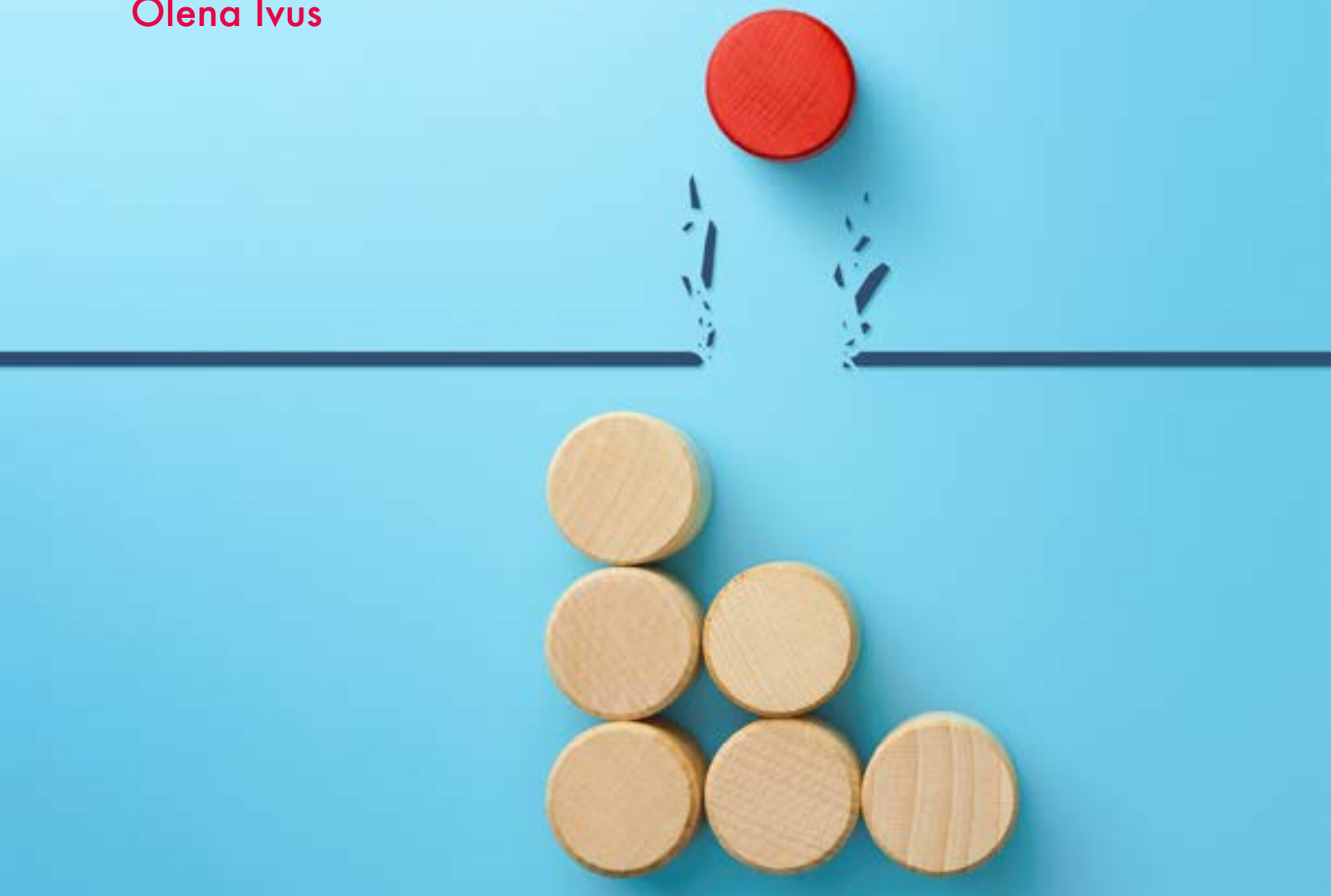
Centre for International
Governance Innovation

CIGI Papers No. 294 – May 2024

Breaking Barriers

The Link between Stronger IPRs and Trade in Services

Olena Ivus



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About the Author

Olena Ivus is a senior fellow at CIGI. Her research explores the interface between Canada's domestic innovation and international trade.

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Her work has been published in leading journals, including the *Journal of International Economics*, *Canadian Journal of Economics*, *Economic Inquiry* and the *Journal of International Business Studies*.

Olena received a Thomas Edison Innovation Fellowship for 2016–2017 from the Center for the Protection of Intellectual Property at George Mason University Antonin Scalia Law School. In 2010, she won the World Trade Organization Essay Award for Young Economists.

Olena holds a Ph.D. in economics from the University of Calgary.

Acronyms and Abbreviations

BOP	Balance of Payments
EBOPS	Extended Balance of Payments Services
FDI	foreign direct investment
GATS	General Agreement on Trade in Services
IMF	International Monetary Fund
IP	intellectual property
IPRs	intellectual property rights
KIBS	knowledge-intensive business services
LDCs	least developed countries
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
TRIPS	Trade-Related Aspects of Intellectual Property Rights
TSD	Trade in Services Database
WTO	World Trade Organization

Executive Summary

As innovation becomes more prevalent and systematically integrated into service industries, service firms increasingly turn to intellectual property rights (IPRs) as a means of safeguarding their intellectual assets. The reliance on these legal rights becomes even more pronounced when service companies endeavour to expand their global reach and tap into international markets where the protection of IPRs is relatively weak, and imitation is more widespread. Disparities in the level of IPRs protection and enforcement across countries can pose significant barriers to cross-border trade and investment in service sectors where the safeguarding of intellectual property (IP) is fundamental. The risk of IP infringement and the limited protection afforded to patents, copyrights and trademarks in certain countries can discourage the expansion of businesses into these markets, limiting the overall growth and accessibility of services in those areas. The key question is: How does the protection of IPRs impact cross-border trade in services?

Using data for 94 countries over the period of 1990–2010, this paper puts forward new empirical evidence about the impact of global strengthening of IPRs protection on cross-border trade in services. The analysis considers three different types of IP (patent rights, copyright and trademarks) and two different outcome variables (the total value of service exports from high-income countries and the value of service exports from Canada). The analysis also exploits variation in sensitivity to IP protection across two groups of service sectors: knowledge-intensive business services (KIBS) and non-KIBS. KIBS activities include computer services; legal, accounting and management consulting; research and development (R&D); advertising; and architectural, engineering and technical services. These activities play a substantial role in innovation processes and so are expected to be most sensitive to changes in the strength of global IPRs.

The results show that for the period of 1990–2010, controlling for other factors, strengthened patent, copyright and trademark protection in importing countries was associated with greater imports of KIBS from high-income exporting countries. Across sectors, cross-border trade in computer services and business and management consulting and public relations services is highly sensitive to the strength of patent, copyright and trademark protection, while cross-border trade in legal services, for example, is sensitive to copyright and trademark protection only. At the same time, the stronger IPRs protection did not appear to affect imports of non-KIBS.

Service exports from Canada respond differently depending on the type of IPRs and its strength in the importing partner country. The effect of trademark protection on KIBS exports from Canada is positive and stable over time. The effect of copyright protection was not distinguishable from zero in 1990, but copyrights have become increasingly important for Canada's KIBS exports since then. Stronger patent protection promotes Canadian exports in KIBS activities, but only into other high-income countries. Again, however, there are important differences across sectors.

Traditional arguments supporting IPRs protection highlight their central role in fostering innovation, and the observed surge in KIBS exports could be attributed to various forms of innovation in the service sectors, such as the introduction of inventive products and novel service delivery methods for end-users. However, robust IPRs protection can give rise to competitive challenges within service sectors and may limit consumer access due to prices above competitive levels and restricted output. Policy makers are tasked with striking a delicate balance — safeguarding IPRs to promote innovation and facilitate cross-border knowledge and technology transfer, while concurrently ensuring healthy competition and affordability in prices. An effectively balanced IPRs framework calls for customizing IPRs protection to the specific needs of sectors, reinforcing it in areas where innovation and protection are critical, while maintaining flexibility in sectors where collaboration and knowledge sharing are of primary importance. This customization should be carried out within the framework of international agreements, including the World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).[1]

1 To a certain extent, the various obligations stipulated by the TRIPS Agreement are counteracted by significant flexibilities, granting member countries the discretion to tailor their IPRs policies to suit their specific needs. Footnote 32 provides further details.

Introduction

The worldwide trade in services has grown fifteen-fold from US$400 billion in 1980 to US$6.2 trillion in 2019 (United Nations Conference on Trade and Development 2019). At the same time, the strength of IPRs has largely increased around the world since 1995, when the TRIPS Agreement came into effect.[2] The growth in cross-border trade in services coincided with the WTO members' implementation of significant adjustments to their IPRs protection, in order to meet the strong standards mandated by the TRIPS Agreement. Figure 1 plots the value of service exports from high-income countries (on the left) and the strength of IPRs protection in importing countries (on the right) over the period of 1990–2011.[3] The value of exports in each year is measured relative to the value in 1990, and likewise for each type of IP.[4] The data shows that by the year 2010, the value of service exports has increased by a factor of 35, while at the same time, the strength of patent, copyright and trademark protection has increased by about 33 percent. This pattern suggests that the global strengthening of IPRs protection is positively associated with trade in services. But is there a cause-and-effect link, implying that changes in the strength of IPRs directly lead to changes in service trade? Or could the observed association be merely influenced by unaccounted for shared (also called confounding) factors? The empirical method employed in this paper aims to isolate and quantify the causal impact of stronger IPRs protection on cross-border trade in services, by controlling for numerous confounding factors, whether they are observed or not.

The academic literature and policy work on the link between the protection of IPRs and trade in services is sparse.[5] One reason for this is the poor quality of trade data in services. Collecting data on cross-border trade in services is particularly challenging due to the intangible nature of services and because at-the-border duties cannot be applied to services.

This is in contrast to trade data for merchandise goods, which have been collected with quite high quality and accuracy. Nonetheless, the quality of services statistics has greatly improved in recent years, enabling empirical research.

