Gnangnon, Sèna Kimm

Preprint

Effect of Intellectual Property Rights Protection on Services Export Diversification

Effect of Intellectual Property Rights Protection on Services Export Diversification

Author: Sèna Kimm GNANGNON[1]
Manuscript date: January 2022

Abstract

The effect of the betterment of enforced intellectual property rights (IPRs) provisions on services export concentration has been investigated. The analysis has used a panel dataset of 103 countries (both developed and developing countries) over the period of 1985-2014. It has revealed that countries with low levels of enforced IPRs tend to concentrate their services exports on few items, while countries with a high degree of enforced IPRs experience a greater level of services export diversification. Furthermore, the betterment of IPRs protection influences positively services export diversification, and the magnitude of this positive effect is higher for advanced countries compared to relatively less advanced economies. These results are particularly relevant for developing countries, including the least-developed countries that have both weakly enforced IPRs and high levels of services export concentration.

Keywords: Intellectual property rights; Services export concentration.

JEL Classification: E31; F13; O34.

DISCLAIMER

This is a working paper, which represents the personal opinions of individual staff members and is not meant to represent the position or opinions of the WTO or its Members, nor the official position of any staff members.

[1] Economist at the World Trade Organization (WTO), Geneva, Switzerland. E-mail for correspondence: senakimm.gnangnon@wto.org and kgnangnon@yahoo.fr

1. Introduction

Does the strengthening of intellectual property rights (IPRs) systems contribute to enhancing services export diversification? The present study aims to address this question, which, to the best of our knowledge, has received little attention in the literature.

The importance of services exports for economic growth and development has now been well established in the literature (e.g., Hoekman, 2017; Hoekman and Shepherd, 2017; Kong et al., 2021; Lanz and Maurer, 2015). Interestingly, a recent literature has provided empirical evidence that exporting a wide range of services items across different services sectors (including both traditional and modern services[2]), as well as exporting sophisticated services items, is strongly beneficial to economic growth. This provides policymakers with new avenues for promoting economic growth and development (e.g., Anand et al., 2012; Gnangnon, 2021a; Mishra et al., 2011; Stojkoski et al., 2016).

In the meantime, the process of global diffusion and strengthening of intellectual property rights (IPRs) systems that followed the entering into force of the Trade-Related Aspects on Intellectual Property Rights (TRIPS) Agreement[3] on 1st January 1995, has led to a rich literature[4] on the economic effects of changes in IPRs. The global transformation of IPR standards is underpinned by the theoretical hypothesis that strengthening of IPRs systems will provide incentives to innovate, and in this way, promote economic growth and development. In reality, the effectiveness of IPRs in achieving higher economic growth and development has been the subject of a hot debate in both the policy and academic circles (e.g., Chang, 2001; Dinopoulos and Segerstrom, 2010; Eicher and García-Peñalosa, 2008; Gould and Gruben, 1996; Hudson and Minea, 2013; Kim et al. 2012; Lorenczik and Newiak, 2012).

Specially, the effect of IPRs on international trade is ambiguous (e.g., Grossman and Helpman, 1990; Grossman and Lai, 2004; Helpman, 1993; Maskus and Penubarti, 1995). For

[2] There is no clear distinction between traditional and modern services in the literature. For example, Eichengreen and Gupta (2013a) consider that "traditional services" include trade and transport, tourism, financial services and insurance, while "modern services" encompass communications, computer, information, and other related services. According to Sahoo and Dash (2017), traditional services include transport and travel services, while modern services encompass transportability and tradability, financial services, insurance, business processing and software services.

[3] The TRIPS Agreement is one of the founding Agreements of the WTO. It sets out the minimum standards of intellectual protection to be provided by WTO members in the following fields: copyright and related rights; trademarks, including service marks; geographical indications; industrial designs; patents, including the protection of new varieties of plants; the layout-designs of integrated circuits; and undisclosed information, including trade secrets and test data. Further information on the TRIPS Agreement could be found online at: https://www.wto.org/english/tratop_e/trips_e/trips_e.htm and https://www.wto.org/english/tratop_e/trips_e/ta_docs_e/modules1_e.pdf

[4] See for example, e.g., Dinopoulos and Segerstrom (2010); Eicher and García-Peñalosa (2008); Hudson and Minea (2013); Kim et al. (2012); Panda et al. (2020). See also the literature review provided by Hassan et al. (2010); Mrad (2017); Park and Lippoldt (2008).

example, according to Maskus and Penubarti (1995), IPR systems can have ambiguous effects on international trade. The strengthening of IPRs can increase firms' market power, and encourage them to adopt a monopolistic behaviour, thereby increasing prices and reducing sales. On the other hand, stronger IPRs can provide incentives to export patentable goods to countries with stronger intellectual property protection, as the risk of imitation in these countries is low. Building on models of dynamic general equilibrium with two regions (North and South) and where North innovates and the South imitates technologies invented in the North, Helpman (1993) has pointed out four channels through which IPRs can influence trade between countries. These include terms of trade, inter-regional allocation of manufacturing, product availability, and Rreserach and development (R&D) investment patterns. In addition to the empirical literature on the effect of IPRs on international trade, including exports and imports flows (e.g., Branstetter et al., 2011; Delgado et al., 2013; Falvey et al., 2009; Ivus and Park, 2019; Panda et al., 2020; Yang and Maskus, 2009), some works have investigated the effect of IPRs on export product upgrading, including export product diversification and export product quality upgrading (e.g., Campi and Dueñas, 2016; Dong et al., 2022; Glass and Wu, 2007; Gnangnon and Moser, 2014; Liu et al., 2021; Ndubuisi and Foster-McGregor, 2018; Song et al., 2021). However, we are not aware of a study that has investigated the relationship between changes in IPRs and services export diversification.

The present paper aims to bridge this void in the literature by building on the recent works[5] on the macroeconomic determinants of services export diversification, to examine the effects of the strengthening of IPRs on services export diversification. We argue that stronger IPRs would affect services export diversification through its effects on innovation.

The empirical exercise, which has used the two-step system generalized method of moments (GMM) estimator, and provided empirical support to the hypothesis that the betterment of enforced IPRs contributes significantly to enhancing services export diversification, in particular for relatively high levels of enforced IPRs. Additionally, the strengthening of IPRs protection induces greater services export diversification, and advanced countries enjoy a higher positive effect than relatively less advanced economies.

In the remaining part of the analysis, section 2 provides a theoretical explanation underpinning the effect of IPRs on services export diversification. Section 3 presents the empirical strategy, and section 4 interprets empirical outcomes. Section 5 concludes.

[5] These studies include for example, Anand et al., 2012; Eichengreen and Gupta, 2013a; Gnangnon (2020a,b; 2021b,c,d,e,f,g;), .and Sahoo and Dash (2017).

2. Theoretical considerations

This paper postulates that stronger IPRs would affect services export diversification through their positive innovation effect. It first discusses the issue of innovation in the services sector (sub-section 2.1), and then explores how IPRs could affect services export diversification through the innovation channel (sub-section 2.2).

2.1. On the importance of innovation in the services sector

According to OECD/Eurostat (2018: p20), "*an innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).*" OECD/Eurostat (2018: p21) further makes a distinction between *'product innovation'* and *'business process innovation'*. A product innovation is a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market (see also OECD, 2009). A business process innovation is a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use by the firm.

In competitive markets, innovation is expected to reduce the price of services items, improve their quality, or leads to the introduction of new services products (e.g., Kang and Won, 2016). According to the Community Innovation Surveys[6], there are two main types of services innovation, namely 'product innovation[7]', and 'process innovation'. While 'product innovation' helps to improve the quality of existing services or contribute to the introduction of new service products, 'process innovation' enhances efficiency through improvements in the production process. Services innovation have been classified in the literature on the basis of their characteristics (Hipp et al., 2000, 2003). Product innovation reflects an increase in the variety of products (services items) through the modification and differentiation of products, and is therefore related to differentiated goods or services (e.g., Kang and Won, 2016). According to Abernathy and Utterback (1978), product innovation relies significantly on knowledge advancement, including R&D and the information communication and technology associated with a relatively high profit margin through quality competition rather than price competition. Barras (1986) has argued that process innovation is mainly identified in the course of mass production with

[6] See information online at: https://ec.europa.eu/eurostat/web/microdata/community-innovation-survey

[7] According to the OECD, a 'product innovation' is a good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics (see information online at: https://www.oecd.org/site/innovationstrategy/defininginnovation.htm).

standardized products. In a spirit similar to that of Abernathy and Utterback (1978), and Barras (1986), Johnston and Clark (2005) have provided that the 'volume' versus 'variety' allows determining the dimensions of service innovation, with innovation in high-volume and low-variety services tending to focus on efficiency and standardization, while innovation in low-volume, high-variety and capability-based services tend to rely on client-based customization and specialization.

While the prevalence of innovation in the goods (including manufacturing) sector, and the link between IPRs and innovation in the goods sector has been well documented in the literature[8], the innovation in the services sector (and the effect of IPRs on innovation in this sector) has been relatively neglected in the literature (e.g., Love and Mansury, 2007; Pires et al., 2008; Zahler et al. 2014).

