

The impacts of TRIPS on patenting in Latin America: the different performance of residents and non residents

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Motivation

- TRIPS meant a major step towards the international harmonization of IPR regimes
 - Strong debates have emerged around its impacts on developing countries
 - So far there are relatively few rigorous empirical evidence on the subject
 - We aim at contributing to the debate focusing on the impacts of TRIPS on patenting in LAC
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Research questions

- Did TRIPS-driven modifications in patent laws in LAC (or, more in general, stronger IPR regimes) have a positive impact on patenting in those countries?;
 - Have those modifications had different impacts on patenting by residents and non-residents?
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Patenting and innovation: a word of caution

- Although IPRs and patents concentrate the bulk of the academic and policy debate on appropriability and innovation, there are other appropriation channels
 - These channels (specially those based on market mechanisms) are more effective for guaranteeing the returns of innovations
 - However, patenting activity has increased strongly, specially motivated by “strategic” objectives (technological blocking, litigations, etc.)
 - Hence, if patents were already an imperfect indicator of innovative activity, this is even more so in the present situation
 - This has very relevant implications at the time of reading and interpreting our findings.
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TRIPS and developing countries: potential positive impacts

- Create more incentives for R&D activities in developed countries to be oriented towards the technological needs (specially in the health area) of the developing countries
 - Foster domestic R&D activities in developing countries
 - Stimulate technology transfer from developed countries via trade, FDI and licensing
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TRIPS and developing countries: potential negative impacts

- Hinder the possibilities of technological imitation through reverse engineering and other channels
 - This could in turn block the road towards the development of “genuine” innovation capabilities
 - The distribution of benefits from TRIPs are very uneven, with developing countries probably suffering net losses in the short run
 - Stronger IPR protection may lead to higher prices of medicines
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The evidence (I)

- The empirical evidence on whether IPR systems in developing countries affect innovation in developed countries is not conclusive.
 - Some case study research on the pharmaceutical industry suggest that there were better solutions to tropical diseases when countries such as India strengthened their property rights regimes (Lanjouw and Cockburn, 2000).
 - However, more general evidence shows that stronger IPR regimes in developing countries did not motivate increases in R&D in developed countries (Sharma and Saxena, 2006).
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The evidence (II)#

- Most studies claim that stronger IPR regimes do not foster local innovation in developing countries (Sharma and Saxena, 2012).
- Few studies, however, claim positive effects (Chen and Puttitanun, 2005; Kanwar, 2007; Kanwar and Evenson, 2003).
- Methodological drawbacks:
 - Empirical studies mostly mix a sample of developed and developing countries (hence IPR indexes could be taking the explanatory power of other key institutional variables)
 - In fact, some studies show that when the sample between developed and developing countries is split in two groups the relation turns up to be negative for the second group (Schneider, 2005).
 - Stronger IPRs may increase patents counts, but that means that they encourage more patenting activity but not necessarily more innovation.

The evidence (III)

- Stronger IPRs favor technology transfer to developing countries (Watson, 2011), particularly in relation to licensing (Branstetter *et al.*, 2006) and trade (Fink and Braga, 2005) that to a large extent occur within multinational companies (Di Vita, 2013; Dinopoulos and Segerstrom, 2010)
 - But the evidence is not as strong in terms of improving the attraction of FDI (Bronckers, 1994).
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The evidence (IV)

- There are extremely few studies that assesses specifically for the impacts of TRIPS on developing countries.
 - The few exceptions normally incorporate a dummy variable taking the value one for the period after TRIPS (1995 onwards) in econometric analysis using cross-national samples mixing developed and developing countries.
 - This approach creates methodological problems because it is not possible to identify the extent to which changes are strictly related to TRIPS rather than to other contextual factors that affect patenting simultaneously.
 - Hamdan-Livramento (2009) shows that TRIPS impact is positive on technological transfer measured as FDI flows and licensing but negative for the actual application on new technologies because it increases the costs of using new technology by entrepreneurs in developing countries.
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Summing up

