Is Copyright Protection Necessary to Promote Innovation? – An Evolutionary Economics Approach

1 Introduction

In general, intellectual property (IP) protects the individual product of mind which otherwise might be adopted by the whole community without any reward for the creator. Thus, following a quite common argumentation, creators and inventors would not be active without the legal protection of their intellectual fruits. Consequently, intellectual property rights (IPRs) are broadly accepted and in recent decades there has been an undeniable trend to further broaden them.[1]

At the same time, more conflicts of IPRs with e.g. competition law occur as firms try to abuse their dominant position stemming from their IPRs in order to achieve a competitive advantage. A quite popular case is the Microsoft case.[2] In this case Microsoft justified its abusive behaviour with its IPRs and alleged that they are crucial as incentives to innovation. According to this argumentation, without the protection of its IP, Microsoft would not be able to recover the costs of development and to profit from its innovations.[3] Thus, in absence of IPRs, Microsoft would not invest in innovation anymore.

The paper will basically concentrate on the question how copyrights and IPRs in general influence or enhance appropriation of inventions or if as well other arguments can be found.[4] The paper will first survey the neoclassical theory regarding IP rights, especially copyrights. Thereby, some attention will be spend on the question how broad the degree of protection should be and how IP rights and innovation influence each other. In the next section I will turn to a more evolutionary economics approach, analysing how the appropriability problem is seen and treated from an innovation economics perspective. Finally, the last section tries to combine the results from the neoclassical theory of copyrights and the insights from innovation economics. It will be shown, that the traditional approach to copyrights is based on too narrow assumptions. Accordingly to innovation economics other instruments to profit from innovations can be found.

2 Traditional Approaches to Copyright

In this chapter, I will start with a short overview on the rationale for copyrights in a static model. Afterwards, Section 2.2 will analyse the determination of the appropriate scope of protection. Thereby, it will be discussed whether copyrights influence innovation or if in the traditional approach to IPRs also other appropriability mechanism can be considered.

2.1 Intellectual Property as Public Good

The idea of intellectual property protection is strongly connected with the public good characteristics of intellectual property.[5] Once the idea is created, it is difficult to keep others

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1 See Frischman 2005, p. 1.

2 See European Commission decision in case COMP/C-3/37.792 Microsoft, C(2004) 900 final. A resume of the decision can be found in Banasevic et al. 2004.

3 The Microsoft case will not be discussed in the following. For a detailed discussion see exemplarily Economides 2001; Evans/ Nichols/ Schmalensee 2005; Fisher/ Rubinfeld 2000; Gilbert/ Katz 2001; Klein 2001; Lévêque 2005; Vezzoso 2006; Whinston 2001.

4 The main focus of this paper lies on copyrights. As far as my remarks concern other IPRs this will be explicitly mentioned.

5 Besides this economic rationale for IP protection there are also alternative approaches which may be considered. One of the most famous is the approach of John Locke, who makes the assumption that everybody has a natural right of property

from using it ("non-excludability"). Further, the usage of an idea is non-rival, or in other words, the marginal costs of producing another unit of this good are zero.[6] It was Pigou (1924) who first considered the structure of the public good problem and the related externalities. He stated that due to the insufficient appropriability fewer innovations would be made than desirable from a total welfare standard. Therefore, he developed the theory of externalities, „instances in which marginal private net product falls short of marginal social net product because incidental services are performed to third parties from whom it is technically difficult to exact payment".[7] Thus, he generated the concept of subsidies and taxes to create incentives for innovation.

Arrow (1952) further analysed the problems occurring due to the public good characteristics of IP. He stressed that IP is characterized through inappropriability, indivisibility and uncertainty. Without any legal protection these attributes would lead to an underproduction of ideas: "In the absence of special legal protection, the owner cannot, however simply sell information on the open market. Any purchaser can destroy the monopoly, since he can reproduce the information at little or no costs. Thus the only effective monopoly would be the use of the information by the original possessor."[8] Arrow pointed out that this monopoly is not only socially inefficient but may not be desirable for the original producer himself as he may not necessarily be able to exploit the ideas as effectively as others.[9] Moreover, even if a legal monopoly on intellectual property may foster appropriability, "[T]he very use of the information in any productive way is bound to reveal it at least in parts. Mobility of personnel among firms provides a way of spreading information."[10]

In his article *The Problem of Social Cost* Coase devised the thesis that a market for externalities would evolve through the creation of property rights leading to an optimal allocation. However, the basic assumption for this is a world without transaction costs.[11] Thus, according to Coase, the problem is not the development of ideas but the allocation. This means implicitly, that a broad range of e.g. different technological solutions already exists and that IP protection now creates the right incentives to choose the best solutions out of this pool.[12] Without any property rules for IP, an undersupply of the latter would result, as without copyrights society or consumers would not be able to signal the collective value of the works to the authors. Furthermore, "the copyright law also specifies the existence of property rights in goods that do not yet exist and that will not be called into existence without the knowing

in his body. Like people own their body they also own the labour of their body as well as the fruits of their minds. Hence, if someone develops an idea or makes an invention he has the natural right on it, which should be protected with copyrights or patents. Nevertheless, nowadays IP protection is more or less based on economic considerations. For a detailed discussion of the natural law approach and its today's applicability compare Yen 1990.

