

Intellectual Property Rights, Trade Agreements, and International Trade

Mercedes Campi¹ Marco Dueñas²

¹CONICET - University of Buenos Aires, IIEP, Argentina

²Universidad de Bogotá Jorge Tadeo Lozano, Colombia

Workshop on Macroeconomics and Development
2017 RIDGE December Forum
Buenos Aires, Argentina. December 14 - 15, 2017

Outline

- Motivation
 - Recent evidence on TAs, trade, and IPRs
- Objectives, contribution, and main findings
 - Evaluate the impact of TAs with IPRs chapters on international trade
- Data and methodology
- Results of the econometric estimations
 - Matching econometrics
 - Gravity estimations
- Conclusions

Motivation

- With the process of globalization: increasing interaction among countries through FDI and trade
- Since the 1990s:
 - reduction of trade barriers
 - signing of different types of bilateral, regional, and multilateral trade agreements, and also investment agreements
- Also, changes in global institutional and normative aspects
 - WTO in 1994 to regulate international trade and to establish a framework for trade policies
 - Several agreements demanding institutional reforms, including those related with intellectual property rights (IPRs)
 - Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS)

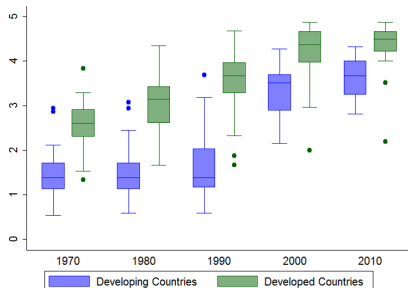
Motivation

- Process of global strengthening and harmonization of IPRs systems
 - TRIPS agreement: countries commit to adopt or modify their IPRs systems according to minimum standards
 - Developed countries (DCs) have increased the level of existing IP protection and developing countries (LDCs) have either adopted new systems or adapted their existing systems to the “minimum standards” demanded by the TRIPS
 - New sectors (plant varieties, micro-organisms and pharmaceutical products)
- Despite this, the effect of tighter IPRs systems is not clear, especially for developing countries

Evolution of global IP protection

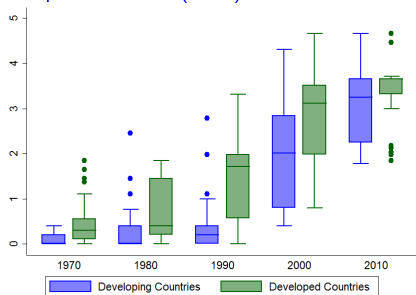
Index of patent protection

Ginarte & Park (1997) and Park (2008)



Index of IP protection in agriculture

Campi & Nuvolari (2015)

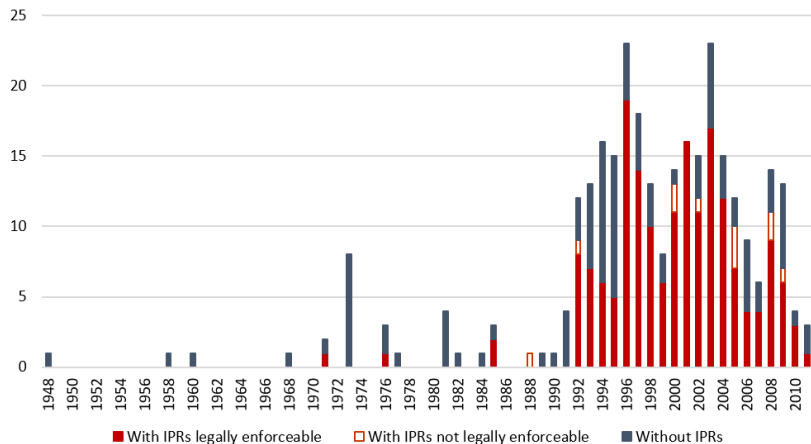


- Averages have been increasing over time, for both DCs and LDCs
- DCs had and have stronger IPRs systems
- Comparatively, LDCs increased more their IPRs systems
- Dispersion between and within groups has decreased

Trade agreements and IPRs

- Increasing number of trade agreements that include complex chapters covering IPRs, with IP provisions that demand higher standards of IP protection and are known as TRIPS-Plus or TRIPS+
 - Most favored nation
 - National treatment
 - In particular, IP-demanding countries are often DCs, while LDCs are the ones that need to implement the reforms
- Consequently, despite TAs are in principle a trade policy:
 - Increasingly guiding the design of IPRs systems and strengthening IP protection worldwide
 - Drivers of significant reform in LDCs and the implementation implies a real and complex challenge for them

