



Paper to be presented at the DRUID Academy conference in Rebild, Aalborg, Denmark on January
21-23, 2015

Does utility model protection substitute or complement patent protection?

Jussi Heikkilä

University of Jyväskylä
School of Business and Economics
jussi.heikkila@jyu.fi

Abstract

While the effect of changes in patent protection strength on innovative activity has been studied extensively, the role of second tier patent protection in national innovation systems has been a neglected research topic. Empirical evidence on the interaction between patent and second tier patent protection, especially in advanced economies, remains very scarce. This paper studies how the abolition of Dutch short-term patent system affected the level of domestic patent filing activity in the short and medium run. Synthetic control method is implemented to investigate the effect. The results indicate that the abolition of the short-term patent institution did not affect the level of domestic patent applications, which indicates that there was a shift from short-term patents to normal patents. The result questions the justification of the short-term patent protection in advanced economies: a better option might be to adjust patent systems for the needs of SMEs and individual inventors than to have separate second tier patent protection institutions.

The relationship between first and second tier patent protection:

The case of the Dutch short-term patent system abolition¹

Jussi Heikkilä²

Jyväskylä University School of Business and Economics

December 2014

ABSTRACT

While the effect of changes in patent protection strength on innovative activity has been studied extensively, the role of second tier patent protection in national innovation systems has been a neglected research topic. Empirical evidence on the interaction between patent and second tier patent protection, especially in advanced economies, remains very scarce. This paper studies how the abolition of Dutch short-term patent system affected the level of domestic patent filing activity in the short and medium run. Synthetic control method is implemented to investigate the effect. The results indicate that the abolition of the short-term patent institution did not affect the level of domestic patent applications, which indicates that there was a shift from short-term patents to normal patents. The result questions the justification of the short-term patent protection in advanced economies: a better option might be to adjust patent systems for the needs of SMEs and individual inventors than to have separate second tier patent protection institutions.

Keywords: second-tier patent protection, short-term patent, utility model system, patenting activity, synthetic control method

JEL: O34, O38

¹ A paper to be presented at DRUID Academy Conference 2015 on Economics of Management and Innovation, Technology and Organizations. Aalborg, Denmark, January 21-23, 2015.

² Doctoral student at Jyväskylä University School of Business and Economics, Email: jussi.heikkila@jyu.fi

1 Introduction

“Institutions like the patent system or the Small Business Innovative Research (SBIR) grants program are themselves ideas. These institutions have evolved over time to promote an efficient allocation of resources, but it is almost surely the case that better institutions – better ideas – are out there to be discovered.”

Charles Jones 2005

Utility models and short-term patents are intellectual property rights, which are especially designed to protect minor and improvement inventions. They are generally referred to as second tier patent protection instruments³. They supplement patent system as innovation policy instruments and they may be used as alternative protection methods for technical inventions. Second tier patent protection has been considered especially beneficial for developing countries since it can be used as a learning device in technological catching up process (Kim et al. 2012, Suthersanen 2006), but to my knowledge there exists no empirical evidence of its benefits for advanced economies. In fact, increasing number of authors has questioned the need for such systems in advanced economies especially due to the potential legal uncertainty, which unexamined patent rights may create (e.g. Janis 1999, Björkwall 2009, Königer 2009, Bielig 2012).

Second tier patent protection systems differ between countries⁴ and jurisdictions but the main differences relative to patent protection are shorter period of protection (generally 6-10 years), lower application costs and less stringent patentability requirements (Kim et al. 2012)⁵. Furthermore, the pendency time from application to grant is usually much shorter than in case of patents because in most jurisdictions there is no examination for novelty and inventive step. Probably due to the lack of international harmonization, the share of resident applicants of total utility model applications worldwide was as high as 98.1% in 2012 (see

³ In this paper the general umbrella term “second tier patent protection” is used to refer to any kind of utility model and short-term patent system.

⁴ According to WIPO(2013) around 75 countries provide protection for utility models.

⁵ For an overview see World Bank’s and OECD’s Innovation Policy Platform on utility models: <https://innovationpolicyplatform.org/content/utility-models?topic-filters=12277>.

WIPO 2013, pp. 92-95)⁶. Thus, second tier patent protection is mainly a protection method for domestic firms and individuals.

The first second tier patent protection system, which still is in place, was introduced in Germany in 1891 to fill the gap between design and patent protection (Commission 1995, Janis 1999, Suthersanen et al. 2006)⁷. Since then, many countries have adopted some sort of second tier patent protection system⁸ to create incentives to invest in R&D of minor inventions. However, still after over 120 years of practice, the empirical evidence on the effectiveness of second tier patent protection systems is scarce and the relationship with patent protection remains obscure (Janis 1999, Kim et al. 2012). According to Janis (1999) the second tier patent protection has been considered as “backwater of intellectual property”, since TRIPS does not explicitly mention it and leaves WTO members with freedom to formulate their own second tier patent regimes as they see fit (see also Königer 2009, Boztosun 2010). The result is a lack of harmonization and very scarce empirical evidence on the functioning of second tier patent protection systems. It remains especially unclear whether advanced economies actually need second tier patent protection to supplement normal patent protection in order to boost innovative activity.

This paper aims to shed light on the interaction between domestic first and second tier patent systems by providing empirical evidence on the abolition of the Dutch short-term patent system in June 2008. As the trend in harmonisation of patent protection has been the strengthening of IPRs (see e.g. Ginarte & Park 1998, Mazzoleni & Nelson 1998, Sakakibara & Branstetter 2001, Gallini 2000, Moser 2005, Qian 2007, Park 2008, Lerner 2009), the case of Netherlands provides a rare opportunity to study weakening of an IPR system. As we do not observe a counterfactual, i.e the Netherlands with short-term patent protection after the abolition, synthetic control method (Abadie & Gardeazabal 2003, Abadie, Diamond & Hainmueller 2010, 2014) is applied to construct one in order to investigate the treatment effect of Dutch “zesjarige octrooi” abolition on domestic patenting activity.

⁶ It should be noted that about 90% of all world’s utility model applications are Chinese and in China the share of non-resident utility model applications in 2012 was 0.8% whereas in e.g. Germany the share was 22.9% (see WIPO 2013).

⁷ According to Janis (1999) the 1891 German utility model regime was originally conceived as a form of design protection.

⁸ Utility models and its equivalents are sometimes referred to as “petty patents” (Australia, Thailand), “short-term patents” (e.g. Belgium, Ireland, the Netherlands), “certificate of utility” (France) or “innovation patents” (Australia).

The paper is structured as follows: In section 2 the economics of the second tier patent protection is discussed, section 3 presents the case of the Dutch short-term patent system abolition and section 4 concludes.

2 Economics of second tier patent protection

“Patent law and utility model law [are] both set out to protect technical inventions, so that friction between the two systems cannot be ruled out.”

European Commission (1995)

This section discusses the role of second tier patent protection institutions as parts of national innovation systems and their relationship with normal patent institutions. Some strategic considerations are also presented.

The effect of patents on innovative activity has been one of the most controversial topics in economics. Although there exist some evidence of positive association between the strength of intellectual property rights and economic growth (e.g. Gould & Gruben 1996) several previous empirical studies find no or little evidence on the positive association between strengthening patent protection and the rate of innovation (Sakakibara & Branstetter 2001, Qian 2007, Lerner 2009)⁹. Notwithstanding, one of the central arguments advocating strengthening of IPR systems is that stronger patents presumably promote innovative activity of domestic firms (Branstetter 2004). While the effect of patents on innovative activity is generally disputable, the empirical evidence on benefits of second tier patent protection in advanced economies remains non-existent.

Patent protection solves a part of the information paradox (Arrow 1962), creating incentives to create and diffuse technological knowledge. Patents also enable trade and licensing activity of exclusive rights: by defining boundaries of intellectual property rights, they may

⁹ For example, Lerner (2009) using data on 177 events of patent policy changes in a sample of 60 countries during past 150 years finds that strengthening of local patent laws has not increased domestic patent applications, whereas it has significantly increased patenting by foreigners in the reforming country.

decrease transaction costs in licensing technological knowledge (e.g. Arora 1995). The most common motivation for second tier patent protection systems is the need to foster innovation activity of SMEs by providing faster, cheaper and simpler protection than patent system provides (AIPPI 1986, European Commission 1995, Janis 1999, Suthersanen 2006, Björkwall 2009). Another argued justification is the shortening of product life cycles (e.g. European Commission 1995). The basic argument in advocacy of utility model system is that it creates greater incentives and opportunities for individual inventors and entrepreneurs to pursue minor inventive activity and incremental R&D and adapt it to local production needs (Kim et al. 2012). In the context of technological catch up Kim et al. (2012) found using Korean firm level data that technologically lagging firms may use utility model protected minor inventions as “a learning device” and “a stepping stone”, which fosters subsequent development of patentable inventions.