Love and Mansury (2007) have documented that new services introduced via innovation occur through external linkages, particularly with customers, suppliers, and strategic alliances, as well as through both the presence of highly qualified workforce, and unqualified ones. Pires et al. (2008) have used firm-level data in Portugal to compare innovative activities in the various manufacturing and services sectors. They have documented statistically that service firms do not perform less than manufacturing ones in terms of innovation. Additionally, the best performing service sectors (e.g., financial services) are as innovative as the best performing manufacturing sectors (high-technology manufacturing). Zahler et al. (2014) have used firm-level data on manufacturing and services sector for Chile, to compare the manufacturing and tradable services from a joint trade and innovation perspective. Their analysis has revealed interesting findings. Some of these findings are that manufacturing firms tend to have a much higher propensity to export than services firms, but services firms that do export are not necessarily much larger than non-exporters. Yet, exporters tend to be more skill intensive than non-exporters, but the export skills premium in the services sector is greater than the one in the manufacturing sector. While services firms are as innovative as manufacturing firms in terms of both inputs in and outputs of innovative activity (this is in line with the findings by Pires et al. 2008), services firms tend to rely relatively more on non-technological forms of innovation than manufacturing firms. Non-technological forms of innovation include for example, innovations in product design and organisational management in production, work environment or management structure of the firm, while 'technological' innovation, which refers to introduction of new products or processes in the market, and expenditure related to R&D, physical equipment acquisition and training related to them (see Zahler et al. 2014, p 954). On another note, in both the manufacturing and services

[8] See for example, Akiyama and Furukawa (2009); Brüggemann et al. (2016); Chen and Puttitanun (2005); Naghavi and Strozzi (2015); Papageorgiadis and Sharma (2016) and Sweet and Maggio (2015).

sectors, exporters exhibit a higher innovation performance than non-exporters, and within each group of exporters and non-exporters, services firms have a higher propensity to innovate than manufacturing firms.

Using German manufacturing and service firms data, Peters (2009) has shown that there exist a path dependence in innovation, both in the manufacturing and services sector, as past innovation experience drives positively current innovation in both the manufacturing and service sector firms. Nevertheless, persistence is less prevalent and state dependence effects are less pronounced in the services sector than in the manufacturing one. The author has concluded that the implication of the presence of state dependence in innovation behaviour is that innovation-stimulating policy programs open up potential long-lasting effects.

A relatively nascent strand of the literature has emphasized the link between IPRs and services innovation. For example, Miles et al. (2000) have underlined that many service firms do not patent, as the patent system often deals with more tangible innovations. Noting that the intangible nature of many service innovations creates challenges for the IPRs systems, they have discussed the management of knowledge, innovation, and intellectual property in knowledge intensive business services. Maskus (2008) has explored the different interrelationships between innovation in service industries and the need for IPRs protection. He has concluded that IPRs are of increasing importance in sectors such as information technologies, the internet, digital entertainment, and financial services, as these sectors have engaged in significant innovation. He has also noted that IPRs protection would be relevant in other services sectors that have not made much use of IPRs, but where innovation was emerging. Bader (2008) has pointed out the importance of IPR protection for service innovations in the financial services industry sector (the case of the reinsurance company Swiss was studied). Battisti et al. (2014) have used the Eurostat Fourth Community Innovation Survey (CIS4) dataset on 17 service sectors across 18 countries, and found that radical innovation is concentrated in the knowledge-intensive research and development sectors. Interestingly, across all sectors, IPRs tend to be used by leading innovators to protect their ideas, and service innovators to engage in international sales. Using Japanese firm-level data, Morikawa (2014) has found that while service firms have shown fewer product innovations than do manufacturing firms, the productivity of innovative service firms is very high. At the same time, services firms tend not to hold many patents (see also Miles et al. 2000), although their holding of trade secrets is similar to that of manufacturing firms. In addition, patents and trade secrets influence in the same way product innovations in both manufacturing and the service sectors, while trade secrets affect process innovations only for manufacturing firms.

The relatively brief literature review provided in this section shows that stronger IPRs for services products could promote innovation and the development of services exports, including enhance services export diversification. However, in the absence of data on indicators of services innovation at the aggregate (macroeconomic) level, we postulate that regardless of the possible effect of IPRs strengthening on services export diversification through the services innovation channel, the improvement of IPRs could affect services export diversification through the economic complexity (i.e., the export of sophisticated products) channel.

2.2. How could IPRs affect services export diversification?

Some works have considered how IPRs affect export products upgrading (e.g., Campi and Dueñas, 2016; Dong et al., 2022; Glass and Wu, 2007; Gnangnon and Moser, 2014; Liu et al., 2021; Ndubuisi and Foster-McGregor, 2018; Song et al., 2021).

Glass and Wu (2007) have developed a model where Northern firms innovate to improve the quality of existing products and may, later, shift production to the South by engaging in foreign direct investment, and Southern firms may then imitate the products of multinationals. They have obtained empirically that stronger IPR protection can reduce imitation, and shift innovation away from improvements in existing products toward the development of new products. Gnangnon and Moser (2014) have documented empirically that the legal protection for minor and adaptive inventions has encouraged the diversification of export products in both developed and developing countries. Campi and Dueñas (2016) have found that the strengthening of IPRs (for the agricultural sector) has, *inter alia*, exerted a negative effect on the intensive margin of agricultural trade and a positive impact on the extensive margin of agricultural trade. Ndubuisi et al. (2018) have established empirically that stronger IPRs promote export at the extensive margins. Dong et al. (2022) have used firm-product level data from Chinese exporters, and city-level data on the protection of IPRs to test empirically the effect of IPRs on export product quality. This effect is expected to materialize through strengthened R&D input, new product development, and mitigated financial constraints. The authors have shown that the betterment of de facto IPRs contributes to enhancing the upgrade of export product quality, although this effect varies across geographic regions (it is not statistically significant for certain regions). Song et al. (2021) have investigated the effect of domestic and foreign intellectual property rights (IPR) protection on quality upgrading, using firm-level data from China. They have postulated that the effect of IPR protection on firms' export quality depends on whether the innovation induced effect - which promotes export product quality upgrading - dominates the threshold induced effects, which inhibit quality upgrading. Their empirical analysis has revealed that the innovation channel

dominates the threshold effects channel, as both domestic and foreign IPR protection positively influence export quality upgrading. Liu et al. (2021) have found that the effect of patent protection on export quality upgrading depends on countries' technological stage. Specially, the patent protection helps to improve export product quality if an economy's product quality is sufficiently close to the world frontier level. On another note, in a recent study, Sweet and Maggio (2015) have documented why a country's level of economic complexity[9] is a better proxy for its level of innovation than traditional indicators such as the number of patents granted or disbursements on research and development (R&D) - used to measure level of innovation in a country. Sweet and Maggio (2015) have demonstrated empirically that strengthening IPR systems generates a greater level of economic complexity, which genuinely reflects a country's level of innovative inputs.

Thus, this short literature review conveys the message that strengthening IPRs protection is likely to induce greater export product diversification and/or the improvement of export product upgrading. We now need to explore the conclusions of the relevant literature on the effect of export product upgrading (or economic complexity) on services export diversification. This is because, as the strengthening of IPR protection is associated with greater export product diversification, it would lead to greater services export diversification if greater services export diversification, in turn, promotes services export diversification.

First, as services are strongly embedded in manufactured exports (e.g., Ceglowski, 2006; Jiang and Zhang, 2021; Kimura and Lee, 2006; Lodefalk, 2014; Su et al., 2021), we can expect that the export of manufacturing products, including sophisticated ones[10] would reflect the increase of services production, including through the introduction of new services items in the production process of manufacturing outputs. This expansion of services production can be associated with the diversification of services export at the intensive margins (i.e., an increase in the number of existing services items exported) or the diversification of services exports at the extensive margins (i.e., the introduction of services export products).

Second, in a recent paper, Gnangnon (2021b) has provided empirical evidence that greater economic complexity (as a measure of innovation input) is positively associated with services export diversification. The paper builds on the theoretical argument that countries that export increasingly complex products would likely experience a higher penetration in international markets for goods, and develop a network in this market that could, in turn, be used to export a

[9] The concept of "economic complexity" provides an indication of the information about the amount of "productive knowledge" (i.e., the technical know-how/the set of capabilities) embedded in the productive structure (and hence export structure of a country) (e.g., Hidalgo and Hausmann, 2009; Hausmann et al., 2013; Mishra et al., 2020).

[10] Exports of sophisticated manufacturing products can be associated with greater economic complexity.

wide range of services items. This argument is drawn from the "network effect" hypothesis developed by Eichengreen and Gupta (2013b), whereby a country that has a high penetration in goods markets would likely use the networks that it has established in these markets to export and eventually diversify its services export items. Eichengreen and Gupta (2013b) and Sahoo and Dash (2014) have provided empirical support to this hypothesis. Building on the same arguments, Gnangnon and Priyadarshi (2016) have reported that greater export product diversification is associated with a rise in the commercial services exports in Least developed countries. Gnangnon (2020a) has reported, among others, that the diversification of export products fosters the diversification of services exports, and Gnangnon (2021c) has found empirically that a higher manufactured export share in total exports induces greater services export diversification. In the spirit of the findings of the work by Gnangnon (2021a), it could be expected that innovation would enhance services export diversification through its positive impact on export product diversification. This is because Chen (2013) has established that innovation (measured by patents counts) fosters export product diversification both at the extensive margins (i.e., by increasing the number of products exported from a country) and at the intensive margins (i.e., by raising the export value of each product from a country). As export product diversification exerts a positive effect on services export diversification (e.g., Gnangnon, 2020a), one could expect that innovation would promote services export diversification through its positive impact on export product diversification.

