

CHAPTER 4. AN EMPIRICAL ASSESSMENT OF THE ECONOMIC IMPLICATIONS OF PROTECTION FOR TRADE SECRETS

In this chapter, the indicator developed in Chapter 3 is used to assess the economic implications of variations in the stringency of protection in a larger sample of economies over an expanded time horizon. The assessment is based on dual approaches, one qualitative and one quantitative. This work – the first of its kind ever to be carried out with respect to trade secrets – delivers new insights on the importance of trade secrets protection to economic performance, including innovation and growth. Most importantly, the assessment leads to the finding that the stringency of trade secrets protection is positively related to indicators of innovation. The work also shows that the stringency of trade secrets protection grew substantially in the sample economies between 1985 and 2010.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities or third party. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

It should be noted that statistical data on Israeli patents and trademarks are supplied by the patent and trademark offices of the relevant countries.

ABSTRACT

This chapter takes stock of the protection of trade secrets for a sample of 37 countries, provides historical data for the period since 1985, and considers the relationship of the stringency of the protection of trade secrets to relevant economic performance indicators. The chapter finds that there has been a notable increase in the stringency of trade secrets protection in a broad sample of countries during the period from 1985 to 2010. The chapter also finds a positive association between the stringency of trade secrets protection and key indicators of innovation and international economic flows. Further details of the methodology and additional country data can be found in the original version of chapter 3, which is an OECD Trade Policy Working Paper, available at <http://dx.doi.org/10.1787/5jz9z43w0jnw-en>.

EXECUTIVE SUMMARY

This chapter takes stock of the protection of trade secrets for a sample of 37 countries, provides historical data for the period since 1985, and considers the relationship of the stringency of the protection of trade secrets to relevant economic performance indicators. The chapter is structured around two main approaches: a qualitative assessment of relevant economic performance issues drawing on the literature and a quantitative assessment of the relationship between the Trade Secrets Protection Index and indicators of economic performance. The study employs the methodology for assessment of the stringency of trade secrets protection that was developed in chapter 3.

The assessment of the stringency of trade secrets protection across a broad sample of countries in recent decades found substantial variation between countries at specific points in time and in protection regimes of specific countries over time. The qualitative assessment then considered a number of potential areas where variation in trade secrets protection could influence economic performance. These included economic incentives for innovation, labour mobility, spillover effects and technological diffusion. The empirical assessment found that the stringency of protection in the developed countries rose in particular during the 1990s and then stabilised, while developing countries on average tended to rise throughout the entire study period. The quantitative assessment of the relationship of this increased stringency of protection to indicators of economic performance found a tendency for there to be a positive relationship. This includes indicators of innovation inputs and international economic flows of investment and trade. Through such relationships, trade secrets protection may have implications for developments in domestic innovation, international technology transfer and access to technology-intensive inputs and related products.

These findings represent a first step in the assessment of trade secrets protection. However, it should be noted that the relationships highlighted here reflect association but not necessarily causality. It is also necessary to note that the relationships identified in the empirical assessment apply to a specific sample during a specific time period and a certain range of variation. This does not mean that ever stronger protection, for example, will yield similar results. Nonetheless, the positive and statistically significant relationships identified do provide an indication that provision of adequate protection of trade secrets may be an appropriate element of a policy framework supporting certain key aspects of economic performance. Further research could contribute to confirming these findings and exploring the effects of trade secrets protection at sectoral and firm level.

Introduction

This chapter takes stock of the protection of trade secrets for a sample of 37 countries, provides historical data for the period since 1985, and considers the relationship of the stringency of the protection of trade secrets to relevant economic performance indicators. The paper is structured around two main approaches: a qualitative assessment of relevant economic performance issues drawing on the literature and a quantitative assessment of the relationship between the *Trade Secrets Protection Index* and indicators of economic performance. The study employs the methodology for assessment of the stringency of trade secrets protection that was developed in chapter 3. The chapter begins with an overview of the international framework for protection of trade secrets. It then provides sections treating each of the main themes in turn. The conclusions highlight policy relevant findings with respect to the implications of the stringency of protection available for trade secrets.

Overview: International Framework for Protection of Trade Secrets

The World Trade Organisation's (WTO) *Agreement on Trade-Related Aspects of Intellectual Property Rights* (TRIPS) Agreement was the first multilateral agreement to directly address trade secrets protection (Box 4.1.). The approach laid out in the TRIPS Agreement is based on the notion that protection against unfair competition should include protection for undisclosed information¹¹⁶. In presenting this approach, the TRIPS Agreement makes reference to the prior-existing protection against unfair competition as presented in the Paris Convention for the Protection of Industrial Property (1967), a convention that is administered by the World Intellectual Property Organization¹¹⁷.

Guided by the provisions of Article 39 of the TRIPS agreement, the definition of trade secrets has tended to converge across the countries considered in this assessment. As noted in Chapter 3, definitions generally recognise a trade secret as information that is secret, has commercial value as a result, and is subject to reasonable efforts to maintain the secrecy. The concepts tend to be applied as follows:

- *Secrecy*. The information protected must actually be secret. Secrecy need not be absolute. Secrecy requires that the information must not be readily publically accessible and that it is revealed to others only under conditions that maintain secrecy with respect to the broader public¹¹⁸. Thus, the trade secret owner may share the information with employees and business partners.
- *Commercial Value*. The information must have economic value as a result of its being secret and must derive some utility from being kept secret.
- *Reasonable Efforts to Maintain Secrecy*. The information must be the subject of reasonable efforts on the part of the rights holder to maintain its secrecy. By its nature, a trade secret claim arises when measures to protect the secret have failed. Thus, the law tends not to require one who claims a trade secret to be entirely successful at protecting it. In national laws, the necessary effort is often broadly described as “reasonable,” in keeping with Article 39 of TRIPS¹¹⁹.

Here it is important to note that trade secrecy does not provide an exclusive right to use of the information, provided that the second party obtains the information fairly or it enters the public domain by fair means. Thus, unlike patented inventions or copyright protected content, trade secrets are not protected for a statutory time limit and they can run out in the regular course of competition.

The scope of trade secret protection varies somewhat by country, but broadly concerns three categories of information: 1) technical information; 2) confidential business information; and 3) know-how. Technical information typically includes industrial processes, blueprints, formulae and similar information regarding technology. Confidential business information typically includes customer lists (in cases where they include truly non-public information), financial information, business plans and similar information regarding the operation of a business. Know-how includes information about methods, steps and processes for achieving efficient results. Most countries recognise the first two categories, often without differentiating them. Know-how is a term commonly used both in discussion of proprietary information and in agreements, but it enjoys less formal recognition as a separate, defined category of trade secrets.

As can be seen from Box 4.1., the TRIPS Agreement does not provide much guidance on the specifics of the national systems to be put in place to protect trade secrets. Consequently, countries employ a broad range of means to provide the TRIPS-mandated protection. In some instances, countries have implemented express legislation. In others, the obligation is met by laws that include misappropriation via such means as breach of contract, inducement of others to breach contracts and acquisition by third parties of information

known to be disclosed dishonestly or where it was negligent not to know. This variation in means can affect the ways businesses and workers conduct their affairs and thus there are reasons to believe that the legal protection of trade secrets may have important economic effects.

Box 4.1. The TRIPS Agreement on Undisclosed Information

Protection of undisclosed information is addressed in Article 39 of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO). This agreement entered into force on 1 January 1995 and established an international standard requiring WTO Members to protect undisclosed information including agricultural and pharmaceutical test data.

**Section 7: Protection of Undisclosed Information, Article 39
[of the TRIPS Agreement]**

1. In the course of ensuring effective protection against unfair competition as provided in Article 10bis of the Paris Convention (1967), Members shall protect undisclosed information in accordance with paragraph 2 and data submitted to governments or governmental agencies in accordance with paragraph 3.¹

2. Natural and legal persons shall have the possibility of preventing information lawfully within their control from being disclosed to, acquired by, or used by others without their consent in a manner contrary to honest commercial practices² so long as such information:

- (a) is secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question;
- (b) has commercial value because it is secret; and
- (c) has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret.

3. Members, when requiring, as a condition of approving the marketing of pharmaceutical or of agricultural chemical products which utilize new chemical entities, the submission of undisclosed test or other data, the origination of which involves a considerable effort, shall protect such data against unfair commercial use. In addition, Members shall protect such data against disclosure, except where necessary to protect the public, or unless steps are taken to ensure that the data are protected against unfair commercial use.

Footnotes:

- 1. These paragraph references refer to paragraphs 2 and 3 of Article 39 of the TRIPS Agreement.
- 2. At this point in the original text, there is a footnote, numbered 10, that states:
For the purpose of this provision, "a manner contrary to honest commercial practices" shall mean at least practices such as breach of contract, breach of confidence and inducement to breach, and includes the acquisition of undisclosed information by third parties who knew, or were grossly negligent in failing to know, that such practices were involved in the acquisition.

Source: Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), WTO.

Qualitative Assessment

This qualitative assessment is based on key themes emerging from the economic and business literature and available statistics on the issue of trade secrets protection. It describes the theoretical and perceived role of trade secrets in economic performance and innovation. Information on firm-level impacts is included, including with respect to small and medium size firms (SMEs) and start-ups. The relationship

to national economic development is also considered. The evidence highlights the value of trade secrets, as well as the scope and nature of trade secret theft and misappropriation among competing firms.

Previous theoretical work points to several ways in which trade secret protection may incentivise investment in research and development (R&D) as well as the creation of commercially valuable information. First, such protection may increase the appropriability of the results from investment in the development of technical and confidential business information. It does this by deterring employees, business partners and third parties from misappropriating or misusing specific information meeting the trade secrets criteria. Kitch (1980) views this benefit in terms of reducing the risk of theft, while Friedman et al. (1991) emphasise that there is a reduction in the cost of protection in cases where the avenues of legal recourse are clear and effective (i.e. in the absence of such legal protection firms may need to invest more heavily in security measures). In either case, there is a potential for increased returns from R&D investment, and thus such innovation may be incentivised.

