

IMITATION, PATENT PROTECTION AND ENTRY MODE

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M. Pluvia Zuniga

Elif Bascavusoglu

- Firms choose between different entry modes to serve foreign markets; exports, foreign direct investment, or arm's length contracts (Markusen, 1995).
- Since the likelihood of imitation differs for each entry mode, the impact of IPR protection consequently varies across these different modes to serve foreign markets (Vishwasrao, 1994).
- Hence, the degree of IPR protection affects the type and nature of technology transfer.

- The purpose of this paper is to evaluate how international variations of IPR protection may affect the choice to serve a foreign market.
- How does stronger IPR protection affects FDI, licensing and exports ?
- Does the influence of IPR protection differ across entry modes, according to the development or technical level of host countries?
- Do tighter IPR modify the internalization and location decision of foreign firms?

1. *Theoretical Framework:*

- The likelihood of imitation is stronger for knowledge assets located in the recipient countries (FDI and Licences versus Exports).
- It's even stronger when knowledge assets are shared and located outside the firm (Licences versus FDI and exports).
- Consequently, when the destination country has a weak IPR system, firms will prefer exports to FDI and licensing (Either and Markusen, 1996; Maskus and Penubarti, 1995) and FDI to licensing in order to control their knowledge assets and its diffusion (Horstmann and Markusen, 1987; Vishwashrao, 1994).
- We expect a higher impact on licence flows over direct investment and trade when patent protection is strengthened.

2. How Does Stronger IPR affect Entry Mode:

- Increasing imitation costs, stronger IPR reduce the cost of transferring production, and specially, the cost of externalizing production (Glass, 2000; Markusen, 2001; Glass and Saggi, 2002).
 - Hence when IPR protection increases, the cost of FDI and licensing over exports decreases.
- Improving legal framework, stronger IPR reduce the cost of monitoring licensee and the risk of contract defection.
 - Hence when IPR protection increases, the cost of licensing over FDI and exports decreases.
- Stronger IPR allow also a higher rate of return to licensor and a higher rate of innovation in northern countries (Yang and Maskus, 2000).

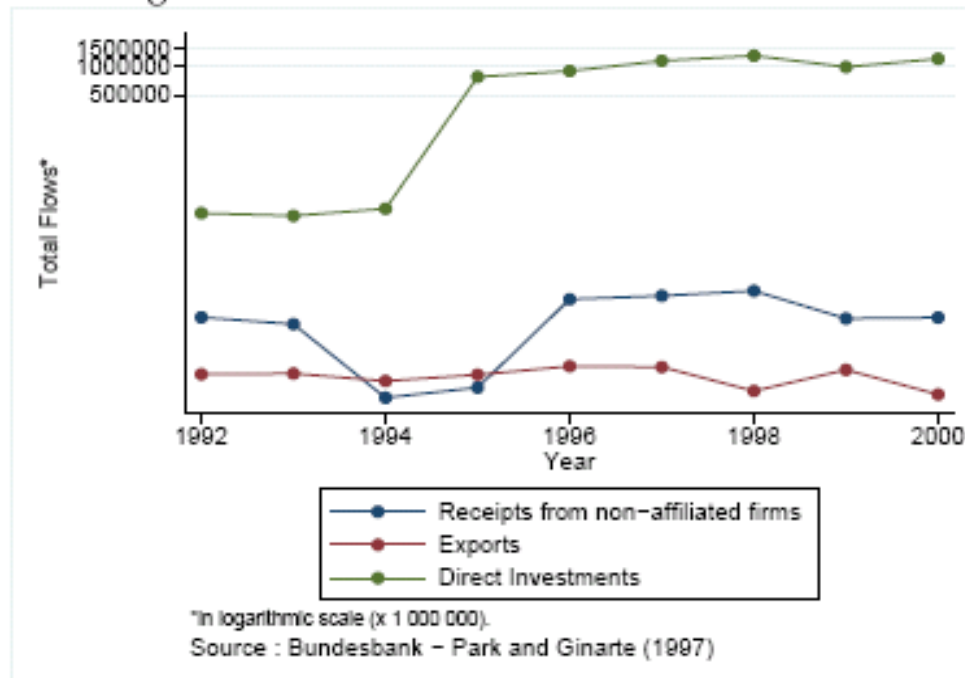
3. Empirical Studies :