Introduction of a second tier patent protection system can be interpreted as a loosening of the patentability criteria with respect to inventive step (cf. van Dijk 1996): a larger set of inventions then satisfies inventive step requirement. As a result, inventions that do not fulfil the inventive step requirement of patents may be registered as utility models or short-term patents. Van Dijk (1996) refers to inventive step and novelty requirements, which define the set of inventions that are novel and inventive enough to be patented, as “patent height”¹⁰. Patent height can be adjusted either directly by loosening the inventive step requirement of patents or indirectly by introducing second tier patent protection system. It is a question of empirics, whether one single or two complementary institutions provide a better outcome.

From the rejection rates of patents we know that there are several patent applications, in which the invention does not satisfy patentability requirements. When second tier patent protection is in place, these applications can be changed to utility model or short-term patent applications. In several jurisdictions it is possible to file both patent application and utility model application for the same invention at the same time: Utility model provides faster protection for the invention and becomes void if the patent with the same priority is eventually granted after examination (Björkwall 2009, Bielig 2012). According to Commission

¹⁰ Van Dijk (1996) explains the difference between patent breadth and height to be “delicate but fundamental”: “Breadth restricts the practice of copying patented products, one could say by setting a maximum number of product characteristics that are allowed to be imitated. Height forms a restriction for improvement by requiring a minimum number of new product characteristics.”

(1995, p.22) the possibility to file a utility model simultaneously with patent application in order to get protection for the pendency period was reported equally important with other reasons to apply for utility model protection such as low cost and uncertainty of invention's value. Moreover, patents and utility models can also be substitutes for inventions with low expected life cycles.

There exists evidence that utility models may have promoted innovation activity in countries, which are in catching up-phase. Kim et al. (2012) find that utility model protection is insignificantly related to GDP per capita growth in high income countries and only in middle-income countries it has a positive association. Maskus & McDaniel (1999) show that technology diffusion through utility model applications had a positive impact on Japan's post-war productivity growth and also that patent applications led to further utility model applications. However, after reaching certain level of technology both Japan and Korea made policy changes that allocated the attention from utility models to patents i.e. from imitative innovations to more radical innovations. As Moser (2005) has demonstrated, patent systems may have an important role in directing innovative activity. Similarly, the second tier patent protection may allocate inventors' and entrepreneurs' attention and R&D investments from more radical inventions to incremental and imitative ones because second tier patent protection increases appropriability of imitative inventions relative to patentable inventions.

Although utility models are often considered as an especially appropriate IPR for developing countries (Suthersanen 2006, Kim et al. 2012), utility model protection is provided also in several advanced economies: in 2014 of 34 OECD countries 24 and of 28 European Union countries 21 had some type of second tier patent protection system in place (either utility model, short-term patent or equivalent). Those developed countries that do not offer some type of IPR for minor inventions are actually in minority. Appendix 1 presents a table of OECD countries and their second tier patent protection systems.

The global trends in the number of utility models (figure 1) indicate that Japan and Korea exploited intensively utility model protection during their technological catching up phase. Currently, China seems to be following similar strategy as the tremendous growth in Chinese utility model applications can be seen in figure 1. According to WIPO (2013) an overwhelming majority (89.4%) of worldwide total utility model applications originated from

China in 2012 and of 837500 applications in 2012 only 87200 were filed outside China. On the contrary, the growth in European utility model applications has been quite modest¹¹. Figure 1 shows that number of German applications has decreased whereas the number of applications in other European countries has increased reflecting the active adoption of utility model systems during 1990s.

[Figure 1 about here]

It is an open question, whether developed countries actually need second tier patent protection as a supplement for normal patent protection to foster innovation activity. The United States, the United Kingdom, Canada, Norway, Sweden, Israel and Switzerland are examples of advanced economies, which have never had a second tier patent protection system in place. However, Janis (1999) points out that the US and the UK *de facto* had second tier patent protection during certain periods of the 20th century. In the UK non-existent examination of inventive step under Patents Act of 1949 led inventions with very low level of inventive step to be patented and similarly in the US the applied non-obviousness requirement at the USPTO was very low (Janis 1999). A separate second tier patent protection system might be preferred to a patent protection with very low non-obviousness because maximum duration of a utility model or a short-term patent is generally much shorter than that of a patent and therefore the period of exclusion would be more limited.

Patents are not absolute and iron clad rights to exclude competitors – although many theoretical models assume so – but rather they provide the patent holder with a right to try to exclude others from commercially utilizing the protected invention (Lemley & Shapiro 2005). Utility models, which in most jurisdictions are granted without any examination for novelty and inventive step, are even more uncertain with respect to their validity than examined patents. The required lower inventive step for utility models is very challenging to

¹¹ One reason for low rate of utility model system utilization might be lacking awareness. Suthersanen (2006) emphasizes that high utility model activity in Germany is related to the fact that German industry is very knowledgeable of their IPR regime. Also one policy recommendation of Suthersanen (2006) is that introduction of a new utility model system should be complemented with efforts to create “a utility model culture”, which includes increasing awareness by e.g. training programs, helpdesk services, web and print literature “to inform potential users of how the new system works, and how it differs from existing standard patent and designs systems”. The review of Australian petty patent system (ACIP 1995) states that patent attorneys rarely advised their clients to apply a petty patent because a standard patent is not much more expensive and it provides protection for a much longer term.

define¹². Examination at the patent office ensures on average some level of quality for patents but in case of most utility model systems there is not this kind of verification. As a result, boundaries of property rights are uncertain and not verified at all. Due to this fact many jurisdictions require plaintiff to pay for examination of the utility model before it can sue claimed infringers. According to Janis (1999) the costs of this uncertainty seem to be “chronically underappreciated” in second tier patent protection proposals including European Commission’s (1995) proposal for a community utility model.

There is a risk that increasing number of utility models leads to an increased uncertainty over boundaries of intellectual property rights and hinder subsequent R&D and innovative activity. As has been demonstrated in the case of patents, too many fragmented and overlapping property rights may lead to a tragedy of the anticommons (Heller & Eisenberg 1998). Interestingly, we do not observe firms “flooding” the market with utility model applications in order to create uncertainty for potential entrants and competitors. Maybe the fact that in most utility model regimes the protectable subject matter is much more limited for utility models than for patents explains partly why we do not observe utility model races¹³. It is also interesting that the USPTO has been often criticized for granting dubious patents (e.g. Jaffe & Lerner 2004), but much less attention has been paid to uncertainty created by second tier patent protection¹⁴.

In strategic patenting literature defensive patenting is often mentioned as one patenting motive (e.g. Somaya 2012). The aim of the firms that patent defensively is mainly to retain their freedom to operate and block others from patenting (Somaya 2012). To my knowledge, there exist no studies focusing on defensive uses of utility models, although utility models would seem to perfectly fit defensive and pre-emptive patenting strategies (see Guellec et al. 2012). By filing utility models on substitute inventions firms may ensure their freedom to operate and deter entry of potential competitors by increasing their risks and uncertainty.

¹² For example in Irish patent law a valid short-term patent requires the invention to be “not clearly lacking an inventive step”.

¹³ For example in most second tier patent protection regimes software does not belong to the protectable subject matter. However, the heterogeneities between systems are again highlighted by the fact that e.g. in Austria software can be protected by utility models.

¹⁴ The adoption of second tier patent protection was rejected in the UK and in Sweden because of expected uncertainty it would create. Also the Dutch short-term patent system was ultimately abolished for the same reason (ROW1995b 2007). Björkwall (2009) criticizes the uncertainty, which non-examined utility models create for competitors, in the context of Finnish, Danish and German utility model systems.