A further incentivising effect noted in the literature is the role that trade secrets may play in conferring competitive benefits. Lemley (2011) observes that firms may invest in developing trade secrets because the prospect of supra-competitive profits motivates them to do so. In this view, a trade secret may confer a competitive advantage through a production process that reduces cost or delivers a unique product. In addition, incentives may be associated with trade secrets as an alternative or complementary protection to patents. In cases where patents are legally unavailable, too expensive to maintain, or undesirable due to their disclosure requirement, Maskus (2000) and Friedman et al. (1991) argue that trade secrets can substitute for patents and provide incentives to innovate. Trade secrets can also provide protection during the developmental phase leading to a patent (i.e. prior to a formal patent application). In some cases (e.g. due to the immediate availability or potentially low costs), firms may even employ trade secrets as their preferred strategy for protection of their intangible assets (e.g. see Arundel, 2001, or Cohen et al., 2000).

On the other hand, in cases of weak protection for trade secrets, there could be more spillovers of R&D information amongst competitors. Such information may stimulate investment by firms in further internal R&D to complement the incoming information or to gain a first mover advantage. For example, a firm may need to have sufficient internal R&D to make use of external R&D, and vice versa (Lokshin et al., 2006). Weak appropriability could drive firms to pursue R&D in competitive races to develop products, relying on first mover advantage, temporary secrecy, or patents to secure an edge¹²⁰. While this is a theoretical possibility, there are some indications that relatively stringent trade secrets protection may actually deliver an increased sharing of information among potential collaborators, as businesses are reassured that they can enforce their rights in the event of a breach of trust or misappropriation (Lemley, 2011). This potential was highlighted in a recent study commissioned by the European Commission (Baker & McKenzie, 2013), which included a survey of firms' use of trade secrets. The survey found that while 60% of businesses share their trade secrets regularly or occasionally, among those that declined to share such information 40% cited fear of loss of confidentiality as the reason. Moreover, even in countries with relatively stringent trade secrets protection, there are usually exemptions or limitations on the definition and scope of trade secrecy that permit spillovers of general knowledge, skills and experience.

The availability of trade secrets protection may influence firms' size and structure, as well their engagement in the labour market. If trade secrets protection is less stringent, then firms that depend on critical non-public information may be less willing to expand, as secrets are kept within a trusted circle (e.g. some family businesses). In such an environment, firms may be less willing to outsource manufacturing or to engage in joint ventures. Labour market implications are further highlighted via two studies of the United States (Png, 2012a and 2012b). He found that some US states enacting increased trade secret protection may have experienced relatively modest declines in the mobility of postgraduate engineers and scientists (e.g. due to enforcement of contractual requirements concerning non-competition);

this in turn might slow the pace of spillover effects. However, Png (2012b) found that enactment of a trade secret law in US states was associated with a significant increase in R&D spending. Other studies point to implications for spillovers in that less stringent trade secrets protection may cause firms to attempt to retain employees by attempting to prevent employee movement by paying employees wage premia or hiring relatives (Sherwood, 1990). More stringent trade secret protection may also impede employee mobility by: (a) enforcing non-compete provisions¹²¹ or (b) imposing confidentiality obligations on ex-employees that make them less valuable to new employers¹²².

There are some indications that innovative small and medium size enterprises (SMEs) may be particularly reliant on trade secrecy as protection for their intellectual assets (Brant and Lohse, 2013). Subject to reasonable efforts on the part of such firms to maintain the required secrecy, in many jurisdictions trade secrets protection is readily available without burdensome administrative requirements and in some cases may be maintained at comparatively low cost¹²³. While patents may be appropriate for protecting some types of intellectual property – as in cases where a new technology is readily discerned by competitors upon the release of a product into the market, they can also be more costly in terms of time and resources¹²⁴. For example, in addition to filing and maintenance fees and administrative requirements, patenting may expose SMEs to risks of litigation (Lanjouw and Schankerman, 2004)¹²⁵. Thus, in cases where trade secrets protection is adequate and appropriate, its use may prove advantageous for certain SMEs.

The availability of trade secrets protection may also play a role in international diffusion of technologies and other information via foreign direct investment (FDI) or trade. Firms may be more likely to invest or trade in a country that protects trade secrets, particularly where that investment requires the business to reveal or develop trade secrets (e.g. in cases where tacit knowledge is employed in the implementation of patent-protected processes). In entering a market, firms face a choice of engaging a local partner or starting a subsidiary. The stringency of trade secret protection may affect this choice by making a firm more or less willing to share product information and sales techniques with a local partner (CREATE, 2012). In the literature on intellectual property rights (IPR) protection and FDI, there is some evidence that firms respond positively to availability of such IPR protection (e.g. Park and Lippoldt, 2008). In addition, firms in different sectors or employing different technologies may respond differently to the availability of particular types of protection. Thus, trade secrets protection may have economy-wide effects as well as sector or technology-specific effects in relation to FDI or trade.

In terms of the interaction with alternative forms of intellectual property rights, there is a clear potential relationship to patent protection. As noted above, firms that depend on patent protection may tend to rely on trade secrets protection during the developmental stage of the technology (Png, 2012a). However, in some specific cases of technological innovation, firms may forgo patent protection entirely and rely exclusively on trade secrets protection. For example, this may be the case with process innovation where the resulting product is difficult to reverse engineer. The effect may depend on practical aspects of protection under each form of protection¹²⁶. As a legal matter, not all inventions or information that can be kept secret are patentable. In terms of release of a product on the market, not all patentable aspects of the innovations that it may embody can be kept secret, which is a requirement for trade secret protection.

Getting a handle empirically on the effects of trade secret protection is challenging due to the very nature of trade secrets as being secret by definition. In addition, firms are reluctant to report trade secret theft. Even where there are legal actions, the civil litigation and criminal prosecution rates could have a variety of meanings. A lack of litigation could mean that the law is effectively deterring abuses or that trade secret owners or prosecutors view the law as ineffective and legal action as futile. Similarly, high rates of litigation could signal widespread disrespect for the law by defendants or confidence on the part of plaintiffs and prosecutors. In order to take a step towards untangling the economic implications of such

issues, the quantitative assessment that follows will consider the relationship between the stringency of trade secrets protection and certain key economic indicators.

In light of the costs of continued abuse of trade secrets, a number of OECD Members have initiatives underway to address concerns about uncertainty or gaps in protection. With respect to some dimensions of protection, these initiatives seek to harmonise and develop minimum standards. For some stakeholders, the motivation for such reforms is a goal of reducing the complexity of managing trade secrets protection across international boundaries and promoting market opening effects in cases where businesses are currently precluded entry due to vulnerability of their operations to trade secrets abuse¹²⁷. Two notable efforts currently underway concern the European Union and the United States. In the case of the European Union, the European Commission launched in November 2013 a draft directive intended to help harmonise key aspects of civil law protection across the EU Member countries. The directive would provide for a common definition of trade secrets; means through which victims of trade secret misappropriation could obtain redress (e.g. offering protection of secrecy during court proceedings); and remedies (e.g. damages, recall and destruction of infringing products, and availability of injunctions)¹²⁸. In 2013, the United States released the “Administration Strategy on Mitigating the Theft of US Trade Secrets”, which included a set of action items for improved protection domestically and internationally¹²⁹. Among other actions, the strategy would promote prosecution of abuses¹³⁰, development of industry-led best practices, review of laws, diplomatic engagement and public awareness.

Trade Secrets Protection Index

Index Composition

In order to measure the extent of the variation in stringency of available protection for trade secrets, the Trade Secrets Protection Index (TSPI) was developed in Chapter 3. Chart 4.1. presents the detailed composition of the index and its scoring. The index is structured around five main components:

1. Definitions and coverage
2. Specific duties and misappropriation
3. Remedies and restrictions on liability
4. Enforcement, investigation & discovery; data exclusivity
5. System functioning and related regulation.

The approach to scoring provides up to one point for each of the five main components of the index and a maximum total score for the index of five points. However, as can be seen in Chart 4.1., the number of elements covered by each of the main components of the index varies widely. For example, the definition and coverage of trade secrets protection comprises 13 elements, whereas the system functioning and related regulation comprises 4 elements. In order to maintain balance across the five components of the index, the scoring for the various elements under each of the five main components was normalised to ensure equal weighting. In other words, the elements for each main component add up to a maximum score of one¹³¹. Overall, the index is designed to capture information on the stringency of the available protection in a manner that is internationally comparable¹³².

As noted in Chapter 3, the TSPI is designed with several considerations in mind. First, the five components represent key aspects of protection of trade secrets where there is some variation across countries that may influence the stringency of protection. As part of an initial survey, its scope is intentionally very broad. Second, the elements of the TSPI were structured to enable scoring based primarily on objective criteria, supplemented in some cases by qualitative information as necessary (e.g. in certain areas related to system operation). Third, in order to ensure coherence across the components, the

index employs an integrated index approach rather than separate indicators. Fourth, the presentation of the index emphasises transparency, with scores supported by a text chart for each country and verifiable references. Fifth, the index is designed to provide an indication of the stringency of available protection; it aims to be neutral in this assessment. In other words, a higher or low score reflects the strength of protection and not an assessment of the appropriate level of protection. While the TSPI measures stringency, it does not provide an indication of what level of stringency is optimal. (Policy makers will need to determine the appropriate level of protection taking into account their local institutions and conditions¹³³) The index's function is descriptive, not normative, and the scores it produces are thus neither grades nor ratings. Rather, the score is strictly a measure of stringency of protection. As a measurement tool, the TSPI simply measures its target subjects.

TSPI Survey of Countries: Results for an Expanded Sample

For the economic assessment, the TSPI sample has been expanded from the original edition in Chapter 3 to cover sixteen additional countries drawn from around the world, including developed and developing countries¹³⁴. The detailed scoring for each element of the TSPI for all of the countries in the sample can be found in the Annex Table. In addition, a presentation of the framework for trade secrets protection in each of the countries newly added to the sample can be found in the Annex Chart, as can an updated entry for New Zealand¹³⁵. (Charts covering each of the countries in the original sample can be found in Chapter 3, Annex.) The sample has also been deepened to include a time dimension. Depending on data availability, each country's situation is measured at five year intervals starting as early as 1985¹³⁶. As of 2010, the countries in the sample are all members of the WTO and subject to the provisions of the TRIPS Agreement.

