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Preferential Trade Agreements, Intellectual Property Rights, and Third-Country Trade: Assessing the Impacts of the New Multilateralism*

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A str t

Preferential trade agreements (PTAs) have proliferated with the ongoing rise in globalization. Beyond their traditional purview of liberalizing trade and encouraging market access between agreement members, the provisions included in newer PTAs encompass areas not explicitly related to trade in goods: areas such as intellectual property rights (IPRs), the focus of this paper. And while the main effects of the market access provisions of PTAs are felt foremost by the members of the agreements, IPR provisions have the potential to generate spillover effects on member countries' economic relations with non-members. This paper assesses the existence of these IPR policy spillover effects on members' third-country trade (trade with countries outside of the PTA) in industries that differ in the extent to which they rely on IPRs. Countries that enter into PTAs with the United States, the European Union, or the European Free Trade Association—economies that include the most substantive IPRs provisions in the PTAs that they negotiate—exhibit a significant restructuring of their patterns of trade relative to otherwise similar countries that do not. Most of these effects are concentrated in exports, but import effects are also evident, with the results being sensitive to PTA members' levels of development and the sectoral composition of trade. These findings suggest that IPRs provisions shape the effects of PTA formation in ways that have heretofore been unexplored.

wor s **Preferential trade agreements, intellectual property rights, third-country trade, gravity**
JE Co s **F13, F14, F15, O34**

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increasingly important facet of globalization.

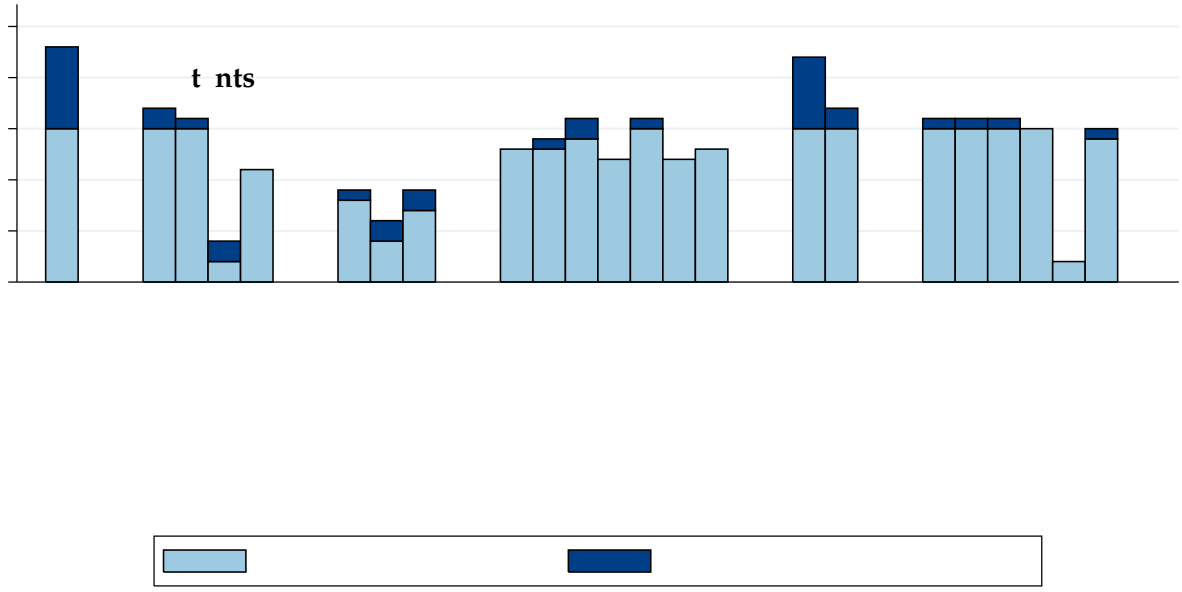
Setting aside the issue of IPRs, the literature on the effects of the formation of PTAs is broad and well-established. As framed in the early treatment by Viner (1950), PTAs engender competing

outside of the PTA. The IPR provisions required in PTAs thus o

at the intersection of PTAs and IPRs, emphasizing the recent history of the PTAs negotiated by the

and the difficulty of obtaining further IPRs concessions from

F ur **Number of IPR-related preferential trade agreements by Presence of Specific Provisions**



changes in the structure of a country's comparative advantage and the composition of its trade. In the classical sense of comparative advantage, countries with robust IPR regimes should be expected to specialize relatively more in those commodities that intensively rely on their protections, and thus export relatively more in industries that are intensive in their reliance on IPRs, and export

Three Mechanisms and Potential Impacts of IPRs-upgrading on PTA Members' Third-Country Trade

	I nt ns v n ustr s	I un nt ns v n ustr s
IPRs as a source of comparative advantage	Exports ↑ Imports ↓	Exports ↓ Imports ↑
Market power (MP) versus market expansion (ME)	MP > ME: Imports ↓ ME > MP: Imports ↑	?
Decisions of MNEs as they relate to IPRs	Exports ? Imports ↓	?
Implied total effects	Exports ↑? Imports ↑↓?	Exports ↓? Imports ↑?

the likelihood that imitation or appropriation of a multinational's proprietary knowledge assets or production processes will take place; strong IPRs and their effective enforcement signal to owners of IP that these sorts of actions are less likely to occur (see, e.g., Markusen 2001 or Javorcik 2002). With an increase in the rigor of a country's IPRs, multinationals might be more inclined to serve a market through local production or licensing versus exports, which would reduce the destination market's imports of IPR-intensive commodities. FDI might also increase competitive pressures on local firms operating in these particular industries, who might as a result export less to other markets. At the same time, it could also be the case that MNEs establish production in a target market and then export from there to nearby markets—e.g. a foreign firm constructing a new plant in Chile to sell to the Argentinean and Peruvian markets. The effect on exports is thus ambiguous. While this analysis focuses on the relationship between IPRs and trade, FDI remains a crucial component of the nexus between the two, and even though the estimation approach will be unable to delineate the specific mechanisms underlying the results, the FDI versus exporting decisions of MNEs are inherently interlinked.

The exact effects of stronger IPRs on trade are thus ambiguous, but the mechanisms outlined above offer some guidance on what impacts are to be expected. Table 2 summarizes the potential effects of these three channels on the third-country exports and imports of IPR-related PTA mem-

gregated by industry, this effect turned out to be exclusive to trade in the least patent-sensitive industries, rather than industries most reliant on patents.

