

## Patent Policy in an Innovation Driven Economy: Schumpeter’s “Innovation Wave” Perspective

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**Abstract:** *Purpose* – This paper applies Schumpeter’s innovation theory approach to current patent policy. The theoretical analysis examines whether the patent policy harms the innovation level in the innovation driven economy. The aim of this paper is to answer the question: Is current patent policy stimulating or does it have a destructive impact on economic development driven by innovations?

*Design/methodology/approach* – In this paper there is a discussion of how patent policy can influence the innovation level in an Innovation Driven Economy. The author has focused on a literature study and has presented a theoretical concept of the “Patent Wave Curve”.

*Findings* – Part I of this paper discusses the role of patent policy in the economy and highlights policy concerns raised by the actions of certain entities. Part II concludes with a brief overview of Schumpeter’s innovation wave concept in the conditions of increased amounts of patent applications. The author therefore suggests that the economic and patent policy debate should change its attention toward finding significant ways of identifying innovation destructive behaviours, instead of eliminating certain business models.

*Originality/value* – With reference to Schumpeter’s innovation theory the author presented in a paper the “Patent Wave Curve” concept. Having regard to Schumpeter’s creative destruction, patent racing theory, the current number of patent applications and patent policy problems (such as NPEs or PAEs activity) there is a point in the economy when without proper impulse it is pushed into an “innovation stagnation trap”.

**Keywords:** patent, policy, innovation, economy

### Introduction

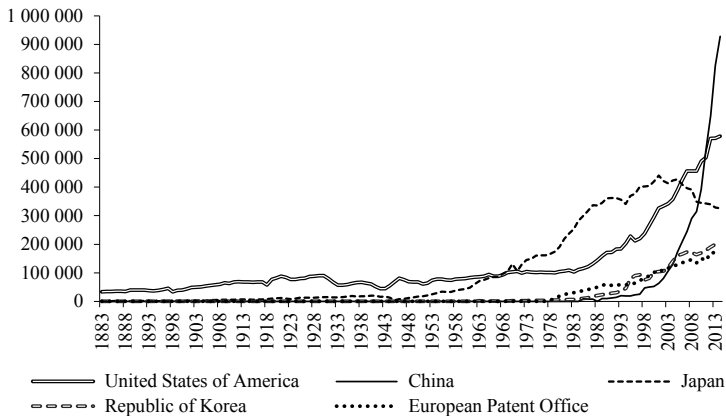
Patent policy should create the conditions in which the protection of intellectual property rights (IPR) should lead to a sense of security by the holder of the patent, and the sense of sanctions from the person or entity violating this law. Intellectual property (IP) protection is an essential and substantial mechanism for protecting a company’s competitiveness (Amara et al. 2008: 1530; Teece 2000: 35). This is fortiori significant because the risk of unanticipated knowledge leakage or innovation imitation is always present (Falvey et al. 2006: 10). Companies gain effective IP protection through intellectual property laws that mitigate such risks as firms that commercialize innovative products in the marketplace (Cohen et al. 2000: 2).

Observed phenomena associated with economic development and some negative consequences of the use of patent policy intensified in recent years. The establishment of the

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United States Court of Appeals for the Federal Circuit (CAFC) in 1982 led to a strengthening of patent rights (Jaffe 2000: 532). Latterly, there was an extreme “explosion” of patent applications at The United States Patent and Trademark Office (USPTO) (Hall 2005: 35, Hall and Ziedonis 2001: 101, Kortum and Lerner 1999: 2, Meurer 2009: 676), and a congruous increase has been noticeable at the European Patent Office (EPO) since the 1990’s (von Graevenitz et al. 2007: 4). Between 1978 and 2014 EPO has studied over 3 million patent applications. Only in 2014 it received over 170,000 patent applications. In the same year USPTO analysed almost 580,000 potential patents. Apart from Japanese and the Republic of Korea Patent Offices, the most significant increase of applications (which amounted to 928,177) was observed in China (see Figure 1). It means that the China Patent & Trademark Office in 2014 was studying 2,543 patent applications a day, which makes 1.76 patent applications per minute.



