Does stronger protection of intellectual property have effect on trade?

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Abstract

In thus study we explore the association between patent protection and international trade, using data for 114 countries for the 2010-2015 years. Our results suggest non-linear (inverted U shape) link between IPR protection index and trade as a share of GDP.

Keywords: trade, IPR, copyright, patents

Introduction

International trade is considered one of the important underlying factors of economic growth (Frankel & Romer, 1999). Research shows that developing countries that adopted liberal trade policies had higher growth rates of GDP per capita (Dollar, 1992). For example, Harrison (1996) using data from developed and developing countries, find that various measures of trade correlate positively with economic growth. Therefore, the research on the causes of trade has grown considerably in size. In this study, we contribute to this literature by exploring the association between patent protection and trade.

The research on the effect of patents on economy mainly explores its effect on economic growth. Hu & Png (2013) rely on a difference-in-difference method to explore the effect of patent protection change on 54 manufacturing industries in up to 72 countries between 1981-2000. They document that stronger patent rights were associated with faster growth among more patent-intensive industries. Moreover, they report that effect of intellectual property is stronger in 1990's. Thompson & Rushing (1996) investigate the association between patent protection and total factor productivity leading to higher GDP growth rates. This study reports that the effect of IPR may be non-linear and conditional on such aspects as GDP and structure of economy. However, in general patent protection has positive effect on economic growth.

Imam (2005) in a review of potential effects of patent protection on economic growth in lower income countries concludes that 'by creating stronger patent protection systems, developing countries can reduce the number of innovative scientists fleeing to developed countries to obtain better protection for their inventions'. Sattar & Mahmood (2011) explore the effect of intellectual property rights on rate of GDP change for a balanced panel of 38 countries (11 from high income countries; 16 from middle income countries; and 11 from low income countries) over the period of 1975-2005 by relying on Ginarte and Park Index of Intellectual

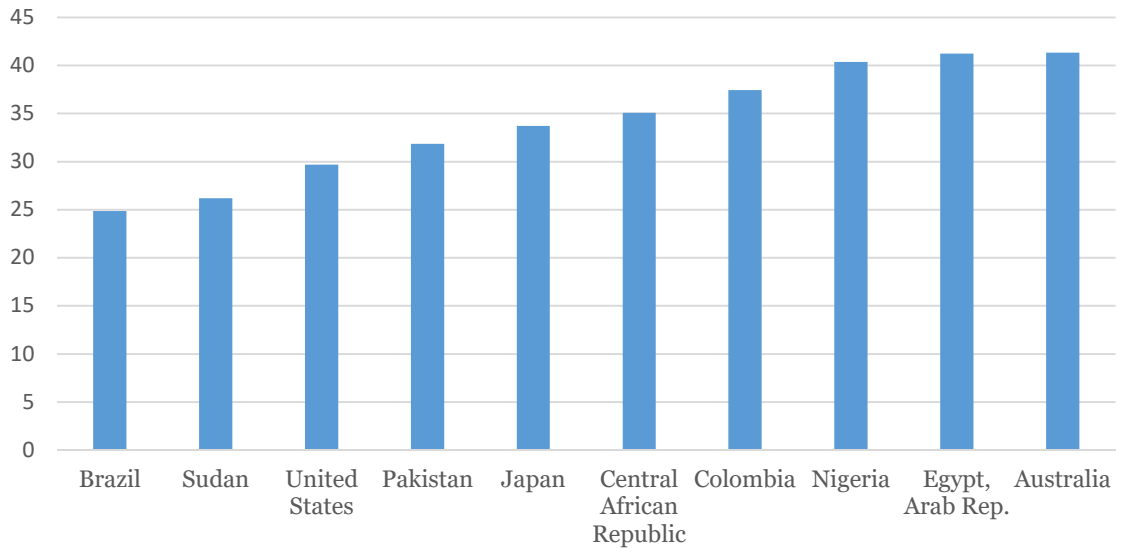
Property Rights (2005). Their study shows that stronger protection fosters growth. But this effect is only marginal in countries that have not attained high income status. Moreover, the effect is stronger in middle income countries. More recently, Hu & Jaffe (2007) in a review of theretical evidence argue that 'the strongest theoretical argument for benefit to developing countries from stronger IPR is that it will encourage innovation in areas specific to their needs. Evidence for the empirical significance of this effect is extremely limited. The only real example that has been identified is research on tropical diseases. It is widely acknowledged, however, that the largest barrier to significant private investment in this area is the lack of significant buying power for any potential cures, rather than weak IPR'.