- Stronger IPR and TRIPS effects are much more positive on technology transfer than on domestic innovation defined as world-first creations and also as application of new technologies.
- TRIPS may have different effects on different actors in developing countries
- Foreign firms may benefit more largely than domestic actors, at least in the short-medium run.
- TRIPS compliance and enforcement imply an international convergence in IPR systems and while multinational firms have long experience in patenting world-first innovation abroad domestic actors rarely achieve patentable innovations and their imitative capabilities may be hampered by stronger IPR system.
- Hence, by complying TRIPS developing countries are mostly inviting foreign firms to patent locally rather than motivating domestic patentable innovation by local actors?

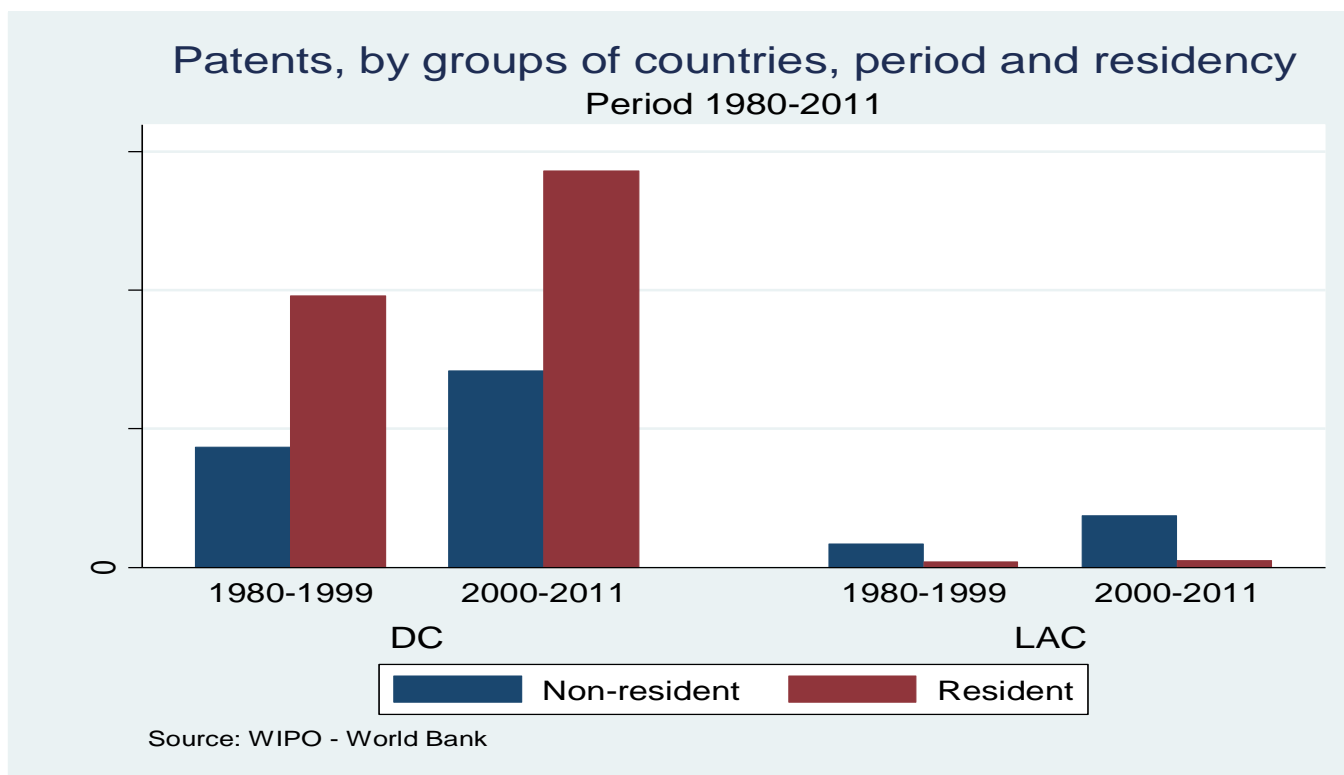
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- The impacts of TRIPS on LAC: some statistical evidence
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LAC have been converging to the IPR standards of DC

