravates deterrence since it aggravates ensuring that the penalty removes the criminal incentive from the beneficiary and motivated agent. To this moment, the analysis is limited to individual sanctions, so the premise for gain-based sanctions is an *identifiable* individual beneficiary.

3. Application to Case Example: Violations of NO_x Emissions Standards

Recall the fictitious NO_x emissions case (Part 3.B.III.2.d; B.II.3) and suppose the following: On the private benefit side, there is the benefit to M of 90 million € of avoiding the more costly emission control system, of 9 million € to M1. On the social benefit side, there is the utility of the 1 million vehicle consumer in terms of the purchase of a low-cost diesel car and its use, estimated by their WTP, revealed by the purchased price of 200 €, i.e., 200 million €. On the social costs side, the damage to B’s lungs was valued at 1 million € based on the cost of rehabilitation measures. The health costs of the other European citizens can only be partially estimated at a total of 2 billion €. Future health costs related to excessive NO_x emissions in urban areas cannot be calculated. With respect to the environment, the costs of air pollution from NO_x emissions, e.g., biodiversity loss, soil contamination, or water quality, can be estimated at 5 billion €. Limitations and controversies around the scope or value definition and assessment,¹⁶¹¹ just as knowledge gaps on potential harmful synergistic and cascading effects of nitrogen and natural limitations of science and its methods, remain. Additional social costs arise, for instance, from incalculable costs due to a loss of trust and market distortion. The list of social costs must be understood as non-exhaustive; the main benefits and costs are portrayed in Table 14.

Table 14 Benefits and costs of violating NO_x emissions standards

Scope	Gain/benefit in million €	Cost/harm in million €
Private	M: 90 M1: 9	B: 1
Social	Vehicle consumers: 200	EU citizen’s health: 2.000 Environmental harm: 5.000

¹⁶¹¹ Cf. Part 3.B.II.1.

a. Optimal Deterrence and Internalization of NO_x Emissions Standard Violations –
Becker

i. On the Scope of NO_x Emissions Standard as Criminal Norms

Drawing on Becker's internalization approach,¹⁶¹² the first question to address in regulating M's activity is whether exceeding NO_x emissions limits by installing the defeat device is inefficient by creating negative net loss $D(O)$. This is the case if the offender's gain is less than the victim's loss ($G(O) > H(O)$) and is conditioned on the positive inclusion of M's and M1 and M2's criminal gain into the social welfare function.¹⁶¹³ The approach implicitly assumes that the NO_x emissions level of 100 mg/km (E^*) for diesel vehicles may not be socially optimal since there are cases where the production (and use) of vehicles with emission values $> E^*$ of 100 mg/km¹⁶¹⁴ increases social welfare.

Inserting the above numbers into the equation for net damage ($D(O) = G(O) - H(O)$),¹⁶¹⁵ the first difficulty lies in determining whose values to include in G and H since there is more than one beneficiary offender and multiple individuals and non-individuals who classify as being harmed. In addition, the damage is the result of an accumulation of individual actions by company representatives (M1, M2, E1, and E2) who jointly caused the damage, but whose actions are difficult to distinguish and attribute to each other.¹⁶¹⁶

Taking a narrow scope of application in terms of direct offenders and victims, i.e., M1's gain and B's harm, the violation of the 100 mg/km N (E^*) was efficient since M1's gain of 9 million € is greater than B's harm of 1 million €. However, such a case-oriented perspective misses the (socio)economic and legal reasons for the regulation in the form of criminalization of the activity concerned:¹⁶¹⁷

It misses the economic rationale as it overrides behavioral norms of environmental law developed from a social welfare perspective as part of an environmental policy geared to overarching societal goals.¹⁶¹⁸ These include environmental goals that must be secured at all costs, such as the 1.5°C climate target enshrined in the Paris Agreement, representing system boundaries beyond which detrimental environmental consequences risk having socioeconomic impacts that

¹⁶¹² Part 4.B.III.1.

¹⁶¹³ Cf. Part 4.B.III.1.a.i.

¹⁶¹⁴ On the efficiency of the NO_x emissions standard, Part 3.B.III.3.a.ii.

¹⁶¹⁵ Part 4.B.III.1.a.i.

¹⁶¹⁶ See further on the problem of attribution, Part 4.E.II.2.

¹⁶¹⁷ Part 4.C.V.1.a.

¹⁶¹⁸ See generally Part 3.B.II.

dramatically exceed abatement costs.¹⁶¹⁹ Since nitrogen oxides lead to the formation of greenhouse gases and indirectly contribute to global warming and associated impacts, such as extreme weather events or loss of biodiversity and ecosystem capabilities,¹⁶²⁰ violating the NO_x emissions level by producing cars with approximately 300 mg/km N and thereby increasing the likelihood of exceeding system boundaries cannot be considered welfare enhancing.

It misses the legal perspective since it disregards that (environmental) criminal law, in general,¹⁶²¹ and NO_x emissions standards, in particular,¹⁶²² represent a social normative order whose formalization responded to the demand to regulate emerging transnational (transcommunal) social interdependencies. These interdependencies emerged from, among others, the mobility of emitting sources (vehicles) and their contribution to global climate problems. Environmental norms were developed to meet the public's demand to avoid health and environmental risks and to make social interaction peaceful.¹⁶²³ Any *willful* disregard of them, i.e., of NO_x standards, irritates the foundations of civility building on mutual trust in norm compliance. In cases of corporate crimes, this may encourage secondary harm, such as destabilizing the financial market. For instance, if a great number of stakeholders simultaneously extract investments due to a fear of loss of share values. Moreover, the breach of trust in mutual compliance is amplified if it goes uncorrected and risks a rippling effect by encouraging other corporate agents to do likewise.¹⁶²⁴

Taking a broad perspective, i.e., the largest sum of criminal gain in the form of M's and M1's private profits as well as social benefit minus the largest sum of social costs in the form of environmental and health costs and costs to B, the act(s) must be deemed as socially inefficient, with a net loss of

$$D(O) = G(O) - H(O) = (90 + 9 + 200) - (2.000 + 5.000 + 1) \text{ million } \text{€} = 299 - 7.001 \text{ million } \text{€} \\ \approx - 6.700 \text{ million } \text{€}$$

¹⁶¹⁹ For instance, on the costs of climate change, Krieger 2022.

¹⁶²⁰ Oehlmann et al. 2021: 48.

¹⁶²¹ Part 4.C.III.2.

¹⁶²² Part 4.C.IV.6.

¹⁶²³ Part 4.C.IV.6.

¹⁶²⁴ For instance, the Volkswagen scandal did not remain within the mother company of VW, but involved other car manufacturers, such as Audi or BMW.

ii. On the Level of Sanctions for NO_x Emissions Standard Violations

Internalization implies that the offender is sanctioned at the level of social harm. On the side of the offender, the question of the concrete damage realized by an attributable action arises. On the side of the damage, questions on measuring the extent of damage, temporal and/or local (e.g., whether and how to include future and indirect damage), persist.¹⁶²⁵ In addition, corporate crimes, especially when widespread, such as violations of European NO_x emissions standards by a manufacturing company of high social status, can create an indeterminable “loop” of harm beyond apparent economic values.¹⁶²⁶

Assuming that the amount of harm is known, the complexity of the nitrogen cycle and possible cascading effects create difficulties related to identifying polluters and the definition of attributable harm. This is aggravated when the concerned norm criminalizes (abstract) endangerment offenses.¹⁶²⁷

As discussed previously (Part 3.B.II.1), determining the welfare effect of policies with large socioeconomic and environmental impacts encounters limitations and uncertainties that can only be approximated through in-depth and long-term analyses by experts from different scientific fields, such as those conducted by the UBA or the EPA.¹⁶²⁸ Transferring this task to the courtroom and a case-by-case criminal law is inconsistent with the functional division of the environmental law regime and risks underestimating the true extent of harm.¹⁶²⁹

b. Absolute Deterrence and Market Bypassing

i. On the Scope of NO_x Emissions Standard as Criminal Norms

In Posner’s view, the main reason for the inefficiency of crime in terms of social undesirability lies in the circumvention of efficiency-ensuring market transaction structures, based on consensual and compensated resource transfer. Thus, the condition is that stakeholders can access an available market, i.e., at minimum, property rights are clearly defined, and transaction costs are not prohibitive.

The NO_x emissions standard is absolute since the entitlement of the public to be free from vehicles polluting above E^* (100 mg/km N) is inalienable.¹⁶³⁰ There is no permit (entitlement)

¹⁶²⁵ Further in this respect, Part 4.E.II.2.

¹⁶²⁶ Cf. the loop-diagram of corporate harm illustrated by Forti & Visconti 20201: fig. 5.1.

¹⁶²⁷ Compare, Part 3.B.II.1.c.

¹⁶²⁸ Compare the study to nitrogen reduction of the UBA, Part 3.B.II.1.c.

¹⁶²⁹ On secondary harm and information costs, Part 4.B.III.3.c.

¹⁶³⁰ Part 3.B.III.3.b.ii.

for emitting that M could obtain, and the market between the state and company M may be described as empty. However, as observed by Posner, for the efficiency argument of market transactions concerning crime regulation, the market must not be *vis-à-vis* the direct parties, the victims (B) of emission, and the emitting party A, but involves third parties.¹⁶³¹ Proceeding with this reasoning, exceeding the NO_x emissions limit bypasses the market for emission control systems that M or M1 and M2 could have used to contractually and consensually purchase to comply for 100 € per vehicle. This would have been socially superior (optimal) as it allows compliance with the emission standard while providing a benefit to the party selling the control system. It also encourages research into emission control technologies and market competition. Channeling M's behavior into available legal market structures is, therefore, efficiency superior (optimal).

This view is consistent with the institutional perspective on law, which regards the law as a normative social order, defining the behavioral space within which individual goals can be pursued consensually and peacefully.¹⁶³² Any violation of the emission standards challenges the institution's function, which is to mitigate environmental and health risks associated with rising NO_x emission levels, as well as mutual trust in compliance. Criminal law in the form of emission standards is an absolute institution¹⁶³³ since any violation is socially condemned and its punishment has an inherent stigmatizing effect, expressing that the act "will not be tolerated or counted in the social weal."¹⁶³⁴

It may thus be argued that a policy of complete deterrence of emission offenses is congruent with an efficiency- and normative-oriented legal policy.

ii. On the Level of Sanctions for NO_x Emissions Standard Violations

Full deterrence requires the sanction to ensure that the party is better off complying than *vice versa* by at least eliminating the (expected) profit.¹⁶³⁵ With respect to corporation M, the expected profit is the profit obtained by substituting the expensive emission control system with a cheaper defeat device, which accumulates to 90 million €. This means that the penalty must exceed the 90 million € to prevent leaving M indifferent to the violation. Since the expected profit was the

¹⁶³¹ Part 4.B.III.2.a.

¹⁶³² Part 4.C.III.

¹⁶³³ Cf. fn. 1563.

¹⁶³⁴ Trumbull 1990: 212.

¹⁶³⁵ Cf. Part 4.B.II.3; Part 4.B.III.2.b. For simplicity, aspects of the probability of enforcement are not considered yet, see further on the relevance of the likelihood of sanction as incorporated within an optimal penalty model, in general, Part 4.D.I.2, concerning corporate environmental crime Part 4.D.IV.1.a.

original motivation for the misconduct, it can be assumed that the corresponding figures are recorded in the company's balance sheet or can be determined by a market analysis of applicable prices. For manager M1, the expected gain in terms of variable performance is likely to be equally recorded in company documents, such as the annual report or pay slips. The penalty must be higher than the expected gain to successfully remove the original motivation, namely 10% of the additional gain, in numbers 9 million €.

The elimination of profits is practical due to the relatively straightforward determinability of the penalty amount. It also corresponds to the social welfare considerations and correlated entitlement protection structure of (NO_x) emission standards, i.e., defining maximum activity levels above which any social desirability must be denied so that the entitlement to be free from concerned emissions is absolute and protected by inalienability rules.¹⁶³⁶ Furthermore, a gain-elimination approach corresponds to the legal institutional perspective, understanding (criminal) norms as – ideally – formalizing social normative order; any *willful* violation disregards the same and contests trust in mutual norm compliance so that its social desirability must be denied.¹⁶³⁷ The gain-elimination approach is also coherent with the case-tailored criminal law perspective since the profit is commonly relatively easy to attribute to the beneficiary. Moreover, it adheres to the principle of *lex certa*,¹⁶³⁸ since the offenders typically know the expected profit in advance. This does not mean that harm should be neglected in sentencing; the argument is that criminal law's primary function is to secure (social and market) transaction structures that result from a functional need and are based on social welfare considerations. In this perspective lies the common ground of law and economics, as will be argued below. The remainder of the work also explores the question of whose expected gain should be considered in determining the relevant sanction when an additional agent (the corporation) is introduced into the deterrence framework.¹⁶³⁹

VI. Aligning the Legal Institutional and Economic Perspective: Crimes as Violations of Social Order and Transaction Structures

In market availability cases, the value of crimes is secondary as their inefficiency can be reasoned based on the circumvention of an efficiency-guaranteeing market mechanism – with the premise

¹⁶³⁶ On the former, Part 3.B.III.3.a.ii, on the latter, Part 3.B.III.3.b.ii.

¹⁶³⁷ Compare, Part 4.C.IV.6.

¹⁶³⁸ Cf. on the principle with respect to the level of punishment, fn. 1593.

¹⁶³⁹ Cf. on corporate criminal liability within the deterrence framework, Part 4.E.

that choice and consent align. In such a case, defining the scope of criminalizing (corporate) environmental harm related to bypassing markets and its function in deterring these circumventions seems consistent with the legal-institutional perspective. The concept of market structures is similar to the perspective on the law as institutionalized social transaction structures in the sense that they facilitate pursuing personal goals peacefully and socially beneficial. Market evasions or criminal acts force society to conduct a transaction in an undesirable manner and, in doing so, challenge trust in the rules of civil interaction. The function of criminal punishment is to (re)ensure trust through compliance with these market or social transaction structures. By this, the behavioral expectations that result from the public choice of a specific entitlement allocation and its protection structure are fulfilled. Such social expectations have an independent value, so their disrespect entails significant harm and can even be considered immoral.¹⁶⁴⁰

The inherent normativity of a social perspective on criminal acts marks the boundaries of a purely economic perspective. However, Posner's conception of market structures seems much narrower than the institutional understanding of criminal law: while Posner acknowledges that market structures need not be explicit, he defines the values recognized in terms of an individual's WTP and WTA. Since both values are typically influenced by, among others, an individual's actual wealth, such a restriction seems inappropriate in light of distributional considerations. Difficulties in incorporating values not manifested in explicit markets, such as justice or freedom, remain. Moreover, in cases where the market is unavailable, the social value of criminal behavior must be revisited. Scenarios include accidental violations of administrative environmental regulations or crimes of necessity. In Buchanan's view, these can be described as individual cases in which a rule that leads to a Pareto-optimal outcome in the majority of cases produces "non-optimal" outcomes; such observance does not imply consensus on changing the rule but rather is a natural consequence of collective decisions based on a probability of the preponderance of optimality.¹⁶⁴¹ In such circumstances, legal rules or procedures can refine the "non-optimal" result, such as legal justification concepts.

Overall, one may conclude that the economic perspective and methodology provide a valuable analytical framework, particularly when normatively specified by the legal system and its practitioners.

¹⁶⁴⁰ On this with respect to contracts, Calabresi 2014: 2. Also Part 3.A.IV.2.c.

¹⁶⁴¹ Buchanan 1962: 347 ff.

VII. Interim Statement

In theory, optimal deterrence can be achieved by adjusting the level of sanctions to the extent of harm or gain. However, Becker's approach to optimal deterrence is based on the idea that some crimes can increase social welfare, primarily by ascribing equal social value to the criminal's gain. An assumed freedom from value judgment justifies this. Such an understanding, however, is blind to possible divergences between the private and social values of a given activity. It ignores the question of whether there are institutional boundaries to socially valuable behavior. The legal institutional approach provides a helpful understanding of the social function and underlying values of criminalization of (corporate) environmental crimes to justify the exclusion of criminal values from social welfare analysis. Thereby, it allows for the complementation of economics with the legal perspective and the informing of social welfare analysis on environmental and social values based on social normative order. The derived normative argument on the value of the activity concerned is consistent with the functional structure underlying the regulatory regime of environmental law. Based on environmental economics, the administratively defined norms define the standards of socially desirable behavior from an overall social welfare analysis. Within this framework, environmental standards define the optimal level of emissions above which any unit of emission is considered harmful to social welfare. Thus, even if one allows the idea of welfare-enhancing crimes based on social benefit and cost considerations (excluding private criminal utilities), the assumption of (corporate) environmental crimes as potentially welfare-enhancing fails.

Against this background, research question 1 (cf. Figure 2 and Part 1.C.II) is answered: The primary function of environmental criminal law is to ensure compliance with socially beneficial rules of conduct by disproportionately degrading the utility function of a violator through the instrument of punishment. The "punishment-as-price paradigm"¹⁶⁴² would distort this functional legal division, designed in light of social welfare, and lead to inefficiencies and possibly market failures. Criminal law has been conceived according to other principles, such as justice or fairness, and punishment focuses on individual cases. The typically disproportionate secondary harms of environmental crimes by corporations and the difficulty of measuring environmental harms in monetary terms prevent a proper investigation of the true extent of all social costs in the courtroom. Therefore, it is argued that the optimal deterrence and harm-based approach is inconsistent with environmental criminal law's social, legal, and economic institutional realities.

¹⁶⁴² Miceli 2019: 24.

This does not mean that harm ought not to be considered in sentencing practice but that the underlying idea of internalization and potential efficiency of the behavior concerned are misleading. Acknowledging compliance as the prime environmental criminal law function, the focus on internalization and harm in sentencing is inconsistent and bears the risk of underdeterrence. As a result, its methodological value for analyzing corporate environmental crimes in the specific case of maximum emission standard violations can be questioned.

Posner's approach, based on complete deterrence and profit, seems more consistent with social and legal realities. Corporate environmental crimes can be understood as circumventing efficiency-preserving market structures in the presence of market availability. While the unavailability of market structures is one of the reasons assumed to cause externalities, this is limited to the victim-causer relationship and overlooks circumvention by third parties on implicit or secondary markets. If a firm emits without a permit, it circumvents the permit market *vis-à-vis* the government. If emissions are above a standard that sets maximum emission levels, the polluter circumvents the labor market, for example, by avoiding investment in emission-reducing technologies. Therefore, conceptualizing corporate environmental crimes as circumventing market structures helps to analyze the optimal scope and function of environmental criminal law. This is further supported by increased market-based instruments, such as emissions trading, which define legal market structures for resource allocation to enhance allocative efficiency. On this basis, the social desirability of corporate environmental crimes must generally be negated based on economic rationales.

Profit-based sanctions also seem more practical since determining the derived benefits from corporate offenses is supposedly easier than determining the overall societal costs. For this purpose, reference to bypassed compliance costs (e.g., the cost of a permit or new technology) and corporate balance sheets is helpful. Furthermore, a deterrent effect is likely since the original motivation in the form of financial gain is withdrawn.