This is an alternative strategy to filing a patent application and subsequently withdrawing it after it has been published (Guellec et al. 2012). Both published patent application and registered utility models add to prior art, which must be considered when novelty of new patent applications is examined at a patent office (Guellec et al. 2012). Thus, competitors cannot anymore patent those inventions (hence the term “pre-emptive patenting”).

At the national level, a second tier patent protection system provides countries with a strategic opportunity to circumvent TRIPS agreement in protection of technical inventions and design the system to reflect country’s level of technological capabilities and specific needs. For instance, in Spain the novelty requirement has been relative instead of absolute (European Commission 1995, p.8 and p.34) so that inventions that are new in Spain but not globally new could have been protected within Spanish utility model system. Similarly in Germany the use of invention outside Germany’s borders has not been an obstacle for valid utility model protection (see e.g. Königer 2009, European Commission 1995, p.8). In Germany and Austria six months grace period has been applied to utility models whereas grace period is not generally applied to patents in Europe¹⁵. As was already mentioned, Japan, Korea and China provide evidence that a second tier patent protection system can be effectively used during technological catch up phase as a learning device. In the future it will be interesting to see, whether India will follow a similar path¹⁶.

3 The case of the Dutch short-term patent system abolition

3.1 Background

The major project of the European Union has been the creation of an effective single market¹⁷. Over the past decades the harmonization process has constantly progressed in many dimensions but patent protection has been one of the most challenging issues. European Commission (1985) has stated: “Differences in intellectual property laws have a

¹⁵ See national utility model legislation documents at WIPO’s webpage for more country level differences: <http://www.wipo.int/wipolex/en>

¹⁶ See e.g. “Govt mulls IPR courts to fast-track cases” <http://indianexpress.com/article/business/economy/govt-mulls-ipr-courts-to-fast-track-cases/>. Accessed 1.12.2014.

¹⁷ The European integration process aims at creating “one single market”, which goals are free movement of goods and undistorted competition (see Commission 1985). According to European Commissions single market strategic programme in 1993 “the overriding aim of Community action in the field of intellectual property is to achieve free circulation of goods which are covered by intellectual or industrial property rights” (Commission 1993, p.32).

direct and negative impact on intra-Community trade and on the ability of enterprises to treat the common market as a single environment for their economic activities.” Also the ultimate objective of the European Patent Convention, which was signed in 1973 and became effective in 1977, was to create a community patent that would cover the whole area of member states as in the US (Harhoff et al. 2009). Since 1977, the number of EPC contracting states has increased from 7 to 38 in 2014. Simultaneously the European patent has replaced direct applications to national patent offices in significant amounts¹⁸.

Introduction of second tier patent protection systems in EU member countries seem to have been closely linked to the European integration process. Since 1985, most of old and new EU members have adopted second tier patent protection systems¹⁹, the Netherlands among them in 1995. The year 1992 was particular as seven European countries introduced second tier patent protection systems that year. In the beginning of the same year Maastricht treaty (Treaty on European Union) was signed and the EU was created. A few years after European Commission suggested a community utility model for the single market (European Commission 1995). However, this project ended when the member countries suspended the utility model directive in 2000 because they wanted to put the priority on the Community patent²⁰. Therefore, still in 2014 member countries have their own national patent offices, own patent territories and there are no harmonized second tier patent protection systems in the single market. Transaction costs to obtain an EU wide patent protection remain high: having many IPR regimes results in stacking of application (including also translation costs), maintenance as well as enforcement costs²¹.

¹⁸ Hall & Helmers (2012) report that the decrease is mainly explained by the change in foreign applicants' behaviour as they substitute domestic patents with EPO patents whereas the authors observe no discernible effect among domestic applicants in terms of domestic patent applications. The level of substitution between direct national patent applications and EPO patent applications depends presumably on various factors, major factors being relative prices, expected grant rate and pendency. Furthermore, the more EPO countries, in which an applicant wants her invention to be protected, the higher the likelihood that the chosen filing channel is EPO and not national patent offices.

¹⁹ See appendix 1, which includes countries that are both OECD and EU members.

²⁰ “The work on this proposal was suspended in March 2000, because of the difficulty of reaching agreement on some basic problems raised by the proposal and the priority which the majority of Member States attached to a Community patent.” (European Commission 2002, p.3)

²¹ European patents granted by European Patent Office (EPO) decreases stacking of applications but in general obtaining patent protection in the EU is a much more expensive operation than obtaining a patent in the US or in Japan (Harhoff et al. 2009).

Suthersanen et al. (2006) classified European utility model systems into three regimes: three dimensional regime (Italy, Denmark, Finland, Greece, Portugal, Spain), German regime (Germany and Austria) and patent regime (Belgium, Ireland, the Netherlands [until 2008], France). Since then, many countries have amended their second tier patent legislation and the Netherlands abolished the system completely. The United Kingdom, Sweden, Luxemburg and the Netherlands are pre-2004 EU member countries without second tier patent protection as of 2014. In 2004 EU enlarged by 10 new member countries, of which Czech Republic, Estonia, Hungary, Poland, Slovenia, Slovakia have second tier patent protection systems in place in 2014 whereas Malta, Cyprus, Latvia and Lithuania do not. Of the latest members, Bulgaria and Romania (EU members since 2007) provide utility model protection but Croatia (EU member since 2013) does not. All these different national regimes reflect the complexity of the European IPR environment. Indeed, it requires a lot of effort to learn all the national peculiarities and it should be noted that 99% of European firms are small and medium sized enterprises (SMEs), which have a limited budget to consult experts in IPR issues²².

The Netherlands is a unique case as it is the only country, which has abolished its second tier patent protection contradicting the harmonization process of European IPR systems²³. The Dutch short-term patent system (“zesjarige octrooi”) was in place between 1/1995 and 6/2008. It was originally introduced in order to provide SMEs with a simple, cheap and fast protection for their inventions, when the Dutch patent system was reformed in 1995 (ROW 1995a, 2006 p.viii and p.11). The main difference between the Dutch short-term patent system and other European second tier patent protection systems was that it required inventions to satisfy full patentability standards in order the patent to be valid and had maximum duration of six years^{24 25}. In March 2006, the abolition of the short-term patent

²² INNOVACCESS – A European Network of National Intellectual Property Offices provides information of European IPR regimes in a centralized manner. See <http://www.innovaccess.eu/>.

²³ Interestingly, this was not the first time the Netherlands abolished part of its patent institution: in 1869 the Netherlands abolished patent system (Moser 2005). According to Penrose (1951) patent laws were at odds with the Netherlands commitment to free trade (Moser 2005).

²⁴ Also Belgium and France share the same characteristics. Although Suthersanen (2006) classifies Ireland to the same “patent regime”, actually Irish short-term patent protection does not require the same inventive step as patents and its maximum length is 10 years.

²⁵ At the moment a major caveat of the study is missing price time series of patents and utility models. Prices affect the demand and dynamic cross-elasticity of demand between patents and utility models. For instance de Rassenfosse & van Pottelsberghe (2012) found the price elasticity of demand for patents to be -0.3 i.e. 10% increase of price decreases patent applications by 3%.

system was suggested in an evaluation report of the Dutch Patents Act 1995 (“ROW 1995”) by the Ministry of the Economy (ROW1995a 2006) and the decision to abolish the system in 2008 was announced at the end of February 2007 (ROW 1995b 2007). The main argued reason for the abolition was legal uncertainty that unexamined property rights created. There was a view that the patent office granted unexamined patents, which created also confusion between normal patents and short-term patents²⁶.

A peculiarity of the Dutch system was that applications of patent applicants, who did not request novelty search report within 13 months from application date, were automatically granted six years short-term patents after 18 months from application (ROW1995a, 2007 p.15 and p.32). Due to this fact short-term patent applications cannot be easily distinguished from normal patent applications in statistics, which complicates the analysis. Therefore figure 2 illustrates the popularity of short-term patent protection by presenting the numbers of domestic patent and short-term patent grants instead of applications²⁷.