Much of the literature on the global IPRs regime has focused on patent rights. However, in the context of service industries, patents are not the primary means of protecting IP. Service providers tend to file patent applications less frequently than firms in other industries, primarily due to the intangible nature of innovation in service industries and the difficulty of reducing ideas to novel and commercially viable products. Instead, service companies rely more heavily on other types of IP, such as trademarks and copyrights. A copyright is critical for protecting digital content, such as music, videos and software, which can be easily copied and distributed online without the copyright owner's permission. Trademark protection is also important for services and products where brand recognition and reputation can be critical to success.

This paper studies the relationship between trade in services and the strength of IPRs protection at the international level. More specifically, it uses data for 94 countries over the period of 1990–2010 to put forward new empirical evidence about the impact of global strengthening of IPRs protection on cross-border trade in services. The analysis considers three different types of IP: patent rights, copyright and trademarks. The empirical specification relates the strength of IPRs protection in a given country and year to its total value of service imports from high-income countries in that year. The sensitivity of service exports to the global strengthening of IPRs is expected to vary among high-income exporting nations due to significant discrepancies in the IP intensity within their respective service industries. Subsequently, the analysis narrows

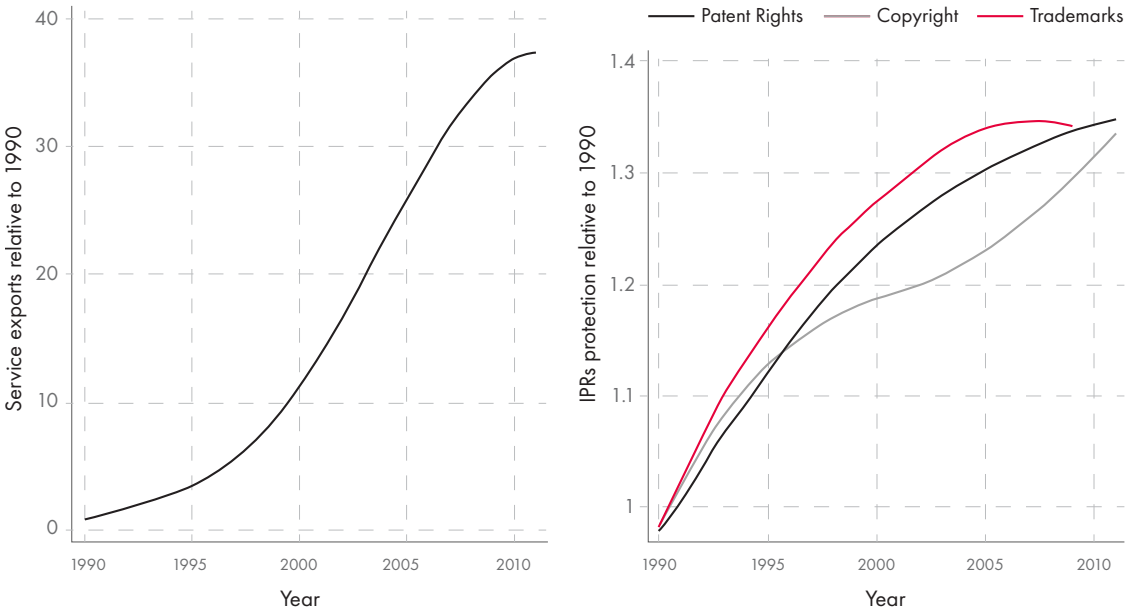
2 The TRIPS Agreement, which took effect on January 1, 1995, marked a significant milestone as the first international agreement to incorporate provisions related to IPRs within the multilateral trading system. TRIPS sets down minimum standards of IPRs, aligning them with the standards typically offered by major industrialized nations, and stipulates rigorous enforcement mechanisms. The agreement's acceptance is a mandatory requirement for membership in the WTO. Consequently, many countries embarked on substantial overhauls of their patent systems following the adoption of TRIPS in 1995. These reforms included broadening the accessibility of protection, expanding the range of patentable inventions, extending the duration of protection and reducing the likelihood of rights being forfeited.

3 The data used to construct Figure 1 is discussed in the section "Data Description."

4 For each variable, the plot displays a lowess line, created by conducting a locally weighted regression of the rate of inventor emigration against year.

5 Two important exceptions are Walter G. Park and Douglas Lippoldt (2005, 2014). These papers are discussed in the section "Literature on Trade-Related IPRs."

Figure 1: The Value of Service Exports and the Strength of IPRs Protection over Time



Source: Created by the author using data on the data index of patent rights protection from Park (2008a), the index of copyright protection from Taylor Reynolds (2003) and Park (2005), and the index of trademark protection from Reynolds (2003).

its focus to examine the value of service imports from Canada, and the results are compared.

The model is estimated using the two-way fixed effects (within) regression estimator that allows control for unobserved effects that are specific to each country-by-sector pair and year. In this model, the effect of stronger IPRs protection on cross-border trade in services is identified using variation in the service trade data over time within each country-sector pair. To put it differently, the estimation relates the changes over time in a country's imports within a given service sector to the changes over time in the strength of its IPRs protection. Any unobserved permanent differences across countries within each service sector, as well as across sectors within each country, are thus controlled for and will not interfere with the estimate of the impact of stronger IPRs protection on service trade.

But one common concern in this context remains: some other domestic policy changes (such as deregulation of entry restrictions and liberalization of restrictions on trade in service sectors) implemented in tandem with the national reform of IPRs could confound the estimate of the impact of stronger IPRs protection. To address this concern of endogeneity due to confounding domestic policy changes, the analysis further exploits variation in sensitivity to IPRs protection across two groups of service companies: the "treatment" group of the KIBS activities and the "control" group of the non-KIBS activities. The KIBS activities include computer services; legal, accounting and management consulting; R&D; advertising; and architectural, engineering and technical services.[6] KIBS companies specialize in providing knowledge-intensive support, heavily reliant on advanced technological or professional knowledge, to the business processes of other organizations. A common trait of KIBS firms is that clients are actively involved in the co-production of the service solution alongside the service provider. KIBS activities have high R&D intensity, contribute to a substantial number of product and process innovations, and share more similarities with companies on other highly innovative manufacturing industries than with the broader service sector (Miles 2005). They are widely regarded in the literature as the most innovative service sectors and thus, are expected to be most sensitive to changes in the strength of national IPRs. The non-KIBS activities include transportation; travel; postal and courier services; as well as

6 The section "KIBS Activities" discusses the KIBS activities in more detail.

construction, insurance, financial, information and government services. Some of these sectors, such as finance and insurance, fall under the category of "knowledge-intensive," yet in comparison to KIBS, they contribute to innovation processes to a lesser extent. Consequently, these sectors are expected to be less sensitive to changes in the strength of national IPRs. The comparison of the impact of IPRs across the two groups of activities serves to further increase the credibility of the findings, because the estimate of the differential impact will not pick up the effects of any confounding domestic policy shocks that are common to both groups.

The Role of IPRs in Service Sectors

Exploring Formal IPRs in Service Sectors

The analysis considers three types of IP: patent rights, copyright and trademarks.[7] This section begins by discussing how different service sectors utilize these formal IPRs.[8]

Patents cover new, non-obvious inventions with industrial utility or new and useful improvements to an existing invention. Traditionally, patents have been associated with tangible inventions,[9] while outputs of service innovations are generally intangible. For this reason, companies operating within the service sector are less likely to apply for patents, in contrast to their counterparts in the manufacturing sector. Instead, they tend to rely more heavily on alternative methods to harness value from their innovations. Some common alternatives to patenting strategies for value extraction include the control of specialized complementary assets, maintaining secrecy, leveraging lead time advantages, employing relational mechanisms of governance and implementing innovative management practices.[10]

However, certain innovations within the service sector are increasingly the subject of patent protection. This emerging trend is particularly pronounced in information technology, software development, R&D, and business and financial services. For example, the R&D services sector actively contributes innovations, often available for licensing, in areas such as chemicals, mechanical engineering and electronics. Meanwhile, business and financial service providers frequently develop services that rely heavily on IPRs, especially in the form of business methods. These business methods are typically codified, often as computer programs, and encompass various means of organizing financial transactions, accounting techniques, inventory control processes and similar processes.

Furthermore, service providers that do not engage in innovative idea generation often find themselves in a position where they rely on, or become users of, patent-protected goods and technologies. Technologies that are safeguarded by patents often involve critical standards that are fundamental to various service industries. Service providers may require patented technologies to deliver their services efficiently and effectively. For instance, a logistics service provider may use patented inventory management software to optimize their operations, or a medical service provider may rely on patented medical devices, software or

7 Another type of IP covered by the TRIPS Agreement is undisclosed information including trade secrets. Article 39.2 requires that a person lawfully in control of such information must "have the possibility of preventing it from being disclosed to, acquired by, or used by others without his or her consent in a manner contrary to honest commercial practices," where "a manner contrary to honest commercial practices" includes breach of contract and breach of confidence; WTO, *Agreement on Trade-Related Aspects of Intellectual Property Rights (unamended), Annex 1C of the Marrakesh Agreement Establishing the World Trade Organization*, 15 April 1994, 1867 UNTS 154, 33 ILM 1144 (1994) (entered into force 1 January 1995) [*TRIPS Agreement*], online: WTO <www.wto.org/english/docs_e/legal_e/27-trips_01_e.htm>. Trade secrets are frequently utilized when the results of service innovation are not easily safeguarded by other types of IPRs and can be securely shielded from disclosure. This strategy is commonly employed in R&D services, especially when the innovation is not yet sufficiently developed for formal recognition by authorities as eligible for protection through other types of IPRs. (The author thanks an anonymous reviewer for this comment.) Douglas Lippoldt and Mark F. Schultz (2014), using the Trade Secrets Protection Index they developed in that paper, demonstrate a significant increase in the stringency of trade secrets protection across a wide set of countries between 1985 and 2010, and further find that the stringency of trade secrets protection is positively associated with key indicators of innovation and international economic flows.

8 For a comprehensive and insightful discussion on this topic, Keith E. Maskus (2008) is a great resource.

9 Two notable exceptions for this traditional association are software patents and business method patents, which protect intangible innovations in the realms of software development and business strategies.

