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Gideon Ndubuisi

Maastricht Economic and social Research institute on Innovation and Technology (UNU-MERIT)
email: **info@merit.unu.edu** | website: **http://www.merit.unu.edu**

Boschstraat 24, 6211 AX Maastricht, The Netherlands
Tel: (31) (43) 388 44 00

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Domestic Intellectual Property Rights Protection and Exports: Accessing the Credit Channel

Gideon Ndubuisi

UNU-MERIT/Maastricht University

ndubuisi@merit.unu.edu

Abstract

Recent studies on the export effects of domestic intellectual property rights protection focus on the innovation, border and technology transfer channels to underscore the pathways by which effective domestic IPRs protection influences own country's export. I extend this literature by arguing that another pathway domestic IPRs protection affects own country's export is via the credit channel i.e. firms access to external finance. Among many others, this occurs because effective domestic IPRs protection creates a scenario wherein exporters can use their intellectual properties in the same way they use tangible assets as collateral in order to overcome the huge variable and upfront fixed costs they face. To underscore this pathway, I evaluate the export effect of domestic IPRs protection within the comparative model framework and find empirical evidence for my hypothesis, with the results indicating that countries with more effective IPRs protection export more from sectors that depend more on external finance and that have more intangible assets.

JEL Codes: F10, F13, F14, F36, O333, O34

Keywords: Intellectual Property Rights; Exports; Access to Finance

1. Introduction

The past two decades has witnessed an unprecedented rise in the levels of intellectual property rights (IPRs) protection in both developed and developing countries. Two prominent drivers of this trajectory are the TRIPs Agreement which comprises the first comprehensive sets of minimum substantive IPRs standards expected of all WTO members, and the current waves of PTAs with substantial chapters on IPRs standards.[1] Amid this rise, trade economists have been obsessed about the trade implications of this rising levels of IPRs protection. Beginning with Maskus and Penubarti (1995), pioneer studies examined the responsiveness of exporters to the levels of IPRs protection in the importing country (Smith, 1999; Foster-McGregor, 2014). Recently, scholastic interest is now on the impact of domestic IPRs protection on country's own export (Yang & Maskus, 2009; Delgado, Kyle & McGahan, 2013; Briggs & Park, 2013; Maskus & Yang, 2018; Ndubuisi & Foster-McGregor, 2018; Ivus, 2019). Although not usually tested empirically, three prominent channels – innovation, border and technology transfer – are often emphasised in this nascent literature to underpin the pathway by which domestic IPRs protection affects own country's export. The current study extends this literature by showing another pathway, the credit channel, by which domestic IPRs protection also affects own country's export.

Exporting is associated with huge fixed and variable costs. Unlike domestic producers, this makes exporters more reliant on external finance which they can assuage either by accessing finance from banks, other financial institutions or trade credits (Manova, 2013).[2] To access these external finance however, a credit lender usually evaluates the borrower's credit risks in order to set the price and non-price terms of the loan which ultimately, determine the counterparty risk and loss given default. Accordingly, building on a recent study by Alimov (2019) which provides compelling evidence that effective domestic IPRs protection influences the credit lenders' assessment of the borrowers expected cash flows risk, the collateral value of its intellectual properties, and information risks (Alimov, 2019, p. 197), I postulate that effective domestic IPRs protection can affect own country's export by enabling exporters meet their enormous external finance demand. To underscore this channel, I evaluate the export effect of domestic IPRs protection within the comparative model framework which has been elevated into the finance literature by Rajan and Zingales (1998). Importantly, this approach gives me a flexible framework to identify this causal pathway by probing the

[1] TRIPs means "Trade Related Aspects of Intellectual Property Rights Agreement" while PTAs means "Preferential Trade and Investments Agreements".