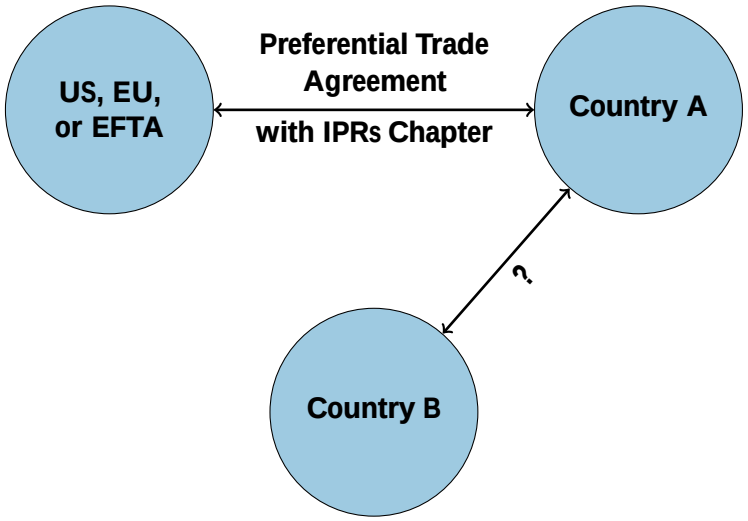
Following Maskus and Penubarti (1995), several other noteworthy studies have approached the issue of IPRs and trade. Smith (2001) further explored the relationship between foreign patent rights and trade, examining the behavior of US multinationals with regard to their decisions vis-à-vis exporting versus selling through an affiliate versus licensing. Exports tended to be positively associated with stronger foreign patent rights, likewise a

in developing countries' imports—an estimated $35 billion in value—resulting from TRIPS implementation, and further, found this expansion to have resulted from an increase in quantities, rather than prices; evidence in favor of a significant market-expansion effect.

Of relevance to this research is the work of Delgado et al. (2013), who inv

? ? r ountr n s

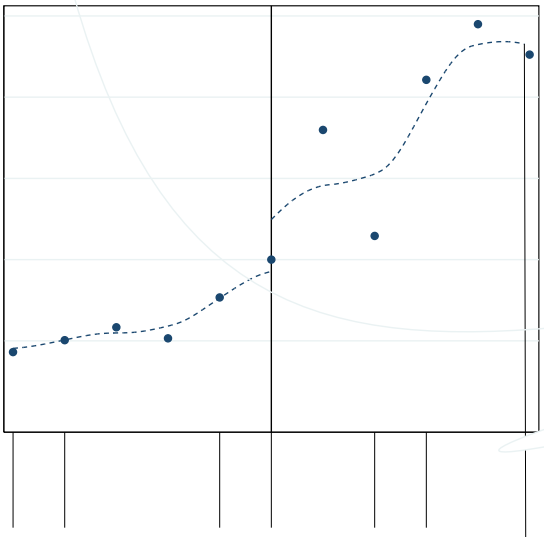
F ur IP-Related PTA Accession and Third-Country Bilateral Trade



imagine that Country A enters into an IPR-related PTA, thus upgrading its IPRs regime, with the explicit purpose of affecting its trade with Country B—if that were the case, Country A could unilaterally improve its IPRs standards without the effort of negotiating and enacting a PTA: for instance, by acceding to international treaties on IPRs or adopting TRIPS-Plus standards of its own volition. The policy treatment of IPR-related PTA accession is thus arguably exogenous with respect to members' trade with non-PTA members. This third-country mechanism in the context of PTAs with IPRs chapters is a novel contribution to the existing literature.

Figure 3 presents a specific case where the existence of a third-country effect is evident in the data by portraying the average bilateral trade in biopharmaceuticals of low-income US IPR-related PTA partners in an event-study framework. Here, the year 0 is the year in which each country entered into an IPR-related PTA with the US, with the value of imports in each panel normalized to equal 100 in this year. The first panel depicts imports from the US, an increase that is expected to be one of the first-order effects of PTA accession, IPRs-related or otherwise. On average, low-income partners' imports of biopharmaceuticals from the US increases in the wake of the formation of the PTA—a reduction in barriers to trade leads to more trade, and the trend in the growth of trade is elevated after the agreements are enacted. The second panel, however, presents a more surprising finding. This series depicts average bilateral trade with all non-US partners (or, in the case of multilateral PTAs such as NAFTA or CAFTA, all non-PTA partner trade). Strikingly, average imports from countries besides the US increase substantially after the enactment of the

F ur ? Bilateral Pharmaceutical Trade of Low-income US IPR-related PTA Members: Imports with US and Other Partners



E p r An s s

In this section, I employ a panel of sector-level bilateral trade data for 187 countries (and thus $187 \times 186 = 34{,}872$ potential country-pair linkages), with coverage over the years 1995 to 2014 (a period over which numerous US and European IPR-related preferential trade agreements were negotiated and entered into force), to examine the role that IPR-related PTAs play in determining the composition and magnitude of members' third-country trade flows. I construct the dependent variable—unidirectional trade flows between bilateral country pairs in a given year/sector—in the following way. For bilateral linkages between countries that will enter into an IPR-related PTA (as defined above) at any point in the sample, or have entered into an IPR-related PTA, I

country enters into such an agreement, and remain equal to one as long as the country remains party to the agreement.[8] For example, since Chile's PTA with the US entered into force in 2004, then for all observations for the year 2004 and later in which Chile is an exporter, IPA_{it} is equal to one, and for all observations in which Chile is an importer, IPA_{jt} is equal to one. To emphasize the interpretation of the IPA variables, it is important to note once more that they correspond to third-country effects, which give the impact of i's (j's) membership in an IPR-related PTA on i's (j's) trade with some extra-PTA member j (i)—hence the variable's definition being specific to a

used in Park (

high-IP goods belonging to none of the above categories (Other). Given results from the existing literature, along with the numerous sector-specific emphases embedded in IPR-related PTAs, noticeable differences might materialize in the extent to which trade in different sectors is affected by IPRs-upgrading.

Finally, since much of the existing literature focuses on the differential effects of IPRs on economies at different stages of development, I assign countries to one of four different income groupings based on per capita incomes, taken from the World Bank's classification (World Bank, 2016): low income (denoted LI), lower-middle income (LMI), upper-middle income (UMI), and high income (HI). To account for the potentially endogenous relationship between the value of trade and per-capita incomes, I fix countries' income classification at their levels at the beginning of the sample (1995).