- IPR and Trade:
 - Weak IPR may deter trade (Maskus and Penubarti, 1995),
 - More impact on larger income countries (Maskus and Penubarti, 1995) ,
 - Non significant effect for small countries (Maskus and Penubarti, 1995; Ferrantino, 1993)
 - Different effect across industries (Maskus and Penubarti, 1995; Fink and Primo Braga, 2000; Smith, 1999)
- IPR and FDI:
 - Positive though weak relationship (Lee and Mansfield, 1996; Maskus, 1998),
 - R&D intensity and collaboration insensitive to IPR (Kumar, 1996)
 - Non significant effect (Maskus and Eby-Konan, 1994; Fink and Primo Braga, 2000)
- IPR and licensing:
 - Stronger IPR stimulate licensing flows (Contractor, 1980; Ferrantino, 1993; Yan and Maskus, 2001),
 - Role of host countries' imitative capabilities (Smith, 2001),
 - No impact of IPR strength on the extent of composition of technology flows in chemical sector (Fosfuri, 2004)

- Endogenous variable is the German bilateral flows:

- Exports
- Affiliate sales
- Receipts from int.patent licensing

Figure 1: German Bilateral Flows' Evolution



- Main independent variable:
 - Strength of IPR protection, Park and Ginarte Index
- Controlling Variables :
 - Labor Costs
 - Market Size
 - Openness
 - Technical Capacity
 - Taxes on international trade
 - Export Intensity
 - High School Enrollment
 - FDI Stock

- We apply theoretical predictions by a reduced econometric estimation inspired from gravity models:

$$Y_{ij} = \ln G + \alpha \ln X_i + \beta \ln X_j - \delta \ln d_{ij} + \epsilon_{ij}$$

Y_{ijt} = bilateral exchange between Germany (i) and the host country (j)
 $X_{i,j}$ = labor and market size.

- We introduce into this equation A_{ij} , which represents other host country' characteristics, such as the human capital, openness, FDI stock, or technological balance of payment. We also integrate into it IPR_j , the IPR protection level:

$$Y_{ijt} = \gamma + \alpha \ln X_{it} + \beta_1 \ln X_{jt} + \beta_2 \ln A_{jt} + \beta_3 IPR_{jt} + \beta_3 D * IPR_{jt} - \delta \ln d_{ijt} + \epsilon_{ijt}$$

- We mainly test the validity of two hypothesis:

- Hypothesis 1 :

Stronger IPR in commercial partner will enhance externalization.

- Hypothesis 2:

The impact of the strength of IPR protection will be larger for arm's length contracts than for FDI and exports.

- The extent of this impact will depend on host countries' market size and technical skills.

- We proceed our analysis in 2 parts:
- In order to asses where and how entry modes are sensitive to foreign IPR protection, we estimate the joint decision of serving a foreign market, by a Seemingly Unrelated Regression (SUR) estimation.
- We analyze whether tighter IPR regimes affects internalization and location decisions when transferring production overseas, by specifying parameters deviations across the equations for exports, FDI and licensing flows.

Simultaneity of Decisions :

Table 2: Relative Impact of IPR Strength and Income Effect

	Baseline			IPR Protection			Income Effects		
	Licences	Exports	FDI	Licences	Exports	FDI	Licences	Exports	FDI
Market Size	1.986*** [0.208]	1.305*** [0.192]	1.146*** [0.167]	2.022*** [0.266]	0.731*** [0.240]	0.794*** [0.241]	2.864*** [0.352]	0.912*** [0.324]	0.761** [0.325]
Labor	-0.763*** [0.180]	-0.617*** [0.162]	-0.973*** [0.127]	-0.873*** [0.237]	-0.213 [0.212]	-0.582*** [0.208]	-1.543*** [0.323]	-0.320 [0.290]	-0.576** [0.286]
High-Tech Export Intensity	0.007 [0.030]		0.079*** [0.029]	-0.034 [0.032]		0.095*** [0.029]	-0.040 [0.032]		0.084*** [0.027]
Taxes on Int. Trade	-0.083 [0.156]	-0.353*** [0.135]		-0.200 [0.169]	-0.444*** [0.142]		-0.187 [0.167]	-0.479*** [0.140]	
FDI Flows(% GDP)	0.000 [0.000]	-0.000*** [0.000]		-0.000 [0.000]	-0.000*** [0.000]		0.000 [0.000]	-0.000*** [0.000]	
Human Skills	-0.028*** [0.011]	-0.029*** [0.009]	0.055* [0.245]	-0.022* [0.012]	-0.038*** [0.010]	-0.010 [0.224]	-0.023* [0.012]	-0.030*** [0.011]	0.031 [0.278]
Solde of Technology BP		0.064* [0.037]	0.030 [0.042]		0.048 [0.038]	0.083** [0.042]		0.035 [0.037]	0.043 [0.038]
IPR index				3.025** [1.485]	1.271 [1.351]	3.356*** [1.484]			
IPR*HI							-0.360 [0.288]	1.152*** [0.254]	0.802*** [0.254]
IPR*UMI							-0.170 [0.310]	0.899*** [0.273]	0.897*** [0.267]
IPR*LMI							0.228 [0.327]	1.318*** [0.290]	1.240*** [0.294]
IPR*LI							2.558*** [0.983]	1.196 [0.879]	-3.811*** [0.909]
Observations	293	293	293	254	254	254	254	254	254
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0,39	0,41	0,38	0,58	0,74	0,59	0,42	0,46	0,48
Breusch Pagan Test of Independence Chi2(x)			0,218			0,1946			0,29

