

I. Patent Protection and Technology Transfer in Developing Economies

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Outline

A. Technology Transfer

- Channels
- Importance
- Issues

B. Global Patent Protection

- Measurement
- Trends

C. Lessons from Economics Research

- Theory
- Evidence



A. Technology Transfer

- Channels
 - Trade, Foreign Direct Investment (FDI), Licensing
- Importance
 - Source of Capital, Employment, Technology, Goods & Services
 - Effect on Local Economic Development and Productivity
 - Article 66.2, TRIPS



Issues:

- How IPRs affect inward technology transfer
- “Quality” of technologies transferred
 - Vintage
 - Nature of activity
 - Effects on local development



B. Global Patent Protection

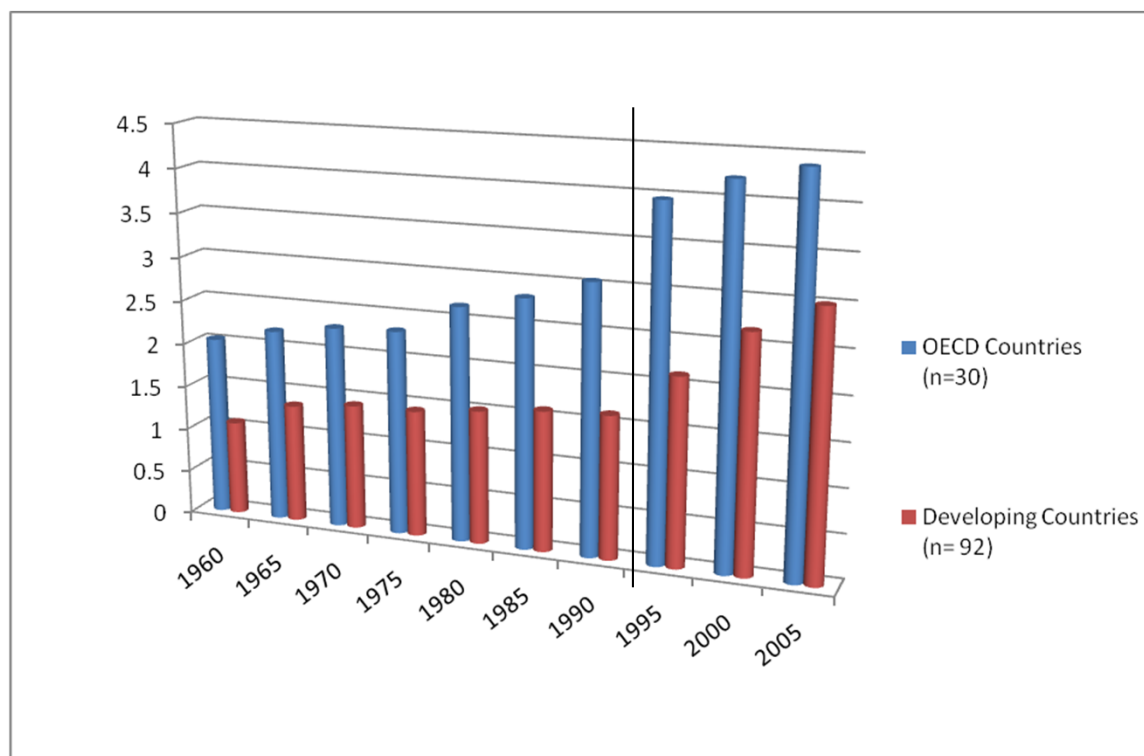
- Patent Rights Index (0 - 5)
 - Duration (0 - 1)
 - Coverage (0 - 1)
 - Restrictions, if any (0 - 1)
 - Enforcement Mechanisms (0 - 1)
 - Membership in International Treaties (0 - 1)

Source: Park (2008) *Research Policy*

Sample Estimates

	1985	1995	2005
USA	4.68	4.88	4.88
Canada	3.16	4.34	4.67
China	1.33	2.12	4.08
Egypt	1.41	1.73	2.77
India	1.03	1.23	3.76
S. Korea	2.45	3.89	4.33

Evolution of the Patent Rights Index, 1960-2005



- The vertical bar indicates the advent of the TRIPS Agreement.