In a nutshell, we postulate the hypothesis that the betterment of IPRs would contribute to fostering services export diversification through its effect of innovation as well as through greater export product diversification.

3. Empirical strategy

Before presenting the model specification that would help explore the effect of IPRs on services export diversification, we display in Figure 1 the correlation pattern in the form of scatter plot between the indicator of the level of effective patent protection (denoted "PRIE") and the Theil index of services export concentration (denoted "THEIL") - which is our main indicator of services export concentration. The Theil indicator of services export concentration is described in Appendix 1. The indicator "PRIE" is computed as the index of Patent Protection (PRI) developed by Park (2008) multiplied by the index of legal enforcement effectiveness extracted from the Fraser Institute database. As a result, the computed index "PRIE" accounts for the enforcement of legal patent provisions in practice, and captures the scope of effective IPR protection (see Hu and Png,

2012; Liu et al., 2021; Maskus and Yang, 2018). The "THEIL" index of services export concentration is computed using the method in Cadot et al., 2011). The left-hand side of Figure 1 shows a strong linear positive correlation between the indicators "PRIE" and "THEIL", while the right-hand side graph of the same Figure indicates that the correlation between these two indicators takes the form of an inverted U-curve. This is suggestive that the strengthening of IPRs is negatively (positively) correlated with services export concentration (diversification) only when the indicator "PRIE" exceeds a certain level. In the empirical analysis, we take into account the possible existence a non-linear relationship between the strengthening of IPRs and services export concentration by introducing both the variable "PRIE" and its squared term in the model specification that we will be estimated.

[Insert Figure 1, here]

To examine the effect of IPRs on services export diversification, we build on the recent works on the macroeconomic determinants of services export diversification or services export structure (e.g., Anand et al., 2012; Eichengreen and Gupta, 2013a; Gnangnon, 2020a,b; Gnangnon, 2021b,c,d,e,f,g; Sahoo and Dash, 2017). Specifically, the baseline specification includes the variable of interest "PRIE" along with its squared term, as well as a set of control variables derived essentially from the previous works cited above. These control variables are the real per capita income, denoted "GDPC" (it represents a proxy for countries' development level); the net inflows of foreign direct investment denoted "FDI"; the depth of financial development ("FINDEV"); the level of human capital ("HUM"); the degree of trade openness ("OPEN"); a proxy for the institutional quality, measured by the degree of democratization in a country ("POLITY2") and the population size ("POP").

Therefore, we consider the following baseline model:

$$SEC_{it} = \beta_1 SEC_{it-1} + \beta_2 PRIE_{it} + \beta_3 PRIE_{i,t}^2 + \beta_4 Log(GDPC)_{it} + \beta_5 FDI_{it} + \beta_6 FINDEV_{it} + \beta_7 HUM_{it} + \beta_8 OPEN_{it} + \beta_9 POLITY2_{it} + \beta_{10} Log(POP)_{it} + \mu_i + \lambda_t + \omega_{it} \quad (1),$$

where the subscript i represents a country, and t stands for the time-period. On the basis of data available, we construct an unbalanced panel dataset of 103 countries (both developed and developing countries) over the period 1985-2014. Following the recent works by Gnangnon (2020a,b) and Gnangnon (2021b,c,d,e,f), we use non-overlapping sub-periods of 5-year average that are 1985-1989; 1990-1994; 1995-1999; 2000-2004; 2005-2009; and 2010-2014, in order to dampen the effects of business cycles on variables in model (1). The variable "SEC" is the indicator

of services export concentration, which is primarily measured by the Theil index of services export concentration (denoted "THEIL"). For checking the robustness of the findings based on the use of "THEIL" as the measure of "SEC", "SEC" is alternatively measured by the Hirschman-Herfindahl index (denoted "HHI") of services export concentration. As indicated earlier, our main variable of interest is the indicator of the level of effective patent protection ("PRIE"). All other variables contained in model (1) are described in Appendix 1. The descriptive statistics on each of the variables used in model (1) are presented in Appendix 2. The list of countries utilized in the full sample is provided in Appendix 3. Note that this Appendix lists countries on the basis the ascending values of the variable "PRIE" over the last sub-period, i.e., 2010-2014 (we explain latter why we proceed in that way). β_1 to β_{10} are parameters that we will be estimated. μ_i stand for countries' fixed effects (i.e., countries' unobservable time invariant characteristics that could affect services export diversification) and λ_t are time dummies that act for global shocks that hit simultaneously all countries' services export diversification paths. ω_{it} is a well-behaving error-term.

For the sake of brevity, we have not rehearsed here the discussion concerning the theoretical effects of control variables of model (1) on services export diversification. We refer readers to the studies by Gnangnon **(**2020a,b) and Gnangnon (2021b,c,d,e,f) for the detailed discussion on the source and computation of each these variables.

Drawing from the studies by Gnangnon **(**2020a,b; 2021b,c,d,e,f), we include the lag of the dependent variable in model (1) in order not only to, *inter alia*, take into account the high persistence nature of the services export concentration, to control for omitted variables in the model specification, but also to address omitted variable problem. Following the same studies, our main estimator is the two-step system Generalized Method of Moments[11] (GMM) estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator helps to handle all endogeneity concerns related to model (1), of which, the correlation between the lagged dependent variable and countries' specific effects, as well as the reverse causality issue (see Gnangnon (2020a,b; 2021b,c,d,e,f). In particular, it is likely here that the variable "PRIE" and its squared term suffer from the reverse causality that runs from the dependent variable to these regressors. This is because lower levels of services export diversification may lead governments that wish to promote the export of a wide range of services items, to strengthen the IPRs system so as to encourage innovation in the services sector.

[11] For a discussion on the appropriateness of this estimator, see the previously cited works on the macroeconomic determinants of services export diversification.

The correctness of the different specifications of model (1) estimated (i.e., the appropriateness of the two-step system GMM estimator for estimating model (1)) is assessed using the three standard statistical tests, which are the Arellano-Bond test of the presence of the first-order serial correlation in the first-differenced error term (denoted AR(1)), the Arellano-Bond test of no second-order autocorrelation the first-differenced error term (denoted AR(2)) and the over-identifying restrictions (OID) test (i.e., Sargan/Hansen test) that helps to test the joint validity of the instruments utilized in the regressions. A rule of thumb requires that these statistical tests have a great power if the number of instruments utilized in the regressions should be lower than the number of countries (e.g., Roodman, 2009).

Even though the two-step system GMM estimator is our preferred estimator, we also report results stemming from the estimation of the static specification of model (1) (i.e., model (1) without the lagged dependent variable as a regressor) using respectively the pooled ordinary least squares and the within fixed effects estimators[12]. It is likely that results reported in columns [1] and [2] of Table 1 are likely biased because the estimators used to obtain these results (pooled ordinary least squares and within fixed effects estimators) do not address the endogeneity concerned mentioned above. However, these results are presented for allowing comparison with results based on the two-step system GMM estimator. Columns [1] to [3] of Table 1 contain the outcomes arising from the estimation of specifications of model (1) (with "THEIL" as the measure of services export concentration) using each of the above-mentioned three estimators. In particular, columns [1] and [2] of Table 1 report results based respectively on the pooled ordinary least squares and the within fixed effects estimators, while column [3] of the Table contains results based on the two-step system GMM estimator. Column [4] of Table 1 presents the robustness check outcomes of the findings in column [3] using "HHI" as the measure of services export concentration.

Finally, we examine how the effect of IPRs protection on services export concentration varies across countries in the full sample. To that end, we estimate, by means of the two-step system GMM estimator a specification of model (1) that includes the interaction between the indicator "PRIE" and the real per capita income on the one hand, and the squared term of "PRIE" and the real per capita income on the other hand. Results of this estimation are provided in column [5] of Table 1.

[12] For these two estimators, we correct the standard errors using the approach proposed by Driscoll and Kraay (1998) that helps deal with the heteroscedasticity, serial correlation, and contemporaneous cross-sectional dependence in the residuals

4. Interpretation of empirical results

Results in columns [1] and [2] of Table 1 show (with different magnitudes of the coefficients) that the coefficients of the variable "PRIE" and its squared terms are respectively positive and negative, while significant at the 1% level. These outcomes suggest that there is a non-linear effect of IPRs[13] on services export concentration ("THEIL") that takes the form of an inverted U-curve. This finding confirms the non-linear correlation pattern observed in Figure 1. Based on results in the first two columns of the Table, we can conclude that there is a level of "PRIE" above which the effect of IPRs on services export concentration changes sign, i.e., it becomes negative (as below this level, the effect is positive). For results based on the pooled ordinary least squares estimator, this level of "PRIE" amounts to 2.05 (see the bottom of column [1]), while for results based on the within fixed effects estimator, this level of "PRIE" is 2.43 (see the bottom of column [2]). To recall, values of the variable "PRIE" range between 0 and 3.92. We, therefore, deduce that countries whose level of IPRs protection exceeds 2.045 (for results in column [1]) and 2.427 (for results in column [2]) experience a (negative) positive effect of enforced IPRs protection on services export concentration (diversification). For these countries, the greater the level of IPRs protection, the higher is the positive effect of IPRs protection on services export diversification. Conversely, for countries whose level of IPRs is lower than 2.045 (for results in column [1]) and 2.427 (for results in column [2]), IPRs strengthening leads to a greater services export concentration, with the magnitude of this effect decreasing as the level of IPRs protection improves.

