

IPR MEASUREMENT AND EFFECTS ON INNOVATION: IMPLICATIONS FOR CHINA

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Outline

Construction of Index of Intellectual Property Rights

Case Study: South Korea

Implications for China

Background

□ GDP

□ GPA

□ IPR Index

Background

Email Requests for IPR Data (2)	2008 – 2010):
Fellow Academics	12%
Business	< 1%
Government/Institutions	7%
Undergraduate Students	5%
Graduate Students	17%
Students in China	58%

I. Construction of Measures of IPR

Survey Approach

- World Economic Forum (WEF) Global Competitiveness Report
- Institute for Management Development (IMD) World Competitiveness Yearbook
- Mansfield (1994), Sherwood (1997)
- Index Approach
 - Rapp and Rozek (1990)
 - Ginarte and Park (1997), Park (2008)
 - Ostergard (2000), Reynolds (2003)

IA. Survey Approach

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"

Moving Average Score

Per country:

Score (year t) = ω_t Rating (year t) + ω_{t-1} Rating (year t-1)

Sample Estimates

World Economic Forum

	2010 Score (Rank)	2001 Score (Rank)
USA	5.1 (24 th)	6.5 (3 rd)
Germany	5.7 (9 th)	6.3 (6 th)
S. Korea	4.1 (44 th)	4.0 (37 th)
China	4.0 (49 th)	2.9 (60 th)
India	3.6 (66 th)	3.0 (58 th)
	139 countries	79 Countries

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
- Expensive

IB. Index Approach

□ 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)

Duration

Application-Based Systems: 20 Years

□ Grant-Based Systems: 17 Years

Coverage

- Pharmaceuticals
- Chemicals
- Food
- Surgical Products
- Microorganisms
- Plant & Animal Varieties
- Software
- Utility models (Petty patents)

Restrictions, if any

Working Requirements

Compulsory Licensing

Revocation

Enforcement Mechanisms

Preliminary Injunctions

Contributory Infringement

Burden-of-Proof Reversal

Membership in International Treaties

Paris Convention

Patent Cooperation Treaty

□ UPOV (New Varieties)

Budapest Treaty (Microorganism Deposits)

□ TRIPS

Sample:

	1990	Rank	2005	Rank
United States	4.68	1	4.88	1
France	3.88	8	4.67	5
Japan	3.88	9	4.67	6
United Kingdom	4.34	3	4.54	11
Germany	3.97	6	4.50	14
Korea (South)	3.69	12	4.33	18
China	1 33	93	4 08	34
Mexico	1 36	01	3.88	30
	1.00	405	0.70	39
India	1.03	105	3.76	41
Brazil	1.28	94	3.59	49
Cameroon	1.90	52	3.06	71
Thailand	1.21	97	2.66	96



Figure 1. Strengthening of Patent Rights by Income Group

Quintiles (Real GDP per capita, 1990, in constant 2000 U.S. dollars)



[■]%Chng Duration [■]%Chng Enforcement [□]%Chng Loss of Rights [□]%Chng Membership [■]%Chng Coverage

Figure 3. Composition of Change in Patent Strength 1990 - 2005, Middle Quintile



□%Chng Duration □%Chng Enforcement □%Chng Loss of Rights □%Chng Membership ■%Chng Coverage

Figure 4. Composition of Change in Patent Strength 1990 - 2005, Top Quintile



□%Chng Duration □%Chng Enforcement □%Chng Loss of Rights □%Chng Membership ■%Chng Coverage

Correlations with other Measures

	1995	2000	2005
World Economic Forum IPR		0.74	0.67
Institute Mgt Development IPR	0.65	0.56	0.48
Econ Freedom Network: Property Rights	0.69	0.66	0.68
Business Software Alliance: Piracy Rate	-0.74	-0.67	-0.75
Governance Indicators: Rule of Law	0.70	0.72	0.73
Governance Indicators: Regulatory Quality	0.58	0.76	0.79
Governance Indicators: Government Effectiveness	0.77	0.76	0.78
Doing Business: Legal Rights			0.35
Doing Business: Investor Protection			0.25
Doing Business: Cost of Contract Enforcement			-0.51

More detail: China

Components:	1995	2000	2005
Membership Intl Agreements	0.200	0.800	1.000
Coverage	0 250	0.625	0 750
overage	0.200	0.020	0.700
Loss of Rights	0.333	0.333	0.333
Enforcement	0.333	0.333	1.000
Duration	1.000	1.000	1.000
Total	2.117	3.092	4.083

China: Complementary Data



China: Complementary Data



China: Complementary Data



II. Case Study (S. Korea)

 Kim, Yee-Kyoung, Lee, Keun, Park, Walter, and Choo, Kineung, (2010),
"Appropriate Intellectual Property Protection and Economic Growth in Countries at Different Levels of Development", in progress.