However, the limitations of the profit-based approach to corporate offenses arise from the multiplicity of agents and the associated complex benefit and interest structure. This might make it challenging to identify the beneficiary to ensure that the negative incentives of criminal sanctions reach the original decision-maker. Another issue of profit-based sanctions is when the intended criminal gain has not been realized.

The peculiarity of environmental damage is that it reconciles the social and economic normative order: Moral and economically rational behavior is defined by indispensable ecological limits of the system, to which both the civil and economic order must subordinate themselves in the

interest of self-preservation, i.e., to sustain social peace and economic efficiency. In this respect, natural sciences become crucial by defining behavioral limits. It is against their background that the question of the welfare space, i.e., the range of behavior in which socially valuable behavior may take place and the question of social values, is to be interpreted. Since natural sciences apply universally, irrespective of academic boundaries, they naturally encourage a certain approximation of economically and socially valuable conduct.

Emerging climate litigation and progressive jurisprudential decisions, such as the BVerfG's climate ruling, point to an existing legal order that is seen as inadequate concerning codifying necessary social and economic rules of conduct for self-preservation. This indicates the inherent social (normative) and economic contingency of the social and legal order with regard to changing social problems, and the need of its constant revision and adjustment.

However, correcting inefficiencies of environmentally harmful behavior due to unreflective pricing continues to be the task of (administrative) environmental law. In contrast, the role of environmental criminal law is secondary, leaving aside case-based exceptions.

For further analysis, these aspects must be left aside, and it is assumed that the current environmental legal regime, including environmental criminal law, adequately represents the socially and economically optimal welfare space. The value of environmental crimes is therefore negated, so the policy goal of full deterrence is *theoretically* socially desirable – albeit constrained by its associated social costs (research question 1). The next step is to examine the optimal sanction design for the intended criminal law's function and the corresponding sentence; this leads to research question 2 (cf. Figure 2 and Part 1.C.II). Economic considerations guide the perspective of analysis, while reflection follows.

D. The Optimal Design of Criminal Law (Enforcement)

The crime policymaker can reach the desired deterrence level by pricing the conduct by a fine or imprisonment and their probability (p) and level (f) of imposition.¹⁶⁴³ Under a complete gain-based policy approach, their combination must be greater than the gain, $pf \geq g$; the optimal fine is $f^* \geq g/p$. From an economic perspective, consensus exists on the efficiency considerations that determine the desirable interplay of enforcement variables. The ideas go mainly back to Becker's

¹⁶⁴³ While there are more forms than fines and imprisonment in the United States, the analysis will be limited to the two most important and exclusive forms in Germany. For instance, punishment forms such as the death penalty or shaming are either unconstitutional in Germany, cf. Art. 102 GG, or not within the domain of criminal law policy and enforcement.

work and his rational choice approach to crime and punishment, the central aspects of which are illustrated in the following.

I. The Optimal Penalty Model

1. Type of Sanction: Fines and Imprisonment

Assuming that fines and imprisonment have an equal impact on the behavior of individuals, fines should be used to their maximum.¹⁶⁴⁴ The idea is that fines are less costly than custodial sentences because the social costs of fines are minimal.¹⁶⁴⁵ Since fines are a direct return to the government or victim, they change the distribution and not so much the level of social welfare.¹⁶⁴⁶ Furthermore, when optimally measured, fines are assumed to fully compensate for harm and restore the *status quo ante*,¹⁶⁴⁷ leaving victims indifferent. From the “punishment-as-price”¹⁶⁴⁸ perspective, the offender is a social “debtor” in a transaction, and the *ex post* compensatory fine paid is equivalent to an *ex ante* legal purchase.¹⁶⁴⁹

In contrast, in the long run, the social costs of incarceration include prison maintenance and social welfare losses due to the incarceration of a potentially earning member of society.¹⁶⁵⁰ The costs persist after release, as an individual’s incarceration reduces his subsequent legal productivity (e.g., through loss of contacts) and prospects for legal employment.¹⁶⁵¹ The latter reduces the opportunity costs of criminal conduct and makes recidivism more likely.¹⁶⁵² It also points to the increased costs of imprisonment related to social stigma. The stigma of incarceration, which affects a person’s wealth, and other ancillary costs, such as a ban on employment or social exclusion, are thought to increase the deterrent effect of incarceration and be positively correlated

¹⁶⁴⁴ Becker 1968: 193; Polinsky & Shavell 1984: 90, 95; Posner 1980: 410. Cf. Levitt & Miles 2007: 459.

¹⁶⁴⁵ Becker 1968: 190, 193 f.; Polinsky & Shavell 1984: 89 f. See also Levitt & Miles 2007: 459. Either zero, i.e., assuming that fines are only private, not social costs, Posner 2014: 7 f. Or that they are only incurred at the time of collection, cf. Posner 2014: 260.

¹⁶⁴⁶ Becker 1968: 180. In contrast, in the case of a custodial sentence, $b > 0$ means that part of the payments made by the offender does not benefit society, resulting in a net social loss, see also Polinsky & Shavell 1984: 90.

¹⁶⁴⁷ Cf. Becker 1968: 194.

¹⁶⁴⁸ Miceli 2019: 24.

¹⁶⁴⁹ Becker 1968: 195 ff.

¹⁶⁵⁰ Becker 1968: 179 f. See also on the costs of imprisonment, Arlen 2012: 163 f. For a profound critique of the conventional law enforcement response to crime, advocating for investment in social inclusion programs, such as job training, to address the roots rather than the symptoms of criminal behavior, Waller 2006.

¹⁶⁵¹ Posner 2014: 263.

¹⁶⁵² Posner 2014: 263. It should be noted that the reasoning could also be the other way around: From an *ex ante* perspective, the impairment of earning opportunities from legal activities increases the cost of the (first) offense, thereby increasing the deterrent effect.

with the social status.¹⁶⁵³ However, the welfare effect of stigma and collateral social costs are double-edged: on the one hand, the deterrent effect increases and the social losses of crime decrease; on the other hand, the loss or reduction of employment prospects negatively affects social welfare.¹⁶⁵⁴ In light of the social costs of imprisonment, its duration should be kept to a minimum to keep the maintenance costs low.¹⁶⁵⁵

The cost superiority of fines dictates imprisonment as a “backup” when fines are insufficient to deter the offense.¹⁶⁵⁶ The inadequacy of fines as a deterrent and the need for incarceration arises when offenders cannot pay the fine.¹⁶⁵⁷ Thus, the need for incarceration is linked to the offender’s wealth, i.e., it is required for offenders without sufficient financial means.¹⁶⁵⁸ Another reason for the risk of underdeterrence by fines is the non-compensability of harm, typically assumed in felony crimes.¹⁶⁵⁹

Compared to other areas of law, e.g., tort or administrative law, the criminal justice system is relatively costly and should be reserved for harmful behavior that fines cannot deter.¹⁶⁶⁰ If sanctions of another area of law can achieve the same level of deterrence, the economic rationale for resorting to criminal law no longer holds.

2. Level of Sanction and Combination of p and f

The policymaker can leverage the overall targeted level of sanction by scaling its level (f) and probability (p) of imposition. Both variables are part of the criminal’s decision-making process and affect the number of offenses committed (O) and, ultimately, the social loss (L).¹⁶⁶¹ Therefore, a rational public policy can indirectly minimize L through the choice of p and f .¹⁶⁶² Assuming zero transaction costs, increasing f reduces L at no cost.¹⁶⁶³ The social loss effect of

¹⁶⁵³ What Posner refers to as “human capital,” cf. Posner 2014: 263.

¹⁶⁵⁴ Posner 2014: 261.

¹⁶⁵⁵ This means that imprisonment sentences are likely to be less than their monetary equivalent – an argument, that Becker puts forward to defend the “fairness” of imprisoning offenders with insufficient assets, see Becker 1968: 196 f.

¹⁶⁵⁶ Becker 1968: 193; Polinsky & Shavell 1984: 95; Shavell 1985: 1236.

¹⁶⁵⁷ Becker 1968: 196 f. For instance, cf. also Miceli 2019: 33; Polinsky & Shavell 1984: 95.

¹⁶⁵⁸ Cf. Becker 1968: 197. In 1971, the Supreme Court held that imposing a prison sentence in cases where the defendant is indigent for offenses punishable by a fine would discriminate against the poor, cf. Supreme Court of the United States, *Tate vs Short*, 401 U.S. 395, April 2, 1971. See also on the discussion of fairness and equality with respect to defendants of different wealth, Supreme Court Review 1971.

¹⁶⁵⁹ Which Becker assumed being a special scenario of the general problem of insolvency, Becker 1968: 196.

¹⁶⁶⁰ On efficiency considerations of administrative and criminal law, cf. Svatikova 2012. On tort and criminal law, for instance, Polinsky & Shavell 2007: 406 ff.

¹⁶⁶¹ On the former, Part 4.B.I.1; on the latter, Part 4.B.III.1.a.ii.

¹⁶⁶² Becker 1968: 183.

¹⁶⁶³ Becker notes that juries or judges may be unwilling to impose very large fines so that the level of the fine is relevant to (increasing) the enforcement costs, Becker 1968: 184.

raising p is ambiguous, as the costs of crime decrease while enforcement costs increase.¹⁶⁶⁴ When individuals are risk-neutral, the (dis)utility resulting from each variable is identical and a correspondingly higher level of sanction can compensate for a low probability of punishment and minimize social loss.¹⁶⁶⁵

For example, A owns a bicycle that he values at \$200, while thief B values it at \$100. A profit-seeking policy implies scaling p and f to an expected sanction benefit that is more than equal to B's profit of \$100. The cost superiority of increasing f dictates a reduction of p toward zero and a corresponding increase in f , for example, $\$1,000,000 * 0.0001$, cf. Figure 30.

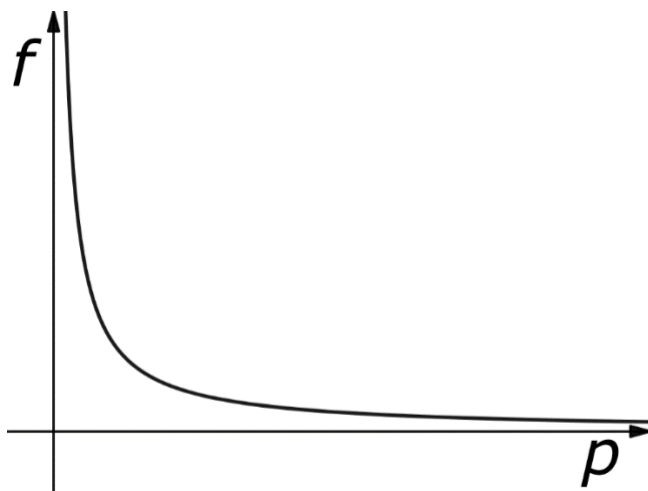


Figure 30 Optimal penalty combination of p and f

Crimes that are more easily detected (or, more generally, to enforce) are thus less severe to punish than crimes with a low p .¹⁶⁶⁶ The main upper limit for f remains the offender's solvency.

While infinity in theory persists, constraints in practice reveal that “[f]ines are not punishment panacea.”¹⁶⁶⁷ In the following, further developments are analyzed concerning the primary constraints, namely (1) the offender's (in)ability to pay, (2) marginal deterrence, (3) misperception of p , and (4) different risk attitudes. It is beyond the scope of this work to present

¹⁶⁶⁴ See Part 4.B.III.1.a.ii.

¹⁶⁶⁵ Cf. Becker 1968: 183 f.

¹⁶⁶⁶ Hylton 2018: 2522.

¹⁶⁶⁷ Posner 2014: 262.

all variants, specifications, and extensions of the model so that its basic features will be presented to illustrate its controversy;¹⁶⁶⁸ less attention will be on normative considerations.¹⁶⁶⁹

II. Limitations on the Optimal Penalty Model

1. (In)Solvency

The main constraint of the optimal penalty model is the risk of (in)solvency. When the offender's wealth does not cover the fine, it may underdeter. To determine the feasibility of fines, Steven Shavell developed five guiding criteria:¹⁶⁷⁰ (1) the amount of wealth, (2) the probability of detection and conviction, (3) the number of private benefits from the illegal activity, (4) the probability that an act will cause harm, and (5) the extent and distribution of the harm if it occurs.

- (1) The smaller a person's wealth, the less likely it is that the expected costs of the offense will outweigh the benefits and, hence, the smaller the deterrent effect of the fine.¹⁶⁷¹ In the most extreme case, a fine can never deter an offender with no assets.¹⁶⁷² The lower the assets, the greater the likelihood that insolvency problems will arise and imprisonment is needed.¹⁶⁷³
- (2) The lower the probability of detection and conviction, the higher the required monetary sanction to achieve the desired level of deterrence by at least eliminating the profit from the crime;¹⁶⁷⁴ and thus, the greater the risk of insolvency and the need for imprisonment.¹⁶⁷⁵
- (3) The greater the private benefit of the crime, the greater the fine must be to achieve the desired deterrent effect.¹⁶⁷⁶ The greater the fine, the greater the likelihood of insolvency and the need for non-monetary sanctions.¹⁶⁷⁷

¹⁶⁶⁸ For an overview, see, e.g., Garoupa 1997. For a comprehensive modeling, see Shavell 2004: chaps. 20–25. The analysis is limited to practical economic limitations, and less (legal) normative considerations. Cf. Arlen & Kraakman 1997: 695 f. fn. 21.

¹⁶⁶⁹ Arlen and Kraakman observe that there may be normative considerations, which limit the optimal penalty model. For instance, the incorporation of the offender's gain outlined in Part 4.C. For an overview on additional limitations of the optimal penalty theory in general, cf. Raskolnikov 2020.

¹⁶⁷⁰ Shavell 1985: 1236 f. While these criteria determine the feasibility and efficiency of monetary sanctions, they simultaneously determine the necessity of non-monetary sanctions, cf. Shavell 2004: 509 f.

¹⁶⁷¹ Shavell 1985: 1236 f. For example, a sanction of \$10 weighs relatively heavier for an individual whose wealth is \$100 than an individual whose wealth is \$1000.

¹⁶⁷² Shavell 1985: 1237.

¹⁶⁷³ Shavell 2004: 510.

¹⁶⁷⁴ Shavell 1985: 1237.

¹⁶⁷⁵ Shavell 2004: 510.

¹⁶⁷⁶ Shavell 1985: 1237.

¹⁶⁷⁷ Shavell 2004: 510.

(4) and (5) The greater the probability and magnitude of the expected harm, the greater the need for deterrence, and the more likely that its benefits will outweigh the increased enforcement costs.¹⁶⁷⁸

Since fines can usually be imposed through less costly administrative law and procedures, solvency limits associated with the level of the sanction and the need for custodial sentences are assumed to be among the main economic reasons for criminal law (sanctions).¹⁶⁷⁹

2. Marginal Deterrence

The consideration of marginal deterrence requires the comparison of different offenses and the gradation of penalties according to the magnitude of harm; namely, to derive an ordinal order between the severity of damage and associated penalty, cf. Figure 31. It implies the demand for differentiated sanctions to avoid unintended and more harmful substitutive effects. Bentham¹⁶⁸⁰ and Beccaria¹⁶⁸¹ introduced, and Stigler (1970)¹⁶⁸² later operationalized the idea. Stigler observed that offenders decide marginally whether to commit a crime. Therefore, associated costs and benefits are marginal and considered incremental. The (dis)utility – and thus, deterrent effect – of a particular decision is relative to the (dis)utility of the previous or next decision step. This means that high fines may ultimately have unintended deterrent effects and that sanctions that are too high remove the incentive to refrain from more harmful actions.¹⁶⁸³

For example, cf. Figure 31, if a likely offender X wants to get the purse of Y, he has the choice between committing theft (A) and robbery (B). Since B is likely to cause greater harm than A, a sanction level of B^* relative to A would adhere to marginal deterrence. On the contrary, a sanction level of $B\#$ would not, since it encourages X to commit the more harmful crime of robbery instead of theft in order to reach his goal of getting the purse of Y.

¹⁶⁷⁸ Cf. Shavell 1985: 1237. Shavell 2004: 510.

¹⁶⁷⁹ On the limits of administrative law and penalties due to the threshold of sanctions when the related harm is great, Svatikova 2012: 140. See also Faure et al. 1996: 559. Moreover, the more cooperative strategy of administrative authorities carries the inherent risk of conflicts of interest and thus may undermine the efficiency of the sanction, cf. Faure & Visser 2004: 67. In contrast, the cooperative strategy may also be advantageous, cf. Fenn & Veljanovski 1988.

¹⁶⁸⁰ “But if a man must needs commit an offence of some kind or other, the next object is to induce him to [...] choose always the least mischievous, of two offences that will either of them suit his purpose,” Bentham 1988: 180.

¹⁶⁸¹ Compare his statement that, if punishment is too harsh, “men are naturally led to the perpetration of other crimes,” cf. Beccaria 1819: 93.

¹⁶⁸² Stigler 1970; 1974. The latter, the reprinted publication, will be referenced for further analysis.

¹⁶⁸³ Stigler 1974: 57.

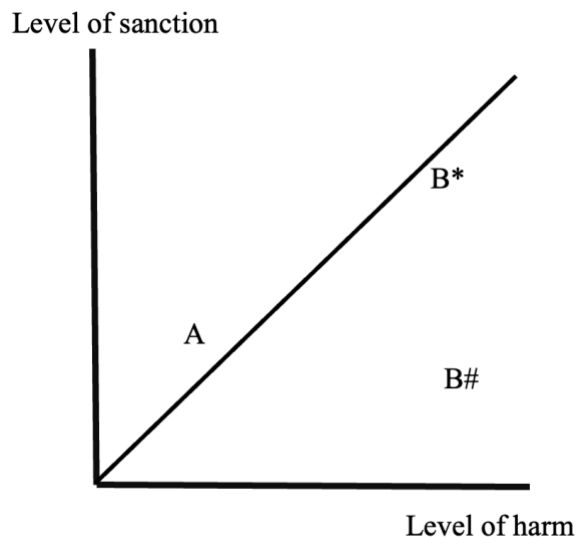


Figure 31 Marginal deterrence

Since the sanction level incentivizes *ex ante*, the perceived harm of the regulated activities must equally be determinable *ex ante*. This is usually easier in the case of crimes such as robbery and murder, as the relative harm is likely to predominate compared to other crimes. However, ultimately, the subject's and society's perception of harmfulness is crucial – which is dynamic and hard to quantify in practice.¹⁶⁸⁴ While marginal deterrence follows in the case of harm-based sanctions, this is less the case for profit-based sanctions unless the criminal benefit is somewhat equal to the victim's harm; as it is the case in financial crimes, for example. Otherwise, some linearity between gain and harm is helpful to deter marginally.

3. Misperception of the Probability of Sanction

For the optimal deterrence of an offender, it is not the actual but the perceived costs of the probability (p) and the level (f) of the sanction that are decisive.¹⁶⁸⁵ The optimal penalty model assumes that offenders perceive p and f correctly. While perception and reality may correlate, perception may be imperfect. This is partly because individuals have difficulty estimating probabilities and because the probability of punishment is relatively dynamic (compared to a more static level of sanction).¹⁶⁸⁶ In addition, the perception may be biased due to cognitive

¹⁶⁸⁴ See generally on difficulties of investigating the public's perception of the seriousness of crimes, Warr 1989.

