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DOES FOREIGN INTELLECTUAL PROPERTY RIGHTS PROTECTION AFFECT U.S. EXPORTS AND FDI?

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Does foreign intellectual property rights protection affect U.S. exports and FDI?

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Abstract

Using GMM models on a panel data of fifty-three countries, we examine whether stronger foreign IPR protection stimulates international transactions of U.S. multinational firms. The empirical results suggest that foreign countries that strengthen their IPR protection, especially those with strong imitative ability, can attract more international transactions from U.S. multinational firms.

Keywords: export, FDI, intellectual property rights, GMM

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1. Introduction

The passage of the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights Agreement (TRIPS) in 1995 is a major milestone in global efforts to harmonize international laws governing intellectual property rights (IPR). Since then, the potential impact of stronger IPR on international trade and investment has been a subject of great interest among researchers and policymakers.

The existing theoretical literature provides no definitive judgment on whether enhanced ownership advantage via stronger IPR protection increases or decreases international trade and investment (Dunning, 1993; Maskus and Penubarti, 1995). It is plausible to expect that the strengthening of IPR protection would have a positive "market expansion effect" such that multinational firms can increase their market shares in the host country. In contrast, it is equally likely that stronger IPR protection would result in a "market power effect" that would induce the firm to restrain its output sales in foreign markets in order to enjoy monopoly and higher prices (Maskus and Penubarti, 1995; Smith, 2001), with the possible consequence that some developing countries may have even less access to new technologies. Therefore, the net effect of IPR on international trade and foreign direct investment (FDI) is ambiguous.

Unfortunately, empirical evidence on the impacts of IPR protection is relatively scarce (Awokuse and Yin, 2010; Maskus, 1998; Nicholson, 2007; Park and Lippoldt, 2003; Smith, 2001). To our knowledge, previous studies focusing on IPR were mostly based on cross country-level analysis with regard to either one of three major international transaction modes (exports, FDI, licensing). Several empirical studies can be found on the relationship between IPR and trade flows exclusively (Fink and Primo Braga, 2005; Maskus and Penubarti,

1995; Smith, 1999), but the results are ambiguous. Similarly, many empirical studies have focused on the relationship between IPR protection and FDI only (Branstetter et al., 2007; Javorcik, 2004; Lee and Mansfield, 1996; Nunnenkamp and Spatz, 2004).

However, much fewer empirical studies exist that jointly examined the linkages between IPR protection and multiple modes of international transactions (Ferrantino, 1993; Park and Lippoldt, 2003; Smith, 2001). Maskus (1998) argues that prior studies were incorrectly specified if they do not recognize the joint decisions made by multinationals. In particular, multinational firms may choose to export, engage in FDI sales, or license in response to stronger patent rights. It is a joint decision making process. Therefore, it is crucial to jointly analyze the impact of IPR protection on various modes of international business transactions.

This paper addresses this issue by evaluating how foreign IPR protection affects exports and FDI by U.S. firms[1]. We contribute to previous studies in two ways. First, in contrast to most previous studies that study the effects of IPR on exports and FDI separately, we analyze the relationships jointly. Second, this paper goes beyond the commonly used cross-sectional ordinary least squares analysis based on one year of data (Maskus and Penubarti, 1995; Smith, 2001). Rather, by applying the generalized methods of moments (GMM) panel estimator to data over 1994-2006 we could capture the dynamics in the relationships among the variables and explicitly address potential endogeneity issues. The rest of the paper is organized as follows. Section 2 summarizes the empirical methods and

[1] Due to unavailability of adequate data for licensing activities, only exports and FDI were considered in this study.

estimation while Section 3 describes the data and the key results. Section 4 concludes the paper.