Table 3 briefly summarizes the features of the countries in the data at the start of the sample, broken down by income groupings. I denote those countries that enter into an IPR-related PTA with the US or Europe at any point in the sample as "member countries," and those that do not as "non-member countries." Included in the table are averages of countries' GDPs as well as aggregate values of exports and imports in high-IP and low-IP industries (defined in more detail in the next subsection), commodities the production of which is respectively intensive in or unintensive in the use of different types of IPRs.

Within income groups, member countries are generally similar to non-member countries with respect to economy size, with the exception of the upper-middle income group, in which non-members tend to be larger at the beginning of the sample in a statistically significant way. In terms of the volume of trade that the two types of countries undertake, no statistically significant systematic differences exist, again with the exception of the upper-middle income countries—though much of this difference is likely explained by the disparity in the average sizes of these countries. Whether these differences exist after controlling for factors such as economy size and other country-level characteristics will be revealed in the econometric analysis. Though on their face, these summary statistics can only reveal a limited amount of information, they are reassuring in that the countries that select into IPR-related PTAs do not seem to do so because they initially undertake high or low levels of trade in IPR-intensive commodities.

? **Sample Summary Statistics (1995)**

	r ountr s		on r ountr s		D r n	
Variable	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**t-stat**
H n o HI? ountr s						
GDP	499.74	648.38	825.51	2,179.54	−325.77	−0.65
High-IP trade	113.81	121.86	77.51	177.25	36.30	0.75
Low-IP trade	58.26	57.12	40.21	80.66	18.05	0.81
pp r n o I ountr s						
GDP	24.53	38.68	158.33	225.58	−133.80	−2.11*
High-IP trade	5.77	7.31	22.91	29.28	−17.14	−2.05*
Low-IP trade	4.95	5.74	18.85	17.17	−13.90	−

posed estimating the underlying structural gravity model v

The dependent variable is the unidirectional value of bilateral exports from exporter i to importer j in sector s in year t, which is denoted by T_{ijst}. In the baseline, s indexes IPR-intensive (high-IP) versus IPR-unintensive (low-IP) sectors. High-IP_s and Low-IP_s are indicator variables that respec-

ple for reasons unrelated to IPR-related PTA accession. By c

Equation (2) is similar to equation (1), but now, the IPA and TRIPS variables are interacted with the income group of the importer or exporter—thus, the policy effects originally captured by coefficients β_5 through β_{12} are now allowed to differ across income groups:

$$
\begin{aligned}
\mathbf{T_{ijst}} = \exp\Big\{ & \beta_1 \log\left(\mathbf{GDP_{it}}\right) + \beta_2 \, \mathbf{High\text{-}IP_s} \times \log\left(\mathbf{GDP_{it}}\right) \\
& + \beta_3 \log\left(\mathbf{GDP_{jt}}\right) + \beta_4 \, \mathbf{High\text{-}IP_s} \times \log\left(\mathbf{GDP_{jt}}\right) \\
& + \sum_g \beta_{5g} \, \mathbf{Group_i^g} \times \mathbf{Low\text{-}IP_s} \times \mathbf{IPA_{it}} + \sum_g \beta_{6g} \, \mathbf{Group_i^g} \times \mathbf{High\text{-}IP_s} \times \mathbf{IPA_{it}} \\
& + \sum_g \beta_{7g} \, \mathbf{Group_i^g} \times \mathbf{Low\text{-}IP_s} \times \mathbf{TRIPS_{it}} + \sum_g \beta_{8g} \, \mathbf{Group_i^g} \times \mathbf{High\text{-}IP_s} \times \mathbf{TRIPS_{it}} \\
& + \sum_g \beta_{9g} \, \mathbf{Group_j^g} \times \mathbf{Low\text{-}IP_s} \times \mathbf{IPA_{jt}} + \sum_g \beta_{10g} \, \mathbf{Group_j^g} \times \mathbf{High\text{-}IP_s} \times \mathbf{IPA_{jt}} \\
& + \sum_g \beta_{11g} \, \mathbf{Group_j^g} \times \mathbf{Low\text{-}IP_s} \times \mathbf{TRIPS_{jt}} + \sum_g \beta_{12g} \, \mathbf{Group_j^g} \times \mathbf{High\text{-}IP_s} \times \mathbf{TRIPS_{jt}} \\
& + \alpha_i \, \mathbf{t} + \alpha_j \, \mathbf{t} + \alpha_{g_i st} + \alpha_{g_j st} + \alpha_{ij} \Big\} + \nu_{ijst}.
\end{aligned}
\tag{2}
$$

$\mathbf{Group_i^g}$ and $\mathbf{Group_j^g}$ are indicator variables that denote whether exporter i or importer j belongs to income group $g \in \{\mathbf{LI}, \mathbf{LMI}, \mathbf{UMI}, \mathbf{HI}\}$. With three dozen coefficients of interest to interpret (2 sectors $\times$ 4 income groups $\times$ 2 policies for both importers and exporters), this is a complicated regression equation.[18]

Turning to estimation, the results from estimation of equation (2) are shown in Table 4.[19] Columns (1) and (2) respectively display the exporter and importer coefficients, both of which are generated by the same regression. Because of the inclusion of the bilateral pair fixed effect α_{ij}, observations on bilateral linkages where trade is always zero—e.g. Afghanistan is never recorded as exporting to Zimbabwe during the years in the sample—must be omitted, since this fixed effect perfectly predicts trade between such pairs. It is important to note that the estimates in both columns are from the same regression, with exporter and importer effects "unstacked" to facilitate

unchanged with the use of these alternative definitions.

[18] To illustrate the correct interpretation, consider the impact of exporter i's accession to an IPR-related PTA on its high-IP exports. The exact effect depends on the income group of i, and is given by either β_{6LI}, β_{6LMI}, β_{6UMI}, and β_{6HI}; for instance, a low-income country will see a difference of β_{6LI} on its high-IP exports. Similar interpretations will apply to the other sector, group, and policy combinations.