[2] Unlike domestic producers, some of the additional fixed and suck costs associated with exporting include learning about the profitability of potential export markets; making market-specific investments in capacity, product customization and regulatory compliance; and setting up and maintaining foreign distribution networks while some of the variable costs – e.g. shipping, duties, and freight insurance (Manova, 2013 p. 714).

relative export performance of those sectors that are more financially vulnerable (i.e. sectors that are more externally finance dependent and that have more intangible assets) for each additional increase in the levels of domestic IPRs protection. My identification assumption follows that, "if effective domestic IPRs protection matters for export by expanding firms access to finance in order to assuage the huge fixed and variable costs associated with exporting, this should apply more forcefully to more financially vulnerable sectors".

My empirical design comprises export from 27 industries in 47 countries to 175 countries between 1998-2011. To forestall the results, I find that countries with more effective domestic IPRs protection export significantly more from sectors that are more financially vulnerable. Among many others, this can occur because effective domestic IPRs protection boosts the value of IPRs protected products or assets, in which case owning them can then signal technological capability and sophistication of a firm to financial investors. Also, it creates a scenario wherein exporters can use their intellectual properties – patents and trademarks – in the same way they use tangible assets as collateral in accessing finance in order to overcome the huge variable and upfront fixed costs they face. This argument is consistent with anecdotal evidence such as the Development Bank of Japan and the Landesbank Rheinland-Pfalz in Germany which since 1995 use patents as collateral for loans to venture firms. It is also consistent to the South African Trade Marks Act, No. 94 of 1993 which provides that a registered trademark may be hypothecated by a Deed of Security. I further extend the analysis to evaluate the impact of domestic IPRs protection on the export margins. The results suggest that effective domestic IPRs protection increases export, relatively more for financially vulnerable sectors both along the extensive export margins (i.e. probability of exporting and number of products exported) and the intensive export margins (export volume, average value per export and export duration).

My study makes three major contributions to the literature. First, it extends the nascent literature on the export effects of domestic IPRs protection (Yang & Maskus, 2009; Delgado et al., 2013; Briggs & Park, 2013; Maskus & Yang, 2018; Ndubuisi and Foster-McGregor, 2018; Ivus, 2019) by documenting another pathway by which effective domestic IPRs protection affects own country's export. Second, it also extends the aforementioned literature by exploring a fine-grained IPRs protection indicator that goes beyond the *de'jure* indicator to measure the actual enforcement of IPRs protection. Indeed, Maskus and Yang (2018) in an effort to capture this aspect of IPRs protection interact Ginarte and Park (1997) *de'jure* indicator of IPRs protection with Fraser Institute's index of legal systems and property rights. Although their approach is intellectually appealing, a potential drawback is that we are now unaware of the source of variation in the data. Contrary to this approach and as discussed further in section

4b, my empirical analysis explores Papageorgiadis, Cross and Alexou (2014) *de'facto* IPRs protection indicator that are solely targeted at cross-country variations in the levels of IPRs enforcement. Finally, the study also contribute to the emerging literature on export survival (Besedeš & Prusa, 2010; Chen, 2012; Azomahou, Maemir & Wako 2019) by underlining effective domestic IPRs protection as a potential determinant, further showing how this is possible.

The rest of the paper is organised as follows: Section 2 discusses prior literature and sets the hypothesis; Section 3 discusses the research methodology. Section 4 describes the data sources. Section 5 presents and discusses the results while section 6 concludes.

2. Prior Literature and Hypothesis

Over the past two and half decades, trade economists have been obsessed about the trade implications of the rising levels of IPRs protection. Pioneer studies in this literature however focused on the impact of foreign IPRs protection on export. Among many others, the underlying thesis of these studies is that technology is embodied in exported goods thereby making exports conduit of technology spillover which can be perfectly protected with formal means of IPRs such as patents in the importing country. Erstwhile studies then evaluated the responsiveness of exporter to the levels of IPRs protection in the importing country while taking into account importers' market size and imitative ability. Maskus and Penurbarti (1995) was the first to empirically test this relationship using a cross-sectional sample of exports from 28 manufacturing sectors in 22 OECD countries into 25 developing countries. Similar analysis has also being carried out by studies such as Smith (1999) and Foster-McGregor (2014) among many others. Generally, a stylised fact from this literature is that exporters are responsive to the levels of IPRs protection in the importing country and they usually increase exports in the event of effective IPRs protection when the importing country is endowed with higher imitative ability.