**Figure 1.** Number of patent applications for the top five offices in the world (1883–2014)

Source: WIPO Statistics Database, 2015.

In 1985 in the top five patent offices in the world almost half of million patent applications were submitted. In 2014 this amount was around 2.2 million, which gives increase of almost 450% in that period. The undisputed cause of such a situation is the development of a Knowledge Based Economy (KBE), innovation policy and technological development. Knowledge and information has now become not just part of doing business, but is a key value driver of a company. One can even risk posing a statement that nowadays we have more to deal with an Innovation Driven Economy (IDE) than with a KBE (Lee and Wang 2003, Goh 2005, Zweimüller 2000, Sadkowska 2009). In the IDE there is less heavy industry and more and more services, inventions and commercialization processes. It can be observed in the decreasing value of tangible assets in enterprises and an increasing number of intellectual properties. Patenting, however, is one of the most important technology protection

mechanisms employed by innovative firms both in developed economies (Cohen et al. 2002: 1350) and in emerging economies (Zhao, 2006: 1195).

This paper applies Schumpeter's innovation theory approach to current patent policy. The theoretical analysis examines whether the patent policy harms the innovation level in an innovation driven economy (IDE). The aim of this paper to answer the question: Is current patent policy stimulating or has a destructive impact on economic development driven by innovations? Part I of this paper discusses the role of patent policy in the economy and highlights the policy concerns raised by the actions of certain entities. Part II concludes with a brief overview of Schumpeter's innovation wave concept in the conditions of an increased amount of patent applications. The paper is prepared in the historical - empirical mainstream.

## **1. Patent and the patent policy in the IDE**

Without intellectual property rights, technological (and not only) knowledge would be public property. The inventors' competitors would be able to imitate the idea without a penalty and claim the new knowledge to be their own. If companies want to make the production of technological knowledge available not entirely free of charge, they must invoke their temporary monopolistic right accorded by patenting. The patent right is therefore one of the important so-called "property rights" or "rights of free disposal", which play an important part in more recent developments in microeconomic theory. In the IDE context, the patent is the most important property right (Grupp 2007: 507).

Although literatures explore patent systems from various perspectives, such as morality, gender, race, etc., most patent systems in most industrialized nations are heavily influenced by some version of a utilitarian law and economics perspective (Hughes 1988: 287, Mossof 2007: 689). The major driver of patent policy development is the competitiveness of entities and entrepreneurs applying for a patent system.

If all participants in the process of implementing innovations could imitate without cost, any innovation as soon as it is introduced then we could not expect to improve the competitive position resulting from the possession of innovation. Accordance with the above assumptions, if an entity would improve its complete position, the rest of the population would immediately catch up and then the competitive advantage is unchanged. Therefore, patents and the comparative speeds of innovating become a stimulus preserving mechanisms. As long as one entity can innovate faster than other entities imitate, some appearance of rewards are maintained. long term innovation is about determining and maintaining the competitive process. Nevertheless a population of identical behaviours cannot generate competition (Metcalf 1998: 103).

Patent genesis, irrespective of whether a statistic is or is not available, affects the innovation behaviour of the market participant. Many innovation processes would take a totally different course without patent protection. Patent protection may act as the instigator

of innovative activities, because it helps the innovator to obtain temporary monopolistic rents. To this extent, in a market economy, the patent system can embody an aspect of knowledge allocation closely resembling the allocation of traditional economic goods (Grupp 2007: 510).

The protection of IP is the most common motive of patent application but in IDE one can identify new motives. In literature there were identified five motives of patent applications: The prevention of imitation, signalling, securing the freedom to operate, generating licensing opportunities and blocking (see Table 1).