¹⁶⁸⁵ Shavell 2004: 503 f.

¹⁶⁸⁶ The probability of being sanctioned is of practical importance and is not codified in positive legal principles; it may well be irregular in time and place. The analysis is therefore limited to misperceptions of the probability of punishment. The perception of the amount of sanction (f) may also be incorrect, which is more likely if it is determined by a jury or subject to wide discretion by the court. However, sanctions are usually static and can be

deficiencies, such as the availability bias, i.e., a potential offender who knows someone who was just been arrested is likely to overestimate the probability of arrest/punishment.¹⁶⁸⁷

Potential offenders may thus only have vague (biased) information about the actual likelihood of punishment and make inefficient decisions. Lucian A. Bebchuk and Louis Kaplow (1992) have shown that the loss of social welfare due to misperceptions is greater in cases with a low probability of arrest.¹⁶⁸⁸ Therefore, the probability should increase until its marginal costs exceed the marginal welfare loss due to misperceptions and over- or under-deterrence.¹⁶⁸⁹

For example,¹⁶⁹⁰ suppose that tax evasion results in a loss of \$20. The harm is internalized by a fine of \$1000 and a probability of arrest of 2%, or \$100 and 20%. Assume that in both scenarios, 50% of individuals overestimate the probability by 1% point and 50% underestimate it by 1% point. The amount of welfare loss is defined by the degree of deviation caused by misestimating p and looks as follows in Table 15, with $E(S)$ representing the expected sanction:

Table 15 Welfare effects of misperception of p

	Accurate estimation	Underestimation by 1%	Overestimation by 1%
Scenario 1	$E(S) = \$1000 * 0.02 = \20	$E(S) = \$1000 * 0.01 = \10	$E(S) = \$1000 * 0.03 = \30
Deviation		– \$10	+ \$10
Scenario 2	$E(S) = \$100 * 0.20 = \20	$E(S) = \$100 * 0.19 = \19	$E(S) = \$100 * 0.21 = \21
Deviation		– \$1	+ \$1

The larger the proportion of a percentage point in the original percent, the greater the effect of changing the percentage point. The result is that deviations in lower probability ranges, respectively, in higher penalty ranges, have a more significant effect on the (mis)calculation. Therefore, the deviation from the actual sanction, and thus the social loss, is greater for low probabilities compensated by high fines (scenario 1, Table 15) – and *vice versa*. If the cost of increasing the probability from 2% to 20% is less than the social loss caused by the misperception, scenario 2 is more efficient.¹⁶⁹¹

correctly identified in advance with limited costs, cf. Shavell 2004: 481. See also Harel 2014b: 310 f. For considerations on imperfect information on the level of the penalty, cf. Garoupa 1999.

¹⁶⁸⁷ Englerth & Towfigh 2017: 250 para 510.

¹⁶⁸⁸ It should be noted that Bebchuk and Kaplow refer to the probability of apprehension, which is only one aspect of p , which generally includes the overall probability of punishment, i.e., apprehension, trial, conviction, and punishment. Therefore, it can be assumed that the uncertainty and indeterminacy of information leading to misjudgments are even greater when estimating the probability of punishment.

¹⁶⁸⁹ Bebchuk & Kaplow 1992: 366 f. 369 f.

¹⁶⁹⁰ The example refers to a sanction at the internalization level, but the general results and implications are the same for a sanction to eliminate gains.

¹⁶⁹¹ Garoupa 1999: 184.

The most efficient sanction design may therefore not necessarily be a minimum probability combined with a maximum penalty. In other words, higher enforcement costs due to higher probabilities are justified if decisions improve sufficiently and more than compensate for the loss in social welfare.¹⁶⁹²

4. Risk Attitudes and Subjective Deterrent Effects of the Probability and Level of Sanction

a. Risk Attitudes

The optimal penalty assumes that an increase in f can compensate for any decrease in p .¹⁶⁹³ Both variables are substitutive for each other, and their product defines the expected disutility such that the offender is indifferent to the composition of the penalty. This assumption holds for risk-neutral offenders.¹⁶⁹⁴ However, risk attitudes commonly vary, and the assumption of the equal disutility of p and f is empirically controversial. Instead, there are indications that offenders are risk-seeking, which means that p weighs greater.¹⁶⁹⁵ Thus, risk attitudes in decision-making under uncertainty may decrease or increase the deterrent effect since the objectively expected gain and subjectively experienced utility diverge.¹⁶⁹⁶ This means that the optimal level of sanction also depends on the risk attitude. For example, assuming risk neutrality, an expected sanction of \$10 can be imposed by a sanction of \$100 with a probability of 10% or a sanction of \$1000 with a probability of 1%. However, if the individual is risk-averse, he weighs the expected disutility of the sanction level disproportionately to its probability, making the latter combination a stronger deterrent.¹⁶⁹⁷ There are various reasons for different risk attitudes; for instance, an individual's wealth may reduce risk aversion, calling for higher sanctions on the affluent.¹⁶⁹⁸

b. Subjective Deterrent Effects of the Probability and Level of Sanction – Empirics

Empirical evidence allows falsifying theoretical assumptions about the deterrent effect of the sanction variables. In practice, however, measuring the actual deterrent effects is difficult. A

¹⁶⁹² Bebachuk & Kaplow 1992: 366 f. 369 f.

¹⁶⁹³ See Part 4.D.I.2.

¹⁶⁹⁴ Polinsky & Shavell 1979: 883. Becker 1968: 183.

¹⁶⁹⁵ See Part 4.D.II.4.b below, also Becker 1968: 178.

¹⁶⁹⁶ See also on this, Becker 1968: 178; Shavell 2004: 479–481.

¹⁶⁹⁷ Shavell 2004: 479 f. Cf. Becker 1968: 178.

¹⁶⁹⁸ Cf. Polinsky & Shavell 1984: 90; Shavell 2004: 482. This changes, however, at the extreme of not having any wealth as insolvency negates deterrence effect so risk-seeking behavior is more likely, cf. Part 4.D.II.1.

comprehensive analysis of empirics on deterrence is beyond the scope of this work. Instead, the intention is to outline the main empirical insights as well as their limitations.

Reasons for methodological limitations in determining a deterrent effect are, among others, that the economic decision model is usually examined from a macro level perspective based on aggregate data in the form of police reports from cities, states, or nations and micro level conclusions on individual decision-making are indirectly derived.¹⁶⁹⁹ This contributes to difficulties, among others, in distinguishing between specific and general deterrence¹⁷⁰⁰ or deterrence from incapacitation effects.¹⁷⁰¹ In addition, the success of deterrence is defined by the absence of the crime variable. This means that it can only be measured by comparing the situation with sanctions to a hypothetical situation without sanctions;¹⁷⁰² and measurable are only situations in which deterrence failed.

Furthermore, a complex and changing environment aggravates distinguishing causality from correlation by comparing two status quo. There is a risk of variable simultaneity as higher crime rates generally lead to greater resources spent on crime control.¹⁷⁰³ Another reason that makes reliable and comparable data difficult is that methods usually differ¹⁷⁰⁴ and that there is a presumably large dark figure for many crimes.¹⁷⁰⁵

Despite these practical obstacles, there have been several scientific attempts to test Becker's economic model of crime.¹⁷⁰⁶ Most studies focus on increasing both sanction variables, confirming a deterrent effect.¹⁷⁰⁷ Other studies distinguish between the deterrent effect of p and f , casting doubt on the assumption of their equal decision weight and, thus, on the efficiency of a " p close to zero, f to infinity"-sanction design. The probability of punishment (p) is mainly determined indirectly through the relationship between policing and crime¹⁷⁰⁸/arrest¹⁷⁰⁹ rates and

¹⁶⁹⁹ Levitt & Miles 2007: 462 f. Cf. also Paternoster 1987: 173.

¹⁷⁰⁰ On studies on environmental enforcement based on aggregated data, cf. Cohen 2000.

¹⁷⁰¹ A decrease in crime associated with incapacitation is not a response to incentives but to limited available alternatives, cf. Levitt & Miles 2007: 463; Shavell 2004: 504 f. fn. 22.

¹⁷⁰² This contributes to difficulties in justifying criminal sanctions based on general deterrence arguments, cf. Koller 1979: 73.

¹⁷⁰³ Levitt & Miles 2007: 463; Shavell 2004: 504 f. fn. 22.

¹⁷⁰⁴ Cf. also Harel 2014a: 38.

¹⁷⁰⁵ Levitt & Miles 2007: 463. With regard to environmental crimes in Germany, Gerstetter et al. 2019: 13.

¹⁷⁰⁶ One of the first experiments was conducted by Ehrlich 1973. For an overview of studies conducted and potential biases, see Levitt & Miles 2007: 462 ff.

¹⁷⁰⁷ Ehrlich confirmed a deterrent effect of the probability of imprisonment as well as the severity of punishment, Ehrlich 1973: 544 ff. Chambliss studied crime rates for parking violations and found a significant deterrent effect of an increase in severity (increasing fine per violation) and probability of punishment (increasing number of personnel devoted to checking tickets) for frequent violators, while there was no such effect with regard to seldom violators (once or twice per year), Chambliss 1966: 72 ff.

¹⁷⁰⁸ E.g., Kovandzic & Sloan 2002.

¹⁷⁰⁹ For example, Corman & Mocan 2000.

conviction/imprisonment and crime rates.¹⁷¹⁰ Most studies confirm a deterrent effect of an increase in p ,¹⁷¹¹ especially concerning the probability of apprehension,¹⁷¹² while the deterrent effect of an increase in f is contested.¹⁷¹³ Thus, the prevailing view is the existence of a deterrent effect,¹⁷¹⁴ in which the probability of sanction carries more weight than its severity.¹⁷¹⁵ Given the limitations on empirical evidence, one is well advised to avoid generalized statements on p and f .¹⁷¹⁶

III. Interim Resumé and Statement

Becker's seminal work operationalized the economic approach to behavior for an efficiency-based crime policy by providing a decision-making model to which a successful penalty model must correspond. The model assumes a rational offender who weighs the expected costs and benefits of the behavioral alternative and chooses the alternative with the greatest benefit. The main cost variables are the probability (p) and the level of sanction (f), which can be imposed by different forms of punishment, of which imprisonment and fines constitute the most important. The cost-superiority of the latter means relying on fines whenever they are feasible, i.e., backed up by wealth. Imprisonment then functions as an alternative when fines are unsuccessful. The likelihood and magnitude of sanctions are the anchor points of any deterrence-based criminal policy. They allow the policymaker to influence the criminal's decision-making process by scaling the costs associated with the criminal alternative according to the social policy objective. Internalization/deterrence can be achieved by combining p and f to equal the social costs or the criminal gain. When p and f weigh equal in disutility, a decrease in one variable can be offset by an equal increase in the other. Increasing p is much more costly due to related enforcement costs, so the economic imperative is to primarily raise f . Theoretically, this implies scaling p close to zero while raising f to an infinite level.

¹⁷¹⁰ See, among others, Baltagi 2006; Cornwell & Trumbull 1994.

¹⁷¹¹ Cf. Cornwell & Trumbull 1994. Cornwell and Trumbull found a deterrent effect on the probability of arrest and conviction. Baltagi replicated the data of Cornwell and Trumbull and found a deterrent effect on the probability of arrest, conviction, and imprisonment, Baltagi 2006: 544 f.

¹⁷¹² Nagin 2018.

¹⁷¹³ As already indicated by Becker 1968: 178. For instance, cf. Cherry 2001. Cherry did not find any effect of the length of imprisonment. Different, Baltagi 2006; Cornwell & Trumbull 1994. While Baltagi replicated the data of Cornwell and Trumbull, who found a negative but insignificant relationship between prison length and crime for all crimes. For a review of conducted research generally questioning the deterrent effect merely due to a fear of punishment see, Paternoster 1987.

¹⁷¹⁴ For a recent meta-analysis, see Rupp 2008: 192.

¹⁷¹⁵ Garoupa 2003: 13; Roxin & Greco 2020: § 3 para. 25. See also Cherry 2001: 454; Rupp 2008: 190.

¹⁷¹⁶ A review and in-depth analysis of empirical data is beyond the scope and focus of this work.

The limits of the theoretical model are prescribed by practice. The main practical criterion for the feasibility of fines is the individual's (in)ability to pay. Any fine not covered by the subject's wealth is presumed inefficient and thereby the latter defines the upper limit of the maximum penalty, which, if reached, is to be replaced by imprisonment.

The efficiency threshold of the fine relates to the level of damage or (and) the gain of the crime since the sanction must offset them. In general, the greater the harm or (and) gain, the more likely monetary sanctions will fall flat and must be supplemented by imprisonment. Therefore, the higher the level of assets and the likelihood of punishment, the greater the likelihood that fines will be feasible. Above a certain level of harm and/or profit, an investment in public enforcement and an increase in the likelihood of punishment becomes inevitable.

Moreover, a "low- p -high- f -penalty" model must consider marginal deterrence to avoid incentivizing the substitution by a more severe alternative. The restriction to the degree of harm in defining an ordinal sanction scale underlines the utilitarian nature of the economic approach; aspects of the degree of guilt are generally secondary. That may shift if guilt has implications for or enters economic considerations; for example, if disregarding the question of guilt is conceptualized as a social cost, e.g., through a loss of confidence in the rule of law. Furthermore, practical legal boundaries become apparent as most jurisdictions would rule such an approach unconstitutional.¹⁷¹⁷

In addition, differences in risk attitudes are crucial for determining the optimal penalty since they promote or inhibit the deterrent effects of p and f . Risk aversion is assumed to decrease with an individual's wealth, so fines should increase accordingly. At the lower end of wealth, risk aversion may increase again since monetary sanctions cannot deter an offender without assets

The limitations of the optimal punishment model point to the need for an individualized sanction approach, which is limited in its feasibility given the necessary general and abstract nature of legal norms. As a result, the core aspects of the economic model typically remain fundamental to empirical work on criminal law.¹⁷¹⁸ Ultimately, the predictive power determines the value of the model.¹⁷¹⁹ Empirical evidence points toward a greater deterrent effect of the probability of punishment, suggesting that offenders are risk-averse. The general economic analysis of the sentencing framework allows to approach research question 2 (cf. Figure 2 and Part 1.C.II). The

¹⁷¹⁷ For instance, the German constitution requires that any punishment be proportionate to the *gravity* of the offense and the *culpability* of the offender, see further on sentencing in Germany, Hörnle 2010.

¹⁷¹⁸ Cf. arguing that, despite the theoretical developments, the central ideas of the penalty model remain the focus of criminal law enforcement, Levitt & Miles 2007: 459.

¹⁷¹⁹ On this Part 2.B.I.8.a.

framework is then explored and tailored to the specific case of environmental criminal law and the regulation of corporate environmental crime.

IV. Application to Corporate Environmental Crime

1. Design of Sanctions: Optimal Penalty Model

For successful deterrence of corporate environmental crimes, the criminal sanction’s expected disutility must outweigh the crime’s expected utility (gain). In practice, the deterring value of the criminal sanction is decreased by the uncertainty of its imposition, depending on the probability of law enforcement. The optimal level of f is related with the level of gain (or harm) to be offset and the “base value” of p , which then define the compensatory level of f .

a. The Optimal Fine for Corporate Environmental Crime

The cost-superiority of fines¹⁷²⁰ implies imposing fines whenever feasible. Accordingly, the focus is on defining the optimal fine, considering the probability of sanction. In this context, some particular aspects need to be taken into account in cases of environmental crime committed within a corporate context.

i. Probability of Sanction

The infliction of a criminal sanction requires – in its basic terms – an act that causes illegal harm, which can be attributed to a liable offender.

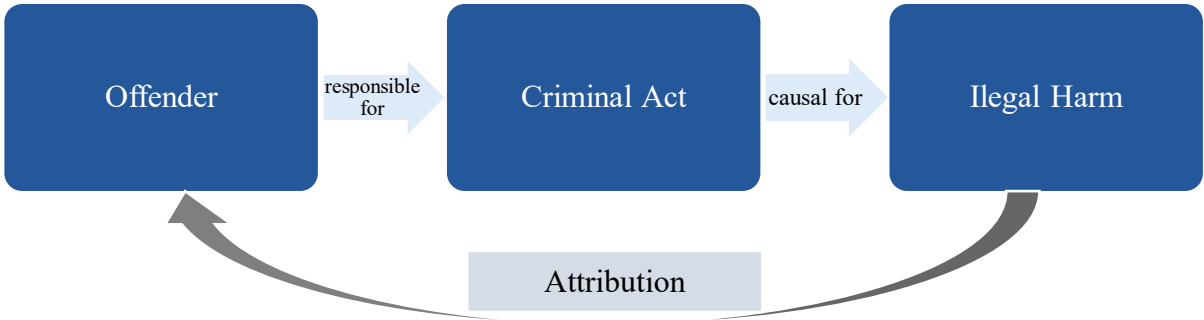


Figure 32 Elements of criminal liability and punishment

¹⁷²⁰ See Part 4.D.I.1.

Corporate environmental crimes commonly exhibit difficulties in all these and thus challenge law enforcement and practitioners, cf. Figure 32.¹⁷²¹

Detecting illegal harm is challenging since the visibility of corporate environment crime is diminished; in particular, due to its legal ambiguity and the associated difficulties in differentiating illegal from legal behavior.¹⁷²² Victimization is often indirect, which diminishes its perceptibility.¹⁷²³ This aggravates private reporting, so public control activities are needed for detection.¹⁷²⁴ Diminished harm perceptibility contributes to a tendency to understate the severity of harm¹⁷²⁵ and the notion that (corporate) environmental crimes are “victimless crimes.”¹⁷²⁶ In addition, environmental crimes commonly involve act-based sanctions, and criminalization occurs independently from harm.¹⁷²⁷

When harm is uncovered, causalities¹⁷²⁸ and attribution (cf. arrows, in Figure 32) are aggravated because the detrimental effects commonly arise from the accumulation of various harmful acts.¹⁷²⁹ Moreover, the delay in the manifestation of environmental damage impedes the collection of relevant evidence.¹⁷³⁰ Proving individual liability is further challenged by the fact that natural processes and their relations are expressed in probabilities.¹⁷³¹ This makes it challenging to make an informed assessment of victimhood at the time in the courtroom.

In addition, the corporate structure challenges law enforcement.¹⁷³² Corporate crimes are committed by multiple agents embedded in an organizational structure.¹⁷³³ Modern

¹⁷²¹ On the difficulties of proving whether there was misconduct and who was ultimately responsible in cases of corporate crime, Coffee 2020: 72 f.

¹⁷²² See further on this matter, Sahramäki et al. 2015: 41.

¹⁷²³ For instance, compare for corporate crimes in general Coffee 1980: 8. Braithwaite & Geis 1982: 295. See on diffuse victimization and the absence of direct victims, Hagan et al. 1980: 818. On the BP Oil spill case, Garrett 2014: 163 f.