Contrary to the above studies, Yang and Maskus (2009) examined the nexus between domestic IPRs protection and own country's export using a partial equilibrium analysis. The outcome of their model suggests that effective domestic IPRs protection lowers the marginal cost of production by reducing technology transfer costs and ultimately, turns the country into an export platform after some adjustment periods. Using micro level data of US subsidiary firms in 91 developed and developing countries, Briggs and Park (2013) find that exports of these subsidiaries respond positively to effective patent rights but only in developed countries. Delgado et al. (2013) use product-country data to examine the export effects of countries' compliance with the TRIPs agreement. Their study reports an increase in the exports of knowledge intensive goods for both developing and high-income countries that complied with the TRIPs agreement.

Ndubuisi and Foster-McGregor (2018) evaluated the export effects of domestic IPRs protection within a gravity framework and further examining the impact at the extensive and intensive export margins. Their study finds a positive impact of effective domestic IPRs protection on total export which works essentially via the extensive margin. Contrary to these studies, Maskus and Yang (2018) use the factor proportion model and found that effective domestic IPRs protection increases the export of R&D intensive and patent-sensitive goods. Importantly, the study show that the impact of effective IPRs protection on the export of R&D intensive and patent-sensitive goods increases with higher inflows of patent applications, FDI employment and intra-firm trade with Multinational firms. Ivus and Park (2019) use a sample of 42 developing countries and also document positive export increase from patent-intensive sectors due to increased domestic IPRs protection.

Albeit not usually tested empirically, three prominent channels – innovation, border and technology transfer – are often emphasised in the aforementioned studies to underpin the pathway by which the levels of domestic IPRs protection affects own country's export. The innovation channel unites two strands of literature including, the product-cycle and technology-gap (Vernon, 1966; Krugman, 1979) trade models and "IPR-innovation" models (Arrow, 1962; Chu & Puttitanun, 2005) to argue that effective domestic IPRs protection affects own country's exports through its impact on the rate of innovation which comes about by incentivising the decision to invent and the commercialisation of invented products (Mazzoleni & Nelson, 1998; Briggs & Park, 2013; Ndubuisi & Foster-McGregor, 2018).[3] The knowledge transfer channel on the other hand argues that effective domestic IPRs protection expands domestic firms access to superior technologies which either reduces the marginal cost of production, improves their productivity or the quality of their goods due the use of more efficient technologies, thereby turning the country into an export platform after some adjustment periods (Yang & Maskus, 2009; Maskus & Yang, 2018) or contribute to its export success.[4] The border channel works along influencing the number of exporter's market destinations or the product the exporter can serve a foreign market with since countries like USA or regions like EU prohibit the importation of IPRs infringing goods into their markets (Ndubuisi & Foster-McGregor, 2018). Contrary to these studies, the channel I argue and test here is the credit channel.

The role of firms' access to finance in promoting export activities is well documented in the literature (Manova, 2013; Crino & Ogliari, 2017). Essentially, unlike domestic

[3] Essentially, product-cycle and technology-gap trade models assume innovation predicts the export performance of a country.

[4] This must not be blueprint technologies. It could also be in the form of uncodified knowledge which are willfully transferred to firms but are governed by formal contracts and enforced by the IPRs institution of the country.

producers, exporting is associated with additional huge variable and fixed costs. Consequently, a firm's participation in foreign market becomes a function of its ability to overcome these costs, with access to external finance being often emphasised as a panacea in this regards. Building on a recent work by Alimov (2019) which provides compelling evidence that effective domestic IPRs protection influences the credit lenders' assessment of the borrowers expected cash flows risk, the collateral value of its intellectual properties, and information risks (Alimov, 2019, p. 197) and ultimately expands firms access to external finance, I postulate that effective domestic IPRs protection can also affect own country's export by expanding incumbent firms access to finance with which they can use to loosen their financial constraints, especially as it relates to huge fixed and variable costs associated with exporting.