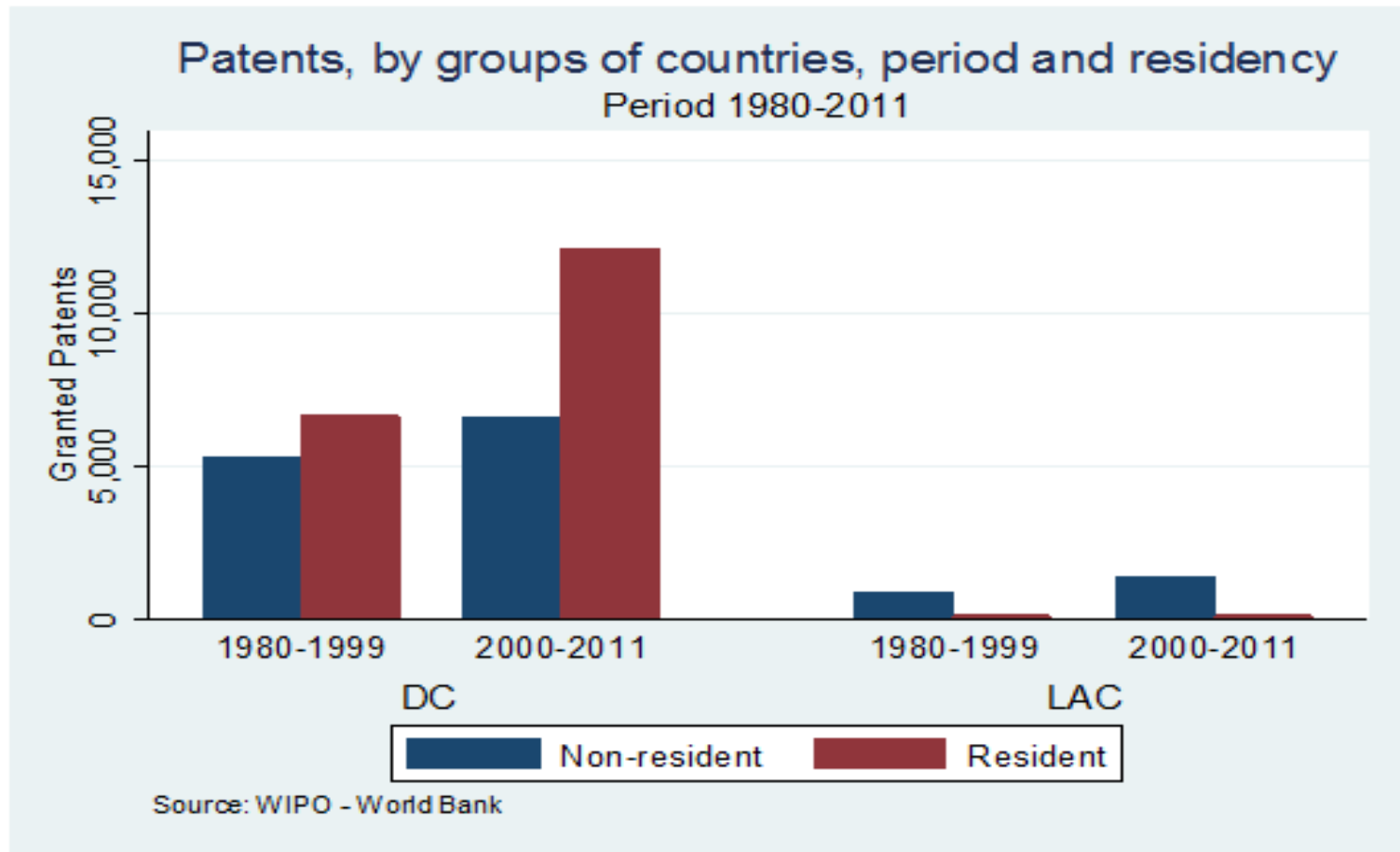
Evolution of the Ginarte-Park index by group of countries in our sample