10 Maskus (2008, 261) writes in this respect: "The notion that services are not generally patentable is captured by the fact that there are no categories in the International Patent Classification (IPC) that refer specifically to standard service activities (e.g., trade, health care, consulting, and financial services). Service firms that take out patents must do so for inventions that may be classified in other categories."

pharmaceuticals to treat patients. Some services, especially in regulated industries, may require the use of patented technologies to ensure compliance.

Copyright encompasses the protection of creative works, such as written content, software, graphic design and a wide array of original materials utilized in the service sector. It extends its safeguard to architectural and engineering designs, literary and artistic creations, recorded music, films and the transmission of content through television, cable and satellite networks. Copyright coverage can also be expanded to encompass digital platforms including websites, software and marketing materials, and it plays a pivotal role in the safeguarding of digital goods and services distributed over the internet. In today's digital landscape, companies providing such services increasingly rely on copyright protection, along with other technical measures, to thwart unauthorized duplication (Ivus and Park 2022).

While patents and copyrights might not be as commonly utilized in service industries as they are in manufacturing, most service firms rely heavily upon trademark protection. Trademarks play a pivotal role for service-oriented businesses as they safeguard critical branding elements such as names, logos and service marks, and signal quality and reliability to consumers. Registering a trademark effectively addresses information asymmetry problems, as it prevents the use of similar marks by others and thus averts consumer confusion. Moreover, trademark registration signifies a commitment to expanding marketing initiatives into new geographic regions or diversifying product lines, which is a form of innovation in its own right.

Literature on Trade-Related IPRs

This paper explores how differences in the strength of IPRs protection across trading partners affect exports in service sectors from high-income countries, or from Canada specifically. Academic literature addressing the role of IPRs protection in service sectors is almost entirely lacking, with most empirical research concentrating exclusively on the trade implications of global strengthening of IPRs in manufacturing industries.[11]

The theoretical literature establishes that IPRs are trade-related, but it does not provide a clear prediction on how the strength of IPRs protection affects international trade flows. In both Judith C. Chin and Gene M. Grossman (1990) and Alan V. Deardorff (1992), extending IPRs from the innovating North (advanced countries) to the non-innovating South (developing countries) encourage Northern firms to develop new technologies. If Northern firms also compensate for lax IPRs by masking their technologies, which takes resources away from production, then stronger IPRs lead to increases in Northern output (Taylor 1993). But stronger IPRs also enhance the monopolistic power of innovators (Deardorff 1992; Chin and Grossman 1990), which reduces Northern exports.

The unambiguous relationship between the strength of IPRs protection faced by a firm in a foreign market and its exports to that market is also underscored in Keith E. Maskus and Mohan Penubarti (1995). In this seminal paper, the authors emphasize the trade-off between greater market size and enhanced market power. On one hand, stronger protection of IPRs creates a positive market expansion effect: it limits imitative activity in the foreign market and thus increases the demand faced by the exporting firm, encouraging the firm to export more. On the other hand, stronger protection of IPRs creates a negative market power effect: it grants monopoly power to the exporting firm by assuring exclusive rights for its products and technologies, and this allows the firm to behave more monopolistically and export less. Since the two effects are off-setting, no unambiguous theoretical prediction can be made about the effects of strengthening IPRs protection on international trade flows.

Olena Ivus (2007) notes that the market expansion effect serves as a rationale for the numerous initiatives undertaken by international organizations to harmonize and strengthen the protection of IPRs on a global scale. Developed nations assert that disparities in IPR protection act as non-tariff trade barriers, disrupting natural trading flows. Conversely, the market power effect supports the viewpoint of developing countries, suggesting that a more rigorous IPR system could potentially grant foreign corporations temporary monopoly control.[12]

11 The literature examining the impact of strengthening IPRs is thoroughly reviewed in Maskus (2000, 2012) and Saggi and Ivus (2020).

12 It is also important to emphasize that market power can provide an additional incentive for other innovators to develop (and eventually patent) alternative solutions, either by inventing around an existing patent or by leap-frogging it with a new technology.

Moreover, a more stringent IPR regime could impede legitimate trade in imitation products.

The theoretical literature further emphasizes industry differences in the impact of IPRs. In Ivus (2011), stronger foreign patent rights expand exports more in industries with higher imitation risk. In L. Kamran Bilir (2014), the impact of patent rights on multinationals' manufacturing location decisions depends on product life-cycle lengths. Bilir's key insight is that firms with short life-cycle products are less sensitive to patent protection because their technologies may become obsolete before imitation can occur. Alireza Naghavi, Julia Spies and Farid Toubal (2015) and Olena Ivus, Walter Park and Kamal Saggi (2016) further argue that technological complexity of products acts as a barrier to imitation and distinguished products by the complexity level of the tasks involved in their production to study the impact of foreign patent rights on the firms' product-sourcing decisions.

The empirical literature also exhibits a wide range of results. For example, for the aggregate of manufacturing industries, researchers have found no significant impact of a strengthening in patent rights (Ferrantino 1993) to a significantly negative impact (Smith 1999) or a significantly positive impact (Maskus and Penubarti 1995; Rafiquzzaman 2002). Moreover, the trade impact of stronger IPRs protection differs across countries and industries. Maskus and Penubarti (1995), for example, found that the trade impact of patent rights is less positive in sectors with greater sensitivity to patent protection, which could be due to the market power effect being stronger in such industries. These results were obtained using data on exports from 22 Organisation for Economic Co-operation and Development (OECD) member countries into 25 developing countries across 28 manufacturing sectors during the year 1984. In addition, Pamela J. Smith (1999) showed that weak foreign IPRs are a barrier to US exports, but only to countries that pose a strong threat of imitation. The threat of imitation in a particular country is assumed to be a function of local R&D intensity and the degree of patent protection. Mohammed Rafiquzzaman (2002) found, using data on Canadian manufacturing exports for the year 1990, that stronger patent rights in importing countries induce Canadian firms to export relatively more to high-income countries than to low-income countries. Furthermore, consistent with the results in Smith (1999), stronger patent rights increase Canadian exports to importers that pose a strong imitation threat (due to the market-expansion effect) but reduce Canadian exports to importers that pose a weak imitation threat (due to the market-power effect). Catherine Y. Co (2004) further found that manufacturing exports in non-R&D-intensive industries falls, but exports in R&D-intensive products are unaffected on average. Ivus (2015) showed, using detailed product data on US exports from 1990 to 2000, that the strengthening of IPRs increased exports of new products in patent-sensitive industries. Importantly, the expansion in product variety (that is, the extensive margin of trade) accounted for the entire increase in US exports. These results demonstrate that patent protection is a significant institutional factor in US firms' business decisions over the introduction of new products and processes into a developing country marketplace.

The strength of IPRs regimes also influences the overall market entry strategies of firms, including their choice of entry mode into foreign markets. Firms can choose from various modes of entry: direct exporting; undertaking foreign direct investment (FDI) by establishing fully owned subsidiaries; forming strategic alliances and joint ventures; and engaging in licensing agreements with arm's-length firms. Each of these strategies comes with its own costs and risks. FDI, for example, carries the advantage of cost savings due to lower wages in developing countries but entails the expenses of establishing a subsidiary and the risk of potential imitation.[13] Arm's length licensing, on the other hand, can involve relatively minimal commitment and allows firms to test a market before committing to FDI, or to realize an early return on their R&D investments (Park and Lippoldt 2005). However, arm's length licensing also involves a heightened risk of imitation, as it required sharing technological information with external parties compared to keeping such information internal within a subsidiary (Ivus, Park and Saggi 2015).

Empirical evidence generally supports the notion that stronger IPRs protection in developing countries promotes technology transfer via

13 Shifting production to developing countries with weak protection of IPRs introduces a higher risk of imitation because local employees can misappropriate the firm's technology to start up imitative production (see, for example, Glass and Saggi 2002; Lai 1998; Poole 2013). The incentive to internalize transactions by establishing a wholly owned subsidiary in a foreign country declines when market exchange of technology across national borders becomes more secure (Markusen 1995, 2001; Ethier and Markusen 1996).

licensing and FDI.[14] Park and Lippoldt (2005), for example, find a positive association between stronger patent protection and merchandise imports, services imports and FDI in developing countries at the aggregate level. The author further emphasizes that the overall impact of strengthening IPRs on entry mode decisions depends on the specific business environment and the importance that rights holders assign to IPRs issues relative to other non-IPRs factors.

While concerns regarding imitative capacity and the risk of IPRs abuse in destination markets are valid for rights holders, imitation is challenging to measure precisely because it lacks the market mediation inherent in licensing and FDI transactions. Nonetheless, the evidence suggests that imitative capacity and the risk of IPRs abuse in destination markets are legitimate concerns for rights holders. Minyuan Zhao (2006) emphasized that the innovating firms can discourage imitation by developing technologies that require complementary knowledge and resources not readily available to potential imitators. When the value of a technology is highly dependent on the proprietary firm's internal resources, firms are better able to appropriate value from their R&D even in the absence of strong IPRs protection. This conclusion is supported by the empirical evidence in Zhao's paper, which shows that technologies developed by firms with R&D in weak IPRs countries show stronger internal linkages. Multinational companies are able to substitute internal organizations for external IPRs in countries with weak institutional environments.

The underlying technological complexity of the firms' product can also act as a barrier to imitation. Bruce Kogut (2008) notes that "technology... consists of the principles by which individual skill and competence are gained and used, and by which work among people is organized and coordinated" and measures technological complexity as the degree of distinct and multiple kinds of competencies used to manufacture a product, arguing that "the more complex a manufacturing capability, the more difficult it should be to imitate." In the context of Zhao (2006), more complex technologies can be separated and recombined to discourage imitation. Furthermore, in the context of technology licensing strategy of multinational firms, Ivus, Park and Saggi (2017) underscore two offsetting effects. On one hand, strengthening IPRs lowers appropriability hazards and so reduces the firms' reliance on affiliated licensing as the more secure means of transfer. This is the internalization effect. But on the other hand, lower appropriability hazards also encourage the firms to increase the volume of technology transfer via licensing, both within and outside the firm. This is the appropriability effect. Which effect prevails depends on the underlying technological complexity of the firms' products. Ivus, Park and Saggi found that a strengthening of patent protection in the host country increases the incentive to license innovations to unaffiliated parties, while the volume of affiliated licensing falls among complex-technology firms (such as machinery and equipment, electronics and components, and transportation) and rises among simple-technology firms (such as pharmaceuticals and non-pharmaceutical chemicals).