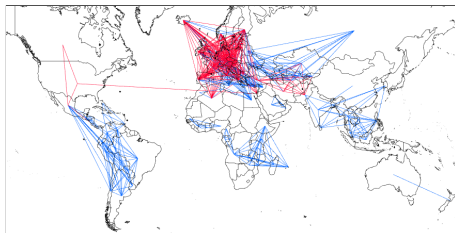
Evolution of the number of signed trade agreements. 1948-2011



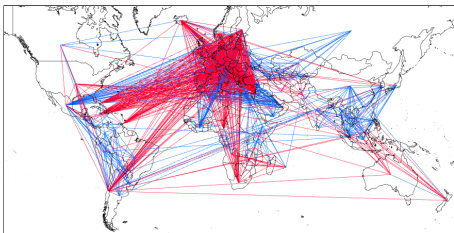
Network of countries connected through TAs

TA with IPRs chapters (red) and without IPRs chapters (blue)

1995



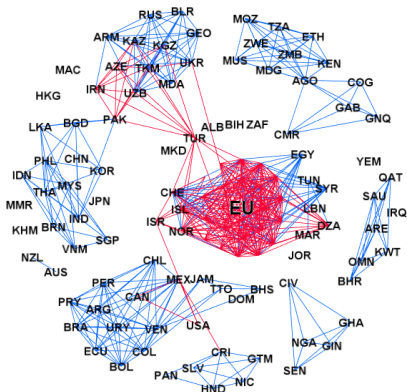
2010



- TAs have been increasing in number and signatory countries, especially, TAs with IP chapters
- Fragmented in 1995
- Most countries are part of a single network in 2010 but still regional groups

Trade agreements. Evolution of the network

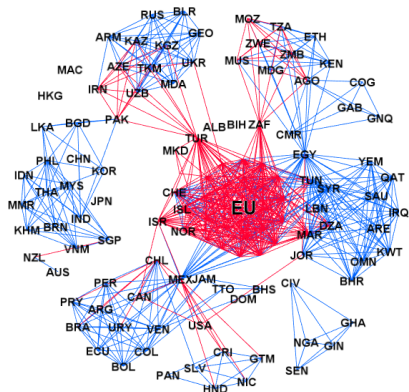
1995



- Presence of clusters or communities
- Three clusters of TAs with IP chapters
 - Western European countries
 - Eastern European countries
 - US, Canada, Mexico, and Costa Rica

Trade agreements. Evolution of the network

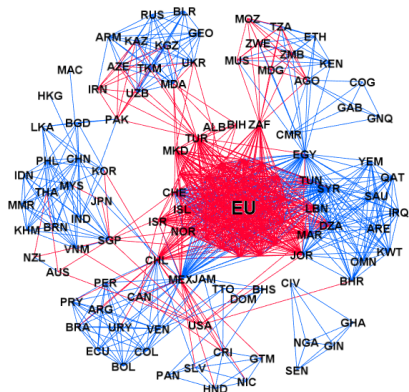
2000



- A new cluster emerges: African countries

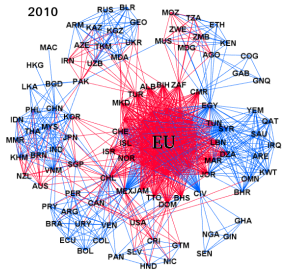
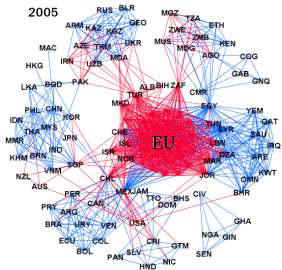
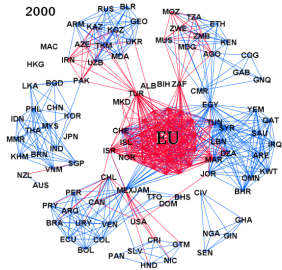
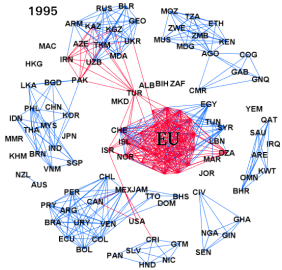
Trade agreements. Evolution of the network