	Countries	1990	1995	2000	2005
Developed countries	28	2.7407692	4.0164286	4.2528571	4.4189286
LAC	13	1.2046154	2.3230769	3.2884615	3.5053846

Differently from what happened in DC, in LAC only non residents have increased the rate of patent applications



And the same happens with patent grants



Methodology and data sources

- We built a dataset of 28 DC and 13 LAC countries that applied TRIPS before year 2000 for period 1980-2011
 - We have WIPO data for granted patents and applications by residents and non-residents in each national patent office.
 - We employ World Bank data (World Development Indicators database) for control variables used in the literature
 - We use panel-data techniques on negative binomial regressions (count data)
 - **Exercise 1:** fixed effect model to assess the impact of strengthening IPR regimes using Ginarte-Park index assessed in different subsamples (among them them patent by residents in LAC)
 - **Exercise 2:** experimental design using DD and DDD techniques to specifically assess the effect of TRIPS compliance by LAC
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Descriptive statistics, 2010

	Gross fixed capital formation (% of GDP)	GDP per capita, PPP (constant 2005 international \$)	Population in millions	Trade (% of GDP)	Ginarte-Park Index	Electric power consumption (kWh per capita)	Patent Grants			Patent Applications		
							Resident	Non-resident	Total	Resident	Non-resident	Total
Argentina	22	14,363	40	40	4.0	2,904	211	1155	1366	552	4165	4717
Bolivia	17	4,350	10	76	3.4	616	5	67	72	80	333	413
Brazil	19	10,093	195	23	3.6	2,384	314	2937	3251	2705	19981	22686
Chile	21	14,520	17	70	4.3	3,297	95	925	1020	328	748	1076
Colombia	22	8,479	46	34	3.7	1,012	26	613	639	133	1739	1872
Costa Rica	20	10,453	5	78	2.9	1,855	0	45	45	8	1212	1220
Ecuador	25	7,201	14	72	3.7	940	2	31	33	4	690	694
Guatemala	15	4,297	14	62	3.2	567	0	104	104	7	374	381
Mexico	21	12,481	113	62	3.9	1,990	229	9170	9399	951	13625	14576
Paraguay	17	4,626	6	110	2.9	1,003	1	5	6	18	347	365
Peru	25	8,555	29	48	3.3	1,106	4	361	365	39	261	300
Uruguay	19	12,642	3	53	3.4	2,763	4	25	29	23	761	784
Venezuela	19	10,973	29	46	3.3	3,287				33	33	66
13 LAC (mean)	20	9,464	40	60	4	1,825	74	1,287	1,361	375	3,405	3,781
13 LAC (coeff of var)	15%	38%	136%	38%	12%	56%	151%	204%	198%	201%	181%	183%
Australia	28	34,602	22	40	4.2	10,286	1178	13379	14557	2409	22478	24887
Austria	21	35,313	8	104	4.3	8,356	955	175	1130	2424	249	2673
Belgium	20	32,882	11	158	4.7	8,388	424	108	532	620	140	760
Canada	22	35,223	34	61	4.7	15,137	1906	17214	19120	4550	30899	35449
Czech Republic	25	23,625	11	130	4.3	6,321	279	632	911	868	114	982
Denmark	17	32,379	6	95	4.7	6,327	112	43	155	1626	142	1768
Finland	19	31,310	5	79	4.7	16,483	722	201	923	1731	102	1833

Descriptive statistics (cont)