[19] Only recently have algorithms been developed to efficiently estimate relationships with a large number of high-dimensional fixed effects such as ours. I implement the PPML estimation using a modification of the iterative Gauss-Seidel algorithm of Guimarães and Portugal (2010) based on the `reghdfe` module for Stata by Sergio Correia (2014).

their presentation.[20]

I first focus on the results for exporters in column (1). The income elasticities of exports are significantly positive, and broadly conform to previous estimates from the literature. The income elasticity with respect to high-IP exports ($0.129 + 0.373 = 0.512$) is larger than for low-IP exports

Bilateral Trade in Low-IP and High-IP Sectors (excluding trade with current or future IPR-related PTA partner)

	(1) Exports	(2) Imports
log(GDP)	0.129***	0.533***
	(0.036)	(0.032)
High-IP × log(GDP)	0.373***	0.023
	(0.033)	(0.034)
LI × Low-IP × IPA	−0.131	−0.264*
	(0.107)	(0.154)
LMI × Low-IP × IPA	−0.265***	−0.003
	(0.097)	(0.066)
UMI × Low-IP × IPA	−0.748***	−0.062
	(0.143)	(0.099)
HI × Low-IP × IPA	−0.222**	0.029
	(0.100)	(0.079)
LI × High-IP × IPA	−0.064	0.298**
	(0.215)	(0.134)
LMI × High-IP× IPA	0.388***	0.019
	(0.111)	(0.078)
UMI × High-IP × IPA	0.471***	0.258***
	(0.155)	(0.082)
HI × High-IP × IPA	0.173***	−0.031
	(0.067)	(0.068)
LI × Low-IP × TRIPS	−0.298***	0.230**
	(0.077)	(0.107)
LMI × Low-IP × TRIPS	−0.561***	0.146**
	(0.084)	(0.058)
UMI × Low-IP × TRIPS	−0.488***	−0.173**
	(0.077)	(0.078)
HI × Low-IP × TRIPS	0.451***	0.068
	(0.102)	(0.096)
LI × Low-IP × TRIPS	0.595***	0.354***
	(0.115)	(0.097)
LMI × Low-IP × TRIPS	1.428***	−0.079
	(0.154)	(0.049)
UMI × Low-IP × TRIPS	1.130***	0.137**
	(0.163)	(0.055)
HI × Low-IP × TRIPS	0.150**	0.012
	(0.074)	(0.059)
Observations		1,055,276
No. of country pairs		27,892
Country trends		✓
Group-sector-year FEs		✓
Pair FEs		✓

Notes: The dependent variable is bilateral trade flows excluding trade with future/current IPR-related PTA partners. Columns (1) and (2) present exporter and importer coefficients from the same regression. Robust standard errors clustered by bilateral pair are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

upgrading—other impediments to trade, such as underdeveloped institutions in areas besides IPRs, impede these countries' ability to develop and maintain robust export sectors in IPR-intensive industries. Exports of LMI countries, however, are affected by IPRs-upgrading, but these countries seem to be able-4.005(d)]TJ293.52tr areasd

Though TRIPS is not the primary focus of the analysis, it is worthwhile to briefly describe what the estimates of the associated coefficients convey (in the empirical exercises to follow, discussion of the TRIPS estimates will be omitted for the sake of exposition). The export results in column (1) seem to mirror the estimates of the IPA export coefficients. Across all levels of income, TRIPS compliance corresponds to substantial decreases in low-IP exports (though only in a statistically significant way for LI, LMI, and UMI countries) and substantial increases in high-IP exports (for all income groups). This has an important implication for the results on IPA: it is not TRIPS alone, nor IPR-related PTAs alone, that impact trade via the IPRs channel. The policies seem to operate in tandem, and IPR-related PTA accession offers a channel for IPRs upgrading with marginal impacts that go beyond those of TRIPS.

? r n I nt ns v u s tors

The most important takeaway thus far is the finding of significant effects of IPR-related PTA accession on exports to extra-PTA third countries in low-IP and high-IP sectors consistent with an

A Bilateral Trade in Low-IP and High-IP Subsectors (excluding trade with current or future IPR-related PTA partner)

	(1) Low-IP	(2) AI	(3) BIO	(4) CHEM	(5) ICT	(6) MED	(7) PT	(8) Other
E port r ts								
log(GDP)	0.124***							
	(0.036)							
Sector × log(GDP)		0.610***	0.362***	0.405***	0.282***	0.623***	0.532***	0.383***
		(0.043)	(0.065)	(0.039)	(0.039)	(0.055)	(0.038)	(0.032)
Sector × LI × IPA	−0.079	0.092	0.272	−0.113	−0.791	1.260**	−0.655**	0.274
	(0.111)	(0.334)	(0.532)	(0.383)	(0.546)	(0.602)	(0.279)	(0.264)
Sector × LMI × IPA	−0.246**	0.939***	2.007***	0.338*	−0.121	0.995***	1.045***	0.482***
	(0.099)	(0.215)	(0.211)	(0.186)	(0.221)	(0.224)	(0.150)	(0.108)
Sector × UMI × IPA	−0.716***	1.534***	1.952***	0.325*	0.271	1.844***	0.624***	0.485***
	(0.146)	(0.230)	(0.254)	(0.186)	(0.279)	(0.288)	(0.193)	(0.110)
Sector × HI × IPA	−0.212**	0.461***	1.131***	0.523***	−0.453***	0.313***	0.586***	0.181**
	(0.099)	(0.099)	(0.158)	(0.086)	(0.098)	(0.116)	(0.113)	(0.072)
Sector × LI × TRIPS	−0.319***	0.380**	−0.469*	−0.216	1.698***	−0.493**	0.146	0.223*
	(0.078)	(0.167)	(0.283)	(0.183)	(0.160)	(0.207)	(0.157)	(0.120)
Sector × LMI × TRIPS	−0.559***	0.985***	1.227***	0.875***	2.812***	2.137***	1.207***	1.066***
	(0.083)	(0.289)	(0.254)	(0.223)	(0.180)	(0.253)	(0.201)	(0.147)
Sector × UMI × TRIPS	−0.489***	1.273***	+1.4569.99(1)-5.99284(.)-3.088.01610.p28759284(.)8.01636(2)5(1)5(6)--2569.98(0)-5.99284(.)8.016					

the pharmaceutical imports of LI countries, which on average increase by a dramatic 1,704.7%. When viewed in conjunction with the results in the next section on the extensive margin of trade, this will be powerful evidence in favor of a strong market expansion effect dominating any market power effects in pharmaceuticals. Beyond pharmaceutical trade, other notable effects come through on the import side: LI PTA members also witness their imports of chemicals, medical devices, and other high-IP commodities increase in the wake of the implementation of rigorous IPRs standards, while ICT imports are seen to decline. For LMI countries, medical device imports in-

margin of trade, which I will take to be the number of varieties exported or imported within each of the specific low-IP and high-IP sectors. Stronger IPRs in a PTA member country might facilitate domestic production of IPR-intensive goods that would not otherwise be produced and exported, and could potentially expand the extensive margin of exports. Similar logic could motivate an expansion in the number of imported varieties: stronger IPRs in a destination market reduce the expected costs of entering that market that might arise from deterring imitation or making sure that IPRs are effectively enforced. On the other hand, if stronger IPRs expand the set of varieties that are produced domestically, this could crowd out imports of these varieties, and thus the overall effect on the extensive margin of imports is not immediately apparent. IPRs, then can thus