First, effective domestic IPRs protection excludes others from unduly appropriating the rents and values due to a IPRs protected product(s) or assets. Along this line, owing these products/assets can thus signal to financial investors that a firm has proprietary rights over a technology or product that could penetrate foreign markets if the firm had the time and resources to develop it (Maskus, 2015, p. 15) and thereby increases firms access to external finance. In principle also, the IPRs protected products/assets value enhancement due to effective domestic IPRs protection ensures higher and steadier profits for the firm thereby alleviating any concern about future earnings. For an exporting firm with valuable IPRs assets, this will reduce their credit risks and other things equal, expand their access to external finance as a firm's assess to external finance are often jointly contingent on her future cash flows and creditworthiness. Second, external finance are often backed by collateral since in the event of default lenders must recover their losses by exploiting the value of hypothecated asset. On the other hand, IPRs assets are considered as poor collaterals due to their intangibility and concerns about redeployment (Hall & Lerner, 2010; Alimov, 2019). By conferring stronger market power to the patent holder however, effective IPRs protection increases the liquidity and redeployability of these assets, including its liquidation value from the lenders perspective in the event of default (Alimov, 2019). In this case, effective IPRs protection creates a scenario wherein exporters can use these assets – such as patents and trademarks – in the same way they use tangible assets as collateral. Third, effective IPRs protection enhances the firms' ability to securely disclose private "soft" information about their IPRs protected assets with the lender which they will be unlikely willing to disclose under weaker IPRs regime. This will reduce uncertainty about the firm's future prospects and ultimately, the cost of loan (Alimov, 2019 p. 197).

The forgoing discussion leads to the hypothesis that effective domestic IPRs protection will increase exporters' export activities because it loosens exporters' liquidity

constraints, thereby enabling them overcome the enormous variable, sunk and fixed costs they face.

3. Methodology

My empirical model builds on Rajan and Zingales (1998) whom interacted sector financial dependence intensities with an indicator of national financial development to study the impact of financial development on the output growth of more external finance dependent sectors. In a similar fashion, my empirical model interacts each sector's financial dependence intensities with country level IPRs protection indicator to evaluate whether countries with more effective domestic IPRs protection export relatively more in sectors that are more financially vulnerable i.e. sectors that require more outside capital and are with few conventional collateralisable assets. The baseline equation that guides this exercise is thus given as:

$$E_{cjst} = \alpha_c + \alpha_j + \alpha_t + \beta_0 IP_{ct} + \beta_1 (IP_{ct} * EF_s) + \beta_2 (IP_{ct} * AT_s) + \beta_{i\ldots1} X_{i\ldots1} + \varepsilon_{cst} \ldots . (1)$$

where E_{cst} is the export value of country *c*'s export from sector s to country *j* in period *t*. IP_{ct} is the level of IPRs protection in country *c*. EF_s and AT_s are the financial vulnerability intensities of each sector, with the former indicating the extent of sector's dependence on external finance and the latter indicating the tangibility of each sector's assets (more on this in the next section). Whereas the total impact of effective domestic IPRs protection on export is given as $\frac{\partial(\ln E_{cjst})}{\partial IP_{ct}} = \beta_0 + \beta_1 EF_s + \beta_2 AT_s$ we are interested in the relative export response of more financially vulnerable sectors due to effective domestic IPRs protection which are given by the parameter $\beta_1$and β_2 while the respective sizes of these parameters give the magnitude of this response. β_1 and β_2 are therefore the parameters of interests. α_c, α_s and α_t are country, sector, and year fixed-effects, respectively. In addition to accounting for omitted variables such as Multilateral Resistance Terms that may bias our results, the inclusion of these fixed-effects serve two other purposes. First, following Baldwin and Taglioni (2006), they control for a deflation problem, with the export data being expressed in current values. Second, they serve to isolate the effects of our variables of interest, $IP_{ct} * EF_s$ and $IP_{ct} * AT_s$, from any other country-, sector-, and year-specific effects. $X_{i\ldots1}$ comprises a host of conventional gravity and sources of comparative advantage variables. The inclusion of these variables is both guided by literature and the effort to guard against omitted variable bias. The gravity variables controlled for include exporter and importer gross domestic products (GDP) and trade costs including bilateral distances ($\ln DIST$), common border ($CONTIG$), colony ($COLONY$) and Common language ($COMLAN$). With the exception of Distance which is measured in kilometers per distance, these other variables are dummies which take the value of one if the country-pairs are common in those dimensions and zero