Main Findings and Interpretation 1:

- IPR strength has a positive and significant impact on licensing and a stronger impact on FDI flows, whereas it seems to play no role for trade.
- Imitation risks are found to be higher for production localized in the country. Stronger patent laws might not alter significantly the intensity of trade, but they do enhance the location advantage of FDI and licensing.
- Conforming previous findings (Markusen, 1995; Yang and Maskus, 2001) a country with an important market size will attract more licensing and FDI flows relative to exports.

IPR and Economic Development :

- We calculate a set of development dummies according to the income level of our host countries (World Bank).
- In higher and upper middle income countries, IPR enhance stronger economic flows.
- However, no significant effects across the different levels are found for licensing flows.
- For FDI and exports, the strongest effects concern middle low economies.
- For lowest income countries, a negative impact is found for FDI, and no effect for trade.

IPR and Imitation Threat :

Table 3: Relative Impact of IPR Strength and Imitation Threat

	Imitation Effects 1			Imitation Effects 2			Imitation Effects 3		
	Licences	Exports	FDI	Licences	Exports	FDI	Licences	Exports	FDI
Market Size	2.123*** [0.264]	0.719*** [0.239]	0.862*** [0.263]	2.102*** [0.282]	0.745*** [0.262]	0.798*** [0.278]	2.154*** [0.269]	0.812*** [0.247]	0.767*** [0.264]
Labor	-0.748*** [0.247]	-0.311 [0.217]	-0.818*** [0.213]	-0.782*** [0.245]	-0.210 [0.218]	-0.945*** [0.224]	-0.822*** [0.237]	-0.260 [0.210]	-0.918*** [0.215]
High-Tech Export Intensity	-0.032 [0.032]		0.074** [0.031]	-0.032 [0.036]		0.095*** [0.034]	-0.024 [0.033]		0.090*** [0.031]
Taxes on Int. Trade	-0.182 [0.171]	-0.465*** [0.142]		-0.185 [0.171]	-0.433*** [0.141]		-0.178 [0.171]	-0.440*** [0.141]	
FDI Flows(% GDP)	0.000 [0.000]	-0.000*** [0.000]		0.000 [0.000]	-0.000*** [0.000]		0.000 [0.000]	-0.000*** [0.000]	
Human Skills	-0.020 [0.013]	-0.045*** [0.011]		-0.023* [0.012]	-0.035*** [0.011]		-0.022* [0.012]	-0.037*** [0.010]	
Solde of Technology BP		0.050 [0.037]	0.006 [0.043]		0.049 [0.037]	0.019 [0.043]		0.046 [0.037]	0.017 [0.043]
IPR*WI							-0.242 [0.291]	1.247*** [0.256]	1.058*** [0.291]
IPR*SI							-0.335 [0.300]	1.131*** [0.262]	0.960*** [0.297]
IPR*VHIh				-0.278 [0.341]	1.086*** [0.294]	1.101*** [0.322]			
IPR*HIh				-0.330 [0.299]	1.127*** [0.261]	0.924*** [0.296]			
IPR*MIh				-0.205 [0.297]	1.255*** [0.260]	1.066*** [0.293]			
IPR*Lih				-0.318 [0.332]	1.142*** [0.289]	1.198*** [0.331]			
IPR*Hires	-0.271 [0.290]	1.226*** [0.254]	1.070*** [0.288]						
IPR*Wires	-0.179 [0.321]	1.065*** [0.281]	1.345*** [0.328]						
Observations	254	254	254	254	254	254	254	254	254
Years Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0,64	0,45	0,57	0,38	0,45	0,45	0,37	0,45	0,44
Breusch Pagan Test of Independence chi2(x)			0,1246			0,21			0,22

- Licensing is not affected by the level of imitative skills, and furthermore, is insensitive to IPR regime regardless of the level of host countries' technical level.
- Even if the differences between the dummy groups are not so clear-cut for FDI and exports, coefficients are larger for exports.
- Trade flows seem to react to stronger protection of IPR in countries with high and medium imitative skills.
- Licensing contracts do not react automatically to stronger level of patent protection, suggesting a monopoly power effect.