6 See e.g. Gordon/ Bone 2000, p. 192 et seq.

7 Pigou 1924, p. 151.

8 Arrow 1959, p. 9.

9 See Arrow 1959, p. 9.

10 Arrow 1959, p. 9 et seq. From a welfare economic point of view this implies that, on the one hand, there is an underproduction of ideas as the price is below the average costs and, on the other hand, the ideas are not optimal used because the price is above marginal costs.

11 This is known as the Coase Theorem. Obviously, the condition of no transaction costs is not fulfilled in our world. Thus, with this assumption Coase alluded to a market failure as due to transaction costs an optimal allocation will never be realized. See Frischman 2005, p. 8. Thus, considering transaction costs, there is a strong argument for copyrights. Giving the author the entitlement of the IP instead of giving it to the public reduces the transaction costs essentially. "It is much easier for copiers to identify the author whose entitlement they must purchase, than it is for the author to identify multiple copiers all of whose entitlement he must purchase," Gordon/ Bone 2000, p. 193.

12 See Dosi/ Marengo/ Pasquali 2006, p. 4 et seq.

participation of an artist or author."[13] Simply spoken, if an author does not have the rights on his work, he will not produce it.[14]

Demsetz agreed with the Coase Theorem, stating that property rights are necessary to internalize positive or negative externalities. From his point of view, it is obvious that there is a close relationship between property and externalities. Externalities occur when the cost of including the harmful or beneficial effects into private decision are too high. Therefore, it is the primary objective of property rights to give incentives to internalize these externalities or, at least to improve the internalization of externalities.[15] Demsetz argued that ownership of transferable property rights allows internalization.[16] According to him "the emergence of new property rights takes place in response to the desires of the interacting persons for adjustment to new benefit-cost possibilities."[17] Thus, the property rights will develop as long as the benefits of internalization are higher than the cost of internalization. Furthermore he argued that private property is preferable to common ownership as the negotiation costs are less. "Indeed, an increase in the number of owners is an increase in the communality of property and leads, generally, to an increase in the cost of internalizing."[18]

Following this argumentation, IP protection is necessary due to the public good characteristics of IP and the resulting problems of externalities and inappropriability. Without protection creators would not be able to recover their costs of creation, as imitators can produce the relevant good cheaper. Thus, creators do not have any incentive to produce. This leads to an underproduction of intellectual goods.

2.2 Optimal Scope of Protection and Its Influence on Innovation

The definition of the appropriate scope of copyright protection is a question of balancing incentives to innovate against access to information: the broader the copyright protection, the higher the incentives to innovate. At the same time a broader scope of copyright protection limits the access to these works. Lunney (1996) described the problem as follows: "The more desirable a work is, the greater is the need to ensure the creation of the work and the greater the need to secure its widespread dissemination."[19] The creation of a new work normally involves "borrowing or building on material from a prior body of works, as well as adding original expression to it."[20] Consequently, high protection of copyright work influences as well the costs of innovation because a future creator will suffer higher costs due to licensing fees for the needed work or due to searching for non-protected knowledge. Thus, as she does not have the possibility to free ride on earlier inventions or has to pay high license fees, her incentive to innovate will probably decrease.[21] Obviously, incentive and access will always oppose each other. Thus, it is one of the tasks of copyright law to find the right balance between both.

In their seminal article *An Economic Analysis of Copyright Law* Landes and Posner especially focused on the balance of incentive and access. Hence, they postulated for copyright law to "maximize the benefits from creating additional works minus both the losses from limiting

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13 O'Hare 1985, p. 410.
14 To illustrate this correlation, O'Hare cited the Coasian example of the farmer and the cow raiser. If the cowboy has the right to damage as well the future harvest of the farmer, the farmer simply will not grow his corn; see O'Hare 1985, p. 410.
15 See Demsetz 1967, p. 348.
16 See Demsetz 1967, p. 349.
17 Demsetz 1967, p. 350.
18 Demsetz 1967, p. 357.
19 Lunney 1996, p. 486.
20 Landes/ Posner, 1989, p. 332.
21 See Besen 1989, p. 350.

access and the costs of administering copyright protection."[22] The authors divided the cost of producing a copyright protected work into two components: firstly, the cost of creating the work which they call "cost of expression" and secondly, the cost connected with the duplication or reproduction of the work. Thus, the work will only be created, when the difference between the expected revenue and the cost of the duplication of the work exceeds the cost of creation.[23] Altogether, Landes and Posner drew the following implications of their analysis: At the optimal level of copyright protection, the amount of producer and consumer surplus per work must exceed the cost of creating the marginal work and at the same time the level of protection should be below the level that maximizes the number of works created. Otherwise the additional welfare due to more creation would be overweighed through the higher cost of expression and the greater administrative and enforcement cost. Furthermore, if, over time, growth in income and technological advances enlarge the size of the market for any given work, and the cost of copying declines, copyright protection should expand.[24]

However, Plant (1934) was one of the first challenging the need of IP and especially copyright protection. In his work on copyrights he illustrated, that even in the absence of copyrights authors would still have an incentive to write and also get a reward for their effort. With the example of British authors in the 19th century who earned more in America without copyrights than in Great Britain he showed, that several other instruments exist to ensure a sufficient income apart from copyrights. First of all, he considered the so-called first-mover advantage for the publisher who first was bringing a new novel to the market. Second, it was a common habitude to publish a large edition to low prices so that there were no incentives for rival publishers to copy this book.[25] In England, copyright and high prices for books were justified with the explanation that they were essential to cover the cost of the unsuccessful books. As Plant remarked, "[T]he higher the profits from the copyright monopoly, the greater the willingness to publish the doubtful successes."[26] In this context he pointed out, that from an economic perspective the alternative output is to consider "which the resources would have yielded in the other employment."[27] Thus, according to Plant it is not desirable to promote the writing of books to "non-discriminatory" terms.[28]

Hurt and Schuchman (1966) and Breyer (1970) also had a sceptical view regarding copyrights. For instance, Hurt and Schuchman argued that clearly some works exist which have high cost of creation, e.g. encyclopaedias, or literary work which is made in expectation of any reward. "However, it does not necessarily follow that the grant of a copyright monopoly is the only such device possible, nor that it is the most desirable device."[29] They rather suggested supporting such works during the period of their creation, e.g. through government or private patronage by tax-exempt foundations.[30] Nevertheless, they came to the conclusion that in some cases copyright might be welfare enhancing, e.g. "ventures which require discriminatory pricing to cover costs"[31] but in cases where no copyright protection is necessary to cover the costs, it is welfare decreasing. Thus, according to them no clear

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22 Landes/ Posner 1989, p. 326.
23 See Landes/ Posner 1989, p. 327.
24 See Landes/ Posner 1989, p. 343 et seq.
25 See Plant 1934, p. 172. et seq.
26 Plant 1934, p. 183.
27 Plant 1934, p. 184.
28 "One special weakness of copyright monopoly as an administrative device is the *non-discriminatory* nature of the encouragement it affords to ventures which are to risky to be embarked upon in a free market. […] Yet, if there were public reasons for financing particular ventures of this sort, subsidies provided from general taxation have more to commend them than a copyright monopoly; and if that system were politically impossible, it would be surely be better that copyright monopoly be limited to such enterprises," ibid. p. 192 et seq.
29 Hurt/ Schuchman 1966, p. 426.
30 See Hurt/ Schuchman 1966, p. 426.
31 Hurt/ Schuchman 1966, p. 430.

conclusions on the welfare effects of copyright can be drawn.[32] In his article *The Uneasy Case for Copyright* Breyer came to similar results: "To demonstrate that an initial publisher's costs are high, while reproduction costs are low, is not sufficient to establish the need for copyright protection. Rather, one must examine other factors - the probable speed and ferocity of competitive response, the presence of subsidies, the ability of buyers to channel revenue to publishers and authors in the absence of protection - before it can be said that copyright protection is needed."[33] Thus, he concluded that at the current state it is not possible to make clear recommendations to maintain or to abolish copyright.

Apart from the authors mentioned above, most economists and lawyers consider IP as a quasi public good. Thus, IP protection is necessary to promote innovation because otherwise appropriability problems would occur. In the following I will present some approaches from evolutionary economics in order to show that IP protection is not as decisive for innovation as described above.

3 Evolutionary Economics and Appropriability of Innovations

The previous sections make it obvious, that the arguments for IP protection are more or less based on a neoclassical perspective. Thus, this static approach does not consider the eclectics of reality and the complexity of innovation processes. In this chapter I first will describe the model of dynamic competition and its development as evolutionary economics basically depend on this model. Thus, I will give a short overview on this topic and try to illustrate the main differences to the neoclassical model of perfect competition. In the second section I will introduce some endogenous factors of innovation showing that firms cannot choose technologies and innovations out of a given pool of possibilities like in the model of perfect competition. Afterwards I will further deepen the problem of spillovers and appropriability from an evolutionary economic perspective. Thereby I will analyse amongst others which requirements a firm has to fulfil to exploit external knowledge. The last section of this chapter resumes some empirical surveys which basically show that there is no definite empirical evidence for the assumption that IPRs spur innovation.

3.1 Dynamic Competition

Schumpeter (1934) was one of the first who pointed out that the neoclassical economic theory is not appropriate to explain and to illustrate innovation-based economic development processes.[34] In his seminal work *The Theory of Economic Development* he made the distinction between an economy moving year in, year out on an almost identical path, like a closed circuit system, and a developing economy which is characterized by jerky movements and changes.[35] Thus, the neoclassical equilibrium theory may be suitable for the analysis of this "circuit" as well as for the analysis of exogenous changes but it is not able to explain an endogenous development of the economic system and its subjects.[36] Following the concepts in the tradition of Schumpeter, competition can be understood as a dynamic process of rivalry in which the interaction of creative or innovative and adaptive or imitative forces evokes permanent dynamics.[37] A central role in this system has the so-called pioneer entrepreneur

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[32] Hurt/ Schuchman 1966, p. 432.
[33] Breyer (970, p. 72.
[34] See Schumpeter 1934.
[35] See Schumpeter 1934, p. 94.
[36] See Schumpeter 1934, p. 94 et seq. According to Schumpeter, small and only gradual occurring developments, like the continuously growing of a small shop to a larger store, can be subsumed under a static development. Thus, as Witt explained, Schumpeter reinterpreted the neoclassical description of a macroeconomic equilibrium as a theory of an actual steady temporal conduct of an economic system. In this interpretation, the agents' conduct appears as uniform and habitual. See Witt 1987, p. 35 et seq.
[37] See Budzinkski 2004, p. 4.

who first develops new ideas, products as well as procedures which replace present products and procedures. Their imitation finally induces the diffusion of these successful new products and procedures. Due to this dynamic development previous structures become destroyed and new ones develop. Schumpeter called this process 'creative destruction'. Thus, in this model, technological progress can be accounted the driving power for economic evolution.[38] Or, in other words, the appearance of entrepreneurs, i.e. individuals who are capable to enforce new combinations of resources and to change organisation and market structures, is decisive for evolutionary processes.[39] Hence, competition in the Schumpeter sense is a process of innovation and imitation. At the same time, competition is responsible for the generation and diffusion of technological progress and thus, functions as the motor for endogenous economic development.[40]

At large, with this theory Schumpeter prepared the ground for the concepts of dynamic competition which basically have been developed by Arndt, Clark and Heuss.[41] They conceived dynamic competition as rivalling process of permanent innovation, imitation and overhauling between the competitors. Thus, innovation and imitation processes proceed at the same time. Unlike the Schumpeterian approach innovation in the model of dynamic competition also embraces small innovative improvements, not only fundamental changes.[42] Nevertheless, this approach comprises as well that the innovating firms need an incentive for the innovative conduct in form of an effectual advance against their competitors. Thus, the concept of dynamic competition accepts at least a temporary monopoly position. In this context Arndt (1952) differentiated between competition of pioneers, i.e. the innovators, and a competition of imitators. A competition of imitators can only occur when differences exist. Thus, it is the objective of the competition of imitators to level differences (levelling competition), whereas competition of innovators aims at generating new differences (groundbreaking competition).[43] According to this theory, an efficient competition requires interplay of both. Only in cases in which an innovator succeeds in strengthen his advance in a way that imitators cannot overhaul anymore, competition is disturbed.[44]

Another important characteristic of dynamic competition is its rival character. The prospect of realizing additional profits due to innovations as well as the fear of loosing market shares due to other firms' innovations confers large incentives to firms to improve their products and services and to adopt superior products or process of more successful competitors. Thus, the concept of dynamic competition includes an incentive mechanism as well as a sanction mechanism. But besides that, it induces a momentum in which the competitors reciprocally propel each other and spur further innovation.[45] At large, this concept explains why firms have incentives to innovate and highlights the importance of competition and differences between firms. Only in a heterogeneous environment firms are motivated to invest in innovation and thereby achieve an advantage over their competitors. The next section will now concentrate on endogenous factors influencing innovation and success of innovation.

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38 See Kerber/ Schwalbe 2007, para. 1025.

39 See Witt 1987, p. 38. As Witt subsumed, another necessary condition for the first occurrence of firms and innovations is a steady phase of the economy which allows the calculation of the introduction of certain improvements or innovations. Consequently, the diffusion of an 'innovation wave' is affected by the in drove appearance of entrepreneurs. See ibid, p. 39 et seq.

40 See Kerber 1997, p. 40.

41 See Arndt 1952, Clark 1954, 1961 and Heuss 1965.

42 See Kerber 1997, p. 40.

43 See Arndt 1952, p. 36 et seq.

44 See Arndt 1952, p. 38 et seq.

45 See Kerber 1997, p. 41.

3.2 Routines, Tacit Knowledge and Appropriability

In their model on firms' endogenous growth Nelson and Winter (1982) introduced their concepts on routines. According to them, firms dispose of 'routines as genes', including characteristics of firms starting with well-defined technical routines for production processes as well as procedures for hiring or firing, policies regarding investment, R&D, advertising or business strategies, etc. These routines are in their functionality similar to biological genes as future firms build upon persistent routines and as they are selectable in the sense that some routines may do better than others and, thus, survive or grow in importance.[46] Hence, firms' future technological possibilities are heavily constraint by their past technological capabilities.[47] In these routines, essential coordination information is stored and 'remembered by doing', thus, the routines depend also on individual knowledge, "also, much of the knowledge that underlies the effective performance is tacit knowledge of the organization, not consciously known or articulable by anyone in particular."[48] Therefore, the concept of routines implies that firms' capabilities to innovate are restricted by their previous routines. In fact, innovations are generated on the basis of existing products, processes and technological knowledge.