International management literature has further emphasized the high cost of sharing and managing knowledge across countries and investigated the role of the local institutional environment (such as IP protection) in impacting firm strategy. A well-established finding is that imperfections in contracting (for example, due to weak IPRs) can impede transfers of proprietary knowledge and technological innovation between independent entities, particularly for transactions or projects with high asset specificity and the hazard of technological leakage or freeriding on brand name and reputation. These contractual hazards determine the impact of the institutional environment on multinational market entry mode.

The literature also studied the ability of innovating firms to profit from technological innovation and highlighted "appropriability hazards," which are distinct from contractual hazards discussed above and result from the technological leakage of information, leading to imitation by rivals. Where the appropriability regime is weak, technology is very difficult to protect and innovators must turn to business strategy in order to limit imitation. This is the main insight of David J. Teece (1986). Two key dimensions of the appropriability regime are the efficacy of legal mechanisms of protection (such as patents) and the nature of technology. Teece argued that appropriability hazards are high

14 See the specific evidence in Branstetter, Fisman and Foley (2006); Branstetter et al. (2011); Javorcik (2004); Lee and Mansfield (1996); and the overview discussion in Maskus (2000) and Park (2008b).

when knowledge is less complex because such knowledge is easy to misappropriate and imitate.

A substantial body of literature has studied the impact of global IPRs reforms on the trade in manufacturing goods, but the impact of global IPRs reforms on trade in services has received considerably less attention. A natural question is: Does trade in services significantly differ from trade in goods? Theoretical literature underscores substantial distinctions. A fundamental characteristic of most services, as initially observed by T. Peter Hill (1977), is the necessity for production and consumption to occur concurrently and within the same location for a service transaction to take place. The advent and widespread adoption of the internet, coupled with advancements in digital technology, have significantly transformed traditional service models. This shift has facilitated the remote and digital delivery of services, raising new issues for international trade (López González and Ferencz 2018).[15] Nonetheless, it is still largely true that in many service industries, inputs from both exporting and importing countries are typically necessary for trading a service (Mirza and Nicoletti 2004). This distinctive trait — the nature of joint production — challenges the applicability of the law of comparative advantage to services trade (Deardorff 1985) and also prompts us to question the degree to which variations in global standards of IPRs serve as impediments to trade in services.

Empirical literature finds that some determinants of trade in services are remarkably similar to the determinants of trade in goods. Keith Head, Thierry Mayer and John C. Ries (2009), for example, show that in the gravity equation framework, common language and common colonial origin promote trade in services and trade in goods to a similar degree. Hildegunn K. Nordås and Dorothée Rouzet (2015) further show that services trade restrictions are negatively associated with imports and exports of both services and manufactured goods. The study used the OECD data on the Services Trade Restrictiveness Index and data on regulatory measures affecting trade in 18 services sectors and 40 countries as of 2013. Another relevant study is by Holger Breinlich and Chiara Criscuolo (2011), which reports a set of stylized facts on firms engaging in international trade in services using detailed firm-level data on exports and imports for the United Kingdom. The data shows a strong degree of firm-level heterogeneity in services trade, which is similar to trade in goods. The authors further find that the adjustment channels through which trade barriers impact service exports and imports are also similar, although the intensive margin (that is, trade per service, per trading partner) is more important for explaining cross-firm variation in service trade, while the extensive margin (the number of trading partners and the number of services traded) is more important for explaining cross-firm variation in goods trade. The selection and concentration patterns observed across destinations and exported services in the data suggest that market and service type-specific fixed costs are also a key element of service trade.

The similarity in trade patterns and factors affecting both services and goods trade implies that the findings derived from the extensive body of literature on the influence of IPRs on manufacturing industry trade may hold substantial relevance in the context of services trade. However, to establish reliable conclusions, a more rigorous examination is needed.

The empirical literature on global IPRs reforms and trade in services is limited, with notable exceptions. Park and Lippoldt (2005) examine the impact of the strengthening of IPRs in developing countries during the 1990s on international licensing activity. Using four IPRs strength measures (patent rights, copyrights, trademark rights and enforcement effectiveness) and two data sets (data on US parent firms' licensing receipts from unaffiliated sources and international firm-level data on cross-border licensing transactions involving international joint ventures or strategic alliances), the study finds that most licensing income sources (such as industrial processes, software and pre-recorded performances) respond positively to patent protection and enforcement effectiveness. However, trademark and copyright protection show weak influences, possibly due to the counteracting market power effect. The study concludes that strengthening IPRs in developing countries enhances their access to technology through licensing and suggests that IPRs reforms should be part of a broader

15 López González and Ferencz (2018, 6) show that the digital transformation plays a crucial role in trade, especially for more complex manufactured goods and services deliverable digitally, and gives rise to new complementarities between goods and services. "Digital transformation refers to the economic and societal effects of digitisation and digitalisation. Digitisation is the conversion of analogue data and processes into a machine-readable format. Digitalisation is the use of digital technologies and data as well as interconnection that results in new or changes to existing activities."

strategy for promoting economic development in conjunction with complementary policy.

A more recent study, Park and Lippoldt (2014), assesses the impact of IPRs protection on technology transfer to developing countries from 1990 to 2005. The study considers three modes of technology transfer — services trade (including intangible asset licensing), merchandise trade and FDI — and examines sectoral impacts, distinguishing high-tech sectors from others. The findings indicate that stronger IPRs protection is positively linked to imports of technology-intensive services in developing countries, with patent rights exhibiting a stronger association compared to copyrights and trademark rights. Stronger patent protection attracts inflows of high-tech products (for example, pharmaceutical goods, chemicals, computer services, information, office and telecom equipment), and these inflows positively correlate with local R&D activities and patenting, both resident and non-resident.

This paper is closely related to that of Park and Lippoldt (2014) and makes three additional contributions. First, it extends the analysis over a longer time frame and examines how the sensitivity of service exports to changes in IPRs strength has evolved over time. Second, its empirical approach controls for unobserved effects specific to each country-by-sector pair and year. To enhance empirical methodology, the study distinguishes between KIBS and non-KIBS sectors,[16] acknowledging the crucial role of KIBS as key drivers of the global economy (Lesher and Nordås 2006). Lastly, the research considers service exports from both high-income countries collectively and specifically from Canada, providing a comparative analysis. Notably, there is a scarcity of academic research on the trade impact of IPRs in the Canadian context, with Rafiquzzaman's (2002) work — focused solely on manufacturing trade and based on outdated data from 1990 — being frequently cited.

The following section presents the empirical analysis employed in this paper.

Methodology

The empirical analysis is used to measure the impact of the strength of IPRs in an importing country on the country's import flows in service sectors. The sample covers up to 94 importing countries over the period of 1990–2010.[17] The focus initially is on the aggregate service imports from the group of high-income exporting countries, but the analysis later is also repeated using data on imports of services from Canada by the rest of the world. To identify the effect of stronger IPRs protection on cross-border trade in services, the estimation uses variation in the import data over time within each country-sector pair. The basic statistical model (1) is specified as follows:

$$Y_{ijt} = \alpha + \beta_1 IPR_{it} + \beta_2 KIBS_j \times IPR_{it} + X'_{it}\gamma + \alpha_{ij} + \alpha_t + \alpha_{it} + \varepsilon_{ijt}, \quad (1)$$

where the outcome variable Y_{ijt} is the total value of imports (in logs) into country i in service sector j in year t from high-income exporting countries. The independent variable IPR_{it} is a measure of the strength of IPRs protection in country i and year t. This variable is measured using three types of IP: patents, copyright and trademarks. These measures are discussed in detail in the section "The Strength of IPRs Protection." Next, $KIBS_j$ is the KIBS activity dummy variable, which is equal to one if a service sector j is in the group of KIBS activities and is equal to zero otherwise. KIBS activities are discussed in the section "KIBS Activities." The vector X_{it} contains time-varying country controls, such as population (in logs), real GDP (in logs), human capital index (in logs), capital stock (in logs), the index of financial openness, the index of the degree of economic freedom in the legal system and the security of property rights, the index of the degree of economic freedom to trade internationally, four indices of political risk (external conflict, internal conflict, corruption and government stability), and the quality of legal institutions. These controls are discussed in more detail in the section "Data from Other Sources." The model also includes fixed effects for each country-sector pair (α_{ij}), fixed effects for each year (α_t) and the vector of country-specific time trends (α_{it}). Last, α is the constant term and ε_{ijt} is the stochastic error

16 The comparison of the trade impact of IPRs protection across KIBS and non-KIBS will not reflect the impact of other concurrent policy changes, as long as such changes have common impacts across the two groups.

17 The availability of data varies across the three measures of IPRs and is discussed in the section "The Strength of IPRs Protection."

term. The model is estimated using the two-way fixed effects (within) regression estimator.

The key variable of interest is the interaction term $KIBS_j \times IPR_{it}$, which is the product of the KIBS activity dummy and the strength of IPRs protection. This interaction term allows the sensitivity of imports with respect to country differences in the strength of IPRs to vary across the two sector groups: KIBS and non-KIBS. While the coefficient β_1 measures the impact of IPRs in the non-KIBS group, the coefficient β_2 measures the differential impact of IPRs in the KIBS group. A positive sign on the estimated coefficient β_2 would mean that stronger protection of IPRs promotes imports relatively more in the KIBS activities, as compared to the non-KIBS activities.[18]

Data Description

The Trade in Services Database

The data on annual bilateral services trade flows comes from the Trade in Services Database (TSD). This database is provided by the World Bank and described in detail in Joseph Francois and Olga Pindyuk (2013).[19] The TSD contains information on services trade flows in the General Agreement on Trade in Services (GATS) "mode 1" (cross-border supply) and GATS "mode 2" (consumption abroad). Mode 1 covers remote provisions of services, while mode 2 covers services supplied in the territory of a nation by consumers or sellers travelling abroad. Due to data limitations, the data set does not have information on cross-border services trade in GATS mode 3 (commercial presence) and GATS mode 4 (presence of natural persons). Mode 3 reflects foreign affiliates sales to host country consumers, while mode 4 includes the cross-border temporary movement of skilled labour (for example, accountants and software engineers).