2. Empirical methods and estimation

An empirical analysis of the determinants of exports and FDI could be modeled with the gravity equation (Anderson and Wincoop, 2003; Bergstrand, 1990). Our model specification is an extension of Smith (2001), which used a variation of the gravity equation for a cross-section of countries for a single year. The modified gravity equation could be expressed as:

$$ln(Z_{ijt}) = \alpha + \beta_1 ln(GDP_{jt}) + \beta_2 ln(DISTANCE_{ij}) + \beta_3 ln(IPR_{jt}) + \beta_4 ln(X_{ijt}) + \varepsilon_{ijt} \qquad (1)$$

where Z_{ijt} denotes either exports or FDI from the U.S. (i.e. country i) to host country j. GDP_{jt} represents output or income of host country j, $DISTANCE_{ij}$ is a proxy for trade cost and is measured by the geographical distance between country j and the U.S. The variable IPR_{jt} measures the strength of IPR protection in the host nation. Furthermore, X_{ijt} represents a vector of all other control variables in the model, such as: exchange rate (EXCHRATE), openness to trade and investment (OPENNESS), imitative ability (IMITATE), and FDI, foreign corporate tax rates (TAX), and export (EXPORT). Finally, ε_{ijt} is a normally distributed random error term.

As in Smith (2001), we account for the effect of imitative ability of host country by estimating a modified version of equation (1) that interacts dummy variables of strong and weak imitative abilities with the IPR variable. The modified equation is given as:

$$ln(Z_{ijt}) = \alpha + \beta_1 ln(GDP_{jt}) + \beta_2 ln(DISTANCE_{ij}) + \beta_3 (IPR_{jt}) \times SI_{jt} + \beta_4 (IPR_{jt}) \times WI_{jt} + \beta_5 DUMSI_{jt}$$

$$+ \beta_6 ln(X_{ijt}) + \varepsilon_{ijt} \qquad (2)$$

where SI and WI denotes strong and weak imitative abilities, respectively. $DUMSI_{jt}$ is a dummy variable that equals one for countries with strong imitative abilities and equals zero otherwise.

For both export and FDI equations, a positive sign is expected for the coefficient on foreign GDP. A negative sign is expected for distance. Exports and FDI should be substitutes. The expected sign for IPR coefficients are ambiguous because it will depend on whether the market expansion (positive) or the market power effect (negative) dominates. In addition, strong imitative ability by itself should threaten knowledge assets and have a negative effect. Thus, given strengthened IPR, countries with weak imitative abilities tend to exhibit the market power effect while the market expansion effect is more prevalent if IPR protection increases in countries with strong imitative abilities. Moreover, we expect exports to decline and FDI to rise as the exchange rate appreciates and a positive sign is expected for the openness parameter. Finally, a negative sign is expected for the parameter on taxes in the FDI equation.

Static pooled OLS estimation of equations (1) and (2) using panel data may suffer from omitted-variable bias because of unobserved heterogeneity effects and it may fail to capture the dynamic nature of trade and investment decisions by multinational firms, whose past activities could have a significant effect on current (and future) export and FDI levels. Thus, it is more appropriate to reformulate equations (1) and (2) as dynamic panel regressions of the form:

$$z_{ijt} = \alpha z_{ijt-1} + \beta x_{ijt} + \eta_j + \lambda_t + \varepsilon_{ijt} \qquad (3)$$

where the subscripts i, j and t denote home country, host country and time periods, respectively, z_{ijt} is export or FDI levels, x_{ijt} is the vector of other explanatory variables; η_j and λ_t are unobserved host-country-specific and time-specific parameters, respectively.

Endogeneity concerns become an issue in the estimation of equations (3) because the lagged endogenous regressor will be correlated with the error term. Thus, panel data regression estimates from both fixed-effects and random-effects estimators will be biased and inconsistent. To address this issue, we apply the GMM model, an instrumental variable (IV) estimator. In the estimation process, lags of the endogenous and exogenous variables are suitable instruments for the model (Arellano and Bover, 1995).