[Insert Table 1, here]

We illustrate graphically the effect of IPRs on services export concentration for different levels of IPRs protection. Hence, Figure 2 presents, at the 95 per cent confidence intervals, the marginal impact of the IPRs on services export concentration (THEIL index) for different levels of IPRs protection. The statistically significant marginal impacts at the 95 per cent confidence intervals are those including only the upper and lower bounds of the confidence interval that are either above or below the zero line. We note from this graph that the marginal impact of the IPRs protection on services export concentration decreases as the level of IPRs protection improves, and takes positive and negative values, although it is not always statistically significant at the 5% level. This marginal impact is not statistically significant for levels of IPRs protection ranging from 1.35 to 1.85 - these two numbers were obtained from Stata software when constructing Figure 2 - (it is worth recalling that values of the indicator "PRIE" range between 0 and 3.92). As a result,

[13] From now onwards, we refer "IPRs" as to "enforced IPRs" given the way the indicator "PRIE" has been computed.

countries whose levels of IPRs protection range between 1.35 and 1.85 experience no significant effect of intellectual property rights on services export diversification. At the same time, for countries whose degree of IPRs protection is lower than 1.35 (i.e., comprised between 0 and 1.35), the strengthening of IPRs protection exerts a positive and significant effect on services export concentration (the marginal impact is positive and significant), i.e., it enhances services export concentration, and the lower the degree of the IPRs protection, the higher is the magnitude of the positive effect of IPRs protection on services export concentration. Conversely, countries whose levels of IPRs protection exceed 1.85 experience a negative (positive) and significant effect of IPRs protection on services export concentration (diversification) (as the marginal impact is negative and significant at the 5% level). For these countries, the greater the degree of IPRs protection, the higher is the magnitude of the positive impact of IPRs protection on services export diversification. Overall, strengthening intellectual property rights contributes to enhancing services export diversification, especially when it exceeds a certain level, which is 1.85.

[Insert Figure 2, here]

Results concerning the one-period lag of the dependent variable in the three remaining columns of Table 1 (i.e., columns [3] to [5]) are consistent with those obtained by previous works of the macroeconomic determinants of services export concentration. Services export concentration indicators exhibit a state dependence path, as the coefficient of the lag of "THEIL" and "HHI" are positive and significant at the 1% level. The outcomes of the statistical tests presented at the bottom of columns [3] to [5] of Table 1 confirm that the estimated dynamic specifications of model (1) are correctly specified, and hence that the two-step system GMM estimator is well suitable for performing the empirical analysis. As a matter of fact, across these two columns, the p-values of the AR(1) test are always lower than 0.01 (the 1% level of statistical significance); the p-values of the AR (2) test are all higher than 0.10, and the p-values related to the OID test are also all higher than 0.10.

Turning now to estimates of the variables of interest in column [3] of the Table, we note that these estimates are in line with those reported in columns [1] and [2], although of different magnitudes. It appears that the level of "PRIE" above which the betterment of IPRs protection negatively influences services export concentration, i.e., induces greater services export diversification, amounts to 1.65. Thus, countries whose level of enforced IPRs protection is lower than 1.65 experience a positive effect of IPRs on services export concentration. However, countries whose levels of enforced IPRs protection exceeds 1.65 enjoy a positive effect of IPRs protection on services export diversification, and the greater the level of enforced IPRs protection,

the higher is the magnitude of the positive effect of IPRs protection on services export diversification.

[Insert Figure 3, here]

It can be useful at this stage of the analysis to examine graphically, how the effect of enforced IPRs protection on services export concentration evolves as the level of IPRs protection improves. Figure 3 presents, at the 95 per cent confidence intervals, the marginal impact[14] of the intellectual property rights on services export concentration (THEIL index) for different levels of IPRs protection. We note from this graph that the marginal impact of IPRs protection on services export concentration decreases as the level of IPRs protection improves, and takes positive and negative values, although not always statistically significant at the 5% level. This marginal impact is not statistically significant for levels of IPRs protection ranging from 1.35 to 1.85 (it is worth recalling that values of the indicator "PRIE" range between 0 and 3.92). As a result, countries whose levels of IPRs protection range between 1.35 and 1.85 experience no significant effect of IPRs protection on services export diversification. At the same time, for countries whose degree of IPRs protection is lower than 1.35 (i.e., comprised between 0 and 1.35), the strengthening of IPRs protection exerts a positive and significant effect on services export concentration (the marginal impact is positive and significant), i.e., it enhances services export concentration, and the lower the degree of the IPRs protection, the higher is the positive effect of IPRs protection on services export concentration. Conversely, countries whose levels of IPRs protection exceed 1.85 experience a negative (positive) and significant effect of IPRs protection on services export concentration (diversification) (as the marginal impact is negative and significant at the 5% level). For these countries, the greater the level of intellectual property rights, the higher is the positive impact of IPRs protection on services export diversification. Overall, strengthening IPRs protection contributes to enhancing services export diversification, especially when IPRs protection exceeds a certain level, which is 1.85. As indicated earlier, Appendix 3 displays the list of countries on the basis the ascending values of the variable "PRIE" over the last sub-period of the analysis, i.e., the period 2010-2014. It appears that the majority of countries that have weakly enforced IPRs protection levels are least developed countries[15]. For example, countries whose levels of enforced IPRs are lower than the value of 1 are as follows (in the ascending order of the values of "PRIE"): Mozambique, Myanmar Central African Republic, Bangladesh, Congo Democratic Republic,

[14] The statistically significant marginal impacts at the 95 per cent confidence intervals are those including only the upper and lower bounds of the confidence interval that are either above or below the zero line.

[15] The category of least developed countries includes poorest and most vulnerable (to external and environmental shocks) in the world. Information on this category of countries is provided online at: https://www.un.org/ohrlls/content/least-developed-countries

Benin, Angola, Swaziland, Malawi, Venezuela, Burkina Faso, Burundi, Cameroon, Zimbabwe, Madagascar, Nepal, Mali, Liberia, Senegal, Zambia, Gabon, Pakistan, Congo Republic, Honduras, Niger, Sudan, Indonesia, and Nigeria. Concurrently, countries whose level of enforced IPRs protection is higher than the level of 1.85 include (in the ascending order in terms of strengthening of IPRs protection): Tanzania, Mexico, South Africa, Russia, Morocco, Romania, Mauritania, Czech Republic, Portugal, Ireland, Bulgaria, Lithuania, Hungary, Canada, New Zealand, Chile, France, Luxembourg, Belgium, Japan, Netherlands, Switzerland, Sweden, Denmark, Austria, Finland, United States, Germany, Singapore, Australia, and Norway.

Results in column [4] of Table 1 (based on the "HHI" indicator) confirm the findings in column [3] concerning the existence of a non-linear effect of IPRs protection on services export concentration. In fact, we note from this column that while the coefficient of "PRIE" is not significant at the conventional significance levels, the coefficient of the squared term of "PRIE" is negative and significant at the 1% level. We, therefore, conclude that the effect of IPRs protection on services export diversification is positive, and increases non-linearly as the IPRs protection system is further enhanced.

With regard to estimates related to control variables, we focus on results reported in column [3] of Table 1, given that the Theil index of services export concentration is our preferred measure of services export concentration, and the two-step system GMM estimator is our preferred estimator. It is, nevertheless, important to underline that estimates presented in column [4] are with few exceptions, largely consistent with those in column [3]. We notice from results in column [3] that the real per capita income exerts a positive and significant effect on services export concentration, which suggests that as countries improve their real per capita income level, they tend to increase their degree of services export concentration. FDI inflows tend to be positively associated with services export concentration, while financial development and the improvement in the level of human capital enhance services export diversification. Trade openness exerts no significant effect on services export concentration, whereas the institutional quality and the population size are positively associated with services export concentration.

We now consider the outcomes in column [5] of Table 1. To recall, these outcomes serve to investigate how the effect of enforced IPRs on services export concentration across countries in the full sample. The results show that the variable "PRIE" and its squared term have coefficients that are respectively positive and negative, although significant at the 1% level. At the same time, the interaction variables ["PRIE*(Log(GDPC)"] and ["PRIE^2*(Log(GDPC)"] hold coefficients that are respectively negative and positive, while significant at the 1% level. As these results are difficult to interpret, we examine them graphically. Figure 3 presents, at the 95 per cent confidence

intervals, the marginal impact of intellectual property rights on services export concentration (THEIL index) for varying levels of the real per capita income. It appears from this Figure that the marginal impact of IPRs protection on services export concentration is always negative and statistically significant, and decreases as the real per capita income rises. Overall, the strengthening of IPRs helps to foster services export diversification, with advanced countries enjoying a higher positive effect of intellectual property rights on services export diversification than relatively less advanced economies.