[Figure 2 about here]

On average, there were about 600 short-term patent grants per year which is roughly fourth of annual patents granted by the Dutch patent office. In Dutch Patent Act 1995 patent application costs were decreased and the application process was made more rapid²⁸, which probably explain the strong growth in the number of patents granted after 1995. In official documents of the Dutch Ministry of the Economy it was estimated that 75% of annual 600 short-term patent applicants would shift to apply for 20 years patents (ROW1995b 2007, p.13). As figure 2 displays patent grants and not applications, we cannot verify this change in structure of national patent applications. There is always lag from application to grant. Nevertheless, figure 2 shows that the number of domestic normal patent grants increased

²⁶ In order to decrease this kind of confusion, the Irish review of the Patent Act 1992 suggested to change the name of Irish short-term patent to utility model. See:

<http://www.djei.ie/publications/ria/2012RIARReviewPatentsAct1992.pdf>

²⁷ For the number of EPO patent applications see figure 2 on page 7 of ROW1995a (2006). I do not have INPADOC extension to PATSTAT database, so I am missing data on designated countries of EPO patent applications and validated countries of EPO patent grants.

²⁸ According to an anonymous expert source, the system was establish in response to increased importance of European patent office, which at that time had lower patenting requirements than Dutch patent office and was therefore reducing the number of domestic patent applications. Also (ROW1995a) states that the possibility to apply for patents through EPO decreased domestic patent applications. Hall & Helmers (2012) have documented the negative impact of joining EPO on national direct patent applications.

after abolition of the short-term patent system indicating that applicants might have shifted from short-term patents to normal patents.

As pointed out in the previous section, the main argument against utility model systems is the legal uncertainty it may create due to lack of prior examination at the patent office (Janis 1999, Björkwall 2009). Expected legal uncertainty was the reason why the UK rejected adoption of a utility model system in 1986 (European Commission 1995, pp.56-57) and EU member states suspended the utility model directive in 2000 (European Commission 2002, p.6)²⁹. Finally, the abolition of Dutch utility model system in June 2008 was motivated exactly by the legal uncertainty unexamined short-patents created (ROW 1995b 2007, p.10).

3.2 The synthetic control method

In brief, the synthetic control method facilitates comparative case studies with small samples and “when no single untreated unit provides a good comparison for the unit affected by the treatment or event of interest” (Abadie, Diamond & Hainmueller 2014). It was introduced by Abadie & Gardeazabal (2003) and was further developed by Abadie, Diamond & Heinmueller (2010). The method has been applied for instance to study the effect of terrorism on economic growth (Abadie & Gardeazabal 2003), the effect of smoking law change on cigarette consumption (Abadie et al. 2010), the effect of Germany reunification on economic growth (Abadie et al. 2014) and the effect of economic liberalization on economic growth (Billmeier & Nannicini 2013). To my knowledge, this study is the first to apply SCM to investigate a change in patent policy³⁰.

In studies, which focus on estimating country level effects of policy changes, the number of potential control countries is always very limited. In case of national IPR system, the availability of appropriate control countries is even more limited due to many interacting institutions and confounding factors³¹. In these cases regression-based methods such as difference-in-differences design are infeasible and researchers tend to prefer qualitative

²⁹ One reason for this was that member countries wanted to focus on promoting more important Community patent (Björkwall 2009). Janis (1999) also emphasized that efforts to harmonize utility model system may have taken attention from more important topics such as Community patent.

³⁰ Although Moser (2005) cites Abadie & Gardeazabal (2003) and applies similar method.

³¹ Original idea of the paper was to study effects of introduction of utility model system on domestic patenting activity in advanced economies. After studying institutional frameworks more in detail, it turned out that countries adoption of utility model systems was so linked to other harmonization processes such as joining EPO that the set of appropriate potential control countries shranked to a handful.

case study methods. Synthetic control method provides a way to fill in the gap between quantitative and qualitative research approaches (Abadie, Diamond & Hainmueller 2014).

The implementation of SCM is straightforward. We observe a panel of $J+1$ countries, of which first one is exposed to the treatment (the Netherlands) and J are not, over T periods. Y_1 and Y_0 are the outcome variable values for the treated and non-treated countries respectively. These J countries serve as potential controls and any weighted average of non-exposed countries is considered as a potential control. Let W be a $(J \times 1)$ vector of positive weights given to non-treated countries that sum to one. Each choice of W represents a weighted average of the available control countries i.e. a synthetic control for the treated country. Let T_0 be the number of pre-treatment periods.

Let $X_1 = (Z_1', Y_1^1, \dots, Y_1^{T_0})$ be a $(k \times 1)$ vector of pre-treatment characteristics' values (Z') and outcome variable values (Y in every pre-treatment period) of the treated unit and X_0 to be $(k \times J)$ vector of the same values of control countries respectively. Vector Z consists of matching variables, which are meant to be predictors of post-treatment outcomes and they should not be affected by the treatment (Abadie, Diamond & Hainmueller 2014). In other words there should not be an anticipation effect. The aim is to match values of these characteristics as closely as possible between the treated and the synthetic control.

The discrepancy between the actual and the synthetic Netherlands is given by $X_1 - X_0W$. The vector of weights W^* is chosen to minimize $(X_1 - X_0W)'V(X_1 - X_0W)$ subject to $w_j \geq 0$ ($j = 1, 2, \dots, J$) and $w_1 + \dots + w_J = 1$ where V is a $(k \times k)$ symmetric and positive semidefinite matrix. Abadie & Gardeazabal (2003) and Abadie, Diamond & Hainmueller (2010) suggest choosing V matrix, which minimizes the mean squared prediction error (MSPE) of the outcome variable in the pre-treatment period and that approach is applied here. Vector W^* ($J \times 1$) defines the combination of control countries, which best resembles treated country in pre-treatment period. An estimate of the treatment effect is calculated by comparing post-treatment values of the treated actual unit against the values of synthetic control in chosen point of time t after the treatment: $Y_1^t - W^{*'}Y_0^t$.

3.3 Data

We use monthly and annual country-level panel data for the period from December 2002 to December 2011. The Dutch short-term patent system was abolished in June 2008, but to

account for the possible anticipation effect, the pre-treatment period is defined to end on February 2007 when the decision of the abolition was published³². The length of pre-treatment period is therefore 51 months (12/2002-2/2007) and post-treatment period 58 months (3/2007-12/2011).

The outcome variable is the number of patent and second tier patent applications filed at the Dutch patent office per month scaled by average population (millions) for the studied time period. This variable reflects the number of exclusive rights, which were applied to protect technical inventions. EPO's patents and PCT patent applications are excluded as international protection is probably applied for more valuable inventions³³. The patent data is extracted from European patent office's PATSTAT database and population numbers are from OECD.

The set of potential controls³⁴ consists of European countries, which were members of OECD, the EU and EPO and which had some type of second tier patent protection system in place in the beginning of the pre-treatment (12/2002). These criteria ensure a certain level of institutional similarity. The 11 countries are Finland, Denmark, Austria, Belgium, France, Germany, Italy, Greece, Ireland, Portugal and Spain³⁵. See appendix 1 for a table, which presents years of second tier patent protection system adoption in OECD countries. Although there exist certain differences across national second tier patent protection systems, it is assumed that the systems are comparable in their number of domestic patent and second tier patent applications per population. The evaluation of the Dutch 1995 patent reform (ROW1995a, p.18) itself suggests that short-term patent systems of France, Belgium

³²The decision was published on the 28th of February 2007 (ROW1995b 2007). In robustness checks also other alternatives for treatment timing were considered. The evaluation of ROW1995 already suggested the abolition in March 2006. See section 3.4.

³³We did not have PATSTAT's INPADOC extension, which includes information about designated and validated countries of international applications (EPO and PCT). In case of EPO the practice has been to designate all countries since 1999 because if more than eight countries are designated, there are no additional costs for designating more countries (Eaton et al. 2003, Harhoff et al. 2009).

³⁴Adadie et al. (2010) refer to set of potential controls as "donor pool".

³⁵Hungary, Poland, Czech Republic, Slovenia and Slovak Republic met the presented criteria after they joined EPO during the first years of the new Millennium and the EU on the 1st of May 2004. They are not considered in the main analysis since joining the EPO probably affected strongly the substitution between direct national patent applications and EPO applications (see Hall & Helmers 2012). Hungary, Poland and Turkey are considered as potential controls in robustness checks.

and the Netherlands should be considered as offering an equivalent protection to utility models³⁶.

