Chapter 4
Economic Analysis of Law

[E]conomics is a powerful tool for analyzing a vast range of legal questions [. . .].[1]

4.1 Introduction

The seminal groundwork for the economic analysis of law was done by Ronald H. Coase and Guido Calabresi. In his essay, 'Some Thoughts on Risk Distribution and the Law of Torts' (1961), Calabresi's analysis of the allocation of risks in tort law runs counter to the legal principle of fault. In 'The Problem of Social Cost' (1960), Coase developed a theorem, now named after him, which would become one of the central tenets of economic analysis of law. The conclusion of the *Coase theorem* is that the world of law should be analysed in terms of its economic impacts so as to instill a dimension of economic efficiency into legal institutions. Coase made his name not only with this theorem but also with his famous essay on 'The Nature of the Firm' (1937). In both papers, a central concept is that of *transaction costs*.[2] Another important contribution was made by Gary S. Becker who attempted to apply the economic approach to non-market areas. In his essay on 'Crime and Punishment' (1968) he made a fundamental contribution to the economic analysis of crime. Finally, Richard A. Posner's textbook, *Economic Analysis of Law* (1972), systematically analysed the law in terms of its effects on economic efficiency.

4.2 Concepts

4.2.1 Transaction Costs

Transaction costs are a key concept in economic analysis of law. The expression denotes the costs of procuring information, negotiating, executing, checking and enforcing contracts. As Coase puts it:

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[1] Posner, *EAL 5*, p. 3.

[2] See Sect. 4.2.1.

K. Mathis, *Efficiency Instead of Justice?*, Law and Philosophy Library 84,
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> In order to carry out market transactions it is necessary 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.[3]

In his analysis in 'The Problem of Social Cost', Coase initially assumes a world without transaction costs, as a means of demonstrating what would happen in ideal conditions.

4.2.2 Property Rights

The term 'property rights' is broader in scope than 'rights of ownership'. The constitutive idea of the property rights concept is the understanding of *resources as bundles of rights*, and hence the exchange of goods as the exchange of bundles of rights.[4] Thus the question of the efficient allocation of property rights often comes within the purview of economic analysis of law.[5]

Property rights describe all the conceivable ways in which someone may utilize a resource: exploitation of the resource, alteration of its form and substance, receipt of rents, and freedom to transfer such rights to others. The concept of property rights encompasses not only private property but also state property; and restricted rights *in rem* as well as intangible property rights. *Generally speaking, property rights are defined as any legal norms which regulate the allocation of powers over resource use*. A property right is said to be extremely concentrated if all powers over a resource are held by one and the same person. On the other hand, if several people or even everyone can claim a right over the same resource, it is said to be attenuated.[6] The process of defining property rights includes regulating how they will be protected. The protection of property rights operates by way of *property rules* (affording protection of *in rem* rights) on the one hand, and *liability rules* (defining rights under liability law) on the other.[7]

4.2.2.1 Property Rules

Third parties may only interfere with a property right with the consent of its holder, and the holder can defend against any invasion of property rights.[8]

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[3] Coase, 'Social Cost', p. 15.

[4] Schäfer and Ott, p. 87.

[5] Calabresi and Melamed, pp. 1090 ff.

[6] Schäfer and Ott, p. 515.

[7] Cf. Calabresi and Melamed, pp. 1089 ff.

[8] Schäfer and Ott, p. 516.

4.2.2.2 Liability Rules

Liability rules only give protection to property rights through a claim for damages. It is not necessary to obtain consent for such claims from the holder of the property right. Liability rules are the basis for damages claims arising from expropriation by the state, for example, or from accidents.[9]

4.3 The Coase Theorem

4.3.1 The Concept

The Coase theorem states that where property rights are clearly allocated, and in the absence of transaction costs in a market, property rights will be exchanged until economic resources reach the place where they will be utilized most efficiently, regardless of where they were originally allocated.[10]

The theorem consists of two claims, the hypothesis of invariance and the hypothesis of efficiency. The *invariance hypothesis* proposes that the initial endowment of property rights has no influence on the eventual allocation of resources. Market transactions ensure that property rights end up in the 'right' place, if they were not there to begin with. Furthermore, according to the *efficiency hypothesis*, the end result will always be a Pareto optimal solution.[11] *The implication of the Coase theorem is that private costs will equal social costs, since all externalities are internalized through private arrangements*.[12]

Apart from the obviously unrealistic assumption of zero transaction costs, a further assumption is that property rights have been clearly assigned to somebody at the outset. This is often not the case, especially for environmental resources.[13] From a legal viewpoint, the significance of the theorem is that it requires the law to ensure that property rights are clearly defined and unequivocally assigned. While the chosen method of assignment has an influence on income distribution, it has no effect – assuming zero transaction costs – on efficiency.

Coase had brought forth the idea for the theorem later named after him in a previous article on 'The Federal Communications Commission' (1959).[14] However, other

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[9] Calabresi and Melamed, pp. 1106 ff.

[10] Cf. Veljanovski, 'Coase Theorems', p. 54. Note that various interpretations of the Coase theorem exist; see Cooter, pp. 457 f. and Sect. 4.3.3.3c).

[11] Siemer, p. 7.

[12] Stigler, p. 113.

[13] Who has property rights to the air, for example? Do residents have a right to fresh air or do motorists have a right to pollute the air? Similar problems are posed by emissions of other kinds, e.g. noise.

[14] Coase, Communications, pp. 23 f.

Chicago economists – including Milton Friedman and George Stigler – believed the argument to be wrong:

> Their objections centered on what George Stigler was later to term the "Coase Theorem".[15]

In his paper on 'The Problem of Social Cost', Coase therefore made an attempt to explain his argument at greater length. This paper was addressed to economists, who were struggling to grasp the paradigm shift that Coase had obviously initiated.

> I suppose this lack of comprehension represents another example, about which Thomas Kuhn has told us, of the difficulty which scientists find in changing their analytical system, or, as he puts it, in moving from one paradigm to another.[16]

Meanwhile Coase had never expected his paper to exert such a sustained influence on the discipline of law:

> It is generally agreed that this article has had an immense influence on legal scholarship, but this was no part of my intention. Law came into the article because, in a regime of positive transaction costs, the character of the law becomes one of the main factors determining the performance of the economy.[17]

Accordingly, where there are positive transaction costs, the law has a decisive role to play. Coase's initial proposition, however, is that harms are always reciprocal in nature. He goes on to develop his theorem in the framework of a model without transaction costs. Only then does he take up the question of the effects of positive transaction costs.

4.3.2 The Reciprocal Nature of Harmful Actions

Coase argues that harm is always a reciprocal matter. If person A harms person B, traditionally one would ask how to proceed against A. But that is the wrong question if we accept the argument that harm is *reciprocal in nature*:

> We are dealing with a problem of a reciprocal nature. To avoid the harm to B would inflict harm on A. The real question that has to be decided is: should A be allowed to harm B or should B be allowed to harm A?[18]

If the noise and vibrations from a confectioner's machinery disturb a doctor's work, for instance, and the confectioner is forced to avoid making any noise out of consideration for the doctor, this can also be construed as the doctor harming the confectioner.[19] The crucial question is, should more confectionery be produced or

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[15] Coase, 'Law and Economics', p. 249.

[16] Coase, 'Law and Economics', p. 250.

[17] Coase, 'Law and Economics', p. 250.

[18] Coase, 'Social Cost', p. 2.

[19] The idea that both parties can always be seen as causal agents of externalities certainly has some logic, but only up to a point. Often the idea is absurd, as the following example shows. Let us assume that A shot B. A now argues in his own defence that if B had not chosen to stand in A's way as he accidentally fired the gun, B would not have been killed.

more medical services provided? Or if all the fish in a river died as a result of water pollution, the question is whether the value of the loss of fish is higher or lower than the value of the goods that the water was polluted in order to produce?[20]

4.3.3 The Absence of Transaction Costs

4.3.3.1 Negotiations Ensure an Efficient Outcome

Coase develops his argument with reference to an example involving cattle and wheat: a rancher's cattle trample a farmer's wheat fields while grazing. Obviously this is a negative external effect since the rancher is fattening his cattle to the detriment of the farmer. According to Coase the right to free grazing can be defined as one the many rights deriving from cattle ownership. It means that cattle are allowed to roam and may venture into other people's fields. On this analysis, it is up to the farmer to take his own precautions. Now one might equally invoke the right to undamaged fields as one of the rights deriving from the ownership of agricultural land. Seen in that light, it is unacceptable for cattle to graze in wheat fields. Both definitions in this case describe an identical right: from the farmer's perspective, the right to an undamaged wheat field, and from the rancher's perspective, the right to free fodder.[21]

This property right can be thought of as a right to inflict harm. If the rancher holds this right, then he is entitled to allow his cattle to graze in the wheat fields. If the farmer possesses it, the rancher has no such entitlement. According to Coase, this right to harm should be tradeable. If the rancher holds the right, the farmer should pay him for the right to harm, at a price commensurate with the scale of the potential damage. This would avert any harm to the farmer. From the rancher's viewpoint, the possibility of selling the right increases his opportunity costs of cattle herding, such that he has to consider whether it is worthwhile to persist in damaging the wheat fields. If, however, the farmer holds the right to undamaged wheat fields, he can sell the rancher the right to inflict harm, and accept the consequence of crop damage, at least by building it into the asking price for the right to inflict harm.[22]

The tradeability of the right to inflict harm means that in their own interests, both the rancher and the farmer will consider the other party's interests: Smith's principle that pursuit of self-interest increases the welfare of all (the 'invisible hand')[23] results in internalization of the external effect by voluntary agreement. Consequently, the most efficient use is made of economic resources.[24]

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[20] Coase, 'Social Cost', p. 2.