This is an imperfect measure of the extensive margin (consider, for instance, the most disaggregated definition of the extensive margin of trade in specific chemicals or pharmaceuticals, where varieties can be delineated at the molecular level), yet it still captures the role of IPRs in influencing the binary decision of whether a particular variety is traded between two countries. On one hand, if the notion of IPRs acting as a determinant of comparative advantage is to be believed, then a country with stronger IPRs will export more varieties of IPRcoue exatew3626.99849sker99512(e)(e)-5(t)-.99735(

A The Extensive Margin of Trade in Low-IP and High-IP Subsectors (excluding trade with current or future IPR-related PTA partner)

	(1) Low-IP	(2) AI	(3) BIO	(4) CHEM	(5) ICT	(6) MED	(7) PT	(8) Other
E port r ts								
log(GDP)	–0.092***							
	(0.010)							
Sector × log(GDP)		0.016***	0.030***	0.164***	–0.062***	0.037***	0.063***	0.048***
		(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.003)
Sector × LI × IPA	0.121***	–0.372***	0.118	0.297**	–0.091	–0.426***	–0.292***	0.026
	(0.047)	(0.069)	(0.097)	(0.141)	(0.059)	(0.103)	(0.071)	(0.058)
Sector × LMI × IPA	–0.138***	0.273***	0.373***	0.115***	0.158***	0.301***	0.218***	0.041
	(0.025)	(0.035)	(0.042)	(0.040)	(0.035)	(0.035)	(0.032)	(0.026)
Sector × UMI × IPA	–0.285***	0.136***	0.053	–0.198***	0.233***	–0.056	0.007	–0.045**
	(0.027)	(0.037)	(0.040)	(0.034)	(0.044)	(0.037)	(0.028)	(0.022)
Sector × HI × IPA	–0.049***	0.010	0.309***	0.266***	–0.173***	–0.017	0.089***	–0.036***
	(0.014)	(0.021)	(0.020)	(0.017)	(0.019)	(0.018)	(0.014)	(0.010)
Sector × LI × TRIPS	–0.232***	0.206***	0.138***	0.137***	0.146***	0.245***	0.168***	0.082***
	(0.015)	(0.033)	(0.030)	(0.031)	(0.027)	(0.026)	(0.031)	(0.015)
Sector × LMI × TRIPS	0.096***	–0.207***	0.150***	0.102***	0.179***	0.015	9886(0)5(4)5(5)5(*)4.00146(*)79*6I6d[(9	

B The Extensive Margin of Trade in Low-IP and High-IP Subsector

composition. Again, there seem to be threshold effects that

high-IP sectors:[26]

$$
\begin{aligned}
\mathbf{T_{ijst}} = \exp\Big\{ & \beta_1 \log(\mathbf{GDP_{it}}) + \beta_{2s}\, \mathbf{High\text{-}IP_s} \times \log(\mathbf{GDP_{it}}) \\
& + \beta_3 \log(\mathbf{GDP_{jt}}) + \beta_{4s}\, \mathbf{High\text{-}IP_s} \times \log(\mathbf{GDP_{jt}}) \\
& + \sum_g \sum_{g'} \beta_{5gg'}\, \mathbf{Group_i^g} \times \mathbf{Group_j^{g'}} \times \mathbf{Low\text{-}IP_s} \times \mathbf{IPA_{it}} + \sum_g \sum_{g'} \beta_{6gg'}\, \mathbf{Group_i^g} \times \mathbf{Group_j^{g'}} \times \mathbf{High\text{-}IP_s} \times \mathbf{IPA_{it}} \\
& + \sum_g \beta_{7g}\, \mathbf{Group_i^g} \times \mathbf{Low\text{-}IP_s} \times \mathbf{TRIPS_{it}} + \sum_g \beta_{8gg'}\, \mathbf{Group_i^g} \times \mathbf{High\text{-}IP_s} \times \mathbf{TRIPS_{it}} \\
& + \sum_g \sum_{g'} \beta_{9gg'}\, \mathbf{Group_j^g} \times \mathbf{Group_j^{g'}} \times \mathbf{Low\text{-}IP_s} \times \mathbf{IPA_{jt}} + \sum_g \sum_{g'} \beta_{10gg'}\, \mathbf{Group_j^g} \times \mathbf{Group_j^{g'}} \times \mathbf{High\text{-}IP_s} \times \mathbf{IPA_{jt}} \\
& + \sum_g \beta_{11g}\, \mathbf{Group_j^g} \times \mathbf{Low\text{-}IP_s} \times \mathbf{TRIPS_{jt}} + \sum_g \beta_{12gs}\, \mathbf{Group_j^g} \times \mathbf{High\text{-}IP_s} \times \mathbf{TRIPS_{jt}} \\
& + \alpha_i\, \mathbf{t} + \alpha_j\, \mathbf{t} + \alpha_{g_i st} + \alpha_{g_j st} + \alpha_{ij} \Big\} + \nu_{ijst}.
\end{aligned}
\tag{5}
$$