In SCM predictor variables should predict post-treatment period outcomes (exclusive rights per million of population) as closely as possible. Following prior literature (Porter & Stern 2000, Qian 2007, Kim et al. 2012) we use conventional predictors for the number of patent applications: R&D intensity (alternatively total R&D expenditure or full time equivalent R&D employees in robustness checks), GDP per capita (constant 2005 PPP prices), share of industrial employees of total population, average years of schooling (of population older than 25 years, Barro & Lee 2013), IPR index (Ginarte & Park 1997, Park 2008), trade openness and economic freedom index (Gwartney et al. 2014). Annual values within pre-treatment period 2002-2006 are available for R&D measures, GDP per capita, population and share of industrial employment and they are averaged. For schooling, IPR index, trade openness and economic freedom the value of 2005 is used.

These variables are generally used in knowledge or ideas production functions (e.g. Porter & Stern 2000) in which number of patents is interpreted as a proxy for innovations. Here the interpretation is a bit different: the interest simply lies in the number of applied exclusive rights. Filing a patent application is a strategic decision and the aim here is to understand how the abolition of a complementing institution affects the filing behaviour of applicants. R&D intensity (and other R&D measures) and share of industrial employees are proxies for the effort to produce patentable inventions. GDP per capita (purchasing power), population (market size) and economic freedom index reflect the expected returns from patenting. Similarly IPR index is a proxy for expected returns from patenting as it measures the strength of patent protection i.e. enforcement. Trade openness index measures the flow of ideas across borders and schooling measures the level of human capital i.e. absorptive capacity, both which are positively associated with subsequent production of new patentable ideas. Predictor variables are summarized in appendix 2.

3.4 Results

The synthetic Netherlands is constructed as a convex combination of potential control countries, which most closely resembles the Netherlands in terms of patenting activity

³⁶ “Hierbij dient opgemerkt te worden dat de WIPO Nederland, België en Frankrijk ook schaaft onder de landen waar een utility model bestaat.” (ROW1995a 2006)

predictors (appendix 2) within the specified pre-treatment period (12/2002-2/2007) i.e. before the decision of the short-term patent system abolition was made. SCM gives following weights for potential control countries: Denmark 0.186, Belgium 0.177, Ireland 0.543, Germany 0.019 and Portugal 0.075³⁷. All other potential control countries (Finland, Austria, Greece, Spain, France and Italy) are assigned zero weight each. Table 1 compares pre-treatment period patenting activity predictor means between the actual Netherlands and the synthetic. The characteristics match relatively well except for population. The reason for this is that the monthly patenting activity of Ireland, Denmark and Belgium match best with patenting activity of the Netherlands as demonstrated by assigned country weights but these countries are much smaller in population. Similarly, due to the large weight assigned to Ireland R&D intensity between the Netherlands and the synthetic control do not match especially well. According to OECD statistics during 2002-2006 the average R&D intensity of Ireland was 1.2% while it was 1.9% for the Netherlands.

[Table 1 about here]

Figure 3 displays monthly domestic patenting activity for the Netherlands (black) and its synthetic counterpart (grey) between 12/2002 and 12/2011. As monthly patenting of the synthetic control closely tracks the trajectory of the actual Netherlands and predictor variables match relatively well, we may assume that the synthetic control provides an approximation of the number of patents, which would have been applied in the Netherlands in case the short-term patent system was not abolished. The treatment effect of abolition of the Dutch short-term patent system is then the difference between the actual Netherlands and the synthetic one.

It seems that the announcement of patent policy amendments had a negative effect on the level of domestic patenting activity in the short run after March 2007 (as depicted by the black dotted line in figure 3) but the abolition of short-term patent system itself did not have a significant effect on domestic Dutch patenting activity as the trajectories do not diverge after June 2008 (as depicted by the red line)³⁸. We do not observe a level drop, which would

³⁷ These weights are also relatively robust for different specifications of predictor variables: in all cases Ireland gets the largest weight and Belgium and Denmark second largest.

³⁸ Similar results are obtained when the treatment period is defined to be the publication of the evaluation report, which suggested abolition of the system, in February 2006 and also when the treatment period is defined to be the actual abolition of the system in June 2008.

be expected if potential short-term patent applicants ceased from applying patents. Potential short-term patent applicants seem to have shifted to apply for normal patents as was expected in the official documents of the Dutch Ministry of the Economy (ROW1995b 2007, p.13).

[Figure 3 about here]

When applying SCM the assessment of treatment effect's significance cannot be done with standard large sample inferential techniques. Thus, alternative methods need to be used. Abadie et al. (2010) suggest placebo tests in which the synthetic control method is applied to every control country separately. If the effects of the treated country are large relative to estimated effects from placebo tests to control countries, then this can be interpreted as evidence of treatment's significance. Figure 4 displays the results for the placebo tests: the black line is the gap between actual and synthetic control of the Netherlands whereas grey lines depict the difference between monthly patenting activity and its synthetic control for each control country³⁹. Placebo tests verify that we do not observe a significant change in the total number of applied domestic patents after abolition relative to control countries: The gap between the Netherlands and its synthetic control does not differ from the gaps between control countries and their synthetic controls.

[Figure 4 about here]

3.5 Limitations

An obvious limitation of the study is that we are missing the price information of national patent and short-term patent protection. De Rassenfosse & van Pottelsberghe de la Potterie (2012) have shown by comparing USPTO, JPO and EPO that patent fees can be used as an effective policy leverage to affect the propensity to patent. Hence, patenting fees are an important predictor of the number of patent applications in a country.

Furthermore, we are missing the number of EPO patent applications, which are designated to sample countries, and grants that are validated in sample countries⁴⁰. EPO patent

³⁹ Gap between Germany and its synthetic control is not presented in figure 4 due to inadequate fit.

⁴⁰ PATSTAT does not include information on designated countries, but it can be supplemented with INPADOC database that has legal status data and also list of designated countries of EPO patents. Also PCT patent applications are excluded from the analysis.

application data would make the analysis more complete because sum of national patent, second tier patent and EPO patent applications would construct a better outcome variable to measure the number of all patent applications in a country. Unfortunately, EPO patent applications are a cumbersome measure because since June 30th of 1999 there has been “a bulk discount” in designating countries for protection (Eaton et al. 2003): After payment for seven, the designation for additional member countries was free. Harhoff et al. (2009) state that using designated states would due to this “bulk discount” lead to biased estimates and recommends use of actual validations.

Another significant caveat of the current analysis is the heterogeneity of national systems. TRIPS agreement, which aims to strengthen and harmonize IPR systems, does not contain any benchmark nor lay out any substantive minimum standards for national utility model systems (Janis 1999, Königer 2009). Therefore there exist different variants of second tier patent protection systems, which have their own national peculiarities. Finally, some confounding factors make it difficult to distinguish the effect of short-term patent system abolition from others. In case of the Netherlands, the introduction of patent box in 2007 is this type of confounding factor: a major policy change, which probably had an effect on patenting activity of Dutch inventors. The global financial crisis, which started in autumn 2008, also hit sample economies hard and led to decrease in domestic patent applications in most sample countries. However, due to its global nature, patentees in all sample countries faced the same global uncertainty and therefore the negative effect of financial crisis on patenting is assumed to be relatively symmetric.

4 Conclusions

This paper has shed some light on the interaction between first and second tier patent protection by presenting the case of short-term patent system abolition in the Netherlands. The results indicate that the abolition in June 2008 did not lead to a level drop in the Dutch patent applications, which indicates that potential short-term patent applicants probably shifted to apply for normal 20 year patents as was expected by the policy makers (ROW1995b 2007, p.13).

The results cannot be directly generalized to other second tier patent protection systems due to country specific characteristics: The Dutch short-term patent system was probably

closer substitute to normal national 20 years patent than most other European second tier patent protection systems due to the same patentability requirements. However, if legal certainty is generally appreciated in the form of clearer intellectual property rights then one single patent system with examination might be preferred to a combination of a patent system with examination and a second tier patent system without examination.

Thus far there exists no documented empirical evidence on the positive effects of second tier patent protection on innovation activity in advanced economies. Further research should address in the spirit of Moser (2005) does second tier patent protection affect the direction of innovation i.e. structure of R&D efforts by directing attention from more radical inventions towards imitative and incremental inventions. Furthermore, more empirical evidence is needed on the role of second tier patents for SMEs and individual inventors in acquiring finance and in licensing activity.