[21] Coase, 'Social Cost', pp. 19 f.

[22] Siemer, p. 2.

[23] See Sect. 5.3.

[24] Siemer, pp. 2 f.

The crucial point of the Coase theorem is that – in the absence of transaction costs – this result comes about by voluntary negotiations, regardless of which party was originally assigned the property rights:

> [T]he ultimate result (which maximises the value of production) is independent of the legal position if the pricing system is assumed to work without cost.[25]

The validity of the Coase theorem in principle can be shown from the following numerical example:[26] The smoke from a factory chimney contaminates the laundry hung out to dry by five neighbours. The damage amounts to €1,000 each or €5,000 in total. The damage can be prevented in one of two ways: every household is provided with a dryer, at a unit price of €600, which costs €3,000 in total, or the factory chimney is fitted with a filter costing €1,000. It is obvious that in these circumstances, the filter is the more efficient solution, because €5,000 worth of damage can be prevented at the least cost of €1,000.

The next question is whether the most efficient solution is chosen regardless of whether the neighbours have a right to clean air or the factory has a right to pollute. If the neighbours have a right to clean air, the factory has three options (see Table 4.1): to pollute and pay €5,000 in damages, to pay for dryers for the neighbours at a total cost of €3,000, or to fit a filter for only €1,000. Obviously it will opt for the third solution as the most efficient. If on the other hand the factory has a right to pollute, the neighbours also have three options: to endure damage amounting to €5,000, to buy dryers for a total of €3,000 or to pay for a filter for the factory, costing €1,000. They too will opt for the filter as the most efficient solution.

The example shows that private arrangements always result in the most efficient solution, regardless of where the property rights are allocated.

Table 4.1 Options for a factory emitting smoke and five neighbours whose laundry is affected

Neighbours have a right to clean air – factory has three options:	Factory has a right to pollute – neighbours have three options:
(1) Pay compensation, € 5,000	(1) Endure damage, € 5,000
(2) Pay for dryers, € 3,000	(2) Buy dryers, € 3,000
(3) Buy filter, € 1,000	(3) Pay for filter, € 1,000

4.3.3.2 Negotiation as an Alternative to State Intervention

In *The Economics of Welfare* (1932) the British economist Arthur C. Pigou demanded that in the event of externalities, the state should intervene and levy a tax

[25] Coase, 'Social Cost', p. 8.

[26] Cf. Polinsky, pp. 11 f.

(a 'Pigou tax'). Let us assume that sparks from a steam train set an adjacent wheat field on fire. Under the causation principle the railway would have to pay for the damage, this being a negative external effect of production. However, in the example under review, the environmental damage caused by the flying sparks is not built into the railway's calculations. Thus the social costs of the damage are greater than the private costs. In order to bring them into line with the social costs, the state should levy a tax.[27]

Pigou bases his view on a key finding of welfare theory: society's resources are always directed to their most highly valued use if individuals consider the external effects (i.e. those not affecting them personally) of their economic actions as if they were, in fact, directly affected. In other words, a Pareto optimum can only be achieved when the social costs equal the private costs of production, and of consumption.[28] With negative external effects, the social costs are greater than the private costs; with positive externalities the difference is the other way round. The alignment of private and social costs is called internalization.[29]

Coase rejects this sort of state intervention, arguing instead for *negotiated solutions* arranged between the parties affected. In the example discussed above, the railway company could compensate the farmer for the destruction of his fields, thus enabling him to cultivate his wheat somewhere else. Or, alternatively, the farmer could pay to have the locomotives fitted with some technology which prevented flying sparks. *According to the Coase theorem, from the point of view of efficiency it makes no difference who pays whom; the railway may pay off the farmer, or vice versa*.[30]

As we know, in economic terms, both parties are causal agents: if the farmer were to stop sowing wheat in the field, he would not suffer any damage. For Coase, external effects are always a reciprocal problem. If the railway is forced to compensate the farmer, then it has a loss of utility which is not necessarily of lesser value than the farmer's burnt wheat. A negotiated solution would be more constructive than a tax, because it gives due consideration to both parties' utility. However, according to Coase, such a solution presupposes zero transaction costs and clearly defined property rights:

> [I]f market transactions were costless, all that matters (questions of equity apart) is that the rights of the various parties should be well-defined and the results of legal actions easy to forecast.[31]

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[27] Coase, 'Social Cost', pp. 28 ff.

[28] Pigou, pp. 183 ff.

[29] Cf. Schumann, *Mikroökonomie*, p. 38 and pp. 492 ff.

[30] From the point of view of *income distribution*, on the other hand, who pays whom is not inconsequential.

[31] Coase, 'Social Cost', p. 19.

4.3.3.3 Critique

(a) The Assumptions are Unrealistic

The first complaint concerns the theorem's restrictive preconditions: the absence of transaction costs and the clear assignment of property rights. In most cases, it is high *transaction costs* which make the internalization of external effects seem unviable to the parties involved. In reality, the costs of negotiation are likely to be very high indeed, particularly where one or even several parties must reach a unanimous agreement. Only those who expect the compensation to exceed their negotiation costs will be interested in negotiating. But even if contract negotiations are successful, further costs will be incurred to enforce contracts by means of damages payments.[32]

In the case of environmental problems, often there is *no clear assignment of property rights*. Moreover, water and air pollution are often the doing of many polluters, and are rarely attributable to a single perpetrator. But as damage of this kind can only be eliminated using complex and costly technology, state intervention is often necessary regardless.[33] Appropriate environmental policy instruments in such cases might be maximum emission limits, environmental taxes or emissions permits (tradeable pollution rights).[34] Application of the Coase theorem to this scenario does, of course, also allow for the possibility that people likely to be harmed could pay the polluters to desist from their emissions.[35] For example, water consumers in Baden-Württemberg, Germany, pay a water levy called the *Wasserpfennig* ('water penny'), in return for which farmers reduce their use of groundwater-polluting fertilizers and pesticides.[36] The debate on compensation payments from industrialized nations to certain Third World countries in the aim of preventing further deforestation of rainforests is similarly inspired by Coasean thinking.[37]

(b) Wealth and Endowment Effects Influence Allocation

The Coase theorem asserts that the final allocation will always be the same and always Pareto efficient, regardless of the assignment of property rights. It grants that the assignment of property rights will have an impact on income distribution, but this has no bearing on the allocation.

This apparent dichotomy between distribution and allocation has to be questioned, however. How property rights are assigned certainly influences the distribution of wealth. Indirectly, the *wealth effect* will indeed have some impact on allocation. This effect stems from the fact that the rich and the poor generally buy different kinds of goods. A change in distribution will alter the structure of demand,

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[32] Schumann, *Mikroökonomie*, p. 499.

[33] Hoffmann, p. 297.

[34] See Sect. 4.3.5.

[35] Schumann, *Mikroökonomie*, p. 499.

[36] Schumann, *Mikroökonomie*, p. 500.

[37] Hoffmann, p. 297.

since demand is dependent upon income or wealth. This in turn has an influence on prices, and hence on the outcome of the allocation. Aside from this, prices may also be influenced by the *endowment effect*.[38] The supply and demand price of a commodity can differ for the same person. The observation has been made that once people have acquired an item, they are only prepared to resell it when the price offered is higher than the price they paid for it.[39]

While the final allocation, even taking all these effects into consideration, will always be Pareto optimal, it will not necessarily always be the same.[40] *Taking wealth and endowment effects into account, the efficiency hypothesis remains valid but the invariance hypothesis does not*.[41]

(c) Bargaining is Not the Same as Competition

Cento Veljanovski points out various possible interpretations of the Coase theorem, and thus the problem of talking about *the* Coase theorem at all. The two forms of interpretation he distinguishes are the *bargaining theorem* and the *competitive market theorem*.[42]

The bargaining theorem assumes two or several interested parties, who make contact with the intention of entering into a contract. The competitive market theorem, in contrast, presupposes an economic model of perfect competition. With a theoretically infinite number of parties on both sides of the market, no single player can determine the market price. Under the negotiation model, the price is the subject of negotiations. Under the competitive market model, it is simply a given and is not therefore negotiable.

According to Veljanovski, Coase mixes the two models. Although he refers to the competitive market model, Coase's examples describe personalized, bilateral transactions in which the terms of trade are negotiated to completion by the parties directly involved.[43]

> The bargaining Coase Theorem is seemingly rendered identical to the competitive market model through a semantic confusion between the common usage of the word competitive and its technical economic meaning.[44]

According to Leif Johansen, however, bargaining is a very inefficient method of decision-making:

> [B]argaining will often be an inefficient decision procedure in the sense that it tends to distort the information basis for decisions, it tends to use or waste resources in the process,

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[38] Cooter and Ulen, p. 83.

[39] See also Sect. 8.4.4.2.

[40] See also Sect. 3.2.2.

[41] Calabresi and Melamed, pp. 1095 f.

[42] Veljanovski, 'Coase Theorems', pp. 55 f.

[43] Veljanovski, 'Coase Theorems', pp. 55 f.

[44] Veljanovski, 'Coase Theorems', pp. 62 f.