For the year 2010, the expanded sample has a profile that is similar to the original sample as described in Chapter 3. The scores in the expanded sample range from 2.5 to 4.5 points, with a median of 3.6 (Table 4.1.)¹³⁷. Despite the significant gap between the high and low scores, the overall dispersion of the scores is fairly modest. The sample was also tested for the impact of two alternative weighting schemes, one giving double weighting to *enforcement, investigation, discovery and data exclusivity*, and another giving double weighting to *remedies and restrictions on liabilities*. These alternate weighting schemes did not alter the country rankings significantly as can be seen from the Spearman Rank Correlation coefficients. Thus, by this standard, the TSPI with equal weights appears to be a robust indicator for the relative underlying trade secret protection.

In Figure 4.1., the country rankings for the TSPI can be seen as of 2010, ranging from a high score in the United States to a low score for the Philippines. The OECD countries tend to have higher rankings in the table than the partner countries. In 2010, all of the countries have TSPI scores of 3 or above, with the exception of Bulgaria, India, the People's Republic of China, Indonesia, Russia and the Philippines. Table 4.2. and Figure 4.1. present the composition of the TSPI scores for each country in the sample as of 2010. The area of *duties and misappropriation* has the highest average scores and shows a fairly high degree of alignment. The areas of *enforcement, investigation and discovery; data exclusivity* and *system functioning and related regulation* have the lowest average scores, with wide variation in the scores and particular weakness in a few developing and transition economies.

The evolution of the TSPI over time is presented in Figure 4.2. and Table 4.3. As can be seen from the Table, the overall average score increased incrementally in each period. The Figure highlights an important perspective on the composition of these changes. There is a significant gap between the scores of the OECD and the trade partner countries in the sample. Over time this gap has closed somewhat, but remains significant. The OECD scores gradually rose before stabilising during 2005 and 2010. Figure 4.2 reflects substantial increases in the average partner country scores in the period following the entry into force of the TRIPS Agreement. Figure 4.3. presents the evolution over time, by economy and year. From this visual

perspective, notable strengthening – here defined as sustained changes of greater than one point from 1990 to 2010 – can be readily seen for economies such as Brazil, China, Korea, Mexico, Spain, Chinese Taipei, and Thailand. In addition, certain transition economies demonstrated notable increases in their scores during the period since 1995 including Lithuania and the Russian Federation. In the cases of China and Russia, their accession to the WTO may have played a role in promoting availability of more stringent protection for trade secrets over the past decade. Analytically, the availability of the multiple observations for each economy permits assessment of the relationship of increased stringency of trade secrets protection to relevant indicators of economic performance over time, an issue discussed in the next section of the chapter.

Figure 4.4. presents two illustrative scatter plots for the full pooled sample to highlight the basic relationship of the TSPI to two key variables for economic performance. The first is real R&D per capita (Panel A) and the second is real foreign technological services (Panel B, shown with the variables as natural logarithms). For each economy and time period, each point in the charts represents the TSPI score and the level for the variable of interest. As indicated by the upward sloping trend lines, the patterns in each panel provide an indication of a simple positive correlation between TSPI stringency and the variables of interest. The trendline in Panel A accounts for about a quarter of the variation in the plot and the trend line in Panel B accounts for about one-fifth of the variation in the plot. However, a more rigorous examination of the data, controlling for other factors, is required to obtain a robust assessment. This is the object of the next section.

Quantitative Assessment

Maskus (2000), Primo Braga (1990) and others have noted that economic theory is inconclusive on the expected outcomes from a strengthening of intellectual property rights; empirical analysis is required to complement the theoretical perspectives. A strengthening of rights may promote market expansion effects as rights holders are better able to leverage their intellectual property. Thus, such reforms may motivate stakeholders to increase innovation and access to innovation in a manner that tends to benefit users as well as producers of intellectual property. However, reforms could in theory increase the market power of rights holders such that they have an incentive to constrain access and exploit their existing stock of innovation, possibly with little economic benefit to society as a whole.

Similarly with respect to trade secrets, one might expect improved protection of trade secrets to improve the ability of the owners to appropriate economic benefits from their secrets. However, the incentives for further innovation, exploitation and diffusion of new trade secrets could in theory be diminished somewhat by a strengthened availability of protection for existing trade secrets (despite their fragility). Consequently, empirical analysis can play an important role in assessment of trade secrets reforms. It is needed in order to test the hypothesis that greater stringency of protection contributes to increased innovation and diffusion of trade secrets. Due to lack of data availability, the quantitative empirical assessment presented below does not look at these market effects directly, but rather it considers the associated net changes in economic indicators at an aggregate level while controlling for other factors.

Thus, building on the expanded TSPI sample, the following quantitative assessment considers variation in trade secret protection in relation to an illustrative set of relevant economic performance indicators. The modelling is based on standard regression analysis, using an approach similar to that employed in previous OECD studies on economic implications of the strengthening of IPR protection¹³⁸. The selection of economic indicators emphasises types of activity where effective protection of trade secrets may be reasonably hypothesised to play a role in promoting expanded activity. Where regression analysis is pursued, particular attention is focused on issues of auto-correlation and of endogeneity¹³⁹.

Methodological approach

The quantitative assessment explores empirically the potential relationships identified in the qualitative assessment. It considers these in a dynamic fashion using pooled regression analysis for the period from 1990 to 2010, though a number of assessments cover shorter time periods due to data limitations. The sample is an unbalanced panel in that the sample does not cover every country for every year. Due to indications of autocorrelation in the residuals (low Durbin-Watson test scores), the regressions were run using country fixed effects¹⁴⁰. As feasible, all variables were entered as natural logarithms, with the result that the coefficients indicate the relationships in approximate percentage terms.

The regressions were set up using a standard linear regression model¹⁴¹:

$$\ln(\text{economic performance indicator}_{n,t}) = \alpha_0 + \alpha_1 \ln(\text{TSPI}_{n,t}) + \alpha_2 \ln(Z_{n,t}) + \text{Error term}$$

where n is country, t is time (year), and Z represents the control variables.

In all cases, the independent variable of interest is the TSPI. The dependent economic performance indicators of interest covered innovation inputs (R&D expenditure, researchers in R&D) and innovation-related international economic performance (real FDI inflows, total services imports, real technological services imports, and real merchandise imports). The control variables were selected based on indications of potential competing influences *vis-à-vis* trade secrets protection and include indicators of market openness and regulation, market size, income level, and human capital development. The protection of patent rights was considered as measured by the Park-Ginarte Patent Rights Index. The patent rights index is constructed in a manner similar to that of the TSPI¹⁴²; details of its composition are presented in Chart 3. Chart 4 provides an overview of the underlying data sources for the variables.

In order to illustrate various relationships, the regression runs presented employ fairly diverse approaches. In the first run, the TSPI variable was lagged in order to test for endogeneity. In the second run, it was interacted with the Patent Rights Index to observe whether the combined indicator also exhibited a significant association with an indicator of economic performance. In the area of services, the two runs were implemented using first differences approaches. This was done to provide an indication as to whether change in the TSPI stringency over time affected the pace of change in imports in the sector.

Results

The results of the quantitative economic assessment are shown in Table 4.4 and Figure 4.5. The assessment begins with consideration of the relationship of trade secrets protection to R&D activity and then turns to international economic flows.

Table 4.4., parts (1) and (2), consider two aspects of the relationship of stringency of trade secrets protection to real economy-wide R&D expenditure (government and business) per capita¹⁴³ and R&D intensity as measured by R&D personnel as a share of the labour force. A positive and statistically significant relationship is found between trade secrets protection (lagged one period) and the indicator for R&D expenditure¹⁴⁴. A similar – though slightly larger – association is found between the combined TSPI-patent rights indicator and R&D personnel as a share of the labour force. Among the control variables, GDP and GDP per capita, respectively, are statistically highly significant in each of the runs. Table 4.4., part (3), examines the relationship of real FDI inflows to TSPI, finding a particularly strong and positive association. A one percent change in the TSPI is associated with a nearly 1.5% change in Real FDI inflows (Figure 4.5.). Several control variables proved to be significant as well in this run, including GDP (market size), market regulation, and the share of the labour force with tertiary education.

Table 4.4., parts (4), (5) and (6), considers the relationship of trade flows to the stringency of trade secret protection. In all three cases the relationships were positive. For total services imports and foreign technological services, the relationship was stronger with respect to the change in pace (first differences) than to the simple flows. In other words, an increase in the stringency of trade secrets protection was associated with an increase in the rate of growth of services imports for the sample economies during this time period. This effect was particularly evident with respect to imports of foreign technological services. Among the control variables, GDP per capita and GDP, respectively, were positive and significant. Table 4.4., part (6) considers the relationship of TSPI stringency to real merchandise import flows. Here as well a positive and statistically significant relationship was found.

Overall, this initial round of exploration of the economic implications found a positive and statistically significant relationship between the increased stringency of trade secrets protection and indicators for innovation inputs and international economic flows. FDI inflows and real foreign technological services imports appear to be particularly sensitive to the stringency of trade secrets protection. The strength and consistency of the results across the various analytical approaches lends support to the hypothesis of a positive and fairly robust relationship of the TSPI to the types of economic performance considered here, at least with respect to the sampled economies and timeframe¹⁴⁵.