If the second tier patent protection system does not provide any net benefits to the society then its abolition should be considered. The pioneering decision of the Netherlands to abolish its short-term patent system has not yet induced any other advanced economy to make the same decision. It seems that Penrose's (1951) famous statement holds also for second-tier patent protection systems: "If national patent laws did not exist, it would be difficult to make a conclusive case for introducing them; but the fact that they do exist shifts the burden of proof and it is equally difficult to make a really conclusive case for abolishing them."

Acknowledgements

This paper was written during my visit at UNU-MERIT. I want to thank Pierre Mohnen and Ari Hyytinen for valuable comments. Research funding from Yrjö Jahnesson Foundation, OP-Pohjola group's research foundation and Jyväskylä University School of Business and Economics is gratefully acknowledged.

Appendix 1

OECD countries and second tier patent protection

	Member of OECD	Member of PCT	Member of EU	Member of EPO	Introduction of second tier patent protection	Name of second tier patent protection
AUSTRALIA	1971	1980	-	-	1979	Innovation patent
AUSTRIA	1961	1979	1995	1979	1994	Utility model
BELGIUM	1961	1981	1995	1977	1987	Short-term patent
CANADA	1961	1990	-	-	-	-
CHILE	2010	2009	-	-	1991	Utility model
CZECH REPUBLIC	1995	1993	2004	2002	1992	Utility model
DENMARK	1961	1978	1973	1990	1992	Utility model
ESTONIA	2010	1994	2004	2002	1994	Utility model
FINLAND	1969	1980	1995	1996	1992	Utility model
FRANCE	1961	1978	1952	1977	1968	Utility certificate
GERMANY	1961	1978	1952	1977	1891	Utility model
GREECE	1961	1990	1981	1986	1986	Utility model
HUNGARY	1996	1980	2004	2003	1992	Utility model
ICELAND	1961	1995	-	2004	-	-
IRELAND	1961	1992	1973	1992	1992	Short-term patent
ISRAEL	2010	1996	-	-	-	-
ITALY	1962	1985	1952	1978	1934	Utility model
JAPAN	1964	1978	-	-	1905	Utility model
KOREA	1996	1984	-	-	1961	Utility model
LUXEMBOURG	1961	1978	1952	1977	-	-
MEXICO	1994	1995	-	-	1991	Utility model
THE NETHERLANDS	1961	1979	1952	1977	1995-2008	Short-term patent
NEW ZEALAND	1973	1992	-	-	-	-
NORWAY	1961	1980	-	2008	-	-
POLAND	1996	1990	2004	2004	1924	Utility model
PORTUGAL	1961	1992	1986	1992	1940	Utility model
SLOVAK REPUBLIC	2000	1993	2004	2002	1992	Utility model
SLOVENIA	2010	1994	2004	2002	1992	Short-term patent
SPAIN	1961	1989	1986	1986	1929	Utility model
SWEDEN	1961	1978	1995	1978	-	-
SWITZERLAND	1961	1978	-	1977	-	-
TURKEY	1961	1996	-	2000	1995	Utility model
UNITED KINGDOM	1961	1978	1973	1977	-	-
UNITED STATES	1961	1978	-	-	-	-

OECD members: <http://www.oecd.org/about/membersandpartners/list-oecd-member-countries.htm>

PCT members: <http://www.wipo.int/treaties/en/summary.jsp>

EU members: http://europa.eu/about-eu/countries/index_en.htm

EPO members: <http://www.epo.org/about-us/organisation/member-states.html>

Second tier patent protection information: <http://www.wipo.int/directory/en/>

See also : The INNOVACCESS network of National Intellectual Property Offices <http://www.innovaccess.eu/>

Appendix 2

List of variables

Variable	Description	Source
Patent applications	Number of patent and second tier patent (utility models, short-term patents) applications	EPO PATSTAT database (Spring 2014 version)
IPR index	A composite index measuring strenght of IPR protection. Ginarte & Park (1998) provide 1980-1995 values and Park (2008) 1995-2005 values.	Ginarte & Park (1998) and Park (2008)
GDP per capita	Gross domestic product per capita in 2005 dollar prices and constant PPP	OECD
R&D expenditure	Total R&D expenditure in constant 2005 dollar prices	OECD
R&D employment	Number of full time equivalent R&D employees	OECD
R&D intensity	GERD per GDP	OECD
Population	Number of inhabitants in country	OECD
Industrial employment	Number of employees working in the industrial sector	OECD
Schooling	Average years of schooling for population older than 25 years	Barro & Lee (2013)
Economic Freedom index	A composite index measuring country's general economic freedom	Fraser Institute, Gwartney et al. (2014)
Trade Openness index	A measure of trade openness, part of Economic Freedom index	Fraser Institute, Gwartney et al. (2014)

References

- Abadie, A., Diamond, A. & Hainmueller, J.** 2014. Comparative politics and the synthetic control method. *American Journal of Political Science*, forthcoming.
- Abadie, A., Diamond, A. & Hainmueller, J.** 2010. Synthetic control methods for comparative case studies – estimating the effect of California’s tobacco control program. *Journal of the American Statistical Association* 105(490), 493-505.
- Abadie, A. & Gardeazabal, J.** 2003. The Economic Costs of Conflict: A Case Study of the Basque Country. *American Economic Review* 93, 113–132.

- ACIP.** 1995. Advisory Council of Industrial Property: Review of the petty patent system. Australian Industrial Property Organization. Available at:
<http://www.acip.gov.au/reviews/all-reviews/petty-patent-system/>
- Arora, A.** 1995. Licensing tacit knowledge: Intellectual property rights and the market for know-how. *Economics of Innovation & New Technology* 4, 41–59.
- Arrow, K.** 1962. Economic welfare and the allocation of resources for invention. In R. R. Nelson (ed.), *The Rate and Direction of Inventive Activity*: 609-625. Princeton University Press.
- Barro, R. & Lee, J.** 2013. A new data set of educational attainment in the world, 1950-2010. *Journal of Development Economics* 104, 184-198.
- Bielig, A.** 2012. Intellectual property and economic development in Germany: empirical evidence for 1999-2009. *European Journal of Law and Economics* 33. DOI 10.1007/s10657-012-9324-5.
- Billmeier, A. & Nannicini, T.** 2013. Assessing economic liberalization episodes: a synthetic control approach. *The Review of Economics and Statistics* 95(3), 983-1001.
- Björkwall, P.** 2009. *Nyttighetsmodeller : Ett ändamålsenligt innovationsskydd?* Doctoral dissertation. Svenska handelshögskolan, Helsinki. Available at:
<https://helda.helsinki.fi/bitstream/handle/10227/367/196-978-952-232-030-8.pdf?sequence=2>
- Boztosun, N.** 2010. Exploring the utility models for fostering innovation. *Journal of Intellectual Property Rights* 15, 429-439.
- Branstetter, L.** 2004. Do stronger patents induce more local innovation? *Journal of International Economic Law* 7(2), 359-370.
- Eaton, J., Kortum, S. & Lerner, J.** 2003. International patenting and the European patent office - a quantitative assessment. Mimeo.

European Commission. 1985. COM(85)310 final. Completing the Internal Market. White Paper from the Commission to the European Council. Milan, 28-29 June 1985.

http://europa.eu/documents/comm/white_papers/pdf/com1985_0310_f_en.pdf

European Commission. 1993. COM(93)632 final. Making the most of the internal market: strategic programme.

European Commission. 1995. COM(97)691 final. Proposal for a European Parliament and Council Directive Approximating the Legal Arrangements for the Protection of Inventions by Utility Model; O.J. C 36 (Mar. 2, 1998).

http://ec.europa.eu/internal_market/indprop/docs/model/util_en.pdf

European Commission. 2002. SEC(2001)1307. Summary report of replies to the questionnaire on the impact of the Community utility model with a view to updating the Green Paper on protection by the utility model in the internal market.

http://ec.europa.eu/internal_market/indprop/docs/model/utilreport_en.pdf

van Dijk, T. 1996. Patent height and competition in product improvements. *The Journal of Industrial Economics* 44(2), 151-167.

Gallini, N. 2002. The Economics of Patents: Lessons from Recent U.S. Patent Reform. *Journal of Economic Perspectives* 16, 131–154.

Ginarte, J. & Park, W. 1997. Determinants of patent rights: a cross-national study. *Research Policy* 26, 283-301.

Gould, D. & Gruben, W. 1996. The role of intellectual property rights in economic growth. *Journal of Development Economics* 48, 323-350.