**Table 1**

Identification of patent applications motives

Motive	Description	Research
Prevention of imitation	One of the most widespread motives, it is the foundation of the patent system, it rewards the inventor for publishing the invention with the legal right to exclude others from using it.	Arrow (1962), Nordhaus (1969), Mansfield et al. (1981), Teece (1986), Eaton and Kortum (1999), Shane (2001), Landes and Posner (2003), Schlicher (2003), Yiannaka (2011), Slivko and Theilen (2014).
Signalling	Patent is used as a “signal” to potential investors, partners and stakeholders, patent application informs about technical quality and the inventive step of the invention and about the invention’s novelty, it also determines economic monopoly in terms of exclusion right, additionally patent application improves patent databases for competitors “screening process”.	Gallini (1992, Arundel (2001), Long (2002), Mann (2005), Lemley and Shapiro (2005), Blind et al. (2006), Christensen (2008), Gick (2008), Graham et al. (2008), Sichelman and Graham (2011), Hoenen et al. (2014).
Securing the freedom to operate	Freedom to operate gives the “right to practice the invention in the first place”, patent publication makes the underlying invention prior art and prohibits any third party from patenting the same invention.	Baker and Mezzetti (2005), Blind et al. (2006), Henkel and Pangerl (2008), Rassenfosse et al. (2008), Henkel and Jell (2011), Beldiman (2012).
Generating licensing opportunities	Out-licensing can be a profitable option if the firm does not have the required resources and complementary assets to manufacture and sell a product based on a new invention, licensing is attractive for entities whose “core business” is research and development rather than manufacturing and production, e.g., universities or so-called Patent Assertion Entities (PAEs) or Non Practicing Entities (NPEs).	Teece (1986), Levin et al. (1987), Arora (1997), Duguet and Kabla (1998), Cohen et al. (2000), Hall and Ziedonis (2001), Parchomovsky and Wagner (2005), Rassenfosse et al. (2008), Blind et al. (2009), Fukugawa (2009), Hytonen et al. (2011), Kiebzak et al. (2016).
Blocking	Patents can be intended to prevent competitors from commercializing substitute products or technologies (patent “fencing”), strategies by PAEs or NPEs or “patent trolls” are based on patenting (or acquiring patents) without manufacturing the underlying invention, PAEs “are patent holding individuals or (often small) firms who trap R&D intensive manufacturers in patent infringement situations in order to receive damage awards”.	Cohen et al. (2000), Cohen et al. (2002), Granstrand (2000), Jell and Henkel (2010), Reitzig et al. (2007), Reitzig (2004), Schneider (2008), Ho-unshell and Smith (1988), Cotropia et al. (2014), Hemphill (2014).

Source: own preparation based on Schumpeter (1942); Hughes (1988); Kaufer (1989); Cohen et al. (2000); Blind et al. (2006); Burr et al. (2007); Graham et al. (2008); Sichelman and Graham (2011); Veer (2012).

It is worth noting that the two last motives presented in table 1 were related to Patent Assertion Entities (PAEs) activity. Those are companies whose business models are focused on enforcing patents against infringers in order to receive damages or settlement payments (Golden 2007; Lemley and Shapiro 2007; Reitzig et al. 2007; Reitzig et al. 2010). The phenomenon of PAEs is often considered as being overrated, but has still caused significant litigation cases and financial losses and therefore draw the attention of economic research (Bessen et al. 2011). According to Meurer (2012) more than 500 billion USD has been lost in 1990–2010 in the US economy. “Blocking” as a motive of patent applications is a kind of *signum temporis* in IDE. Because of the results of the negative impact of activity PAEs on patent policy companies have recently become the subject of a lot of research. While the adequate quality of patent files is a fundamental requirement, efficient IPR enforcement also postulates an essential factor for a working patent system that should particularly create encouragement to innovate and not to opportunistically block the market with a dense web of patent files. At this moment we are not able to give solutions for patent spinney or the increasing number of patent wars resulting in multiple litigation cases. However, we should consider that activity of PAEs that might have negative effects but may also cure the failures of the patent system (Pohlman et al. 2013: 118).