¹⁷²⁴ On corporate crimes, Hagan et al. 1980: 818. On environmental crimes, Gerstetter et al. 2019: 14, 131.

¹⁷²⁵ Society has different perceptions of the seriousness of environmental crime. In a recent study, Shelly et al. found that the public generally perceived environmental crimes to be as serious as other types of crimes such as property crimes or theft. Water pollution, resulting in the death of 20 people, was perceived as slightly more serious than the rape of a woman, Shelley et al. 2011: 316 Table 2. Measurement of perceptions faces inherent difficulties because it varies across individuals, e.g., with gender, age, and media use, cf. Hanslmaier & Kemme 2011. Hanslmaier and Kemme found that media use negatively affects perceptions of crime. See generally on the non-specificity and subjectivity when measuring the perception of the seriousness of crimes, Warr 1989.

¹⁷²⁶ Sahramäki et al. 2015: 41 f.

¹⁷²⁷ Cf. Part 4.C.V.1.b.

¹⁷²⁸ Faure 2009a: 257.

¹⁷²⁹ Faure et al. 1996: 554; Starr 1986: 383.

¹⁷³⁰ Faure et al. 1996: 554. Cf. also on difficulties related to the prompt collection of evidence, Gerstetter et al. 2019: 106 f.

¹⁷³¹ I.e., scientific “findings” are expressed in terms of probabilities, Braithwaite & Geis 1982: 299. Cf. also Sahramäki et al. 2015: 41.

¹⁷³² Arlen 2012: 163.

¹⁷³³ Alexander 2004: 20 f. On environmental crimes as the result of multiple management decisions, cf. Segerson & Tietenberg 1992: 181. See also on reported difficulties of evidence due to separation of labor within firms, Gerstetter et al. 2019: 41.

organizations' decentralized structures, division of labor, and opaque internal information flow complicate determining liability.¹⁷³⁴ The result is that enforcement agencies struggle to determine the responsible agent(s) and establish the necessary *mens rea*.¹⁷³⁵

The outlined difficulties relating to the required criminal elements (see above Figure 32) in the case if corporate environmental crimes leads to a comparatively low probability of punishment (detection, arrest, and conviction).¹⁷³⁶ This implies that the level of sanction must be sufficiently high to ensure that the (expected) cost of the crime outweighs the (expected) benefit.¹⁷³⁷

While there may be differences between different types of environmental crime, for instance, the illegal disposal of waste is presumably easier to detect than illegal air pollution,¹⁷³⁸ it appears that, compared to other types of crime, environmental crime typically exhibits one of the issues mentioned above.

ii. Level of Sanction

The size of the fine required to compensate for the low detection rate increases further by the high profit/harm involved in corporate (environmental) crimes.¹⁷³⁹ In addition, the level of the fine must exceed the retraction of gain/internalization of harm, and “an undefinable kicker,”¹⁷⁴⁰ an “extra something”¹⁷⁴¹ must be added. In practice, however, limits remain that put a ceiling or distort the theoretically infinite and optimal fine.

iii. Case Example: NO_x Emissions Standards

The outlined theoretical considerations can be illustrated by their application to the NO_x emissions case example. Recall that the probability of being caught is 5%, meaning the penalty level must be modified.¹⁷⁴²

¹⁷³⁴ Gerstetter et al. 2019: 41, 105 Table 3; Heine 1995: 31 ff.

¹⁷³⁵ Arlen 2012: 163. Uhlmann 2013: 1336.

¹⁷³⁶ For instance, on corporate crimes, cf. Arlen 2012: 163. On a presuming high dark number of environmental crimes, cf. Gerstetter et al. 2019: 131.

¹⁷³⁷ Cf. Arlen 2012: 163. See also Coffee, mentioning corporate environmental crime, cf. Coffee 1980: 8. Also Faure 2009b: 325; Starr 1986: 383.

¹⁷³⁸ See on German crime statistics, which show that the greatest number of reported environmental crimes relates to the illegal disposal of waste, Bundeskriminalamt (BKA) n.d.

¹⁷³⁹ On harm of corporate crimes, if the sanction aims at internalization, cf. Arlen 2012: 163. On substantial gain involved in corporate (environmental crimes), cf. Coffee 1980: 8 f. See also on gain involved in corporate crimes, Baysinger 1991: 353 f.

¹⁷⁴⁰ Calabresi & Melamed 1972: 1126.

¹⁷⁴¹ Posner 1985b: 1201.

¹⁷⁴² Part 4.B.II.3.

In the case of an internalizing penalty (social costs in terms of environmental and health costs¹⁷⁴³), the penalty would change from 7.001 million € / 0.05 = ~ 140 billion €.

In the case of full deterrence, the optimal penalty becomes evident considering the expected utility maximization calculation of M1.¹⁷⁴⁴ Taking the private benefit to M1, the penalty must ensure that M1 is better off complying by eliminating the expected profit $EU_{illegal} M1$; the penalty when getting caught must be amended to be greater than 180 million € so that the expected cost of getting caught is greater than the costs of compliance:

$$EU_{illegal} M1 = 9 \text{ million } \text{€} - (180 + x \text{ million } \text{€} * 0.05) = \text{at least } 0 \text{ €},$$

rather $-x$; where x is the additional part that must be added to ensure that the penalty does not leave M1 indifferent to whether or not to offend.

$$EU_{illegal} M1 = 0 \text{ €} (-x) < EU_{legal} M1 = 0 \text{ €}$$

b. Limitations to the Level of the Fine

i. Risk Attitudes and Perception of p

The individual's decision is based on the *perceived* expected sanction rather than the *actual* sanction. This means that the offender's knowledge and awareness of the applicable rules and regulation are essential to the efficiency of deterrence.¹⁷⁴⁵ The business context in which corporate offenses occur, and their calculated and planned nature suggest that sanction variables in the likelihood of conviction and sentence are known. Corporate information structures make it easier for the likely offender to obtain relevant information.¹⁷⁴⁶

However, risk preferences and biases may distort the perceived deterrent effect of actual information and lead to under- or overdeterrence. This aspect relates to the bounds mentioned earlier.¹⁷⁴⁷ The risk preferences of corporate offenders remain controversial: On the one hand, the high status of white-collar criminals implies higher tangible and intangible opportunity

¹⁷⁴³ Table 14.

¹⁷⁴⁴ Part 4.B.II.3.

¹⁷⁴⁵ Compare Part 4.D.II.4.

¹⁷⁴⁶ Part 4.B.II.2.

¹⁷⁴⁷ Part 4.B.II.4.

costs,¹⁷⁴⁸ and future orientation may enhance the deterrence effect.¹⁷⁴⁹ Corporate criminals would then rather be risk-averse. On the other hand, future orientation and high expected benefits, such as promotions or business bonuses, may promote risk-seeking by increasing incentives to engage in criminal activity.¹⁷⁵⁰ Risk-seeking may be further encouraged by character traits such as narcissism or high self-confidence, typically attributed to corporate offenders,¹⁷⁵¹ or by the corporate culture in which the individual is embedded.¹⁷⁵² In addition, the low probability of sanction due to the corporate shield increases expected benefits while reducing costs and may encourage compliant individuals to engage in deviance.¹⁷⁵³

ii. Marginal Deterrence

Marginal deterrence sets an upper boundary to the level of sanction.¹⁷⁵⁴ The decisive factor for marginal gradation of the fine is usually the extent of the damage associated with the act. If the gain level is the benchmark, marginal deterrence is less easy to maintain;¹⁷⁵⁵ and, to some extent, requires that the amount of gain and harm are roughly linear. Environmental (corporate) crimes affect natural elements with cumulative and synergetic effects in their systematic relationship with each other. This means that assessing the penalty according to the extent of the damage (*ex ante*) in the case of (corporate) environmental crimes is generally complicated by the non-linearity of the interactions between environmental elements and processes and the associated difficulties in foreseeing the consequences.¹⁷⁵⁶

For corporate (environmental) crimes, it is further partially argued that their “non-violent” nature implies that sanctions must be comparatively low.¹⁷⁵⁷ The assumption of “non-violence” is questionable. Growing environmental awareness may increase the perceived seriousness of

¹⁷⁴⁸ I.e., a higher social status to loose, see Kadish 1963: 426. Also Braithwaite & Geis 1982: 302. Cf. Geerken & Gove 1975: 509., stating an assumingly greater deterrence in “upper classes.”

¹⁷⁴⁹ See Part 4.B.II.1 and Part 4.B.II.2.

¹⁷⁵⁰ Which relates to bounded willpower in the sense that short-term benefits may be overweighted, cf. Part 4.B.II.4.c. Also Starr 1986: 382 f. Starr argues that corporate environmental crimes are conscious choices in pursuit for profit. Similar for corporate crimes, Baysinger 1991: 353 f.

¹⁷⁵¹ Chatterjee & Hambrick 2007: 357 f. In contrast, not finding any statistically significant correlation between narcissism and risk-taking, Cragun et al. 2020: 918 f.

¹⁷⁵² On the Enron case and risk-taking as part of the culture, cf. Moohr 2003: 959, 965 f. See further Part 4.B.II.4.b.

¹⁷⁵³ Baysinger 1991: 353 f.

¹⁷⁵⁴ On marginal deterrence, Part 4.D.IV.1.b.ii Hylton 1998: 426.

¹⁷⁵⁵ Parker criticizes the classical approach, among others, due to difficulties of adjusting the penalty level, cf. J. S. Parker 1989: 555.

¹⁷⁵⁶ The irregularity of harm associated with (corporate) environmental crimes equally complicates marginal deterrence in the case of the internalization approach. To incorporate the appropriate sanction incentives, the offender must be able to estimate, at least to some extent, the expected harm associated with a particular act.

¹⁷⁵⁷ Arlen 2012: 163; Polidori & Teobaldelli 2019: 389.

corporate environmental crimes.¹⁷⁵⁸ In contrast, public perception of environmental crimes, viewed as part of the climate or environmental crisis, may be counteracted by additional threats such as wars or pandemics. The dissolution of the temporal and spatial boundaries of the crises of the 21st century poses a particular challenge, the social processing of which is difficult to assess and predict.¹⁷⁵⁹

Deterrence with a focus on marginal harm is further complicated by legal constraints and principles, such as the offender's culpability, which is typically relevant in sentencing practice.¹⁷⁶⁰ Overall, legal constraints and the risk of creating incentives for more severe crimes are good reasons for setting the penalty close to the offender's gain.¹⁷⁶¹

iii. (In)Solvency

The main economic limit to the level of the fine is the (in)solvency of the person concerned, so the priority of the fine depends on the ability to control the risk of insolvency. On the one hand, a high fine that offsets the low probability and eliminates the illegal gain increases the solvency risk. On the other hand, a high-profit crime partially reduces the risk of insolvency the closer the probability of sanction is to 1 – assuming risk neutrality and accurate perception. However, as explained above, the probability of conviction is usually low, and insolvency may undermine the deterrent effect. In such a case, the optimal penalty model suggests imprisonment as a complementary penalty¹⁷⁶² or an increase in the probability of detection, depending on how cost-effective both are.¹⁷⁶³

c. Imprisonment

The prime economic constraint on incarceration or increasing its likelihood is the social cost associated with it.¹⁷⁶⁴ In the case of corporate offenders, the social costs of imprisonment may be

¹⁷⁵⁸ See on a study underscoring the perceived seriousness of environmental crimes, Shelley et al. 2011: 315 ff.

¹⁷⁵⁹ On the social understanding of crisis as a negotiation process and its meaning for relevant actors like practitioners and scholars, Haverkamp et al. 2023: 21 ff.

¹⁷⁶⁰ For instance, questions of culpability, cf. “the sanction imposed is justly proportionate to the gravity of the act and the culpability of the offender,” translated by the author, cf. BVerfG, *Urteil*, 1 BvR 550/52, May 10, 1957: para. 189.

¹⁷⁶¹ For instance, cf. Hylton 1998: 426.

¹⁷⁶² Faure & Visser 2004: 63 f.

¹⁷⁶³ Polinsky & Shavell 1979.

¹⁷⁶⁴ As most prominently outlined by Becker 1968. Also Alexander 2004: 23 f.; Polinsky & Shavell 1984: 90. On the economics of fines and imprisonment Part 4.D.I.1.

even greater because of removing a generally efficient person from society.¹⁷⁶⁵ The costs of prosecution are assumingly likewise higher due to the difficulties in detection and conviction described above. Other limits on imposing long prison sentences include the health or age of the offender and marginal deterrence.¹⁷⁶⁶ Concerning the latter, as most corporate crimes are seen as nonviolent crimes, it is argued that long prison sentences negate the marginal deterrence of violent crimes.¹⁷⁶⁷

2. Interim Statement

The analysis provides the following insights with regard to research question 2 (Part 1.C.II):

In the case of corporate (environmental) crimes, the enforcement rate is usually relatively low while profit (and/or damage) is high, making successful deterrence difficult. Reasons for this include a low detection rate due to their limited perceptibility and the causation of indirect harm. If detected, enforcement is complicated, for instance, when proving the causation of environmental damage or culpability within a multi-agent setting. Accordingly, based on the optimal penalty model, a high penalty is needed to remove incentives and deter successfully. However, an optimal penalty model that relies primarily on increasing fines while keeping the probability of punishment low encounters several practical limitations:

First, the offender's cognitive limitations or risk attitudes may distort the optimal graduated sentence. In addition, marginal deterrence must be considered to avoid encouraging more serious substitution offenses by setting penalties too high. In this respect, the non-linear nature of environmental damage generally challenges marginal deterrence. The most critical constraint on increasing fines is the individual's ability to pay. While white-collar criminals are likely to be among the more affluent part of the population and profits are generally high, the risk of insolvency cannot be fully controlled. In addition, legal constraints or other non-economic normative considerations may put a ceiling on the penalty and cause judges to be reluctant to impose high penalties. These limitations undermine the practical limitations of the optimal penalty model. When fines reach the limits of feasibility, imprisonment can serve as a complementary punishment, or the probability of detection must increase. Both options involve much higher enforcement costs and reach practical limits, rendering them economically

¹⁷⁶⁵ Arlen 2012: 163 f.; Becker 1968: 179 f. I.e., if production level is measured in terms of earnings. The assumption that monetary rewards for employment are linear, or at least somewhat equivalent to social productivity, can be questioned.

¹⁷⁶⁶ Arlen 2012: 163 f. Also Polinsky & Shavell 1984: 389.

¹⁷⁶⁷ Arlen 2012: 163 f. Also Polinsky & Shavell 1984: 389.

suboptimal. As a result, there is a tendency to make recourse to corporate criminal liability as a less costly enforcement alternative. The central features of the underlying ratio, nature, and design are analyzed in the next step to determine whether corporate criminal liability provides an efficient remedy and to approach research question 3 (Figure 2 and Part 1.C.II).

E. Corporate Criminal Liability

I. Economic Rationale

Sanctions for corporate (environmental) crime can be monetary and non-monetary¹⁷⁶⁸ and be imposed on (1) the individual(s), (2) the corporation, or (3) the individual(s) and the corporation. Optimal deterrence requires that social costs determine the optimal enforcement strategy. Individual liability for corporate (environmental) crimes faces economic (e.g., solvency, enforcement costs) and legal (e.g., assigning culpability to an individual actor, establishing causality) obstacles. In contrast, corporate criminal liability is viewed as more efficient because (1) of the corporation's cost advantage over judicial authorities, and (2) the circumvention of the insolvency (risk) of the individual actor by recourse to corporate assets.

1. The Corporation as the “Least-Cost Enforcer”¹⁷⁶⁹ – Internal Corporate Structures to Reduce Enforcement Costs

Before increasing (the cost of) enforcement or relying on imprisonment, it is much easier and less costly to resort to the more apparent collective misconduct and impose a corporate penalty. The idea is that the company can use its existing organizational structures as a deterrent¹⁷⁷⁰ or be encouraged to support government enforcement by cooperating in investigating and reporting an incident in exchange for a reduced penalty.¹⁷⁷¹ Insights into internal networks and access to information put the corporation in an advantageous position to prevent, detect, and sanction an employee's misconduct.¹⁷⁷² Internal structures such as the wage system or promotion reduction allow the corporation to transfer the cost of punishment to the individual *ex post*, which has *ex*

¹⁷⁶⁸ The analysis will be limited to financial sanctions in the form of fines since corporations cannot be imprisoned. Possible non-monetary corporate sanctions may include an order to implement a compliance management system or corporate liquidation.

¹⁷⁶⁹ Garoupa 2000: 244.

¹⁷⁷⁰ Alexander 2004: 24. See also Arlen & Kraakman 1997: 692 ff.; Polidori & Teobaldelli 2019: 390.

¹⁷⁷¹ Arlen 2012: 175 ff.; Arlen & Kraakman 1997: 693, 706 ff. On deferred and non-prosecution agreements, see Arlen 2012: 151–153.

¹⁷⁷² Compare Polidori & Teobaldelli 2019: 390. See also Garoupa 2000: 244. Arlen & Kraakman 1997: 697 ff.

ante a preventive effect on future misconduct.¹⁷⁷³ To further reduce individual incentives to engage in criminal wrongdoing, the corporation can, among other things, introduce monitoring or evidence-gathering mechanisms.¹⁷⁷⁴ It can also create a compliance culture that makes peer reporting more likely and raises the psychological costs of misconduct.¹⁷⁷⁵ A higher detection rate would then allow for a lower penalty and thus reduce the insolvency risk. Overall, internal insights and mechanisms make the corporation a comparative “least-cost enforcer.”¹⁷⁷⁶ Therefore, optimal enforcement points towards the efficiency of the company’s involvement in the enforcement process.¹⁷⁷⁷

2. The Corporation as the “Sugar Daddy” – Corporate Assets to Diminish Insolvency Risks

A second economic argument for corporate criminal liability is relevant when an agent has been convicted but lacks the assets to pay the fine. The inability to pay the fine negates its deterrent effect.¹⁷⁷⁸ Increasing p or imposing imprisonment to deter sufficiently is costly. A cost-efficient way of circumventing the individual’s insolvency is to rely on the typically greater corporate assets,¹⁷⁷⁹ which allows fines to be used for longer.¹⁷⁸⁰ By this, reliance on corporate penalties also ensures compensatory payments to victims.¹⁷⁸¹

II. Legal Rationale

1. Difficulties in Determining Liable Agents, Actions, and Attributing Consequences

In addition to economic considerations, there are also legal arguments in favor of corporate criminal liability; compare the elaborations in Part 4.D.IV.1.a.ii Level of Sanction. Criminal law principles are generally tailored to the isolated conduct of a single actor who fulfills all the elements of the offense. In turn, the involvement of multiple agents in corporate crime fragments the elements of the crime and makes it challenging to attribute acts or establish the necessary

¹⁷⁷³ See, e.g., Arlen 2012: 160 f. For a helpful overview, Polidori & Teobaldelli 2019: 390.

¹⁷⁷⁴ Arlen 2012: 164 ff.; Arlen & Kraakman 1997: 692 f.; Polidori & Teobaldelli 2019: 390.

¹⁷⁷⁵ Arlen 2012: 164.

