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INNOVATION AND IPR PROTECTION IN THE DIGITAL ERA: THE CASE OF HIGH INCOME COUNTRIES. 1990 - 2005

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INTRODUCTION

In 1971, the innovative British comedy team Monty Python’s Flying Circus released a film entitled “And Now for Something Completely Different.” If we fast forward to the 21 Century, many observers are finding that innovation processes are changing and delivering something very different – if not completely different – from previous era. 2 Prahalad & Krishnan (2008), for example, point to the emergence of co-creation as a driving force in innovation, closely associated with the phenomena of globalisation and individualised customer experience. 3 At a recent series of workshops on innovation

1. The views expressed do not necessarily reflect those of the OECD or the governments of its member countries or GEM – Sciences Po. The author wishes to thank: Ricardo Cavazos for comments on an earlier draft of this text and assistance in implementing the regression analyses; Jonathan Senft for helpful suggestions on the project; and, for helpful feedback on the presentation underlying this article, the participants at a seminar held at the French Senate on 8 June 2009 entitled “The Stakes of Innovation in Europe”, which was organised by the Research Network on Innovation.
2. The term “digital era” as used here refers to the period since the early 1990s covering the time of development and widespread implementation of the Internet, roll out of mobile telephony, and greatly increased availability of computers and other digital devices such as digital storage drives, music players, cameras and similar apparatuses, with substantial take up of these technological offerings by government, business, academia and consumers.
3. Prahalad & Krishnan (2008) argue that to succeed in the new age of innovation, “firms must partner with individual customers to co-create customized experiences”. They point to several firms that have understood and capitalised upon the co-creation model (e.g. Starbucks, Facebook, ING and Google).
organised by the OECD, numerous speakers and discussants expressed perceptions of change in the nature and pace of innovation. In comparison to the less globalised and less liberal, pre-Internet period leading up to the 1990s, something indeed appears new and different with respect to innovation.

Change is taking place across multiple factors that influence innovation. First of all, there is a changing economic environment. Globalisation and economic liberalisation have made significant progress, particularly during the period since 1990. In part this was driven by the conclusion of the Uruguay Round of trade negotiations in 1994, which led to reductions in border protection and establishment of global minimum standards for intellectual property rights (IPRs). As a consequence, intellectual property can now be viewed as a formally-recognised subset of intellectual assets in the context of the international trading system. Evidence of the spread of liberalisation during the last two decades can be seen in various indicators. For example, according to an indicator of economic freedom published by the Fraser Institute, high income countries made further progress in liberalisation and a number of emerging economies made quite substantial progress (Chart 1). Secondly, this liberalisation is accompanied by substantial technological progress which was fuelled by innovation and which, in turn, fuelled and accelerated further innovation. The advent of the Internet and associated technologies is emblematic of these developments. Thirdly, there is a change in the manner in which innovation activity is taking place. It is increasingly collaborative, extending not only beyond the walls of the firm, but internationally; it involves more user-driven and open approaches than was previously the case.

This article considers innovation, intellectual assets and IPRs in the digital era. It begins with a discussion of the nature of innovation and intellectual assets, then continues with a discussion of the IPRs and the incentives for innovation. It then describes the strengthening of the international framework for IPRs, with particular regard to patents. This is followed by a presentation of the illustrative case of high income countries and strengthened patent protection. The conclusion highlights key points.

4. During 2007-08, the OECD Committee on Industry, Innovation and Entrepreneurship supported a series of three workshops held in Copenhagen, London and Trento (Italy). These workshops considered different aspects of contemporary innovation, primarily in the business sector. For more information see the websites:
Innovation and IPR protection in the digital era

Chart 1 – Progress in Economic Freedom, selected countries

Source: Gwartney et al. (2009).
Note: The scores in the chart are indices representing the degree of economic freedom, with a score of 10 representing full liberalisation.