3. Data and Empirical Results

Table 1 contains the descriptive statistics for each variable. The data sample consists of 53 countries, including developed and developing countries.[2] The gross domestic product (GDP) of all countries was obtained from World Bank's *World Development Indicators.* U.S. exports data were obtained from the U.S. Department of Commerce and the U.S. International Trade Commission websites, while U.S. FDI data were obtained from the Bureau of Economic Analysis' (BEA) online databank. Geographic distance is the great circle distance between capital cities from Haveman's international trade website[3]. Exchange rates (local

[2] The list of 53 countries are as follows: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Costa Rica, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, Finland, France, Germany, Greece, Honduras, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Nigeria, Norway, Panama, Peru, Philippines, Poland, Portugal, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, United Kingdom, Venezuela.

[3] See: http://www.macalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/Data/Gravity/dist.txt,

currency per USD) were obtained from CEIC online database[4]. Tax refers to corporate income tax rates in host countries as a percentage of taxes on affiliates sales, which was calculated from BEA's *U.S. Direct Investment Abroad: Results from Annual Surveys*. The measure for openness to international transactions was found in Fraser Institute's *Economic Freedom of the World (EFW) Annual Report*, it counts openness to not only international trade but also capital flows.

Two alternative measures of IPR strength were considered. While we used the EFW's IPR index developed by Fraser Institute's Economic Freedom of the World Annual Report (1980-2006), we also adopted the index of patent rights measure by Ginarte and Parks (1997), updated in Park (2008).[5] Similar to Smith (2001), we also constructed a proxy variable to capture the impact of host countries' imitative ability. A higher score denotes stronger imitative ability.[6]

Table 2 contains the results from the estimation of a dynamic system GMM model based on equations (1) and (2), which examines the impact of foreign IPR protection and imitative ability on U.S. exports and FDI. As suggested by Arellano and Bond (1991), we performed Sargan test for over-identifying restrictions to ensure the adequacy of the GMM model estimation. The test results indicate that the model was properly specified. From table

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[4] See: http://www.ceicdata.com/

[5] Please refer to Awokuse and Yin (2010) and Park (2008) for more detailed description of the IPR variables definition and construction. While only the results based on the EFW's IPR index are reported here, the results based on the alternative IPR index by Park (2008) are quite similar.

[6] The data used to construct the imitative abilities indicator includes: government education expenditure, education enrollment, number of R&D researchers, patent applications, patents in force, railways traffic passengers and freight, literacy rates aged 15-24, primary education completion rate, telephone lines and cellular subscribers per 100 population, internet users per 100 population and personal computers per 100 population. Data for the indicator variables were obtained from the UN *Human Development Report* and UNESCO *Statistical Year Book*.

2, the strengthening of IPR by U.S. trading partners has a negative impact on exports of U.S. products, but a positive impact on FDI. For example, one index value increase in IPR protection leads to a 0.022 percent decline in U.S. exports and a 0.048 percent increase in U.S. foreign affiliate sales, on average across all countries. This result suggests that the strengthening of IPR protection tends to have a market power effect on U.S. exports and a market expansion effect on FDI.

Furthermore, we distinguish between countries with strong imitative ability and countries with weak imitative ability (see equation 2). Similar to previous results for the aggregated IPR variable, results from both exports and FDI equations indicate negative and positive IPR effects, respectively. Specifically, the strengthening of IPR protection leads to a decrease in U.S. exports to countries with weak imitative ability, which supports the market power effect. Overall, explicitly accounting for countries' imitative ability did not appear to matter much in identifying the impact of IPR protection on FDI. In either case, strengthening of IPR protection tends to have a positive market expansion effect. Nevertheless, the coefficient is slightly larger for IPR's effect for countries with strong imitative ability. Overall, these empirical results imply that U.S. multinational firms would rather export to countries with weak IPR regimes and increase FDI to locations where IPR is protected. The other control variables in the models have the expected signs. For example, the GDP coefficients are positive and statistically significant in most cases indicating that large host country market size attracts both exports and FDI. Exchange rate has the expected signs for both exports