Search activities, in this regard, are activities' scanning the environment for alternatives to firm's present routines. They take place before and after transforming a production process into a routine and, hence, reduce uncertainty and costs of innovation by lessening the number of trials needed.[49] Thus, "search activities are ways of 'learning by not doing'."[50] In consequence of the search activities the firm's knowledge basis grows, the characteristics of the products and processes improve and the firm's fitness, i.e. the capacity of a technology to adapt to external changes, increases.[51] At this point, it is important to differentiate between information and knowledge. Information is factual, whereas knowledge "establishes generalization and correlation between variables."[52] Thus, pieces of information get only valuable and understandable in the context of certain knowledge. Therewith knowledge has also an interpretive function. However, it can be differentiated between tacit, codified and cumulative knowledge. The latter evolves due to path dependencies or due to the creation of barriers. The knowledge used to produce and to operate in the market is the firm's collective knowledge. This knowledge contains more than the sum of the individual knowledge as it comprises as well the interplay between individuals and it is used to produce the firm's output. [53] However, knowledge can only seldom be divided to solely tacit or solely codified knowledge. Mostly, it is partly tacit as well as it is partly codified. Especially in firms the codification of knowledge is important to communicate and to further improve the firm's collective knowledge base and, hence, to spur progress of firms' research activities. The newer a field of research or the kind of knowledge the more difficult is the process of codification as individuals have different associations, intuitions and definitions. Thus, according to Saviotti, a piece of knowledge can never be used to zero costs from others even if it is completely codified. To understand and use the information, the imitator always needs the same 'code' to retrieve the information. Thus, if the person does not know the code she first has to learn this code and, hence, has cost of appropriability.[54] This implies for the

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46 See Nelson/ Winter 1982, p. 14.
47 See Dosi 1988, p. 225.
48 Nelson/ Winter 1982, p. 134.
49 During the research activities the production processes are only simulated and thus, causes lower costs than a real implementation. See Saviotti 1998, p. 844.
50 Saviotti 1998, p. 844.
51 See Saviotti 1998, p. 846.
52 Saviotti 1998, p. 845.
53 See Saviotti 1998, p. 845.
54 See Saviotti 1998, p. 848.

innovator that a higher degree of involved tacit and collective knowledge induces higher appropriability of the innovation.

Altogether, firms collect and combine different kinds of knowledge and capabilities including e.g. legal, financial, marketing, technological and scientific knowledge, which correspond for instance to the use of certain production processes, knowledge embodied in scientific instruments or to what Teece (1986) called complementary assets.[55] According to Teece these complementary assets are decisive for appropriation of innovation. In his article *Profiting from technological innovation* Teece illustrates that especially in regimes with low IP protection the ability to appropriate the returns of an innovation depends on the set of competences. To successfully commercialise an innovation not only knowledge in R&D or in manufacturing is necessary but also knowledge in finance, marketing, legal and other aspects.[56] Thus, a firm that makes an innovation and disposes of complementary assets will probably be better able to appropriate the returns of the innovation and than a firm without or with fewer complementary assets.[57] All in all, a key finding of Teece was that the degree of imitability depends firstly on legal protection like copyrights, patents and trademarks and, secondly, on the inherent reproducibility of the technology for which the degree of tacit and explicit know-how is decisive.[58] That is, as long as the innovator does not dispose over complementary assets, it is not sufficient to rely on IP protection to profit from innovation.

3.3 Spillovers and Absorptive Capacity

Nevertheless, representatives of the neoclassical school tend to highlight the negative impact of knowledge spillovers to innovation. In their seminal work on learning and innovation, Cohen and Levinthal (1990) relativised the problem of spillovers as disincentive to innovative activity. According to them, firms first have to invest in their own R&D before they are able to capture external knowledge. Therefore, Cohen and Levinthal explained that it is a critical component of firms' innovative capabilities to be able to exploit external knowledge. Their ability to evaluate and to use knowledge from outside sources depends in large parts from prior related knowledge. In detail, this prior knowledge contains as well basic skills as knowledge of recent developments in certain technological or scientific fields. "Thus, prior related knowledge confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends. These abilities collectively constitute what we call a firm's "absorptive capacity"."[59] According to Cohen and Levinthal it can be shown that due to activity in own R&D the ability increases to absorb and to use knowledge from external knowledge sources. The same is valid for activities in manufacturing operations in certain fields: the firms know better how to use and exploit certain developments in markets in which they are active.[60]

Thus, Cohen and Levinthal also highlighted that individual capabilities are as well a critical component for absorptive capacity. Therefore it is necessary to invest in personal training of the firm's individual members.[61] Nevertheless, it might be problematic to acquire skills from outside because firm's absorptive capacity develops cumulatively and therefore, the acquired knowledge or capabilities need to be integrated in the already existing skills and knowledge.

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55 Saviotti 1998, p. 855.
56 See Teece 1986, p. 288.
57 See Teece 1986, p. 292.
58 See Teece 2006, p. 1134.
59 See Cohen/ Levinthal 1990, p. 128. In an earlier work they differentiate between learning-by-doing and absorptive capacity. According to their definition learning-by-doing refers to an automatic process by which the firm becomes more practiced and efficient in already known processes. In contrary, absorptive capacity allows firms to exploit external knowledge and to do something completely different. See Cohen/ Levinthal 1989, p. 169.
60 See Cohen/ Levinthal 1990, p. 129.
61 See Cohen/ Levinthal 1990, p. 131.