By and large, plethora studies seem to suggest that patent protection is positively related to economic development. In this study, we explore the effect of IPR protection on international trade on a sample of 114 developed and developing countries for the period 2010 - 2015. The results of the study show that patent protection is non-linearly related to international trade, as measured by trade as a share of GDP.

Data and methods

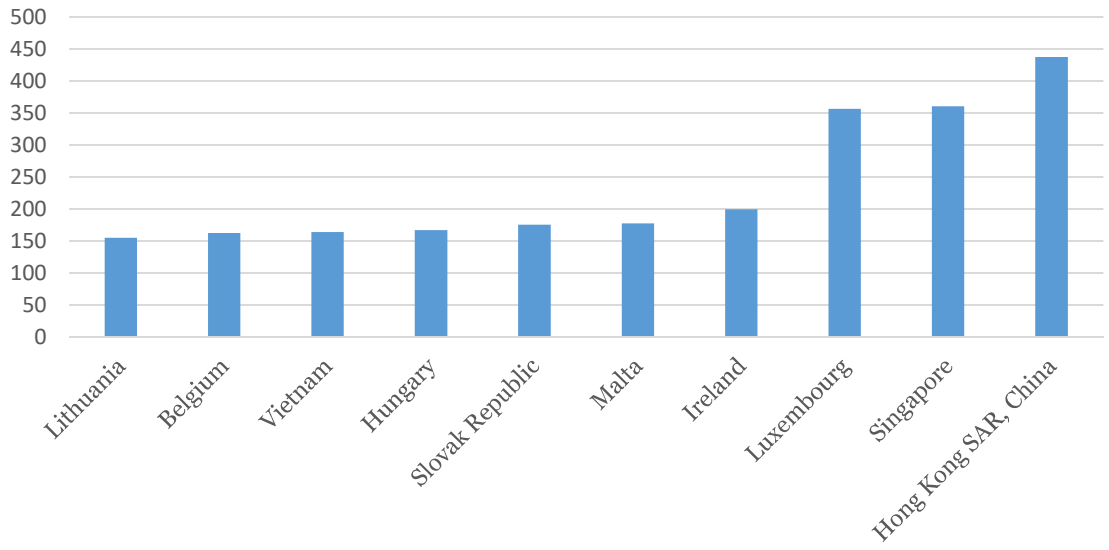
The dependent variable in this study is trade as a share of GDP as a proxy for international trade. The data comes from World Bank (2015). In our sample trade ranges from 25% of GDP in Brazil to 437% in Hong Kong. Figures 1 and 2 present the most and least trade open countries. As it can be seen, these countries are very heterogeneous in terms of their level of development and IPR protection.

Figure 1. 10 least trade open countries



Notes: Trade as a share of GDP, %

Figure 2. 10 most trade open countries



Notes: Trade as a share of GDP, %

The main independent variable is IPR protection index from Park (2008). In his study, Park (2008) provides an revised edition to the index of patent protection published in 1997. The earlier papers has offered the index for 1960–1990 for 110 countries. The index has now been

revised to 2005 and enlarged to 122 countries. The IPR index ranges from 1.78 in Iraq to 4.88 in the USA. The higher values indicate stronger protection of intellectual property.