According to the position of IPR in IDE there should be an exploration of the law and economics of patent approaches. In particular, there should be examined the different policy goals these approaches develop and the major areas of significant conflict in contemporary policy debates about patents. The basic theme is that enforcing patents as IPR can improve the socially constructive coordination that simplify the complex process of commercializing the invention, thereby improving both access and competition (Etkowitz and Leydesdorff 1997: 131; Agarwal and Gort 2001; Kieff 2003; Kieff 2006; Kieff 2007).

The patent system solves two problems caused by innovation. Firstly the monopoly position allowed by the patent corrects the inadequate inducements to invest in private R&D. Secondly the publication of the patent provides the diffusion of the invention. Therefore, this conception determines the patent system as a perfect source of social and technological efficiency in the long term. Hence, growth driven by innovation should compensate the static deadweight loss of the transitory monopoly position. Furthermore the limited span of the IPR granted by the patent (the official maximal patent life) strengthens this positive dynamic effect by limiting the number of periods during which this deadweight loss occurs. The weaknesses of the patent system has been enhanced in the literature since Arrow's classic article (Arrow 1962), that underlines the necessity for the patent system to be extremely complex and subtle in order to secure the complete appropriation of the invention by the innovator (Yildizoglu 2009: 389). How is this shaped by the image of the patent system in the light of Schumpeter's theory of innovation and long wave cycle?

## 2. Patent racing and Schumpeter's innovation wave concept

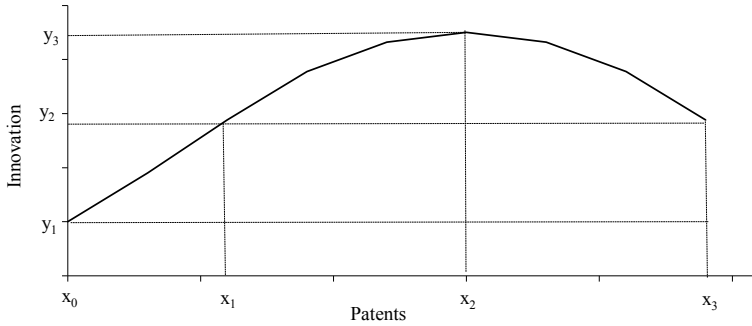
Patent documents are a potential source of “idea-creating” knowledge spill overs because firms are allowed to study patent documents, not only to investigate whether a new product or process is likely to be patentable or not, but also to collect relevant research information. This information may be used freely, as long as the patented product or process is not imitated. In reality patents offer far from perfect protection against imitation (Arundel et al. 1995: 7). Furthermore broad patents have the potential to damage the creativity of the capitalist model (Merges and Nelson 1990: 912). The negative impact of patents and patent policy on the economy can be expressed in many ways. It is impossible to assess patent policy without considering the long-term cycle and assumptions of Schumpeter's theory of innovation. Furthermore Schumpeter's proposition from *Business cycles* concerning long economic cycles, which are given a shift by waves of radical innovations, has been recognized by the author of this paper as a basis for further considerations. In view of recent research, Schumpeter's long cycle wave proposition appears to be highly realistic because (Kleinknecht 1986: 108):

- there is evidence in recent history of a long wave pattern in indicators of the general economic activity of various countries,
- innovation data on various definitions independently confirm that radical innovations are not distributed randomly over time but tend to cluster in the late depression and early upswing period of long waves,
- arguments are brought forward to explain the waves of innovations as an endogenous element of the long wave process.

Schumpeter actually argued that innovation leads to a temporary monopoly, not that monopoly leads to innovation. Furthermore, Schumpeter's purpose of his analysis of firms was did not answer the question: how firms innovate or a defense of monopolies and oligopolies. It was rather an evolutionary analysis of how technology in a specific institutional context changes the structure of the economy and eventually changes the institutional context (Mayhew 1980).