	Gross fixed capital formation (% of GDP)	GDP per capita, PPP (constant 2005 \$)	Population in millions	Trade (% of GDP)	Ginarte-Park Index	Electric power consumption (kWh per capita)	Patent Grants			Patent Applications		
							Resident	Non-resident	Total	Resident	Non-resident	Total
France	19	29,484	65	53	4.7	7,729	8779	1120	9899	14748	1832	16580
Germany	17	33,565	82	88	4.5	7,215	9630	4048	13678	47047	12198	59245
Greece	18	23,982	11	54	4.3	5,242	467	12	479	728	16	744
Hungary	18	16,958	10	167	4.5	3,876	0	65	65	649	47	696
Iceland	13	32,779	0	103	3.5	51,440	7	132	139	57	19	76
Ireland	12	35,993	4	183	4.7	6,025	211	32	243	733	59	792
Israel	18	25,995	8	72	4.1	6,856	343	1950	2293	1450	5856	7306
Italy	20	27,083	60	55	4.7	5,384	14454	1652	16106	8877	846	9723
Japan	20	30,965	127	29	4.7	8,394	187237	35456	222693	290081	54517	344598
Netherlands	17	36,925	17	148	4.7	7,010	1597	350	1947	2527	240	2767
New Zealand	19	24,400	4	55	4.0	9,566	394	3953	4347	1585	5051	6636
Norway	20	46,906	5	70	4.2	25,175	431	1200	1631	1117	696	1813
Poland	20	17,348	38	86	4.2	3,783	1385	1619	3004	3203	227	3430
Portugal	20	21,665	11	69	4.4	4,929	121	19	140	499	46	545
Republic of Korea	28	26,774	49	102	4.3	9,744	51404	17439	68843	131805	38296	170101
Slovakia	22	20,121	5	164	4.2	5,164	57	319	376	234	48	282
Spain	22	26,901	46	57	4.3	6,155	2499	274	2773	3566	213	3779
Sweden	18	34,125	9	93	4.5	14,939	1116	264	1380	2196	353	2549
Switzerland	20	39,072	8	92	4.3	8,175	461	280	741	1622	533	2155
United Kingdom	15	32,814	62	63	4.5	5,733	2323	3271	5594	15490	6439	21929
United States of America	14	42,079	309	29	4.9	13,394	107792	111822	219614	241977	248249	490226
28 DC (mean)	19	30,402	37	89	4	10,258	14,153	7,751	21,904	28,015	15,354	43,369
28 DC (coeff of var)	19%	24%	167%	48%	6%	91%	286%	282%	264%	258%	310%	259%

Exercise 1: Do stronger IPR regimes have an impact on domestic patenting?

Table 3: Estimation of fixed-effects panel data negative binomial regression, original coefficients period 1980-2011

	All countries all residency		LAC countries, only non-residents		LAC countries, only residents	
	patent (A)	applic. (B)	patent (G)	applic. (H)	patent (I)	applic. (J)
GDP per capita, PPP (constant 2005 international \$)	6,E-06 **	3,E-06	2,E-04 ***	1,E-04 ***	1,E-04 ***	1,E-04 ***
Electric power consumption (kWh per capita)	6,E-05 ***	2,E-05 ***	-5,E-04 ***	-1,E-04	-7,E-04 ***	-3,E-04 **
Population (in millions)	0,009 ***	0,018 ***	0,005 ***	0,007 ***	0,007 ***	0,013 ***
Trade (% of GDP)	-0,003 ***	-0,003 ***	0,003	0,001	0,007 **	-0,004 *
Regulation: Index Ginarte-Park	-0,115 ***	-0,011	0,071 *	0,322 ***	-0,151 ***	-0,063 **
Constant	0,597 ***	0,418 ***	-0,116	0,326 **	0,704 ***	1,073 ***
Observations	2,232	2,312	337	358	331	357
Number of country	41	41	13	13	13	13
Average time periods	27,22	28,2	25,92	27,54	25,46	27,46
chi2	552.1	3715	27.23	850.3	51,61	181.4