NATURE OF INNOVATION

The definition of innovation has evolved over time in response to the changing realities in the real economy. The current edition of the Oslo Manual (OECD-EC, 2005) defines an innovation as, “The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.” Thus, innovation can be in line with traditional popular ideas of technological developments in products or processes. But, it can also appear as non-technological developments (sometimes technology enabled) in organisation (e.g. in the workplace or in the manner in which firms interact with the outside world), marketing (e.g. design, packaging or manner of promotion), or repurposing of existing products.

One driving force behind changes in innovation appears to be the increasing importance of investment in intellectual assets (sometimes referred to as intangible assets). The scale of this investment is substantial, with estimates for some OECD economies amounting to the equivalent of between 7.5 and
11.7% of gross domestic product, depending on the country (Chart 2). Moreover, it appears that investment in intangibles is climbing over time. For example, Corrado et al. (2006) have estimated this development in the United States over the past 55 years, where they find that business investment in intangibles grew from less than 6% to about 14% of business output, while the comparable investment in tangible assets declined from about 12% to less than 10%, albeit with some fluctuation along the way. Barnes and McClure (2009) draw on the literature to present roughly comparable evidence from several OECD countries showing significant long-term growth of investment in intangibles as a share of output over recent decades for a number of countries including Australia, Finland, Japan, the United Kingdom and the United States rising for these countries from a range of 6-10% of output in 1985 to 8-14% in 2005, despite some levelling off of the trend following the recession early in the present decade.

Chart 2 – Total Investment in Business Intangible Assets (% GDP)

Sources: US: Corrado et al. (2005, 2006); UK: Giogio-Marrano & Haskel (2006); Japan: Fukao et al. (2007); Netherlands: van Rooijen et al. (2008); and Finland: Jalva et al. (2007).

Note for Japan: The data are not strictly comparable with those for the other countries due to incomplete coverage of some asset classes.

5. In the absence of official statistics on the composition of intangible assets, the comparison in the chart is based on point-in-time estimates from the literature. Barnes and McClure (2009) provide a review of some of this literature from a dynamic perspective, noting the limitations of such a comparison. For example, the available assessments cover different time periods and use different measures of output in the indicators relating intangibles to the larger economy.
The allocation of investment in intangible assets by category varies substantially across the advanced economies for which there are estimates. Charts 3 and 4 provide an illustration of the composition of investments in business intangible assets for the United States and United Kingdom. The various categories can be seen in the charts, whereby the United States is distinguished by its sizeable investment in organisational structure and the United Kingdom by its comparably sized investment in firm-specific human capital.  

**Chart 3** – Investment in Business Intangible Assets, 1998-2000, United States

Source: Corrado et al. (2005, 2006).

6. The charts presenting the composition of intangible assets in the United States and United Kingdom should be compared with caution. As there are not official indicators for this comparison, the data are drawn from estimates available in the literature. They are not strictly comparable in terms of the year of reference and there may be some variation in the methods, though the authors of the United Kingdom study did take into account the approach used in the study of the United States (which came first).
An OECD study by Lippoldt et al. (2008) reviewed macro, regional and firm level aspects of intellectual assets in relation to value creation. The OECD study highlighted the importance of intellectual assets to value creation, economic growth and competitiveness in a modern economy. The authors note, “Effective development and deployment of intellectual assets can fuel value creation both in terms of expansion of the stock of wealth and in the generation of current value through new or improved products and processes.” In this regard, it is important at all levels for decision makers to be aware of these intangibles and to monitor their progress. By making this an explicit priority, these assets can be better managed and leveraged. The OECD study further states that “Failure to correctly assess intellectual assets can lead to misallocation of resources and other inappropriate decisions by managers, policy makers and others.”

The exploitation of intellectual assets can yield a high return on investments, in part, because of the intangible nature of these assets. This intangible nature means that deployment of the assets is often non-exclusive, non-rivalrous and readily scalable. For example, patents and software can be made readily available for repeated use by the owners or licensees. The creation of value from such assets is not certain, however, and is highly contingent on the management capabilities and business strategies (Lippoldt et al., 2008).
can be particularly challenging for small businesses, which may lack resources to develop and exploit important opportunities associated with their assets.