Location, Internalization and Joint Effects :

- Do stronger IPR increase location advantages such that firms transfer knowledge assets outside the source country?
- Do stronger IPR increase externalization of production such that firms transfer knowledge assets outside the source firm?
- Our hypothesis concerning the reaction of bilateral flows to stronger IPR are as follows:

Table 4: Predicted Responsiveness to Foreign IPR protection by bilateral exchanges

	Location Decision		Internalization Decision		Location and Internalization Decision		
	Inside country	Outside country	Inside firm	Outside firm	Inside Firm and Country	Outside country and Inside firm	Outside country and firm
Exports	LOW		LOW		LOW/LOW		
FDI		HIGH	LOW			HIGH/LOW	
Licensing		HIGH		HIGH			HIGH/HIGH

Table 5: Pooled Transactions; Distinguishing Location and Internalization Effect

	Baseline	Location Effects	Internalization Effects	Joint Effects
DUM-FDI	0.186*** [0.012]	0.978*** [0.022]	0.966*** [0.036]	0.172*** [0.011]
DUM-LIC	0.346*** [0.009]	0.983*** [0.018]	0.322*** [0.007]	0.996*** [0.048]
Ln(GDP)	1.016*** [0.192]	0.654*** [0.111]	0.613*** [0.116]	1.322*** [0.134]
Ln(LAB)	-0.511*** [0.169]	-0.230** [0.096]	-0.320*** [0.101]	-0.696*** [0.126]
High-Tech Export Intensity (%)	0.058*** [0.017]	0.112*** [0.016]	0.092*** [0.015]	0.047*** [0.017]
High School Enrolment	-0.010 [0.009]	-0.037*** [0.007]	-0.018*** [0.006]	-0.024*** [0.007]
IPR index	1.145* [0.172]	1.491** [0.730]	3.473*** [0.729]	-1.697** [0.800]
Dummy – GDP		-0.348*** [0.040]	-0.196*** [0.058]	-1.092*** [0.189]
Dummy – LAB		0.000 [0.000]	0.000 [0.000]	0.679*** [0.216]
Dummy – High Tech Exp I.		-0.111*** [0.019]	-0.099*** [0.024]	-0.047 [0.029]
Dummy – High School Enr.		0.031*** [0.007]	0.012 [0.009]	0.021* [0.011]
Dummy – IPR		1.256** [0.626]	3.538*** [0.827]	3.247*** [1.119]
Constant	-7.890** [3.986]	-3.687 [2.261]	-4.309* [2.434]	-7.558*** [2.507]
Observations	814	814	814	814
Number of countries	35	35	35	35

Main Findings and Interpretation 4 :

- Stronger IPR has a positive market expansion effect on all forms of bilateral exchange on average.
- A strengthen of IPR regime confer a location advantage, that is a positive answer of FDI and license flows relative to exports.
- It also leads to an externalization effect, increasing licenses relative to FDI and exports.
- Hence we can conclude that the impact of IPR is larger when knowledge assets are outside the country and the firm.
- The results for joint effects are consistent with this findings, the response of FDI flows to strengthened IPR is not significantly different from the response of licenses.

- Our purpose was to evaluate whether and how IPR protection affects the entry mode of foreign firms.
- Our results suggest that intellectual property protection influence the decision to commercialize production overseas, in a general way.
- When the simultaneity of decision is taken into account, arm's length contracts and direct investment seem to increase by the strength of IPR protection, with a more important impact on FDI than licences.
- When controlling for economic development, IPR protection seems to foster licensing flows in low income countries, and FDI and trade in middle-income countries.

- Regarding imitation threat, there's no difference across groups in attracting FDI and trade. Furthermore, imitation risk doesn't seem to matter for determining the licenses flows.
- IPR protection appears to promote economic flows when it linked to important demand and market factors.
- Pooled estimates attenuate however this non significant results on licensing.
- Strengthen IPR improve the attractiveness of host countries, particularly for decisions concerning location within and outside the firm.