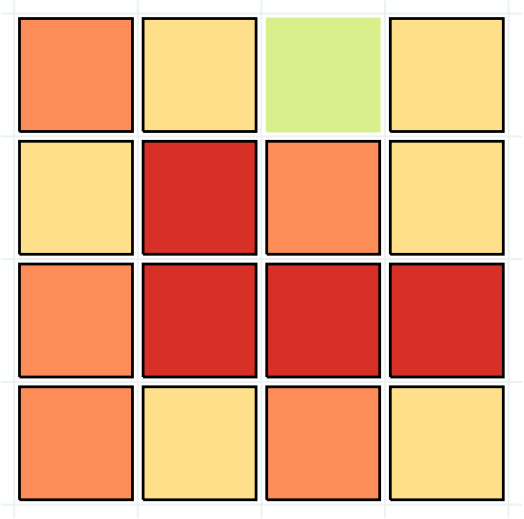
I first a

Effects of IPR-related PTA Accession by Income Group of Trade Partner

F ur Effects of IPR-related PTA Accession by Income Group of Trade Partner

A Low-IP Exports

B High-IP Exports



levels of income; for HI countries, this effect is limited to

and sectoral definitions should come as no surprise. First, as these results relate to notions of comparative advantage, countries at higher levels of development are likely to be better equipped to realize the impacts of stronger IPRs: these countries have different endowment structures relative to less-developed countries, and the upgrading of IPRs per se for lower income countries might not have noticeable effects if other crucial institutions necessary for trade to take place are lacking. Second, given the exact wording of the agreements and the policies that they mandate—namely, TRIPS-Plus provisions relevant to pharmaceuticals, chemicals, and other specific sectors, along with requirements to accede to international treaties on specific areas of IPRs—certain sectors are more likely to be observably impacted than others. The fact that third-country pharmaceutical and chemical trade generally undergoes the largest impacts aligns with this aspect of the agreements. And, importantly, these effects are evident even upon controlling for TRIPS compliance, suggest-

might interact with each other to affect trade, innovation, or the way in which multinationals conduct FDI. Other outcomes beyond trade in goods likewise merit consideration. This work is but a first step in the direction of exploring this increasingly important aspect of globalization, and the results suggest that ignoring the non-trade policy aspects of PTAs would be to ignore the full array of mechanisms through which PTAs impart their impacts.

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App n

D t ₹our s

The data sources are described in Table A1. To construct the measures of bilateral trade flows by sector (high-IP vs. low-IP, and then broken down into more detailed sectors within the high-IP classification), I start with commodity-level bilateral trade data from CEPII (see Gaulier and Zignago 2010) classified by 6-digit Harmonized System codes. Because the high-IP vs. low-IP industry classifications from Delgado et al. (2013) and US Department of Commerce (2012) are delineated by SITC industries, I map (in a one-to-one fashion) the HS6 trade data to a corresponding SITC code based on a concordance from the EU RAMON database (Eurostat, 2017). From here the value of61000cmB1-5(t)-4.00146(a)5(t)-4.00146]TJETQ0gq1000100(m)-67(r)-0.998iothe h

A Countries' Income Group Classifications

H n o HI? ountr s			
Andorra	Denmark	Italy	Singapore
Aruba	Finland	Japan	Spain
Australia	France	Kuwait	South Korea
Austria	French Polynesia	Macao	Sweden
Bahamas	Germany	Netherlands	Switzerland
Belgium	Greenland	New Caledonia	United Arab Emirates
Bermuda	Hong Kong	New Zealand	United Kingdom
Brunei	Iceland	Norway	United States
Canada	Ireland	Portugal	
Cyprus	Israel	Qatar	

pp r n o I ountr s			
Antigua and Barbuda	Czech Republic	Mauritius	St. Kitts and Nevis
Argentina	Gabon	Mexico	St. Lucia
Bahrain	Greece	Oman	Trinidad and Tobago
Barbados	Hungary	Saudi Arabia	Uruguay
Brazil	Libya	Seychelles	
Chile	Malaysia	Slovenia	
Croatia	Malta	South Africa	

ow r n o I ountr s			
Algeria	Fed. States of Micronesia	Marshall Islands	Solomon Islands

(P)1.75079(o)-2.71[(a)-31102.4(4(r)6.87519(2.79998[(e)(h)6.51849((M)-4.21497(i)-3.4[illegible]TJ[(A)1.76713(r)6.90037(v)50(a)(l)-14(e)-463572i)-3.43623(a)-3515.01-

Sectoral definitions and associated SITC Rev. 3 codes and code descriptions

H I n ustr s o o I nt ns v n ss	
Patent-intensive	
Crude fertilizers: 277, 278	Metalworking machinery: 73
Organic and inorganic chemicals: 51, 52	General machinery: 74139, 7421–3, 7427, 743–9
Dyeing materials: 53	Office machines: 75
Medicinal and pharmaceutical products: 54	Telecommunications: 76
Essential oils and perfume materials: 55	Electrical machinery: 77
Chemical materials and products: 59	Professional apparatus: 87
Rubber manufactures: 6214, 625, 6291–2	Photographic apparatus: 881–2, 884, 8853–4

A Bilateral Trade in Low-IP and High-IP Sectors (excluding trade with current or future IPR-related PTA partner)

	Export	ts	Import	ts
	No TRIPS Controls (1)	With TRIPS Controls (2)	No TRIPS Controls (3)	With TRIPS Controls (4)
log(GDP)	0.108***	0.129***	0.512***	0.533***
	(0.036)	(0.036)	(0.033)	(0.032)
High-IP × log(GDP)	0.371***	0.373***	0.024	0.023
	(0.030)	(0.033)	(0.032)	(0.034)
LI × Low-IP × IPA	–0.130	−0.131	–0.365***	−0.264*
	(0.106)	(0.107)	(0.126)	(0.154)
LMI × Low-IP × IPA	–0.399***	−0.265***	0.089	−0.003
	(0.087)	(0.097)	(0.077)	(0.066)
UMI × Low-IP × IPA	–0.725***	−0.748***	0.008	−0.062
	(0.131)	(0.143)	(0.111)	(0.099)
HI × Low-IP × IPA	–0.228**	−0.222**	0.061	0.029
	(0.098)	(0.100)	(0.079)	(0.079)
LI × High-IP × IPA	0.006	−0.064	0.287**	0.298**
	(0.205)	(0.215)	(0.128)	(0.134)
LMI × High-IP× IPA	0.914***	0.388***	–0.059	0.019
	(0.128)	(0.111)	(0.095)	(0.078)
UMI × High-IP × IPA	0.582***	0.471***	0.233**	0.258***
	(0.170)	(0.155)	(0.091)	(0.082)
HI × High-IP × IPA	0.152**	0.173***	–0.070	−0.031
	(0.068)	(0.067)	(0.067)	(0.068)
LI × Low-IP × TRIPS		−0.298***		0.230**
		(0.077)		(0.107)
LMI × Low-IP × TRIPS		−0.561***		0.146**
		(0.084)		(0.058)
UMI × Low-IP × TRIPS		−0.488***		−0.173**
		(0.077)		(0.078)
HI × Low-IP × TRIPS		0.451***		0.068
		(0.102)		(0.096)
LI × High-IP × TRIPS		0.595***		0.354***
		(0.115)		(0.097)
LMI × High-IP × TRIPS		1.428***		