2005



- TAs spread within communities but also between
- Several Asian countries enter the network, which gets more dense

Evolution of the network of trade agreements



Objectives and Contribution

State of the art

- Despite the relevance of this process, the number of studies addressing the effects of trade agreements with IP provisions is very low
- There is a lack of available data, although recently several different research groups started working on databases
- There are methodological issues to include TAs in regressions of international trade

Objective

- To evaluate the impact of TAs and TAs with IPRs chapters on international trade

Main findings

- Trade agreements increase bilateral trade flows but unevenly for DCs and LDCs
- The effect of TAs with IP chapters and TAs with no IP chapters on bilateral trade flows are not significantly different
- Gains from trade-related issues might not compensate the effort related to IP reforms, particularly for LDCs

Data and econometric estimations

- Data
 - TAs and TAs with IP chapters 1995–2011 from Kohl et al. (2016)
 - Bilateral trade flows from Gaulier and Zignago (2010) (BACI) for 1995-2014
 - Two groups of products of different IP intensity from Delgado et al. (2013) [Details](#)
- Econometric estimations. We use two complementary strategies
 - Matching econometrics (cross-section)
 - Gravity model using difference-in-difference (panel data)
- For both, we define:

Control group \rightarrow { country pairs which did not signed any TA

Treatment group \rightarrow $\left\{ \begin{array}{l} \text{country pairs which signed TAs with no IP chapters: } TA^{nip} \\ \text{country pairs which signed TAs with IP chapters: } TA^{ip} \end{array} \right.$

Data: Summary statistics

		1995	2000	2005	2010
Number of links	TA^{nip}	618	822	929	1,053
	TA^{ip}	542	850	1,397	1,851
	No TAs	13,602	13,090	12,436	11,858
Average of the log of trade	TA^{nip}	10.68	10.56	10.95	11.43
	TA^{ip}	12.48	12.26	11.70	11.22
	No TAs	8.37	8.25	8.48	8.72
Difference in log between	TA^{nip} and No TAs	2.31	2.31	2.47	2.71
	TA^{ip} and No TAs	4.11	4.01	3.22	2.50

- Bilateral trade links with any type of TAs increase and with no TAs decrease
- Country pairs with any type of TAs trade more
- The difference between the control group and the treated groups changes over time: TA^{nip} increases, while with TA^{ip} , decreases
- The number of links increased by (1995-2010):
 - TA^{ip} : 3.4 times
 - TA^{nip} : 1.7 times

Matching econometrics (cross-section) Abadie and Imbens (2006)

- Main motivation:
 - Difficulty of separating the effects of trade related issues and IP issues included in the same TA
 - Define a control group of country pairs without TAs and compare and pair them with the two treated groups
- Matching mechanism and estimator:
 - Simulates random assignments based on a set of economic characteristics of the country pairs in both groups that might be as much similar as possible
 - We estimate a logit model to find propensity scores:
 - the independent variable is TA^{ip} or TA^{nip}
 - the covariates are:
 $x = \{\ln(\text{GDP}_i \cdot \text{GDP}_j), \ln(d), \text{contig}, \text{comlang}, G_{dc \leftrightarrow dc}, G_{dc \leftrightarrow ldc}, G_{ldc \leftrightarrow ldc}\}$

Details

Matching econometrics

- Allows to derive the change in the expected value of total bilateral trade taking as a reference:
 - the non treated group of countries: Average treatment effect (ATE). Universal applicability of the treatment
 - the treated group of countries: Average treatment effect of the treated (ATET). Counterfactual, the average gain from the treatment of the treated

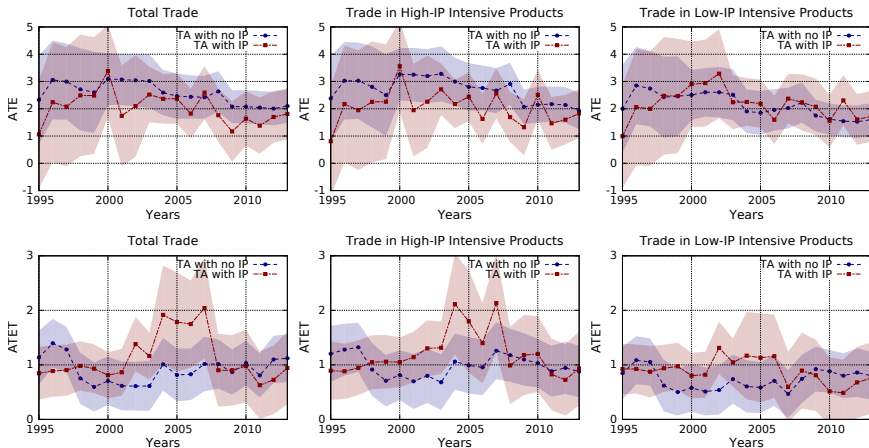
$$ATE^{nip}(x) = E[\tilde{w}_1^{nip} - \tilde{w}_0 | X = x];$$