Gwartney, J., Lawson, R. & Hall, J. 2014. Economic Freedom Dataset, published in *Economic Freedom of the World: 2014 Annual Report*. Fraser Institute. Available at:

http://www.freetheworld.com/datasets_efw.html

Guellec, D., Martinez, C. & Zuniga, P. 2012. Pre-emptive patenting: securing market exclusion and freedom to operate. *Economics of Innovation and New Technology* 21(1), 1-29.

Hall, B. & Helmers, C. 2012. The impact of joining the regional European Patent Convention system. Mimeo. Available at (accessed 29.11.2014):

http://eml.berkeley.edu/~bhhall/papers/HallHelmers12_EPCaccession.pdf

Harhoff, D., Hoisl, K., Reichl, B. & van Pottelsberghe de la Potterie, B. 2009. Patent validation at the country level – the role of fees and translation costs. *Research Policy* 38, 1423-1437.

Heller, M. & Eisenberg, R. 1998. Can patents deter innovation? The anticommons in biomedical research. *Science* 280(5364), 698-701.

Jaffe, A. & Lerner, J. 2004. *Innovation and its disconnects: How our broken patent system is endangering innovation and progress and what to do about it.* Princeton University Press.

Janis, M. 1999. Second tier patent protection. *Harvard International Law Journal* 40(1), 151-219.

Jones, C. 2005. Growth and ideas. In “*Handbook of Economic Growth*”, Volume 1B edited by Aghion, P. & Durlauf, S. Elsevier.

Kim, Y., Lee, K., Park, W. & Choo, K. 2012. Appropriate intellectual property protection and economic growth in countries at different levels of development. *Research Policy* 41(2), 358-375.

Königer, K. 2009. Registration without examination: Utility model – a useful model? In “*Patents and Technological Progress in a Globalized World*” edited by Amicorum, L. & Straus, J. MPI Studies on Intellectual Property, Competition and Tax Law Volume 6.

Lerner, J. 2009. The empirical impact of intellectual property rights on innovation: Puzzles and Clues. *The American Economic Review* 99(2), 343-348.

Maskus, K. & McDaniel, C. 1999. Impacts of the Japanese patent system on productivity growth. *Japan and the World Economy* 11, 557-574.

Mazzoleni, R. & Nelson, R. 1998. The benefits and costs of strong patent protection: a contribution to the current debate. *Research Policy* 27, 273-284.

- Moser, P.** 2005. How Do Patent Laws Influence Innovation? Evidence from Nineteenth Century World's Fairs. *American Economic Review*, 95(4): 1214-36.
- Park, W.** 2008. International patent protection: 1960-2005. *Research policy* 37, 761-766.
- Penrose, E.** 1951. *The Economics of the International Patent System*. John Hopkins University Press, Baltimore.
- Porter, M. & Stern, S.** 2000. Measuring the ideas production function: Evidence from international patent output. NBER working paper no. 7891.
- Qian, Y.** 2007. Do national patent laws stimulate domestic innovation in a global in a global patenting environment? A cross-country analysis of pharmaceutical patent protection, 1978-2002. *The Review of Economics and Statistics* 89(3), 436-453.
- de Rassenfosse, G. & van Pottelsberghe de la Potterie, B.** 2012. On the price elasticity of demand for patents. *Oxford Bulletin of Economics and Statistics*.
- ROW1995a.** 2006. Evaluatie Rijksoctrooiwet 1995: Eindrapport. Ministerie van Economische Zaken (Nederland). Available at: <http://www.rijksoverheid.nl/onderwerpen/intellectueel-eigendom/documenten-en-publicaties/kamerstukken/2006/03/03/evaluatie-rijksoctrooiwet-1995-eindrapport.html>
- ROW1995b.** 2007. Rijksoctrooiwet 1995 amendment decision. Available at: <http://www.rijksoverheid.nl/documenten-en-publicaties/besluiten/2007/02/28/evaluatie-rijksoctrooiwet-1995.html>
- Sakakibara, M. & Branstetter, L.** 2001. Do stronger patents induce more innovation? Evidence from the 1988 Japanese patent law reforms. *The RAND Journal of Economics* 32(1), 77-100.
- Somaya, D.** 2012. Patent strategy and management: An integrative review and research agenda. *Journal of Management* 38(4), 1084-1114.
- Suthersanen, U.** 2006. Utility models and innovation in developing countries. The International Centre for Trade and Sustainable Development Issue Paper 13, UNCTAD.
- WIPO.** 2013. World Intellectual Property Indicators. WIPO Economics & Statistics Series.

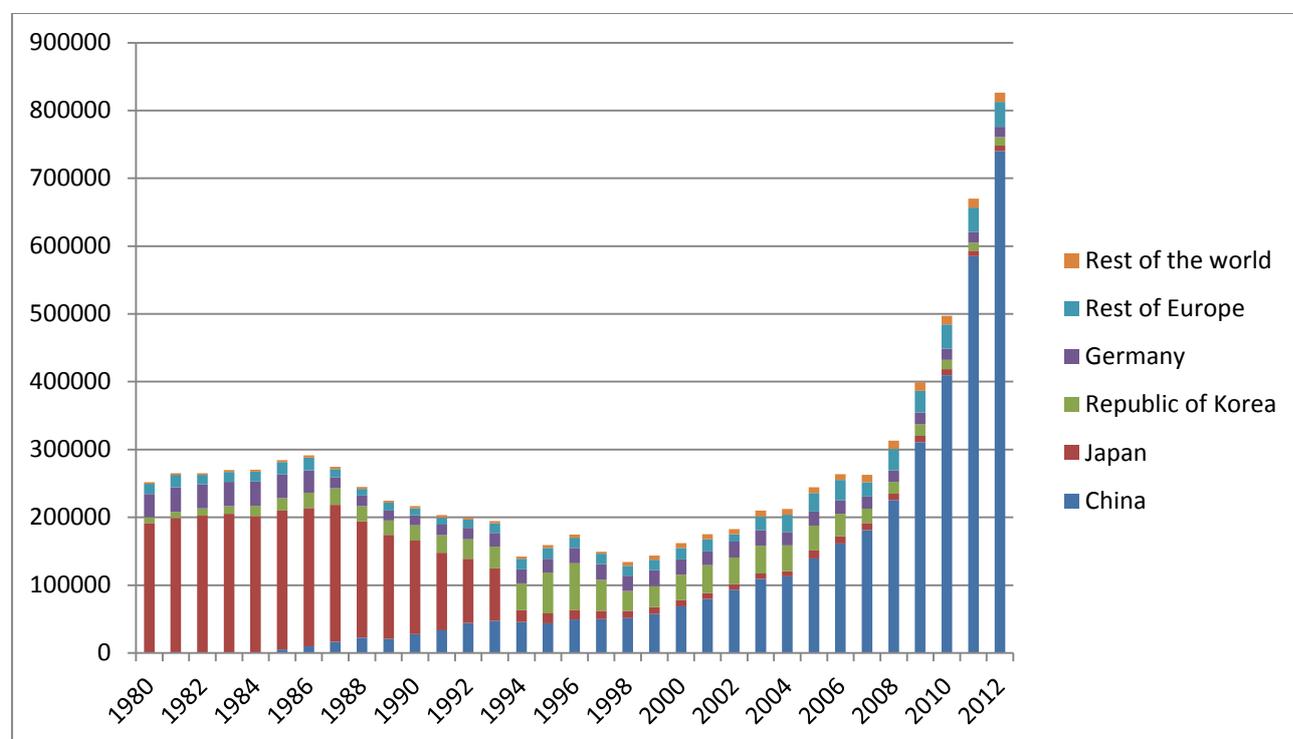
TABLES AND FIGURES

Table 1: Patenting activity predictor means before abolition of the Dutch short-term patent system

	The Netherlands	Synthetic control
Patents per month per million inhabitants	12.54	12.98
R&D intensity	1.90	1.55
Population	16300000	7410215
Industrial employment share	0.36	0.35
GDP per capita	34016.66	33910.16
Trade openness	8.69	8.67
Economic freedom	7.92	8.08
Schooling	10.98	11.06
IPR index	4.67	4.65

Notes: All variables are averaged over pre-treatment period, December 2002 - February 2007.

Figure 1: Worldwide utility model applications⁴¹



⁴¹ WIPO statistics exclude short-term patents.