Conclusions

This assessment of the stringency of trade secrets protection across a broad sample of countries in recent decades found substantial variation between countries at specific points in time and in protection regimes of specific countries over time. The qualitative assessment then considered a number of potential areas where variation in trade secrets protection could influence economic performance. These included economic incentives for innovation, labour mobility, spillover effects and technological diffusion. The empirical assessment found that the stringency of protection in the developed countries rose in particular during the 1990s and then stabilised, while developing countries on average tended to rise throughout the entire study period. The quantitative assessment of the relationship of this increased stringency of protection to indicators of economic performance found a tendency for there to be a positive relationship. This includes indicators of innovation inputs and international economic flows of investment and trade. Through such relationships, trade secrets protection may have positive implications for developments in domestic innovation, international technology transfer and access to technology-intensive inputs and related products.

These findings represent a first step in the assessment of trade secrets protection. However, it should be noted that the relationships highlighted here reflect association but not necessarily causality. It is also necessary to note that the relationships identified in the empirical assessment apply to a specific sample during a specific time period and a certain range of variation. This does not mean that ever stronger protection, for example, will yield similar results. Thus, care is required in the interpretation of the results. Nonetheless, the positive and statistically significant relationships identified do provide an indication that provision of adequate protection of trade secrets may be an appropriate element of a policy framework supporting certain key aspects of economic performance. Further research could contribute to confirming these findings and exploring the effects of trade secrets protection at sectoral and firm level¹⁴⁶.

CHARTS, TABLES AND FIGURES

Chart 4.1. Trade Secrets Protection Index

Components and scoring	Score range	Normalised score
1. Definition and Coverage	0-13	0-1
a) Scope		
<ul style="list-style-type: none"> • If scope covers all confidential business information, subject to: 1) deriving value from secrecy and 2) the owner's reasonable efforts to maintain secrecy, score = 1; If scope also subject to requirement that information is imparted to the recipient in confidence, score = ½ 	0, 1	
b) Additional Elements of Definition		
<ul style="list-style-type: none"> • Inventory of trade secrets required (requirement=0; no requirement=1) • Must be reduced to writing (requirement=0; no requirement=1) • Must be identified as a trade secret to recipient (requirement=0; no requirement=1) • Written notice to recipient required (requirement=0; no requirement=1) 	0, 1	
c) Acts covered as <u>civil</u> infringement:		
<ul style="list-style-type: none"> • Breach of duty (not covered=0, partially covered=½¹⁴⁷, covered=1) • Wrongful acquisition or misappropriation (not covered=0, covered=1) • Third party liability for acquisition with knowledge or reason to know (not available=0, available=1) • Third party liability for acquisition without knowledge - enjoin "innocent parties" (not available=0, available=1) 	0, 1	
d) Acts covered by <u>criminal</u> law		
<ul style="list-style-type: none"> • Breach of duty (not covered=0, partially covered=½, covered=1) • Wrongful acquisition or misappropriation (not covered=0, covered=1) • Third party liability for acquisition with knowledge or reason to know (not available=0, available=1) • Third party liability for acquisition without knowledge, enjoin "innocent parties" (not available=0, available=1) 	0, 1	

Chart 4.1. Trade Secrets Protection Index (continued)

Components and scoring	Score range	Normalised score
2. Specific duties and misappropriation¹⁴⁸	0-5	0-1
<ul style="list-style-type: none"> • Commercial relationship (covered if arising from: express agreement ½ + implied duty ½) • Current employment relationship (covered if arising from: express agreement ½ + implied duty ½) • Past employment relationship (covered if arising from: express agreement ½ + implied duty ½) • Restrictions on post-relationship duty of confidentiality (if any restrictions on matters beyond general skills and knowledge, by relationship: commercial ½ + employment ½) • Validity of contractual restrictions on competition (if unenforceable=0, significant limitations=½ (e.g., limited by time or place for either commercial or post-employment situations), generally enforceable=1) 	0, 1	
	0, 1	
	0, 1	
	0, 1	
	0, 1	
	0, 1	
3. Remedies and Restrictions on liability	0-11	0-1
a) Restrictions on liability		
<ul style="list-style-type: none"> • Additional elements of proof in infringement claims (if none: civil=½ + criminal=½, criminal ½ point; score 1 if there no criminal law and civil score is ½) 	0, 1	
b) Civil remedies		
<ul style="list-style-type: none"> • Preliminary injunction (if available = 1, if not = 0) • Ex parte action available under preliminary injunction (if available = 1, if not = 0) • Permanent injunction (if available = 1, if not = 0) • Injunction to eliminate wrongful head start (if available = 1, if not = 0) • Delivery or destruction of infringing materials (if available = 1, if not = 0) • Compensatory damages (direct or out of pocket damages or consideration of profits or other damages= 1) • Yielding of defendant's profits (if available = 1, if not = 0) • Availability of punitive or statutory damages (if available = 1, if not = 0) 	0, 1	
	0, 1	
	0, 1	
	0, 1	
	0, 1	
	0, 1	
c) Criminal remedies		
<ul style="list-style-type: none"> • Fines, damages or loss of assets (if not available = 0, if minimal per expert opinion= ½, if substantial = 1) • Jail sentence (if available = 1, if not = 0) 	0, 1	
	0, 1	

Chart 4.1.. Trade Secrets Protection Index (continued)

Components and scoring	Score range	Normalised score
4. Enforcement, investigation and discovery; data exclusivity	0-6	0-1
a) Enforcement, investigation and discovery		
• Emergency search to preserve and obtain proof (unavailable=0, available but with significant restrictions= ½ (e.g., conducted solely by an official or 3rd party expert), readily available=1)	0, 1	
• Ex parte emergency search availability (unavailable=0, available but with significant restrictions=½, readily available=1)	0, 1	
• Pre-trial discovery (unavailable=0, documentary only or strict limitations = ½, ready availability of documentary and interrogatories = 1)	0, 1	
• Protection of confidentiality of trade secrets in litigation (none=0, partial= ½, fully available=1)	0, 1	
b) Data exclusivity		
• Drugs (years: 0=0; 0.1-3=1/3; 3.1-7.9=2/3; >8=1)	0, 1	
• Agricultural chemicals (years: 0=0, 0.1-4.9=1/3, 5-8=2/3; > 8=1)	0, 1	
5. System functioning and related regulation	0-4	0-1
• Technology transfer: registration requirement (none=1; one or more = 0)	0, 1	
• Technology transfer: substantive review or regulation (none=1; one or more = 0)	0, 1	
• Fraser Institute score for <i>Legal System and Security of Property Rights</i> (score ranging from 0 to 10, divided by 10) ¹⁴⁹	0, 1	
• Expert characterisation of the operation of the protection in practice (NB, based on internationally recognised or peer-reviewed sources; see country charts for details) (Negative = 0; none = ½; positive = 1)	0, 1	
Index Total		===== 0-5

Chart 4.2. Trade Secrets Protection Index Coverage, Expanded Sample, 1985-2010

Trade Partner Economies (20)	OECD Countries (17)
Argentina	Australia
Brazil	Canada
Bulgaria	France
China	Germany
Colombia	Ireland
Ghana	Israel*
Hong Kong, China	Italy
India	Japan
Indonesia	Korea
Latvia	Mexico
Lithuania	Netherlands
Malaysia	New Zealand
Peru	Spain
Philippines	Sweden
Russia	Turkey
Singapore	United Kingdom
South Africa	United States
Chinese Taipei	
Thailand	
Viet Nam	

Notes: The sample is an unbalanced panel. Not all countries are covered in every year.

*The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Chart 4.3. Composition of the Patent Rights Index

1) Membership in International Treaties	<u>Signatory</u>	<u>Not signatory</u>
-- Paris Convention and Revisions	1/5	0
-- Patent Cooperation Treaty	1/5	0
-- Protection of New Varieties (UPOV78 or 91)		1/5 0
-- Budapest Treaty (Microorganism Deposits)	1/5	0
-- Trade-Related Intellectual Property Rights (TRIPS)	1/5	0
2) Coverage	<u>Available</u>	<u>Not Available</u>
-- Patentability of pharmaceuticals	1/8	0
-- Patentability of chemicals	1/8	0
-- Patentability of food	1/8	0
-- Patentability of surgical products	1/8	0
-- Patentability of microorganisms	1/8	0
-- Patentability of utility models	1/8	0
-- Patentability of software	1/8	0
-- Patentability of plant & animal varieties	1/8	0
3) Restrictions on Patent Rights	<u>Does Not Exist</u>	<u>Exists</u>
-- "Working" Requirements	1/3	0
-- Compulsory Licensing	1/3	0
-- Revocation of Patents	1/3	0
4) Enforcement	<u>Available</u>	<u>Not Available</u>
-- Preliminary Injunctions	1/3	0
-- Contributory Infringement	1/3	0
-- Burden-of-Proof Reversal	1/3	0
5) Duration of Protection	<u>Full</u>	<u>Partial</u>
	1	$0 < f < 1$

-- where f is the duration of protection as a *fraction* of 20 years from the date of application or 17 years from the date of grant (for grant-based patent systems).

Overall score for Patent Rights Index: sum of points under (1) – (5).

Note: The index was developed by Walter Park and colleagues at American University (Ginarte and Park, 1997; Park, 2008).

Source: Park and Lippoldt (2008).