$$ATET^{nip}(x) = E[\tilde{w}_1^{nip} - \tilde{w}_0 | TA^{nip} = 1, X = x];$$

$$ATE^{ip}(x) = E[\tilde{w}_1^{ip} - \tilde{w}_0 | X = x];$$

$$ATET^{ip}(x) = E[\tilde{w}_1^{ip} - \tilde{w}_0 | TA^{ip} = 1, X = x];$$

Matching Econometrics. Estimation results



- Both types of TAs increase trade
- There are no statistically significant differences in the effect of the TAs

Gravity Estimation

- Panel data estimation (fixed effects with time dummies)
 - To control for the endogeneity of TAs: Baier and Bergstrad (2007)
 - TAs depend on economic and geographical country-characteristics Cheon et al. (2015)
- Difference-in-difference: control group and the two treated groups
- Sectors of different IP intensity
 - IPRs interact with the level of technology of the exporter Shin et al. (2016)
- TAs are usually *phased-in* over time
 - We include their lags
- Different effects of TAs for countries of different development level

Gravity Estimation

- In $W_{ijt} = w_{ijt}$: export (log) from country i to country j of the year t .
- The gravity equation is defined as:

$$w_{ijt} = X_{ijt} \cdot \beta + TA_{ijt}^{nip} \cdot \zeta + TA_{ijt}^{ip} \cdot \xi + \tau_t + \eta_{ijt}; \quad \text{with: } i, j = 1, \dots, N;$$

- Country-specific macro variables:

$$X_{ijt} = \{\ln(GDP_{it}), \ln(GDP_{jt}), hc_{it}, hc_{jt}\};$$

- Trade agreements:

$$TA_{ijt} = \begin{cases} TA_{ijt}^{nip} \\ TA_{ijt}^{ip} \end{cases} ;$$

- τ_t are time dummies;
- η_{ijt} is the residual.

Gravity model: Estimation results of bilateral trade

Model	(1)	(2)	(3)	(4)	(5)
<i>TA</i>	0.098*** (0.026)				
<i>TA^{nip}</i>		0.154*** (0.052)		0.136*** (0.042)	0.129*** (0.041)
<i>TA^{ip}</i>			0.072** (0.028)	0.083*** (0.027)	0.036 (0.027)
<i>TA^{nip}_{t-5}</i>					0.029 (0.035)
<i>TA^{ip}_{t-5}</i>					0.130*** (0.020)
ln(GDP _{<i>i</i>})	1.129*** (0.053)	1.147*** (0.057)	1.144*** (0.056)	1.127*** (0.053)	1.137*** (0.053)
ln(GDP _{<i>j</i>})	1.442*** (0.045)	1.473*** (0.049)	1.477*** (0.048)	1.440*** (0.045)	1.450*** (0.046)
hc _{<i>i</i>}	0.185* (0.097)	0.169* (0.103)	0.226** (0.102)	0.184* (0.097)	0.176* (0.097)
hc _{<i>j</i>}	-0.016 (0.090)	-0.047 (0.095)	-0.025 (0.095)	-0.018 (0.090)	-0.026 (0.090)
Constant	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes
Country pairs FE	yes	yes	yes	yes	yes
Observations	201,769	180,572	188,326	201,769	201,769
R-squared	0.205	0.194	0.199	0.205	0.206
Number of links	11,919	11,420	11,467	11,919	11,919