Figure 2: Patents granted by the Dutch patent office (source: PATSTAT)

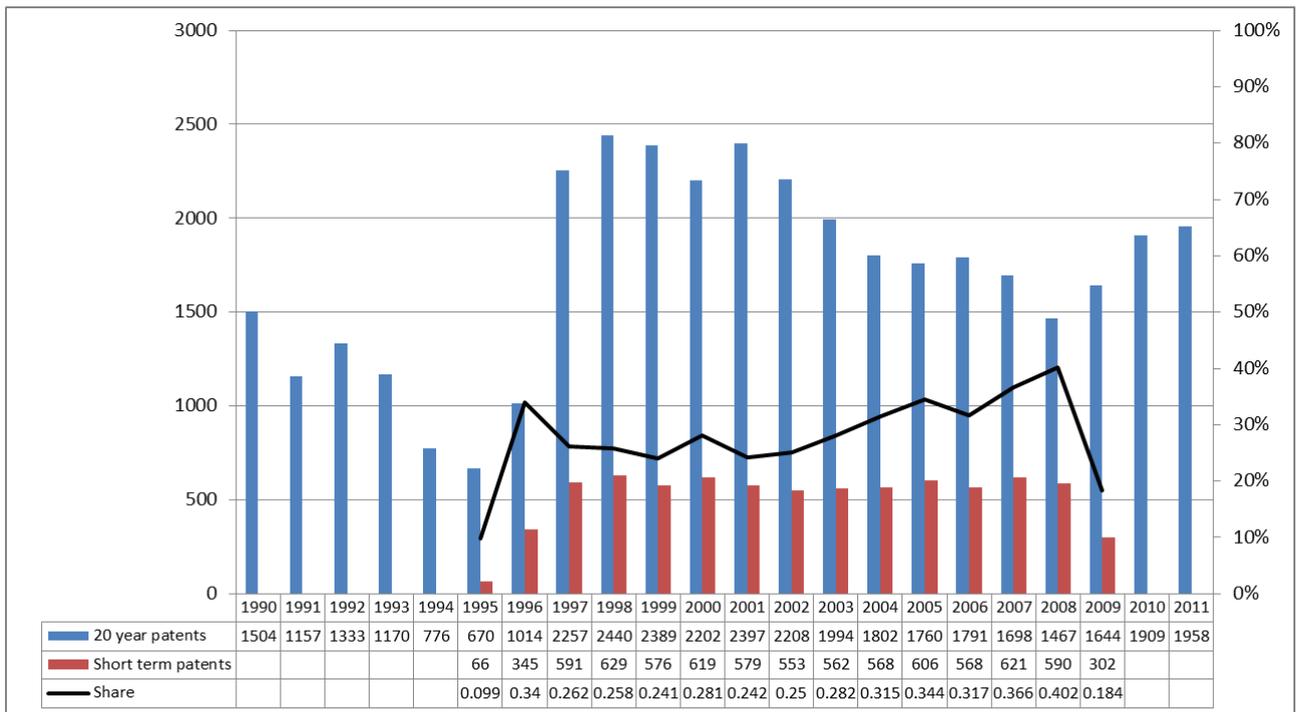
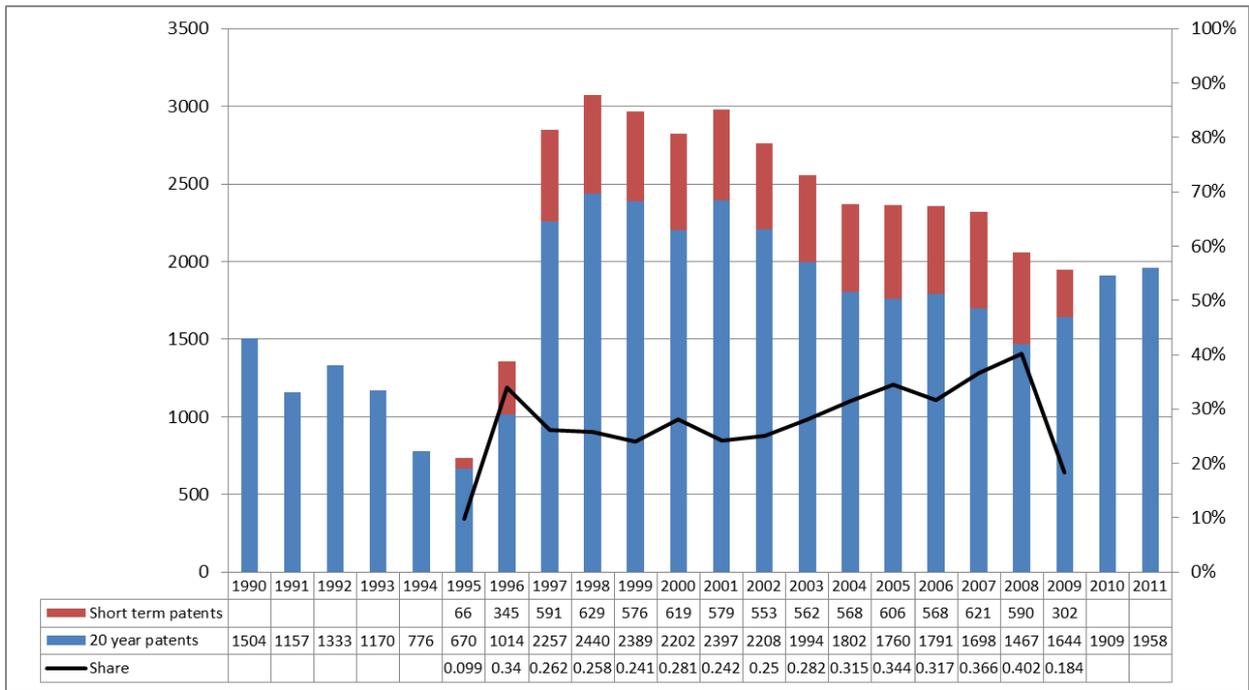


Figure 3: Monthly patent applications per million inhabitants in the Netherlands: Synthetic vs. actual

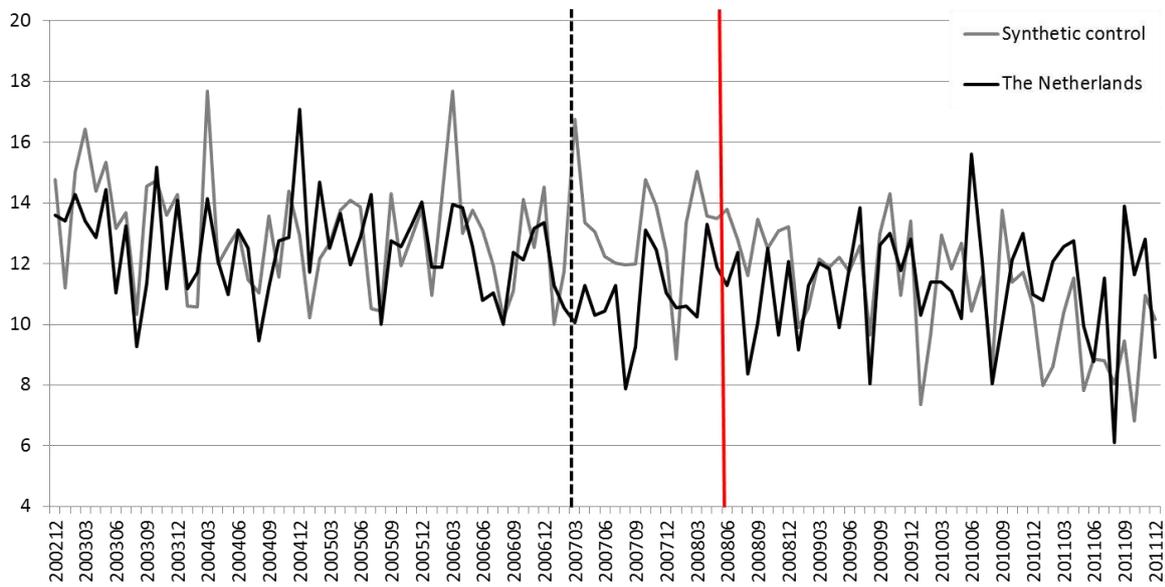


Figure 4: Patenting activity gaps in the Netherlands and placebo gaps in control countries