Governments are recognising the importance of innovation to their economies. A variety of policy initiatives have been undertaken in recent decades to promote innovation and diffusion of innovation, including moves to strengthen intellectual property rights. In view of the potential economic implications, it is important to assess such developments. Innovation is branching and dynamic, by definition difficult to know in advance. Therefore, particular care is required not to introduce policies that would unduly prejudice technological developments, or constrain the competition and entrepreneurship that drive innovation. At the same time, the variability in innovation performance across countries provides an indication that policies may play a role in contributing to innovation developments (both positive and negative).

**IPRS AND INCENTIVES FOR INNOVATION**

The intangible nature of intellectual assets can make them vulnerable to imitation or abuse by competitors. While some intellectual assets are subject to “natural” protections (e.g. they may be difficult to reverse engineer, duplicate or imitate), recourse to more formal recognition and protection of intellectual property may be needed in order to provide economic incentives for innovation and to enable rights holders to defend their legitimate interests. Some forms of IPR protection have been available in some countries for centuries. For example, the US Constitution ratified in 1789 included a copyright and patent clause. Since the 1880s, international agreements now supplemented and administered by the World Intellectual Property Organisation (WIPO) have provided for some standardisation in the treatment of intellectual property. However, it was the World Trade Organisation’s Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) that most effectively ensured implementation of minimum standards of protection for intellectual property across most of the world including developing countries. While the TRIPS Agreement has been in effect since 1995, the implementation in developing countries has rolled out in a phased manner due in part to provision of transition periods. In all, the TRIPS Agreement specified protection for seven broad types of intellectual property including copyright and related rights, trademarks, geographical indications, industrial designs, patents, layout-designs (topographies) of integrated circuits, and undisclosed information (trade secrets). 7

7. It is notable that the TRIPS Agreement also includes provisions to limit abuse of this protection, in part through its provisions on the control of anti-competitive practices in contractual licences.
Various international accords including the TRIPS Agreement recognise the rights of intellectual property holders to protect their property, but also to license, rent, or assign the property. This is an important element in facilitating diffusion of the knowledge and technology embodied in the property. The reason is that such recognition opens the way for domestic and international trade in goods and services related to the intellectual property. Rights holders can leverage this property through diffusion via various commercial channels, not only by employing it directly in products or processes, but also by making it available to others.

The strengthening of IPR protection appears to be eliciting a commercial response. Not only are firms better able to capitalize on their intellectual property through direct in-house deployment of innovative processes or production of goods and services that embody their innovations; some are also moving to capitalize on their intellectual capital via external transactions. That is, some innovative firms have exploited opportunities to “monetize” unutilized or early stage results from research and development (R&D) through disposal outside the firm via sale, licensing or cross-licensing or other commercial arrangement. Other firms have found benefit from the emerging market for intellectual property by facilitating its functioning, seeking to securitise intellectual property in offerings (e.g. bundling patents such that investors would benefit from developments in their asset value and royalty streams) or providing opportunities to connect intellectual property owners with potential customers or partners.8

Not all of the activity stimulated by IPR protection is necessarily commercial or for profit. Some innovators have turned the system around to use it in a manner protecting openness and avoiding exclusive appropriation of benefits by commercial interests. The non-profit corporation Creative Commons is one example. That corporation provides free licenses and other legal tools to enable innovators to provide their desired degree of exclusivity, thereby “making it easier for people to share and build upon the work of others, consistent with the rules of copyright.”9 The open-source software movement is another example.

The availability of protection for IPRs and the emergence of markets and new channels for dissemination provide powerful incentives for innovation and diffusion of innovation. Globalisation, rules-based trade liberalisation, the Internet and other technological progress are combining to provide

8. One such firm is Ocean Tomo (http://www.oceantomo.com/), which bills itself as “the Intellectual Capital Merchant Banc® firm” and operates an on-line auction for patent owners.
9. For more on Creative Commons, see their web site at the following location (as of 19 September 2009): http://creativecommons.org/about/.
greatly increased opportunities or leveraging intellectual assets. The potential returns are greater than those that were available in the past. While commercial interests may benefit from this profit potential, society at large may also benefit from the drive it can provide for new innovation and diffusion of innovation including through international technology transfer.