Alternative Measures of IPR

- World Economic Forum (WEF) *Global Competitiveness Report*
- Economist Intelligence Unit (EIU)
- Business Software Alliance (BSA), Piracy Rates

Example

World Economic Forum (WEF):

“Intellectual Property Protection in your country

Is Weak and Not Enforced < 1 2 3 4 5 6 7 > Is Strong and Enforced

Circling 1 means you *completely* agree with the answer on the left-hand side

Circling 2 means you *largely* agree with the answer on the left-hand side

Circling 3 means you *somewhat* agree with the answer on the left-hand side

Circling 4 means your opinion is *indifferent* between the two answers

Circling 5 means you *somewhat* agree with the answer on the right-hand side

Circling 6 means you *largely* agree with the answer on the right-hand side

Circling 7 means you *completely* agree with the answer on the right-hand side”

Surveys

WEF (out of 7 points)		Measure	EIU (out of 5 points)	
2000	2010	Country	2000	2010
6.5	5.1	USA	5	5
6	5.5	Canada	5	5
3.6	4.0	China	1	3
4.0	3.6	Egypt	2	3
3.0	3.6	India	2	3
3.9	4.1	S. Korea	3	3

Survey Approach

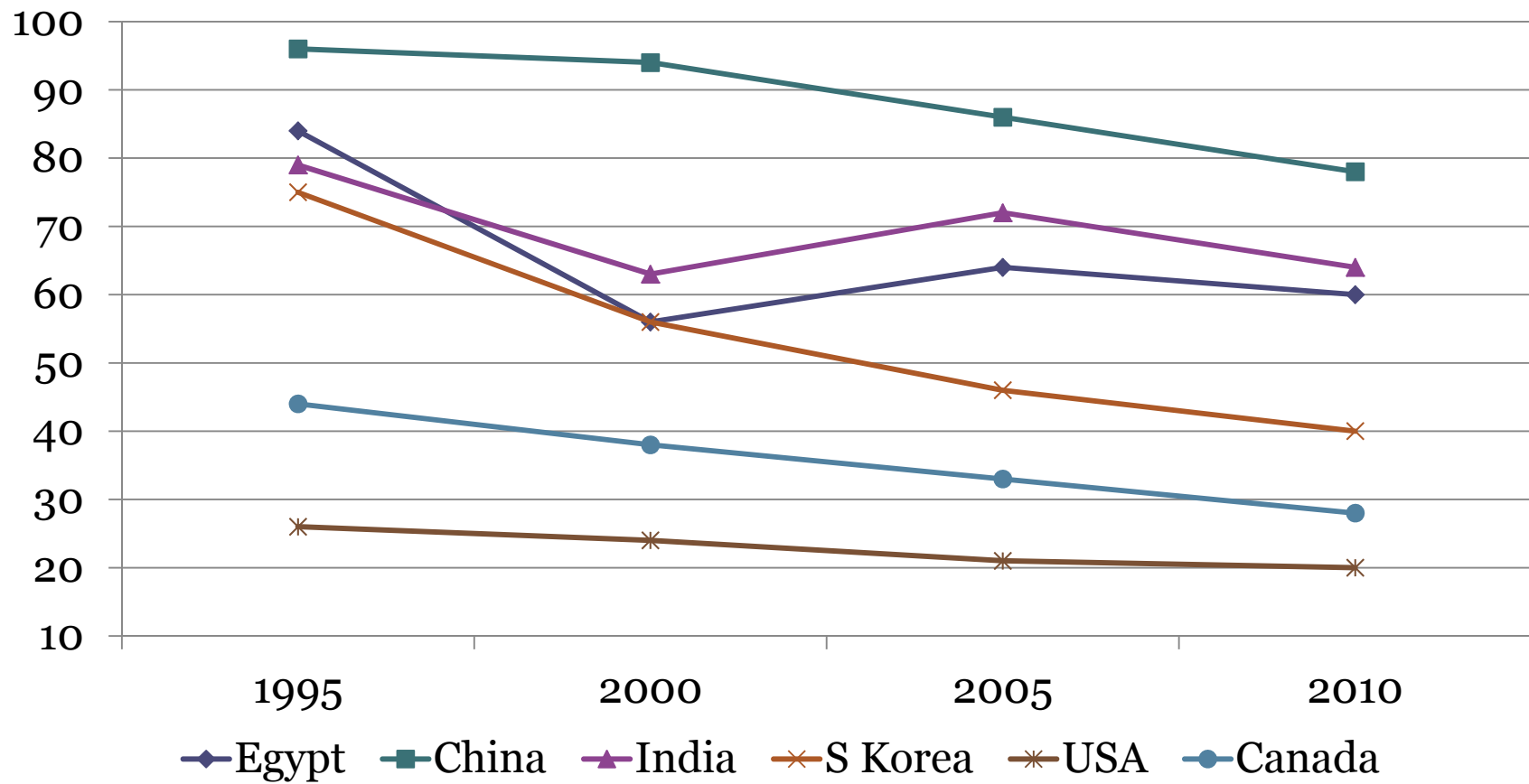
Advantages

- Based on experience
- Provides information that is otherwise unobserved (e.g. actual practice)