¹⁷⁷⁶ Compare, for instance, Garoupa 2000: 244. Arlen 1994: 835; 2012: 145. Arlen & Kraakman 1997; Kornhauser 1982: 1377; Polidori & Teobaldelli 2019: 390.

¹⁷⁷⁷ For instance, cf. Polidori & Teobaldelli 2019: 390.

¹⁷⁷⁸ See above Part 4.D.IV.1.b.iii

¹⁷⁷⁹ Compare, for instance, concerning the rationale for corporate tort liability, Posner & Landes 1980: 914 f.

¹⁷⁸⁰ With respect to corporate environmental liability, Faure 2020: 85.

¹⁷⁸¹ Kornhauser 1982: 1350.

mens rea.¹⁷⁸² Furthermore, traditional hierarchical organizational structures with clear incentives and control directions are disappearing; modern corporations are organized vertically by distributing and decentralizing strategies and decision-making processes.¹⁷⁸³ This makes it difficult to determine the ultimate perpetrator and establish (criminal) liability.¹⁷⁸⁴ Proofing individual wrongdoing is even more complicated in environmental crime cases due to the difficulty of identifying clear causalities associated with environmental harm.¹⁷⁸⁵ As a consequence, enforcement costs and acquittal rates are high in the case of corporate environmental crimes.¹⁷⁸⁶ Corporate criminal liability solves these problems by holding the corporation collectively accountable. The pressure on prosecutors to target an individual actor based on vague evidence or a specific function is reduced.¹⁷⁸⁷ Consequently, there is a legal trend of recognizing corporate criminal liability¹⁷⁸⁸ – as an alternative/a complement to individual liability.

2. Case Example: Determining Liability for NO_x Emissions

The challenges of modern criminal law in criminalizing corporate environmental crimes that contribute to the rationale of recourse to corporate criminal liability (outlined, among others, in Part 1.A as well as Part 4.D.IV.1.a.i) can be illustrated by the NO_x emissions and the determination of individual liability for violating the level of 100mg/km.

Figure 33 shows that the relevant actions that led to the final harmful action in the form of the release of nitrogen by the vehicle driver are divided among different actors (of M1, M2, E1, E2, care salesman, citizen) and different points in time. Furthermore, between the acts (1) and the realization of the damage (3) are natural processes that contain NO_x emission, such as the nitrogen cycle; these are complex and vary in time and challenge the determination of a causal harm-act relation. The realized damage (3) is then dispersed locally (Europe or beyond), temporally (such as the futural loss of bees), and personally (various European citizens). This makes it difficult to assess its actual extent and to attribute it to an executed act of an agent (1).

¹⁷⁸² Arlen 2012: 163 f. Compare Part 4.D.IV.1.a.i.

¹⁷⁸³ Baysinger 1991: 356 f. See also Heine 1995: 31 ff.

¹⁷⁸⁴ Cf. Heine 1995: 31 ff. For case examples of the HSBC and Barclays banking case, in which no individual has been trialed, cf. Garrett 2014: 100 ff.

¹⁷⁸⁵ See Part 4.D.IV.1.a.i.

¹⁷⁸⁶ Gerstetter et al. 2019: 117, 121 f.

¹⁷⁸⁷ Faure 2020: 86.

¹⁷⁸⁸ First recognized in the United States in Supreme Court of the United States, *New York Central & Hudson River R.R. Co. vs United States*, 212 U.S. 481, February 3, 1909. Corporate criminal liability was subsequently also introduced in more and more European Countries, see on this Beale & Safwat 2004. In Germany, the issue has been subject to constant debate, cf. Evertz 2016; Heine 1995. See also Part 1.A.

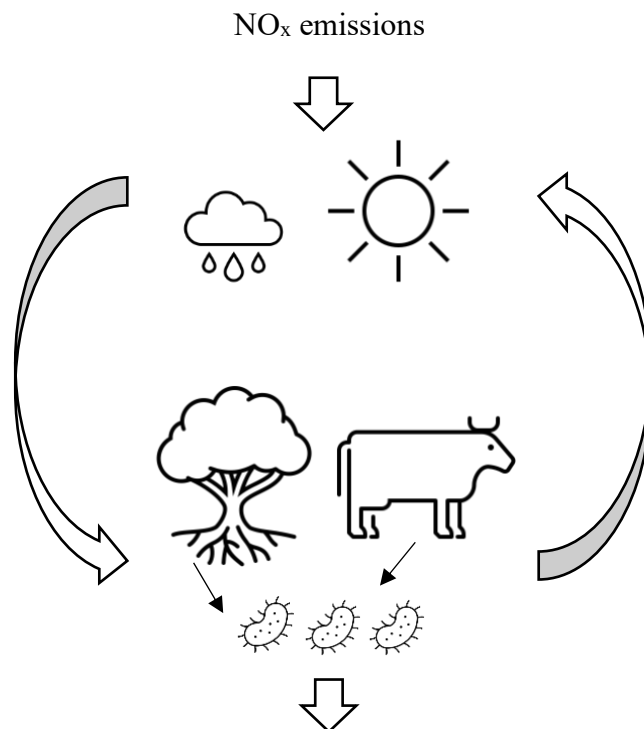
(1) Multiple Agents and Actions:

Action of *deciding* to engage: managers M1 and M2
+
Action of *producing* and *installing* the defeat device: engineer E1 and E2
+
Action of *selling* the vehicle: vehicle salesman
+
Action of *emitting* NO_x by use: vehicle drivers, such as citizen A



(2) Natural processes:

NO_x ► impact on the nitrogen element cycle and with possible cascading effects
NO_x ► impact on the formation of nitrous oxide (N₂O) and ozone (O₃), which contributes to climate warming



(3) Harm:

Health: including the respiratory problems of B and other European citizens
+
Environmental: including the danger of extinction of bees, futural harm related to climate warming, such as heavy rains or droughts in the global south
+
Material: including damage costs to buildings
+
Direct economic: including market distortion, reduction of incentives for investment in nitrogen-reducing technology, measures for mitigating effects of climate change

Figure 33 Agent, act, and harm relation of violations of NO_x emissions standards¹⁷⁸⁹

¹⁷⁸⁹ No claim is made to scientific correctness, the presentation merely serves to illustrate the complexity inherent in natural processes, such as the nitrogen cycle.

III. Theoretical and Legal Framework of Corporate Crimes and Corporate Criminal Liability

While the harm of corporate misconduct usually manifests at the collective meso level, underlying individual actions are causal. Consistent with this, methodological individualism implies correcting the meso level outcome with micro level incentives. Corporate criminal liability introduces an additional actor into the original individual-based deterrence framework central to the efficiency of sanctions by either encouraging or deterring crime.¹⁷⁹⁰ Corporate sanctions thus distort this initially individual incentive-decision-action structure by placing the incentives at a different subject than the original actor whose behavior is to be changed. This challenges the economic enforcement model, raising questions on whether the principal, the agent, or both should be sanctioned and how.¹⁷⁹¹

Therefore, the next step is to analyze the structural differences of corporate offending, the extent to which economic models and concepts are applicable, and how sanctions should be designed. To this end, the legal codification of corporate criminal liability and sentencing is outlined first. Subsequently, the economic perspective, theoretical embedding, and the associated optimal sentencing framework are examined. In the next step, their informative value and limits will be explored.

1. Legal Liability Framework: Corporate (Criminal) Liability in the United States and Germany

a. United States

Corporate criminal liability has its origins in the Anglo-American tradition.¹⁷⁹² The central doctrine under which a corporation may be held criminally liable for the acts of an employee is vicarious liability, which implies that *mens rea* and *actus reus* of an individual are directly transferred to the corporation.¹⁷⁹³ Vicarious liability has evolved from the common law doctrine of *respondeat superior*, under which a principal is liable for the acts of his agent, whom he is legally responsible for controlling if the agent acts at least with the intent to benefit the employer

¹⁷⁹⁰ Cf. Figure 1 and Figure 2.

¹⁷⁹¹ For example, cf. Arlen 2012: 144. As well as Garoupa 2000: 243.

¹⁷⁹² On the historical development, see Bernard 1984.

¹⁷⁹³ Nanda 2010: 607.

within the scope of his employment.¹⁷⁹⁴ The employer is liable without having acted at all,¹⁷⁹⁵ regardless of the employee's position within the firm.¹⁷⁹⁶ The doctrine is usually used for closely held businesses.¹⁷⁹⁷ Typically, in larger firms (where day-to-day management and ownership diverge), a form of "duty-based" liability is imposed.¹⁷⁹⁸ The employer is responsible for failing to meet a duty concerning preventing or reporting the incident.¹⁷⁹⁹ The employer is liable for having acted himself wrongfully, such as failing to supervise the agent.¹⁸⁰⁰ Prosecution can then commonly be avoided through proper monitoring, i.e., by implementing compliance regimes, self-reporting tools, or cooperation in the event of an incident.¹⁸⁰¹ To determine whether the corporation has exercised the required level of due care, courts and agencies evaluate the effectiveness of internal compliance structures to detect and prevent criminal conduct.¹⁸⁰²

b. Germany

Within Europe, an increasing number of countries has included corporate criminal liability in their laws or is in the process of doing so.¹⁸⁰³ Despite this legal trend, the German legal system adheres to the *societas delinquere non potest* principle and limits criminal liability to individuals.¹⁸⁰⁴ Legal entities are thus sanctioned based on § 30 OWiG for an administrative offense for acts of the persons entrusted with the management of the company, including the management board or other controlling bodies. In this context, the administrative offense of the individual must first be established,¹⁸⁰⁵ and the conduct must be "a result of which duties

¹⁷⁹⁴ Supreme Court of the United States, *New York Central & Hudson River R.R. Co. vs United States*, 212 U.S. 481, February 3, 1909. In the decision the court relied upon the *respondeat superior* doctrine to establish corporate criminal liability; "An employer may be vicariously liable only for employee action taken within the scope of employment, that is, with intent to benefit the employer," cf. Arlen & Kraakman 1997: 688; United States District Court for the Northern District of Illinois, *DS Auto Parts, Inc. vs Schwartz*, 838 F.2d 964, 967, February 4, 1988; Nanda 2010: 607; Polidori & Teobaldelli 2019: 388.

¹⁷⁹⁵ Cf. Kornhauser 1982: 1347.

¹⁷⁹⁶ Cf. Arlen & Kraakman 1997: 688.

¹⁷⁹⁷ Arlen 2012: 151.

¹⁷⁹⁸ Arlen 2012: 151.

¹⁷⁹⁹ Polidori & Teobaldelli 2019: 388.

¹⁸⁰⁰ Cf. Kornhauser 1982: 1347.

¹⁸⁰¹ Even if criminal prosecution is avoided, the company may be subject to financial or non-monetary penalties based on deferred prosecution and non-prosecution agreements, cf. Arlen 2012: 151 ff.; Polidori & Teobaldelli 2019: 392.

¹⁸⁰² Krawiec 2005: 582 ff. Critical on this, cf. Part 4.E.V.4; Effective Compliance and Ethics Program, United States Sentencing Commission 2021.

¹⁸⁰³ For instance, articles 121–122, 131–137 of the French *Code Pénal*. The Netherlands was the first Western European country to codify true corporate criminal liability by extending the doctrine of corporate liability, previously limited to economic crimes to all types of crimes, cf. Doelder 1996: 291–298. Cf. also Faure 2020: 86 f.

¹⁸⁰⁴ For instance, cf. Faure 2020: 87.

¹⁸⁰⁵ R. Schmitz 2019: para. 140.

incumbent on the legal person or on the association of persons have been violated, or where the legal person or the association of persons has been enriched or was intended to be enriched” (§ 30(1) OWiG). If the bearer of the administrative regulation is a legal person, the liability is transferred to the acting persons (§ 14 StGB).¹⁸⁰⁶ Although the principle of *societas delinquere non potest* still applies, introducing corporate criminal liability is an ongoing debate. The 40th German Jurist’s Convention of 1953 already addressed the issue and denied its necessity.¹⁸⁰⁷ Since then, several drafts have been presented,¹⁸⁰⁸ and some form of corporate criminal liability is expected to be introduced in the foreseeable future.¹⁸⁰⁹ The political pressure on introducing concepts for meaningful penalties for corporate misconduct is rising; in particular, due to increasing corporate regulation, such as (non-financial) reporting requirements related with the Corporate Sustainability Reporting Directive (CSRD).

2. Theoretical Analysis Framework: The Principal-Agent Theory

The principal-agent framework is the classic economic framework for studying corporate crime and liability.¹⁸¹⁰ A principal-agent relationship can be defined as “a contract under which one or more persons (the principals(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent.”¹⁸¹¹ In the case of corporations, shareholders are usually considered principals, while the company’s top managers are considered agents.¹⁸¹² Typically, the principal owns some property and wants to increase its value through some action but cannot act himself, so he relies on another agent to provide his ability to act in exchange for compensation.¹⁸¹³ The externalization of behavior means that the welfare effects of one party (principals) depend on another party’s actions (agent).¹⁸¹⁴ Both parties are assumed to act in self-interest¹⁸¹⁵ and to have different preferences in (the allocation of) risk.¹⁸¹⁶

¹⁸⁰⁶ Heine & Schnittenhelm 2019b: para. 28.

¹⁸⁰⁷ Deutsche Juristentag 1953: 613 f.

¹⁸⁰⁸ Most recently, cf. Part 4.E.VI.

¹⁸⁰⁹ Würz 201 AD. See also Bundesministerium der Justiz und für Verbraucherschutz 2020. Cf. also Faure 2020: 87.

¹⁸¹⁰ Alexander 2004: 22 f.; Alexander & Cohen 1999: 3; Gottschalk 2018: 111. Garoupa 2000: 244.

¹⁸¹¹ Jensen & Meckling 1976: 308.

¹⁸¹² For instance, cf. Jensen & Meckling 1976; Macey 1991: 320. Garoupa, on the other hand, sees the state as the principal, the company as the supervisor, and the employee as the agent, cf. Garoupa 2000: 244.

¹⁸¹³ On the principal-agent model, see Perloff 2020: 674 ff.

¹⁸¹⁴ Cf. Perloff 2020: 675.

¹⁸¹⁵ Jensen & Meckling 1976: 8; McGuire 1988: 6.

¹⁸¹⁶ Macey 1991: 320 f.

The multi-agent nature of corporate crime means that the actors and their relationships with each other are relevant for deterrence.¹⁸¹⁷ Agency theory allows for studying organizational decision-making and characteristics from a transaction perspective.¹⁸¹⁸ Organizations are seen as “*legal fictions which serve as a nexus for a set of contracting relationships among individuals.*”¹⁸¹⁹ These contract structures are relevant to individual behavior by defining rights and costs and benefits distributions.¹⁸²⁰ They serve as a means to align the objectives and interests of different individuals,¹⁸²¹ which is central due to the risk of agent behavior contrary to the principal’s interest.¹⁸²² Risk-sharing and monitoring are the main mechanisms to align the interests of the principal and the agent.¹⁸²³ Risk-sharing defines the cost-benefit distribution and thereby the incentive structure and risk preferences¹⁸²⁴ and, ultimately, the behavior.¹⁸²⁵ Ideally, the risk is shared equally, and interests are fully aligned.¹⁸²⁶ Within this framework, legal liability alters the distribution of risk and, thus, related incentives by defining the primary cost carrier. For instance, in the case of managerial liability, shareholders may be interested in criminal corporate activity as they benefit without cost bearing.¹⁸²⁷ Corporate criminal liability shifts the risks to the corporation since the agent can (partially) externalize the costs of his conduct. Internal monitoring becomes paramount to control contract compliance.¹⁸²⁸

3. Enforcement Model: The Neutrality Principle

The basic model of corporate crime deterrence model adopts the transaction perspective of the agency theory and incorporates the relevance of transaction costs derived from the Coase theorem:¹⁸²⁹ When internal structures reduce transaction costs to zero, penalties are freely

¹⁸¹⁷ For instance, cf. Alexander & Cohen 1999. Alexander and Cohen elaborate on the relevance of the ownership structure for corporate crime.

¹⁸¹⁸ McGuire 1988: 6.

¹⁸¹⁹ Emphasis adopted, footnote omitted, see Jensen & Meckling 1976: 310. Congruent with the theory of modern corporations, cf. Alexander 2004: 22. It should be noted that the term contract is understood broadly, including formal (e.g., insurance policies) and informal (e.g., other reward and punishment systems, such as bonuses) forms of contracts, Rees 1985: 3 f.

¹⁸²⁰ Jensen & Meckling 1976: 307 f. For different types of contracts, see Perloff 2020: 675 f.

¹⁸²¹ Jensen & Meckling 1976: 311.

¹⁸²² The mere fact of self-interested agents indicates that there may be some action contrary to the principals interest, cf. Jensen & Meckling 1976: 308, 311.

¹⁸²³ McGuire 1988: 6.

¹⁸²⁴ McGuire 1988: 6.

¹⁸²⁵ Cf. on the contractual distribution of rights and relevance to individual behavior, Jensen & Meckling 1976: 307 f.

¹⁸²⁶ For instance, when the agent does not bear all the costs of his action he may be less willing to put effort or make riskier choices, cf. McGuire 1988: 6 f.

¹⁸²⁷ Macey 1991: 322 ff.

¹⁸²⁸ Compare, McGuire 1988: 6 f.

¹⁸²⁹ Kornhauser 1982: 1347 ff. On the Coase theorem, Part 3.A.III.

transferable. Efficiency outcomes and the ultimate allocation of sanctions (the ultimate subject) are *invariant* and equally *efficient*; regardless of whom the sanction is imposed on in the first instance.¹⁸³⁰ Thus, deterrence can be equally achieved by sanctioning the individual or the corporation;¹⁸³¹ which is referred to as the “neutrality principle.”¹⁸³² The optimal sanctioning model, either $f = g/p$ (gain-based sanction) or equally $f = h/p$ (harm-based sanction), can be applied to both subjects. As discussed above, the high enforcement costs of corporate (environmental) crimes and insolvency risks limit the efficiency of individual sanctions.¹⁸³³ Thus, from an economic (and legal) perspective, corporate criminal liability is *prima facie* superior. In line with this, the analysis of the neutrality principle will be unidirectional, focusing on corporate sanctioning, while the arguments for a penalty transfer from the individual to the corporation are the same.

The wage function is the primary transaction mechanism available to the firm to shift costs of noncompliance.¹⁸³⁴ It allows the principal (the firm) to shape the agent’s incentives (the worker) and align interests. An internal *ex ante* or *ex post* transfer of the risk of liability or the costs of sanctions achieves internalization by (deterrence of) the employee.¹⁸³⁵ *Ex ante*, the corporation can optimally prevent deviance by monitoring the agent’s behavior¹⁸³⁶ and use the wage to incentivize the desirable level of care;¹⁸³⁷ *ex post*, it can pass on liability costs.¹⁸³⁸ These internal reward and punishment structures allow the company to provide its employees with optimal incentives to reduce misconduct and liability risks.¹⁸³⁹ Theoretically, there is a costless and complete cost-permeability between the macro, meso, and micro level (and *vice versa*)¹⁸⁴⁰ – hence, corporate and individual liability are equal alternatives. Therefore, the state can achieve the intended incentives at the micro level through less costly sanctions at the meso level (and *vice versa*); compare the question mark between the meso and micro level in Figure 2. This

¹⁸³⁰ Cf. Part 3.A.III.3.