otherwise. For the conventional sources of comparative advantage, I account for the linear terms of skill (H_{ct}), natural resources (N_{ct}) and physical capital (K_{ct}) endowments of each country alongside their respective interaction terms with the skill (h_s), natural resource (n_s) and physical capital (k_s) intensities of each sector. Finally, ε_{cst} is the idiosyncratic error term. Estimation of equation 1 is achieved using OLS estimator.

4. Data

(a) Dependent Variable

Original data for the dependent variable is sourced from the BACI-CEPII database. I extract a sample of 47 countries from the 6 digit HSC-0 dataset for which there are corresponding independent and control variables. I then use a concordance table to map the 6 digit HSC-0 products into the 3 digit ISIC Rev. 3.[5] From this, I derive five outcome indicators including, total export, a latent variable indicating whether a country export, number of product export, export volume, average value per product and export duration. In line with extant literature (Besedeš & Prusa, 2010; Chen, 2012; Manova, 2013; Ndubuisi & Foster-McGregor, 2018; Azomahou et al., 2019), I define the latent variable and the number of exported product as the extensive export margin while the export volume, average value per exported product and duration of exports are define as the intensive export margins.

(b) Independent and Control Variables

For the independent variable, I use the newly constructed patent right enforcement index developed by Papageorgiadis et al. (2014) (hereafter, PPI). The PPI data covers a sample of 48 countries for the period 1998-2014. In contrast to the Ginarte and Park (1997) index which is a widely used index in the IPRs literature, the PPI index is a *de'facto* IPRs indicator and is available annually. The construction of the index is based on three components that are informed by the transaction costs theory including: (i) servicing costs relating to the quality of patent administration; (ii) property rights enforcement costs relating to the quality of judicial enforcement and the level of corruption in the judiciary; and (iii) monitoring costs relating to the effectiveness and commitment of public authorities that enforce patent rights, and cultural and societal attitudes towards the purchase of infringing goods. The index is constructed on a 0-10 scale and uses factor analysis to allocate weights to each of the three transaction costs dimensions. Countries scoring high on the index indicate strong patent systems whereas low scoring indicates otherwise. On the downside and as is obvious from the above definition, the index only captures patent rights enforcement. Notwithstanding this, studies that have explored other dimensions of IPRs protection such as trademarks and copyrights generally find patent rights to matter most (Park & Lippoldt, 2008).

[5] https://wits.worldbank.org/product_concordance.html

The standard gravity variables including, DIST, CONTIG, COLONY and COMLAN are sourced from the BACI-data while data on country characteristics including exported and importer GDP and natural resource rents are taken from the World Development Indicators. Data on human capital and physical capital are taken from the version 9.0 of the Penn World Table