Limitations

- Limited Time-Series
- Comparability Issues
- Lump all IPR together
- Subjective

Piracy Rates



Correlations with other Measures

Correlation with Patent Rights Index (Coefficient of Variation = 0.47)

Other Measures:	1995	2000	2005	Coefficient of Variation
Economist Intelligence Unit	0.71	0.73	0.72	0.39
World Economic Forum	n/a	0.74	0.67	0.33
Software Piracy	-0.74	-0.67	-0.75	0.34

Coefficient of Variation = Standard Deviation/Mean



Recap

- Levels of Patent Protection higher in ‘North’ than in ‘South’
- Gap in levels have narrowed
- Next: Impact on Technology Transfer

C. Research Findings

- Theoretical Debates
 - How patents influence technology transfer:
 - Reduce Imitation (non-market access)
 - Market channels: Trade, FDI, Licensing
 - Market Expansion vs. Market Power
 - *Role of Imitative Capacity*
 - Ownership, Location, and Internalization (OLI)
 - Volume & Composition of Technology Transfers
 - *Role of Imitative Risks vs. Setup Costs*

Evidence

- Trends in Trade (Merchandise Imports)

	1995		2010		
Country Group	Level	Share of World	Level	Share of World	% Growth (1995 – 2010)
Developed	4442	69.2	8012	57.7	80.3%
Developing	1837	28.6	5426	39.1	195.4%
- Africa	152	2.4	441	3.2	189.5%
- America	305	4.7	806	5.8	164.4%
- Asia	1373	21.4	4167	30	203.5%

Data are in constant 2005 billions of U.S. dollars
Source: UNCTAD Stats

Evidence

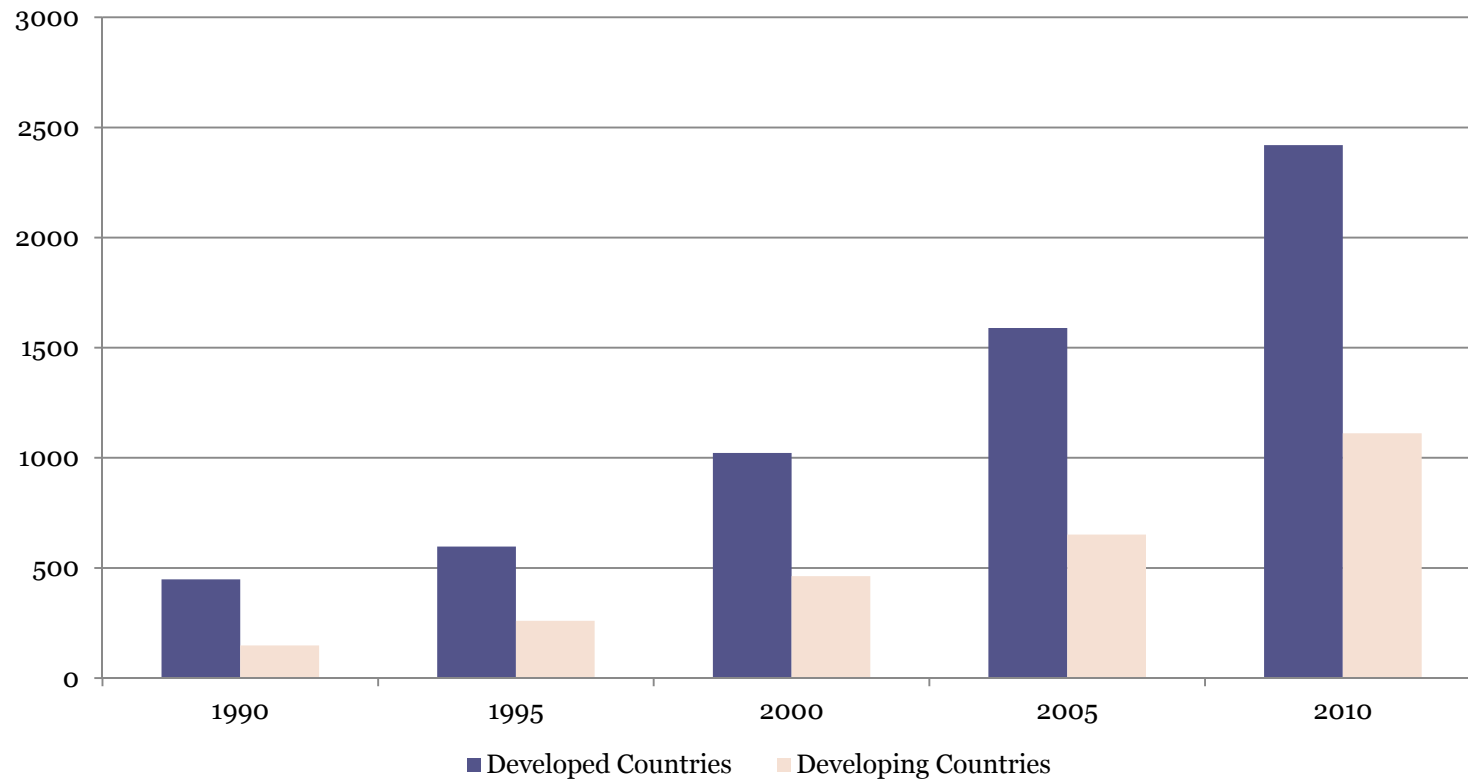
- Trends in FDI (Inward Stock)