> particularly by delaying decisions for reasons which are not technically necessary, it will more or less frequently lead to breakdown and failure to realize the potential gains, and threats will sometimes be carried out.[45]

An important dimension of negotiations is *strategic behaviour*.[46] For one thing, according to Veljanovski, this does not result in an unequivocal solution. Moreover, it does not usually result in an efficient outcome either – which would diametrically contradict the Coase theorem:

> Indeed if there is any theorem in such a world it is the exact opposite of the Coase Theorem. The appropriate theorem in bargaining contexts is [. . .]: Direct bargaining has an inherent tendency to dissipate the gains-from-trade through strategic behaviour.[47]

Where there are only two interested parties, i.e. in the case of a bilateral monopoly, the socially optimal bargaining solution is not the sole conceivable outcome. In fact, individual skilfulness at negotiation or other inequalities between the parties – inequalities which come under the heading of 'power' – can significantly alter the outcome of negotiations, compared with what would happen if power were not a factor. So, efficient allocation is by no means guaranteed.[48] Robert Cooter essentially shares this view but is not quite so pessimistic about the matter:

> Reality lies in between the poles of optimism and pessimism, because strategic behaviour causes bargaining to fail in some cases, but not in every case.[49]

By assuming zero transaction costs, Coase believes he has eliminated all obstacles – including strategic behaviour, for example – which might jeopardize an efficient outcome of bargaining; on the other hand, the apportionment of the gains from trade depends to a very major extent on the respective parties' adeptness as negotiators:

> What payment would in fact be made would depend on the shrewdness of the farmer and the cattle-raiser as bargainers.[50]

Coase is evidently mixing the bargaining model and the competitive market model, which also appears to cast doubt on the validity of the efficiency hypothesis. So it seems that the Coase theorem – *the* central proposition of economic analysis of law – does not itself stand up to economic analysis.

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[45] Johansen, p. 519 (whole passage italicized in the original).

[46] Game theory addresses this matter, making a distinction between cooperative and non-cooperative behaviour.

[47] Veljanovksi, 'Coase Theorems', p. 60. Cooter calls the opposite of the Coase theorem the 'Hobbes theorem'. Cooter, p. 459.

[48] Cf. Schumann, *Mikroökonomie*, p. 499.

[49] Cooter, p. 459.

[50] Coase, 'Social Cost', p. 6.

4.3.4 Taking Account of Transaction Costs

4.3.4.1 The Choice Between Different Social Arrangements

In his subsequent explanations, Coase gives up the assumption of cost-free transactions because he believes it to be unrealistic himself. Taking transaction costs into consideration alters the outcomes of the analysis, however: rights to inflict harm would now only be traded if a positive gain could be achieved after deduction of the transaction costs. Should transaction costs really hinder an efficient allocation of property rights in the market, social arrangements of three other kinds can be considered: *amalgamation* of the interested parties into a firm; *state regulation*; or a *laissez-faire* situation.[51]

If the interested parties (the injurers and the victims) amalgamate into a firm, the external effects would automatically be internalized. Transaction costs would be reduced, but additional administrative costs would be incurred in their place for internal organization.[52] The state has to contend with similar administration costs, which is why Coase calls the state a 'super-firm'. He makes no general pronouncement on which solution will be best in a given instance; this depends on the scale of transaction costs and administrative costs. Coase believes, however, that economists and politicians had previously overestimated the benefits of state regulation.[53]

4.3.4.2 The Crucial Importance of Law

When transaction costs are taken into consideration, the theorem gains enormously in relevance but with precisely the opposite implications: the higher the transaction costs, the more it matters how property rights are allocated, and the greater their impact on the efficiency of an economy. If transaction costs are higher than zero – which is always the case in reality – then the law, i.e. the assignment of property rights, definitively has an influence:

> If transaction costs were zero (as is assumed in standard economic theory) we can imagine people contracting around the law whenever the value of production would be increased by a change in the legal position. But in a regime of positive transaction costs, such contracting would not occur whenever transaction costs were greater than the gain that such a redistribution of rights would bring. As a consequence the rights which individuals possess will commonly be those established by the law, which in these circumstances can be said to control the economy.[54]

This in turn can be demonstrated with reference to the numerical example of the factory and its neighbours that we used earlier.[55] Let us assume that the transaction

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[51] Coase, 'Social Cost', pp. 15 ff.

[52] This is the subject of the article 'The Nature of the Firm'.

[53] Coase, 'Social Cost', pp. 16 ff.

[54] Coase, 'Law and Economics', p. 251.

[55] Cf. Polinsky, pp. 12 f.

Table 4.2 Options for a factory emitting smoke and its five neighbours, taking transaction costs into account

Neighbours have a right to clean air – factory has three options:	Factory has a right to pollute – neighbours have three options:
(1) Pay compensation, € 5,000	(1) Endure the damage, € 5,000
(2) Pay for dryers, € 3,000	(2) Buy dryers, € 3,000
(3) Buy filter, € 1,000	(3) Pay for filter, € 1,000 + € 2,500 transaction costs = € 3,500

costs per neighbour were € 500, making a total of € 2,500. These are the costs incurred by the neighbours if they have to take part in negotiations and reach a joint decision.

If the neighbours have a right to clean air, the factory still has three options (see Table 4.2): to pay €5,000 in damages, to buy dryers for the neighbours for a total of € 3,000, or to fit a filter for € 1,000. It will opt for the filter which is the most efficient solution.

The matter takes on a different complexion if the factory has a right to pollute. In this case the neighbours have the following three options: they can endure the damage of €5,000 altogether or buy dryers for a total of €3,000. The third option consists of paying for a filter for the factory, but this option entails transaction costs because the neighbours can only reach such a decision collectively, and will have to engage in negotations in order to do so. Taking total transaction costs of €2,500 into account, the filter solution now costs €3,500 rather than €1,000. Deterred by the prohibitively high transaction costs, the neighbours will buy themselves dryers individually.

The example shows that in the presence of transaction costs, the original allocation of property rights can have a bearing on efficiency. In the case discussed, it would be advantageous if the residents could be assigned a right to clean air, since that is the only basis on which the most efficient solution (fitting a filter) will be chosen. If, on the other hand, the factory has a right to pollute, the neighbours will choose a suboptimal solution (buying dryers). While this is the best possible decision in the given circumstances, there is a different way of assigning property rights which would make an even more efficient solution possible.

In this context, Coase points out the interdependence of law and economics: the reality of positive transaction costs reveals the economic functions of law. The law should provide allocation rules which reduce the necessity for subsequent transactions. Coase stresses the economic policy function of the dispensation of justice.

> It would therefore seem desirable that courts should understand the economic consequences of their decisions and should, insofar as this is possible without creating too much uncertainty about the legal position itself, take the consequences into account when making their decisions.[56]

[56] Coase, 'Social Cost', p. 19.

Wherever possible, property rights should be directed right at the outset to the place where they will be put to the most efficient use. If the most efficient arrangement is unknown, however, then any barriers to achieving it should be eliminated by minimizing the costs of the transfer, the enforcement of the associated rights, and the costs of application of the law.[57]

So Coase advocates an economically reasoned system of law, which will have repercussions both for legislation and for application of the law. According to Veljanovski, the role of law from the viewpoint of economic analysis can be described in the following three ways:[58]

(1) Maximizing economic efficiency;
(2) Minimizing transaction costs;[59]
(3) When market transactions fail due to unduly high transaction costs, the law should simulate the outcome in a competitive market.[60]

Veljanovski believes only the first aim to be right, and is sceptical about the second and third. Lowering transaction costs would not guarantee efficient solutions, because the outcome of negotiations is often inefficient. Simulating the ideal market would be equally wrong, because having accepted the fact that in reality there are always transaction costs, the market outcome – ignoring transaction costs – can no longer set an authoritative standard.

> Once it is accepted that markets are costly then the competitive market outcome is no longer the relevant benchmark. The costs of using the market must also be taken into account, as must the cost of the legal system designed to replace the coordination function that would have been provided by a costless pricing system.[61]

The efficiency objective of law consists of lowering the coordination costs of economic activities, bearing in mind that operational costs attach to both the market and the legal system. The challenge is to determine the most efficient form of institutional regulation in any given instance.[62]

4.3.5 Practical Implementation by Means of Emissions Permits

Coase's bargaining solution has been put to prominent use in environmental policy – albeit in state-institutionalized form – with the creation of tradeable emissions permits.[63] Conceivable as it is to transfer certain environmental goods into private

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[57] Siemer, pp. 82 f.

[58] Veljanovski, 'Coase Theorems', p. 68.

[59] Cf. for example Polinsky, p. 13.

[60] After Posner, *EAL 5*, p. 16. See Sect. 8.4.1.

[61] Veljanovski, 'Coase Theorems', p. 69.

[62] Veljanovski, 'Coase Theorems', p. 69.