Chart 4.4. Data Sources

1. OECD (2013 and 2014), *OECD.Stat*, (database); doi: 10.1787/data-00285-en.

- GDP real in USD (2005) converted at purchasing power parity exchange rates

2. World Bank (2013 and 2014)

a. *World Governance Indicators*, on-line edition: <http://info.worldbank.org/governance/wgi/index.aspx#home>

- Government effectiveness

b. *World Development Indicators*, on-line edition, <http://data.worldbank.org/data-catalog/world-development-indicators>

- GDP deflator (for use in calculations of constant value)
- Population (for per capita calculations)
- Researchers in R&D, per million people (NB: 1996 data assumed constant, used for 1995)
- Resident and non-resident patent application data
- R&D as a percent of GDP
- Share of the labour force with tertiary education

3. Park (2008) and correspondence with the author, Walter Park, American University

- Patent rights index

4. UNCTAD http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx?sRF_ActivePath=P,5,27&sRF_Expanded=P,5,27

- Foreign direct investment data

5. International Monetary Fund, Balance of Payments Statistics <http://elibrary-data.imf.org/finddatareports.aspx?d=33061&e=170784>

- Services imports, by sector

6. UN Comtrade Database <http://comtrade.un.org/>

- Merchandise trade data

7. Fraser Institute, *Economic Freedom of the World* dataset, 2013, www.freetheworld.com/release.html

- Chain-linked indices: Market regulation (area 5)

Table 4.1. Trade Secret Protection Index: Statistics Scoring Using Alternative Weights, 2010

	Total Scores, by Weighting Scheme		
	Equal weights: 20% for each component	40% for enforcement, investigation, discovery and data exclusivity; 60% divided equally among the other components	40% for Remedies and restrictions on liability; 60% divided equally among the other components
Argentina	3.12	2.45	3.14
Australia	3.99	4.07	3.79
Brazil	3.31	3.42	3.56
Bulgaria	2.96	3.37	2.68
Canada	4.48	4.61	4.38
China	2.71	2.72	2.71
Colombia	3.15	2.84	3.04
France	3.76	3.75	3.61
Germany	3.76	3.55	3.73
Ghana	3.43	3.20	3.25
Hong Kong, China	4.03	4.06	3.93
India	2.92	2.99	3.10
Indonesia	2.52	2.00	2.69
Ireland	4.15	4.15	4.02
Israel	4.08	4.13	3.85
Italy	3.85	3.93	3.85
Japan	4.27	4.04	4.22
Korea	3.81	3.41	3.88
Latvia	3.64	3.46	3.64
Lithuania	4.44	4.47	4.35
Malaysia	3.48	3.48	3.46
Mexico	3.32	2.97	3.40
Netherlands	4.22	4.31	4.31
New Zealand	4.04	4.04	4.00
Peru	3.06	3.06	3.09
Philippines	2.45	2.46	2.69
Russia	2.47	2.48	2.87
Singapore	4.00	4.01	3.86
South Africa	3.14	2.98	3.27
Spain	4.42	4.36	4.34
Sweden	3.56	3.40	3.58
Chinese Taipei	3.12	2.72	3.36
Thailand	3.42	2.77	3.76
Turkey	3.41	2.83	3.47
United Kingdom	3.97	4.12	3.71
United States	4.49	4.55	4.62
Viet Nam	3.01	3.16	3.17
Overall Average	3.57	3.47	3.58
Max	4.49	4.61	4.62
Median	3.56	3.42	3.61
Min	2.45	2.00	2.68
Standard Deviation	0.59	0.69	0.52
Coefficient of Variation	0.17	0.20	0.15
Correlation Coefficient (equal weight scores versus alternate schemes)		0.94	0.96
Spearman Rank Correlation (equal weight scores versus alternate schemes)		0.92	0.96

Table 4.2. Trade Secrets Protection Index, by economy and component, 2010

Components and scoring	1. Definition and coverage	2. Duties and misappropriation	3. Remedies and restrictions on liability	4. Enforcement, investigation and discovery; data exclusivity	5. System functioning and related regulation	Totals
Normalised range	0-1	0-1	0-1	0-1	0-1	0-5
Argentina	0.81	1.00	0.64	0.08	0.60	3.12
Australia	0.65	1.00	0.64	0.86	0.84	3.99
Brazil	0.77	0.80	0.86	0.75	0.13	3.31
Bulgaria	0.46	0.60	0.36	0.92	0.62	2.96
Canada	0.69	1.00	0.82	1.00	0.97	4.48
China	0.62	0.60	0.55	0.55	0.40	2.71
Colombia	0.85	0.90	0.55	0.39	0.47	3.15
France	0.77	0.90	0.64	0.75	0.70	3.76
Germany	0.85	0.90	0.73	0.58	0.71	3.76
Ghana	0.62	1.00	0.55	0.50	0.77	3.43
Hong Kong, China	0.62	0.90	0.73	0.83	0.95	4.03
India	0.50	0.90	0.73	0.64	0.16	2.92
Indonesia	0.69	1.00	0.64	0.08	0.11	2.52
Ireland	0.62	1.00	0.73	0.83	0.97	4.15
Israel	0.65	1.00	0.64	0.86	0.93	4.08
Italy	0.69	0.90	0.77	0.83	0.65	3.85
Japan	0.85	1.00	0.82	0.67	0.94	4.27
Korea	0.77	1.00	0.82	0.44	0.78	3.81
Latvia	0.85	0.70	0.73	0.58	0.79	3.64
Lithuania	0.92	1.00	0.82	0.92	0.78	4.44
Malaysia	0.50	0.80	0.68	0.69	0.80	3.48
Mexico	0.77	0.70	0.73	0.39	0.74	3.32
Netherlands	0.85	0.70	0.91	0.92	0.85	4.22
New Zealand	0.62	1.00	0.77	0.80	0.85	4.04
Peru	0.77	0.80	0.64	0.61	0.25	3.06
Philippines	0.35	0.70	0.68	0.50	0.22	2.45
Russia	0.54	0.50	0.82	0.50	0.11	2.47
Singapore	0.69	1.00	0.68	0.80	0.83	4.00
South Africa	0.62	1.00	0.73	0.50	0.30	3.14
Spain	0.85	1.00	0.82	0.83	0.92	4.42
Sweden	0.69	0.70	0.73	0.58	0.86	3.56
Chinese Taipei	0.85	0.60	0.82	0.30	0.55	3.12
Thailand	0.85	0.70	0.95	0.17	0.75	3.42
Turkey	0.85	1.00	0.73	0.22	0.62	3.41
United Kingdom	0.62	1.00	0.59	0.92	0.84	3.97
United States	0.85	0.90	1.00	0.94	0.80	4.49
Vietnam	0.62	0.30	0.73	0.72	0.65	3.01
Overall Average	0.70	0.85	0.72	0.63	0.65	3.57

Table 4.3. Trade Secrets Protection Index, by economy and year, 1985-2010

	1985	1990	1995	2000	2005	2010
Argentina	2.16	2.19	2.18	3.16	3.12	3.12
Australia	3.81	3.81	4.00	4.01	4.00	3.99
Brazil	2.27	2.28	2.27	3.15	3.30	3.31
Bulgaria			2.65	2.64	2.63	2.96
Canada	4.12	4.14	4.43	4.44	4.42	4.48
China		0.90	1.78	2.22	2.69	2.71
Colombia	2.84	2.84	2.83	2.92	3.15	3.15
France	3.40	3.71	3.70	3.72	3.71	3.76
Germany	3.26	3.77	3.78	3.78	3.78	3.76
Ghana	3.24	3.32	3.33	3.29	3.41	3.43
Hong Kong, China	3.87	3.86	4.03	4.01	4.03	4.03
India	2.83	2.82	2.86	2.86	2.89	2.92
Indonesia	1.77	1.78	1.75	2.50	2.52	2.52
Ireland	3.76	4.01	4.04	4.04	4.15	4.15
Israel	3.59	3.53	3.59	3.82	4.08	4.08
Italy	3.54	3.56	3.53	3.56	3.85	3.85
Japan	4.06	4.07	4.17	4.17	4.17	4.27
Korea	2.16	2.19	3.08	3.69	3.82	3.81
Latvia			2.70	3.32	3.65	3.64
Lithuania			3.22	4.11	4.44	4.44
Malaysia	3.46	3.46	3.47	3.44	3.48	3.48
Mexico	1.67	1.95	3.34	3.32	3.33	3.32
Netherlands	3.87	4.21	4.22	4.24	4.23	4.22
New Zealand	3.59	3.60	3.62	3.62	4.04	4.04
Peru	2.64	2.66	2.93	2.98	2.99	3.06
Philippines	2.75	2.41	2.48	2.47	2.46	2.45
Russia			1.19	1.63	2.47	2.47
Singapore	3.76	3.76	3.79	3.79	4.01	4.00
South Africa	3.08	3.04	3.12	3.13	3.15	3.14
Spain	2.61	2.85	4.32	4.32	4.42	4.42
Sweden	2.28	3.54	3.55	3.55	3.55	3.56
Chinese Taipei	2.10	2.10	2.57	2.88	3.00	3.12
Thailand	2.28	2.29	2.27	2.28	3.44	3.42
Turkey	3.22	3.19	3.20	3.21	3.43	3.41
United Kingdom	3.47	3.83	3.85	3.98	3.98	3.97
United States	4.11	4.11	4.12	4.54	4.50	4.49
Vietnam					3.01	3.01
Overall Average	3.08	3.12	3.22	3.41	3.55	3.57

Table 4.4. Illustrative Modelling of Relationship of TSPI to Selected Economic Performance Indicators (All variables entered as natural logarithms)

	(1) Real R&D, per capita (constant USD, 2005)	(2) R&D personnel, as % of the labour force	(3) Real FDI inflows (constant USD, 2005)	(4) Change in real services imports, per capita (constant USD, 2005); all variables entered as first differences	(5) Change in real foreign technological services imports (e.g., licencing & royalty payments for intangibles), constant USD (2005); all variables entered as first differences	(6) Real merchandise imports (constant USD, 2005)
TSPI			1.494783 **	0.551834 **	1.380278 **	0.664822 **
			<i>0.608775</i>	<i>0.228515</i>	<i>0.568653</i>	<i>0.258105</i>
TSPI lagged 1 period	0.469547 **					
	<i>0.195527</i>					
Interact (TSPI x Patent Rights Index)		0.583355 **				
		<i>0.248242</i>				
GDP per capita (real, USD 2005)		0.782631 ***		2.047991 ***		1.231150 ***
		<i>0.293873</i>		<i>0.313472</i>		<i>0.097923</i>
GDP (real, USD 2005 ppp)	1.170749 ***		2.472000 ***		1.419025 **	
	<i>0.128488</i>		<i>0.279946</i>		<i>0.697704</i>	
Market Regulation (Fraser Institute)	-0.174773		1.412879 **		0.857275	0.426688
	<i>0.304992</i>		<i>0.664468</i>		<i>0.682397</i>	<i>0.285595</i>
Share of labour force with tertiary education			0.778480 ***			
			<i>0.219858</i>			
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Periods included	4	5	5	5	5	5
Years	1995-2010	1990-2010	1990-2010	1990-2010	1990-2010	1990-2010
Adjusted R2	0.987531	0.902006	0.953125	0.421721	0.407905	0.971826
Countries Covered (see note)	24	20	23	23	23	24
N	80	82	64	109	93	110

Note: Statistical significance is shown as follows: * p< 0.05, ** p< 0.01, *** p< 0.01. Standard errors are shown in italics. For each regression run (1 to 6), the country coverage is: (1) Australia, Canada, China, Colombia, France, Germany, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, Russia, Singapore, South Africa, Spain, Sweden, Turkey, United Kingdom, United States; (2) Australia, Canada, China, France, Germany, Ireland, Israel, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, Russia, Singapore, South Africa, Spain, Sweden, Turkey, United Kingdom; (3) Australia, Canada, China, Colombia, France, Germany, Indonesia, Ireland, Israel, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, Russia, Singapore, South Africa, Spain, Sweden, Turkey, United Kingdom and United States; (4) Same as (3) above; (5) Same as (3) above; (6) Same as (1) above. The Patent Rights Index was only considered in the second regression run shown in the table, as part of the variable "Interact".