Country Group	1995	2010	% Growth (1995 – 2010)
Developed	3107	11296	263.5%
Developing	1039	5377	417.2%
- Africa	109	501	357.0%
- America	229	1556	577.8%
- Asia	697	3310	375.1%
Least Developed	15	137	492.3%

Data are in constant 2005 billions of U.S. dollars. Source: UNCTAD Stats

Evidence

- U.S. FDI Abroad



Data are in constant 2005 billions of U.S. dollars. Source: U.S. Bureau of Econ Analysis

Evidence

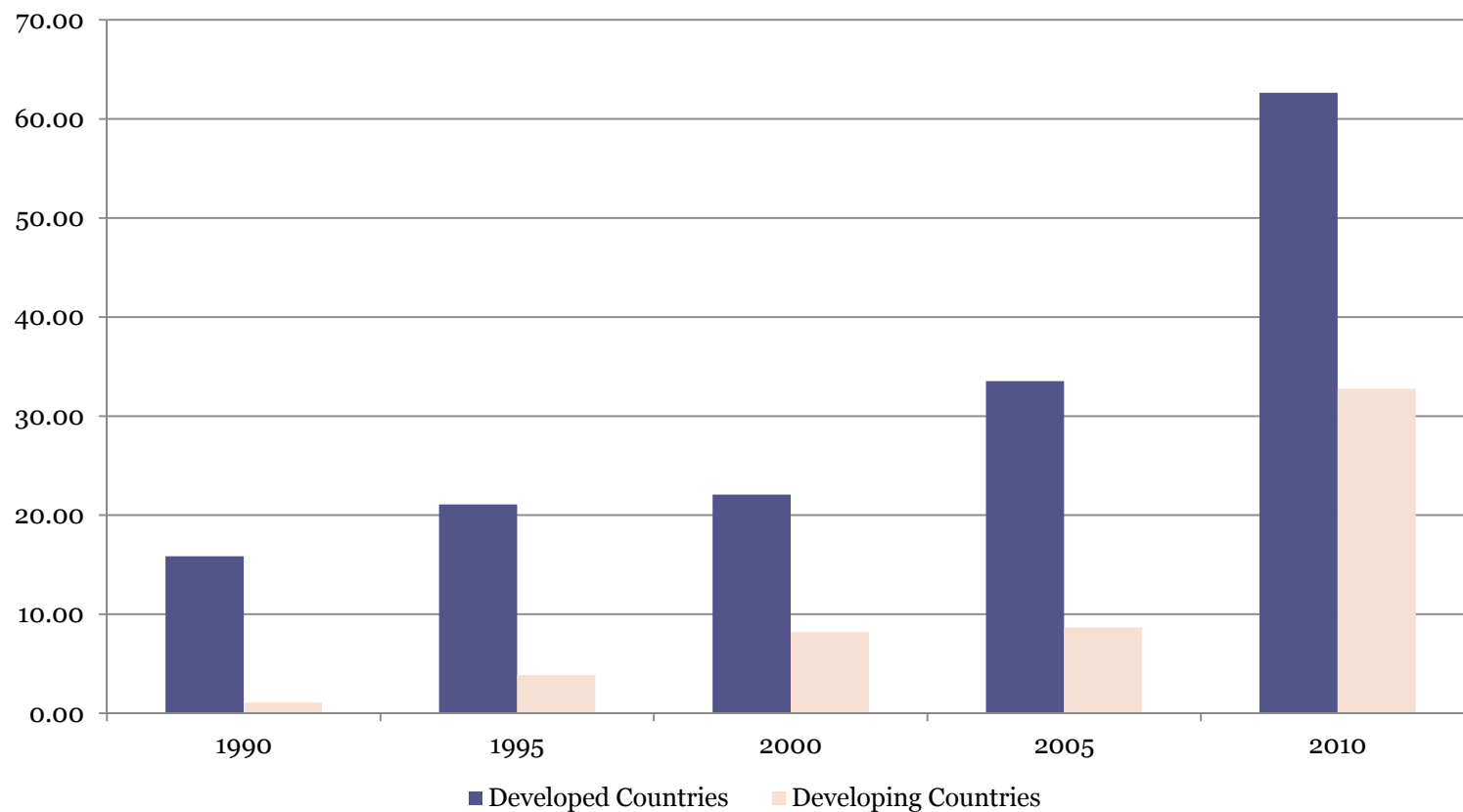
- Trends in Licensing (Royalty & Fee Payments)