A High-IP and Low-IP Trade, Alternative Samples

	Exports			Imports		
	(1) All trade	(2) No partner trade	(3) No US/EU/EFTA trade	(4) All trade	(5) No partner trade	(6) No US/EU/EFTA trade
log(GDP)	0.127***	0.129***	0.100**	0.552***	0.533***	0.527***
	(0.034)	(0.036)	(0.047)	(0.033)	(0.032)	(0.047)
High-IP × log(GDP)	0.302***	0.373***	0.392***	0.014	0.023	−0.090**
	(0.027)	(0.033)	(0.047)	(0.031)	(0.034)	(0.044)
Low-IP × LI × IPA	−0.169*	−0.131	−0.290*	0.277	−0.264*	0.019
	(0.090)	(0.107)	(0.151)	(0.305)	(0.154)	(0.209)
Low-IP × LMI × IPA	−0.453***	−0.265***	−0.002	0.037	−0.003	0.191*
	(0.084)	(0.097)	(0.145)	(0.057)	(0.066)	(0.106)
Low-IP × UMI × IPA	−0.973***	−0.748***	−0.440**	0.002	−0.062	−0.058
	(0.112)	(0.143)	(0.182)	(0.078)	(0.099)	(0.151)
Low-IP × HI × IPA	−0.242***	−0.222**	0.129	−0.005	0.029	−0.015
	(0.083)	(0.100)	(0.203)	(0.069)	(0.079)	(0.110)
High-IP × LI × IPA	−0.609***	−0.064	0.211	−0.031	0.298**	0.103
	(0.174)	(0.215)	(0.243)	(0.183)	(0.134)	(0.146)
High-IP × LMI × IPA	0.398***	0.388***	0.163	−0.012	0.019	0.009
	(0.094)	(0.111)	(0.162)	(0.043)	(0.078)	(0.088)
High-IP × UMI × IPA	0.387***	0.471***	0.336*	−0.040	0.258***	0.530***
	(0.146)	(0.155)	(0.183)	(0.113)	(0.082)	(0.143)
High-IP × HI × IPA	0.159***	0.173***	0.062	−0.004	−0.031	−0.012
	(0.057)	(0.067)	(0.184)	(0.053)	(0.068)	(0.128)
Low-IP × LI × TRIPS	−0.394***	−0.298***	−0.246***	0.188*	0.230**	−0.002
	(0.080)	(0.077)	(0.090)	(0.108)	(0.107)	(0.122)
Low-IP × LMI × TRIPS	−0.549***	−0.561***	−0.524***	0.132***	0.146**	0.087
	(0.072)	(0.084)	(0.100)	(0.051)	(0.058)	(0.077)
Low-IP × UMI × TRIPS	−0.482***	−0.488***	−0.414***	−0.060	−0.173**	−0.239***
	(0.061)	(0.077)	(0.088)	(0.069)	(0.078)	(0.089)
Low-IP × HI × TRIPS	0.468***	0.451***	0.567***	0.109	0.068	0.208*
	(0.102)	(0.102)	(0.125)	(0.088)	(0.096)	(0.111)
High-IP × LI × TRIPS	0.720***	0.595***	0.495***	0.380***	0.354***	0.604***
	(0.108)	(0.115)	(0.137)	(0.098)	(0.097)	(0.113)
High-IP × LMI × TRIPS	1.301***	1.428***	1.130***	−0.098**	−0.079	0.056
	(0.132)	(0.154)	(0.182)	(0.044)	(0.049)	(0.086)
High-IP × UMI × TRIPS	0.844***	1.130***	1.060***	0.041	0.137**	0.277***
	(0.164)	(0.163)	(0.203)	(0.044)	(0.055)	(0.081)
High-IP × HI × TRIPS	0.052	0.150**	0.129	−0.007	0.012	−0.067
	(0.085)	(0.074)	(0.108)	(0.057)	(0.059)	(0.114)
Observations	1,120,596	1,055,276	720,040	1,120,596	1,055,276	720,040
No. of country pairs	29,525	27,892	19,114	29,525	27,892	19,114
Country trends	✓	✓	✓	✓	✓	✓
Group-sector-year FEs	✓	✓	✓	✓	✓	✓
Pair FEs	✓	✓	✓	✓	✓	✓

Notes: Robust standard errors clustered by bilateral pair are reported in parentheses. Samples used: All trade, columns (1) and (4): full dataset, including PTA linkages; No partner trade

A A Bilateral Trade in Low-IP and High-IP Subsectors (All bilateral trade flows, including with current and future IPR-related PTA partner)

	(1) Low-IP	(2) AI	(3) BIO	(4) CHEM	(5) ICT	(6) MED	(7) PT	(8) Other
E port r ts								
log(GDP)	0.123***							
	(0.033)							
Sector × log(GDP)		0.549***	0.190***	0.313***	0.206***	0.479***	0.454***	0.321***
		(0.048)	(0.060)	(0.037)	(0.039)	(0.063)	(0.033)	(0.025)
Sector × LI × IPA	−0.108	−1.039**	−1.446**	−1.192**	−0.749***	−0.500	−1.649***	−0.540*
	(0.101)	(0.495)	(0.654)	(0.527)	(0.250)	(0.770)	(0.361)	(0.289)
Sector × LMI × IPA	−0.430***	0.879***	1.115***	0.023	−0.298	0.812***	0.995***	0.582***
	(0.085)	(0.194)	(0.256)	(0.157)	(0.191)	(0.230)	(0.129)	(0.083)
Sector × UMI × IPA	−0.939***	1.287***	1.043**	−0.353	0.117	1.425***	0.549**	0.511***
	(0.118)	(0.240)	(0.423)	(0.300)	(0.261)	(0.194)	(0.224)	(0.096)
Sector × HI × IPA	−0.235***	0.322***	0.896***	0.415***	−0.428***	0.132	0.481***	0.207***
	(0.083)	(0.121)	(0.175)	(0.088)	(0.109)	(0.159)	(0.098)	(0.052)
Sector × LI × TRIPS	−0.416***	0.463***	0.019	0.016	1.736***	−0.129	0.325**	0.337***
	(0.082)	(0.170)	(0.260)	(0.181)	(0.149)	(0.236)	(0.151)	(0.112)
Sector × LMI × TRIPS	−0.549***	0.830***	1.157***	0.715***	2.323***	1.906***	1.200***	1.030***
	(0.071)	(0.262)	(0.239)	(0.209)	(0.157)	(0.205)	(0.178)	(0.131)
Sector × UMI × TRIPS	−0.482***	0.694**	1.222***	1.154***	1.036***	0.736**	1.528***	0.679***
	(0.063)	(0.276)	(0.206)	(0.147)	(0.216)	(0.296)	(0.183)	(0.142)
Sector × HI × TRIPS	0.446***	0.118	0.577***	0.179	−0.381**	0.713***	0.342***	0.251***
	(0.103)	(0.187)	(0.204)	(0.131)	(0.176)	(0.246)	(0.120)	(0.060)
⋮								