Figure 4.1. Trade Secrets Protection Index, By Economy and Component, 2010

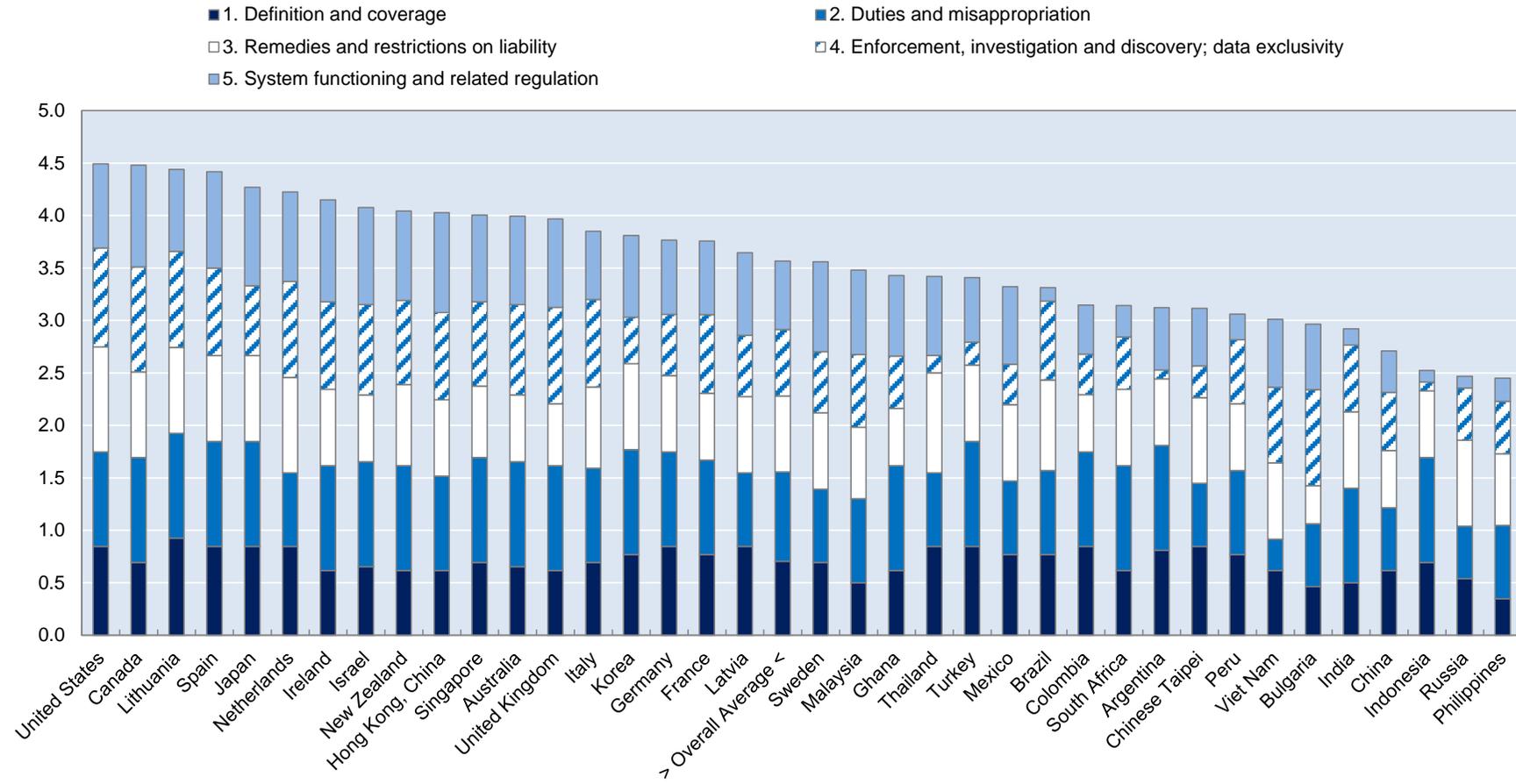
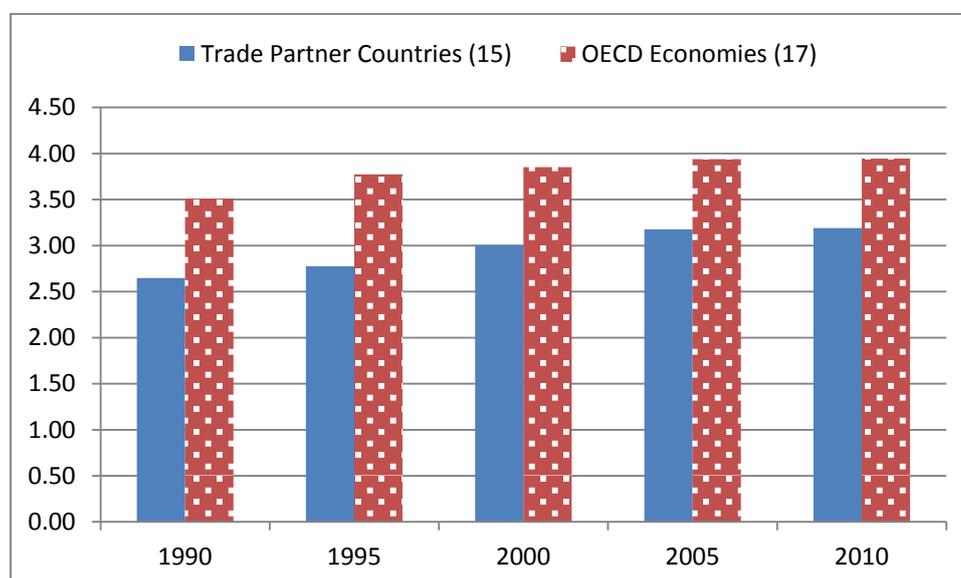


Figure 4.2. Trade Secrets Protection Index, average score by country group and year

Note: This chart presents a balanced panel of economies in each group for which data were available in each of the years shown. Inclusion in the OECD group is based on each country's membership status as of 2010. Country coverage is as follows:

Trade partner economies: Argentina; Brazil; China; Colombia; Ghana; Hong Kong, China; India; Indonesia; Malaysia; Peru; Philippines; Singapore; South Africa; Chinese Taipei; Thailand;

OECD countries: Australia; Canada; France; Germany; Ireland; Israel; Italy; Japan; Korea; Mexico; Netherlands; New Zealand; Spain; Sweden; Turkey; United Kingdom; United States