The incentives to innovate provided through protection of IPRs are undermined through problems with enforcement. The ease of imitation or abuse of intellectual property, particularly in the digital era, makes it difficult for the authorities in practice to ensure means for full and effective implementation of IPRs. Some abuses are treated as civil matters and the defence of the associated IPRs is left to the rights holders through the courts and administrative bodies. However, the injured parties may not be aware of the infringements or their origin, or may lack the means to launch the necessary legal action. Moreover, even where authorities take initiative to intervene directly (such as in criminal cases), it can be difficult to trace unauthorised diffusion back to the points of origin. Tackling this problem is a serious challenge in developed countries, where much of the global abuse of IPRs takes place due in part to the wide availability of facilitating technologies. In developing countries it can be a daunting challenge, due to resource constraints and competing priorities that the authorities may face. One effect of the abuse of IPRs is that innovators may not be able to appropriate the full anticipated benefits (economic and other) of their work, which raises the possibility that the incentives for future innovation are undermined.

An OECD study (2008) examined the international trade in tangible (physical) counterfeit and pirated products, estimating the volume of this trade in 2005 at USD250 billion. While this is a small proportion of overall trade, it is nonetheless large in absolute terms and the signalling effects of this abuse may have disproportionate negative effects on potential innovators in sectors where such abuse is most common. Moreover, the aforementioned estimate does not take into account products produced and consumed domestically or digital products distributed via the internet. The OECD notes that if such products were included, the total magnitude of abuse could be several hundred billion USD more. Particularly disturbing is

10. This applies not only to for-profit interests but also to those that may have other motivations to innovate such as social recognition or altruism, who can now extend the reach of their innovations.
11. For example, OECD (2009) provides a detailed discussion on the piracy of digital content.
12. Some technical assistance is available to developing countries from various partners. For example, WIPO provides a variety of enforcement-related training and awareness-raising activities. The list for January to July 2009 is available here (as of 20 September 2009): http://www.wipo.int/enforcement/en/activities/activities_09.html.
the discussion in the OECD report noting that supply lines for legitimate products in some areas have been infiltrated, a development that raises health and safety issues among other concerns.

A further OECD study (2009) examined piracy of digital products. This is a particularly challenging area for control of IPR abuse. The illicit market for digital products is hard to tackle because of the easy potential availability of infringing products (e.g. via the Internet) and the potential low cost of producing such products. Moreover, consumers may not be aware or concerned about the legitimacy of the products in that the quality can be good or acceptable. Also, such products may offer some advantages in that they are available in advance or in areas where the product is not otherwise sold and may avoid limitations brought on by digital rights management devices.

Governments around the world have struggled to ensure effective implementation of IPR regimes and adequate enforcement. A variety of measures have been undertaken such as establishment of special IPR-focused courts, toughening of legal statutes, provision additional resources for enforcement, expansion of international co-operation in enforcement and launching of public awareness initiatives, among other actions. The affected industries have also responded to the situation, using a combination of legal action against infringers, publicity campaigns, government lobbying and technical measures (e.g. digital rights management) to reduce abuse. 13

At the same time, some innovators are attempting to adapt and employ more open approaches to innovation, finding new means of capitalising on their innovations or redoubling efforts to exploit older approaches that are less vulnerable to abuse. Openness within strategic partnerships or more broadly can promote co-creation and collaborative processes that yield increased scale and pace of innovation (Prahalad and Krishnan, 2008). Boldrin and Levine (2008) discuss some further options. For example, innovators have a timing advantage in the innovative process and can exploit their first-to-market position. Those generating creative content, may be able to capitalise more fully on live performances while using open dissemination of digital editions of the content to raise their public image. Moreover, innovators may be able to diversify their income drawing on diversified sources. For example, a creative content provider may be able to draw additional income from traditional sales through improved pricing schemes for digital content (e.g. in terms of lower price, more flexible licenses or wider geographic availability) while also extracting income from indirect sources