A B Bilateral Trade in Low-IP and High-IP Subsectors (All bilateral trade flows, including with current and future IPR-related PTA partner, cont.)

	(1) Low-IP	(2) AI	(3) BIO	(4) CHEM	(5) ICT	(6) MED	(7) PT	(8) Other
I port r ts								
log(GDP)	0.546***							
	(0.033)							
Sector × log(GDP)		0.108***	0.035	0.043	−0.052	0.118**	0.055*	0.029
		(0.038)	(0.046)	(0.030)	(0.051)	(0.048)	(0.033)	(0.026)
Sector × LI × IPA	0.371	−0.791**	1.984***	0.097	−0.891***	0.259	−0.527	0.299
	(0.302)	(0.360)	(0.437)	(0.311)	(0.204)	(0.418)	(0.341)	(0.201)
Sector × LMI × IPA	0.043	−0.194*	0.046	−0.236***	0.007	0.020	−0.215***	0.032
	(0.058)	(0.109)	(0.170)	(0.077)	(0.113)	(0.117)	(0.070)	(0.043)
Sector × UMI × IPA	−0.003	−0.471**	−0.131	−0.431***	0.208	−0.498**	−0.430**	−0.030
	(0.079)	(0.217)	(0.253)	(0.098)	(0.210)	(0.253)	(0.190)	(0.078)
Sector × HI × IPA	−0.004	−0.068	0.100	0.326***	−0.165	0.067	−0.039	0.046
	(0.068)	(0.114)	(0.160)	(0.099)	(0.120)	(0.166)	(0.093)	(0.051)
Sector × LI × TRIPS	0.162	0.191	−0.924***	0.290**	1.395***	−0.322*	0.228	0.086
	(0.108)	(0.157)	(0.263)	(0.133)	(0.179)	(0.196)	(0.149)	(0.086)
Sector × LMI × TRIPS	0.134***	−0.130	−0.442***	0.246***	0.381***	−0.509***	−0.344***	−0.139***
	(0.051)	(0.105)	(0.130)	(0.063)	(0.119)	(0.098)	(0.072)	(0.044)
Sector × UMI × TRIPS	−0.063	0.136*	−0.104	0.074	0.227**	0.079	−0.064	−0.020
	(0.068)	(0.079)	(0.142)	(0.097)	(0.115)	(0.153)	(0.081)	(0.037)
Sector × HI × TRIPS	0.088	−0.200	0.282**	−0.308***	0.077	0.299*	−0.350***	0.005
	(0.086)	(0.149)	(0.134)	(0.100)	(0.158)	(0.179)	(0.113)	(0.064)
Observations								4,481,584
No. of country pairs								29,520
Country trends								✓
Group-sector-year FEs								✓
Pair FEs								✓

Notes: The dependent variable is unidirectional bilateral trade flows, including bilateral linkages with current and future IPA partners. Each of the columns report coefficients from a single regression, delineated by sector. Robust standard errors clustered by bilateral pair are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Bilateral Trade in Low-IP and High-IP Subsectors (Excluding all US, EU, and EFTA trade)

	(1) Low-IP	(2) AI	(3) BIO	(4) CHEM	(5) ICT	(6) MED	(7) PT	(8) Other
Exports								
log(GDP)	0.115**							
	(0.046)							
Sector × log(GDP)		0.597***	0.133***	0.412***	0.315***	0.590***	0.679***	0.402***
		(0.071)	(0.040)	(0.062)	(0.057)	(0.070)	(0.062)	(0.044)
Sector × LI × IPA	−0.245	0.083	−1.438***	−0.285	−0.181	1.037	0.318	0.471*
	(0.156)	(0.488)	(0.395)	(0.485)	(0.530)	(0.776)	(0.394)	(0.281)
Sector × LMI × IPA	0.004	−0.838***	1.590***	−0.047	−0.104	1.274***	−0.379	0.170
	(0.146)	(0.313)	(0.260)	(0.196)	(0.346)	(0.345)	(0.239)	(0.162)
Sector × UMI × IPA	−0.416**	1.274***	1.339***	0.200	0.087	1.513***	0.136	0.411**
	(0.182)	(0.341)	(0.244)	(0.222)	(0.328)	(0.372)	(0.204)	(0.160)
Sector × HI × IPA	0.112	−0.116	0.761***	0.275	0.538**	−0.237	−0.178	−0.193
	(0.202)	(0.229)	(0.278)	(0.252)	(0.235)	(0.238)	(0.219)	(0.165)
Sector × LI × TRIPS	−0.260***	0.210	0.187	−0.094	1.600***	−0.531**	−0.419**	0.173
	(0.091)	(0.253)	(0.162)	(0.255)	(0.167)	(0.241)	(0.198)	(0.151)
Sector × LMI × TRIPS	−0.527***	0.292	0.972***	0.645**	2.663***	1.833***	0.930***	0.824***
	(0.099)	(0.277)	(0.191)	(0.259)	(0.244)	(0.307)	(0.230)	(0.171)
Sector × UMI × TRIPS	−0.412***	1.628***	0.921***	1.282***	1.873***	1.455***	1.476***	0.627***
	(0.089)	(0.246)	(0.159)	(0.215)	(0.267)	(0.277)	(0.195)	(0.173)
Sector × HI × TRIPS	0.552***	0.289	0.737***	−0.039	−0.339**	0.336	0.268*	0.222*
	(0.126)	(0.197)	(0.240)	(0.138)	(0.168)	(0.251)	(0.149)	(0.118)
⋮								