Figure 4.3. Trade Secrets Protection Index, by country and year

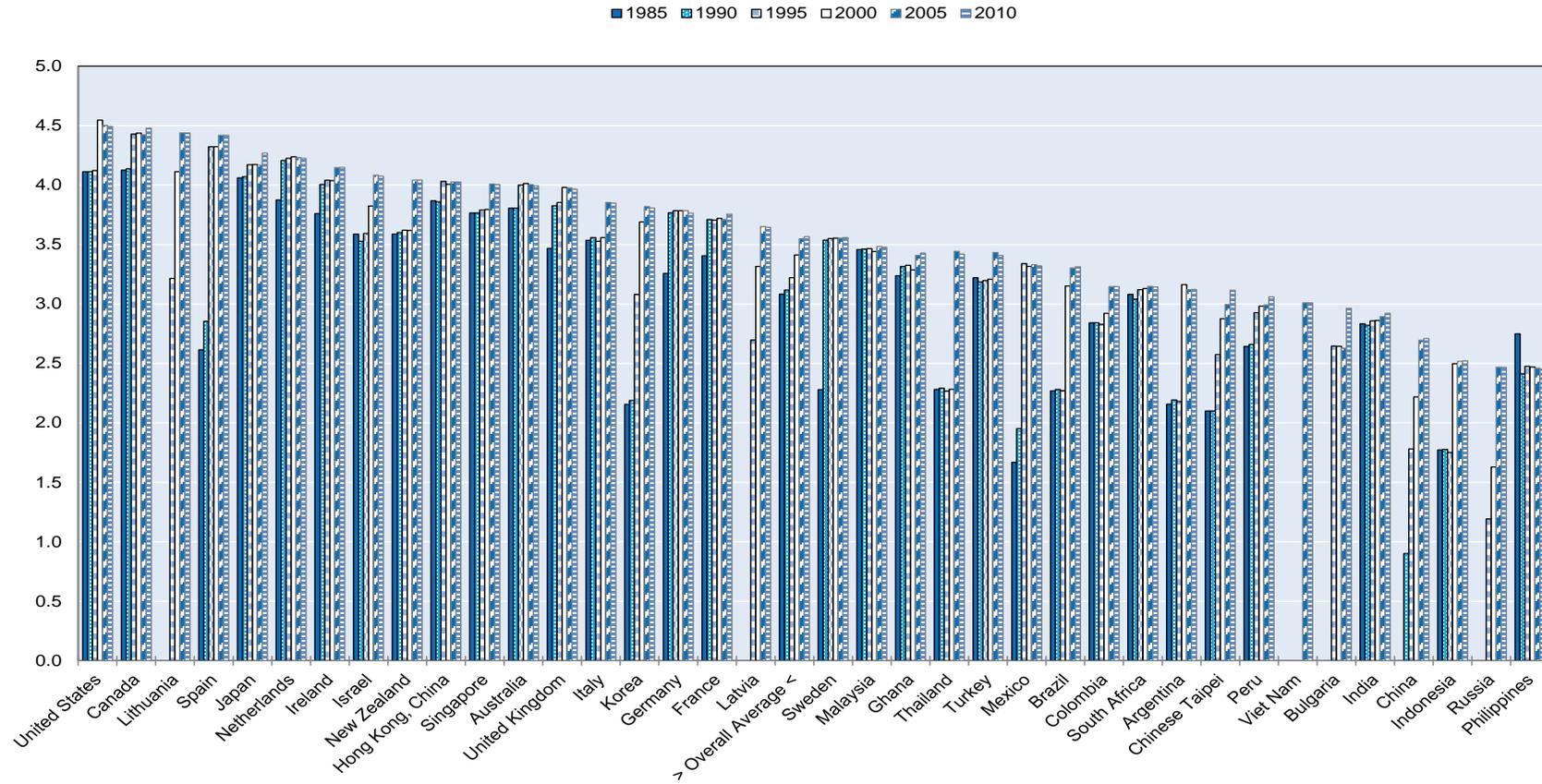
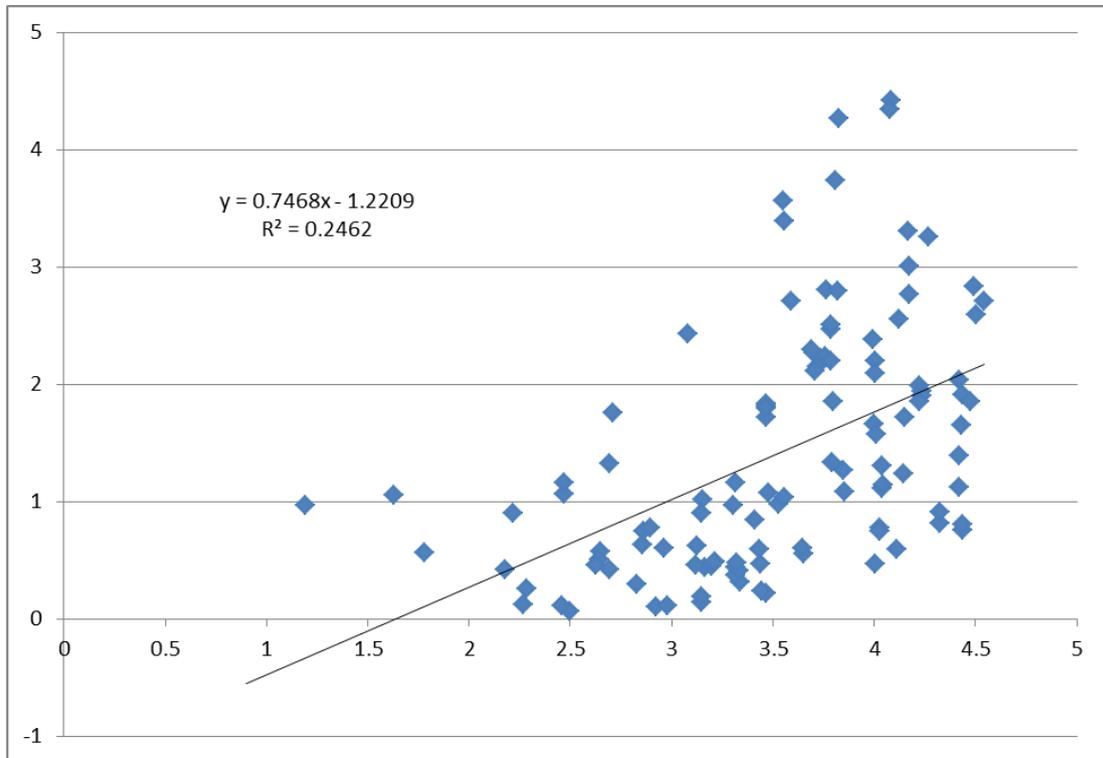


Figure 4.4. Illustrative Scatter Plots

Panel A. R&D as % GDP (vertical axis) and Trade Secrets Protection Index (horizontal axis)



Panel B. Real Foreign Technological Services Imports (log, vertical axis) and Trade Secrets Protection Index (horizontal axis)

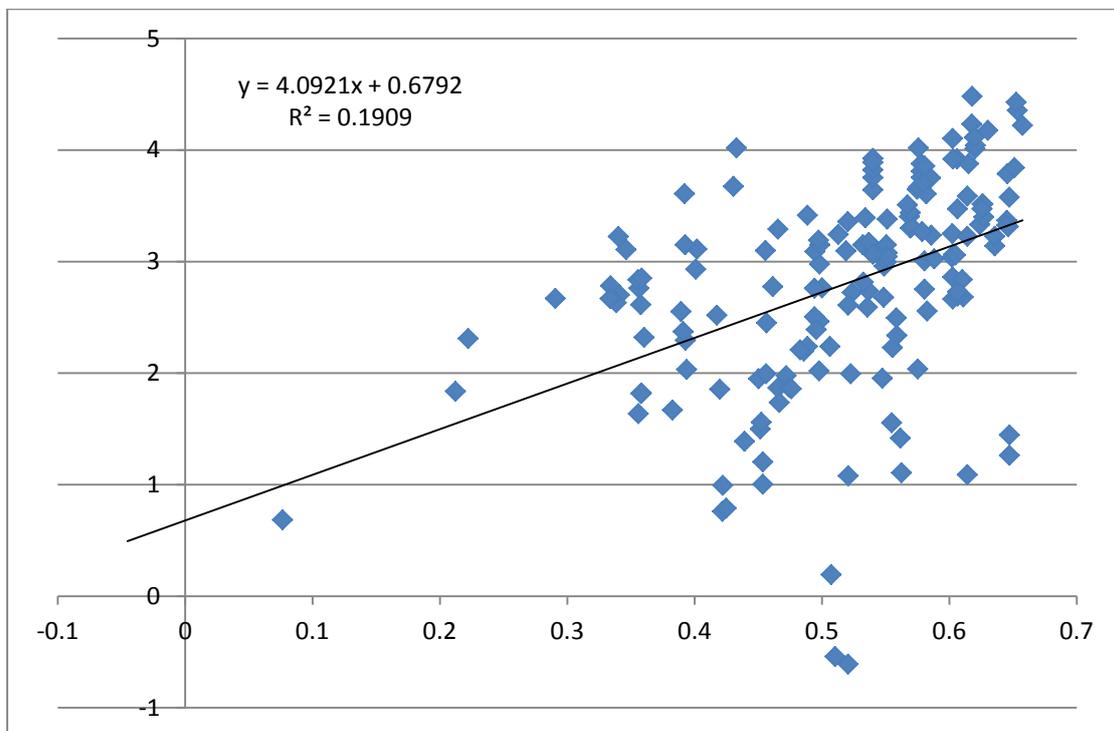
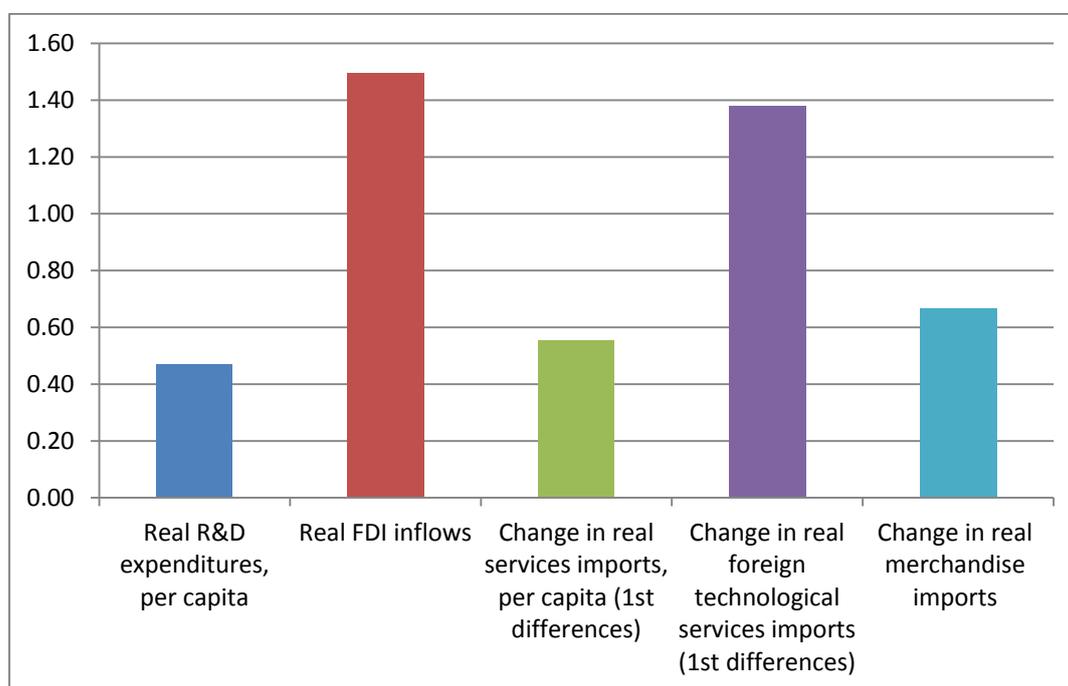


Figure 4.5. TSPI & Econ Performance, 1990 – 2010

(1% change in TSPI = x % change in...)



Note: The bars represent the coefficients from regression of various indicators of economic performance on the TSPI controlling for other factors. All variables entered as natural logarithms. For the iteration with real R&D expenditures per capita the TSPI was lagged one period. For the services runs the regression was calculated using first differences.