5. Conclusion

The present analysis investigates the effect of the betterment of IPRs protection on services export diversification using a panel dataset of 103 countries (both developed and developing countries) over the period of 1985-2014. Results have shown that countries with low levels of IPRs protection experience greater services export concentration, while countries with high levels of IPRs protection (i.e., high levels of IPRs and high degree of enforcement of the IPRs legal provisions) experience greater services export diversification, and the greater the strengthening of IPRs protection (that are enforced), the higher is the positive effect of betterment of IPRs protection on services export diversification. It also appears that many countries with weakly enforced IPRs provisions are developing countries (especially when considering dataset of the sub-period, i.e., 2010-2014) of which a high number of least developed countries. Conversely, many developed countries display high levels of enforced IPRs provisions, and, therefore, experience a high degree of services export diversification. Furthermore, the analysis has demonstrated that the betterment of IPRs protection influences positively services export diversification, with the magnitude of this positive effect being higher for advanced countries compared to relatively less advanced economies.

The key policy message conveyed by the present analysis is that strengthening IPRs protection and ensuring that the legal provisions of IPRs are enforced in practice contributes to enhancing services export diversification. This outcome is particularly relevant for developing countries, notably less developed countries that have weak levels of IPRs protection, but a high degree of services export concentration. In light of the strong role of services exports, and services export diversification (or sophisticated services) for economic growth and development (e.g., Anand et al., 2012; Gnangnon, 2021a; Mishra et al., 2011; Stojkoski et al., 2016), efforts should be made by developing countries and least developed countries among them to strengthen the protection of IPRs systems.

References

Abernathy, W. J., and Utterback, J. M. (1978). Patterns of Industrial Innovation. Technology Review, 64(7), 254-228.

Agosin, R., Alvarez, R., and Bravo-Ortega, C. (2012). Determinants of Export Diversification around the World: 1962-2000. The World Economy, 35(3), 295-315.

Akiyama, T., and Furukawa, Y. (2009). Intellectual property rights and appropriability of innovation. Economics Letters, 103(3), 138-141.

Anand, R., Mishra, S., and Spatafora, N. (2012). Structural Transformation and the Sophistication of Production. IMF Working Paper, WP/12/59. International Monetary Fund, Washington, D.C.

Arellano, M., and Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. Journal of Econometrics, 68 (1), 29-51.

Bader, M.A. (2008). Managing intellectual property in the financial services industry sector: Learning from Swiss Re, Technovation, 28(4), 196-207.

Barras, R. (1986). Towards a Theory of Innovation in Services. Research Policy, 15(4), 161-173.

Battisti, G., Gallego, J., Rubalcaba, L., and Windrum, P. (2014). Open innovation in services: knowledge sources, intellectual property rights and internationalization. Economics of Innovation and New Technology, 24(3), 223-247.

Beck, T., Demirgüç-Kunt, A., and Levine, R. (2000). A New Database on Financial Development and Structure. World Bank Economic Review, 14 (3), 597-605.

Beck, T., Demirgüç-Kunt, A., and Levine, R. (2009). Financial Institutions and Markets Across Countries and over Time: Data and Analysis. World Bank Policy Research Working Paper 4943, Washington, D.C.

Blundell, R., and Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. Journal of Econometrics, 87(1), 115-143.

Branstetter, L., Fisman, R., Foley, C.F., and Saggi, K. (2011). Does intellectual property rights reform spur industrial development? Journal of International Economics, 83(1), 27-36.

Brüggemann, J., Crosetto, P., Meub, L., and Bizer, K. (2016). Intellectual property rights hinder sequential innovation. Experimental evidence. Research Policy, 45(10), 2054-2068.

Cadot, O., Carrere, C., and Strauss-Kahn, V. (2011). Export Diversification: What's Behind the Hump? Review of Economics and Statistic, 93, 590-605.

Campi, M., and Dueñas, M. (2016). Intellectual Property Rights and International Trade of Agricultural Products. World Development, 80, 1-18.

Ceglowski, J. (2006) Does gravity matter in a service economy? The Review of World Economics, 142(2), 307-328.

Chang, H-J. (2001). Intellectual Property Rights and Economic Development: Historical lessons and emerging issues, Journal of Human Development, 2(2), 287-309.

Chen, W.-C. (2013). The Extensive and Intensive Margins of Exports: The Role of Innovation. The World Economy, 36(5), 607-635.

Chen, Y., and Puttitanun, T. (2005). Intellectual property rights and innovation in developing countries. Journal of Development Economics, 78(2), 474-493.

Čihák, M., Demirgüç-Kunt, A., Feyen, E., and Levine, R. (2012). "Benchmarking Financial Development Around the World. Policy Research Working Paper 6175, World Bank, Washington, DC.

Delgado, M., Kyle, M., and McGahan, A. M. (2013). Intellectual property protection and the geography of trade. The Journal of Industrial Economics, 61(3), 733-762.

Dinopoulos, E., and Segerstrom, P. (2010). Intellectual property rights, multinational firms and economic growth. Journal of Development Economics, 92(1), 13-27.

Dong, B., Guo, Y., and Hu, X. (2022). Intellectual property rights protection and export product quality: Evidence from China. International Review of Economics & Finance, 77, 143-158.

Driscoll, J. C., and Kraay, A.C. (1998). Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. Review of Economics and Statistics, 80(4), 549-560.

Eichengreen, B., and Gupta, P. (2013a). The Real Exchange Rate and Export Growth Are Services Different? World Bank Policy Research Working Paper 6629, World Bank, Washington, D.C.

Eichengreen, B., and Gupta, P. (2013b). Exports of services: Indian experience in perspective. Indian Growth and Development Review, 6(1), 35-60.

Eicher, T., and García-Peñalosa, C. (2008). Endogenous strength of intellectual property rights: Implications for economic development and growth. European Economic Review, 52(2), 237-258.

Falvey, R., Foster, N., and Greenaway, D. (2009). Trade, imitative ability, and intellectual property rights. Review of World Economics, 145(3), 373-404.

Feenstra, R., C., Inklaar, R., and Timmer, M.P. (2015). The Next Generation of the Penn World Table. American Economic Review, 105(10), 3150-3182.

Glass, A.J., and Wu, X. (2007). Intellectual property rights and quality improvement. Journal of Development Economics, 82(2), 393-415.

Gnangnon, S. K. (2020b). Effect of Poverty on Services Export Concentration in Developing Countries. Journal of International Commerce, Economics and Policy, https://doi.org/10.1142/S1793993324500017

Gnangnon, S. K. (2021c). Manufacturing Exports and Services Export Diversification. The International Trade Journal, 35(3), 221-242.

Gnangnon, S. K. (2021d). Aid for Trade and Services Export Diversification in Recipient-Countries. Australian Economic Papers, 60(2), 189-225.

Gnangnon, S. K. (2021e). Effect of Multilateral Trade Liberalization on Services Export Diversification. Journal of Economic Studies, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/JES-01-2021-0057

Gnangnon, S. K., and Priyadarshi, S. (2016). Export Product Diversification, Services Production and Exports in Least Developed Countries. Journal of International Commerce, Economics and Policy, Vol. 07, No. 03, 1650013.

Gnangnon, S.K. (2020a). Effect of the Internet on Services Export Diversification. Journal of Economic Integration, 35(3), 519-558.

Gnangnon, S.K. (2021a). Services diversification and economic growth. The European Journal of Comparative Economics, 18(1), 49-86.

Gnangnon, S.K. (2021b). Effect of Economic Complexity on Services Export Diversification: Do Foreign Direct Investment Inflows Matter? Preprint Paper, Research Square, 10.21203/rs.3.rs-860821/v1

Gnangnon, S.K. (2021f). Development aid and services export diversification. International Journal of Economic Policy Studies, 15(1), 125-156.

Gnangnon, S.K. (2021g). Services export diversification and services export revenue stability: does trade openness matter? International Trade, Politics and Development, 5(2), 90-113.

Gould, D. M., and Gruben, W. C. (1996). The role of intellectual property rights in economic growth. Journal of Development Economics, 48(2), 323-350.

Grossman, G. M., and Helpman, E. (1990). Trade, innovation, and growth. American Economic Review, 80(2), 86-91.

Grossman, G. M., and Lai, E. L.-C. (2004). International protection of intellectual property. American Economic Review, 94(5), 1635-1653.

Hassan, E., Yaqub, O., and Diepeveen, S. (2010). Intellectual Property and Developing Countries: A review of the literature. Report prepared for the UK Intellectual Property Office and the UK Department for International Development. RAND Europe, Cambridge, United Kingdom

Hausmann, R., and Hidalgo, C.A. (2009). The building blocks of economic complexity. Proceedings of the National Academy of Sciences, 106 (26), 10570-10575.

Hausmann, R., Hidalgo, C., Bustos, S., Coscia, M., Chung, S., Jimenez, J., et al. (2013). The Atlas of economic complexity: Mapping paths to prosperity. Boston, MA: Macro Connections Media Lab, Center for International Development at Harvard University.

Helpman, E. (1993). Innovation, imitation, and intellectual property rights. Econometrica, 61(6), 1247-1280.