[63] Boie, pp. 156 f.

ownership or ownership-like rights, in practice the idea of direct negotiations on the internalization of external effects has proven to be of only limited feasibility.[64] This is because pollution of the environment tends to involve multiple parties who are not known to one another and who, on occasion, may figure as both polluter and victim simultaneously.[65] Therefore the lack of information and the high transaction costs are prohibitive factors.[66] If direct negotiations are held nevertheless, a further issue is the likelihood that coalitions will be formed, which get in the way of Pareto-efficient bargaining solutions.[67]

Tradeable emissions permits, first proposed in 1968 by the Canadian economist John Harkness Dales for the reduction of water pollution, offer a practicable alternative to direct negotiations among private parties, because they combine the theoretical idea of the Coase theorem with the exigencies of practice.[68] By specifying clear limits and allocations, the right to use the environment is made a tradeable commodity, thereby allowing prices for environmental resources to become established.[69] The price mechanism ensures that the reduction of emissions occurs where the marginal costs of avoidance are lowest. To prevent unduly high transaction costs from inhibiting the trade in these rights to use the environment, the state creates a suitable institutional basis: a market for emissions permits.[70]

The implementation of the permit solution works as follows: the state begins by determining the overall permitted quantity of emissions units, within the political process, and divides up this quota into a corresponding number of permits.[71] In predetermining the absolute permissible emissions level, the state is simultaneously setting an environmental standard. Therefore the permit solution can also be called a quantity solution with a standard-oriented approach.[72] Only holders of a permit may emit the amount of pollutants documented therein.[73] Because the number of permits is limited, they and the permitted rights can be viewed as a scarce resource. The pollution of the environment now has a price, which is established in a market by supply and demand.[74]

Once the permits have been allocated, emitters whose only means of avoiding emissions are cost-intensive restructuring or reinvestment will be interested

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[64] Wicke, pp. 242 ff.

[65] Frey, *Umweltökonomie*, pp. 111 f.

[66] Cf. Feess, p. 149.

[67] Frey, *Umweltökonomie*, pp. 111 f.

[68] Jacobs, p. 33.

[69] Diehr, p. 27.

[70] Diehr, p. 27. On the dangers of high transaction costs in a permit system, see Jacobs, pp. 90 ff.

[71] Wicke, p. 241.

[72] Jacobs, p. 33; Feess, p. 123. Environmental taxes, in contrast, are classified as price solutions.

[73] Endres, p. 110. In this context, note that controls of the volume of emissions must be carried out.

[74] Jacobs, p. 65.

in purchasing a sufficient quantity of permits to cover their emissions volume. Generally a company will only purchase permits up to the point where the marginal costs of pollution avoidance are higher than the marginal costs of a permit.[75] Those polluters who can reduce their emissions at low cost, e.g. by fitting filter systems, will prefer some such method of avoidance over the purchase of a permit. Accordingly, these companies will make emission-avoiding investments for as long as their marginal costs of emission avoidance are lower than the marginal costs of purchasing a permit. The stipulated emissions reductions are always made by the companies which face the lowest marginal costs of emissions avoidance.[76] Through the striving of economic actors to maximize their self interest, the environment as a resource, or the right to make use of it, is allocated to those for whom it has the highest value. Because the overall costs of environmental protection are consequently minimal in macroeconomic terms, the permit solution is cost-efficient.[77]

In addition to the cost-efficiency already mentioned, the permit solution has a dynamic incentive effect and a high degree of ecological precision. The dynamic incentive effect describes the potential of an instrument to induce progress in environmental technology.[78] Since emitters can sell permits they no longer need, the permit solution is capable of stimulating the polluters' interest in discovering new methods of environmentally sound production and developing and implementing them in practice.[79] Ecological precision means the capacity of an environmental policy instrument to achieve the stipulated emissions target level exactly.[80] The permit solution is especially precise because the amount of permitted emissions is fixed. So the arrival of new emitters has no effect on the total emissions load.[81] If, despite this, the total load is felt to be too high, the state can resort to its 'open market policy' to reduce the number of environmental licenses in circulation by buying them back, either for retention or cancellation.[82] Finally, from an economic perspective, permits also satisfy the requirement of competition-neutrality because companies causing equal amounts of environmental pollution are made to bear equal financial burdens.[83]

According to the Coase theorem hypothesis of invariance, for the efficient allocation of resources it makes little difference who is originally assigned the use rights in the environmental medium subject to the external effect. Therefore the form of the

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[75] Feess, p. 123.

[76] Endres, p. 126; Jacobs, p. 55.

[77] Jacobs, p. 55; Endres, p. 126. Whether the permit-trading solution, like Coase theorem direct bargaining, also results in Pareto efficiency depends essentially on Pareto-efficient definition of the total permissible emissions volume, i.e. the standard.

[78] Endres, p. 106.

[79] Jacobs, p. 61.

[80] Endres, p. 106.

[81] Jacobs, p. 68.

[82] Frey, *Umweltökonomie*, p. 122.

[83] Jacobs, p. 65.

initial allocation is of no consequence for the function of the system itself and for its environmental effectiveness. It does, however, make a very important difference to the competitive situation among the parties involved.[84] This being the case, the question of how use rights are allocated is nevertheless an important one in emissions trading. Under the emissions permits system, two alternative procedures are proposed for initial assignment: permits can be sold to the highest bidder ('auctioning'), or allocated based on each party's historical pollution ('grandfathering').[85] Whereas under the auction procedure the permit is allocated to the highest bidder in return for payment, under the grandfathering system the emitters receive their permits on the basis of their past needs – perhaps after deduction of a stipulated reduction target – at no cost.[86]

Under the *auctioning* approach, the parties obtain their allocation of permits by taking part in regular auctions.[87] All parties, new entrants included, are given the same opportunity to trade and each is free to determine how many permits to purchase (out of the total number to be issued). This arrangement largely circumvents the politically and legally thorny decision as to how many permits should be allocated to each party and by what criteria. So right from the outset, the permits go to where they deliver the greatest utility, which results in a relatively high level of economic efficiency.[88] Despite its great advantages, however, even this procedure has some fairly serious weaknesses. The prices arrived at by auction are often based on projected macroeconomic trends and forecast production load, but these are equally defining factors for price formation in the trading phase. This could bring a significant element of volatility into the permit market,[89] making longer-term planning a great deal more difficult for the parties involved. Furthermore, the parties may engage in collusion prior to the auctions, which has the potential to distort the market.[90]

Under the '*grandfathering*' system, on the other hand, environment users have a relatively high level of planning and legal certainty and do not incur additional costs.[91] These advantages are counterbalanced by some major disadvantages, however: companies which have made environmental investments even prior to the allocation are effectively penalized, because their reduced emissions volume entitles them to a smaller allocation of permits.[92] This type of distribution also raises difficulties for newcomer parties who enter the market during the trading period. In the

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[84] Diehr, p. 36. On the income and welfare effects of the type of allocation, see also Perman et al., pp. 224 ff.

[85] Feess, pp. 124 f.

[86] On the various initial allocation methods, see Diehr, pp. 36 f.

[87] Diehr, p. 38.

[88] Cansier, p. 99.

[89] Boie, p. 160.

[90] Diehr, p. 39.

[91] Cansier, p. 99.

[92] Boie, p. 160.

absence of a concrete history of environmental pollution, reference must be made to supplementary criteria.[93] All in all, this ought to make the auction solution superior to a grandfathering system. For reasons of political viability, however, the latter is the allocation procedure frequently used in practice.[94]

An applied practical example of the permit solution can be illustrated by the *Kyoto Protocol*, adopted on 11th December 1997 as a supplementary protocol to the United Nations Framework Convention on Climate Change, (UNFCCC) with the objective of climate protection. The state parties to the Protocol succeeded for the first time in agreeing a binding quantitative target for the reduction and limitation of six[95] greenhouse gases.[96] The industrialized nations made commitments that, during the period from 2008 to 2012, they would reduce emissions of these greenhouse gases by an aggregated 5.2% from 1990 levels.[97] Not every signatory country has the same emissions reduction obligations; in fact, country-specific emissions targets and interaction options were negotiated with due regard to each country's developmental status.[98] The Kyoto Protocol only stipulates the binding emissions target for the signatory state parties; how this target is to be achieved in reality is left largely to the parties themselves.[99]

After the Kyoto Protocol was adopted at the 3rd Conference of the Parties to the Framework Convention on Climate Change in Kyoto, Japan, its entry into force hung in the balance for a long time because two final hurdles first had to be overcome: the Protocol had to be ratified by at least 55 countries, and between them the participating states had to account for 55% of the CO_2 emissions of the countries that were party to the 1992 Framework Convention.[100] After the USA's withdrawal, it was finally Russia's accession which cleared the way for the Kyoto Protocol to take force on 16th February 2005.[101] The Protocol can be seen as a milestone in international climate policy because it is the first treaty to define climate protection targets with binding force in international law and to place them within a fixed time frame.

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[93] Diehr, p. 37.

[94] Mühlbauer, pp. 27 f.

[95] Carbon dioxide (CO_2, serves as a reference value), methane (CH_4), nitrous oxide (laughing gas, N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

[96] Endres, p. 260; Diehr, p. 61.

[97] Endres, p. 260; Diehr, p. 62.

[98] Mühlbauer, pp. 34 f. Thus Switzerland has an emission reduction target of −8%, Germany −21%, the United Kingdom −12.5%, Japan −7%, Russia 0% and Spain +15%. The initial allocation of emission rights was done via a modified 'grandfathering' procedure based on the 1990 emissions level, taking account of the country-specific reduction obligation.

[99] Diehr, p. 63. However, credit is not available for CO_2 reductions achieved by building nuclear power stations instead of, for example, coal-fired power stations.

[100] Endres, p. 261.

[101] Mühlbauer, p. 25.