Let's assume hypothetically that there is a given level of patents ( $Y$ ) in a patent system and in the economy that is so high, that it “paralyzes” the system and causes a decrease in the level of innovation ( $X$ ). In this condition the patent function of enforcing diversity of innovation was not followed. Consequently a further increase in the number of patents in the system leads to a decrease in the level of innovation in the economy. A concept can be determined as the “Patent Wave Curve” presented in Figure 2.

This conception assumes that there is a certain level of innovation  $y_1$  which occurs without any patents functioning in the economy ( $x_0 = 0$ ). If the works of the inventor can be copied without cost, others may turn invention into innovation, and erode the incentives to invest in the invention. This has been recognized as a justification for patent and copyright systems and rightly so for a long time. Inventors and innovators may still gain an adequate



**Figure 2.** Patent Wave Curve

Source: own preparation.

return from their investments without patent protection. Secrecy, or a short product life cycle, are familiar examples and help explain why patent protection is only considered as being significant in a small number of industries, those with high invention costs and long lead times to the market. (Metcalfe 2007: 949). At the point of coordinates  $x_2$  and  $y_3$  there is maximum level of innovation in the economy. You can therefore venture to say that the patent policy can generate innovation effectively in the economy only between  $x_0$  and  $x_2$ . A further increase in the number of patents in the economy (above the  $x_2$ ) will cause a decrease in the level of innovation in the economy but only to the  $y_2$  level (which corresponds to  $x_1$  number of patents). You can therefore identify three stages in the development of innovation in the economy because of the number of patents in the system:

- stage of “rapid growth of innovation level” where  $Y \in <y_1, y_2>$ , and where the number of patents is  $X \in <x_0, x_1>$ ,
- stage of “stabilization of innovation level” where  $Y \in <y_2, y_3>$ , and where the number of patents is  $X \in <x_1, x_2>$ ,
- stage of “decrease of innovation level” where  $Y \in <y_2, y_3>$ , and where the number of patents is  $X \in (x_2, x_3)$ .

In this part of a paper two questions occur: Whether it is possible to increase the level of innovation in the economy above the level  $y_3$ ? and: Whether it is possible to increase the number of patents in the economy above the level of  $x_3$ ? J.A.Schumpeter believed that the presence of discrete and “revolutionary” changes in the economy is the core of “economic development” that “kicks” the economy out of its static mode (“circular flow”) and sets it on a dynamic growth path (Schumpeter 1942: 15). The point with coordinates  $(x_3, y_2)$  is crucial for the presented concept. At that point the economy without a proper impulse is pushed into the “innovation stagnation trap”. A Solution to this problem may be the emergence of “creative destruction” in the economy. Schumpeter believed innovation is the centre of economic change causing “gales of creative destruction”. As a result in the presented concept there will be an alternative point  $y_3'$  fulfilling the assumption:  $y_3' > y_3$ . It means that “creative

destruction” contributes to the creation of new (higher) levels of innovation possible to generate in the economy in the long term.

The presented concept is also in line with a “patent racing theory” proposed as an alternative to the traditional economic analysis of the patent system. Implementing innovations through inventions has a social nature. A multiple independent invention is very common and often occurs nearly simultaneously. Especially because this is a situation where more than one individual or team makes the discovery independently from each other (Lamb and Easton 1984; Simonton 1979, 2010). The “Patent racing theory” holds that intellectual property rights may benefit society particularly through the fostering of a racing culture among inventors and their employers (Lemley 2012). Evaluating the effects of “patent races” on innovation we can arrive at two conclusions. Firstly “patent races” have the potential *advantage* of spurring innovation. “Patent races” can increase the probability of innovation when inventors have different ideas for how to solve a targeted problem. “Patent races” can also accelerate progress when it is the case that with enough attempts, any approach can be made to succeed. Secondly because of their “winner-takes-all” nature, “patent races” have the *disadvantage* of generating the wasteful duplication of efforts: many contenders invest resources to reach the same target but eventually, only one of them will be rewarded, meaning that the others invested in vain (Scotchmer 2005: 112, Belleflamme 2014). Furthermore “patent races” can be duplicative. If the innovation effort has high fixed costs, “patent races” can have the deleterious effect of increasing social costs without accelerating innovation. The “patent race” involves costs in the economy without significant benefits (Scotchmer 2005: 189).