Hipp, C., Tether, B. S., and Miles, I. (2000). The Incidence and Effects of Innovation in Services: Evidence from Germany," International Journal of Innovation Management, 4(4), 417-453.

Hipp, C., Tether, B. S., and Miles, I. (2003). "The Effects of Innovation in Standardized, Customized and Bespoke Services: Evidence from Germany," in J. Tidd and F. M. Hull, eds., Service Innovation: Organizational Responses to Technological Opportunities and Market Imperatives, Imperial College Press, London, 175-210.

Hoekman, B. (2017). Trade in services - Opening markets to create opportunities. UNU-WIDER Working Paper 2017/31. United Nations University World Institute for Development Economics Research, Helsinki, Finland.

Hoekman, B., and Shepherd, B. (2017). Services Productivity, Trade Policy, and Manufacturing Exports. World Economy, 40(3), 499-516.

Hu, A., and Png, I. (2012). Patent rights and economic growth: evidence from cross-country panels of manufacturing industries. Oxford Economic Papers, 65(3), 675-698.

Hudson, J., and Minea, A. (2013). Innovation, intellectual property rights and economic development: A unified empirical investigation. World Development, 46, 66-78.

Ivus, O., and Park, W. (2019). Patent reforms and exporter behaviour: Firm-level evidence from developing countries. Journal of the Japanese and International Economies, 51, 129-147.

Jiang, X., and Zhang, S. (2021). Visualizing the services embodied in global manufacturing exports, Physica A: Statistical Mechanics and its Applications, 571, 125365.

Johnston, R., and Clark, G. (2005), Service Operations Management, 2nd edn., Prentice Hall, Pearson Education Ltd, Harlow.

Kang, G.S., and Won, Y. (2016). Regulation and Service Exports: Theoretical and Empirical Analyses. The Korean Economic Review, 32(2), 269-294.

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

Kimura, F., and Lee, H. H. (2006). The gravity equation in international trade in services. Review of World Economics, 142(1), 92-121.

Kong, Q., Shen, C., Chen, A., Peng, D., and Wong, Z. (2021). How demand scale affect services exports? Evidence from financial development perspective. Research in International Business and Finance, 58, 101428.

Lanz, R., and Maurer, A. (2015). Services and global value chains: Some evidence on servicification of manufacturing and services networks. Journal of International Commerce, Economics and Policy, Vol 06, No. 03, 1550014.

Liu, Y., Park, W.G., and Fu, D. (2021). Export quality and patent protection: Stage-dependent effects in development. Review of Development Economics, 25(2), 601-629.

Lodefalk, M. (2014). The role of services for manufacturing firm exports. Review of World Economics, 150, 59-82.

Lorenczik, C., and Newiak, M. (2012). Imitation and innovation driven development under imperfect intellectual property rights. European Economic Review, 56(7), 1361-1375.

Loungani, P., Mishra, S., Papageorgiou, C., and Wang, K. (2017). World Trade in Services: Evidence from A New Dataset. IMF Working Paper WP/17/77, International Monetary Fund, Washington, D.C.

Love, J., and Mansury, M. A. (2007). External Linkages, R&D and Innovation Performance in US Business Services. Industry & Innovation, 14(5), 477-96.

Marshall, M.G., Gurr, T.R., and Jaggers, K. (2018). Polity IV Project: Political Regime Characteristics and Transitions, 1800-2017. Centre for Systemic Peace: Vienna, VA.

Maskus, K.E. (2008). The Globalization of Intellectual Property Rights and Innovation in Services. Journal of Industry, Competition and Trade, 8, 247-267.

Maskus, K. E., and Penubarti, M. (1995). How trade-related are intellectual property rights? Journal of International Economics, 39(3), 227-248.

Maskus, K. E., and Yang, L. (2018). The impacts of post-TRIPS patent reforms on the structure of exports. Canadian Journal of Economics, 51(2), 483-509.

Miles, I., Andersen, B., Boden, M., and Howells, J. (2000). Service production and intellectual property. International Journal of Services Technology and Management, 1(1), 37-57.

Mishra, S., Lundstrom, S., and Anand, R. (2011). Service Export Sophistication and Economic Growth. Policy Research Working Paper, WPS5606, World Bank, Washington, D.C.

Mishra, S., Tewari, I., and Toosi, S. (2020). Economic complexity and the globalization of services.
Morikawa, M. (2014). Innovation in the Service Sector and the Role of Patents and Trade Secrets. RIETI Discussion Paper 14-E-030.

Mrad, F. (2017). The effects of intellectual property rights protection in the technology transfer context on economic growth: the case of developing countries. Journal of Innovation Economics & Management, 23, 33-57.

Naghavi, A., and Strozzi, C. (2015). Intellectual property rights, diasporas, and domestic innovation. Journal of International Economics, 96(1), 150-161.

Ndubuisi, G., and Foster-McGregor, N. (2018). Domestic Intellectual Property Rights Protection and the Margins of Bilateral Exports. UNU-MERIT Working Paper 2018-035, Maastricht, The Netherlands.

OECD (2009). Innovation in Firms: A Microeconomic Perspective. OECD Publishing, Paris, https://doi.org/10.1787/9789264056213-en

OECD/Eurostat (2018). Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en

Panda, S., Sharma, R., and Park, W.G. (2020). Patent Protection, Technological Efforts, And Exports: An Empirical Investigation. Journal of Developing Areas, 54(2), 145-162.

Papageorgiadis, N., and Sharma, A. (2016). Intellectual property rights and innovation: A panel analysis. Economics Letters, 141, 70-72.

Park, W. G. (2008). International patent protection: 1960-2005. Research Policy, 37(4), 761-766.

Park, W., and Lippoldt, D. (2008). Technology Transfer and the Economic Implications of the Strengthening of Intellectual Property Rights in Developing Countries. OECD Trade Policy Papers, No. 62, OECD Publishing, Paris.

Peters, B. (2009). Persistence of innovation: stylised facts and panel data evidence. The Journal of Technology Transfer, 34, 226-243.

Pires, C. P., Sarkar, S., and Carvalho L. (2008). Innovation in Services-How Different from Manufacturing? The Service Industries Journal, 28(10), 1339-56.

Roodman, D. M. (2009). A note on the theme of too many instruments. Oxford Bulletin of Economic and Statistics, 71(1), 135-158.

Sahoo, P., and Dash, R. K. (2014). India's surge in modern services exports: Empirics for policy. Journal of Policy Modeling, 36, 1082–1100.

Sahoo, P., and Dash, R. K. (2017). What Drives India's Surge in Service Exports? The World Economy, 40(2), 439-461.

Song, X., Huang, X., and Qing, T. (2021). Intellectual property rights protection and quality upgrading: Evidence from China. Economic Modelling, 103, 105602.

Squalli, J., and Wilson, K. (2011). A New Measure of Trade Openness. The World Economy, 34(10), 1745-1770.

Stojkoski, V., Utkovski, Z., and Kocarev, L. (2016). The Impact of Services on Economic Complexity: Service Sophistication as Route for Economic Growth. PLoS ONE, 11(8), e0161633. Structural Change and Economic Dynamics, 53, 267-280.

Su, X., Anwar, S., Zhou, Y., and Tang, X. (2021). Services trade restrictiveness and manufacturing export sophistication. The North American Journal of Economics and Finance, 51, 101058.

Sweet, C.M., and Maggio, D.S.E. (2015). Do Stronger Intellectual Property Rights Increase Innovation? World Development, 66, 665-677.

Yang, L., and Maskus, K.E. (2009). Intellectual property rights, technology transfer and exports in developing countries. Journal of Development Economics, 90(2), 231-236.

Yeyati, E. L., Panizza U, and Stein, E (2007). The cyclical nature of North-South FDI flows. Journal of International Money and Finance, 26, 104-130.

Zahler, A., Iacovone, L., and Mattoo, A. (2014). Trade and Innovation in Services: Evidence from a Developing Economy. The World Economy, 37(7), 953-979.