The TSD covers 199 countries across multiple sectors over the period from 1985 to 2011. The data is collected using mirror-technique (when information on imports of the partner country is used to fill in data on export trade flows of a reporter country), reconciling aggregate with underlying flows and consolidating other sources of bilateral trade data in services (including the OECD, Eurostat, the United Nations and International Monetary Fund [IMF]). This is done to ensure the most comprehensive coverage of global trade flows in services across countries and over time, which is the TSD's main advantage other the original source data.

KIBS Activities

The trade flows in the TSD are disaggregated into service sectors using the Extended Balance of Payments Services (EBOPS) classification, which provides a breakdown of the Balance of Payments (BOP) Trade in Services items.[20] The TSD includes more than 20 economic activities according to the BOP classification (transportation, travel, communications services, construction services, insurance services, financial services, computer and information services, royalties and license fees, professional and technical services, government services, commercial services and others). Sectors vary in terms of country and year coverage, with fewer observations available at the higher the level of disaggregation.

The empirical analysis in this paper relies on the argument that trade in the KIBS activities is particularly sensitive to national adjustments of IPRs systems. Ian Miles et al. (1995) describes KIBS as "economic activities which are intended to result in the creation, accumulation or dissemination of knowledge," usually in explicit, formal and codifiable form. The authors further detail that KIBS activities rely heavily upon professional knowledge, are themselves primary sources of information and knowledge or use their knowledge to produce intermediate services for their clients' production processes, and are of competitive importance and supplied primarily to business. Pim Den Hertog (2002) and Poh Kam Wong and Annette Singh (2004) further argue that KIBS activities are facilitators, carriers and sources of innovation that provide innovation support and co-produce innovation in client companies. Molly Lesher and Hildegunn Kyvik Nordås (2006) emphasize that business services play a crucial role as inputs in

18 The value of imports can differ across KIBS and non-KIBS activities (within each country and across countries) for reasons other than the sector sensitivity to the strength of IPRs protection. Likewise, the value of imports can differ across countries within each service sector for reasons other than the country strength of IPRs. By including the set country-by-sector specific effects (α_{ij}), any such differences are captured as long as they are constant over time.

19 The data set is available at https://datacatalog.worldbank.org/search/dataset/0041416.

20 The topical list of codes is available at www.imf.org/external/np/sta/bopcode/topical.htm.

Table 1: Classification of KIBS Activities Based on NACE Rev. 1.1

NACE Division	Description
72	Computer and related activities (comprise hardware consultancy; software consultancy and supply; data processing; database activities; maintenance and repair of office, accounting and computing machinery; and other computer-related activities)
73	Research and development (comprise R&D on natural sciences and engineering and R&D on social sciences and humanities)
74.1	Legal activities; accounting, bookkeeping and auditing activities, tax consultancy; market research and public opinion polling; business and management consultancy activities; management activities of holding companies
74.2	Architectural and engineering activities and related technical consultancy
74.3	Technical testing and analysis
74.4	Advertising

Source: Schnabl and Zenker (2013).

various industries and highlight their significance as one of the most dynamic sectors in many OECD economies. The study finds that broader access to a variety of business services enhances productivity in manufacturing, and that business services are catching up with manufacturing in terms of their contribution to GDP.[21]

In order to isolate the KIBS activities in the TSD data, the definition of KIBS based on the NACE Rev. 1.1 classification,[22] which is widely accepted in the scientific community, has been relied upon. According to this definition, the group of KIBS activities comprises the following NACE divisions.

Some definitions further include NACE divisions 74.5 (labour recruitment and provision of personnel) and 74.8 (miscellaneous business activities n.e.c.).[23] In cases when data below the two-digit level is limited, it is common to classify the entire NACE division 74 aggregate as the KIBS activities.

Table 2 reports the BOP Trade in Services items that correspond to the NACE divisions listed in Table 1. Accordingly, these service sectors in the TSD data are classified as the KIBS activities.

In the empirical analysis, the sensitivity of service imports in the treatment group of KIBS activities is compared to the sensitivity of service imports in the control group of non-KIBS activities. Table 3 lists the service sectors in the TSD data classified as the non-KIBS activities.

The Strength of IPRs Protection

The paper focuses on the three types of IP: patents, copyright and trademarks. This section discusses the measures used for each type.

First, to measure the strength of patent protection across importing countries and years, the Park (2008a) index of patent rights protection is used. The index is available for each five-year time period from 1960 to 2015. It is based on legislation and case laws that establish how such legislative provisions are interpreted and enforced. The components that comprise the patent rights index include membership in international agreements, duration of protection, the patentability of certain types of inventions such as software, enforcement mechanisms and the presence of any restrictions on patent rights (such as compulsory licensing and working requirements). For example, patent rights protection is stronger if protection is over a longer period, covers more types of inventions, has limited exceptions for private use, if strong enforcement mechanisms are widely available, and if the country adheres to various international agreements on

21 In addition, Lesher and Nordås (2006) find that in small OECD and developing countries, the gains from trade in business services are realized primarily from accessing a broader and more specialized supplier base than what the domestic economy alone can support, but in the largest OECD countries, they mainly stem from reduced costs associated with imported services.

22 NACE stands for the Nomenclature of Economic Activities and is the European statistical classification of economic activities.

23 See www.eurofound.europa.eu/en/resources/article/2005/knowledge-intensive-business-services-what-future.

Table 2: KIBS Activities by EBOPS Service Types

EBOPS	Description
263	7.1 Computer services
274	9.3.1 Legal, accounting, management consulting and public relations
275	9.3.1.1 Legal services
276	9.3.1.2 Accounting, auditing, bookkeeping and tax consulting services
277	9.3.1.3 Business and management consulting and public relations services
278	9.3.2 Advertising, market research and public opinion polling
279	9.3.3 Research and development
280	9.3.4 Architectural, engineering and other technical services

Source: Created by the author using data from Schnabl and Zenker (2013) and concordance tables from https://sites.google.com/site/erikvandermarel/concordance-tables.

Table 3: Non-KIBS Activities by EBOPS Service Types

EBOPS	Description
205	1 Transportation
236	2 Travel
246	3.1 Postal and courier services
247	3.2 Telecommunications services
249	4 Construction services
253	5 Insurance services
260	6 Financial services
264	7.2 Information services
287	10 Personal, cultural and recreational services
291	11 Government services, n.i.e.
983	Services not allocated

Source: Created by the author using data from Schnabl and Zenker (2013) and concordance tables from https://sites.google.com/site/erikvandermarel/concordance-tables.

patents. Each component is assigned a value from zero to one, which equals the share of conditions a country satisfies, and the final index is a sum of these five values so that the overall score ranges from zero (lowest) to five (highest).

Second, the strength of copyright laws and regulations across importing countries and years is measured using the index of copyright protection developed in Reynolds (2003) and Walter Park (2005). This index is available for each year from 1989 to 2011. It is constructed using four measures of copyright laws and regulations: duration and coverage of protection; limitations and exceptions (for example, compulsory licensing or provisions on fair use and fair dealing); enforcement mechanisms; and membership in international copyright agreements. Each measure

is assigned a value from zero to one, which equals the share of conditions a country satisfies, and the overall index is a sum of these four values, ranging from zero (lowest) to four (highest).

Last, to measure the strength of trademark laws and regulations across importing countries and years, the Reynolds (2003) index of trademark protection is used. This index is available for each five-year time period from 1980 to 2005. It is constructed based on three clusters of trademark protection: coverage, which measures the range of trademarks that are allowed to be registered and protected; procedures, which represents how procedural elements affect the strength of trademark laws, with certain procedures highlighting trademark enforcement; and treaties, which reflects the number of international trademark treaties the country is party to in any given year. The overall index is constructed by averaging the three cluster scores and ranges from zero (lowest) to one (highest).

The three indices discussed above are constructed based on objective criteria, which ensures a consistent and measurable approach.

The availability of data varies across the three measures of IPRs. The final sample with non-missing data on service imports and the index of patent rights covers 104 importing countries from 1985 to 2011. Using data on the index of copyright protection changes the coverage to 103 importing countries from 1989 to 2011, and using data on the index of trademark protection changes it to 72 importing countries from 1985 to 2009.[24]

Table 4 reports the means of the three indices — patent rights, copyright and trademark — at five-year intervals, across all countries for which IPRs data is available. Raw data is summarized in Panel A; whereas in Panel B, the copyright and trademark indices have been rescaled to cover the same range as the patent rights index, between zero and five. It is apparent that the strength of IPRs protection has increased over the 1990–2010 time period. In percentage changes, the index of IP protection has increased by 72 percent for patent rights, 60 percent for copyright and 33 percent for trademarks. The data further suggests that the institutions for IPRs protection co-evolve. Over this time period, the correlation between the patent rights and copyright indices increased from 0.60 to 0.74, while the correlation between the patent rights and trademark indices increased from 0.45 to 0.56.

Data from Other Sources

The analysis uses a number of importing country variables from different sources to control for the countries' level of development, institutional strength and capacity, and effectiveness of governance. Population data is from the World Bank (2010) World Development Indicators. Data on real GDP, the capital stock measure and the human capital index are from the Penn World Tables version 9.0 (Feenstra, Inklaar and Timmer 2015).[25] The index of the degree of economic freedom is from James Gwartney, Robert Lawson and Joshua Hall (2016). The index is utilized in two areas: the legal system and security of property rights and the freedom to trade internationally. Next, the index of financial openness is from Menzie D. Chinn and Hiro Ito (2006). This index measures a country's degree of capital account openness, based on the binary variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. The analysis further uses four indices of political risk from the International Country Risk Guide: external conflict, internal conflict, corruption and government stability. Last, to control for the quality of legal institutions, data from Aljaž Kunčič (2014) is used. The institutional quality data are only available for the period of 1990–2010 and therefore using this measure reduces the final sample size. Nonetheless, it is important to control for the quality of legal institutions since the measures of IPRs protection could be picking up the effects of broader institutional changes correlated with the strength of IPRs.