The economic heart of the Kyoto Protocol is the endeavour to achieve emissions reductions as cost-efficiently as possible. To this end, the Protocol proposes three 'flexible mechanisms', the *Kyoto mechanisms*.[102] In addition to trading in emissions rights ('emissions trading'), these mechanisms are 'joint implementation' and 'clean development' (i.e. that development should be environmentally sustainable).[103]

Both the joint implementation and the clean development mechanisms serve to foster cooperation between state parties on the implementation of climate protection projects, and to enable the state parties to fulfil a share of their emission reduction obligations abroad.[104] Alongside the benefits of scaling up the transfer of environmental technology, however, the clean development mechanism also harbours the risk of what is known as '*ecocolonialism*'. To prevent industrialized countries from simply shifting the focus of environmental efforts onto developing countries whilst their domestic industries blithely continue to emit greenhouse gases, limits were imposed on the crediting of emissions reductions achieved by climate protection projects in developing countries towards industrialized countries' emissions targets.[105] The flexible mechanisms also allow several states to join forces as an emissions community in order to fulfil their obligations jointly (known as a 'bubble policy'). For example, as an emissions community the European Union has undertaken to achieve a −8% reduction in emissions; within this community, however, national reduction commitments may differ in size.[106] This makes it possible to take advantage of country-specific strengths in the reduction of particular gases.[107]

Whether tradeable permits actually lead to a reduction in emissions is questionable, at least for the time being. Indeed, probably for political reasons, some countries were not issued with any reduction targets at all. For example, by the year 2012, Russia and Ukraine only have to stabilize their emissions at the 1990 level. Yet following the political upheaval of 1990 and the collapse of their industrial sectors, these countries have actually experienced something like a 30% decline in emissions. They therefore have surplus emissions permits, which they are free to sell to other countries without any commensurate need to reduce their own emissions.[108] This is known as the '*hot air problem*' because effectively all they

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[102] Mühlbauer, pp. 35 f.; Endres, p. 261.

[103] Endres, p. 261; Diehr, pp. 64 f.

[104] For instance, this enables the Netherlands to credit emissions reductions from financing a wind farm in Lithuania ('joint implementation') or a solar electricity plant in Brazil ('clean development') towards its Kyoto commitments. In this way, at least, developing countries are included in the Kyoto measures. Cooperation does not take place directly at governmental level, however, but between the implementing companies at the level of the concrete projects. Mühlbauer, pp. 36 f.; Diehr, p. 66.

[105] Diehr, p. 68. If, for example, CO_2 can be more cheaply avoided in Poland than in Germany, whilst it is cheaper to avoid CH_4 in Germany than in Poland, then they both have an interest in making the greenhouse gas reductions in whichever is the cheaper location.

[106] Wiesmeth, p. 13.

[107] Endres, p. 263; Diehr, p. 65.

[108] Wiesmeth, p. 262.

are selling is hot air, and consequently emissions trading actually produces a net rise in emissions.[109] Without the Kyoto Protocol, however, emissions would have escalated with a vengeance and a great deal of valuable experience of international cooperation could never have been gathered.

In December 2007, the 13th Conference of Parties to the Framework Convention on Climate Change met in Bali for new negotiations on the future of global climate policy. The aim of the talks was to agree on a road map (the Bali Action Plan) for future negotiations on the post-2012 climate policy regime. It was felt to be too soon to define concrete targets at this conference, however. A proposed reduction target of 25 to 40% of emissions was deleted from the drafted texts at the insistence of Japan and the USA. Nevertheless, important countries – including India, China and, for the first time, the USA – indicated their willingness to engage in global climate policy.

4.4 Applications of Economic Analysis of Law

In the following section, some selected applications of economic analysis of law will be introduced. We will begin with a detailed presentation of a model concerning tort law, a popular field in which to apply economic analysis of law. That will be followed by two shorter examples, one concerning contract law and the other concerning the economic analysis of crime.

4.4.1 The Incentives of Liability Rules

4.4.1.1 Introduction

From the perspective of economic analysis of law, the primary function of legal rules on liability under tort law is not to ensure that compensation is awarded for any damage – the lawyer's immediate concern – but to exert an influence on the *future behaviour* of potential injurers and victims. Economic analysis is an *ex ante* analysis, whereas the legal perspective is an *ex post* analysis. When they assess an instance of damages, economists are not primarily interested in the incident that has already occurred,[110] but in those that might arise in the future. They are concerned with the *precedent effect* of the law.

Under the economic analysis of law, the goal of liability law is to minimize the social costs of accidents. In this connection, Guido Calabresi developed the argumentational device of the '*cheapest cost avoider*': the party which can avoid the damage at the lowest cost should bear the liability for the damage.[111]

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[109] See Endres, pp. 264 ff.

[110] These costs are 'sunk' and hence no longer relevant to the decision.

[111] Calabresi, *Accidents*, pp. 136 ff.

Torts, from an economic viewpoint, are a form of non-market-coordinated competition for the use of scarce resources, and can therefore be interpreted as externalities. Since, according to Coase, it always takes at least two parties to bring about external effects (each functioning as a causal agent), an efficient liability rule should demand that both parties to an incident of damage must determine their optimal course of action by taking the full (internal and external) costs into account.[112]

4.4.1.2 A Model for Minimizing the Social Costs of Accidents[113]

In the model that follows, the expected social costs C of an accident can be calculated from the costs of precautions taken to prevent it, and the expected damage from an accident. The precept of efficiency requires *minimization of the expected social costs of accidents*.

Let x be the extent of precautions, and let one unit of precautions cost an amount w of monetary units.[114] It follows that the level of precautions is computed from wx which is plotted as a straight line through the origin with a positive slope of w. As more precautions are taken, the probability p of an accident decreases, which is why $p(x)$ is a declining function. Let A be the accident damage quantified in monetary terms;[115] thus, the expected value of the accident damage is $p(x)A$. We will assume that A is constant so that $p(x)A$ is also a declining function. The sum of the costs of precautions and the expected value of damage gives us the function for the expected social costs:

$$C(x) = wx + p(x)A \tag{4.1}$$

In Fig. 4.1, the minimum point of this curve is at x^*, which represents the socially efficient level of precautions. Mathematically, the social costs of accidents are minimal when the first derivative of Equation (4.1) is equal to zero:[116]

$$C'(x) = w + p'(x)A = 0 \tag{4.2}$$

$$w = -p'(x^*)A \tag{4.3}$$

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[112] Koboldt, Leder and Schmidtchen, p. 364.

[113] Cooter and Ulen, pp. 271 f.

[114] For the sake of simplicity, the variable w is assumed to be constant. It would be unproblematic to extend the model – on the principle of decreasing abstraction – with the assumption that w varies as the level of precautions increases.

[115] This is economic concept of damage which comprises diminished utility on all levels (material and immaterial) expressed as a monetary value. Damage in this economic sense extends to types of damage not covered by our normative concept of damage as well as the kind of non-pecuniary loss for which just redress may be awarded.

[116] Furthermore the second derivative must be greater than zero, i.e. $C''(x) = p''(x)A > 0$.

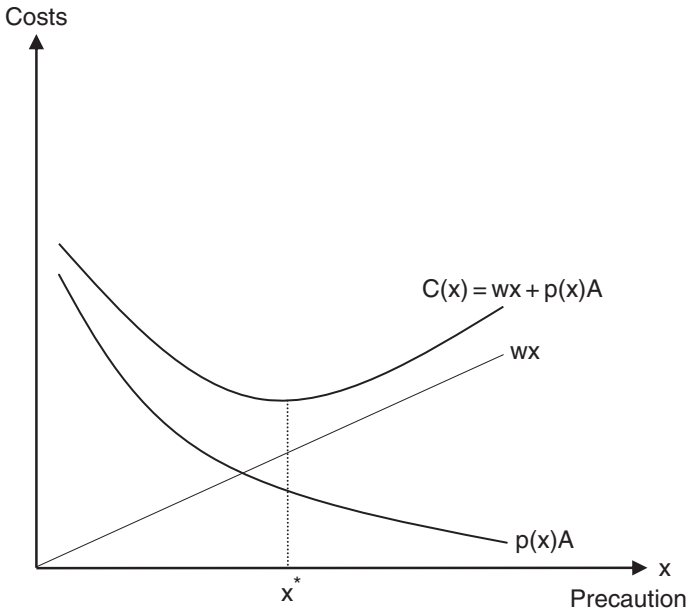

Fig. 4.1 Social costs of accidents (cf. Cooter and Ulen, p. 271)

At the optimum, the marginal cost w of an additional unit of precautions is equal to the saved marginal cost of the expected damage $-p'(x^*)A$.[117] If the level of precautions is chosen in accordance with this equation, the solution is socially efficient. *This means that precautions should be taken up to the point where the marginal damage likely to be prevented is at least as great as the marginal cost w of avoiding that amount of marginal damage. At the optimum, marginal damage and marginal cost are equally high.*[118]

4.4.1.3 Explanation with Illustrative Example

Let us suppose that a factory produces effluent with potentially carcinogenic effects on nearby residents. If the effluent were not treated, people's health would be harmed to the tune of €10 million. By fitting a one-stage water treatment facility costing €4 million,[119] damage to health could be reduced by €5 million.[120] By

[117] The superscript * stands for 'optimum'.

[118] Mathematically the marginal damages are infinitisemally small. In applied practice, however, one chooses a finite unit. Also see the following example.

[119] This corresponds to variable w in Equation (4.3) (on the left of the equation).