Patents vs. Utility Models

Similarities

•

:

:

- Exclusive Rights
- Disclosure
- Registration

Differences

- Duration
- Substantive
 - Examination
- Inventive Step
- Scope

:

Theoretical Perspectives

□ Grossman and Lai (2004)

Optimal IPR varies between North and South

Eicher and Penalosa (2008)
Endogeneity between IPR and Development

Suthersanen (2006)
Incremental Innovation and learning-by-doing

Theoretical Perspectives

Evenson and Westphal (1995)

Strong IPRs can be a powerful instrument for encouraging many forms of investment at all levels of technological development if they are sufficiently focused on promoting those forms of investment which are respectively important at each level. More imagination than has previously been given to their design is clearly in order. ... [U]tility models exemplify the gains in creativity in this area. Utility model protection, for example, is actively sought in the few countries, like Korea, that grant it. Moreover, the evidence suggests that it stimulates the kinds of minor, adaptive inventions that are important in the early to middle phases of technological development."

Rosenberg (1979)

Cumulative Impact of Small Improvements

Why Utility Models suited S. Korea

- Weak Patent System and Enforcement
- Lagging Technological Capability and Limited Technological Resources
- Relied on Imported Technologies, Reverse Engineering, and Imitation
- Adapted Foreign Technologies for Local Needs
- Innovation was Incremental in Nature

Korean Trends



Note: Revision of Choi and Lee (2005)

Korean Trends

R&D/GDP(%) 4 3.5 3 2.5 2 1.5 1 0.5 0 ્વ¹ ૾ વ¹ ૾ વ⁶ ૾ વ⁶ ર વ⁶ ર વ⁶ ર વ⁶ ર વ⁶ ર વ⁶ ર q⁶ 2 q⁶ 2

Korean Trends



U.S. Patents Granted in 2009

Rank	Country	Count
1	JAPAN	35501
2	GERMANY	9000
3	KOREA, SOUTH	8762
4	TAIWAN	6642
5	CANADA	3655
6	UNITED KINGDOM	3175
7	FRANCE	3140
8	CHINA, PEOPLE'S REPUBLIC OF	1655
9	ISRAEL	1404
10	ITALY	1346

Resident Patenting in S. Korea



Utility Models Inventions

Resident Patenting in S. Korea



Ratio of Utility Models to Invention Patents (S. Korea)



Study in a Nutshell

- Datasets 1970 2003
 - International Panel Data Set (World Bank)
 - > 70 Countries
 - Korean Annual Firm Level Data Set (KIPRIS and KIS)
 - > 3000 Firms
- Empirical Model (Dynamic)
 - Y = f(Y₋₁, P, UM, Control Variables)
 - $P = g(P_{-1}, IPR, Control Variables)$
 - Y denotes GDP (or Sales), P patents, UM utility models

International Panel Data Results

Innovation Equation		Growth Equation			
Variables	(1)	(2)	Variables	(3)	(4)
Patent Rights Index (PRI)	0.699***		Patenting Intensity (PI)	0.048***	0.067***
PRI * D	-0.489**		PI * D		-0.066*
Utility Model Dummy (UM)		-0.078	Utility Model Intensity (UMI)	0.001	-0.003
UM * D		0.227*	UMI * D		0.012**
Controls, Time Dummies, Constant	Included	Included	Controls, Time Dummies, Constant	Included	Included
N	255	255	Ν	328	328

Korean Firm Level Results

Sales Growth Equation			
Variables	(1) Full Period	(2) Pre 1987	(3) Post 1987
Patenting Intensity	0.025**	-0.019	0.053***
Utility Model Intensity	0.009	0.047**	0.005
Controls, Year Dummies, Constant	Included	Included	Included
Ν	14359	3034	11325

Innovation Equation

Variables	(4)
Patent Applications _{t-1}	0.539***
Patent Applications _{t-2}	0.258***
Utility Model Applications _{t-5}	0.084**
Utility Model Applications _{t-6}	0.039*
Controls, Year Dummies, Constant	Included
Ν	9903

Lessons of Study

□ Effects of IPR varies by level of economic development

- Patents raise cost of innovation; onerous in LDCs
- Patents most effective where innovative capacity exists
- Endogeneity between IPR and technological development

Utility Models

- Incentives for incremental innovation
- Helps build innovative capacity
- Stepping stone for further technological progress
- Best utilizes local capabilities
- Rapid development in S. Korea is connected to "incremental innovation" as a strategy for technological catch-up

III. Implications for China

□ Relevance?

Transition from Imitation to Innovation

Transition from Weak IPR System to Strong

Incentives for Stronger IP Enforcement in China

Resident Patenting in China

Applications

Grants



Ratio of Utility Models to Invention Patents (China)



Issues:



Issues:

