Economic and Legal Impact of Patent Policy

BY

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Abstract

The purpose of this paper was to determine real economic and legal effects of the patent policy. In order to find out whether the traditional assumption of patents is still true in more detailed approach, the following questions should be answered:

- Does patent policy motivate innovations?
- Does patent policy lead to monopoly?

Patent's nature, its macroeconomic effects, the theory of patent portfolio, the patent insurance program and compulsory licensing were discussed in this paper to answer these questions. All the discussed topics helped to get deeper knowledge on patent policy, but it was the proposed alternative approaches of patent insurance program, that helped to see the main legal gap of the patent policy. Also the discussion on patent portfolio theory demonstrated economic restrictions that prevent SMEs from gaining from patents.

The discussion let us to conclude that, as a result of economic and legal constraints, a patent is not of the same value for large companies and SMEs. Consequently, it can not be accepted as a general tool for motivating of innovations. In order to answer the second question, government's approach to monopolies and abuse of dominance was discussed in this paper. While providing a patent holder with unique rights, a government prevents monopoly, using legal instruments. Consequently, normally, patent policy does not lead to monopoly.

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Table of Abbreviations

EC – European Commission

EU – European Union

IPR – Intellectual property rights

SME – Small and medium enterprises

TRIPS – Trade related aspects of intellectual property rights

U.S. – United States

WIPO – World Intellectual Property Office

WTO – World Trade Organization

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Introduction

The goal of this paper is to review a patent's nature and its economic effects, and describe alternative economic measures and a legal mechanism aimed at eliminating of a patent's negative economic impacts.

In the first chapter of the thesis a patent's costs and benefits, patent policy instruments, a patent's length and scope are described. Also patents economic impact on competitors and customers is described in the same chapter. Almost all written materials on patents include the following general economic assumption: patents were created in order to motivate innovations, but their negative economic impact is a monopoly power granted to a patent holder. A closer look reveals that the first part of this expression, regarding incentive for innovations, is not an economic dogma, and most of the small and medium sized enterprises (SMEs) can not gain from patenting in real life. As a rule, patenting of a single invention creates both economic and legal problems. First, an individual patented invention has too narrow scope to be profitable. On the other hand the broader the scope, the higher probability of infringement. Second, SMEs can not protect themselves in case of patent litigation. Consequently, they prefer to not patent an innovation at all.

The second and third chapters of the thesis describe the patent portfolio theory and the patent insurance program respectively. The patent portfolio theory and the patent insurance program are two measures offered by the authors to help firms to gain from patenting, and insure their costs in case of litigation. Parchomovsky and Wagner (2005) developed an alternative theory of patent portfolios. They claim that the main argument of the patent portfolio theory is that the real value of patents is not in their individual significance, but in their aggregation into a

patent portfolio. The second measure - the patent insurance program was developed by Danish Patent and Trademark Office (DKPTO) in order to help SMEs, which are in more vulnerable situation than large companies, to avoid or be prepared to potential patent litigation

Because of the different reasons provided in the chapters below, both the patent portfolio theory and the patent insurance program are mainly supported by one source, and there are not sufficient works on implementation in SMEs in case of the patent portfolio theory, and implementation abroad of EU in case of the patent insurance program.

As it turned out, the second part of the general economic assumption, regarding patents negative economic impact in the face of a monopoly power, also is not an indisputable, firm fact. Risk of monopoly increases when a government provides a patent holder with temporary, but unique right for a certain product, service or process. The legal impact of patents is an application of legal instruments in order to prevent a creation of monopoly in a market. Consequently, a patent's legal impact is a government's implication of a legal mechanism (compulsory licensing) aimed at elimination of negative economic effects. A patent policy's legal impact in the face of the compulsory licensing is discussed in the fourth chapter of the thesis.

Correa (2007) claims that, there is a difficult relationship between protection of intellectual property rights and competition policies, which creates a challenge especially in developing countries with little or no experience in competition law. He states that intellectual property law provides a patent holder with an exclusive right, whereas competition law tries to eliminate market barriers that prevent fair competition. According to the article, many developing countries do not have efficient instruments for implementation of competition law. The author proposes that developing countries apply their own method of competition law application, because except Article 40 of TRIPS (Agreement on Trade Related Aspects

of Intellectual Property Rights) there is no international regulation, restricting a country's measures to curb abuse of patents. Correa says that Article 31 of TRIPS introduces a concept of "refusal to deal", which provides a condition for implementation of compulsory licensing.[1] He also writes on the "essential facility" concept, which applies to the conditions when licensing is crucial for maintaining a competitive market.[2]

According to the author, while there is no international regulation for competition law implementation, and the developing countries can apply individual approaches, it would be useful to use the concepts of "refusal to deal "and "essential facilities" applied in developed countries. Pitofsky, Patterson and Hooks (2002) write that in the U.S. the "essential facilities doctrine" is a subset of "refusal to deal" concept, that restricts a monopolist's power to prevent a fair competition. As it is stated in the same article, the "classic" approach of the doctrine was applicable to natural monopolies, and later on it was also applied to intellectual property assets.

Julian Arnold (1993) writes about four main reasons of compulsory licensing. She argues that, because of the different economic and historical positions, developed and developing countries have different positions with regard to implementation of compulsory licensing. Correa argues that as a rule, many developed and developing countries use compulsory licensing on the national level following the relative TRIPS Agreement. Nevertheless, he thinks that many developing countries, that were forced to adopt appropriate intellectual property laws, still lack the relevant legal mechanisms to avoid misuse of the intellectual property rights.

1 According to Black's Law Dictionary refusal to deal is "A company's decision not to do business with another company." (Bryan A. Garnier Editor in Chief, Black's Law Dictionary. Eighth Edition.2004)

2 According to Correa, M. Carlos. 2007. "This doctrine applies when one firm, which controls an essential facility, denies a second firm reasonable access to a product or service that the second firm must obtain in order to compete with the first."

Chapter One: The Economics of Patents: Patent's Benefits and Costs

Before trying to understand the economic impact of a patent system its important to know that almost all written materials on patents include the following general economic assumption: a patent provides an economic advantage in the face of motivation for innovations and dissemination of information, and a disadvantage in the face of a monopoly power granted to a patentee.

A patent's economic and legal impact is evaluated and discussed in this thesis without any particular concentration on international regulations or national applications, in order to avoid any distraction from the main purpose of the thesis. The information below on Paris Convention and the concept of the “right of priority” are given just to provide the basic concept on patents at the international stage.

According to Berkowitz and Kotowitz (1982), it is stated in Paris Convention agreements that condition and duration of patents can be defined by individual countries, but can not discriminate against foreigners. Engelfriet (2006) says that another important concept introduced by the Paris Convention is a “right of priority” according to which, a person who filed a patent application in his country can file applications in other countries during a year, and all the applications will be treated as if they were applied on the date of the initial application.

A patent is viewed as one of the most effective legal mechanisms for the protection of intellectual property rights. According to Berkowitz and Kotowitz, patents are granted for inventions, issued from a state or regional patent office, for a maximum twenty years and should contain a publicly available description of invention in their specifications. They also state that the ultimate goal of patents is to prevent others from using the patented invention until the validity period is passed. The authors think that because patents cause big problems

for rivals, they are not granted for all industrial improvements, but just for those that meet the requirements to be patentable inventions. Langinier and Moschini (2002) like most of the other authors writing on patent policy argue that in terms of economics, the essential features of patents are that they provide a motivation for innovations and provide an inventor with monopoly rights.

As it will be described below, both the incentive for innovations and the high risk of monopoly do not have a direct, firm impact on economy. The size of the firms, the market structure of different fields, the economic and legal mechanisms applied to patents are the factors due to which incentives for innovations and monopoly cease to be direct and stable effects of the patent policy.

Langinier and Moschini continue with description of a market system, which has a problem with production of new products based on the patented innovations. According to them, knowledge is a typical public good, and public goods have two main features: they are non-rival in consumption and they are non-excludable. A national defense is given as a typical example of public goods: an individual usage does not affect the total available amount and citizens can not be prevented from using this service. Consequently, a competitive market system does not provide a high level of innovations, because an innovator would bear all the costs of the new invention and everybody would have a motivation for free riding on the innovator's efforts. The authors believe that the issue is addressed by intellectual property rights and particularly patents.

Langinier and Moschini describe the patent policy's trade off in the following approach. A market system restricts the innovations, but patents provide a motivation to innovate, providing the property rights over new inventions. On the other hand, the unique rights that patents provide create a monopoly situation, that negatively affects efficiency of an invention.

At this point a patent system's trade off emerges. As a result, an opportunity provided by a monopoly over an innovation is viewed as a very effective motivation for R&D investments, which wouldn't be effective under a competitive system. On the other hand, monopoly constrains social effectiveness of the new products and processes.

While the problem described above seems to be the main dilemma of patent system, some researchers do not agree with the view that patents lead to a monopoly. Singleton (2006) argues that patents are better for competition rather than for monopoly. According to him, consumers get more options in a market with patents than without, because granted patents motivate the rivals to propose alternative products, services or processes. Nevertheless, because of possible litigation costs in cases of infringement allegations or dependent patents, reviewed in the next chapters, competitors might be prevented from entering a market during long period of time, which may lead to a monopoly.

1. Additional Advantages of Patents

Langinier and Moschini (2002) describe a public disclosure demand as another patent benefit. They believe that generally, patents are publicly disclosed eighteen months after filling. A disclosure is considered as a benefit that allows other inventors not waste their time since it prevents other investors from duplicating already existing inventions.

Langinier and Moschini argue that another benefit of a public disclosure is that further innovations can be based on the publicly available innovations. They also mention prospect theory, described by Kitch (1977) in the article “The Nature and Function of the Patent System”. According to this theory, the property rights on inventions lead to a series of following innovations, and decreases the probability of innovation races.

2. Length and Breadth of Patent Protection

In this sub-chapter we describe two main facets of a patent – its length and scope. It seems at first sight that the longer a period of patent validity, the higher an investment in research for innovations. However, Chu (2009) claims that, twenty years is an optimal patent length, and that a validity period of a patent loses its efficiency with regard to R&D by its 20^{th} year; that is why, a patent validity period is not an adequate mechanism to solve a problem of R&D underinvestment.

Langinier and Moschini (2002) state that because of patent's fundamental trade off, the ideal level of patent protection should be defined. They continue with a patent's degree of market power, which is determined by two features: the duration and the breadth. They state that inefficiency and motivation roles of patents are influenced by the duration of a monopoly power: too short duration may decrease the motivation for research, whereas too long duration may provide an innovator with excessive rent and lead to social inefficiency in terms of competition and further development. Langinier and Moschini conclude that the ideal duration should be defined so as to return the investment in research, so that the inventors do not loose their interest and social cost does not increase. The authors provide an example of a process innovation that decreases the cost of unit production, and conclude that ideal patent length should equalize a social gain from the decrease in a unit cost production and a social loss related to the delay in access of rival firms. The importance of a patent's scope is discussed in the patent portfolio theory chapter, but in a different context.

Donoghue, Scotchmer and Thisse (1998) divide patent breadth into two categories: lagging and leading breadth, with the first protecting from rivalry with inferior products (imitation) and the second – from rivalry by superior products. Langinier and Moschini (2002) write that a patent's breadth is determined by the collection of products enclosed by the patent claims,

which means the more specific the claims, the less the breadth of a patent. A patent breadth is endogenous and unlike its length isn't defined by law. A decrease in the patent breadth is more beneficial to consumers since it leads to a higher competition. On the other hand, too narrow breadth leads to decrease in motivation for an innovation.

Langinier and Moschini provide two economic approaches on optimality of a patent breadth. According to the first approach, narrow and long patents serving with lower level of breadth, but accordingly arranged duration, could be accepted as socially optimal because broad patents provide more monopoly power and consequently, more costly for society. The second option is broad and short patents, which are particularly advantageous in terms of imitation. Because imitation is disinclined when a price is too high in case of broad patents and there is no sufficient time for imitation in case of short patents. The authors claim that any unique optimal patent policy can not be implied to all the industries, and that patent length and scope in various fields are used to protect the innovators at the socially optimal costs. They conclude that a patent's scope and its length can substitute each other in impacting ex-ante motivation for innovation and ex-post benefits from it.

3. Supplementary Innovations

This sub-chapter, based on Langinier and Moschini, discusses nature of complementary innovations, which are usually patented by different firms, and lead to underusing of resources. The authors think that some of these patented inputs are supplementary and some are crucial in production of the new outputs, that is why suppliers keep blocking patents. This situation, in their view, puts a manufacturer in a very vulnerable position, which is called a "tragedy of anticommons" in biotechnology innovations. They continue with concepts of the tragedy of commons and the tragedy of anticommons. The tragedy of commons emerges

form an excessive using of a public property resource. The tragedy of anticommons characterizes a situation when resources are underused.

An offered solution that can address a hold up problem in coordination of patent holders is cross-licensing or a patent pool.[3] According to the article, cross-licensing is widely used in companies involved in design and production of microprocessors. They state that patent pool contains patents that licensed in one package and might be licensed by the owner or by a firm, particularly established to settle this mechanism. On the other hand, Langinier and Moschini warn about the negative side of the patent pools, leading to antitrust issues. Adding a rival patent in a pool may trigger noncompetitive actions and lead to a collusion. The authors conclude that complementary patents should be included in the pool since it leads to an increased competition, but implication of substitute patents may provoke unhealthy behavior far from competition.

4. Patent Policy Mechanisms

According to Chu (2007), despite extending a patent length most probably would not affect R&D in most countries, a patent's length is still the most convenient instrument to measure patents influence on incentives for R&D. Chu states that the minimum level of IPR protection to be provided by all member countries by 2006 was established by TRIPS Agreement (The WTO Agreement on Trade-Related Aspects of Intellectual Property Rights). As a result, in most countries a patent has a statutory length of 20 years. According to his article, a patent maintenance fee differs from country to country. He states that, in U.S. the patent

3 According to Black's Law Dictionary cross-licensing is "An agreement between two or more patentees to exchange licenses for their mutual benefit and mutual use of the licensed products." (Bryan A. Garnier Editor in Chief, Black's Law Dictionary. Eighth Edition.2004)

maintenance fees are due 3,5 years, 7,5 years and 11,5 years after a patent is granted, whereas a patent maintenance fee is annual in some European countries.

It is written in the article, that in case patents are not renewed until the end of the statutory term; increasing the statutory patent length is not an effective way to increase R&D. Generally, an average patent is not worth as much as a patent maintenance fee, after being granted for a certain period. Schankerman and Pakes (1986) came to the conclusion that, in European countries only about 50% of all patents are renewed within 10 years, 10% of which are renewed until the end of the statutory term. As for U.S. patents, Bessen (2008) estimates profit depreciation rate of 14% for them, which means that average patent's value is decreased at the rate of 14% annually. Kwan and Lai (2003) found that increasing an effective lifetime of a patent increases research and prosperity. Chu (2009) believes that patent length loses its effectiveness on R&D in about 20 years and extending a patent length to more than 20 years results in a significant increase in R&D and consumption, and shortening a patent length results in a decrease in both R&D and consumption.

5. Negative Macroeconomic Effects of Patent Policy

Rideau (2001) in his article states that patents have three main negative macroeconomic effects. In my view all three claims become groundless before the counterarguments. The first, the author states that both historically and conceptually a monopoly has a negative effect on economy. He continues with a double negative effect on both consumers and competitors as the cost of the monopoly's beneficial effect on the monopolist. Rideau writes that as a result of scattering over a large population these effects are not obvious, but nevertheless the main reason of monopoly's inefficiency is a double negative effect of protectionism. The author misses the important point of competition law applications, and

government regulations against anti-competitive actions, namely application of compulsory licensing in case of a threat of monopoly in the area of intellectual property rights.

Rideau also claims that if a motivation to innovate is positively correlated with expected market profits, a fall of potential profits resulting from patent monopolies leads to a decrease in the motivation for innovation. He thinks that a few overpaid researchers in a large monopolist structure will be seen as focused beneficial effects of the patent system, but the detrimental effects represented by many inventors, that could not be paid by smaller businesses will not be seen. I think the author does not take into consideration legal mechanisms aimed at eradication of patents abuse.

The author writes that, only in case of "atomic" innovations, tertiary effects may begin to compensate for negative primary and secondary effects. According to him, "atomic" innovation is an innovation in a field, where patent application never leads to further innovation and at the same time never depends on previous innovation. In all other cases patents are claimed to be detrimental to innovation for their whole duration. Rideau concludes that, "atomic" innovations are not of such value to society as to justify a patent system that has important detrimental effects on all other innovations. In my opinion, the treatment of dependent patents is an obvious example of using a cross-licensing, which prevents the problem described above. Compulsory licensing is another effective mechanism, used to avoid this problem.

6. A Competition Method in Intellectual Property Protection

Corea (2007) argues that there is a dilemma between the patent policy and fair competition, which is mainly a challenge for countries with little experience in competition law. He thinks that according to intellectual property law, patent owners have a unique right over their

assets, whereas according to competition law, consumer benefits should be shielded by eliminating market barriers. The author states that because most of the developing countries do not have proper procedure for implementation of their competition laws, they may use a wider method of competition policy, which impacts the relationship between intellectual property and competition.

For Correa, competition is an effective motivation for development of new technologies, and granting intellectual property protection does not make a government helpless in the face of monopolization. It is claimed that a government can use rules to promote competition and alleviate monopolization. According to the article, though there are no strict international regulations, "refusal to deal" and "essential facility" are the fundamental concepts used in developed countries, in order to prevent monopolization that might be caused by a patent system. Corea believes that licensing is crucial for competition and rejection of licensing leads to monopolization. Consequently, national patent laws may permit compulsory licensing in response to unilateral refusal of voluntary licensing. Another approach described by him is permission to use the patented inventions by third party in case a patent holder, controlling a core facility, refuses to provide a second firm with a reasonable access to a service or a product that it should acquire to be able to compete with the first one. Correa also thinks that in case of "patent packages" held by the same patent holder, inadequate expansion of legitimate patents' market power may cause anti-competitive interference.

Chapter Two: A Theory of Patent Portfolios

One of the generally accepted opinions on patents is that individual patents are unlikely to be profitable since as a rule, their cost exceeds their profit. Coming to a conclusion that patent theory is incomplete, Parchomovsky and Wagner (2005) developed an alternative theory of patent portfolios. The main argument of the patent portfolio theory is that, the real value of patents is not in their individual significance, but in their aggregation into a patent portfolio.

The reason that the patent portfolio theory is described based on one main source is given below. Normally, it is not efficient to patent one invention, because of the potential legal and economic problems. The patent portfolio theory is proposed by Parchomovsky and Wagner as a way to avoid these potential problems, but the theory is not optimal for all companies. Only rich companies can afford themselves to patent related inventions and build a patent portfolio. Consequently, it is hard for SMEs to implement this theory in real life, which is the main reason the theory is mainly supported by one work and there are not sufficient works on theory's implementation in SMEs.

The authors claim that patent portfolio is a strategic collection of distinct-but-related individual patents that provide a portfolio holder with important advantages. According to the patent portfolio theory, patent portfolio benefits are very essential and stimulate patenting regardless of the individual patents potential value. The authors claim that each additional patent's marginal expected revenue is higher than its marginal cost of acquisition. Under the patent portfolio theory, it is rational to patent when the net expected value of obtaining an individual patent is likely to be zero, because an individual patent creates and maintains a patent portfolio.

Parchomovsky and Wagner believe that the important feature of the patent portfolio is that patents are related, and held under common control. On the other hand, they think that patents' relatedness does not mean that they are not diverse at all. Similarity of technological features is assumed as a crucial feature of the patent portfolio. The authors write that a unifying concept of patent portfolios might be based on process, problem or product. They also think that, though collections of less related or completely unrelated patent portfolios exist, they lack the power of a normal patent portfolio. There is not any quantity requirement in patent portfolio. According to the theory, despite additional patents cause diminishing returns to portfolio when its size increases beyond a definite limit size, generally, the more the number of patents, the better is portfolio.

1. Patent Portfolios Advantages

Parchomovsky and Wagner claim that the benefits of patent portfolios can be divided into two categories: the benefits from scale and from diversity. The benefit from scale is based on the fact that big enough number of related patents gives its holders true power to exclude others from a market. It also provides a degree of power that is not achievable by using individual patents alone. The benefit from diversity is based on a patent portfolio's structure, and reflects a portfolio's status as a combination of related patents. Diversity, according to the authors, formed as a combination of many patents, offers a benefit to diversify and address the risk and uncertainty. It is emphasized that risk of uncertainty is very typical of innovations and can not be achieved in case of individual patents. The authors believe that, in the modern marketplace patent portfolios provide meaningful patent protection, whereas individual patents have increasingly doubtful value.

According to Parchomovsky and Wagner, a firm that holds a patent portfolio, goes through innovation process much more confidently. It is stated that, the broader the scope of protection, the wider the technological range, that decreases a possibility of infringement. Flexibility and speed are viewed as crucial economic advantages in modern dynamic markets. Consequently, they claim that the ability to invent, implement, produce and ship products is a certain economic advantage provided by patent portfolios.

According to the theory, patent portfolios have a multiplier effect and allow a holding firm to attract and coordinate related technological developments, which provide a firm with a predominant position in a field. As a result, innovators become interested in combining their innovations with a portfolio holder, but not develop their own business.

The authors think that, patent portfolios reduce a probability of patent litigation between a portfolio holder and an individual patentee. They argue that settlement will always be preferred to litigation, due to broad and total scope of protection created by a portfolio. It is claimed that even when both parties are portfolio holders, operating in a certain field, a probability of litigation is diminished to minimum by the chances that both parties would be found liable. According to the theory, a portfolio holders' position is much stronger in dealing with others than that of their competitors because they have a huge potential of infringement claims, at least some of which might be successful, and because of strong market position they can reach more advantageous arrangements.

Parchomovsky and Wagner believe that generally, individual patents do not have strong defense in litigation because of the relative lack of value, but patent portfolios have essential defensive power to dissuade litigation on infringement claims. This is a patent portfolio's power, derived from the scale of the portfolio. According to the theory, a patent portfolio is a valuable asset, whereas a value of an individual patent is questionable and hardly can attract

investments. Consequently, patent portfolios are competitive enough, and can provide long term prospective to attract and maintain capital investments.

The authors claim that the most important advantage of a patent portfolio is that an individual patent does not define a portfolios value. As a result, by allocating the importance among individual patents, patent portfolio allows the holders to address risk and uncertainty, which is typical for innovations.

The authors assume that innovations neither guarantee any economic success, nor provide any basis to view future circumstances and any decision made in innovation sector can later on turn out to be unwise and imprudent. In this terms, patent portfolio is assumed as a tool to secure protections of a technological development. It is also assumed that because normally patent portfolios attract and coordinate patents with related features, they can address the risk and uncertainty, which is common for all the individual patents .

Parchomovsky and Wagner argue that since patent portfolio embraces a diverse nature of patents, the researchers of the related fields can be sure that a patent protection will be provided by a portfolio holder. Consequently, such researchers have more confidence in the future and less concern of infringement. According to the theory, diverse patent portfolio also address the uncertainty related to future market conditions, like availability and price of material. Unlike individual patents, benefits based on patent portfolio's diversity allow the firms to have a stronger position in the marketplace in the future and be less vulnerable to the competitors patent or market related claim. The most important diversity feature of a patent portfolio is claimed to be its competence to address uncertainty against patent law. The uncertainty in the law, altering the value of an individual patent would not be of much importance, whereas uncertainties related to a bunch of patents that consist a portfolio would cause much stronger reflection and make the portfolio holder to protect it.

2. Impact on Microeconomics, Individuals and SMEs

Another view argued in the article is that the higher a number of patents, the higher a level of innovation in a country. High entry level of patents is supposed to ensure economic growth and development in innovation fields. Parchomovsky and Wagner think that a large firm is not hurt by the cost of a patent process as much as small one, and fill numbers of applications to patent for any invention in order to protect all improvements. They also assume that a number of high-quality patents, kept by a company define its worth. That is why the more valuable a company's patent portfolio, the higher the price that should be paid by competitors in case of a takeover.

The authors argue that filling patents is too costly for the individuals; consequently, licensing or selling an invention to a larger company or obtaining a sponsorship, are normally, the only ways that an independent inventor can get a source for patent application. They also write that when an individual fills a patent within a company, he or she gets a rank of "inventor" and if he or she publishes a pattern, his or her possible benefits and standing with the company rises.

According to the theory, patent family can be very good for a start-up firm, and SMEs can attract capital using their patents, which helps them to secure market share, in order to avoid being swallowed by the larger companies. This feature is described as essential particularly for firms in intellectual property areas like information technology and biotechnology sectors. Parchomovsky and Wagner claim that in case a firm licenses intellectual property, it can participate in the innovation networks of other companies. They argue that it is unreasonable to invest in research for innovations if a company can not protect its own inventions, but because of patent protection, firms have time to continue their research in the same direction

and develop their inventions. As a result, perfect innovation provides SMEs with opportunity to become a prosperous company.

The authors also discuss the research of institutions and universities that started patenting their inventions during the last decades, providing transfer of knowledge from universities to public, which funds universities' and research institutions' research and provides new possibilities for innovation.

They also believe that increase in the number of patents directly relates to the fact that patents are strategic for a competition. The authors thinks that a number of patents per employed is much bigger in Japanese and American firms than those in Europe. The reason of lower patent activity in Europe is based on high financial costs of patents and uncertainty regarding possible litigation of patent infringement, which are the big problems for SMEs. According to the article, there is a positive correlation between a market value of a firm and its involvement in a patent law case: SMEs are much more vulnerable to patent law cases than large companies. The authors suppose that investors do not believe in SME's success in a litigation for intellectual property rights, that is why when knowledge of a patent law case becomes public, market value of SMEs promptly fall.

3. Importance of the Quantity

According to patent portfolio theory, adding patents to a portfolio increases its scale and diversity. Consequently, based on the theory companies patent in order to increase patent portfolio benefits, which are defined by a quantity of patents. The authors think that acquiring a patent is beneficial even if its individual value is less than its cost, and patenting decisions are not directly related to their value. They believe that what is important is a marginal value of the additional patent being higher than its cost. Despite the benefits of quantity are not

infinite, and adding more patents gradually decreases benefits from adding patents to a portfolio, the value of underlying patents are not affected by the value limits of patent portfolio. Consequently, it is argued that decisions on patenting are not taken based on the patents individual value. The below two cases are provided by Parchomovsky and Wagner in order to demonstrate the application of the theory.

Qualcomm was one of the technology companies that became famous in the middle of the 1990's. A wireless technology “Code Division Multiple Access” (CDMA) was invented by the company as an alternative to the previous digital system in 1989. Due to superior technology CDMA gradually superseded the previous system. Quallcomm patented many applications of the new technology in the 1990's, which led to $ 200,000 increase in the company's income form the licensing division. The company's stock increased over 2,000% in 1999. Using its patent portfolio system the company prevented its rivals from competing in CDMA market and created a double income stream getting revenue form its products, services and licensing fees from its partners.

The second case provided in the article is IBM case. IBM has accumulated over 25,000 patents since 1994. The once advanced company became sluggish in the 1980's. In 1993, the worst year in the company's history, the CEO was replaced. The new CEO increased company's efforts to use intellectual property assets, with focus on product research and motivating campaign to increase the number of patents. The new approach resulted in substantial growth of the company's patent portfolio and notably decreased the amount of money spent to earned patents. Number of ideas patented by IBM increased several times during the last decade.

4. Different View on Patent Portfolio Theory

Couhlin (2007) writes that according to Parchomovsky and Wagner, patent portfolio theory explains the patent paradox, and the main assumption of the theory is that the marginal expected gain from adding a patent to a portfolio of related patents is more than the marginal cost of acquiring it. He continues that patent portfolio theory describes valuation of patents for large companies, but does not take into consideration the behavior of small firms in relation to their patents. Couhlin argues that small companies assess and explore their patents in a different way from large companies; consequently, even though the portfolio theory helps to explain patent's value for large companies, it does not help with assessment of patents for small companies. In his view, small companies and individuals trying to enter in a certain field, assess patents differently than large companies trying to intensify their position within a field.

Also he claims that two factors that are essential for proper patent assessment were not taken into account in the patent portfolio theory. First, value of the patent to a patent portfolio was described without any consideration of its claim scope. Generally, patent portfolios are used to increase patent claim scope because single patents lead to a limitation on the scope of claims. However, it is not necessarily a number of patents, but the scope of the claims that determines the quality of a patent portfolio. Couhlin argues that the reasons for acquiring and keeping a patent create a patent's value, but the value of patent portfolio can not be increased by simply adding patents to a patent portfolio. He argues that a patent portfolio's value increases as the aggregate claim scope of its patents increases in a certain technological area. However, a patent portfolio theory does not explain how claim scope corresponds to a patent's value. Consequently, the increase of the scope is explained by size of portfolio, but is not necessarily gained by adding new and related patents.

Second, the change of patent value over time also was not taken into account by the patent portfolio theory. Payment or non-payment of maintenance fees sets up a patent's value when a patent fee is paid, but not before the time of payment. The author explains his opinion with the fact that, many patents have higher value before payment of the first maintenance fee, because of speculation in the value of patented technology.

Chapter Three: Structure of a Legal Expense Insurance

Patent insurance scheme was developed by Danish Patent and Trademark Office (DKPTO) and implemented the first time in 2007 in Denmark. According to the European Commission's Report from Conference on Making IPR Work for SMEs (2009) DKTPO's non monetary support was very crucial for the program's implementation.

Along with patent portfolio theory the patent insurance program was developed in order to help SMEs, which are in more vulnerable situation than big companies, to avoid or be prepared to potential patent litigation. Gortz and Konnerup (2001) argue that the patent legal insurance scheme was applied in several countries, but it was not aimed at helping SMEs with regard to potential litigation. Consequently, the program developed by DKPTO in Denmark is the first attempt to establish an insurance program, which would help SMEs to patent their inventions.

According to the mentioned Conference Report of the European Commission, the requirements for the program's full implementation are large population of SMEs and high rates of patent registering. Fuentes (2009) adds one more requirement for the full implication of the scheme - technical development in the EU. He concludes that the scheme is possible in EU.

Because the patent insurance program was developed and recently implemented in the EU, and currently feasible in the EU only, its theoretical part is mainly supported by the article by Gortz and Konnerup. The first implementation in Denmark in 2007 was described in the relevant Conference Report of European Commission.

Gortz and Konnerup argue that surveys among SMEs demonstrate that fear of high litigation costs prevent SMEs from patenting their inventions. As a result, there is a potential market

for a legal expense insurance for patent holders from SMEs. The authors propose three possible methods for effective patent insurance programs:

- A standard insurance enterprise, with expertise to evaluate every individual patent case;
- An electronic system, where specialists assess every individual patent prior to proposing electronic patenting exchange;
- A venture arrangement, where patenting firms consulted in return for the partial posession.

It is argued that, all three programs contain expertise that evaluates patent portfolios and their possible risks. According to them, since a huge amount of information is required to calculate the risks and benefits for patents in different countries, with various patent models, it would be too difficult to create a private insurance market, offering legal expenses insurance. Hence, Gortz and Konnerup suppose that short term governmental involvement would be optimal for accumulating such data.

In their opinion some patents are obscure regarding the risk of litigation and more permanent kind of public sector participation is required to give such patents a chance to be covered by insurance. Consequently, public participation should be added here to private insurance system. According to the authors, such participation could be based, for example, on export credit schemes. Such programs are assumed to be much stronger under international protection since local programs would have a power on local patents only. The reason for this is explained by the assumption that a subsidy from government would be provided only to local patent holders, and a local insurance institution would get deep knowledge of local legal and patent systems, and would have great difficulties with providing the same service to foreign patent holders.

1. Legal Expense Insurance Scheme for SMEs

Gortz and Konnerup argue that, normally, firms decide on whether to invest in R&D or not based on costs of patent law cases, which results in patent density in a country. According to the article, researches provided empirical evidence that in the result of capital constraint, SMEs stand aback from taking patents in fields with many patented inventions, or dominated by large firms. In this way SMEs protect themselves from conflicts with powerful companies with large financial funds. The authors think that an insurance program would be very helpful in rapidly growing areas. They claim that a legal expense insurance program would substantially decrease a number of patent lawsuits because supported SMEs will decrease the number of infringements. Consequently, the believe that this can balance the disparity between large and small companies, and SMEs would get a financial power to compete with large firms on a fair basis.

Fuentes (2009) argues that mandatory patent insurance is possible in case if satisfies the patentees and attract insurers. Technical development in the European Union is given as a third condition. Fuentes thinks that mandatory patent insurance for SMEs, which is the only way of efficient patent litigation insurance, is possible in EU.

2. Patentee's Insurance

Gortz and Konnerup (2001) claim that a patent lawsuit is a huge pressure, which requires enormous funds, takes a lot of time and demands paid statements from expensive specialists. It also requires administrative sources. In their opinion, even if a patentee wins litigation, they can not cover the financial losses. As it is stated in the article, in the beginning a patent holder registers for a legal expense insurance, and once he thinks that the patent was

infringed, he asks the insurance company to assess whether the case was covered by contract. Another described option is establishment of venture capital companies, which would provide consulting and financing services to the newly established SMEs. According to the article, monetary support by venture capital can be implemented in three stages. The first one is to set up a firm in order to implement a good undertaking. The second one is the assessment of the investment's potential. The third is optimal way of gaining for a firm a capital and knowledge. A venture capital firm should decide on whether it should be a mixture of loans with equity assets or not, whether to participate in routine operations or not. In case an investor has no experience in patent infringement issues, there should be a common financial support to balance the differences with large firms. If an investor has an experience in patent infringement issues, it would be logical for him to be involved in routine operations. The authors say that both patent insurance program and venture capital firms solve the capital problems of SMEs. They conclude that insurance programs help SMEs to protect their patents from infringement, venture capital investments provide the newly established companies with necessary financial funds.

3. The Role of Government in Legal Expense Insurance Program

It is argued by Gortz and Konnerup that a state's participation might be crucial at the initial stage, in order to set up the patent insurance program, and it is essential that legal expense insurance program implements private arrangements. It is important that private companies are not rivals to public companies. They believe that public involvement is substantial for the cases, where a risk is too high for private companies providing patent insurance arrangements. Another situation when a state's involvement is very important, is insurance in specific areas with very high risks and specific circumstances.

The authors propose that a patent insurance service is provided through direct insurance of private insurance companies. In this way part of the risk is moved from a private sector to a public sector, and a public sector gets a power to equalize a patent insurance arrangement's losses and profits. Consequently, a state can take a complement role of commercial insurance provider.

The authors believe that it is essential that gradually public sector can withdraw when market for legal expense insurance reaches good enough position, in terms of patent, legal systems and particular technologies. It is concluded that a number of new inventions can be greatly increased if a public sector provides services for the fields that do not have any private insurance companies.

4. Insurance Premium

Gortz and Konnerup think that a state may enter into agreement with commercial companies to calculate the insurance premium, but international agreement on premiums may eliminate the need for subsidy from state. Location (countries), technology groups and size of a company are assumed to be the main features to determine a premium in the commercial market. Other discussed considerations are importance of the company to the market, individual legal systems' approach to patent litigation, a level of charges and a broader assessment on the validity of the patent within the field. It is claimed that as a result of a state reinsurance program, part of the risk will be moved from the private insurance companies to the public companies. Consequently, insurance of risky patents will become more certain for commercial insurance providers. The authors think that the majority of insurance providers use standard methods for assessment of each patent's risk and a public sector's reinsurance program or insurance through commercial insurance companies eliminate just part of the risk

born by the commercial companies. That is why insurance providers' premium calculations are credible. It is proposed that a deductible reduces a risk of insurance abuse by the patent holders and contributes to disclosing a patent holder's evaluation of the risk.

5. Mandatory Insurance and Patent Assessment Method

According to the article, the patentees with higher risk of patent litigation are more likely to insure themselves than the patent holders, who do not think that would participate in patent litigation. It is claimed that mandatory insurance would lead to a greater number of insurances , which would substantially decrease an insurance company's costs per insurance subscriber, but this would result in less insurance premiums. On the other hand, according to Gortz and Konnerup, obligatory insurance may trigger the two problems. Firstly, it would reduce the number of patents. Secondly, many patent holders, who do not think that they would participate in patent litigation, would not subscribe to the insurance without being obliged to do so, and mandatory assessment would become a reallocation from patents with low risk to patents with high risk.

As it is claimed in the article, considerations on patent application and renewal mirror a private economic worth of patents, and a monopoly isn't the only value that the patent holder gets. For example, one of a patent's secondary values is that it precludes rivals from entering into certain fields. The main concept of the method is described as an argument that when a patent holder does not renew the patent, then it became so worthless that it does not worth to pay a renewal fee.

The reason why a litigation process is involved in the patent assessment model is explained by the authors in the following way: the authorities providing patents do not provide patent security. It is only a patent holder, who can protect his patent through a litigation;

consequently, the value of patent's security directly depends on the credibility of the threat to bring a lawsuit. It is argued that if the rivals think that the patent holder will protect his patent through a litigation process, they will not infringe the patent. Otherwise the patent will infringed and as a result, the patent will be worthless for the patent holder.

According to the authors, a patent value is not the same because the invention value, a patent holder's failure to enforce specific rights makes the patent worthless, but it does not affect the commercial value of the invention. They believe that the return from a patent is its commercial value during one year and a distribution of patent returns with specific age reveals many patents with very low worth and several patents with high worth.

According to the authors, a patent holder passes through a constants learning procedure on technical options of the invention and commercial market for the application of inventions, and as a result of the learning process, the returns from a patent can increase gradually. They argue that normally some patents have a long preliminary development period when their gain is very low. In case a patent is renewed despite the low profits in the beginning, it means that the patent holder expects much bigger profit in the future; consequently, the older the patent, the less is possibility to learn something new. Gortz and Konnerup claim that for a patent holder it's more likely to implement a three-year old patent rather than a fifteen-year old patent, and the reason is that the value of a patent gradually decreases and the patent holders would use the most beneficial opportunities of their patents. The authors continue with an argument that, as a result of the learning process, the renewed patents will receive higher income for every next year. This method accepts that a patent's return should be minimum as much as the previos year's profit upon depreciation, and if a patent holder learned something additional about the commercial exploitation of his patent, his return will exceed the previous year's depreciated level.

On the other hand, the authors argue that according to the traditional linear depreciation rate, every next year decreases asset's value by a fixed percentage, also there is a risk of sudden obsolescence , which is a 100% depreciation pulling a patent's value to a zero. The reason of the acute obsolescence is given as a new product, or a process that makes the old invention needless.

6. Main Reasons of Patent Renewals

Gortz and Konnerup think that the present return and the likelihood of counterbalancing the renewal fee with the future return, as well as the likelihood of winning a litigation are the main considerations in deciding on whether to renew a patent or not. Consequently, the higher the current and future returns, the higher the probability of renewal. They describe different conditions affecting patent returns as below:

- The higher the likelihood of the patent returns, the less the probability of it's renewal. The reason is that the patent holder is less likely to learn anything new;
- The earlier the patent holder becomes certain of the returns, the higher the likelihood of the negative return in the future and the less the likelihood of renewal;
- The longer the period of generating zero return in the beginning, the less the likelihood of renewal;
- The smaller the probability of immediate obsolescence and the smaller the depreciation rate, the greater the probability of renewal;
- The higher the legal expenses connected to a litigation, and the smaller the probability of winning the case, the less the probability of renewal;
- The more the renewal fee, the less the probability of renewal.

They also argue that the total patent valuation model reflects the likelihood and worth of patent renewal in the various age classes, and provide the below six variables of the methodl:

- The initial fluctuation of the patent returns;
- The rate of certainty of the patent returns;
- The likelihood of zero returns during the early years of the patents lifetime;
- The rate of traditional linear depreciation;
- The likelihood of sudden obsolescence;
- The likelihood of winning a litigation;

7. Patent's Welfare Promoting Features

According to the above mentioned article, patents may provide exclusive rights to produce, sell, import, or use a product. Having an invention, which is significantly different from the existing technology, is given as the main condition of getting a patent.

The same article provides two basic functions in the patent system: motivation for R&D and knowledge database. It is assumed that a firm's incentive for R&D is increased by taking out patents, which provides unique, but limited in time rights for an invention. Because all patents must become public, a patent system provides diffuse of knowledge. According to the authors, its underlined in the economic literature that the economic benefits of a patent overbalance its shortcomings, that is why there should be stronger patent protection policy. In this regard theoretical studies are backed by empirical conclusion, pointing importance of the patent system for R&D, innovations and economic growth.

It is argued that normally, countries with developed patent protection system have the highest level of prosperity and improvements of patent system, like patent insurance, lead to more patent implementations. Consequently, as a result of patent insurance scheme, more

inventions are patented since firms increase their researches when it is easier to get a patent, which promotes new invention and higher welfare. The authors think that the more inventions are patented, the more the diffuse of knowledge, which allows using existing inventions and leads to a higher efficiency. They conclude with the fact that higher efficiency is eventually an increased welfare, which is achieved because new inventions allow producing more with the same inputs of capital, labor and materials, or producing the same level of production with less input.

8. Effects of the Patent Policy on R&D

As it is stated by O'Donoghue and Zweimuller (1998), the theoretical literature emphasizes that R&D efforts, investments and activities can be increased substantially in the result of increased probability of getting patents. Gortz and Konnerup think that private R&D efforts and a number of inventions are positively correlated. According to them, these inventions may be aimed at improving the quality of production or altering the production procedure , which means that the same quantity of output may be produced and consumed with less activity, or more can be produced with the same amount of inputs.

It is said by the authors that there are plenty of analysis in the related literature on the link between inventions, efficiency and R&D efforts. Slok and Sorensen (2000) showed that increase in a government support for innovation by one Danish kroner will increase private research expenses by 1-1,5 kroner and partially increase efficiency by 2-2,5 kroner and approximately 12 years required to have R&D efforts absolutely worked out.

Gortz and Konnerup claim that because patented invention must be published, patenting diffuses knowledge, which provides other firms with a chance to use the previous innovations in the new research, other applications and industries. The result is increase in total

production. It is argued that, despite empirically it is difficult to show the relationship between the spread of knowledge, productivity and growth, plenty of empirical researches reveal the same direction and demonstrate that the influence of knowledge diffusion can be at least as important as the firms R&D. According to Griliches (1998), different empirical analysis claim that the total production is affected by the diffusion of knowledge up to the twice as much as by the research in companies. As it is described in the article, these results match with studies that show that the knowledge transfer between the firms is one of the main sources of increase in efficiency, and that the economic advantages of R&D, resulted from a diffusion of knowledge is much more efficient at macro level than at micro level.

Public subsidy makes R&D activities more efficient. Jones and Williams (1998) think that the ideal amount of investment in R&D is up to four times as big as the real level of investment, paid by private investors. Gortz and Konnerup conclude that, the economic influence of the patent insurance scheme, which decreases the patent enforcement costs, is divided into primary and secondary influence: the primary influence is an increased investment in R&D and secondary effect is diffusion of knowledge.

9. Patent Insurance Program Implementation

Danish Patent and Trademark Office strongly insisted on the establishment of the private insurance schemes in Denmark, and provided a substantial support to launch the scheme. According to the European Commission's Report from Conference on Making IPR Work for SMEs (2009), the first insurance company offered a generic patent insurance product to local companies in Denmark in December 2007. According to the same source, before Danish companies could buy only custom-made patent insurance products, which were not

affordable for SMEs. It is also mentioned that a private UK company - The Samian Underwriting Agency operates the insurance product,and then spreads the related risk by working with big insurance companies, including Lloyds of London. The described scheme is completely private and is not supported by Danish Patent and Trademark Office (DKTPO) or any other public organization. According to the report, the DKTPO revealed related information on Intellectual Property Rights in Denmark to all interested insurance companies and made proposals on components, that could be useful for SMEs in a patent insurance product.

The report reveals that the DKTPO raised awareness about possibility of taking out patent insurance on its website, in the newsletters and via information meetings and that the DKTPO's non-monetary support and stimulation have been substantial in promoting patent insurance scheme. This kind of support from national patent offices is valued as crucial, especially during the initial stages of development and market entrance.

According to the European Commission's Report from Conference on Making IPR Work for SMEs (2009), depending on degree of protection, geographic coverage and related field, annual expense for patent insurance varies between € 1,200 and € 32,000 and the typical SME patent insurance amount is closer to the lower end of the range.

As it is described in the report, the legal costs covered by insurance may include attorney and lawyer fees, expenses and disbursements. It is mentioned that as a legal result of SME's action against a third party infringing insured patent, sale or use of any product or process infringing insured patent may be prevented. The mentioned amount of indemnity varies between € 130,000 and € 650,000. According to the same source, depending on the level of protection insurance can cover only Denmark, The European Patent Convention Member States, European countries, Worldwide (without USA and Canada), Worldwide (with USA and Canada).

The described patent insurance covers:

- Factual or suspected infringement of the insured patents under the local patent laws;
- Defense of counterclaims brought by the defendant;
- Accidental infringement of the third party's patented product or process;

The described advantages of patent insurance include:

- SME's ability to protect the patent rights at affordable cost. The reason of relatively law cost of patent insurance is the spread of the risk among many SMEs, that insured their patents;
- Deterrence against patent infringement. The probability of infringement is much less for SME's holding insured patents;
- Full usage of patented assets. Patents protected by insurance against infringement by third parties have greater resale value.

Since the scheme was established in December 2007, it is too early to evaluate its performance. The essential support provided by Danish Patent and Trademark Office is given as a main reason for program's launch in Denmark. The main factor required for success of the patent insurance program is the high volumes. High volumes can make the scheme affordable for SME's and profitable for private sector investment. It was stated in the above mentioned report that a market size is substantial factor. The authors of the report suppose that most probably the insurance companies will concentrate on the main EU markets unless a Europe-wide solution is found. They conclude with an opinion that the main features of the key markets are big population of SMEs and high rates of patent registering.

Chapter Four: Compulsory Licensing

As it was described in the previous chapters, patent policy has various impacts on a country's economy. The main negative impact of a patent is a high probability of monopoly and the consequent abuse of that position. The risk of monopoly increases when a government provides a patentee with temporary, but unique rights. The legal impact of patents is an implementation of the legal instruments in order to prevent a creation of monopoly in a market. According to Julian-Arnold (1993), except prevention of monopoly, there are three other cases for implementation of compulsory licensing: dependent patents, non-working patents and patents that are essential for public interest.

In his article Maskus (2006) stated that, despite providing a motivation for new innovations, patents lead to monopolies. Consequently, it is very important to develop regulations to protect patents, and simultaneously maintain the right balance in a market. According to the author, a government uses compulsory licensing in order to enforce anti-monopoly regulations, and to compel a patent holder to use the patented innovations on a nonexclusive basis.

As it was stated in the international bureau of World Intellectual Property Organization "...,the beneficiary of a compulsory license has the right to perform acts covered by the exclusive right under an authorization given by an authority against the will of the owner of the patent for invention. For Julian-Arnold, a compulsory license is an involuntary contract between a willing buyer and an unwilling seller, imposed and enforced by the state. According to the author, the survey of international intellectual property law reveals four most prevalent compulsory licensing provisions, applicable to the below four cases :

- When a dependent patent is being blocked;

- When a patent is not being worked commercially;
- When it is in public Interest (Compulsory Licensing for Food and Medicine Inventions);
- When a remedy is needed in antitrust or misuse situations.

1. Dependent Patent

Correa (2007) claims that TRIPS Agreement and many national legislatures establish compulsory licensing for the cases, when an invention's implementation is impossible without infringement of a fundamental invention.

Julian-Arnold (1993) states that a dependent patent can not be developed without infringing a patent issued before, that is why the latter patent can not be issued unless two patent holders come to a licensing agreement. This condition is detrimental to society both because of the prevention of the new patent introduction, and delay due to possible litigation.

The author states that compulsory licensing provisions were included in Patent Laws of many states, and provides an example from Swiss Patent Law, Article 36:

If a patented invention cannot be used without violating the prior patent, the owner of the more recent patent shall have the right to the grant of a license to the extent required for such use of his invention, provided that that invention serves a purpose entirely different from that of the prior patent, or that it involves a considerable technical advance. Where both inventions serve the same economic purpose, the registered owner of the prior patent may grant the license on the condition that the owner of the junior patent in turn grants him a license or the use of his invention. In case of dispute, the judge shall decide on the grant of the licenses, their extent and duration and on the compensation to be paid.

(Systematische Sammlung des Bundesrechts (SR) (catalogue of Swiss Law), 232.14). However, the author points out that because of the high probability of lengthy opposition proceeding, causing waste of money and time, a cross license would be the best solution, meeting both party's economic interests, when the improvement is a technological progress.

In this case both the fundamental and dependent patent holders are interested in mutual licensing

According to the International Bureau of WIPO, the invention claimed in the dependent patent should be technically preponderant to the invention claimed in the previous patent. The aim of this requirement is a prevention of patent applications for trifling inventions.

2. Non-use

The second reason of obligatory licensing discussed by Julian-Arnold is non-use of a granted patent. The author states that a patent is accepted as a contract between a State and an individual, which grants a patent holder a unique right to exploit an invention. Consequently, a patent holder who fails to exploit the invention breaches an implicated condition, which leads to a patent grant's reduction or cancellation. According to Saunders (2002), patent non-use happens when a patent has not a current commercial value and when licensing is refused. Also he claims that a non-use may lead to monopoly and restrain technological development when a patent holder consciously keeps a patented product, service or process away from the market. As per Correa (2007) according to the Paris Convention, many developed and developing countries set up compulsory licensing for nonworking patents. He states that initially it was assumed as industrial use, but later on the concept was changed to commercial use in developed countries.

In the opinion of Julian-Arnold, non-use provisions are implemented to promote exploitation of patented inventions and prevent a patent holder from denying a public access to the required subject matter, which is detrimental to society. These provisions are divided into two categories: compulsory working and compulsory licensing. The author points out that "compulsory working" means that a patent should be worked out commercially within the

borders of the country, which granted the patent, whereas “compulsory licensing” means the governmental arrangement of non voluntary licensing between private parties. When compulsory licensing fails the patent is revoked.

An example sited by the author is Article 5 of the Paris Convention, recognizing a country's right to impose compulsory licensing provisions, which states:

1. Member states may legislate measures providing for the grant of compulsory licenses to prevent abuses of the exclusive rights conferred by the patent, for example for failure to work.
2. Forfeiture of the patent will not be provided for except where the grant of compulsory licenses is not sufficient to prevent abuses. Forfeiture or revocation of a patent will not be instituted before the expiration of three years from the grant of the first compulsory license.
3. A compulsory license may not be applied for on the ground of failure to work or insufficient working before the expiration of three years from the date of application for the patent, or four years from the date of the grant of the patent whichever period expires last. It shall be refused if the patentee justifies his inaction by legitimate reasons. Such compulsory license shall be non-exclusive and shall not be transferable even in the form of the grant of a sub- license except with that part of the enterprise or goodwill which exploits such license.
(International Convention for the Protection of Industrial Property, Mar. 20, 1883, 25 Stat. 1372, T.S. No. 379)

The author says that, generally, the provision is applied when a patent owner does not work his patent within an agreed time, denies to license patent on acceptable terms, does not meet a requirement for the product and when uses his patent to block the usage of another patent.

More detailed reasons of a patent non-use are provided by International Bureau of WIPO, which states that:: “Working of invention means any one of three things, namely, the making of a product that includes the invention, the making of products by a process that includes the invention, or the use of the process which includes the invention” (International Bureau of WIPO, Compulsory Licenses Measures in the public interest, BLTC/25; paras. 8-10)

3. Public Interest (Including Compulsory Licensing for Food and Medicine Inventions)

Correa believes that many countries use the concept of "public interest" as a basis for compulsory licensing and the concept varies from country to country and over time. Julian-Arnold states that a government can use an invention, or authorize to use an invention when it is crucial for national defense, economy or public health. Relevant laws of Chile and Republic of Korea are given as examples of these types of provisions. "In Chile a compulsory license may be granted when the patent holder has committed a monopoly abuse according to the Resolution Committee established under Decree-Law no. 211 of 1973....In the Republic of Korea a nonexclusive compulsory license may be required if the working of the patented invention is necessary in the public interest. (Law No. 19.039 Establishing the Rules Applicable to Industrial Titles and the Protection of Industrial Property Rights, (Ley Num. 19.039 Establece normas aplicables a los privilegios industriales y proteccion de los derechos de propiedad industrial) Diario Oficial de la Republica de Chile, No. 33.877 of January 25, 1991, pp. 1 et seq, as reported in Industrial Property Laws and Treaties, World Intellectual Property Organization, Volume 2, ; Laws and Enforcement Decrees of Industrial Property, The Office of Patents Administration The Republic of Korea, translated by the Office of Patents Administration, Articles 51, 59 and 60, 1988 edition.)