TABLES and APPENDICES

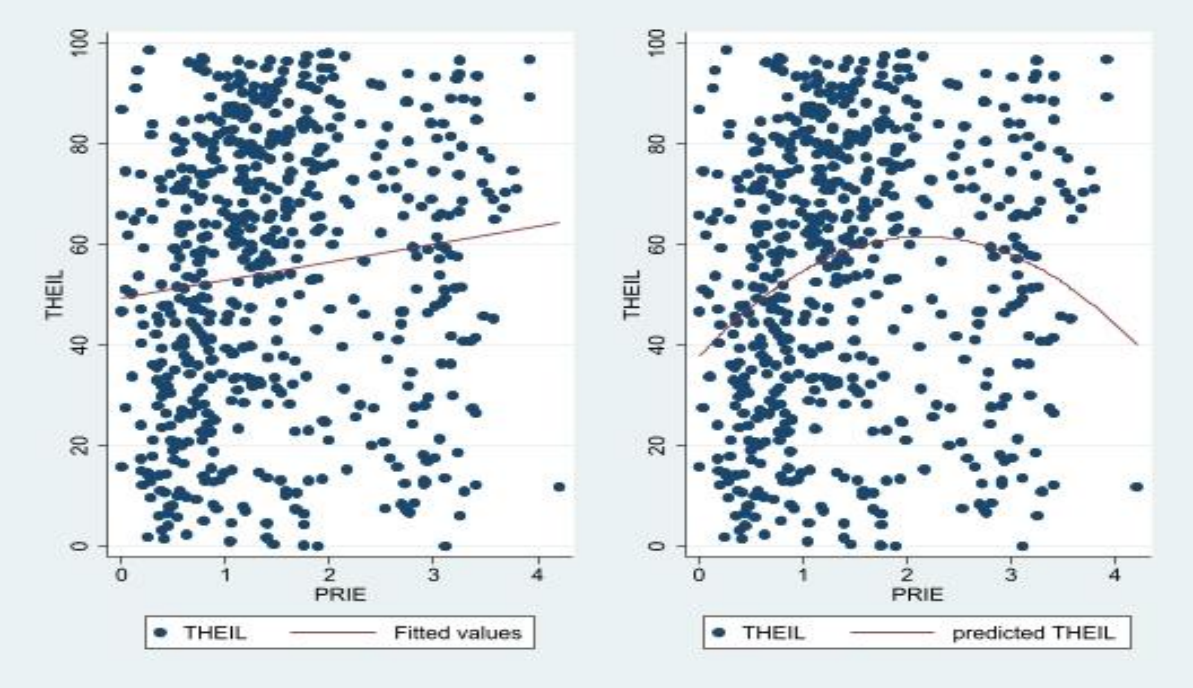
Table 1: Effect of intellectual property rights on services export concentration
Estimators: Pooled Ordinary Least Squares, Within Fixed Effects and Two-Step System GMM

Variables	POLSDK THEIL (1)	FEDK THEIL (2)	Two-Step System GMM THEIL (3)	HHI (4)	THEIL (5)
One-Period Lag of the Dependent Variable			0.657***	0.617***	0.631***
			(0.0183)	(0.0233)	(0.0150)
PRIE	17.32***	37.99***	20.89***	4.217	45.55***
	(5.876)	(5.837)	(4.876)	(3.568)	(15.10)
$PRIE^2$	-4.234***	-7.827***	-6.315***	-2.125***	-18.96***
	(1.420)	(1.449)	(1.016)	(0.787)	(4.681)
PRIE*[Log(GDPC)]					-4.030**
					(1.754)
($PRIE^2$)*[Log(GDPC)]					1.669***
					(0.481)
Log(GDPC)	1.898	12.43***	6.854***	9.116***	5.780***
	(1.431)	(4.439)	(1.264)	(0.855)	(1.592)
FDI	0.427***	-0.0187	-0.139	0.294**	-0.375***
	(0.115)	(0.0705)	(0.137)	(0.147)	(0.0990)
FINDEV	0.197***	0.0232**	-0.0513**	-0.0464**	-0.0573***
	(0.0261)	(0.00909)	(0.0246)	(0.0233)	(0.0153)
HUM	-7.788**	-14.89***	-17.93***	-34.05***	-15.15***
	(3.537)	(5.404)	(4.257)	(3.561)	(2.755)
OPEN	0.0136	0.0913**	0.0164	-0.00978	0.0525***
	(0.0584)	(0.0392)	(0.0220)	(0.0222)	(0.0132)
POLITY2	0.763***	0.223	0.826***	1.291***	0.917***
	(0.165)	(0.169)	(0.217)	(0.196)	(0.141)
Log(POP)	3.486***	47.13***	3.675***	2.480**	5.510***
	(1.285)	(5.380)	(0.854)	(1.001)	(0.528)
Observations - Countries	578 - 103	578 - 103	517 - 103	517 - 103	517 - 103
Level of "PRIE" above which the effect of "PRIE" on "SEC" becomes negative	2.045 = 17.32/(2*(4.234))	2.427 = 37.99/(2*(7.827))	1.654 = 20.89/(2*(6.315))		
R-squared / Within R-squared	0.171	0.2851			
AR1 (P-Value)			0.0000	0.0000	0.0000
AR2 (P-Value)			0.5124	0.3028	0.4633
OID (P-Value)			0.4660	0.1985	0.6154

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "PRI", "PRIE" its squared term, "FINDEV", "OPEN", "HUM", "FDI" and "POLITY2" have been considered as endogenous. have been treated as endogenous. Time dummies have been included in the regressions.*

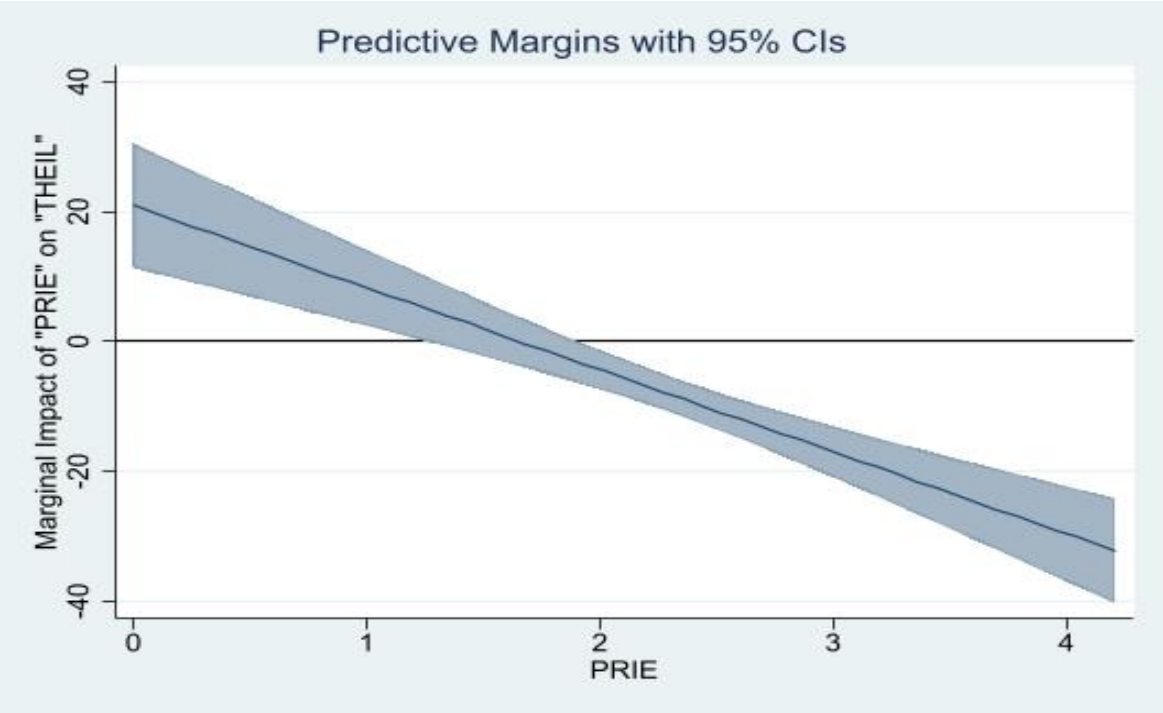
FIGURES

Figure 1: Correlation pattern between intellectual property rights and services export concentration ("THEIL") over the full Sample



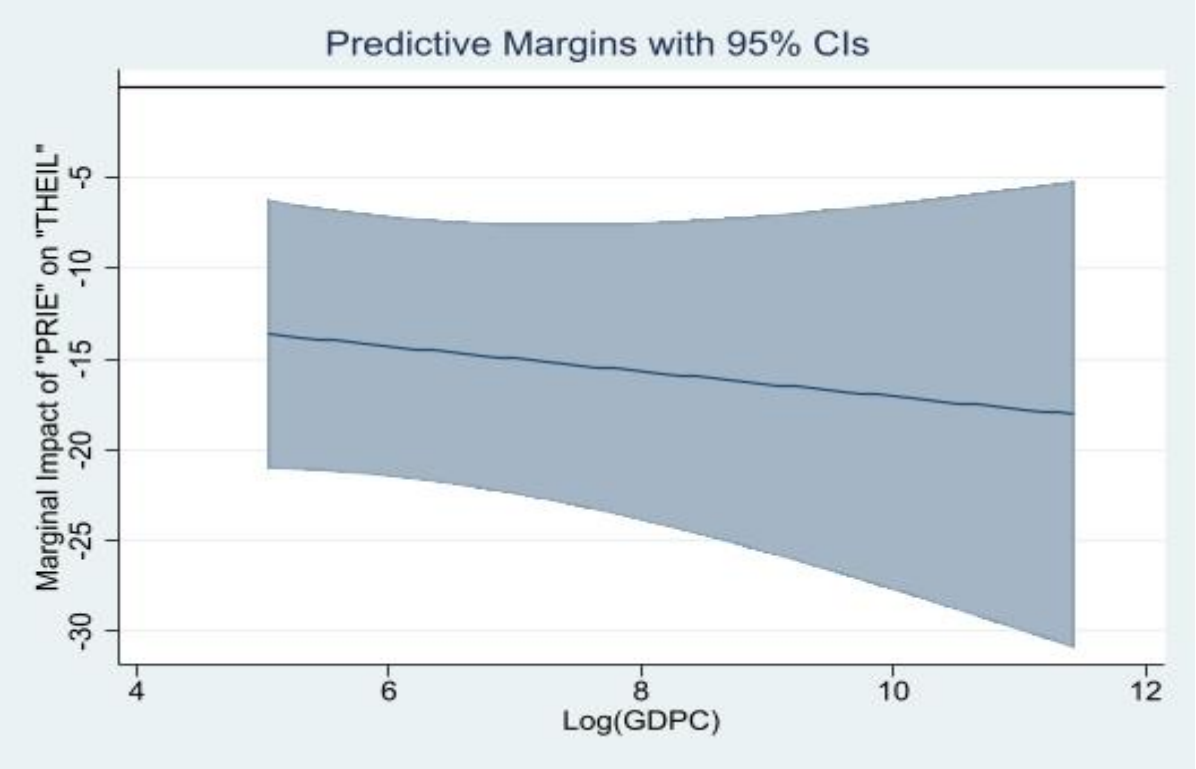
Source: Author

Figure 2: Marginal Impact of "PRIE" on "THEIL", for varying levels of "PRIE"