(c) Sector Characteristics

Data on the intensity of each sector's financial vulnerability vis-a-vis external finance dependence (EF_s) and asset tangibility (AT_s) of each sector are sourced from Manova (2013). These indicators were however originally constructed by Rajan and Zingales (1998) and Braun (2003), respectively. The indicators are constructed using Compustat annual industrial data on all publicly-listed firms in the US. As emphasised in the extant literature (Rajanand & Zingales, 1998; Braun, 2003; Manova, 2013, Crino & Ogliari, 2017), using US as the reference country is convenient due to limited cross-country comparable data and because it ensures that the measures are not endogenous to macroeconomic variables of interests such the levels of domestic IPRs protection. The latter is possible because the method provides a universal ranking of sectors' financial vulnerability which are independent of a country-sector specific financial vulnerability. Furthermore, as the financial market of US is well-developed, using US data as the benchmark ensures that the realised indicators are more reflective of firms' optimal choice over external financing and asset structure in each sector (Rajan & Zingales, 1998; Manova, 2013, Crino & Ogliari, 2017). Accordingly, EF_s is the share of capital expenditures not financed with cash flows from operations, while AT_s is the share of net property, plant, and equipment in total book-value assets. Both measures are averaged over 1986–1995 for the median firm in each industry (Manova, 2013). Premised on the analytical framework set up in section 2, I use these two indicators to capture the financial vulnerability of each sector and then gauge the outcome variable as the levels of IPRs protection varies. For instance, given that effective domestic IPRs protection boosts the value of intangible assets such as patents and trademarks, the exports from those sectors characterised with large intangible assets should increase as they can now either out-license or use their intangible assets as collaterals while sourcing external finance in order to overcome the additional variable and fixed costs associated with exporting. Equally, effective IPRs protection by given value to intangible assets, owning these assets can therefore signal technological capability and sophistication of a firm to financial investors thereby expanding the firm's access to external finance which should apply more forcefully to those sectors that depend more on external finance. Accordingly, I expect that β_1 and β_2 in equation 1 to be positive and negative, respectively. Finally, other sector characteristics including, skill (h_s), natural resource (n_s) and physical capital (k_s) intensities are also sourced from Manova (2013).

Table 1 – The Credit Channel and the Export effects of Domestic IPRs protection

	Panel A						Panel B				
	Total Export						Extensive Margin		Intensive Margin		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
IP_{ct}	-0.024	0.121	0.05	-0.044	0.111	0.05	-0.02	-0.016	0.014	0.066	0.003
	[0.009]***	[0.011]***	[0.011]***	[0.007]***	[0.009]***	[0.009]***	[0.008]**	[0.005]***	[0.011]	[0.007]***	[0.010]
$IP_{ct} * EF_s$	0.198		0.186	0.173		0.162	0.086	0.07	0.148	0.092	0.065
	[0.007]***		[0.007]***	[0.006]***		[0.006]***	[0.004]***	[0.003]***	[0.007]***	[0.005]***	[0.004]***
$IP_{ct} * AT_s$		-0.289	-0.236		-0.341	-0.298	-0.072	-0.06	-0.191	-0.238	-0.081
		[0.022]***	[0.022]***		[0.020]***	[0.020]***	[0.010]***	[0.007]***	[0.024]***	[0.015]***	[0.010]***
Controls	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-FF	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer-FF	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-FF	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year- FF	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.53	0.53	0.53	0.65	0.65	0.65	-	0.72	0.61	0.5	-
N	1,513,174	1,513,174	1,513,174	1,513,174	1,513,174	1,513,174	2,292,624	1,513,174	1,507,537	1,513,174	0.3

*** p<0.01, ** p<0.05, * p<0.10. Standard errors clustered at the country-pair level in square brackets. Controls include host of gravity variables and conventional sources of comparative advantage as discussed in section 3. The dependent variable of column 1-6 is the total export value (E_{cjst}). The dependent variable of column 7 is a latent variable defined as $\rho_{cjst} = Pr\ (\ E_{cjst} > 0|observables)$ where subscripts are as defined in equation 1. In column 8 the dependent variable is the number of exported 6 HSC-0 products. In column 9 and 10 the dependent variables are the volume and the average value of exported 6 HSC-0 products, respectively. The dependent variable in column 11 is the duration of export defined as $D_{cjst} = Pr\ (E_{cjst} > 0|E_{cjst-1} > 0, \dots)$.