[120] In Equation (4.3) this is seen in the expression $-p'(x^*)A$ (on the right of the equation). It is clear that it is difficult to place a value on harm to health, not least because in large part it is intangible in nature.

fitting a second stage of purification, costing another €4 million, a further reduction of health impacts amounting to €3 million could be accomplished. Fitting the first stage of purification is socially efficient: €4 million in costs compare favourably with an expected €5-million reduction in damage, resulting in a net social gain of €1 million. Investing in a second stage of purification would be inefficient, however: the expected additional reduction in damage of €3 million would give rise to additional costs of €4 million, effectively wiping out €1 million of social value.[121]

4.4.1.4 Unilateral Precautions by the Victim[122]

The model presented did not specify who would take the specified precautions. Sometimes only the potential injurer can take precautions, e.g. when a surgeon operates on an unconscious patient. Sometimes, however, both the injurer and the victim can take precautions; e.g. when the manufacturer of a drug ensures its purity and the consumer sticks to the recommended dosage. The model put forward by Cooter and Ulen shows the relationship between the social costs and the precautions taken by the victim and the injurer.

The question now is what *incentives* the various liability rules exert on the behaviour of the parties involved. To answer this, we will analyse the following liability rules: 'no liability', where the victim has to bear the cost,[123] and 'strict liability', where the victim is compensated for the entire damage, regardless of fault. We will first analyse the case in which the victim alone takes precautions. The relevant costs amount to $w_v x_v$[124]

(a) No Liability

Under the 'no liability' rule the victim himself has to bear the full cost of the expected damage, the expected value of which is $p(x_v)A$. Together with the costs of precautions, the victim's costs are:

$$C_v(x_v) = w_v x_v + p(x_v)A \tag{4.4}$$

The victim has an interest in minimizing these costs. Equation (4.4) corresponds to Equation (4.1), so by analogy from the result of Equation (4.3):

$$w_v = -p'(x_v^*)A \tag{4.5}$$

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[121] One could object that both stages of treatment cost €8 million and would save an equal amount in medical costs. In fact, from the viewpoint of efficiency, this solution is on a par with the no-water-treatment option. In comparison to the solution with only one stage of treatment, however, it sacrifices €1 million of social assets. This is where marginal analysis proves its superiority to an analysis based on aggregate or average values. See also the conclusion of Sect. 2.4.

[122] Cooter and Ulen, pp. 272 f.

[123] Also known as 'victim liability'.

[124] The subscript v stands for 'victim'.

This result means that the victim is taking precautions efficiently. *If they cannot claim for damages, victims have an incentive to take a socially efficient level of precautions*.

(b) Strict Liability

We will now discuss the second case which provides for the victim to be compensated for the entire damage. As in case (a), the cost of the victim's precautions is $w_v x_v$, and the expected loss amounts to $p(x_v)A$. But if an accident occurs, the victim receives damages D. Let the damages cover the whole amount of the loss (D = A, therefore A − D = 0). The victim's costs then amount to:

$$C_v(x_v) = w_v x_v + p(x_v)(A - D) \tag{4.6}$$

$$C_v(x_v) = w_v x_v \tag{4.7}$$

The victim will minimize $w_v x_v$. Because x cannot be negative, the minimum point is where $x_v = 0$. The efficient solution, however, would be to behave in accordance with Equation (4.5). *Under strict liability with full compensation for damage, the victim has no incentive to take precautions, which is an inefficient outcome from society's point of view*.

4.4.1.5 Unilateral Precautions by the Injurer[125]

We will now consider how the incentives of the two liability rules influence the behaviour of the injurer. Firstly let us assume that the injurer takes the precautions; consequently he bears the burden of the corresponding costs $w_i x_i$.[126]

(a) No Liability

If the injurer is not liable to pay damages, all he is responsible for are the costs of precautions $w_i x_i$. These costs are minimal at $x_i = 0$. The most efficient option, though, would be to behave in accordance with Equation (4.5). *If the injurer has no liability, he has no incentive to take precautions. This is socially inefficient*.

(b) Strict Liability

Under this liability rule the injurer bears both the costs of precautions and the costs of any accident:

$$C_i(x_i) = w_i x_i + p(x_i)A \tag{4.8}$$

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[125] Cooter and Ulen, pp. 273 f.

[126] The subscript i stands for 'injurer'.

The injurer will minimize these costs. Since Equation (4.8) corresponds to Equation (4.1), again by analogy from the result of Equation (4.3) it follows that:

$$w_i = -p'(x_i^*)A \tag{4.9}$$

This result means that the injurer is taking precautions efficiently. *Since he has to compensate damage in full, this is an incentive for him to take the socially efficient level of precautions*.

4.4.1.6 Implications[127]

We recognize the symmetry of the results: the victim's incentives under one liability rule correspond to the injurer's incentives under the other liability rule. The implications of this are as follows: if only the victim is capable of taking precautions, the result will be socially efficient provided that this party has to bear the cost of the damage. If only the injurer is capable of taking precautions, on the other hand, then strict liability with full compensation for damage is the socially efficient liability rule.

4.4.1.7 Bilateral Precautions[128]

Now we will consider a case in which both the victim and the injurer can take precautions. On this basis, the social cost function is as follows:

$$C(x) = w_v x_v + w_i x_i + p(x_v, x_i)A \tag{4.10}$$

The social costs are minimized by determining $x_v{}^*$ and $x_i{}^*$. The results of the previous analysis are equally applicable to bilateral precautions. The 'strict liability' rule with full compensation for damage induces efficient behaviour in the injurer; the 'no liability' rule does the same for the victim. In both cases, however, the other party behaves inefficiently.

Thus a dilemma arises: neither one liability rule nor the other creates incentives for socially efficient behaviour in both parties, as the possibility of bilateral precautions would require.[129] The problem cannot simply be solved by sharing the loss fifty-fifty. Both sides would then have an incentive to take some precautions, but not to the requisite extent. The outcome would thus be suboptimal.[130]

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[127] Cooter and Ulen, pp. 274 f.

[128] Cooter and Ulen, pp. 275 f.

[129] As in Equations (4.5) and (4.9).

[130] A possible solution is to make the injurer liable for the loss in full, while the victim bears the full burden of costs from the loss. Under such a *decoupling* of loss and compensation, the injurer might have to hand over compensation to the state, for instance.

(a) Liability for Negligence[131]

Since the liability rules discussed above did not yield a satisfactory outcome where there was a possibility of bilateral precautions, we will now examine whether liability for negligence results in a more efficient outcome. This liability rule defines a legal minimum standard of care x° with which a potential injurer must comply in order to avoid liability for damages. We set the legally required level of care at the socially efficient level ($x^\circ = x^*$). Now we consider the injurer's cost function. In the area of non-compliance ($x < x^\circ$) the injurer is liable. He bears the cost of precautions $w_i x_i$ plus the expected damage $p(x_i)A$. His cost function in the area of non-compliance is $w_i x_i + p(x_i)A$.

In the area of compliance ($x \geq x^\circ$) the injurer is not liable and must only pay the costs of his own precautions $w_i x_i$. In this area, therefore, the cost function is the line *wx* in Fig. 4.2. Note the jump discontinuity in the injurer's cost function at x°, which is also where the cost minimum is located. If there is a legally defined minimum standard of due care, and the injurer has to pay compensation for the full amount of damage, then he has an incentive to comply with that standard. If the legal standard of care is equivalent to the efficient level of precautions, then the behaviour of the potential injurer is socially efficient.

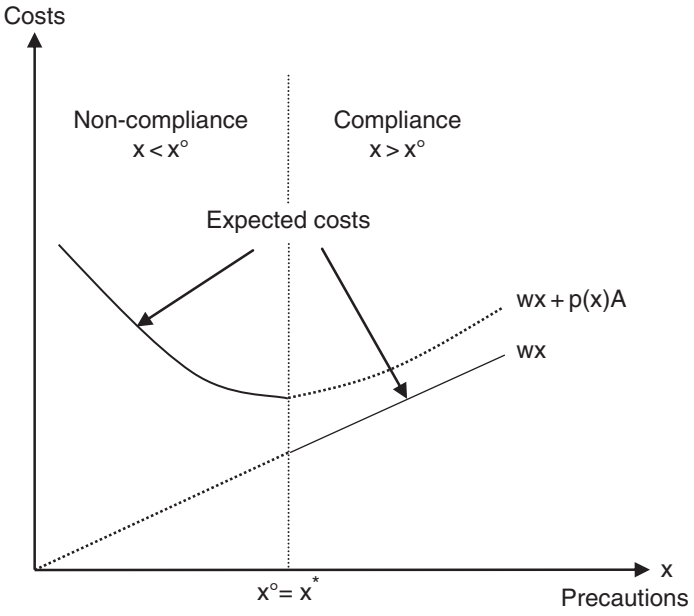

Fig. 4.2 Expected costs with a defined standard of care (cf. Cooter and Ulen, p. 276)

[131] Cooter and Ulen, pp. 276 f.

The critical question now is how the potential victim behaves in this case. If the injurer can avoid liability for damages by complying with a certain standard of care, the victim will behave as under the 'no liability' rule. As we know, in that case he also has an incentive to take the efficient level of precautions. Liability for negligence thus leads to efficient behaviour, both in the injurer and the victim, as long as the legal standard of care corresponds to the efficient level.[132]

(b) The 'Hand Rule' for Determining the Scale of Negligence

In our model of liability for negligence, we assumed that the legally defined standard of care corresponds to the efficient level. It is self-evident that an efficient outcome cannot be achieved in any other way.