13. For example, the Business Software Alliance monitors software piracy around the world and maintains a website to disseminate information on software piracy at the following location: http://www.bsa.org/country/Anti-Piracy.aspx (available as of 20 September 2009).
such as sales of advertising space to third parties on the innovator’s website. Some innovators are providing basic products for free (though often still subject to IPR protection), while selling add-ons, upgrades or related services.

The positive potential of protection of IPRs to encourage innovation and diffusion of innovation is not unconditional. Theoretically, IPRs could be made too strong and confer excess market power on rights holders. If protection is too broad, for example, IPR protection may unduly discourage innovation in fields “neighboring” the protected innovation or socially desirable subsequent incremental innovation.\(^\text{14}\) Thus, the situation of IPRs is complex and economic theory is not unambiguous in its predictions. Consequently, it is necessary to examine empirically the developments in the real economy in order to clarify the possible impacts of the various policy choices (Maskus, 2000). The next section of this article examines the foregoing discussion empirically, with particular focus on patent rights.

**THE INTERNATIONAL STRENGTHENING OF IPRs, PATENT RIGHTS AND HIGH INCOME ECONOMIES**

The 1990s presented a time of global IPR reform, a development discussed by Park & Lippoldt (2004, 2008) and others. The first half of the decade, in particular, was characterised by a strengthening of IPR protection and progress towards increased alignment of associated policies in countries around the world. One indication of this can be found in the significant number of countries that ratified key WIPO IPR treaties during the first half of 1990s, as developing countries and transition countries began to participate more fully in the global economy. For example, 36 of the 164 current contracting parties to the Berne Convention (copyrights) joined during that five year period. Similarly, 36 of the 173 current contracting parties to the Paris Convention (industrial property) joined during that period. Considering that these treaties have been in existence since the 1880s, that is a significant burst of activity. In addition, IPR protection was increasingly included in

\(^\text{14}\) It is notable, however, that some scholars of innovation – including Joseph Schumpeter (e.g. see McCraw, 2007) – point out that often the most economically important innovation is disruptive or transformational in the sense that it displaces entire classes of technology through the process of creative destruction. That is, rather than being incremental, such innovation can mark a large step forward bypassing the existing protected intellectual property. For example, the typewriter industry was displaced by the advent of information technology. In such cases, even strong IPRs in the old technology may not pose a barrier, rather they are “invented around” or bypassed by the innovator.
regional trade agreements and there were various unilateral IPR initiatives. However, arguably the most notable development was the advent of the TRIPS Agreement, which entered into force in 1995.

WTO (2008) notes that the TRIPS Agreement details “how to give adequate protection to intellectual property rights”, “how countries should enforce those rights adequately in their own territories” and “how to settle disputes on intellectual property between members of the WTO”. The objective of the agreement is clearly stated in Article 7, which notes that “The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.” Subject to this additional notion of “balance”, the TRIPS Agreement affirms the applicability of the basic principles of the trading system, namely, national treatment and most favoured nation (MFN) treatment. Moreover, it expressly builds on the framework of previously existing accords administered by the World Intellectual Property Organisation. 15

The TRIPS Agreement goes a step further than the WIPO accords in that it establishes international minimum standards applicable across the WTO membership, though subject to transition periods and certain exemptions (in particular in the case of the Least Developed Countries as identified by the United Nations). Moreover, it provides for enhanced means to ensure IPRs are enforced and that countries abide by their commitments. The agreement established a Council for TRIPS and charged it with monitoring the operation of the agreement and, in particular, WTO Members’ compliance with their obligations under the agreement, while providing members with the opportunity of consulting on matters relating to the trade-related aspects of intellectual property rights. In cases of where this mechanism is not adequate, members have recourse to the Dispute Settlement Understanding, which applies to consultations and the settlement of disputes under the TRIPS Agreement.