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

|Robust standard errors in parentheses

Results for exercise 1

- The effect of strengthening property rights systems vary for different countries and type of actors
 - The aggregate effect does not have a clear interpretation
 - For the subsample of LAC countries stronger IPR systems :
 - Increase patenting activities by non-residents
 - Decrease patenting activities by residents
 - So, is TRIPS (or stronger IPR regimes) mostly inviting foreigners to patent rather than motivating nationals to innovate?
 - Our second econometric exercise tackles this issue directly
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Exercise 2: The effects of TRIPS on patenting in LAC

Table 4: Estimation of zero-truncated negative binomial regression, original coefficients and incidence-rate-ratio, period 1980-2011, clustered standard errors for 41 countries

	Original Coefficients				IRR			
	patent		applications		patent		applications	
a. Post-TRIPS period (>2000)	-0.668	***	-0.251		0.513	***	0.778	
b. LAC countries	-1.728	***	-1.696	***	0.178	***	0.183	***
c. Residents	-0.878	***	-0.195		0.415	***	0.823	
a x b	-0.184		0.325		0.832		1.385	
a x c	1.012	***	0.521	**	2.752	***	1.684	**
b x c	-1.167	***	-1.479	***	0.311	***	0.228	***
a x b x c	-1.66	***	-1.281	***	0.19	***	0.278	***
Electric power consumption (kWh per capita)	-8.74E-06		1.72E-05		1.000		1.000	
GDP per capita, PPP (constant 2005 international \$)	8.31E-09		-1.69E-05		1.000		1.000	
Population (in millions)	0.020	***	0.0222	***	1.020	***	1.022	***
Trade (% of GDP)	-0.017	***	-0.0169	***	0.983	***	0.983	***
Regulation: Index Ginarte-Park	0.481	***	0.429	**	1.618	***	1.536	**
Constant	7.276	***	7.857	***	1,446	***	2,584	***
Observations	2,232		2,312		2,232		2,312	
chi2	456.3		659.6		456.3		659.6	

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

Results for exercise 2

- We use DD and DDD methods to answer two main questions:
 1. Did LAC countries increase their patenting activities after TRIPS?
 - To answer this question we look at the interaction effect between post-TRIPS period and being a LAC country (DD effect indicated as the axb line).
 - Since the coefficient is not significant we interpret: patenting in LAC did not change in the after TRIPS period
 2. Did non-residents took better advantage of the new regulatory environment?
 - To answer this question we look at the interaction effect between post-TRIPS period, being a LAC country and being a resident actor (DDD effect indicated as axbxc line).
 - Residents patent systematically less than non-residents in LAC countries after TRIPS (-81% for granted patents, -72% for applications).

Conclusions

- TRIPS had no overall effect in patenting activity in LAC, but it has favoured patents by non-residents, while probably discouraging patents by residents.
 - When only LAC are considered, stronger IPR regimes only increased the patenting activities by non-residents and decreased that of residents.
 - How can we interpret these results?
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The impacts on residents

- Stronger IPR regimes do not lead to more innovation by domestic firms in LAC due to the presence of different obstacles, namely:
 - Market failures (credit, information, etc.)
 - Institutional and macro instability
 - Lack of human capital
 - Weak National Systems of Innovation
 - Specialization patterns?
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The impacts on non residents

- Alternative interpretations:
 - Foreigners feel safer to innovate and to develop and subsequently patent new technologies in LAC countries.
 - Multinationals use the new opportunities for patenting to revalidate patents obtained elsewhere.
 - These decisions could be motivated by:
 - The genuine desire to transfer existing technologies to the region (although license agreements and trade may suffice) or
 - To block reverse engineering and other imitation procedures.

 - The latter case could have a potentially damaging effect on the long run learning trajectories of LAC firms.
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Policy lessons

- In order to foster innovation by residents, strengthening IPR regimes seems like putting the cart before the horse.
 - First we need to deal with the structural factors blocking innovation in the region
 - In the meantime world class innovators in the region have access to strong patent protection in developed countries
 - The impacts of increased non-residents patenting are not clear and new research is needed to learn about them
 - Anyway reforms in the IPR systems in the region may be desirable in order to prevent multinationals to undertake strategic patenting in the region.
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