5. Empirical Results

Table 1 displays the result on the export effects of domestic IPRs protection via the credit channel. Each column in the table contains a full set of exporter, importer, sector and time fixed effects. Accordingly, I exclude the individual effects of sector-specific time-invariant factors including,EF_s, AT_s, n_s, h_s and k_s since they will be subsumed in the sector fixed-effects. Starting with Panel A, I introduce the variables of interests, $IP_{ct} * EF_s$ and $IP_{ct} * AT_s$, individually in column (1) and (2) and jointly in column (3). These columns neither control for gravity variables nor conventional sources of comparative advantage. Across each column in the panel, we observe that the coefficients for the variables of interest, $IP_{ct} * EF_s$ and $IP_{ct} * AT_s$ have the expected signs and are statistically significant at all conventional levels. These indicate that countries with more effective domestic IPRs protection have comparative advantage in financially vulnerable sectors. More specifically, with the estimated coefficient of 0.162 obtained for the coefficient of $IP_{ct} * EF_s$, the result indicates that if a country increases its IPRs protection, its total export value will increase by 14.7 percent more for a sector at the 90th percentile of external finance dependence than for a sector at the 10th percentile. Conversely, the estimated coefficient of -0.298 obtained for the coefficient of $IP_{ct} * AT_s$ suggests that if a country increases its IPRs protection, its total export value will increase by 9.7 percent more for a sector at the 10th percentile of collateralisable asset tangibility than its sector at the 90th percentile.

To address potential omitted variables column 4-6 account for conventional sources of comparative advantage along with gravity variable as specified in equation (1). As the results suggest, controlling for these variables only marginally affect the sizes of the coefficients of the variables interest but leaves the conclusion unchanged in qualitative terms. The result displayed in Panel A therefore provide the first empirical evidence suggesting that one of the pathway effective domestic IPRs protection affects own country's export is via the credit channel i.e. by expanding firms access to finance. This conclusion is consistent to Alimov (2019) which provides persuasive empirical evidence suggesting that effective domestic IPRs protection expands firms' access to finance by lowering the cost of corporate borrowing, the ability of innovating firms to raise debt, and foreign lenders participation in loan syndicates. The conclusion is also consistent to studies examining how finance and IPRs interact to loosen the liquidity constraints of innovative firms (Amable et al., 2011; Huang et al., 2017). Essentially, a result emanating from this literature suggests that possessing a valuable patent relaxes the R&D financing constraints of a firm as the firms portfolio of intangible assets can be hypothecated in the same way as tangible assets. My result albeit focused on export is somewhat similar in that the additional variable and upfront suck and fixed costs faced by exporters can be paralleled to the R&D financing constraint faced by innovating firms.

Panel B displays the results for the export margins, with column 7-8 displaying the results for the extensive margin and column 9-11 reporting the results for the intensive margin. Column 7 emerges from an estimation of a probit model. The dependent variable in the column is therefore a binary variable representing trade existence, which equals one if a country-sector pair has positive trade in a year and zero otherwise. The coefficients for the variables of interest, $IP_{ct} * EF_s$ and $IP_{ct} * AT_s$, have the expected signs and are statistically significant at all conventional levels. This suggests that the probability of exporting or forming new export relationships increases with effective domestic IPRs protection, relatively more in sectors where firms rely more on outside capital and have less conventional collaterable assets. Colum 8 displays the result when we consider the number of exported products. Again, the key variables of interests, $IP_{ct} * EF_s$ and $IP_{ct} * AT_s$ continue to have the expected sign and are statistically significant at all conventional levels. Next, the subsequent three columns in the table display the result on the intensive margin, with column 9 reporting the result on the volume of exported products; column 10 reporting the result on the average value per product; and column 11 reporting the result on the duration of export. Interestingly, in each column, the coefficients of $IP_{ct} * EF_s$ and $IP_{ct} * AT_s$ continue to maintain the expected signs and are highly significant at all conventional levels. This leads to the conclusion that effective domestic IPRs protection increases export both along the extensive and intensive export margins, relatively more for financially vulnerable sectors. This conclusion is somewhat different from those obtained in Ndubuisi and Foster-McGregor (2018) showing that the export effect of domestic IPRs protection works largely through the extensive margin. Unlike in that study however, the current study document a pathway effective domestic IPRs protection may affect exports along the intensive margin.