Patents, an important component of intellectual property, are exclusive rights granted to innovators upon application to national authorities with

regard to inventions that are novel, useful and mark an innovative step over existing technology. 16 With respect to patent rights, subject to certain exemptions, the TRIPS Agreement made clear that patents should generally be available for most technologies, cover products and processes, provide at least 20 years protection, and ensure the owner’s right to prohibit use by third parties without consent. (Annex 1 below provides more information on patents in the context of the TRIPS Agreement). In view of the importance of patents in the global economy and the changes in the international regime concerning patents, the balance of the paper will focus in particular on this type of intellectual property.

**Patent Rights**

Chart 5 highlights the evolution of the strength of patent rights during the period from 1960 to 2005, using an index developed by Walter Park of American University and colleagues. The index is based on laws on the books and covers five aspects of patent protection: i) membership in international treaties, ii) subject matter covered, iii) restrictions on rights, iv) enforcement provisions and v) duration of protection. 17 The long-term trend towards stronger patent rights is clearly evident. The implementation of the TRIPS Agreement led to a notable uptick in the index for OECD and developing countries. Moreover, as Park (2008) points out, there was increasing alignment in the patent index scores for the countries covered by the index; the co-efficient of variation (standard deviation divided by the mean) declined from an average of 0.45 in the early years of the index (for the 30 years up to 1990) to 0.27 in 2005. The main elements driving the increasing scores in the high income OECD countries (Chart 6) 18 include increased membership in international treaties (especially UPOV, the Patent Co-operation Treaty and, of course, the TRIPS Agreement), increased coverage of subject matter (especially increased coverage of plant and animal matter, utility models and software), and increased stringency in enforcement (especially reversal of the burden of proof in certain IPR cases).

16. Wikipedia defines a patent as, “a set of exclusive rights granted by a state (national government) to an inventor or his assignee for a limited period of time in exchange for a public disclosure of an invention.” Available at: http://en.wikipedia.org/wiki/Patent (as of 20 September 2009).
18. According to the World Bank definition, high income countries amongst the OECD membership include: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, New Zealand, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom and United States. Not included are Mexico, Poland and Turkey. This definition is used in the analysis that follows in the paper.
The strengthening of patent protection was associated with a variety of developments in the high income OECD countries. One development was an increase in the number of patent applications (Chart 7) via the three main
patent offices: Europe, Japan and US. While patent applications do not necessarily equate to applied innovation in the economy, they can provide a partial indication of outputs from innovation processes. It may be that the changes in the patent regime summarised above led to changes in the propensity of inventors to seek patents or changes in the quality and stringency of patent approval processes, factors that would have influenced the volume of applications. The scale of the change in applications is such that further exploration is merited. A first step is taken in the discussion in the next section.

![Chart 7 – Number of Patent Applications (Index 1991 = 100), 1991-2005](chart.png)

Source: OECD Patent Database and USPTO, EPO & JPO annual reports.

**STRENGTHENING OF PATENT RIGHTS AND ECONOMIC PERFORMANCE IN HIGH INCOME COUNTRIES**

In order to assess the changes in the real economy associated with the evolution of the patent rights index scores, a series of regression analyses were performed. Each regression equation was specified to determine the change in a selected variable (indicative of either an economic flow or innovation-related development) associated with a one percent change in the patent rights index scores, controlling for other factors. (See the Chart notes for further details). Although this type of analysis does not determine causality, the results of the present analyses indicate statistically significant positive associations in each case and some of the coefficients are quite large. The approach is similar to that of Park and Lippoldt (2008) in their analysis with respect to
developing countries. However, in the present paper the country group of interest consists of high-income OECD countries and the analysis employs a random effects panel estimator with robust standard errors.