"A critical component of the requisite absorptive capacity for certain types of information […] is often firm-specific and therefore cannot be bought and quickly integrated into the firm."[62] Due to this cumulativeness of firm's absorptive capacity, especially in areas of quickly moving (technical) developments strong path dependences exist. If the firm once missed to invest in certain capabilities it may never be able to make up for this omission and will not be able to assimilate and exploit new information in this area.[63]

Regarding spillovers Cohen and Levinthal explained that they also constitute an incentive to spend more in own R&D. By expanding the own R&D activity firms improve their absorptive capacity and, thus, are able to exploit spillovers from other firms investments in innovations.[64] Hence, following this argumentation, it is reasonable for firms to invest in advanced research but also in basic research even when in the latter main results spill out into the public. However, due to the broad knowledge a firm earns in conducting R&D it will be able to react quickly on competitors advances and permits to exploit immediately new and useful technological and scientific information.[65] However, for a potential imitator it is not free of cost to copy ideas of an innovator. Even in the absence of IP protection, firstly, an imitator has to observe an invention and the knowledge behind and, secondly, she also needs to have the absorptive capacity to understand and implement this knowledge. Thus, only in few cases an innovator probably has to suffer immediately from imitation.[66]

This model of absorptive capacity has been further developed by Zahra and George (2001).[67] They divided it into two subsets which consist all up of four dimensions: (1) knowledge acquisition and (2) assimilation constitute the potential absorptive capacity whereas (3) knowledge transformation and (4) exploitation constitute the realized absorptive capacity.[68] According to this model, "potential capacity provides firms with the strategic flexibility and the degrees of freedom to adapt and evolve in high-velocity environments,"[69] whereas the outcome of innovative conduct represents the realized absorptive capacity. Firms with well-developed knowledge acquisition capabilities are better able to capture external technological knowledge as they can better integrate new information into their own knowledge. Furthermore, firms with distinct knowledge assimilation capabilities have a higher fitness in analysing, understanding and interpreting new technologies. Knowledge transformation, however, describes the firm's capability to develop and refine routines that ease combining existing knowledge and newly acquired knowledge. Thus, a well-developed knowledge transformation capability, however, enables firms to better cross-apply to existing knowledge to new market applications. And, finally, due to the knowledge exploitation capabilities which reflect the firms' ability to reap and incorporate knowledge into its operations, firms are better able to refine, extend and leverage existing competencies.[70]

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62 Cohen/ Levinthal 1990, p. 136.

63 Cohen and Levinthal call the emergence of this effect "lockout". If the firm does not invest in its absorptive capacity from the very beginning, it will not be aware of new developments over time. Even if it becomes aware of new technological possibilities, it probably will not invest in them as the lack of absorptive capacity makes it more costly to adapt these new technologies. Thus, the firm is "locked-out" of subsequent technological developments. See Cohen/ Levinthal 1990, p. 136.

64 See Cohen/ Levinthal 1989, p. 593.

65 See Cohen/ Levinthal 1990, p. 148.

66 This depends mainly on the degree of involved specific knowledge and the degree of involved previous knowledge. The less knowledge is involved, the easier it is to copy.

67 Besides the model of Zahra/ George, there exists also two other developments or interpretations of absorptive capacity. Firstly, Mowery and Oxley (1995) defined absorptive capacity as a set of skills which is necessary to incorporate and interpret the tacit component of transferred knowledge. Secondly, Kim (1997 a, b, 1998) understood absorptive capacity as the capability to learn and solve problems. These two approaches will not be considered in the following.

68 See Zahra/ George 2002, p. 186.

69 Zahra/ George 2002, p. 185.

70 See Zahra/ George 2002, p. 189 et seqq.

This interpretation of absorptive capacity stresses as well that the exploitation of spillovers is more complex than assumed in the model of perfect competition. The competitors first have to invest in their absorptive capacity before they can copy inventions of innovators. As the concept of Zahra and George implies, an imitator needs to establish all four dimensions of absorptive capacity before she can exploit and transfer successfully external knowledge. According to this approach, solely one weakly distinctive dimension will hamper the exploitation of spillovers, because all dimensions build upon each other.

3.4 Empirical Results

However, some empirical studies[71] have been made in order to analyse whether IPRs are indeed essential for appropriability of innovation or whether there might exist other appropriability mechanism. These surveys largely support the evolutionary approach stating that the effect of spillovers is not as detrimental to innovation as the traditional rationale for IPRs describes. In fact, these empirical studies have shown that patents and other IP protection are not necessarily crucial for firms' decision to innovate.

For instance, Mansfield, Schwartz and Wagner (1981) asked the innovating firms whether they would have invested in innovations without patent protection. Apart from the pharmaceutical industry more than three-fourth of the interviewed firms declared that they would have made the innovation in any case.[72] Following their argumentation this is because the existence of patents does not influence decisively the rate of entry and thus, the absence of patent protection does not significantly enhance the competitive pressure on the innovating firms.[73] In a more recent survey, Mansfield (1986) found out, that apart from pharmaceutical and chemical industries, 80 to 90% of the inventions would have been placed at the market in the absence of the patent protection.[74] Even if the sample is very small, about 100 interviewed firms, this result gives an interesting perspective on the relevance of IP protection.