Estimation results: high-IP and low-IP intensive products

Model	High-IP intensive products		Low-IP intensive products	
	(1)	(2)	(3)	(4)
TA^{nip}	0.230*** (0.046)	0.206*** (0.044)	0.145*** (0.044)	0.124*** (0.042)
TA^{ip}	0.119*** (0.029)	0.072*** (0.027)	0.060* (0.031)	0.009 (0.031)
TA_{t-5}^{nip}		0.071* (0.038)		0.066* (0.038)
TA_{t-5}^{ip}		0.131*** (0.022)		0.138*** (0.022)
$\ln(\text{GDP}_i)$	1.138*** (0.052)	1.148*** (0.052)	1.046*** (0.057)	1.056*** (0.057)
$\ln(\text{GDP}_j)$	1.326*** (0.048)	1.335*** (0.048)	1.457*** (0.049)	1.467*** (0.050)
hc_i	0.212** (0.097)	0.202** (0.097)	0.098 (0.104)	0.087 (0.104)
hc_j	-0.006 (0.090)	-0.017 (0.091)	-0.020 (0.098)	-0.030 (0.098)
Constant	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes
Country pairs FE	yes	yes	yes	yes
Observations	185,203	185,203	194,657	194,657
R-squared	0.266	0.266	0.135	0.135
Number of links	11,754	11,754	11,863	11,863

Gravity model: Estimation results with interaction variables

- Estimation with interaction variables between the level of development of the country pairs and the signing of a TA

$$w_{ijt} = X_{ijt} \cdot \beta + \sum_k G_k \cdot TA_{ijt}^{ip} \cdot \zeta_k + \sum_k G_k \cdot TA_{ijt}^{ip} \cdot \xi_k + \tau_t + \eta_{ijt};$$

where G is a binary variable indicating the trade group type
 $k = \{dc \rightarrow dc, dc \rightarrow ldc, ldc \rightarrow dc, ldc \rightarrow ldc\}$.

- We allow for asymmetric effects

Gravity model: Estimation results with interaction variables

Model	Total bilateral trade		High-IP intensive products		Low-IP intensive products	
	(1)	(2)	(3)	(4)	(5)	(6)
$G_{dc \rightarrow dc} \cdot TA^{nip}$	0.188*** (0.062)	0.070 (0.061)	0.326*** (0.071)	0.181** (0.072)	0.167** (0.071)	0.082 (0.068)
$G_{dc \rightarrow ldc} \cdot TA^{nip}$	0.352*** (0.104)	0.289*** (0.100)	0.169* (0.101)	0.148 (0.092)	0.268*** (0.091)	0.223** (0.087)
$G_{ldc \rightarrow dc} \cdot TA^{nip}$	0.124 (0.107)	0.040 (0.102)	0.445*** (0.122)	0.378*** (0.129)	0.027 (0.114)	-0.064 (0.110)
$G_{ldc \rightarrow ldc} \cdot TA^{nip}$	0.084 (0.069)	0.137** (0.068)	0.183** (0.078)	0.203*** (0.074)	0.201*** (0.077)	0.221*** (0.073)
$G_{dc \rightarrow dc} \cdot TA^{ip}$	0.185*** (0.043)	0.103** (0.043)	0.272*** (0.044)	0.180*** (0.043)	0.142*** (0.049)	0.070 (0.049)
$G_{dc \rightarrow ldc} \cdot TA^{ip}$	0.088** (0.044)	0.026 (0.044)	0.023 (0.046)	-0.014 (0.045)	0.031 (0.055)	-0.050 (0.055)
$G_{ldc \rightarrow dc} \cdot TA^{ip}$	-0.018 (0.055)	-0.043 (0.057)	0.107* (0.063)	0.073 (0.060)	-0.025 (0.062)	-0.041 (0.064)
$G_{ldc \rightarrow ldc} \cdot TA^{ip}$	0.107 (0.083)	0.122 (0.075)	0.073 (0.077)	0.084 (0.070)	0.203** (0.094)	0.194** (0.085)
$G_{dc \rightarrow dc} \cdot TA_{t-5}^{nip}$		0.226*** (0.043)		0.289*** (0.052)		0.158*** (0.045)
$G_{dc \rightarrow ldc} \cdot TA_{t-5}^{nip}$		0.201** (0.095)		0.080 (0.091)		0.148 (0.122)
$G_{ldc \rightarrow dc} \cdot TA_{t-5}^{nip}$		0.272** (0.106)		0.220* (0.116)		0.300*** (0.113)
$G_{ldc \rightarrow ldc} \cdot TA_{t-5}^{nip}$		-0.117** (0.053)		-0.040 (0.057)		-0.039 (0.058)
$G_{dc \rightarrow dc} \cdot TA_{t-5}^{ip}$		0.167*** (0.023)		0.190*** (0.027)		0.149*** (0.026)
$G_{dc \rightarrow ldc} \cdot TA_{t-5}^{ip}$		0.183*** (0.036)		0.119*** (0.040)		0.238*** (0.043)
$G_{ldc \rightarrow dc} \cdot TA_{t-5}^{ip}$		0.083 (0.054)		0.109* (0.059)		0.059 (0.057)
$G_{ldc \rightarrow ldc} \cdot TA_{t-5}^{ip}$		0.022 (0.086)		0.005 (0.098)		0.045 (0.090)