Chart 8 presents indicators of selected international economic flows. The increase in foreign direct investment (FDI) is particularly notable, amounting to about a 5% increase in FDI for each percentage point increase in the patent rights index score. This is particularly important because FDI is often associated with inward technology transfers and eventually spill-overs in the domestic economy (Maskus, 2004). Such technology transfer can be an important contributing factor to productivity increases as the new technology is applied in the economy and to further innovation as it may inspire related spin-off innovation or competitive responses. The strengthening of patent rights is also associated with increases in imports of merchandise and services, albeit to a smaller extent. The positive association may be in part due to the improved ability of rights holders to protect their interest and hence an increased willingness to import products and services that embody their intellectual property.

Chart 8 – Change in Economic Flows Associated with a 1% Change in the Patent Rights Index, High Income OECD Countries, 1990-2005

Source: Author calculations with the assistance of Ricardo Cavazos; data from Park and Lippoldt (2008)

Notes: Statistical significant is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1. The values shown are the coefficients from individual pooled regression analyses (OLS) where the variables are in natural logarithmic units. The variable of interest is specified as the dependent variable and the patent rights index as an independent variable; controls are included for other potential influences including real GDP per capita, Freedom to Trade Internationally (Fraser Institute), business regulatory environment (World Bank, Doing Business), IPR effectiveness (as opposed to laws on the books), legal effectiveness, physical property rights and governance. See Park and Lippoldt (2008) for more information on the data set.
Chart 9 presents indicators of selected innovation-related phenomenon. The chart provides a more refined view of patent applications than the simple index shown in Chart 7. In the case of the analysis for Chart 9, other potential determinants are controlled for in order to obtain a better view of the possible influence of the change in the strength of patent rights. The results indicate a robust response in patent applications associated with the strengthening of patent rights. Moreover, the patent flows are split between resident patents and non-resident patents. As discussed in Park & Lippoldt (2008), resident patenting is of interest as an indicator of domestic innovative response, whereas non-resident patenting provides an indicator of possible future inflows of technology and intellectual property (either via FDI or imports). As patents are granted on a country-by-country basis, foreign innovators seeking to enter a market may tend to take steps to protect their intellectual property in advance. Compared to patent applications, the coefficient is smaller for the association of change in expenditure on R&D with change in the strength of patent rights; nonetheless, the coefficient is statistically significant and, as it reflects R&D as a percentage of GDP, the change in absolute value that it represents is quite substantial.

Chart 9 – Change in Innovation Indicators Associated with a 1% Change in the Patent Rights Index, High Income OECD Countries, 1990-2005
CONCLUSIONS

The foregoing analysis has highlighted the changing environment for innovation. The change is global in scale and is in part a function of globalisation, economic liberalisation and accelerated technological progress. One indicator of the changing conditions is the growing importance of intellectual assets, which are in part a product of innovation processes. These assets have particular characteristics that often enable them to be leveraged globally for large economic returns.

Intellectual property constitutes a major component of intellectual assets, governed by a special international regulatory framework. This framework has been the subject of substantial reforms in recent decades to strengthen the protection afforded to the rights holders with respect to their intellectual property. The strengthening of IPRs can be expected to have economic effects, in particular because stronger IPRs may be central to provision of incentives to innovate and to the ability of rights holders to capitalise on their innovation and make access available to others. This article takes a closer look at the strengthening of patent rights in high income countries since 1990 and finds a positive association with the evolution of indicators for international economic flows and domestic innovation processes.

There is an important caveat to this conclusion. This positive finding applies to the evolution of the strength of patent rights from the level in these high income countries in 1990 to the level applicable in 2005. It does not comment on the effect of further strengthening of IPR protection in these countries; it does not speak to the relationship stronger IPRs with respect to other economic and innovation indicators. Thus, it does not imply that stronger IPRs are always a “silver bullet” solution to innovation problems. Nevertheless, the analysis does indicate positive developments as being associated with the strengthening that took place.