In 1947 – long before the advent of the Law and Economics movement – an American federal judge named Learned Hand came up with an economic formula for determining the efficient level of care. This has passed into the literature as the *Learned Hand formula* or the *Hand rule*. The case on which he was ruling concerned whether the owner of a barge could be made liable for leaving it unattended for several hours. During this time the barge had broken free from its mooring and gone on to collide with another vessel. Judge Hand explained in his judgment:

> [T]here is no general rule to determine when the absence of a bargee or other attendant will make the owner of the barge liable for injuries to other vessels if she breaks away from her moorings. [. . .] It becomes apparent why there can be no such general rule, when we consider the grounds for such a liability. Since there are occasions when every vessel will break from her moorings, and since, if she does, she becomes a menace to those about her, the owner's duty, as in other similar situations, to provide against resulting injuries is a function of three variables: (1) The probability that she will break away; (2) the gravity of the resulting injury, if she does; (3) the burden of adequate precautions.[133]

In the opinion he went on to deliver, Judge Hand expressed these arguments in a mathematical formula. If B represents the costs of the injurer's precautions, P is the probability of damage and L is the likely magnitude of damage, then there is a tortious liability for negligence wherever:[134]

$$B < P^*L \tag{4.11}$$

The optimum level of precautions on the part of the potential injurer would thus be:

$$B = P^*L \tag{4.12}$$

That is, the cost of avoidance corresponds to the expected value of the injury costs. Under the Hand rule, liability for negligence begins at precisely the point

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[132] In game theory, this is known as a *Nash equilibrium*: neither party can improve its position as long the other does not change its strategy.

[133] United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947).

[134] Chaudhuri, pp. 79 f.

where the expected value of damage exceeds the cost of avoidance.[135] It is obvious that this economic concept of negligence sends a clear deterrent signal to potential injurers. Anyone can work out for themselves roughly whether a certain potentially dangerous activity is deemed negligent in law and will result in a tortious liability. This presumes, however, that the potential injurer is fully informed of the risk and the likely magnitude of the loss.[136]

The Hand rule in its original form is not a true marginal analysis. Nevertheless the rule is a remarkable attempt to integrate economic considerations into judicial decisions. Moreover the Hand rule can easily be translated into marginal form (the 'marginal Hand rule'). To do so, we will use the terms from our model:[137]

Hand's term	Our term	
B burden	w_i	marginal cost of precautions
L liability	A	(accident) damage
P probability	$p'(x_i)$	marginal probability

We can now substitute our terms into Equations (4.11) and (4.12) and obtain the following formulae:[138]

$$w_i < -p'(x_i)A \tag{4.13}$$

$$w_i = -p'(x_i^*)A \tag{4.14}$$

It will be instantly apparent that Equation (4.14) corresponds to our earlier Equations (4.3) and (4.9). Judge Hand may not have expressed his rule in the marginal form, but the gist of it certainly anticipates the outcome of our analysis.[139]

American courts use the Hand rule frequently to settle questions of negligence. The advantage of case-by-case application of the rule is that the standard of care can be established individually in each legal dispute, although this poses a substantial information burden for the courts. But a standard of care can also be stipulated in law. A further possibility is that courts can look to customs or best practices in the relevant field for guidance.[140]

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135 Chaudhuri, p. 5.

136 Chaudhuri, p. 81.

137 Cooter and Ulen, p. 282.

138 $p'(x)$ *is* negative, because *p(x)* is a function with a negative slope. The minus sign gives the term a positive value again.

139 If the only concern is to assess *whether* certain behaviour – in this case, watching the barge – would have been necessary, the Hand rule in its original form will suffice.

140 Cooter and Ulen, pp. 282 f.

4.4.1.8 Critique

The example of tortious liability shows the explosive force of economic analysis of law: the traditional paradigm in tort law rests on the principle of *compensation for loss*. In contrast, economic analysis is based on the *efficiency paradigm*. Under this analysis, the question is *which liability rule is socially efficient*, i.e. which rule sets the right *incentives* for both the injurer and the victim to arrive at a socially optimal level of losses in terms of the relationship between the expected cost of such losses, on the one hand, and the cost of avoidance, on the other.

H. L. A. Hart objects to this view because traditionally the question asked was not which liability rules set the right incentives, but who has the right to damages – which is a question of justice:

> This theory of incentives runs strongly counter not only to Professor Dworkin's theory that the judge must not concern himself with considerations of general utility but also with the conventional idea that liability in negligence is at least sometimes imposed as a matter of justice between the parties, on the footing that the victim of another's negligence has a moral *right* to have his loss made good by the negligent party, so far as monetary compensation can do this.[141]

Coleman levels the criticism (known as the *bilateralism critique*) that economic analysis of law is incapable of explaining the normative relationship between the injured party and the injurer: economic analysis applies ex ante analysis to hypothetical damages cases from the viewpoint of cost and risk minimization, whereas in reality a court has to rule ex post on real damages cases involving two very concrete parties who stand in a normative relationship with one another based on the case at issue:[142]

> The problem that confronts economic analysis, or any entirely forward-looking theory of tort law, is that it seems to ignore the point that litigants are brought together in a case because one alleges that the other has harmed her in a way she had no right to do. Litigants do not come to court in order to provide the judge with an opportunity to pursue or refine his vision of optimal risk reduction policy.[143]

For Coleman it is the concept of *corrective justice* that best explains the relationship between the injurer and the injured party.[144] But instead of taking its orientation from corrective justice, which is predicated on the bilateral nature of the legal relationship, economic analysis of law pursues a social goal, that of promoting efficiency.[145] In this light, according to Coleman, properties of tort law which

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[141] Hart, 'American Jurisprudence', pp. 143 f.

[142] Coleman, *Practice*, pp. 16 ff.

[143] Coleman, *Practice*, p. 17.

[144] Similar arguments are found in Ernest J. Weinrib: *The Idea of Private Law*; Benjamin Zipursky: 'Rights, Wrongs, and Recourse in the Law of Torts'; and Martin Stone: 'On the Idea of Private Law'. On the same theme, also see Jules Coleman: 'Tort Law and the Demands of Corrective Justice'; and Stephen R. Perry: 'Comment on Coleman: Corrective Justice'.

[145] Bound up with this, according to Coleman, is the unassailable belief in the state as the engine of social change. Coleman, *Practice*, p. 344.

are obvious and intuitively transparent – like bilateralism and corrective justice – suddenly appear inexplicable and obscure.[146]

Indeed it is difficult to conceive of liability law as oriented exclusively towards the efficiency goal, ignoring the bilateral nature of the relationship between injurer and victim. Even in future, bringing about corrective justice will continue to be the primary objective of liability law. This does not preclude attempting, as a secondary objective, to bear social costs in mind and take them into account when defining liability rules, beginning perhaps with the kind of liability rule to choose: both strict liability and negligence are based on the idea of corrective justice; as we have seen in the example, however, negligence may be fundamentally superior to strict liability in terms of efficiency. The goal of any economic analysis of law must be to shed light on the effects of different regulations without demolishing the fundamental structures of liability law – like the bilateral nature of the relationship between injurer and victim – in the process.

The question as to how the relationship between efficiency and justice can be determined is one we shall return to later.[147]

4.4.2 Efficient Breach of Contract[148]

4.4.2.1 Introduction

Another area of law that can be analysed on the basis of the *Coasean framework* is contract law. Unlike the previous examples, all of which dealt with instances of damage, parties to a contract negotiate their terms so as to avoid a dispute if at all possible. Given that the parties are in a position to make provisions on any potential bones of contention in advance, one may well ask why legal rules on breach of contract are needed at all. The reason is that negotiations require a great deal of effort, and as a consequence, provisions often do not extend to every conceivable eventuality. It is therefore incumbent upon contract law, according to A. Mitchell Polinsky, to fill the gaps in contracts:[149]

> Contract law can be viewed as filling in these "gaps" in the contract – attempting to reproduce what parties would have agreed to if they could have costlessly planned for the event initially.[150]

In doing so, the rules applied should guarantee an economically efficient outcome. This means that the contracting parties' common gains from trade should

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146 Coleman, *Practice*, p. 21.

147 See Chapter 9.

148 Polinsky, pp. 27 ff. The example has been modified.

149 From the legal viewpoint, this applies to judicial revision of contracts and dispositive legal norms, but does not hold for mandatory norms which are often motivated by sociopolitical considerations.

150 Polinsky, p. 27.

be maximized.[151] In the example below, two different legal claims for breach of contract will be assessed under this aspect: firstly, compensation for the reliance loss (reliance damages), and secondly, compensation for the expected loss (expectation damages).

4.4.2.2 Breach of Contract in a Case of Double Sale[152]

Let us assume that an artist M could produce a picture for €1, 200.[153] Buyer A wants to buy the picture which he values at €2, 000.[154] A and M agree on a purchase price of €1, 600, which A pays in advance.[155] In reliance on the delivery of the picture, A spends €100 on fittings to display the picture in his apartment.[156] Buyer B is also interested in the picture and makes an offer of €2, 500 (scenario 1) or €1, 800 (scenario 2), each sum representing the picture's exact value to him.

(a) Compensation for the Reliance Loss (Reliance Damages)

If M now proceeds to breach the contract with A, the latter must be compensated so as to return him to the position as if the contract had never been made (negative contractual interest). In the present case, the reliance loss amounts to the €100 of expenditure already incurred by A in preparation for the delivery. Since A can, of course, also demand a refund of the €1, 600 purchase price, M must pay A €1, 700 in total.