24 Two indices — patent rights and trademarks — are only available for each five-year time period. To generate annual data, it is assumed that the strength of protection stays unchanged for the next four years, and the missing index values in years $t + 4$, $t + 3$, $t + 2$ and $t + 1$ are replaced with the index value in year t.

25 The analysis uses expenditure-side real GDP at chained purchasing power parities. Capital stock is at constant 2011 national prices, in million USD. The human capital index is based on the average years of schooling from Barro and Lee (2013).

Table 4: Average Strength of IPRs, by Type and Year

Index	1990	1995	2000	2005	2010
Panel A: Raw data					
Patent Rights	1.94	2.53	2.98	3.25	3.33
Copyright	1.51	1.87	2.11	2.21	2.42
Trademarks	0.45	0.52	0.59	0.60	—
Panel B: Indices rescaled to have zero to five range					
Copyright	1.89	2.34	2.63	2.76	3.03
Trademarks	2.23	2.61	2.95	3.01	—

Source: Schnabl and Zenker (2013).

Results

The Overall Effect

Table 5 shows the results of estimating the basic statistical model (1). Consider first columns (1)–(4), where the outcome variable is the aggregate value of service imports from the group of high-income exporting countries. One index of IPRs protection — patent rights, copyright or trademarks — is included per specification in columns (1)–(3) and all three indices at the same time are included in the specification in column (4).

It is apparent from column (1) in Table 5 that the estimated coefficient β_2 on the interaction term between the KIBS activity dummy and the index of patent rights is positive (2.568) and highly statistically significant, while the estimated coefficient β_1 on the index of patent rights by itself is not statistically significant at the five percent level. These results suggest that patent protection matters only for trade in services included in the KIBS activities group: strengthening patent rights in importing countries encourages high-income countries' exports of the KIBS activities and does not affect their exports of the non-KIBS activities. Specifically, the estimate of 2.568 implies that a one percent increase in the patent rights index in a country boosts its KIBS imports by 2.6 percent. To put this into perspective, for the sample of countries used to produce this result, the index of patent rights has increased by 35 percent on average over the period of 1990–2010. The implied corresponding increase in the KIBS exports from high-income countries is 90 percent.

The results in columns (2) and (3) tell a similar story: copyright and trademark protection promote KIBS exports from high-income countries and do not affect non-KIBS exports. Of the three types of IP, KIBS exports are most sensitive to changes in copyright protection. From column (2), the estimated coefficient β_2 is equal to 4.315, which implies that for each one percent increase in the copyright index in an importing country, KIBS exports from high-income countries rise as much as 4.3 percent. Also, when all three measures of IPRs are controlled for in the specification in column (4), the estimated coefficient on the interaction term KIBS * Copyright index is positive (4.081) and highly statistically significant. At the same time, the estimated coefficients on KIBS * Patent rights index and KIBS * Trademark index are not statistically significant at the five percent level, although this lack of statistical precision could simply be the result of the high correlation between the indices.

Next, in columns (5)–(8), the analysis is repeated for the value of service imports from Canada as the outcome variable. For trademark protection, the estimated impact is similar: a one percent increase in the trademark index boosts Canada's service exports of the KIBS activities by 1.7 percent and has no impact on Canada's service exports of the non-KIBS activities. But patent and copyright protection does not appear to be significantly associated with Canada's service exports, KIBS or non-KIBS, in this time frame for this sample of importing countries.

Dynamic Effects

In order to deepen our understanding of the impact of stronger IPRs protection on cross-border trade in services, it is imperative to examine how the

Table 5: The Overall Impact of Stronger IPRs Protection

	Imports from High-Income Countries				Imports from Canada			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
KIBS * Patent rights index	2.568***			0.984*	2.452			1.607
	[0.436]			[0.581]	[1.700]			[1.893]
Patent rights index (in logs)	-0.341*			-0.124	0.128			0.385
	[0.207]			[0.240]	[0.495]			[0.632]
KIBS * Copyright index		4.315***		4.081***		1.136		-1.272
		[0.553]		[0.729]		[1.184]		[1.514]
Copyright index (in logs)		-0.350		-0.100		-0.223		0.296
		[0.291]		[0.323]		[0.600]		[0.767]
KIBS * Trademark index			2.266***	0.115			1.714***	1.694**
			[0.567]	[0.559]			[0.605]	[0.707]
Trademark index (in logs)			-0.567*	-0.294			-0.579	-0.510
			[0.327]	[0.326]			[0.535]	[0.533]
Population (in logs)	6.259**	5.713*	5.664	5.945	7.770	7.581	7.315	7.546
	[2.940]	[2.940]	[4.241]	[4.306]	[5.311]	[5.364]	[6.594]	[6.707]
Real GDP (in logs)	0.095	0.058	-0.113	-0.209	-0.099	-0.130	-0.186	-0.221
	[0.294]	[0.290]	[0.361]	[0.372]	[0.510]	[0.500]	[0.645]	[0.661]
Human Capital Index (in logs)	-2.807	-2.929	-3.081	-3.938	4.683	4.769	5.522	5.959
	[2.544]	[2.523]	[3.574]	[3.633]	[4.004]	[4.099]	[5.200]	[5.451]
Capital stock (in logs)	1.370*	1.967**	1.105	1.602	2.035	2.059	1.443	1.620
	[0.795]	[0.824]	[1.012]	[1.049]	[1.699]	[1.762]	[2.159]	[2.346]
Financial openness	0.027	0.031	-0.050	-0.083	0.371	0.339	0.347	0.445
	[0.168]	[0.169]	[0.183]	[0.186]	[0.326]	[0.332]	[0.400]	[0.398]
Corruption	-0.007	0.010	-0.006	-0.006	0.062	0.055	0.054	0.042
	[0.033]	[0.034]	[0.035]	[0.036]	[0.049]	[0.052]	[0.051]	[0.055]
External conflict	0.014	0.028	0.007	0.036	-0.039	-0.058	-0.051	-0.066
	[0.026]	[0.029]	[0.031]	[0.036]	[0.031]	[0.039]	[0.033]	[0.042]
Internal conflict	0.010	0.001	0.014	0.001	0.009	0.013	0.037	0.034
	[0.021]	[0.021]	[0.024]	[0.024]	[0.040]	[0.041]	[0.046]	[0.047]
Government stability	-0.013	-0.011	-0.008	-0.007	0.013	0.009	0.014	0.007
	[0.012]	[0.012]	[0.013]	[0.014]	[0.021]	[0.022]	[0.022]	[0.024]
Index of Economic Freedom legal system and property rights	-0.177*	-0.190**	-0.258**	-0.266**	-0.071	-0.065	-0.035	-0.011
	[0.092]	[0.093]	[0.109]	[0.112]	[0.173]	[0.177]	[0.182]	[0.187]
Index of Economic Freedom freedom to trade internationally	0.015	0.018	0.021	0.047	-0.055	-0.042	-0.054	-0.073
	[0.040]	[0.040]	[0.048]	[0.050]	[0.081]	[0.085]	[0.088]	[0.093]
Legal institutional quality	1.543***	1.820***	2.142***	2.092***	1.665*	1.754*	1.598*	1.716*
	[0.522]	[0.531]	[0.632]	[0.640]	[0.922]	[0.920]	[0.953]	[1.004]
Constant	-72.723	-49.583	-46.285	-38.018	-278.893*	-278.060*	-216.845	-227.546
	[106.241]	[106.404]	[167.323]	[168.497]	[164.247]	[168.020]	[228.995]	[236.251]
Observations	12,588	12,231	9,925	9,367	3,695	3,523	3,153	2,967
R-squared	0.536	0.538	0.536	0.546	0.130	0.130	0.135	0.140
Number of country-by-sector pairs	1,095	1,077	902	850	521	505	469	445

Notes: Two-way fixed effects estimation of model (1), using the sample of 94 countries from 1990 to 2010 in columns (1) and (5), 93 countries from 1990 to 2010 in columns (2) and (6), 64 countries from 1990 to 2009 in columns (3) and (7), and 59 countries from 1990 to 2009 in columns (4) and (8). The outcome variable is the value of total imports (in logs) from high-income countries in columns (1)–(4) and the value of imports (in logs) from Canada in columns (5)–(8). All specifications include fixed effects for each country-by-sector pair, fixed effects for each year and country-specific time trends. Robust standard errors in parentheses are clustered at the country-by-sector level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

sensitivity of service exports has evolved over time with respect to changes in IPRs strength. Such transformation could be driven by emerging trends in innovation and the inventive strategies employed by the KIBS sectors to harness formal IPRs.

For this analysis, the basic statistical model (1) is augmented as follows:

$$Y_{ijt} = \alpha + \beta_1 IPR_{it} + \beta_2 KIBS_j \times IPR_{it} + \beta_3 IPR_{it} \times Time + \beta_4 KIBS_j \times IPR_{it} \times Time + X'_{it}\gamma + \alpha_{ij} + \alpha_t + \alpha_{it} + \varepsilon_{ijt}, \quad (2)$$

where *Time* is the number of years that have passed since 1990, which is the first year in the final sample. This augmented model allows the effect of IPRs on imports of the KIBS activities to grow (or weaken) over time. Specifically, the model implies that for each one percent increase in the strength of IPRs, the KIBS exports will rise (relative to the non-KIBS exports) by β_2 percent in 1990, ($\beta_2 + \beta_4$) percent in 1991, ($\beta_2 + 2\beta_4$) percent in 1992, and so on. In other words, the estimate β_4 measures the average annual percentage change in the impact of IPRs on the KIBS exports (relative to non-KIBS) since 1990.