Similar results are presented in the study from Cohen, Nelson and Walsh (2000). Analysing the effectiveness of different appropriability mechanism, their survey shows that among secrecy, lead time, complementary sale or services and complementary manufacturing patents are the least important instrument to profit from R&D investments.[75] Moreover, most firms rely on more than one appropriability mechanism.[76] These results are consistent with earlier findings of Taylor and Silibertson (1973) showing that patents have a significant influence in the chemical and pharmaceutical industries but not in others. Similarly, Levin et al. (1987) examined amongst other the effectiveness of IP protection in their analysis of appropriability in industrial research and development projects. In this study they showed that firms appraise appropriability mechanisms like first-mover advantage, learning curve effects and secrecy much higher than patents.[77] Several other studies verify the finding that lead time and, in most cases, secrecy, are the most important mechanisms to profit from innovations.[78]

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71 Because of better measurability these studies focus mainly on the effect of patents.

72 See Mansfield/ Schwartz/ Wagner 1981, p. 915.

73 See Mansfield/ Schwartz/ Wagner 1981, p. 916.

74 See Mansfield 1986, p.174 et seqq.

75 See Cohen/ Nelson/ Walsh 2000, p. 9. Nevertheless, they also pointed out, that in certain industries like medical equipment and drugs, the importance of patents and other intellectual property rights is significantly higher. See ibid. In their survey they also asked why firms decide to patent respectively not to patent. As the two most important reasons not to patent were named the ease of legally inventing around a patent and the amount of information disclosed in a patent application. Most important reasons for patenting an invention are, firstly, the prevention of copying and, secondly, the prevention of other firm's attempt to patent a related invention. See ibid., p. 14 et seqq. Other motivations for patenting are e.g. the earning of licensing revenues, strengthening the firm's position in negotiations with other firms, like in cross-licensing agreements and the prevention of infringement suits. See ibid., p. 17.

76 See Cohen/ Nelson/ Walsh 2000, p. 8.

77 See Levin/ Klevorick/ Nelson/ Winter 1987, p. 794 et seqq.

78 See exemplarily Arundel 2001; Baldwin/ Hanel/ Sabourin 2002; Harabi 1995; McLennan 1995 cited in Arundel 2001.

Other studies examining the influence of patent and other IP systems on innovative activity could not find any evidence for increased inventions in countries with IP protection in comparison to countries without or with less protection. Nevertheless, it could be shown that innovative activity in countries with well-defined IP systems is more diversified than in others. Hence, in countries without or with only little IP protection the focus of innovative activity lies on industries in which other appropriability mechanism than e.g. patents overweigh.[79]

In her analysis of the influence of IP protection on innovation and economic development of developing countries, Léger (2007) could find no evidence, that IP protection spurs innovation. Rather she comes to the conclusion that it is more likely, that weak IP protection contributed to the rise of the Asian Tiger states.[80] According to her, most currently industrialized countries developed under a regime of weak IP protection, only when they reached a certain technical level, they strengthened their IP system. One reason for this phenomenon is e.g. the costs connected with obtaining protection: information, certification and monitoring costs may overweigh the incentives due to protection in developing markets. Thus, according to Léger, patents and other IPRs fail at least in developing countries to fulfil their traditional functions [81] Thus, "given the poor performance of IPRs for supporting innovation, alternative or complementary methods allowing to better tailor IP systems to the domestic situation should be considered."[82]

To put it in the words of Dosi et al. (2006): "To sum up, (i) in most circumstances, appropriability conditions sufficient to justify private innovative efforts are in place with or without IPR protection, whereas (ii) IPR themselves have only limited importance as drivers of innovative efforts."[83]

4 How Much IP Protection Is Necessary to Appropriate Returns from Innovation?

As the previous section has shown the incentive problematic is much more eclectic than the traditional rationale for IPRs tries to accredit. Insights from innovation economics as well as empirical results illustrate that the appropriability problem contains a broad spectrum of different aspects.

To illustrate the myopia of the static approach to IPRs I will shortly summarize its basic assumptions again. Firstly, the assumptions of the model of perfect competition are valid and, secondly, knowledge has a quasi-public good nature. Representatives of the model of perfect competition implicitly assume that all potential inventions are already given. Thus, the firms only have to choose which innovation they want to convert into reality and whether this would be profitable for them or whether someone else would appropriate the returns of it. Obviously, this assumption cannot picture the coherencies of reality and actual activities in R&D. In fact, it seems to be that the theories based on the model of dynamic competition come closer to reality. In these theories, as described in the previous section, it is assumed that firms do not know for sure whether their innovations will be successful at the market or even successful at all. Thus, the firms develop in trial-and-error processes and test their products,

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79 See Dosi/ Marengo/ Pasquali 2006, p. 12.

80 See Léger 2007, p. 26.

81 See Léger 2007, p. 27. Furthermore, Léger explains that even if patens do not provide strong incentives to innovation; their complementary roles like definition for technological transfer, strategic uses and signalling reputation are of importance in industrialized countries to strengthen innovation. See ibid., p. 36. In contrary, Dosi/ Marengo/ Pasquali (2006) highlighted the strategic value of patents in the sense of creating market entry barriers, of infringement and of counter infringement suits against rivals. See ibid, p. 9.

82 See Léger 2007, p. 37.

83 Dosi/ Malerba/ Ramello/ Silva 2006, p. 897.

technologies or other inventions like hypotheses on the market.[84] Consumers and competitors decide on their success. Taking into account that firms dispose of different routines and knowledge, it cannot be taken for granted that the firms will develop the same idea even if they resort to the same (freely available) knowledge or ideas. This is very different from the approach where firms first survey the technological possibilities and than produce and innovate by choosing out of a given pool of technological knowledge.[85] Hence, already the basis for the traditional explanation for copyrights and other IPRs has to be viewed more differentiated.