As its stated by Fergusson (2006), World Trade Organization (WTO) made an agreement on the application of compulsory licensing for life-sustaining medicines in developing countries in 2003. According to the same article, later the agreement was added to Trade-Related Aspects of Intellectual Property Rights (TRIPS) as an amendment. The author thinks that compulsory licensing for medicine may not be as effective as it was expected in developing countries because in many developing countries patent policy did not cover pharmaceutical industry before 2006.

However, Julian-Arnold (1993) provides five main reasons why a country may have a legitimate interest keeping and stimulating its own science-based pharmaceutical industry. First, the science based pharmaceutical industry helps with the employment of local chemists, doctors, pharmacists; physiologists etc., which in its turn reduces probability that they will leave their country for better employment opportunity. Second, a local pharmaceutical industry may have an enormous contribution to the economy. Third, a local industry is in a more advantageous condition to produce medication corresponding to local average income. Fourth, because of the tremendous cost of a medicine development, as a rule, a small country is not in a position to develop a new medicine, in case it is not a base for a multinational company. Fifth, local pharmaceutical industry plays essential role for national defense.

4. Essential Facilities

As it was argued by Aoki and Small (2002), when input or factor of production has no economically competitive replacement, it becomes an "essential facility". It does not mean that a duplication of that input is impossible, but that the cost would be too high, which means not economically competitive. According to them, essential facilities must be very important for an economy. Telecommunications network and railroad line are typical examples of essential facilities. Normally, market power is gained by refusing or constraining rival's access to the essential facility. The authors also point out that this result may be achieved by imploding a production through exceptional agreements or by requiring unacceptable access fees for a facility.

In their article “Essential Facilities Doctrine under United States Antitrust Law”, Pitofsky, Patterson and Hooks (2002) write that the “classic” approach of the essential facilities doctrine was applicable to natural monopolies, but later cases in U.S. enforcement policy

showed that the doctrine also was applicable to the intellectual property assets. The case of Image Technical Seroices, Inc. v. Eastman Kodak CO was given as an example of the doctrine's application to the intellectual property asset. As a result of the case, the court required Kodak to sell its patented replacement parts on acceptable terms to companies competing with Kodak for servicing of Kodak copiers. The court stated that: "neither patent nor copyright holders are immune from antitrust liability" (Robert Pitofsky, Donna Paterson, Jonathan Hooks, “Essential Facilities Doctrine under United States Antitrust Law” Georgetown Law Faculty Publications and Other Works, pp 455) The court concluded that a firm's refusal to license a protected intellectual property asset, based on anti-competitive intent, could make a firm subject to antitrust liability. This example reveals the change in the nature of the “essential facilities doctrine” in US and its application to the intellectual property rights.

The ensuing example from Ervard (2004) describes the doctrines application in European Union. According to Ervard's (2004) article “Essential Facilities in the European Union: Bronner and Beyond”, in EC law the essential facilities doctrine is provided under Article 82 of the EC Treaty. This article bans misuse of prevailing position in the market. To demonstrate the application of the essential facilities doctrine the author gives an example of CICRA and Maxicar v. Renault (1988), Case No: 53/87 and Volvo v. Erik Veng (1988), Case No: 238/87. Renault and Volvo denied providing independent manufacturers with a license to import, manufacture or sell reproductions of their spare parts without their permission. The manufacturers of spare parts claimed that this leads to abuse of dominant position. The Court of Justice said that, even in exchange for an acceptable royalty, the denial to license in itself does not lead to an abuse of the dominant position.

However the Court stated that the use of intellectual property rights might be an abuse if it includes:

- the arbitrary denial to provide independent repairers with spare parts;
- the unjust fixing of spare parts' prices at certain level;
- a decision to not manufacture spare parts for a certain model, despite exploitation of many cars of that model.

The above statement makes it clear that mere denial to license is not sufficient to be regarded as patent abuse, but only denial supported by other certain conditions might lead to patent abuse.

5. Developing and Developed Countries

Julian-Arnold (1993) believes that protection of patents is an expensive enterprise. The substantial part of the cost is administrative: training and coordinating the bureaucracy of patenting system. The author also argues that, there is a general impression in developing countries that patent protection helps developed countries to keep the economic power. The author continues with the second reason why developing countries hesitate with implementation of patent protection. Piracy can provide developing countries with the goods and services at low cost and also provide an economy with thousands of new jobs. Reichman and Hasenzahl (2003) warn the developing countries that TRIPS regulations that are favorable to them now, could be expelled by protectionist regulations added as a new treaty on patents in the future. Nevertheless, Julian-Arnold states that now developing countries suppose that multinational corporations would set high prices in local markets for products produced in developed countries. Consequently, because of different needs, developed and developing countries have different points of view regarding compulsory licensing.

The author says that the general opinion in the developed countries is that any restriction to the patent grant discourages researchers and deters investment. As a result, compulsory

licensing would decrease the investment in inventions. Reichman and Hasenzahl think that this approach is based on strong belief in competitive market regulations in U.S. Government's intention to increase R&D investment, and to efficiently apply competition law are given as other reasons of the approach. To emphasize the approach Julian-Arnold points out that U.S. Patent law does not include compulsory licensing. She also claims that countries applying such provisions were criticized by U.S. Government and multinational companies. According to the article, compulsory licensing for private competition is not supported in U.S. with exception for regulations for actual abuse of antitrust law.

Correa (2007) writes that despite there is no strict method for competition law implementation and the developing countries can apply individual approaches, it would be useful for them to use the concepts of “refusal to deal ”and ”essential facilities”, applied in developed countries. He concludes with an opinion that many developing countries were forced to implement changes in their intellectual property regulations, but legal mechanisms to prevent misuse of these rights are still weak or don't exist at all.

According to the author, despite there is no international regulation for competition law implementation, and the developing countries can apply individual approaches, it would be useful to use the concepts of “refusal to deal ”and” essential facilities” applied in developed countries.

Conclusion

The contribution of this paper is an attempt to reveal the gaps of the current patenting system and discuss alternative approaches for implementation of more effective patent policy. The discussion in this paper shows that monopoly and incentive for innovations are not the direct, stable and indisputable economic impacts of the patent policy. In order to curb abuse of patents, governments take legal measures. Patenting serves as a motivation for large companies, but SMEs generally, do not benefit from patenting, due to economic and legal restrictions.

Two measures, the patent portfolio theory and patent insurance program, were proposed by the authors, to make the patent system more efficient. Patent portfolio theory demonstrates patent portfolio's priority over individual patents and proposes patent portfolio as a solution to the current incomplete patent system. Despite some counterarguments, the theory is valuable for large companies, but SMEs generally, can not afford themselves to pay for patent portfolios.

According to the patent insurance program, SMEs are vulnerable to litigation costs, that is why they usually, prefer not patenting innovations in order to avoid potential litigation. Consequently, patent insurance program is proposed as a measure to help SMEs to invest in R&D and patent their innovations.

Both patent portfolio theory and patent insurance program are relatively new and have not been widely used yet. Given the advantages of the offered methods, they can make the traditional patent policy more efficient and help SMEs to actively participate in patenting.

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