Furthermore, in these high income countries, it is important to note that a number of complementary conditions exist that may enable them to take particular advantage of the incentives and opportunities afforded by stronger intellectual property rights. For example, they tend to have substantial stocks of human capital as an input to innovation processes and they generally have complementary policies in place that provide supportive conditions for development of innovative commercial activity (e.g. rule of law, broadly appropriate tax codes, or adequate macroeconomic conditions). The relationship of strengthened IPRs to such complementary policies and the associated variation in economic performance is only partly explored in the existing literature and merits further examination.
REFERENCES


ANNEX 1. THE TRIPS AGREEMENT AND PATENTS

Patents are treated in Section 5 of the TRIPS Agreement. As for the other types of intellectual property, the aim is to establish minimum standards for protection. Article 27 notes that subject to certain conditions “patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step [i.e. they are non-obvious] and are capable of industrial application [i.e. useful].” Plant varieties must be protected, but are subject to special treatment in that the protection may be provided either via patents or by an effective sui generis system or by a combination of approaches. With respect to patented processes, the rights of the patent holders extend to products directly obtained from such processes.

WTO Members may exclude from patentability certain types of inventions where necessary so as to protect public order or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment. Members may also exclude from patentability: (a) diagnostic, therapeutic and surgical methods for the treatment of humans or animals; (b) plants and animals other than micro-organisms, and essentially-biological processes for the production of plants or animals other than non-biological and microbiological processes.

Patents are granted at the national level and must be applied for in each national market. Under the provisions of TRIPS, the minimum term of protection is 20 years from the date of filing. Once accorded, the patent

19. WTO Members may provide limited exceptions to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties.

20. Internationally, application is facilitated via a standardized approach through WIPO’s Patent Co-operation Treaty (PCT), which is available to nationals or residents of any of the 141 contracting parties. An application cleared through the PCT process cannot be rejected on formal grounds and the applicant is accorded an additional 18 months to file with the various national offices, among other advantages. More information is available here: http://www.wipo.int/pct/en/treaty/about.htm.
gives the owner the right to prevent third parties from the acts of making, using, offering for sale, selling or importing for these purposes that product (or in the case of a process, then the product obtained directly by that process). Importantly for technology markets, the TRIPS Agreement states that patent owners shall also have the right to assign, or transfer by succession, the patent and to conclude licensing contracts. Importantly for subsequent innovation, the TRIPS Agreement states that members shall require that patent applicants disclose the invention in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art and may require the applicant to indicate the best mode for carrying out the invention known to the inventor at the filing date or, where priority is claimed, at the priority date of the application. In the event a patent is subsequently revoked or subject to forfeiture, the agreement states that an opportunity for judicial review of such decisions shall be available.

On a case-by-case basis and subject to certain conditions, the TRIPS Agreement provides a limited possibility for use of a patent without the authorization of the rights holder. Generally, such use may only be permitted if the proposed user has made efforts to obtain authorization from the rights holder on reasonable commercial terms and conditions and if such efforts have not been successful within a reasonable period of time. However, WTO Members may waive this requirement in the case of a national emergency or other circumstances of extreme urgency or in cases of public non-commercial use. In any event, the rights holder shall be notified as soon as reasonably practicable. Moreover, the rights holder shall be paid adequate remuneration in the circumstances of each case, taking into account the economic value of the authorization (except in situations where, following a due legal process, the authorization is granted to remedy a situation of anti-competitive practice).

In addition, the scope and duration of such use or compulsory license shall be limited to the purpose for which it was authorized and the license awarded on a non-exclusive and non-assignable basis. The TRIPS Agreement states that such action should be authorized predominantly for the supply of the domestic market of the Member concerned, subject to adequate protection of the legitimate interests of the persons authorized for such use, and subject to termination if and when the circumstances which led to it cease to exist and are unlikely to recur. The competent authority shall have the authority to review, upon motivated request, the validity of any decision related to the authorization including whether there is a continued existence of the circumstances provoking the action.

21. In the case of semi-conductor technology, such an approach is limited to public non-commercial use or to remedy a practice determined after judicial or administrative process to be anti-competitive.