Consequently, the neoclassical argument treating knowledge and information as a quasi public good emanates from too restrictive assumptions regarding reality. As it has been shown, a firm has to fulfil certain conditions before it can imitate its competitor. Even if the information on the competitive advantage or the invention is freely available, the potential imitator has to spend resources to exploit the spillovers. Only if the firm already has a broad knowledge in the relevant topic it may be able to adopt or imitate the innovator. Thus, the neoclassical assumption that without IP protection an imitator can copy an innovation immediately and free of cost is not valid. As the firms cannot profit from spillovers of their competitors without any basic knowledge, they always have incentives to invest in R&D activities, even under the assumption of low IP protection. Thus, the degree of appropriation of external technologies and information depends amongst others on the investment in the different dimensions of absorptive capacity.[86] In this context, it is to highlight that according to the model of Zahra and George it is not sufficient if a firm has competencies in only one or two dimensions, for successful a firm needs to have both high potential absorptive capacity and high realized absorptive capacity as the success of appropriability depends on both subsets. Hence, only if a competitor fulfils these conditions she will be able to use the knowledge as easily as the neoclassical approach tries to make belief.

Regarding the appropriability problem from the innovators point of view, it should be considered, that due to routines and tacit knowledge the innovator has an advantage to her competitors even in regimes of weak IP protection. The potential imitator cannot observe these internal processes. Even if she tries to acquire tacit knowledge by hiring former employees of the innovator, it is not clear whether the imitating firm will be able to integrate and exploit this new personal knowledge. Moreover, due to her innovative activity, the innovator also broadens her absorptive capacity and, therefore, has in future advantages in incorporating spillovers compared to competitors who have fewer R&D activities.

On the other hand, one should consider the positive effects of knowledge spillovers on innovation. Due to the mentioned routines and different knowledge basis' it is not clear that firms who have access to the same information, develop as well the same inventions. Regarding the theory of bounded rationality and competition as test of hypotheses firms or individuals do not know which idea, product or other innovation will be successful on the market. Thus, they test their 'hypotheses' due trial-and-error processes on the market. In this context, making as much information available as possible broadens as well the range of innovations which will be made. Consequently, too broad copyright protection hampers innovation not only under the aspect that protection makes access to information more expensive but reduces also diversity.

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84 See Kerber 1997.

85 See Dosi 1988, p. 225. As Dosi/ Marengo/ Pasquali (2006) pointed out, in a Coasian perspecitve IPRs are immaterial because they have only an allocating function and do not influence the inventions directly. Whereas, taking into account that technological opportunities have to be developed by firms and that this development is influenced by complementarities, interdependencies and parth-dependences IPRs are no longer immaterial. In fact, they set opportunities or also constraints for technological inventions and opportunities and as well for market testing. See ibid., p. 4 et seq.

86 See Ricart/ Adegbesan 2006, p. 18.

Reconsidering the empirical results (see section 3.4) it becomes obvious that also from a practical view the importance of IP as incentive to innovate has to be judged more careful. All studies show that there at least instruments which are more decisive for the decision to invest in R&D than IP protection. This result supports as well the critique which was already expressed by representatives of neoclassical school (see section 2.3). Authors like Plant, Hurt and Schuchman and Breyer questions whether such a strong form of copyright protection like we have nowadays is really necessary and already referred to other appropriability mechanisms.[87]

This approach is supported by the theory of Teece, stating that for successfully appropriating returns of innovations complementary assets are decisive. „The profit from innovation framework also makes it abundantly clear that the enterprise's intellectual property portfolio cannot be managed independent of its business strategy, and that business strategy formulation requires an appreciation of intellectual property issues."[88] This makes clear, that to profit from an innovation, the innovating firm cannot solely count on the protection of its intellectual assets but has to invest in its complementary assets like marketing, services, finance etc.[89] Thus, a more differentiated approach regarding IP protection seems to be appropriate.

5 Conclusion

The present paper has shown so far that from an evolutionary economics view the traditional rationale to copyrights explaining that IP protection is necessary to make appropriability of innovations possible, is based on too narrow assumption. It became obvious that from innovation economics a much broader argumentation for appropriation mechanism is available. Nevertheless, to make clear recommendations how to design copyrights and other IPRs and to quantify concretely their influence on innovations further research on innovations and the factors influencing innovation needs to be done. As the empirical studies have shown it is also indicated to differentiate between the different industries as across them the complexity of information, the need for basis knowledge and absorptive capacity and therefore the need for additional protection by IPRs differ as well strongly.

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[87] Palmer, for instance, suggested alternative solutions like (1) technological fences, (2) tie-ins and complementary goods, (3) contractual arrangements for internalization of externalities and (4) marketing strategies like first-mover-advantages, price discrimination and quality control. See Palmer 1988, p. 288 et seq.

[88] Teece 2006, p. 1143.

[89] As Saviotti (1998) points out „this form of appropriability is likely to favour incumbents, due to the higher barrier presented by the acquisition of the complementary assets," ibid, p. 854.

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