Summary of estimation results

	Total bilateral trade		High-IP intensive trade		Low-IP intensive trade	
	TA^{nip}	TA^{ip}	TA^{nip}	TA^{ip}	TA^{nip}	TA^{ip}
No interactions	+	+	+	+	+	+
$dc \rightarrow dc$	+	+	+	+	+	+
$dc \rightarrow ldc$	+	+	+	n.s.	+	n.s.
$ldc \rightarrow dc$	n.s.	n.s.	+	+	n.s.	n.s.
$ldc \rightarrow ldc$	n.s.	n.s.	+	n.s.	+	+
	TA^{nip}_{t-5}	TA^{ip}_{t-5}	TA^{nip}_{t-5}	TA^{ip}_{t-5}	TA^{nip}_{t-5}	TA^{ip}_{t-5}
No interactions	n.s.	+	+	+	+	+
$dc \rightarrow dc$	+	+	+	+	+	+
$dc \rightarrow ldc$	+	+	n.s.	+	n.s.	+
$ldc \rightarrow dc$	+	n.s.	+	+	+	n.s.
$ldc \rightarrow ldc$	-	n.s.	n.s.	n.s.	n.s.	n.s.

- TAs increase trade flows
 - TA^{nip} always stronger positive effect than TA^{ip} (opposite with the lags)
 - unevenly for DCs and LDCs
- Mostly positive between DCs and from DCs to LDCs
- Flows between LDCs only increase for low-IP
- Flows from LDCs to DCs only increase in high-IP

Conclusions

- TAs increase bilateral trade
- But, TA^{nip} increase bilateral trade more than TA^{ip}
- TA^{ip} have higher effects if we consider the lags: IPRs reforms take more time to be implemented
- Previous studies found that IPRs systems create a bias in favor of exporters from DCs relative to those from LDCs
- The effect is uneven for DCs and LDCs
 - TA^{ip} increase bilateral trade flows between DCs and from DCs to LDCs
 - Instead, gains for LDCs are less visible and are weaker
- Thus, can trade gains compensate the effort related with IP reforms for LDCs?

Thank you!

Appendix: Classification of exports according to IP intensity

High-patent products (most of which are also high-trademark)	
Crude fertilizers	Metalworking machinery
Organic & Inorganic chemicals	General machinery
Dyeing materials	Office machines
Medicinal & pharmaceutical products	Telecommunications
Essential oils & perfume materials	Electrical machinery
Chemical materials & products	Professional apparatus
Rubber manufactures	Photographic apparatus
Power-generating machinery	Miscellaneous mfg.
Machinery for industries	
High-trademark products (with low-patent/copyrights)	
Dairy products & beverages	Manufactures of metals
Crude rubber	Pulp & waste paper
Road vehicles	Plastics
Furniture	Paper & related articles
Footwear	
High-copyright products (most of which are also high-trademark)	
Cinematographic film	Printed matter & recorded media

Appendix: Variables employed in the estimations

Label	Related to	Description	Source
w	Link	Exports (in ln) in constant (2000) US dollars	BACI-CEPII
TA^{nip}	Link	Trade agreement with no IP chapters	Kohl et al. (2016)
TA^{ip}	Link	TAs with legally and non legally enforceable IP chapters	Kohl et al. (2016)
GDP	Country	Gross domestic product	Penn World Tables
d	Link	Distance between two countries, based on bilateral distances between the largest cities of those two countries, weighted by the share of the city in the overall country's population	BACI-CEPII
contig	Link	Contiguity dummy equal to 1 if two countries share a common border	BACI-CEPII
comlang	Link	Dummy equal to 1 if both countries share a common official language	BACI-CEPII
G_k	Link	Set of dummies indicating bilateral relations by development levels	United Nations (2017)

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