Countries	2000	2009	% Growth (2000 – 2009)
USA	18	23	24.0%
Canada	4.3	7.0	65.6%
China	1.4	10.1	598.6%
India	0.3	1.7	432.6%
S. Korea	3.6	6.6	80.5%

Data are in constant 2005 billions of U.S. dollars. Source: UNCTAD Stats

Evidence

- U.S. Outward Licensing



Data are in constant 2005 billions of U.S. dollars. Source: U.S. Bureau of Econ Analysis

Statistical Analyses

- Find a “model” to **fit** the data
- Model:
 - **Tech Transfer** = $\alpha + \beta$ **IPR** + γ **Control Variables** + ε
- Findings
 - Mixed, but mostly positive β estimates
- Gaps in previous studies
 - Usually focus is on one tech transfer mode at a time
 - Need more data from non-U.S. source countries
 - Limited studies on the ‘quality’ or technological content of tech transfers

Impact of Patents on Technology Transfer (holding other factors constant): Range of Findings

	Single Mode			Joint Modes
Country Group	Exports	FDI	Licensing	Exports, FDI, and Licensing
Pooled	+, 0	+, 0	+	Ratio of Licensing to FDI, + Ratio of FDI to Exports, +
Developed Countries	?	?	n/a	Ratio of Licensing to FDI, + Ratio of FDI to Exports, ?
Developing Countries	+	+, 0	n/a	Ratio of Licensing to FDI, n/a Ratio of FDI to Exports, +

Symbol Key: + positive effect, - negative effect, 0 insignificant, ? indeterminate, n/a not avail.

Source: Park (2008), Chapter 9 in K. Maskus (ed.) *Frontiers of Economics and Globalization*, Elsevier.



General Findings

(regarding sensitivity of tech. transfer to patent rights)

- Effects vary by industry, type of intangible asset, and level of economic development of host country
- Sequential Pattern
 - Trade, FDI, Licensing (esp. unaffiliated)
- Role of Complementary Factors
 - Market size, wages, investment climate, market concentration, governance, human capital, ...

Technological Content of Technology Transfers

- How do we assess whether FDI/Licensing involved transfers of substantive “technologies” in developing countries?
 - Approach 1: Examine High-tech Sector
 - Approach 2: Non-resident patenting
 - Approach 3: Local R&D, Joint Research Ventures

Source: Park and Lippoldt (2012) forthcoming in Hall et al. (eds.)



Recap (impacts of IPR on technology transfer)

- Market expansion vs. market power effects
- Substitution and scale
- Sequential entry
- Complementary factors, interaction effects
- Level of imitation risk, absorptive capacity
- Alternative means of appropriation
- Varying effects across sectors, technologies, and nature of economic activity
- Higher quality of technologies transferred