Source: Author

Figure 3: Marginal Impact of "PRIE" on "THEIL", for varying levels of the real income per capita



Source: Author

Appendix 1: Definition and Source of variables

Variables	Definition	Sources
PRIE	This is the effective patent protection (PRIE) computed as the index of Patent Protection (PRI) multiplied by the index of legal enforcement effectiveness. The Index of Patent Protection based on of patentee rights. The index comprises five components, each being scored out of one. These include the duration of patent protection relative to the international standard; the subject matter that is patentable (or not unpatentable); the participation in international Intellectual Property Rights agreements; the enforcement mechanisms available; and how limited (or less restricted) the patenting exceptions are (such as any requirement to practice the invention or license the patents to third-parties). The overall index of patent protection varies from zero to five, with higher numbers reflecting strong levels of patent rights.	The indicator "PRI" is developed by Park (2008) see data online at: http://fs2.american.edu/wgp/www/ The index of legal enforcement effectiveness is extracted from the Fraser Institute (see online at: https://www.fraserinstitute.org/). Note that values of "PRI" in the database of Park (2008) range between 0 and 5, while in the database of the Fraser Institute, the values of the index of legal enforcement range between 0 and 10. Following Liu et al. (2021), to compute the indicator of "PRIE", we use the index of legal enforcement deflated by 10 so that its values range now between 0 and 1.
THEIL	This is the Theil index of services export concentration. It has been calculated using the following formula (for example, see Agosin et al, 2011; Cadot et al., 2011): $THEIL = \frac{1}{n}\sum_{k=1}^{n}\frac{x_k}{\mu}\ln\left(\frac{x_k}{\mu}\right)$, where $\mu = \frac{1}{n}\sum_{k=1}^{n} x_k$ n represents the total number of the (services) export lines (k) $n = \sum_{k=1}^{n} k$; x_k stands for the amount of services exports associated with the services line "k".	Author's calculation based on data extracted from the database developed by the International Monetary Fund (IMF) on the international trade in services (see online at: https://data.imf.org/?sk=07109577-E65D-4CE1-BB21-0CB3098FC504) - See also Loungani et al. (2017). The data used to compute the HHI indicator are sectoral data on services exports at 2-digit level, which is the maximum digit-level of disaggregated data available on services. In particular, we have relied on 11 major sectors of services (categories of services) – at the 1-digit level - and used the disaggregated data on services exports for sub-sectors at the 2-digit level. These 11 major services sectors are as follows (the sub-sectors are in brackets): Charges for the use of intellectual property

		n.i.e.; Construction; Financial services; Insurance and pension services; Maintenance and repair services n.i.e.; Manufacturing services on physical inputs owned by others; Other Business Services; Personal, cultural, and recreational services; Telecommunications, computer, and information services; Transport; and Travel.
HHI	This is the Herfindahl index, which is also referred sometimes to as the Hirschman-Herfindahl index. It has been calculated as the sum of the squared shares of each export line k (with amount exported) in total services exports. Values of this index range from 0 to 1. We have multiplied this indicator by 100 so that its values range between 0 and 100. Higher values of this index reflect greater services export concentration, and lower values indicate greater services export diversification.	Author's calculation based on the same data (extracted from the IMF database on the international trade in services) used to compute the THEIL indicator described above.
GDPC	Per capita Gross Domestic Product (constant 2010 US$)	World Development Indicators (WDI) of the World Bank
FDI	This is the ratio of FDI-to-GDP	United Nations Conference on Trade and Development (UNCTAD) database.
OPEN	This is the indicator of trade openness, measured by the share (%) of sum of exports and imports of goods and services in GDP.	WDI
FINDEV	This is the indicator of financial development. It is a composite index of four indicators of financial development, which are the liquid liabilities (% GDP); the private credit by deposit money banks and other financial institutions (% GDP); the bank deposits (% GDP); and the financial system deposit (% GDP). The indicator "FINDEV" has been computed by relying on the factor analysis approach, including the Principal Component Analysis that allows extracting a common factor from the above-mentioned four indicators of financial development. The variable obtained has been transformed into an index whose value range between 0 and 100. Higher values of "FINDEV" reflect a higher depth of financial development, and lower values indicate lower levels of financial development.	Author's calculation based on data on the four indicators from the World Bank's Financial Structure dataset developed by Beck et al. (2000; 2009) and Čihák et al. (2012).
HUM	This is the number of years of schooling and returns to education.	Penn World Tables PWT 9.1 (see Feenstra et al., 2015).
POP	This is the measure of the total Population	WDI
POLITY2	This variable is an index extracted from Polity IV Database (Marshall et al., 2018). It represents the degree of democracy based on competitiveness of political participation, the	Polity IV Database (Marshall et al., 2018)

	openness and competitiveness of executive recruitment and constraints on the chief executive. Its values range between -10 and +10, with lower values reflecting autocratic regimes, and greater values indicating democratic regimes. Specifically, the value +10 for this index represents a strong democratic regime, while the value -10 stands for strong autocratic regime.	

Appendix 2: Descriptive statistics on variables used in the model

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
THEIL	517	56.808	26.388	0.187	98.801
HHI	517	52.982	28.471	0.484	99.004
PRIE	517	1.469	0.929	0.000	3.919
FDI	517	3.151	5.264	-4.239	68.643
FINDEV	517	50.895	35.037	0.000	100.000
OPEN	517	73.455	49.642	0.218	407.120
HUM	517	2.290	0.707	1.037	3.712
POLITY2	517	4.780	5.705	-10.000	10.000
GDPC	517	12633.690	18294.550	226.384	105761.900
POP	517	43100000	120000000	446745	1270000000

Appendix 3: List of countries in the full sample along with values of the variable "PRIE" for the last sub-period, i.e., 2010-2014, provided in the ascending order

Country	**PRIE**	**Country**	**PRIE**	**Country**	**PRIE**
Mozambique	0.000	Haiti	1.126	Israel	1.823
Myanmar	0.037	Uruguay	1.158	Poland	1.825
Central African Republic	0.141	Guatemala	1.161	Tanzania	1.886
Bangladesh	0.160	Sri Lanka	1.166	Mexico	1.902
Congo Democratic Republic	0.205	Paraguay	1.178	South Africa	1.923
Benin	0.296	Jamaica	1.192	Russia	1.933
Angola	0.368	Ghana	1.245	Morocco	1.939
Swaziland	0.387	Algeria	1.251	Romania	1.940
Malawi	0.569	Greece	1.286	Mauritania	1.943
Venezuela	0.571	Dominican Republic	1.287	Czech Republic	1.955
Burkina Faso	0.592	Mauritius	1.292	Portugal	2.000
Burundi	0.593	Slovak Republic	1.331	Ireland	2.090
Cameroon	0.600	Egypt	1.337	Bulgaria	2.165
Zimbabwe	0.608	Sierra Leone	1.349	Lithuania	2.419
Madagascar	0.646	India	1.380	Hungary	2.446
Nepal	0.695	Cyprus	1.391	Canada	2.531
Mali	0.728	Saudi Arabia	1.404	New Zealand	2.550
Liberia	0.737	Philippines	1.430	Chile	2.580
Senegal	0.771	El Salvador	1.441	France	2.709
Zambia	0.784	Kenya	1.477	Luxembourg	2.802
Gabon	0.807	Colombia	1.539	Belgium	2.836
Pakistan	0.826	Costa Rica	1.556	Japan	2.935
Congo Republic	0.833	Uganda	1.571	Netherlands	2.949
Honduras	0.863	Brazil	1.580	Switzerland	3.030
Niger	0.875	Nicaragua	1.590	Sweden	3.054
Sudan	0.880	Bolivia	1.604	Denmark	3.108
Indonesia	0.927	Argentina	1.631	Austria	3.202
Nigeria	0.957	Tunisia	1.648	Finland	3.267
Iran	1.023	Ukraine	1.706	United States	3.277
Rwanda	1.048	Ecuador	1.714	Germany	3.285
Togo	1.079	Italy	1.754	Singapore	3.295
Côte d'Ivoire	1.100	Turkey	1.759	Australia	3.416

Jordan	1.114	Peru	1.783	Norway	3.479
Botswana	1.118	Thailand	1.808		
Panama	1.120	Malaysia	1.813		