¹⁸³¹ Arlen 2012: 160 f.; Segerson & Tietenberg 1992: 181 ff., regarding penalties in environmental enforcement.

¹⁸³² Arlen 2012: 160 f.; Polidori & Teobaldelli 2019: 389. This principle stems from civil liability for accidental wrongdoing but has been equally applied to criminal acts and penalties, Arlen 2012: 160 fn. 48. For an application with respect to criminal penalties, cf. Polinsky & Shavell 1993; Segerson & Tietenberg 1992. Thus, literature on tort liability regimes will equally be referenced.

¹⁸³³ On limitations of the optimal penalty model in cases of corporate environmental crimes, Part 4.D.IV.1.b and Part 4.D.IV.2.

¹⁸³⁴ It should be noted that the wage function is only one transfer mechanism, while there may be other mechanisms in different companies depending on the internal structures. However, as the wage mechanism is assumingly present in all companies, it is mostly analyzed, cf. Arlen 2012: 160 f.; Segerson & Tietenberg 1992: 181.

¹⁸³⁵ Arlen 2012: 160 f. E.g., decreasing salaries, Garoupa 2000: 244. Cohen 1996: 400; Garoupa 2000: 244.

¹⁸³⁶ Cohen 1996: 400; Garoupa 2000: 244.

¹⁸³⁷ Arlen 2012: 160 f.

¹⁸³⁸ Arlen 2012: 160 f. For example, by decreasing salaries, Garoupa 2000: 244.

¹⁸³⁹ Cohen 1996: 400; Polinsky & Shavell 1993: 240.

¹⁸⁴⁰ Compare question mark in Figure 2 Macro, meso, micro level interplay between the goal and design of ECL.

prevents obstacles to establishing individual liability for corporate offenses, such as high enforcement costs or proofing culpability. Individual behavior is optimized at the lowest cost, irrespective of the initial allocation of liability (Coase theorem).¹⁸⁴¹ Therefore, corporate crime can be prevented if sanctions are optimal. However, the persistence of corporate crime indicates that the neutrality principle, just like the Coase theorem, grounds in an economically “perfect world.”¹⁸⁴² In a realistic, imperfect world, transaction costs typically persist, including divergences of interest, information asymmetries, or inadequate control and monitoring arrangements.

4. Corporate Crime as a Principal-Agent Problem: Persisting Transaction Costs

Internal corporate structures reduce but do not eliminate transaction costs, preventing a complete alignment of interests. The main persisting costs relate to the information asymmetry inherent in the principal-agent relationship. Externalization of action separates ownership and control¹⁸⁴³ and outsources direct control over welfare effects.¹⁸⁴⁴ Typically, the principal cannot directly observe the agent’s action but only its impact on the value of his property, based on which he then rewards the agent.¹⁸⁴⁵ While this is the result of the agent’s action, it is also influenced by other external effects,¹⁸⁴⁶ so that the reward only approximates the actual value of the agent’s action.¹⁸⁴⁷ If the principal wants to perfectly match the reward to the agent’s action, he must know the effects of the external variables. However, information gathering and monitoring are expensive and are therefore balanced with their marginal benefits.

Furthermore, other transaction costs arise, inhibiting a complete incentive transfer. For instance, internal company regulations (e.g., the requirement that pays depend on seniority),¹⁸⁴⁸

¹⁸⁴¹ Kornhauser 1982: 1347 ff. It should be observed that the restrictive conditions of the Coase theorem within the context of corporate sanctioning are partially extended by, e.g., complete information, lack of endowment effects, and transaction costs, cf. Alexander 2004: 23. Or full rationality, lack of wealth constraints and transaction costs, or the possibility of the state to enforce at zero costs, cf. Polidori & Teobaldelli 2019: 389.

¹⁸⁴² Garoupa 2000: 244.

¹⁸⁴³ Jensen & Meckling 1976: 309.

¹⁸⁴⁴ Perloff 2020: 675 f.

¹⁸⁴⁵ Kornhauser 1982: 1349; McGuire 1988: 6 f.

¹⁸⁴⁶ In mathematical terms: $V_1 = V_2(a, e)$, with V_1 being the value of his property before, V_2 after action, a being the action of the agent and e being environmental factors, similar Perloff 2020: 675. Cf. also McGuire 1988: 6. These include general aspects such as environmental uncertainty or team production, which can also affect the outcome, Baysinger 1991: 350 f.

¹⁸⁴⁷ McGuire 1988: 7. Cf. also Kornhauser 1982: 1349.

¹⁸⁴⁸ Cf. Kornhauser 1982: 1367.

organizational constraints¹⁸⁴⁹ (e.g., a criminogenic corporate culture),¹⁸⁵⁰ legal (e.g., limitation of tort recovery from government employees, see 28 U.S.C. § 2679(d)) or practical limits (e.g., lack of alternative workers and thus of opportunities to replace misbehaving employees).¹⁸⁵¹ In addition, the costs associated with the risk of the agent's insolvency and the relevance of bounded rationality relating to the subjectivity of perception are still unresolved.¹⁸⁵²

Overall, the firm's ability to shift penalty costs to the agent is limited, leaving room for opportunistic agent behavior. This risk is assumed to rise with the company's size: Larger firms typically mean higher transaction costs and a reduced level of control, which increases the likelihood of interest divergence and misconduct.¹⁸⁵³ In summary, optimal incentives at the meso level may not lead to optimal incentives and resulting behavior at the micro level. For research question 3 (cf. Figure 2 and Part 1.C.II.), this means that recourse to corporate criminal liability in cases of corporate environmental crime may hinder the social goal of ensuring compliance.¹⁸⁵⁴

IV. Interim Statement

From an economic perspective, the high government enforcement costs and low probability of detection, combined with the high levels of damage and profit in corporate (environmental) crime cases, require a strong sanction to deter successfully. Individual sanctions for corporate crimes are costly and usually reach individual solvency limits. In contrast, corporate criminal liability allows the state to encourage the company to use its internal structures to prevent, detect, and punish employee misconduct. The state's enforcement costs are reduced, and the actor with the lowest costs carries out enforcement and takes over prevention. In addition, when enforcement of a fine is futile due to the offender's inability to pay, corporate liability allows recourse to corporate assets to avoid costly incarceration and ensure victim's compensation.

¹⁸⁴⁹ For criticism from an organizational perspective of the assumption of a causal link between corporate sanctions and agency behavior based on the assumption of other internal factors beyond management control, Baysinger 1991: 343 ff.

¹⁸⁵⁰ For example, the tone from the top corporate level that either encourages or hinders a criminogenic corporate culture. On elements relevant to a toxic corporate culture, van Rooij & Fine 2018: 27 Figure 1. Cf. also Part 4.B.II.4.b.

¹⁸⁵¹ Polinsky & Shavell 1993: 240.

¹⁸⁵² Cf. Part 4.D.IV.1.b.i and Part 4.D.IV.1.b.iii.

¹⁸⁵³ Results suggest that firms in which top management holds strong ownership stakes are less criminogenic, cf. Alexander & Cohen 1999. See generally on the interplay between the size of the firm and the ability of exercising control and supervision of employees, Calvo & Wellisz 1978.

¹⁸⁵⁴ On the analysis of the goal of criminal law, in general, Part 4.B.III.; tailored to corporate environmental crime, more specifically, Part 4.C.V.

From a legal perspective, corporate criminal liability facilitates the prosecution of corporate offenses by circumventing the difficulties associated with establishing individual liability for misconduct embedded in a collective scheme. This holds even more true for cases of environmental crimes, characterized by further difficulties on behalf of the harm and complex impact relations.

Methodologically, corporate criminal liability is introduced into the deterrence framework based on the principal-agent theory. The basic structure is the externalization of action to an agent and, thus, the welfare effects of the principal's property and assets. The divergence of conduct and control and a self-interested agent yield the risk of action against the principal's interests. Therefore, internal contract structures and risk-sharing function as the primary mechanism for aligning the interests of the two parties. Legal liability is critical for the agent's behavior as it influences the cost-benefit share. In this regard, corporate criminal liability shifts cost risks to the principal. Theoretically, this imbalance can be resolved through internal transaction structures, such as the wage mechanism or monitoring, to ensure that the cost of punishment and its behavioral incentives reach the original actor. Assuming that transaction costs are zero (Coase theorem), there is a complete permeability of costs and benefits between the collective and the micro level, namely, the principal and the agent. The efficiency outcome is independent of the original subject, and corporate and individual penalties are substitutes. Corporate criminal liability then places compliance costs where they are least costly and most efficient for deterring corporate misconduct.

A more detailed analysis of corporate liability from the principal-agent perspective shows that the efficiency "neutrality" of the sanctioned target has its limitations and misses the complexity that regulates the transformation of incentives between the macro-micro level and *vice versa*.¹⁸⁵⁵ While monitoring and internal rewards and punishments theoretically enable the principal to achieve complete alignment of interests and transfer of legal sanctions, transaction costs exist and prevent perfect incentive transfer. The most critical costs are information asymmetry and the approximate remuneration of the agent's behavior. Since reducing the cost of information asymmetry is equally costly, the firm will optimize it, i.e., until its marginal costs outweigh its marginal benefits. Another main cost factor is the agent's insolvency risk, which corporate criminal liability solves for the government by shifting it to the firm. Internal transaction costs can distort the efficiency of sanctions in such a way that non-deterrence is preferred as the most

¹⁸⁵⁵ Cf. Figure 2; for a comprehensive game theoretical analysis of corporate criminal liability, Christmann & Klein 2024.

cost-efficient corporate option, meaning that an optimal corporate penalty may not lead to the desired result in the form of deterring the original agent.

”*The firm is not an individual.* It is a legal fiction [and] [...] [i]n this sense “behavior” of the firm is like the behavior of a market; i.e., the outcome of a complex equilibrium process. We seldom fall into the trap of characterizing the wheat or stock market as an individual, but we often make this error by thinking about organizations as if they were persons with motivations and intentions.”¹⁸⁵⁶

Organizational behavior, such as corporate crime, involves a variety and hard to distinguish benefits, interests, and behaviors of different agents. Diffusion in interest and benefit structures hinders the curtailment of gain-based penalty models (as argued previously in Part 4.C.V.2.b) and complicates external legal and internal management control. There simply is little knowledge of the situational and transformation mechanisms¹⁸⁵⁷ that mediate legal incentives from the entity to the agent, and if so, any such knowledge would not be generalizable; cf. question mark in Figure 2. While the importance of internal incentive structures is undeniable, and a criminal law policy of corporate liability may be *prima facie* rational by allocating enforcement to the party that incurs the least cost, it raises concerns about its efficiency. In resorting to corporate criminal liability, the policymaker must be aware of these limitations and the social goal of (corporate) environmental criminal law, i.e., ensuring compliance with the legal order.¹⁸⁵⁸

The next step is to examine the potential welfare effects of relying on corporate liability and internal monitoring and compliance regimes, despite the shortcomings outlined.

¹⁸⁵⁶ Emphasis adopted, footnote omitted, cf. Jensen & Meckling 1976: 311.

¹⁸⁵⁷ See

Figure 5 Coleman’s Boat on macro-micro-macro relations Figure 5 Coleman’s Boat on macro-micro-macro relations.

¹⁸⁵⁸ On the analysis of the goal of criminal law, in general, Part 4.B.III.; tailored to corporate environmental crime, more specifically, Part 4.C.V.

V. Welfare Effects of Corporate Criminal Liability in the Case of Persisting Transaction Costs

1. Collateral Costs

To impose corporate criminal liability despite imperfect cost permeability, carries the risk of collateral consequences and welfare losses through “spillover effects.” Spillover effects are costs that corporate penalties imply for third parties (negative externalities).¹⁸⁵⁹ Significant corporate fines imposed under a vicarious liability regime, especially if they threaten the firm’s solvency, can be externalized to uninvolved stakeholders, such as shareholders (e.g., loss of asset value), employees (e.g., terminations of contracts, reduction of promotions or wages) or consumers (e.g., increase in product prices).¹⁸⁶⁰ Other costs arise from reputational damages and losses of business partners, public trust, or shareholder interests.¹⁸⁶¹ Ultimately, the company itself or lower-ranking employees may act as scapegoats, while high-ranking individuals remain untouched.¹⁸⁶² This runs counter to the general public interest in the growth and stability of healthy companies that provide secure jobs and public services or goods in the marketplace. Thus, while interfering with productive business activity may be theoretically optimal, it may not be factually optimal given the broader social context. This is especially true if the penalty is so high that it threatens the firm’s solvency.¹⁸⁶³ Such awareness may ultimately make judges reluctant to impose severe corporate fines.¹⁸⁶⁴

2. Distortion of Marginal Deterrence

The organizational context of corporate crime alters the individual’s cost-benefit analysis because the expected outcome depends on other actors’ decisions, requiring strategic decision-making. The marginal deterrence of one corporate agent may be distorted if another agent also

¹⁸⁵⁹ Alexander 2004: 20 f.

¹⁸⁶⁰ Cf. Coffee 1980: 5 f.; Garrett 2014: 276.

¹⁸⁶¹ The effect of reputational damages is, however, unclear, cf. Arlen 2012: 149 ff. For instance, Alexander and Arlen conclude that reputational damages as costs fail in cases of environmental crime, cf. Alexander & Arlen 2018: 102. Consistent with this, cf. Karpoff et al. 2005. Different Hamdani & Klement 2008: 279 f. Hamdani and Klement argue that a corporation’s criminal conviction does lead to severe reputational damages.

¹⁸⁶² Garrett 2015. On the Arthur Andersen case in this respect, Garrett 2014: 25 ff.

¹⁸⁶³ The Arthur Andersen litigation is an often-cited corporate crime case that highlights collateral consequences of significant corporate penalties; on this, Hamdani & Klement 2008: 277 ff.

¹⁸⁶⁴ Coffee 1980: 6; Gerstetter et al. 2019: 18. See Garrett 2014: 148 ff. Garrett notes that in U.S. practice, sanctions for large-scale corporate crimes are too lenient and fines are paid, if at all, by small businesses at the risk of insolvency.

engages in crime:¹⁸⁶⁵ Suppose managers A and B are considering to commit a crime. In the case of misconduct by one actor, only corporate penalties are imposed, and the level of penalties is expected to lead to the bankruptcy of the firm. Therefore, the expected loss of A and B is the loss share in the case of bankruptcy. If only A commits misconduct, its expected cost increases with the probability of detection. Now, suppose that B also decides to commit a crime and that A knows about it. However, since the criminal behavior of one actor is sufficient to impose sanctions on the firm that trigger its insolvency, the criminal act of the additional actor A does not affect the expected sanction level of the firm; it may only increase the probability of detection.¹⁸⁶⁶ The higher the likelihood that B's crime is detected, the lower the weight of A's decision to commit.¹⁸⁶⁷

3. Potential Perverse Effect of Strict Liability: Decreasing Monitoring and Compliance Efforts

A vicarious liability regime may also be detrimental to marginal deterrence at the collective level, as initially outlined by Jennifer Arlen (1994).¹⁸⁶⁸ Arlen argued that adhering to a vicarious liability principle may discourage a firm's internal monitoring and prevention efforts:¹⁸⁶⁹ Assume that a corporation is – aside from monitoring – unable to prevent all misconduct. Further, assume that monitoring involves reporting incidents, cooperating with public authorities, providing internal documents, and that the corporation cannot entirely shift the sanction to the employee. A firm's investment in monitoring increases the probability of detection and thereby the likelihood of facing liability. The incentives for monitoring are diluted and may even be reversed. Since compliance efforts increase expected costs, it is rational for the firm to reduce compliance and monitoring or invest in cover-up strategies to decrease the risk of detection.¹⁸⁷⁰

Cover-up strategies are detrimental to social welfare:¹⁸⁷¹ They increase enforcement costs of the firm and the government. Therefore, Arlen proposes to impose a sanction that acknowledges

¹⁸⁶⁵ The example builds upon Hamdani & Klement 2008: 283 ff.

¹⁸⁶⁶ Hamdani & Klement 2008: 287.

¹⁸⁶⁷ At the end of the probability range, which is approximately 1, deterrence decreases as the probability increases, cf. Hamdani & Klement 2008: 286 Figure 1.

¹⁸⁶⁸ Arlen 1994.

¹⁸⁶⁹ Arlen 1994: 836 ff. See also on vicarious liability and incentives that hinder deterrence, Hamdani & Klement 2008: 290 ff.

¹⁸⁷⁰ Arlen 1994: 836 ff., 860.

¹⁸⁷¹ See Arlen, stating the inefficiency of concealment expenditures, Arlen 1994: 860.

optimal corporate *ex ante* and *ex post* policing measures and to introduce alternative liability models (duty-based liability regimes).¹⁸⁷²

Such unintended incentives have been documented in the context of the EU Directive 2008/99/EC, regulating environmental pollution. Goeschl and Jürgens (2014) found that criminal prosecution of environmental crimes can dilute the incentives of parallel reporting schemes.¹⁸⁷³ If self-reporting systems and enhanced penalties are not aligned, firms may be less willing to report to the regulator. The reason is that the relative difference between the certain penalty for reporting and the uncertain penalty for not reporting determines the decision of whether to report. While a single authority allows aligning sanction incentives, this changes if an additional law enforcement actor is introduced. Thus, the penalties and incentive levels of the two systems need to be aligned to avoid distortions.¹⁸⁷⁴

4. Underdeterrence and Cosmetic Compliance Regimes

In contrast to Arlen (1993), Kimberley Krawiec (2005/2003) questions the efficiency of duty-based liability regimes.¹⁸⁷⁵ He argues that linking a company's liability to the existence of internal compliance structures is problematic since judges and authorities evaluating the efficiency of such controls are at an informational disadvantage. They may therefore face difficulties in determining the appropriate level of due diligence and/or whether a violation has occurred.¹⁸⁷⁶ Moreover, distinguishing between effective and illusory compliance structures is difficult from an external and *ex post* perspective, i.e., after an incident.¹⁸⁷⁷ Information superiority combined with the prospect of liability reduction incentivizes companies to invest in cosmetic compliance regimes that reduce legal liability risks without reducing the incidence of corporate misconduct.¹⁸⁷⁸ This reduces social welfare through failed deterrence of corporate wrongdoing and costly but ineffective compliance regimes.¹⁸⁷⁹

Krawiec believes one reason for overestimating the effectiveness of internal compliance structures is an overreliance on the under-complex principal-agency framework for analyzing

¹⁸⁷² Arlen 2012: 172 ff.

¹⁸⁷³ Goeschl & Jürgens 2014.

¹⁸⁷⁴ Goeschl & Jürgens 2014: 201.

¹⁸⁷⁵ Krawiec 2005.

¹⁸⁷⁶ Krawiec 2005: 580.

¹⁸⁷⁷ Krawiec 2005: 580.

¹⁸⁷⁸ See on practitioners reporting that compliance is used to limit the criminal liability of the management board, cf. Gerstetter et al. 2019: 125.

¹⁸⁷⁹ He argues that empirical data on the effectiveness of internal compliance systems is rather limited and inconsistent, and therefore the reason for a legal policy shift in the U.S. toward duty-based systems is likely to be due to political interest groups, and not empirics, cf. Krawiec 2003: 510 ff.; 2005: 591 ff.

and deterring corporate crime.¹⁸⁸⁰ Other reasons are, *inter alia*, the cost-efficiency of establishing compliance structures versus changing a business model and practices.¹⁸⁸¹ Ultimately, the emphasis on internal compliance regimes benefits influential interest groups.¹⁸⁸²

VI. The Association Sanctions Act (*Verbandssanktionengesetz*) from an Economic Perspective

A closer look at the draft of the Association Sanctions Act allows investigating the practical relevance of some of the outlined frameworks and their limitations: The main objective of introducing an association liability is to enable the imposition of higher fines beyond the OWiG threshold of 10 million € to strengthen deterrence.¹⁸⁸³ This suggests that the draft is based on the assumption of rationality of the targeted subjects (entities) since successful deterrence by an increase in sanction level requires the decision-maker to incorporate the value change in the variable *f*.¹⁸⁸⁴ The scope of application is to be limited to associations whose purpose is directed to an economic business operation (§ 1). The reason is that a profit-driven context is assumed to increase the risk of deviance.¹⁸⁸⁵ Both aspects correspond to the economic assumptions on a (corporate) agent's rational utility maximization and a corporate criminogenic context, shaped by pursuit and strain for profit maximization.¹⁸⁸⁶

Corporate punishment is to be applied to acts resulting from criminogenic issues of organizational embeddedness, e.g., division of labor and responsibility, social goals and values associated with a criminogenic corporate culture; and individual liability is seen as insufficient to prevent them.¹⁸⁸⁷ Individual misconduct is generally not considered being part of collective misconduct and may only be taken into account if underlying motives can be traced back to the collective context. Rather, a criminal association attitude and philosophy is decisive.

¹⁸⁸⁰ Krawiec mainly reasons this based on the assumption that organizational crime and the distinction between actors, benefits, and interests among the actors involved is much more complex than in the principal-agent model and that organizational contexts are ignored, cf. Krawiec 2005: 597 ff.

¹⁸⁸¹ Krawiec 2005: 610 ff.

¹⁸⁸² Krawiec 2005: 610 f. For more information on the U.S. liability model negotiation process and the role of stakeholders, Krawiec 2003: 495 ff. See also critical, Khanna 2004. Khanna argues that inefficient corporate crime legislation results, on the one hand, from public demand for stricter legal regulation at low cost. On the other hand, stricter criminal liability regimes can be more beneficial to managers than civil liability since they shift liability to the legal entity.

¹⁸⁸³ Bundesministerium der Justiz und für Verbraucherschutz 2020: 1, 46.

¹⁸⁸⁴ Cf. on the model of rational choice, Part 4.B.I.1.

¹⁸⁸⁵ Bundesministerium der Justiz und für Verbraucherschutz 2020: 50.

¹⁸⁸⁶ See on the economic rational choice model in general, Part 2.B.I; with respect to crime, Part 4.B.I.1; and corporate environmental crime, Part 4.B.II.

¹⁸⁸⁷ Bundesministerium der Justiz und für Verbraucherschutz 2020: 52.

This means that scenarios in which the motivation and benefits were purely private are to be excluded.¹⁸⁸⁸ Notably, the association sanction can be imposed independently of the association's actions; proceedings may be instituted against the collective even if investigations against natural persons are ruled out.¹⁸⁸⁹ This separates the incentive-actor relation relevant for behavioral changes and contradicts the implications of methodological individualism.¹⁸⁹⁰ Instead, it appears that the Sanctions Act supposes a certain autonomy of the firm and that overriding organizational goals is the prime cause of corporate misconduct.¹⁸⁹¹

When determining the penalty, the weight, the extent and duration, the “unlawful content” and effects on the protected area of the violation are decisive;¹⁸⁹² not relevant is the profit.¹⁸⁹³

The draft further aims to incentivize investment in compliance and monitoring systems and internal investigations (§ 17 (1)) through penalty mitigation (§ 15 (3) No. 6. and 7). An attempt is made to do justice to persisting internal corporate transaction costs in that the unsuccessful prevention of the offense does not immediately indicate the inappropriateness of the compliance measure. Instead, “proper” compliance measures, efforts, and disclosure and compensation actions are central to penalty mitigations. By contrast, measures of concealment are considered as aggravating factors.¹⁸⁹⁴

Encouragement of internal compliance mechanisms and their acknowledgment in sanction determination point toward a form of “duty-based” liability and the idea of using internal company structures as a more efficient means of prevention and detection.¹⁸⁹⁵ Limiting compliance requirements to visible structures carries the aforementioned risk of promoting “cosmetic compliance,” i.e., inefficient measures that appear efficient from the outside,¹⁸⁹⁶ and ignores challenges in verification and related with conflicts of interest among those involved.¹⁸⁹⁷ In order to avoid collateral damage, such as the dismissal of employees or the risk of insolvency, the economic circumstances of the group act as a corrective.¹⁸⁹⁸

¹⁸⁸⁸ Bundesministerium der Justiz und für Verbraucherschutz 2020: 79.

¹⁸⁸⁹ Bundesministerium der Justiz und für Verbraucherschutz 2020: 73, 92.

¹⁸⁹⁰ On methodological individualism, Part 2.B.I.1.

¹⁸⁹¹ Cf. on the debate on the terminology of corporate crime, Part 1.C.III.2

¹⁸⁹² See further, Bundesministerium der Justiz und für Verbraucherschutz 2020: 92, 95.

¹⁸⁹³ Bundesministerium der Justiz und für Verbraucherschutz 2020: 92.

¹⁸⁹⁴ Bundesministerium der Justiz und für Verbraucherschutz 2020: 95 f.

¹⁸⁹⁵ On the relevance of duty-based regimes to prevent unintended incentives, Part 4.E.V.3; on the neutrality assumption and reliance on internal enforcement structures, Part 4.E.III.3.

¹⁸⁹⁶ With respect to the earlier draft by the state of Nord Rhine-Westphalia, cf. Arentz & Rehm 2015: 10 f.

¹⁸⁹⁷ Part 4.E.V.4.

¹⁸⁹⁸ Bundesministerium der Justiz und für Verbraucherschutz 2020: 93.

VII. Interim Statement

Organizations are constructed entities with own social structures embedded within a broader societal context. Organizational sanctioning must take into account both social realities, cf. research question 3 Figure 2 and Part 1.C.II.¹⁸⁹⁹ In the case of an imperfect internal transfer structure, a severe corporate penalty may ultimately harm third parties, such as consumers or employees. In particular, if the penalty threatens the company's solvency, the effectiveness of an "optimal" penalty is questionable and must be reconsidered by the relevant judiciaries. Furthermore, the organizational context alters marginal decision-making and deterrence. When the maximum corporate penalty becomes very likely because other actors commit misconduct, the individual's expected costs are less affected by an additional (own) offense. Strict corporate liability regimes may also lead to unwanted incentives on the firm level. From a firm's perspective, incentives to invest in monitoring depend on its ability to reduce expected liability costs. Assuming the firm cannot fully prevent misconduct and sanctions despite compliance efforts, monitoring efforts increase expected costs by increasing the probability of detection; with the rational consequence of reducing or replacing monitoring with cover-up strategies. Collateral costs and distorted deterrence incentives argue against vicarious liability and favor a duty-based liability system.

However, duty-based liability may lead to under-deterrence and inefficient compliance structures. The main reason is the information deficit of lawyers and regulators as external and *ex post* supervisors, which impairs their ability to assess the adequacy of the company's monitoring system. Companies can exploit information asymmetry by adopting cosmetic compliance regimes that do not reduce misconduct but reduce liability costs. Duty-based liability regimes further shift enforcement responsibility to the corporate level and should be viewed cautiously. The existence of internal transaction costs that prevent cost transfer to the individual and thereby may trigger detrimental welfare effects questions the optimality of corporate criminal liability. Thus, a joint liability of individual and corporate liability and a duty-based regime, focusing on a firm's crime prevention and policing efforts, is often argued as favorable.¹⁹⁰⁰ However, the relevance of internal and external variables and their interaction for the efficiency of any design is manifested in ambiguous empirics on corporate crime deterrence.¹⁹⁰¹ The

¹⁸⁹⁹ And the argued primacy role of environmental criminal law of ensuring compliance, specifically in cases of corporate environmental crimes, cf. Part 4.C.VI.

¹⁹⁰⁰ Arlen 2012: 167 ff.; Polidori & Teobaldelli 2019: 389 ff.

¹⁹⁰¹ Rupp 2008: 192. Rupp conducted a meta-analysis and confirmed the deterrence hypothesis for typical corporate misconduct such as tax evasion, fraud, and environmental crime: the deterrence hypothesis was confirmed with

complexity of their determination and the risk of specification errors point toward focusing on individual liability.¹⁹⁰²

53.04% for tax evasion, 49.33% for fraud, and 46.57% for environmental crime, cf. Rupp 2008: 126 Table 3.43. On deterrence for environmental crimes, see also Almer and Goeschl (2010), who evaluated the deterrence effect of criminal sanctions for environmental crimes based on data of recorded environmental crime, court trials, prosecution, and imposed sanctions in Germany from 1995 to 2005. The study documented that the probability of standing trial has the strongest deterrence effect, followed by the likelihood of conviction, cf. Almer & Goeschl 2010: 708 f. and 715 f.

¹⁹⁰² More comprehensively on different equilibrium of liability regimes, cf. Christmann & Klein 2024.

Part 5. Conclusio

A. Major Findings and Theses

I. On the foundations of the economic analysis of law

1. On the relationship between law and economics

Interest in human actions and the social order links law and economics as sciences. Within this, the economic analysis of law is part of the development of economics toward a methodological understanding. Its usefulness for legal sciences is especially given if the legal perspective is consequential and the interest is on the social effects of designed rules. Herby, the rational choice model is a fruitful methodological tool for gaining insights into legal incentive structures and associated behavior, while the law claims normative authority by defining the social target.

2. On the economic paradigm, its limitation and value

The classical economic model of human behavior is grounded in material, self-interested, rational utility maximization modeled in terms of the expected utility theorem and satisfying the axioms of rationality. This strict understanding of rationality has been empirically challenged by behavioral law and economics. While falsification in individual cases does not *per se* render a model useless, since reductionism is essential to its functionality, systematic falsification cannot be ignored. The extent to which the criticism applies is related to the conceptualization of the model; i.e., if it is understood as a formal model then falsifiability is *per se* denied. Since the legal value of the model is primarily defined by its predictive power, some specification is essential – which ought to occur on a case-by-case basis.

The normative theory relies on the positive behavioral model to design legal rules to realize a social status quo in terms of efficiency, i.e., maximizing social welfare. Economic efficiency principles emerged from the desire to design consensually based and neutral principles. Especially the reduction to economic measurable units and distributive questions narrows the principles in a way that is inappropriate for the law. Since law pursues additional, originally non-economic social values, the scope for applying the normative efficiency principle depends on its relationship to legal principles. In this regard, research is needed and general conclusions are ruled out. To this end, the validity of the efficiency principle depends on how it is specified, and the extent to which it is incorporated – a task which remains within legal sciences.

II. On the economic perspective on regulation

1. On the function of law

Efficiency principles are based on a consensual and voluntary market transfer that guarantees efficiency. The theory of welfare economics defines its conditions, which are, in particular: (1) the absence of market power of one party, (2) symmetric distribution of and access to information, (3) the absence of transaction costs, (4) and that all resources are always tradable. In a market with perfect competition, all marginal costs and benefits of market activity are internalized, resulting in optimal decisions and actions. Government regulation seems *prima facie* obsolete. However, a closer look reveals that a minimum of public intervention conditions even the functioning of the ideal market: Primarily, to define property rights and ensure compliance with entitlement structures that are necessary for a good to be tradable and for market participants to engage in private negotiations and transfers based on trust. The economic necessity for legal regulation becomes even more apparent when the limits of the ideal market and the realism of market failures are acknowledged. With regard to solving externalities as market failures, the Coase theorem defines the conditions under which private bargaining may still allow allocative efficiency; namely, when transaction costs are minimal and property rights are clearly defined. Reversely, when these conditions are not met, legal rules matter to allocative efficiency.

2. On the function of environmental law

For areas concerning environmental goods, market failures in the form of externalities or public goods, the presence of transaction costs, and the lack of clearly defined property rights tend to be the realistic standard. This means that public regulation is necessary and matters to allocative efficiency. Within this, the socially desirable form of regulation is determined by an overarching societal cost-benefit analysis aiming at approximating social optima.

Market-based approaches, such as emissions trading systems, are environmental regulatory approaches that approximate the ideal coordinative market mechanism and are particularly advantageous in terms of flexibility and information costs. For most market inefficiencies relating to environmental goods, more direct regulation in the form of command-and-control instruments, such as emission standards, is needed. The state determines the allocation of the entitlement and defines strict protective structures to prevent socially undesirable entitlement transfer, indicating inalienability rules. Within this, the function of criminal sanctions is to incentivize compliance with the defined entitlement and transaction structure.

III. On the economic analysis of criminal law

1. On its philosophical and legal theoretical embedment

The economic analysis of criminal law represents a utilitarian and deterrence-based theory and belongs to the consequentialist theories of criminal law. Thus, the legitimacy of criminal law and sanctions is tied to its social impact. Early thinkers, such as Beccaria and Bentham, laid the foundations for the economic analysis of criminal law: at the macro level in terms of designing criminal law to maximize social utility, and at the micro level by assuming that criminals act rationally, so punishment can be used as a disincentive to deter the former.

2. On the positive behavioral assumption of rational choice

In the context of economic analysis of criminal law, the rational choice model provides the analytical basis for understanding and regulating criminal behavior by assuming that crime is the result of a cost-benefit decision process. This means that crime can be prevented if the expected costs of the crime outweigh its benefits. As with the general economic rational choice model, constraints on the actor's rationality apply, so cautious methodological incorporation is essential. For the analysis of regulating corporate environmental crime, a reasonable degree of rationality and material utility focus on behalf of the agent can be assumed since the corporate structure embeds the actor in a context characterized by economic profit maximization with facilitated access to information. This suggests its usefulness for studying the goal and design of criminal sanctions in cases of corporate crime.

3. On efficiency as a goal of criminal law enforcement

Applying the deterrence approach to lawmaking in the context of economic analysis relies mainly on Becker's internalization approach, which applies the classical economic approach to regulating externalities. Consequently, the desirability of criminalizing the act is based on its inefficiency, where a sanction equal to the social harm incentives optimal behavior. The internalization approach avoids distinguishing between sources of utility, i.e., recognizes the social value of criminal gain. The result is that a criminal activity can be efficient and that there is an optimal level of criminality.

An alternative approach goes back to Posner, who justifies the inefficiency of crime in terms of the circumvention of efficiency guaranteeing market transaction structures. The goal of criminal sanctions is then to eliminate profit and channel crime into prescribed transaction structures. It follows that, in theory, complete deterrence is the ideal of any criminal justice policy. Hylton points to the relevance of transaction costs and the assumed social desirability of the criminal

activity in question for the superiority of the two frameworks. At the same time, he emphasizes consideration of the indirect social costs of crime that may argue for full deterrence policies.

The preference for either deterrence framework is related to the highly normative question of whether crime can be of social value, i.e., whether the criminal's gain can be considered a social welfare gain. Assessing this question requires an analysis of the social rationale for criminal law, i.e., how its rules are defined and legitimated, which is a classical subject of criminal law theories and points to the value of a complementary legal analysis.

The institutional analysis of (criminal) law allows for analyzing the occurrence of criminal law from a social perspective, showing its inherent normativity and purposiveness and viewing its compliance as central to the conditions of social peace. For the institution of environmental criminal law, this means that its rules emerged to secure civil progress in the face of environmentally harmful private behavior. Environmental crimes violate these rules by challenging the socially agreed upon and legally defined order, so that their value must be denied. The institutional approach to the social value of environmental crimes is coherent with the economic structure and rationality, underlying the institution of environmental law more broadly and the corresponding function of criminal law and law enforcement: Environmental crimes violate defined economic and social optima and tailored transaction structures ; thus, environmental crimes cannot be considered welfare enhancing. Therefore, Posner's framework, which depicts crime as circumventions of efficiency-guaranteeing market transaction structures is valuable for the analysis of corporate environmental crimes. This implies that a full deterrence approach to environmental crimes, taking into account the costs of enforcement, is socially preferable.

The optimal penalty design model approximates the desirable structure of punishment. It assumes that deterrence can be realized by scaling the cost of punishment based on the probability and size of the sanction. The efficiency dogma dictates relying primarily on fines and the level of the sanction since they impose less social cost than imprisonment or increasing the probability of sanctions. Practical limitations arise primarily from the offender's insolvency, which undermines the deterrent effect of monetary sanctions, and from empirical research that points toward a greater deterrent effect of the probability of punishment. In addition, the failure to consider questions of guilt encounters constitutional and social normative limits, which may ultimately incur societal costs as well.

In the case of environmental crimes committed within corporate structures, the low probability of punishment, the high profit and damage of the crime, and high enforcement costs imply that

the deterrence level of the sanction must be correspondingly high so that – as a rule – the insolvency threshold is reached.

4. On corporate criminal liability

Recourse to corporate structure in the form of corporate criminal liability is considered an efficient remedy because it allows high enforcement costs to be avoided by increasing the likelihood of punishment while maintaining the deterrent effect. The idea is that intra-corporate structures allow the company to prevent, deter, and punish misconduct at a lower cost, ensuring that incentives reach the original actor, thereby shifting “own” punishment costs. In practice, however, internal corporate transaction costs limit the efficiency invariance of the original subject of criminal sanctions. The fact that the costs of punishment may not reach the original agent but are borne by the collective corporate entity may adversely affect social welfare and run counter to the original reasons for imposing the punishment. The use and design of corporate criminal punishment concepts must take into account the relevance of internal organizational structures for the efficiency of criminal sanctions and that “corporations don’t misbehave, people do”¹⁹⁰³ – which is key to any social welfare-oriented criminal justice policy when addressing corporate (environmental) crime.

B. Research Questions Answered

The recourse to criminal law and sanctions represents a social (legal) choice cf. Figure 1. Law is purposive, and lawmaking is consequently not arbitrary. Social consequences are constitutive of the legitimacy of law since, before the law, there were social realities to be regulated. This means the source of its legitimacy as a representative function of the common will is linked to its social consequences and that “[i]n the last analysis a legal system must be judged according to the impact it has on the social order.”¹⁹⁰⁴

The complexity of criminal behavior and agents in cases of corporate environmental crimes, however, equally implies complexity in assessing its social consequences as well as the desirable form of its regulation. This work intended to acknowledge complexity without being held back by it. Rather, effort was made to reduce complexity through the case-specific selection of a methodological framework. The work began with the aim of approaching the question of the function of environmental criminal law and its characteristic instrument of criminal punishment,

¹⁹⁰³ Arlen & Kraakman 1997: 695.