## Conclusions

The observed negative consequences of patent policy have intensified in recent years. Still the major driver of patent policy development is the competitiveness of entities and entrepreneurs applying to a patent system. Whereas however “patent races”, “generating licensing opportunities” and “blocking” patent application motives shifts the competitiveness of firms to another level of consideration. We should evaluate the patent policy as a perfect source of social and technological efficiency in the long term. It should be noted that newly emerging goals apply for patent protection resulting from the activities of companies such as PAEs or NPEs. The author presented the “Patent Wave Curve” as a concept of determining the point when without “creative destruction” the innovation level in the economy will be decreasing. The concept is based on the J.S. Schumpeter’s assertion that the presence of “revolutionary” changes in the economy is the core of “economic development” that “kicks” the economy out of its static mode and sets it on a dynamic growth path. The presented concept is also in line with the “patent racing theory” proposed as an alternative to the traditional economic analysis of the patent system highlighting that innovations through inventions have a social nature. The author therefore suggests that the economic and patent



policy debate should change its focus toward finding significant ways of identifying innovation destructive behaviours, instead of eliminating certain business models and focusing on long-term efficiency analysis.

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#### **POLITYKA PATENTOWA W GOSPODARCE OPARTEJ NA INNOWACYJNOŚCI: PERSPEKTYWA SCHUMPETEROWSKIEJ FALI INNOWACJI**

**Streszczenie:** *Cel* – W artykule wykorzystano Schumpeterowską teorię innowacji w odniesieniu do współczesnej polityki patentowej. Przeprowadzona analiza teoretyczna kształtu współczesnej polityki patentowej uwzględniła zagadnienia dotyczące możliwości rozwoju lub ograniczania rozwoju gospodarki opartej na innowacyjności. Celem artykułu była odpowiedź na pytanie: Czy współczesna polityka patentowa ma konstruktywny czy destruktywny wpływ na gospodarkę opartą na innowacyjności?

*Metodyka badania* – Autor opracowania dokonał przeglądu literatury przedmiotu oraz zaproponował koncepcję „Krzywej Fali Patentowej”.

*Wynik* – W części pierwszej artykułu przeanalizowano rolę polityki patentowej w gospodarce z uwzględnieniem działalności negatywnej pewnej grupy przedsiębiorstw. W drugiej części opierając się na teorii innowacyjności J.A. Schumpetera oraz teorii „wyścigów patentowych” uwzględniono w rozważaniach drastyczny wzrost aplikacji do urzędów patentowych. Sugestią autora artykułu jest aby podczas debat ekonomicznych dotyczących polityki patentowej zmienić punkt nacisku z eliminacji niepożądanych w gospodarce podmiotów na eliminację destruktywnych zachowań systemowych.

*Oryginalność/wartość* – W artykule autor zaprezentował koncepcję „Krzywej Fali Patentowej”. Koncepcja oparta jest o założenia „kreatywnej destrukcji” Schumpetera oraz teorii „wyścigów patentowych”. Koncepcja ma o tyle istotne znaczenie ponieważ nasiliła się ostatnimi czasy działalność spółek typu NPE oraz PAE wraz ze zintensyfikowaną działalnością w ramach aplikacji do urzędów patentowych.

**Słowa kluczowe:** patent, polityka, innowacja, gospodarka

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