Since €1, 700 is the amount that M must pay to buyer A if he breaches the contract, then an offer of €2, 500 from B will induce him to breach it. But that is not all: M will even breach the contract if B offers him only €1, 800. So under the alternative scenarios, M stands to make an additional profit of either €800 or €100. In the first case, the result is efficient: B values the picture at €2, 500, while A values it at only €2, 000. In the second case, however, the breach of contract is inefficient: the picture does not end up with the buyer who values it most highly, because although it is worth €2, 000 to buyer A, it is finally purchased by buyer B who values it at only €1, 800.

It follows that a legal rule which only obliges the seller in breach of contract to pay reliance damages is not capable of guaranteeing an efficient outcome.

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[151] This implies *Pareto efficiency*, since nobody would consent to a voluntary exchange which left them worse off. Another way of expressing this is in Posner's terms: 'wealth' should be maximized. See Sect. 8.4.

[152] Polinsky, pp. 28 ff.

[153] It is a unique item, i.e. not substitutable.

[154] This corresponds to his maximum willingness to pay.

[155] This assumption is not essential but makes the numerical examples more easily understandable.

[156] In the event of non-performance by the seller, this investment is useless.

(b) Compensation for the Expected Loss (Expectation Damages)

In awarding compensation for the expected loss, A must be put in the same position as if the contract had been performed (positive contractual interest). In this case, A would have profited as follows:[157] the €2, 000 value that he places on the picture, minus the purchase price of €1, 600 and additional expenditure of €100, gives a net amount of €300. On the principle of positive contractual interest, A has a claim for this lost profit and for his expenses (€400 in total). A can also claim a refund of the €1, 600 purchase price, so M must pay A €2, 000 in total, which coincides exactly with A's valuation of the picture.

Since €2, 000 is the amount that M has to pay to buyer A if he breaches the contract, an offer of €2, 500 from B will induce him to breach it, because this will earn him an additional profit of €500. On the other hand, if B offers him only €1, 800, M will not breach the contract. This outcome is efficient: the product ends up with the buyer who values it most.

A legal rule which obliges the seller in breach of contract to pay expectation damages sets the right incentives with regard to efficiency.[158]

4.4.2.3 Critique

Contract law is founded on the principle that contracts must be honoured ('*pacta sunt servanda*'). It thus appears rather odd to define contract law in such a way as to create incentives for breach of contract on the grounds of efficiency. Here, again, the efficiency paradigm appears to collide with a fundamental principle of law as we know it.

The bilateralism critique against the economic analysis of liability law can equally be levelled against the economic analysis of contract law. If efficiency is elevated to the target criterion in law, it is argued, there would be no explanation for the 'privity rule' that a contract only confers rights and obligations upon the contracting parties:

> [E]ven if courts were capable of engaging in this kind of reasoning, doing so would ignore the fundamental bilateral interactional framework of contractual interactions because courts have to introduce considerations that are *not* related to the parties to the contract.[159]

Indeed, it is hard to conceive of the social goal of efficiency alone, entirely removed from the reciprocal relationship between the concrete parties to the contract,

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[157] The concept of lost profit (*lucrum cessans*) used here depends upon how highly someone personally values a particular good. It is assessed in terms of the individual's willingness to pay rather than the market price. See also Sect. 8.4.1.1.

[158] This holds true, at least on the assumption that the contracting parties are risk-neutral (i.e. for example a €10, 000 profit at a 50% risk is valued the same as a €20, 000 profit at a 25% risk, or a sure profit of €5, 000, because the expected value of the profit in all cases is €5, 000). It further presupposes that other factors not considered in the model have no influence. Polinsky, pp. 28 f., pp. 33 ff. and pp. 59 ff.

[159] Hevia, p. 113.

as the definitive criterion in contract law. Even so, as we have seen in our example, there is nevertheless scope for taking efficiency aspects into consideration – e.g. in determining whether expectation damages or just reliance damages should be awarded –, without necessarily compromising the bilateral structure of the contractual relationship.

4.4.3 Optimal Punishment

4.4.3.1 Introduction

The idea of bringing economics to bear upon the field of criminal law is nothing new. As long ago as the 18th century, Cesare Beccaria and Jeremy Bentham developed criteria for minimizing the social costs of crime and prosecution. In his essay 'Crime and Punishment', Gary S. Becker instigated a revival of economic ideas in criminal jurisprudence.[160]

4.4.3.2 The Rational Delinquent

As the economic model of behaviour would have it, a person commits a crime if the expected utility derived from it exceeds the expected costs. The utility of the crime may be tangible (e.g. the proceeds of a robbery) or indeed intangible (as with sexual offences). The costs arise from expenditure of various kinds (e.g. on weapons, burglary tools, etc.), the opportunity costs of time dedicated to criminal activity, and the probable costs of punishment, which are the main focus of analysis here. Essentially a punishment is all the more of a deterrent if the probability of being arrested for the crime is relatively high and the sentence likely to be imposed is relatively lengthy. But it is also possible to reduce crime by increasing the opportunity costs of the time dedicated to it. This depends heavily on the opportunities open to a potential criminal to earn an honest living. Even state programmes to combat poverty may reduce the incentive to commit criminal offences. *Overall, measures should be defined so as to ensure that criminal actions carry no rewards*.[161]

4.4.3.3 The Optimal Crime Rate

The social costs of crime stem from the harm it inflicts, on the one hand, and the costs of controlling crime, on the other. In Fig. 4.3, x_0 represents a hypothetical crime-free state where the costs of controlling crime are commensurately high, whereas $x_{\max.}$ would be a hypothetical state without any crime control measures at all, and with a correspondingly high crime rate. *The optimal crime rate* x^* *or, equally, the optimal level of crime control is reached when the total social costs of crime are minimal*.[162]

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[160] Kunz, p. 181.

[161] Posner, *EAL 5*, pp. 242 f.

[162] Cooter and Ulen, p. 396.

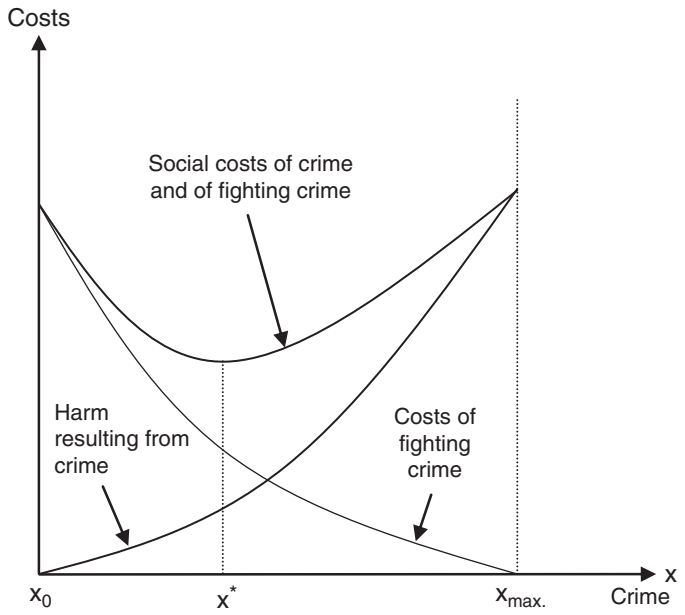

Fig. 4.3 Social costs of crime

4.4.3.4 Critique

The analysis of crime once again exposes the limitations of the economic model of human behaviour. Offenders often fail to act rationally; in fact, many crimes are committed in the heat of the moment. Aside from that, crime is a very complex phenomenon. Among other factors, the offender's *mental attitude* has a strong influence, and attitudes are partly attributable to socialization and learning processes. The economic approach concentrates on explaining behaviour as a reaction to external incentives – which is indeed its strength – whilst the mental attitudes ('preferences') of the offender are taken as given.

Because this is its strength, economic theory is capable of explaining *changes in behaviour* relatively well (for instance: why does a criminal commit more crimes in some circumstances than others?). The pivotal question of *why* someone becomes a criminal at all, though, cannot be explained adequately by this theory. So while the economic theory of crime can supply some extremely useful insights, it proves to have very limited explanatory power.

Moreover, the legitimacy of the law is integral to the effectiveness of the legal state and the legal system. The population accepts the status quo primarily on the strength of its legitimacy, rather than out of any fear of sanctions. A system of law would collapse if it could not rely on general acceptance by the public at large.[163] Constant, petty surveillance of all citizens by officials, who would themselves

[163] Cf. Ott, pp. 149 f.

require monitoring, is simply not feasible. *If a legal state is to function, it must be able to establish and maintain legitimacy and therefore justice. However, an efficient system of law is not automatically a just system of law*.

4.5 Summary

What the applications discussed have in common is that the social optimum – for the number of accidents, breaches of contract or crimes – is not zero, from the point of view of efficiency, but occurs at the point where the corresponding social costs are minimal. This statement may seem disconcerting at first, but bear in mind that even accident prevention or crime control cannot be achieved without incurring costs. Moreover, it should be reasonably straightforward – and perhaps even desirable – to analyse legal rules in terms of their incentive functions vis à vis human behaviour and social efficiency. In other words, there is no fundamental objection to a *positive analysis* of legal rules using the normative yardstick of efficiency. This positive style of analysis, however, must be clearly separated from the *normative demand* for the legal system to be defined in conformity with the efficiency principle. For this demand requires justification which economic theory itself is unable to provide. In his theory of wealth maximization, Richard A. Posner attempted to set out a justification of the efficiency objective. Before we examine this approach thoroughly, however, we first need to place it in a broader context, which is why in Part 2 we will turn our attention to the 'Philosophical Foundations'.