To estimate the effect of IPR on international trade we estimate a simple regression model that can be expressed as:

$$\mathbf{Trade = b_0 + b_1*Patent + b_2*Patent^2 + b_3*GDP + b_4*HC + e \quad (1)}$$

where trade is trade as % of GDP, patent is the IPR protection index, GDP is GDP per capita in PPP, HC is human capital index as measured by national IQs from Lynn & Vanhanen (2012) and e is an error term. We control for GDP per capita and human capital as they seem to be a catch all variable in our model (Salahodjaev, 2016a; Salahodjaev, 2016b). We also control for squared IPR index to capture any non-linear relationship. The main data stats are presented in Table 1.

Table 1. Descriptive statistics

Variable	N	Mean	Std. Dev.	Min	Max
Trade, % of GDP	114	90.19	61.81	24.86	437.33
IPR index	114	3.42	0.81	1.78	4.88
GDP per capita	114	18.04	17.64	0.64	88.16
Human capital	114	85.03	11.69	60.1	107.1

Results

The main results are reported in Table 2. Column 1 is a simple bivariate regression between IPR index and trade. We find that patent protection is positive and significant at the 5% level. This suggests that a 1 point increase in IPR index is associated with 14 percentage point increase in trade openness. This specification explains only 3% of international trade.

In column 2 we bring in two control variables GDP per capita and human quality index. First we find that GDP per capita is positive and significant at the 1% level. For example, if GDP per capita increases by 10,000 PPP then trade rises by 23 percentage points. The human capital index is insignificant in the regression. Turning to our main variable of interest we find that IPR

is now again significant but negative. The VIF multicollinearity test is well below 10 thus, the estimate is not driven by potential collinearity among regressors.

Finally, in column 3 we add squared IPR index. We now find that patent protection is non-linearly related to international trade, and exhibits inverted U shape link. The international trade is highest in countries with moderate degree of patent protection. Moreover, countries with low levels of patent protection may benefit from strengthening intellectual property protection, while in countries with high level of IPR further increase in IPR index is detrimental for trade. This specification explains 28% of international variation in international trade.

Table 2. Main results

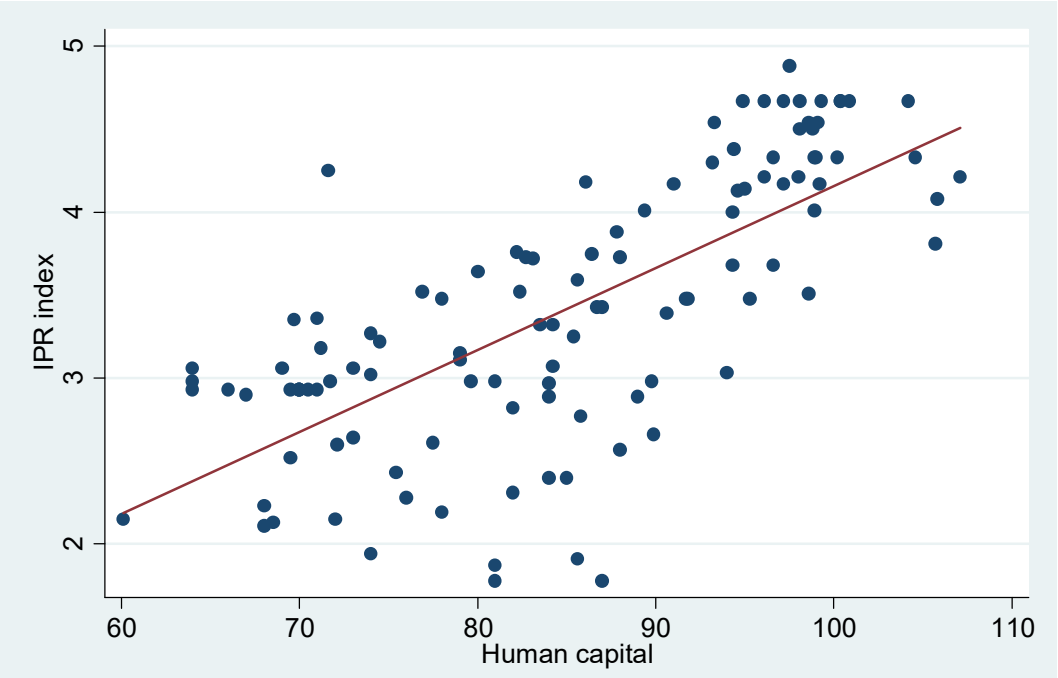
	(1)	(2)	(3)
Patent	14.7765**	-22.0461**	96.0606*
	(7.0876)	(9.3929)	(51.5338)
GDP		2.2735***	2.4568***
		(0.4650)	(0.4627)
HC		0.2401	0.5666
		(0.7238)	(0.7233)
Patent2			-18.3317**
			(7.8699)
Constant	39.6949	104.0948**	-104.6226
	(24.8826)	(51.1092)	(102.6646)
N	114	114	114
adj. R^2	0.0288	0.2536	0.2824

Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

The natural question that arises how developing countries can increase IPR protection? We checked the hypothesis that IPR index may be driven by changes in quality of education, literacy and skills. Thus, we correlated IPR index with human capital index from Lynn & Vanhanen (2012). The visual representation of this correlation is presented in Figure 3. As evident, IPR protection quality crucially depends on the quality of human capital.

Figure 3. IPR index and human capital



Conclusion

Over the past decade there has been ongoing debate on fostering trade in developing countries as trade is an important determinant of economic growth. In thus study we explored one potential channel which may lead to greater trade liberalization in less developed countries and indirectly increase economic growth. In particular, we tested the hypothesis that stronger IPR protection is beneficial for trade.

Our study shows that, in contrast, to our expectations patent protection is non-linearly related to international trade. The international trade is highest in countries with moderate degree of patent protection. Moreover, countries with low levels of patent protection may benefit from strengthening intellectual property protection, while in countries with high level of IPR further increase in IPR index is detrimental for trade.

Thus study has a number of limitation that is avenue for future research. First, due to the unavailability of IPR index on annual basis our study is limited to cross-sectional evidence. Second, taking into account non-linear association between IPR index and trade the use of more sophisticated methods to resolve the problem of potential endogeneity seems impossible in our research.

However, the developing countries may improve their intellectual property protection by investing in human capital and building efficient institutions (Salahodjaev, 2015).

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Appendix 1

Economy	WB code	Trade, % of GDP	IPR index	GDP per capita, '000 PPP
Algeria	DZA	66	3.07	13.20
Australia	AUS	41	4.17	42.54
Austria	AUT	103	4.33	44.15
Bangladesh	BGD	44	1.87	2.71
Belgium	BEL	163	4.67	40.62
Benin	BEN	65	2.93	1.79
Bolivia	BOL	82	3.43	5.79
Botswana	BWA	108	3.52	14.00
Brazil	BRA	25	3.59	14.97
Bulgaria	BGR	127	4.54	15.73
Burkina Faso	BFA	61	2.93	1.52
Burundi	BDI	44	2.15	0.72
Cameroon	CMR	46	3.06	2.67
Canada	CAN	63	4.67	41.87
Central African Republic	CAF	35	2.93	0.91
Chad	TCD	76	2.93	1.96
Chile	CHL	67	2.98	21.14
China	CHN	47	4.08	11.02
Colombia	COL	37	3.72	11.84
Congo, Dem. Rep.	COD	80	2.23	0.64
Congo, Rep.	COG	147	3.06	5.70
Costa Rica	CRI	77	2.89	13.59
Cyprus	CYP	102	3.48	31.71
Czech Republic	CZE	148	4.33	28.31
Denmark	DNK	100	4.67	42.87
Dominican Republic	DOM	56	2.82	11.53
Ecuador	ECU	59	3.73	10.32
Egypt, Arab Rep.	EGY	41	3.73	10.07

El Salvador	SLV	70	3.48	7.72
Ethiopia	ETH	43	2.13	1.23
Fiji	FJI	125	2.4	7.55
Finland	FIN	77	4.67	39.49
France	FRA	59	4.67	37.22
Gabon	GAB	85	3.06	17.60
Germany	DEU	84	4.5	43.04
Ghana	GHA	87	3.35	3.66
Greece	GRC	61	4.3	24.82
Grenada	GRD	76	3.02	11.05
Guatemala	GTM	59	3.15	6.86
Guyana	GUY	133	1.78	6.35
Haiti	HTI	73	2.9	1.58
Honduras	HND	115	2.98	4.55
Hong Kong SAR, China	HKG	437	3.81	50.35
Hungary	HUN	167	4.5	22.34
Iceland	ISL	103	3.51	39.81
India	IND	52	3.76	4.86
Indonesia	IDN	48	2.77	9.28
Iran, Islamic Rep.	IRN	44	1.91	16.55
Iraq	IRQ	66	1.78	14.62
Ireland	IRL	200	4.67	45.64
Israel	ISR	66	4.13	30.88
Italy	ITA	56	4.67	34.80
Jamaica	JAM	82	3.36	8.41
Japan	JPN	34	4.67	34.99
Jordan	JOR	114	3.43	11.34
Kenya	KEN	53	3.22	2.67
Korea, Rep.	KOR	100	4.33	31.90
Liberia	LBR	153	2.11	0.77
Lithuania	LTU	155	4	23.72
Luxembourg	LUX	356	4.14	88.16
Madagascar	MDG	70	2.31	1.37

Malawi	MWI	65	2.15	0.75
Malaysia	MYS	146	3.48	22.71
Mali	MLI	56	2.93	1.48
Malta	MLT	178	3.48	28.27
Mauritania	MRT	118	3.27	3.49
Mauritius	MUS	115	2.57	16.65
Mexico	MEX	66	3.88	16.14
Morocco	MAR	81	3.52	6.85
Mozambique	MOZ	98	2.52	0.99
Nepal	NPL	48	2.19	2.11
Netherlands	NLD	150	4.67	45.73
New Zealand	NZL	57	4.01	32.81
Nicaragua	NIC	103	2.97	4.39
Niger	NER	63	2.93	0.87
Nigeria	NGA	40	3.18	5.31
Norway	NOR	68	4.17	63.62
Pakistan	PAK	32	2.4	4.38
Panama	PAN	139	3.64	17.90
Paraguay	PRY	96	2.89	7.31
Peru	PER	50	3.32	10.85
Philippines	PHL	64	4.18	6.04
Poland	POL	90	4.21	22.87
Portugal	PRT	76	4.38	25.95
Romania	ROU	79	4.17	17.82
Russian Federation	RUS	49	3.68	23.30
Rwanda	RWA	44	2.28	1.48
Saudi Arabia	SAU	81	2.98	48.83
Senegal	SEN	73	2.93	2.18
Sierra Leone	SLE	78	2.98	1.55
Singapore	SGP	361	4.21	75.63
Slovak Republic	SVK	176	4.21	25.51
South Africa	ZAF	61	4.25	12.37
Spain	ESP	60	4.33	31.66

Sri Lanka	LKA	50	3.11	9.98
Sudan	SDN	26	2.61	3.80
Swaziland	SWZ	117	2.43	7.73
Sweden	SWE	86	4.54	43.26
Switzerland	CHE	122	4.33	54.58
Tanzania	TZA	51	2.64	2.25
Thailand	THA	134	2.66	14.60
Togo	TGO	105	2.93	1.29
Trinidad and Tobago	TTO	86	3.75	30.02
Tunisia	TUN	105	3.25	10.53
Turkey	TUR	56	4.01	18.03
Uganda	UGA	49	2.98	1.67
Ukraine	UKR	103	3.68	8.32
United Kingdom	GBR	60	4.54	36.77
United States	USA	30	4.88	50.55
Uruguay	URY	51	3.39	18.44
Venezuela, RB	VEN	50	3.32	17.70
Vietnam	VNM	164	3.03	4.91
Zambia	ZMB	68	1.94	3.50
Zimbabwe	ZWE	94	2.6	1.65