¹⁹⁰⁴ Chambliss 1967: 703.

and how it should be designed to achieve the social goal (cf. Figure 1 box C); more specifically, in the case of corporate environmental crimes (cf. Part 1 Research Questions and Procedure). The analysis was guided by the economic perspective, which allowed gaining substantial insights into the regulatory environmental regime as a whole and specifying the function of the criminal law within; this was then tailored to the case of corporate environmental crimes and illustrated by a case-based analysis exemplary on the Volkswagen emission scandal. This allowed to identify the central aspects of the economic perspective on the need to regulate environmentally damaging behavior and the role of criminal law within. The aim was further to make the economic perspective more accessible to legal practitioners and scholars and to contextualize the role of criminal law, thereby ensuring consistency of the environmental regulatory regime as a whole.

Reliance on the economic analysis of law as the central methodological framework meant that the social objective was primarily defined in terms of efficiency; recourse to the legal perspective intended to serve as a corrective. To this end, the thesis made use of the institutional analysis of (environmental) criminal law, which allowed for exploring the underlying social normative order that can then act as a normative source for the economic perspective. The complementary institutional analysis revealed congruences with the economics approach, as well as inconsistencies of the prevailing internalization approach within the economic analysis of criminal law, answering the research question (1):

1. What is the function/goal of criminalizing (corporate) environmentally harmful conduct?

Environmental (corporate) crimes violate defined social and economic optimality and corresponding codified rules of behavior, and cannot be considered welfare-enhancing or socially desirable. The function of criminal law in the context of environmental regulation is to ensure efficiency through compliance with the regulatory regime and to maintain social trust by preventing violations. This leads to the research question (2):

2. How must environmental criminal law be designed to realize best the function/goal it is intended to achieve?

In theory, prevention can be achieved through a full deterrence approach that ensures that corporate environmental crimes do not pay by (at least) profit elimination. However, in the case

of environmental crimes committed within corporate structures, the identified challenges to criminal law enforcement imply a relatively low probability of detection and costly enforcement. The low probability of sanctioning coincides with the high profit and damage of corporate environmental crimes, so the penalty must be correspondingly high to compensate for the low probability of its imposition. In practice, this usually reveals to be untenable, primarily due to insolvency thresholds and high enforcement costs of individual sanctions. The question of collective sanctions and the corporate entity as a possible remedy, as well as the third question of analysis (3) then become decisive:

3. To what extent does corporate criminal liability serve to realize the function/goal of environmental criminal law?

In this respect, the work aimed to “open” box B Figure 1, i.e., to approach the internal structure and logic crucial for processing the legal incentives. The novelty of this work was to penetrate the macro level question on the goal of criminal law and punishment to the meso and micro level of analysis, tailored to environmental crime and harm (cf. Figure 2 Macro, meso, micro level interplay between the goal and design of ECL.) The fact that corporate misconduct is more than the mere aggregation of individual elements and actions means that, even if we understand the incentive structure at the micro level, successful prevention within an organizational setting requires knowledge and understanding of situational and transformative mechanisms.¹⁹⁰⁵ Since these are highly variable, general conclusions are ruled out. For corporate crime regulation, this means that the mere alignment of interests has its limitations,¹⁹⁰⁶ and corporations “[a]s legal abstractions [...] do not have the same interests as individuals, and therefore cannot be expected to respond in the same way to actual or threatened penalties.”¹⁹⁰⁷ Corporate, white-collar, or organizational crime must be acknowledged to be different from individual offending; it is a multifaceted phenomenon¹⁹⁰⁸ that requires differential theoretical models and corresponding prevention and control strategies. Corporate criminal liability (in cases of environmental crimes and a prevention focus) cannot function as a substitute to individual liability; if anything, as a

¹⁹⁰⁵ Cf. Figure 5 Coleman’s Boat on macro-micro-macro relations.

¹⁹⁰⁶As a note of Pindyck and Rubinfeld on the principal agent perspective indicates: “It is clear that shareholders have been unable to adequately control managers’ behavior. What can be done to address this problem? In theory, the answer is simple: One must find mechanisms that more closely align the interests of managers and shareholders. In practice, however, this is likely to prove difficult,” Pindyck & Rubinfeld 2013: 647.

¹⁹⁰⁷ J. S. Parker 1989: 519.

¹⁹⁰⁸ Schmitt-Leonardy 2017: 72.

complement, taking into account the situational and transformative mechanisms in place, i.e., it may be reasonable in the case of small companies in which ownership, decision-making, and action are united, but less in larger corporations in which decision-, action-, and incentive structures are much more complex.

C. Contribution and Policy Implications

The work intended to conduct a contextual analysis of environmental criminal law through an intra- and interdisciplinary approach and make a case for the necessity and gain of a tailored, differential, and case-based criminal law analysis of corporate (environmental) crime regulation. The analysis revealed a classification and differentiation of the function of environmental law and environmental criminal law. The former oversees general social and societal welfare considerations. It focuses on socially ambiguous, potentially welfare-increasing behavior – behavior that is “contingently efficient”¹⁹⁰⁹ (grey area, cf. Figure 34). Within this, it defines the socially optimal and desirable activity (levels), grounded in social welfare considerations, intended to represent social optima. By this, environmental law defines behavioral spaces whose boundaries must be adhered to in the interest of self-preservation and for future generations (represented by the dotted line; boundaries, which can only be determined approximately). The behavioral area and coherent activities (levels) have developed in the course of societal progress and economic industrialization, balancing conflicting interests. From a legal institutional perspective, they emerged as social informal norms, representing the “ought to” or “ought not to” and are thus inherently normative. In the course of civil progress, these informal norms were increasingly institutionalized into formal rules, whose compliance turned out to be vital for self-preservation. Since each individual acting within the (legal) boundaries of action adheres to them with the expectancy that others do alike, maintaining compliance is central to social peace and trust. Ensuring compliance with these standards is a social expectation toward the state as the supervisory authority; in sanctioning infringements and transgressors, the role of environmental criminal law comes into play (black area). (Environmental) Criminal law delineates the behavioral boundaries outside potentially welfare-enhancing/socially desirable activity areas and provides an instrument of punishment to ensure compliance and safeguard social peace. Thus, welfare considerations define the scope of environmental criminal law. Transferring the externality perspective for defining the optimal sanction and the goal of criminalization in terms

¹⁹⁰⁹ Raskolnikov 2014: 1139.

of internalization is inconsistent with the functional division between environmental law and environmental criminal law. The reasons are that criminal law, by its very nature, entails an individualized perspective and thereby an inherent risk of underestimation of indirect social harm of the act concerned; ultimately, of causing welfare losses. (Corporate) Environmental crimes are “irredeemably inefficient acts.”¹⁹¹⁰ This restricts the function of environmental criminal law to a supervisory and monitoring role to ensure compliance and discloses the internalization approach as untenable.

The first essential contribution of this work lies in uncovering the contradiction between the economic analysis of environmental law and that of (environmental) criminal law while revealing the convergence between environmental economics and an institutional approach to (environmental) criminal law considering socially optimal behavior.

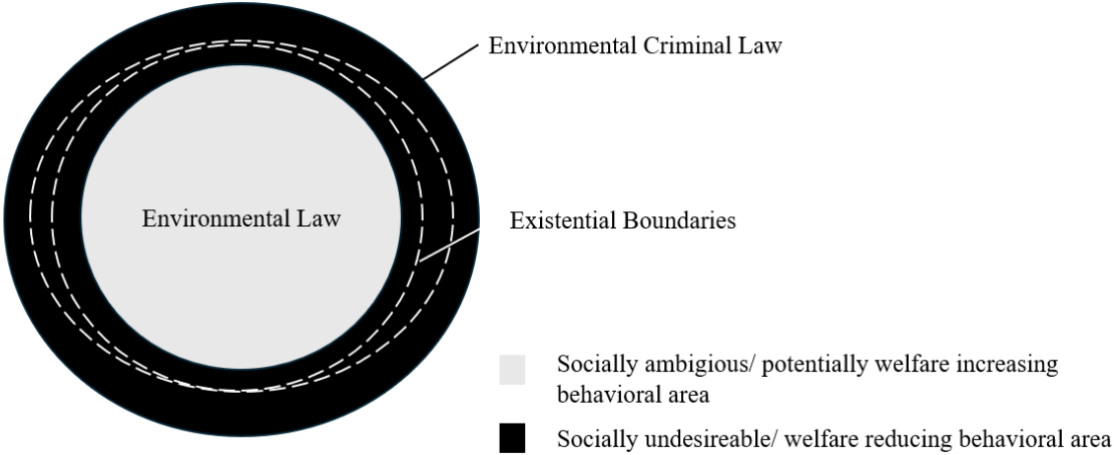


Figure 34 Behavioral welfare areas of environmental law and environmental criminal law

The second major contribution of this work is on the design of sanctions, namely, on the debate of corporate criminal liability and its appropriateness concerning corporate environmental crime. The analysis revealed that the assumption of invariant incentive transfer has inherent limitations; corporate criminal liability may thus be inadequate when prevention through behavioral change, i.e., deterrence, is sought. This implies the centrality of individual liability for corporate misconduct to ensure influencing decision-making in favor of compliance.

¹⁹¹⁰ Raskolnikov 2014.

D. Limitations and Outlook

“[S]cience always begins and ends with problems. The progress of sciences lies, essentially, in the evolution of its problems.”¹⁹¹¹

For law in general, it is central to recognize its function as a means of social control. For this, its specific design ought to occur in light of its social consequences, informed and falsified by practice and empirics. If the intended consequences do not materialize or even unintended consequences are provoked, the law loses its legitimacy and may be harmful. This holds especially true for criminal law. While the law may claim normative cohesion, it must remain cognitively open;¹⁹¹² a balancing act that involves other sciences to be considered and welcomed as sources of information about the social realities to which the law applies. Theories, models, and concepts can never claim universality, but they can serve a supportive function in approaching social complexities. The diversity of objects of study necessitates theoretical pluralism, while their value can only be specified on a case-by-case basis. Interdisciplinarity and the incorporation of theoretical approaches from other sciences should be appreciated as a set of options from which the most appropriate can then be selected to study the object of interest. In this work, the economic analysis of law served to explore the inherent economic structure of environmental criminal law as part of a broader regulatory regime and, thereby, to gain a functional and contextual perspective on its role in the specific case of corporate environmental crime. The contextual consideration and the emphasis of a methodological differentiated and interdisciplinary approach, taking into account the particularity of the case under investigation, was the intention of this work.

For criminal law and research, it is essential to recognize crime as “a set of highly diverse behaviours [...] each of which has its own particular motives, purposes and benefit;”¹⁹¹³ not so much as a coherent phenomenon and a scholarly debate dedicated to finding *the* theory. Instead, there is a need for theoretical diversity and differentiation based on empirics and interdisciplinarity: Punishment does not occur in a vacuum; rather, it is closely related to the criminal act, agent, and circumstances. Therefore, a differentiated criminal justice approach and offense-specific analysis are essential. The economic analysis of law can support this process and contribute to a deepening of knowledge and a careful determination of regulatory functions and designs – especially if there are an economic structure and logic inherent in the regulatory regime,

¹⁹¹¹ Emphasis adopted, see Popper 1994: 155.

¹⁹¹² See further on this, Luhmann 1983: 139.

¹⁹¹³ Cornish & Clarke 2017: 34.

as in the case of the topic of this work: corporate environmental crime. While the rational choice model has its limitations, a judicious and sophisticated recourse to it allows us to contribute to criminal incentive research. In this regard, it is necessary to resolve the paradox that the deterrence approach is mostly studied for offenses for which it is certainly doubtful.¹⁹¹⁴ Instead, the deterrence lens must not be devoted to areas of criminal law where the “deterrence fruits hang high,” calling for much decriminalization policies,¹⁹¹⁵ but to areas where the “fruits hang the lowest,” and where deterrence may be a reasonable goal for criminal law enforcement. This must be done considering legal principles, limited by the question of guilt and the undesirability of over-criminalization. After all, it is important to appreciate the responsibility of management positions and to take into account the natural susceptibility to the error of human action; harsh criminal law that discourages individuals from taking on management positions can certainly not be socially desirable. This vividly illustrates the need to constrain and correct the economic approach by other core principles of criminal law. Namely, to introduce deontological boundaries to any consequentialist approach¹⁹¹⁶ and reverse. Since the perspective of this work was rather structural and functional, normative considerations, such as questions of guilt or the like, have not been addressed further. In this regard, there is room for further research with regard to corporate (environmental) crime and corporate criminal liability.

For criminology, the complexity of the actors, interests, and actions involved in corporate crime means that a purely criminal justice approach is unlikely to achieve the desired social goals for corporate crime prevention. Rather, more research is needed on how they work individually and complementarily. Given the political power of corporations and corporate representatives, there must be caution to ensure that corporate criminal liability does not end up being a convenient shield for managerial liability.¹⁹¹⁷ It is central to understand corporate and individual liability as complements¹⁹¹⁸ and to recall that “Corporate crime is not committed by firms, as such, but by different individuals within the corporation.”¹⁹¹⁹

¹⁹¹⁴ Cf. Raskolnikov 2020: 3. Raskolnikov observes that “the economic theory of crime is plausible when applied to white-collar offenses, but it encounters major problems when applied to violent crime. In contrast, the empirical research of violent crime is vast while the econometric analysis of white-collar offenses is essentially nonexistent.” See also Chambliss 1967: 716. Chambliss observes that “persons likely to be deterred by imposing sanctions are, in general, the most likely to escape them.”

¹⁹¹⁵ For instance, for an economic argumentation for decriminalizing, Hylton 2018.

¹⁹¹⁶ Compare further on this idea, Ulen 2015.

¹⁹¹⁷ See on this, Khanna 2004.

¹⁹¹⁸ On their complementary relation also Faure 2020: 86.

¹⁹¹⁹ Garoupa 2000: 244.

For corporate crime prevention, corporate criminal liability does not constitute a universal remedy. Recourse to it must be conducted considering its consequences and underlying social goals. Interdisciplinary and international comparative legal analysis can play a crucial role in informing German legal policymakers. The United States, with its long-standing doctrine of corporate liability, while still succeeding in reaching individual actors, and its experience with collateral costs and potential corporate failures, may be of particular value in this regard. Since corporate criminal liability, more specifically, and criminal law in general, is only a fragment of preventative action, the lens of control strategies for corporate behavior should be broad and also consider strategies, such as disclosure requirements or sustainable finance. In this regard, interdisciplinary research on their impact on internal compliance mechanisms is welcomed.

For environmental preservation through environmental criminal law, the diesel case illustrates the limitations of criminal law in countering systematic deviance along the boundaries of legality and illegality. The German legal debate around whether “vehicle, in normal use” Art. 5 (1) Regulation (EC) No 715/2007 relates to emission in test mode¹⁹²⁰ or everyday mode, i.e., when on the road¹⁹²¹ and the fact that § 325 (1) StGB excludes vehicles¹⁹²² illustrate the difficulties of law to keep up with technical and civil progress. The case is further insightful in that monetary and individual interests seem to prevail in German legal prosecution, and thus, the burden of law enforcement is increasingly falling back on affected individuals and civil law.¹⁹²³ In this context, it is worth considering to what extent the state can be strengthened as an actor in targeting environmental crimes, e.g., by increasing the resources and competency of the institutions involved, such as the UBA. While strengthening national governance is essential, the transboundary character of agents, acts, and harm makes a transboundary perspective and enforcement approach for combatting environmental (corporate) crime indispensable¹⁹²⁴—concerning the law and its executive agencies. With respect to the latter, transnational organizations, such as Europol, should pay more attention to environmental crime and white-collar milieus.

For environmental preservation through law in general, research into the role of the law in ensuring sustainable social development is still in its infancy and requires an intra- and

¹⁹²⁰ LG Schwerin, *Urteil*, 4 O 57/18, September 20, 2018: para. 65.

¹⁹²¹ LG Bamberg, *Urteil*, 42 O 269/18, May 2, 2019: 8–10.

¹⁹²² Heine & Schnittenhelm 2019a: para. 20.

¹⁹²³ In Germany, cases mainly concern civil compensation claims of customers against VW as a corporation, who purchased cars with installed defeat devices (§§ 826 in conjunction with 31 BGB, or §§ 823 (2) and 31 BGB in conjunction with § 263 StGB); cf. LG Bamberg, *Urteil*, 42 O 269/18, May 2, 2019; Witt 2017.

¹⁹²⁴ On the need for European legal endeavor to combat organized waste trafficking Giardi 2015: 244 ff. Also, concerning waste crime, Hecker 2008: 238 ff. Concerning environmental crime generally, Hecker 2004: 901 ff.

interdisciplinary perspective.¹⁹²⁵ Given the *ultima ratio* function and the administrative accessoriness of environmental criminal law, the functional division implies that the main role is upon public environmental law;¹⁹²⁶ criminal law by itself will be unable to provide the desired environmental protection.¹⁹²⁷ This means that the task of setting the relevant regulatory framework and incentives is upon the former; if the environmental legal regime is inadequate in securing sustainable development and natural resources, the criminal law cannot remedy the situation. Policy decisions such as including nuclear power and gas in the EU taxonomy¹⁹²⁸ illustrate the strong connection between law and politics. Approaches, such as public-choice theory, are welcome to investigate the interplay between political agents and regulation.

For economics as a science, research into its interplay with an influence on social reality and normativity is valuable. This includes research on incorporating *prima facie* non-economic, social, and environmental values. Scientific interdisciplinarity and an alliance of long-term social, environmental, and economic values could be fruitful. Thereby, economics can inform policy and legislation on socially desirable incentives to allow reliance on private market forces to contribute to environmental preservation. Given the urgency of environmental preservation, the efficiency of market-based instruments must be studied cautiously.

For the economic analysis of law and/or law and economics, recourse to it is valuable if done conscientiously of its limitations and tailored to the specific problem; i.e., recourse to it may be more appropriate in some case than in others. Just as any categorical rejection is unsound, so is any categorical endorsement. In this sense, the limitations of any theory should be understood as the logical consequence of a constructed abstraction and generalization of real phenomena (i.e., scientific theories). Each scientific discipline is one piece of the puzzle in discovering the fascination of reality; ultimately, the divergence and exchange of perspectives promote fruitful and collaborative debates and allow for the best possible approximation to the “discovery of reality.” The economic analysis of law provides an opportunity to adopt a more social and consequential perspective. A perspective informed by reality and other sciences such as sociology, criminology, and economics then strengthens the legal voice by employing a “legal analysis of economics” within legal policy.

¹⁹²⁵ A start here is the young sustainability law (*Junges Nachhaltigkeitsrecht* (JNR)), which considers itself as an in-progress, open research network of the next generation of scientists, with the aim of actively shaping the legal sustainability discourse and contributing to its necessary rationalization, cf. Bayer et al. 2023.

¹⁹²⁶ Saliger 2021: para 2.

¹⁹²⁷ Referring to economic criminal law, Sommerer 2021: 141.

¹⁹²⁸ Gawel 2022.

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