Table 6 shows the results. From columns (1) and (2), the estimated coefficient β_4 is positive (0.082 and 0.101, respectively) and highly statistically significant, while the estimated coefficient β_2 is not statistically significant at the five percent level. These results imply that the impact of stronger patent and copyright protection on the KIBS exports strengthens over time. Specifically, the impact of a one percent increase in the strength of patent and copyright protection is indistinguishable from zero initially (in the year 1990) but grows over time by 0.08 percent and 0.1 percent, respectively, per year on average. This implies that in the year 1995, for example, the impact was equal to 0.08 × 5 = 0.4 percent and 0.1 × 5 = 0.5 percent, respectively. Interestingly, the effect of trademark protection exhibits a different pattern over time. From column (3), the estimated coefficient β_4 is negative (-0.218) while the estimated coefficient β_2 is positive (1.271); both estimates are statistically significant at the five percent level. These estimates imply that while the effect of trademark protection was positive at the beginning of the period, it quickly diminished and changed to negative in the later period. More precisely, a one percent stronger trademark protection increased the KIBS exports from high-income countries by 1.27 percent in the year 1990, but this effect has been falling by 0.2 percent per year on average and turned to negative around 1996. Since 1996, stronger trademark protection was negatively associated with exports of the KIBS activities from high-income countries.

Consider exports from Canada now. The results in column (6) imply that the positive effect of trademark protection on the KIBS exports from Canada is stable and does not grow or diminish over time. But the effect of copyright protection, while not distinguishable from zero in 1990, grows over time. From column (5), it rises by 0.04 percent per year on average for each one percent increase in the copyright index. At the same time, from column (4), the strength of patent protection does not appear to matter for Canada's KIBS exports over the period of 1990–2009 considered here.

One possible explanation for the results outlined above is that effective protection through IPRs requires reaching a minimum threshold level. Once this threshold is achieved, and the requisite protection is in place, additional increases may not independently contribute to trade growth.[26] It is also possible that the estimates of trade impact at the aggregate level, as presented above, might obscure significant variations and fail to provide a comprehensive view. As the saying goes, the devil lies in the details. To explore this further, the subsequent empirical specifications allow the effect of IPRs to vary across individual sectors and importing countries based on their income levels.

Effects by Individual KIBS Sectors

From Table 2, the KIBS group is composed of seven sectors. In order to allow the impact of stronger IPRs to differ across individual sectors, the interaction term $KIBS_j \times IPR_{it}$ in the model (1) is replaced here with seven interaction terms (one for each sector). Table 7 shows the results.

There are some important differences across sectors. Consider columns (1)–(3) in Table 7, where the focus is on exports from high-income countries. It is apparent that two sectors — computer services and business and management consulting and public relations services — stand out: exports in these sectors are highly sensitive to the strength of patent, copyright and trademark protection. By contrast, neither of the three types of IP considered here appears to matter for exports in advertising, market research and public opinion polling. Furthermore,

26 The author thanks an anonymous reviewer for this comment.

Table 6: The Impact of Stronger IPRs Protection, Change over Time

	Imports from High-Income Countries			Imports from Canada		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
KIBS * Patent rights index	-0.510		1.602			
	[0.486]		[1.929]			
KIBS * Patent rights index * Year	0.082***		0.015			
	[0.009]		[0.014]			
Patent rights index (in logs)	-0.148		1.241			
	[0.331]		[0.760]			
Patent rights index * Year	0.006		-0.106			
	[0.031]		[0.080]			
KIBS * Copyright index		-0.376		-1.452		
		[0.715]		[1.257]		
KIBS * Copyright index * Year		0.101***		0.040**		
		[0.012]		[0.018]		
Copyright index (in logs)		0.294		1.459		
		[0.563]		[1.895]		
Copyright index * Year		-0.002		-0.089		
		[0.044]		[0.113]		
KIBS * Trademark index			1.271**			1.633***
			[0.502]			[0.612]
KIBS * Trademark index * Year			-0.218***			0.032
			[0.026]			[0.074]
Trademark index (in logs)			0.051			-1.533
			[0.551]			[0.998]
Trademark index * Year			-0.064			0.184
			[0.076]			[0.117]
Time-varying country controls	Yes	Yes	Yes	Yes	Yes	Yes
	-37.227	-11.359	-49.902	-270.082	-311.227	-218.602
Constant	[104.160]	[106.729]	[163.744]	[164.666]	[171.041]	[235.382]
Observations	12,588	12,231	9,925	3,695	3,523	3,153
R-squared	0.551	0.549	0.548	0.132	0.134	0.137
Number of country-by-sector pairs	1,095	1,077	902	521	505	469

Notes: Two-way fixed effects estimation of model (2), using the sample of 94 countries from 1990 to 2010 in columns (1) and (4), 93 importing from 1990 to 2010 in columns (2) and (5), and 64 countries from 1990 to 2009 in columns (3) and (6). The outcome variable is the value of total imports (in logs) from high-income countries in columns (1)–(3) and the value of imports (in logs) from Canada in columns (4)–(6). All specifications include all time-varying country controls that appear in Table 5, as well as fixed effects for each country-by-sector pair, fixed effects for each year and country-specific time trends. Robust standard errors in parentheses are clustered at the country-by-sector level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

exports in R&D and architectural, engineering and other technical services are sensitive to patent and copyright protection; exports in legal services are sensitive to copyright and trademark protection; while exports in accounting, auditing, bookkeeping and tax consulting services are only sensitive to patent protection.

When examining exports from Canada specifically, the computer services and business and management consulting and public relations services sectors continue to stand out as highly sensitive to IPRs protection, although copyright protection does not appear to matter in the latter sector. But exports from Canada also shows three notable differences. First, R&D now also exhibits high sensitivity to all three types of IP. Second, exports in two sectors — accounting, auditing, bookkeeping and tax consulting services and architectural, engineering and other technical services — are now sensitive to trademark protection, but not patent or copyright protection.

Table 7: The Impact of Stronger IPRs Protection, by Individual KIBS Sectors

	Imports from High-Income Countries			Imports from Canada		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Computer services * Patent rights index	5.235***			6.549**		
	[0.945]			[3.290]		
Legal services * Patent rights index	2.644			-4.708***		
	[3.032]			[1.174]		
Accounting and related services * Patent rights index	3.462**			-2.640		
	[1.439]			[10.212]		
Business and management consulting * Patent rights index	4.556***			9.219***		
	[0.853]			[1.529]		
Advertising and market research * Patent rights index	0.744			0.012		
	[0.741]			[1.646]		
R&D * Patent rights index	3.282***			5.107***		
	[0.917]			[1.842]		
Architectural, engineering and technical services * Patent rights index	2.056***			-3.078		
	[0.562]			[2.836]		
Patent rights index (in logs)	-0.364*			0.098		
	[0.207]			[0.492]		
Computer services * Copyright index		7.061***			8.194***	
		[0.725]			[1.656]	
Legal services * Copyright index		6.217***			-1.001	
		[2.120]			[2.395]	
Accounting and related services * Copyright index		3.406*			-7.452*	
		[1.787]			[4.015]	
Business and management consulting * Copyright index		4.287***			1.698	
		[1.178]			[2.190]	
Advertising and market research * Copyright index		1.515			0.885	
		[0.972]			[1.489]	
R&D * Copyright index		6.529***			4.247***	
		[0.846]			[1.440]	
Architectural, engineering and technical services * Copyright index		3.036***			-2.539	
		[0.866]			[3.110]	
Copyright index (in logs)		-0.375			-0.121	
		[0.290]			[0.604]	
Computer services * Trademark index			4.027***			3.378***
			[1.174]			[0.622]
Legal services * Trademark index			7.667**			-5.243***
			[3.085]			[1.320]
Accounting and related services * Trademark index			3.568			7.780***
			[4.529]			[0.737]
Business and management consulting * Trademark index			3.149**			1.892***
			[1.295]			[0.524]
Advertising and market research * Trademark index			1.264*			0.632

Table 7 (continued)

	Imports from High-Income Countries			Imports from Canada		
			[0.760]			[0.744]
R&D * Trademark index			2.252*			1.905***
			[1.199]			[0.675]
Architectural, engineering and technical services * Trademark index			1.184			1.459***
			[1.003]			[0.542]
Trademark index (in logs)			-0.582*			-0.571
			[0.327]			[0.534]
Time-varying country controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-75.274	-47.725	-45.515	-280.013*	-265.517	-213.366
	[106.208]	[105.651]	[167.398]	[165.049]	[167.052]	[229.956]
Observations	12,588	12,231	9,925	3,695	3,523	3,153
R-squared	0.538	0.541	0.537	0.146	0.143	0.139
Number of country-by-sector pairs	1,095	1,077	902	521	505	469

Notes: Two-way fixed effects estimation of model (2), using the sample of 94 countries from 1990 to 2010 in columns (1) and (4), 93 importing from 1990 to 2010 in columns (2) and (5), and 64 countries from 1990 to 2009 in columns (3) and (6). The outcome variable is the value of total imports (in logs) from high-income countries in columns (1)-(3) and the value of imports (in logs) from Canada in columns (4)–(6). All specifications include all time-varying country controls that appear in Table 5, as well as fixed effects for each country-by-sector pair, fixed effects for each year and country-specific time trends. Robust standard errors in parentheses are clustered at the country-by-sector level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

Last, in legal services, stronger patent and trademark protection is negatively associated with exports from Canada over the period considered.

Effects by Importing Country Income Level

Next, the impact of IPRs is allowed to differ across importing countries according to their level of income. For this analysis, importing countries are sorted into three income groups — high-income, upper-middle income and lower-middle income[27] — and the interaction term $KIBS_j \times IPR_{it}$ in model (1) is replaced with three interaction terms: $KIBS_j \times IPR_{it} \times H_i$, $KIBS_j \times IPR_{it} \times UM_i$, and $KIBS_j \times IPR_{it} \times LM_i$, where H_i, UM_i and LM_i denotes, respectively, the indicator variable for countries in the high-income, upper-middle income and lower-middle income groups.

Table 8 shows the results. It is apparent from columns (1)–(3) that the estimated coefficient on each of the three interaction terms of interest is positive and statistically significant. Therefore, the KIBS exports from high-income countries is sensitive to the strength of IPRs in all importing countries, regardless of the income group, and this is true for each of the three types of IP. The comparison of the magnitude of the estimates across the income groups further reveals that patent and trademark protection matters most for promoting KIBS exports into upper-middle income countries, while copyright protection matters most for promoting KIBS exports into high-income countries.