(negative) and FDI (positive). Openness has a negligible effect on U.S. export and FDI while taxes tend to have a negative effect on U.S. FDI.[7]

4. Concluding Remarks

Since the early 1990s, there has been an ongoing debate among analysts regarding the extent to which stronger IPR protection actually stimulate international transactions. This paper examines this issue by evaluating how foreign IPR protection affects how U.S. firms serve overseas markets through exports and FDI. Similar to Smith (2001), the analysis explicitly investigated how the interaction between IPR protection and imitative abilities of host countries impacts international trade and investment. Using panel data from 53 countries over 1994-2006, the empirical analysis was based on a dynamic system GMM modeling framework. The empirical results suggest that IPR has a negative effect on U.S. exports, but a positive effect on U.S. FDI. In addition, the results also indicate that less U.S. exports flow to countries with weak imitative ability after they strengthen IPR protection. The empirical evidence from this study suggests that foreign countries, especially those with strong imitative ability, can attract more international transactions from the U.S. after strengthening their IPR protection.

[7] All models were also estimated using an alternative measure of patents as developed by Park (2008). The empirical results are very similar to those reported in Table 2.

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Table 1

Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Exports (Million USD)	12970.87	26742.23	0.00	230257.00
FDI (Million USD)	23403.85	45329.23	68.00	375348.00
IPR Index by EFW	5.84	1.98	1.47	9.61
IPR Index by Park (2008)	3.70	0.81	1.18	4.70
Exchange Rate	318.99	1401.17	0.04	22727.00
Distance	8153.52	3816.46	733.89	16370.82
GDP (Million USD)	430523.24	742894.04	3432.36	5244246.29
Openness Index	7.45	0.96	4.31	9.78
Tax Rate	0.03	0.05	-0.05	0.48
Imitative Ability	49.31	5.51	29.99	62.69

Table 2
Results from GMM model estimation

	Equation (1)				Equation (2)			
	Exports		FDI		Exports		FDI	
Lagged EXP	0.94	***			0.96	***		
	(0.02)				(0.02)			
Lagged FDI			0.91	***			0.77	***
			(0.04)				(0.06)	
GDP	0.23	***	-0.07		0.11	*	0.15	*
	(0.05)		(0.08)		(0.07)		(0.09)	
DISTANCE	0.48	*	0.05		-0.19		-0.35	
	(0.26)		(0.21)		(0.20)		(0.26)	
IPR	-0.02	***	0.05	***				
	(0.01)		(0.01)					
IPR×SI					0.00		0.05	***
					(0.01)		(0.02)	
IPR×WI					-0.04	***	0.04	**
					(0.01)		(0.02)	
IMITATE	0.52		-0.67		0.22		0.96	
	(0.58)		(0.60)		(0.62)		(0.81)	
DUMSI					-0.26	***	-0.04	
					(0.07)		(0.09)	
EXCHRATE	-0.14	***	-0.04		-0.05		0.01	
	(0.04)		(0.03)		(0.05)		(0.04)	
OPENNESS	0.00		0.00	**	0.00		0.00	
	(0.00)		(0.00)		(0.00)		(0.00)	
FDI	-0.03				-0.02			
	(0.02)				(0.02)			
TAX			-0.01	**			-0.01	*
			(0.00)				(0.00)	
EXPORT			0.02				0.02	
			(0.02)				(0.02)	
Sargan test - Chi-sq.	32.45		28.34		32.75		21.86	
Sargan test - p value	0.99		0.99		0.99		0.99	
AR(1) test - p value	0.12		0.02		0.11		0.01	
AR(2) test - p value	0.35		0.46		0.36		0.45	

Note: *, **, *** indicate significance levels of 10, 5, and 1 percent levels, respectively. Numbers in parentheses under coefficients are standard errors.