ANNEX

Due to the annex's length, interested readers are referred to the original version of this chapter, which is an OECD Trade Policy Working Paper, available at <http://dx.doi.org/10.1787/5jxz15w3j3s6-en> (Lippoldt & Schultz, 2014).

NOTES

- ¹¹⁶ For descriptive convenience this chapter will employ the term “trade secrets” as encompassing “undisclosed information.”
- ¹¹⁷ See Chapter 3, section 2 for further details on the international framework for the protection of trade secrets.
- ¹¹⁸ Moreover, as Pooley (1997) notes, the idea need not be unique to its owner. Several competitors could have developed the same idea via independent innovation and sought to protect it as a trade secret. This possibility is one factor differentiating trade secrets from patents.
- ¹¹⁹ However, some countries impose more specific, additional obligations, which might be characterized as a particular implementation of the broad reasonableness requirement. For example, some common law countries require that the defendant have a contractual or implied obligation to keep the information secret. Other countries require written agreements with recipients and confidentiality notices.
- ¹²⁰ This example highlights the importance of empirical research in considering the relationship of trade secrets protection to economic performance. For example, such competition could possibly lead to disincentives to invest, to inefficiencies (e.g. due to overlapping research) or to increased innovation building on knowledge spillovers, among other possibilities. The net effects can be difficult to determine in advance and it is necessary to examine the experience in practice.
- ¹²¹ Further discussion of non-compete provisions can be found in Chapter 3.
- ¹²² One important issue for mobility concerns investment by firms in training of employees. Firms cannot generally restrain employee use of general skills and knowledge (e.g. from training that is widely available). However, when a firm invests substantial time and resources in training an employee in its own technical products, courts in some jurisdictions may find that the firm has a legitimate business interest that may appropriately be protected via a limited non-compete clause in a labour contract (e.g. Swift, 2007). Where firms face high employee mobility, their incentive to invest in such training in principle could be supported by availability of this protection. Yet, validity of any claims may be difficult for an employer to demonstrate (e.g. Lester, 2001). Thus, some firms may utilise alternative approaches such as contractual requirements for employees to reimburse training costs under certain conditions (Lester, 2001) or payment of wage premia to discourage employee separations (Fosfuri et al., 2001), among other options.
- ¹²³ Depending on the circumstances, this might be accomplished for example via such means as non-disclosure agreements with employees and commercial partners or basic digital or physical security measures.
- ¹²⁴ Certainly, patents can play other important roles for some SMEs, such as cultivation of public recognition of a firm’s innovative capacity or mobilisation of new investor capital, among other possibilities.
- ¹²⁵ With small patent portfolios, some SMEs may have limited bargaining power to settle with bigger players who confront them. Also, SMEs may tend to be less financially able to withstand an expensive legal challenge to a patent (e.g. from a non-practicing entity).
- ¹²⁶ This is part of a larger discussion in the literature concerning approaches used by firms and others to appropriate returns on their investments and innovations. For example, see: Denicoló and Franzoni (2004) and Anton and Yao (2004), among others.

- 127 For example, some observers have expressed concerns on behalf of SMEs. These firms are known as being particularly reliant on trade secrets protection and may find increased opportunities for international expansion under improved conditions of protection for trade secrets.
- 128 The draft directive and related materials are available on line, here (as of 23 May 2014): http://ec.europa.eu/internal_market/iprenforcement/trade_secrets/index_en.htm#maincontentSec1.
- 129 This strategy is available on-line at the following location (as of 3 April 2013): www.whitehouse.gov/sites/default/files/omb/IPEC/admin_strategy_on_mitigating_the_theft_of_u.s._trade_secrets.pdf.
- 130 A recent example of response to espionage and abuse of trade secrets can be found in a US Federal Government court case launched against five Chinese military officials for allegedly hacking into computers at five US companies. US officials are considering the possibility of reinforcing their response in light of such espionage, including potentially freezing assets or using individual sanctions such as visa restrictions, or possibly national-level action at the World Trade Organisation. Source: Wall Street Journal, 2014, "US to Rev Up Hacking Fight", 23 May.
- 131 For example, component 4 *Enforcement, investigation and discovery; data exclusivity* is comprised of six elements. The value for the Component 4 score can range from 0 to one. In the final calculation of the score for the overall component, the scores for any given element would be no more than 1/6 of one point. This would be the case, for example, for data exclusivity for drugs or data exclusivity for agricultural chemicals (each would contribute no more than 1/6 of one point to the component score).
- 132 The development of this index is a pioneering effort in the analysis of protection of trade secrets. However, it should be noted that a variety of similar indices exist in the literature covering various types of intellectual property. For example, Ginarte and Park (1997) and Park (2008) employed laws-on-the-books approaches to examine protection of patents, trademarks and copyright. Pugatch et al. (2014) developed an empirically based index of the strength of IPR protection, which also incorporated industry perspectives. Png (2012a and b) developed an indicator for use in his analytical work on trade secrets protection. Also, the Fraser Institute (2013) and World Economic Forum, among others, have developed substantial sets of relevant systemic indicators for use in economic analyses. Such indicators have been utilised in a number of studies conducted by the Working Party of the Trade Committee and other parts of OECD. Several Trade Committee studies considered policies for protection of intellectual property rights in relation to relevant economic performance indicators. OLIS references include: TD/TC/WP(2002)42/FINAL, TD/TC/WP(2004)31/FINAL, TAD/TC/WP(2007)19/FINAL and TAD/TC/WP(2010)12/FINAL. Subsequent OECD Trade Policy Working Papers were published as: Park and Lippoldt (2003); Park and Lippoldt (2005); Park and Lippoldt (2008); and Cavazos, Lippoldt and Senft (2010). More information on the construction of composite indicators can be found in OECD-EU (2008).
- 133 Note that alternative indicators of trade secrets protection could be developed for more specific, targeted policy development purposes; for example, one could focus exclusively on civil law in a future assessment. For readers interested in such exploration, the Annex table has the detailed country scoring information; readers can thus mix, match and recombine the numbers as they see fit. Moreover, additional aspects might be taken into account. For example, the transparency benefits from having a specific trade secrets statute might be noted or, for those not from a common law background, the challenge of understanding the protection afforded based on court precedent. Also, in the next stage of this line of research, a useful check on the construction of the TSPI would be to confirm the results using a principle components assessment.
- 134 The additional economies covered by this iteration of the TSPI include: Argentina; Canada; Ghana; Hong Kong, China; Indonesia; Ireland; Latvia; Lithuania; Mexico; Netherlands; Philippines; Spain; Chinese Taipei; Thailand; Turkey; and Viet Nam. Also, the scoring for certain of the countries originally covered in Chapter 3 has been updated throughout in light of newly available information and improved precision in the weighting.

135 Annex Table 1 provides the detailed scoring for each element and component of the index for each country. In the event a user would like to consider alternative approaches to constructing indicators, these data will provide the essential building blocks (e.g., for recombining various elements or reweighting the components).

136 For some transition countries, the observations start in 1990 (China) or 1995 (Bulgaria, Latvia, Lithuania and Russia).

137 The sample ranges are broader for earlier years, as can be seen below in Table 3.

138 See endnote 17.

139 With respect to endogeneity, there are a few technical options available to address these issues, if necessary. One option (used below in one model specification) is to lag time series by one or more periods.

140 In part, the choice of correction approach was made taking into account the sample sizes (e.g. see Clark and Linzer, 2012) and Hausman test results.

141 The regression analyses were run using Eviews software and a least squares method.

142 The Patent Rights Index is comprised of five components including: membership in international treaties, coverage by subject matter, restrictions on patent rights, enforcement provisions, and duration of protection. Scores for each component range from zero to one and the index total is calculated as the sum of the scores for the five components, which are equally weighted.

143 Ideally, the regression specified in part (1) would be run separately to consider Business Expenditure on R&D (BERD) instead of economy-wide R&D. However, this could not be done here due to lack of data (only 24 observations were available for the countries and time period covered here). The use of economy-wide R&D could lead to lower statistical significance or introduce a downward bias in the TSPI coefficient in comparison to use of BERD. This is because economy-wide R&D may include public sector and academic institutions where trade secrets might be expected to play less of a role as compared to businesses.

144 In this specification, the association between the TSPI and R&D expenditure appears robust to the lagging of the TSPI variable by one period. Further research could consider additional aspects of potential endogeneity. For example, it may be that accumulation of intellectual assets could fuel demand for further protection of intellectual property (here, taken as including trade secrets) such that there is a feedback effect (e.g. Lippoldt, 2011, p 188). Moreover, the relationships between the variables as dependent or independent (falling on the left or right hand of the models, as specified) could be explored, along with implications for policy formation.

145 In a future analysis, it could be useful to consider developments from an evolutionary perspective to determine whether the relationship of changes in stringency to economic indicators may be non-monotonic for different degrees of stringency.

146 For example, in relation to the stringency of trade secret protection, it could be useful to consider inter-industry variation in strategies for appropriating benefits from innovation and investment.

147 E.g. the duty of confidentiality might be imposed on employees, fiduciaries and third parties with access to information. Partial coverage might arise if under a country's legal regime licensees cannot be covered.

148 The treatment of duties is split within this framework. General coverage of duties is scored under index component 1 (Definitions & Coverage). Component 2 responds to the availability of recourse for specific duties. This permits a detailed assessment, ensuring the indicator responds to variation in key elements.

¹⁴⁹ The Fraser Institute (2012, pp. 3 and 273-5) score for *Legal System and Security of Property Rights* is a composite indicator produced annually. Scores can range from 0 to 10. Based on objective indicators and expert assessments, it takes into account judicial independence, impartiality of courts, protection of property rights, military interference in the rule of law and politics, integrity of the legal system, legal enforcement of contracts, regulatory restrictions on the sale of real property, reliability of the police and business costs of crime. For details see Annex 1 of the present report and www.freetheworld.com/reports.html.

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