Focusing on exports from Canada, the results in column (6) in Table 8 support those in column (6) in Table 5. An increase in trademark protection promotes KIBS exports from Canada into both high-income and lower-income countries.[28] Also consistent with the previous results, the strength of copyright protection does not affect the KIBS exports from Canada, regardless of the importing country income group. The statistically insignificant estimates in column (5) in Table 8 point to this. But

27 This analysis uses data on the World Bank's assignment of countries into income groups based on gross national income per capita for the year 2012. The lower-income country group here combines lower-income and low-income countries according to the World Bank's assignment.

28 The coefficient on $KIBS_j \times Trademark\ index_{it} \times UM_i$ is omitted in column (6). This is because the estimates on the IPRs index, by itself and interacted with other variables, is identified in the specification using variation in the index within each country and over time; and the IPRs index did not change over time within those countries in the upper-middle income group that Canada exported to in the KIBS activities.

Table 8: The Impact of Stronger IPRs Protection, by Importing Country Income Level

	Imports from High-Income Countries			Imports from Canada		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
KIBS * Patent rights index * High-income	2.031**			6.265**		
	[0.920]			[2.461]		
KIBS * Patent rights index * Upper-middle income	2.997***			0.630		
	[0.653]			[2.110]		
KIBS * Patent rights index * Lower-middle income	2.681***			9.136		
	[0.598]			[5.630]		
Patent rights index * High-income	-0.023			1.321**		
	[0.490]			[0.597]		
Patent rights index * Upper-middle income	-0.361			0.435		
	[0.249]			[0.928]		
Patent rights index * Lower-middle income	-0.448			-0.926*		
	[0.314]			[0.491]		
KIBS * Copyright index * High-income		4.449***			1.631	
		[0.678]			[1.314]	
KIBS * Copyright index * Upper-middle income		3.745***			-0.966	
		[1.311]			[3.679]	
KIBS * Copyright index * Lower-middle income		3.898***			-2.219	
		[1.287]			[5.529]	
Copyright index * High-income		0.093			-0.631	
		[0.520]			[0.834]	
Copyright index * Upper-middle income		-0.284			0.123	
		[0.428]			[1.081]	
Copyright index * Lower-middle income		-0.924*			0.700	
		[0.528]			[0.587]	
KIBS * Trademark index * High-income			1.414**			1.645***
			[0.587]			[0.619]
KIBS * Trademark index * Upper-middle income			6.953***			
			[1.352]			
KIBS * Trademark index * Lower-middle income			4.594***			4.986***
			[1.660]			[1.512]
Trademark index * High-income			-0.299			-0.715
			[0.389]			[0.582]
Trademark index * Upper-middle income			-1.521***			0.269
			[0.501]			[0.793]
Trademark index * Lower-middle income			0.091			0.323
			[0.881]			[1.163]
Time-varying country controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-73.645	-61.434	-65.917	-286.297*	-267.322	-210.333
	[105.902]	[106.760]	[165.590]	[167.972]	[169.023]	[229.754]
Observations	12,588	12,231	9,925	3,695	3,523	3,153
R-squared	0.536	0.539	0.538	0.136	0.131	0.137
Number of country-by-sector pairs	1,095	1,077	902	521	505	469

Notes: Two-way fixed effects estimation, using the sample of 94 countries from 1990 to 2010 in columns (1) and (4), 93 countries from 1990 to 2010 in columns (2) and (5), and 64 countries from 1990 to 2009 in columns (3) and (6). The outcome variable is the value of total imports (in logs) from high-income countries in columns (1)–(3) and the value of imports (in logs) from Canada in columns (4)–(6). All specifications include all time-varying country controls that appear in Table 5, as well as fixed effects for each country-by-sector pair, fixed effects for each year and country-specific time trends. Robust standard errors in parentheses are clustered at the country-by-sector level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Footnote 28 explains why the coefficient $KIBS_j$ X *Trademark* $Index_{it}$ X UM_i is omitted in column (6).

the effect of patent protection on the KIBS exports from Canada does vary across importing countries depending on their income level. The estimates in column (4) imply that stronger patent protection promotes Canadian exports in the KIBS activities, but only into other high-income countries.

Conclusion

The role of IPRs protection in service trade has increased in recent years, particularly with the rise of digital trade. Many digital trade transactions take the form of licensing arrangements for IP, and issues of IPRs protection are central to digital technologies. Policy makers and businesses will need to pay close attention to IPRs issues and develop effective strategies for protecting and commercializing intellectual assets in the digital age. This paper highlights the importance of robust IPRs protection in promoting services imports, thereby facilitating access to technology and business inputs, and contributing to the strengthening of an economy.

The analysis focused on the KIBS activities, which provide innovation support and co-produce innovation in client companies. The results show that the strength of patent, copyright and trademark protection in importing countries is of increasing importance for promoting KIBS exports from high-income countries. The observed increase in KIBS exports could be driven by different forms of innovation in service sectors, such as expansion into new business domains, the introduction of innovative products and novel methods for delivering services to end users, and improvements in service quality. Furthermore, IPRs serve as a legal and regulatory framework that enhances the efficiency of markets for technology and information goods and services. First, IPRs effectively address the appropriability challenge. The appropriability problem can be particularly acute in the service industry, given the ease with which some digital products and cultural creations can be readily copied and misappropriated by unauthorized producers or users. Second, IPRs play a significant role in reducing transaction costs associated with the exchange of information-based goods and services. Within service sectors, inventors and licensees often bear substantial transaction costs related to marketing, advertising and the provision of complementary services such as product warranties.[29]

The conventional arguments in favour of protecting IPRs underscore their pivotal role in stimulating innovation, a principle that applies not only to manufacturing industries but also to service sectors. However, it is imperative to acknowledge that robust IPR protection can sometimes lead to competitive problems within service sectors and may limit consumer access due to prices above competitive levels and restricted output.[30] This is particularly evident when network effects and technical standards confer excessive market power upon IPRs, surpassing its original intentions.[31] To address this, a robust competition policy is essential. Keith E. Maskus and Mohammed Lahouel (2000) put forth the proposition that a multilateral agreement within the WTO could effectively address cross-border, anti-competitive effects and potential coordination failures in competition regulation, particularly concerning the intersection of IPRs and competition. Furthermore, Joseph E. Stiglitz (2017, 270) advocated for the implementation of a developmentally oriented competition regime and antitrust policy, drawing parallels with the need for a development-oriented IP regime.

Moreover, safeguarding IPRs in the digital age presents unique challenges. The advent of digital technologies has revolutionized the reproduction and distribution of IP, often occurring without the owner's explicit consent. This digital transformation has made it easier for individuals and entities to infringe upon IPRs, posing novel challenges for enforcement and protection mechanisms. The primary dilemma confronting policy makers lies in striking a delicate balance between safeguarding IPRs to promote innovation, facilitate technology transfer and ensure widespread access to

29 Maskus (2008) described how various service sectors make use of formal IPRs and provides an in-depth analysis of the economic justification for IPRs in the context of service sectors.

30 It is also important to emphasize that IPRs can serve as a safeguard for open-source approaches to innovation, as exemplified by platforms such as Android. In this context, IPR protection is utilized not to restrict access but rather to prevent users from appropriating the innovation and asserting exclusive market rights. This approach allows innovators to maintain control over their creations while preserving access for users, subject to specified terms and conditions. (The author thanks an anonymous reviewer for this comment.)

31 Stiglitz (2017, 270) underscored the need for antitrust authorities to be vigilant against attempts by corporate entities to enhance their market power through changes in the IPRs system.

information and cultural works, while concurrently ensuring healthy competition and affordability in prices. In the context of copyright law, for example, one complex and crucial task for policy makers is balancing anti-circumvention penalties to protect IPRs with the scope for fair use and privacy rights. It is a delicate balance because, on the one hand, strong anti-circumvention measures are necessary to protect creators' rights, ensuring they can benefit from their work and continue to produce new content. On the other hand, overly stringent anti-circumvention penalties can potentially stifle legitimate uses of copyrighted material, infringe upon individuals' privacy and hinder the free flow of information and innovation.

KIBS activities are vital in creating value and contributing to economic growth, and they often involve the exchange of IP and knowledge. As global competition intensifies, the role of IPRs in KIBS trade becomes increasingly pronounced. The results obtained in this paper substantiate this trend. The strength of global protection of IPRs becomes critical in determining the extent to which KIBS activities can expand globally. In order to further promote the global diffusion of KIBS activities, it is imperative to tailor IPRs protection to the specific needs of sectors, reinforcing it in areas where innovation and protection are critical, while maintaining flexibility in sectors where collaboration and knowledge sharing are of primary importance. This customization should be carried out within the framework of international agreements, including the WTO TRIPS Agreement.[32] A well-balanced IPRs framework that encourages innovation and knowledge sharing while protecting the interests of IP owners is essential to promote the growth of KIBS activities in the context of global competition.

As part of a future research agenda, it would be valuable to reassess the trade impacts of IPRs using more recent data and including a wider range of countries when such data becomes available. The analysis in this paper utilized data for up to 94 countries spanning the period of 1990–2010. However, in the subsequent decade, there have been further developments in IPRs protection and advancements in technologies. One question is whether advanced economies are converging toward a standard level of protection, while developing countries continue to derive benefits from catching up. A noteworthy change is the evolving situation for least developed countries (LDCs), which have been granted exemptions from certain TRIPS obligations. As LDCs progress, they may be required to adhere to the complete TRIPS standards. Examining how this shift in the IPRs protection landscape influences the dynamics of IPRs and trade in services could be a fruitful avenue for future research.

32 To a certain extent, the various obligations stipulated by the TRIPS Agreement are counteracted by significant flexibilities, granting member countries the discretion to tailor their IPRs policies to suit their specific needs. In the realm of patent protection, for example, TRIPS mandates the availability of patents for both product and process inventions in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application (article 27). Nonetheless, TRIPS allows member countries to choose national, regional or international exhaustion regimes (article 6), define exceptions to conferred rights (article 30) and exercise compulsory licensing of patents (article 31). TRIPS also strives to strike a balance between safeguarding private IPRs and promoting the broader public interest (article 8); *TRIPS Agreement, supra* note 7.

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