Growth at the extensive margin is usually driven by a reduction in fixed and variable costs as the latter incentivises firms to enter the market or expand the variety of goods they enter the market with. On the other hand, the intensive margin is driven largely by changes in the variable costs. By finding that effective domestic IPRs protection increases export along the extensive and intensive margins therefore, the results show that effective IPRs protection can help overcome the fixed and variable cost associated with export. This occurs because effective domestic IPRs protection expands firms' access to finance with which they can afford to pay the fixed and variable costs of entering foreign markets and the variable cost associated with sustaining existing trade relationship. The result for the duration of export is also highly instructive. Besedeš and Prusa (2010), for instance, advances and empirically showed that survival of existing trade relationships is a necessary requirement for trade deepening and export long-run growth than building new trade relationships, while Azomahou et al. (2018) argue that the extensive margin may be unduly emphasised in the presence of short-lived trade

relationship. On the one hand therefore, the result for export duration suggests a potential pathway effective domestic IPRs protection leads to a deepening of trade relationships and long-run trade growth. It therefore contributes to the nascent literature on the determinants of duration of trade relationships (Nitsch, 2009; Besedeš & Prusa, 2010; Chen, 2012; Azomahou et al., 2019) by showing how effective domestic IPRs protection may help a country sustain an existing trade relationship. On the other hand, the similar result (in qualitative terms) observe both for the extensive margin and the export duration is reassuring on the potential trade expansion effect of IPRs protection and hence resolves Azomahou et al. (2019) scepticism. The results displayed in Panel B therefore leads to the conclusion that effective domestic IPR enhances the ability of countries to form new export relationships, service the new market, and sustain those trade relationships.

Finally, to assess the relative importance of both margins I focus on column 8 and 11. Essentially, both margins follow a linear decomposition such that if both margins are in logs, any linear operator such as OLS should give estimates which when summed will add-up to the corresponding estimate for total exports in column 6. While this conjecture is easily confirmed, examining the coefficient suggests a higher export impact at the intensive margins. Specifically, the results indicate that the intensive export margin accounts for about 57 (=0.07/0.162) percent increase in the relative export performance of more externally dependent sectors and 80 (=-0.06/-0.298) percent increase in the relative export performance of sectors that have few conventional collateralisable assets due to positive changes in the levels of domestic IPRs protection.

6. Conclusion

Recent scholarships on trade effects of IPRs protection are now focused on the impact of domestic IPRs protection on own country's export. While this literature remains sparse and as it is still emerging, extant studies rely on three channels, innovation, technology and border, in their narrative on how effective domestic IPRs protection can affect own country's export. I extend this literature in this study by proffering and empirically showing the *credit channel*, as an additional pathway effective domestic IPRs protection affects own country's export. Among many others, this occurs because effective domestic IPRs protection creates a scenario wherein exporters can use their intellectual properties in the same way they use tangible assets as collateral to overcome the huge variable and upfront fixed costs they face. To underscore this pathway, I adapt the comparative model within a gravity model and evaluate the relative export performance of those sectors that are more financially vulnerable for each additional increase in the levels of domestic IPRs protection. Using a sample comprising bilateral exports from 27 sectors in 47 countries into 175 countries between 1998-2011, the result suggest that countries with more effective domestic IPRs protection export more from

those sectors that depend more on external finance and have more intangible assets. Examining the different export margins, I find that effective domestic IPR enhances the ability of countries to form new export relationships, service the new market, and sustain those trade relationships. These suggests that effective domestic IPRs protection can help increase export by expanding firms access to finance in order to meet up their huge financial demands.

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