Does institutional reform of intellectual property rights lead to more inbound FDI? Evidence from Latin America and the Caribbean

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ABSTRACT

Leveraging a 14-year panel of 18 Latin American and Caribbean countries, we advance the institution-based view in international business research by focusing on how institutional reform of intellectual property rights (IPRs) matters in developing countries. We propose how the adoption timing of an international treaty, the Paris Convention on Industrial Property Rights, leads to more inbound foreign direct investment (FDI). Further, we propose how time spent with this IPR reform interacts with the host country's innovation base to affect inbound FDI. Our findings indicate that more reform time is negatively associated with inbound FDI, but FDI increases for more reform time within countries with substantial domestic innovation bases.

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1. Introduction

In international business research, the institution-based view asserts that the strategies behind the multinational enterprises' (MNEs) foreign direct investment (FDI) decisions are affected by the rules of the game—or, institutions in host countries (Dunning & Lundan, 2008; Peng & Khoury, 2009; Peng, Sun, Pinkham, & Chen, 2009; Peng, Wang, & Jiang, 2008; Ramamurti & Doh, 2004). Extending the basic proposition that "institutions matter," we address research gaps that have overlooked *how* institutions matter by isolating the time-based effects of unfolding institutional reform. We specifically focus on how institutions associated with the protection of intellectual property rights (IPRs) matter for MNE decisions on inbound FDI in developing countries.[2] We address a crucial question: Does institutional reform of IPRs lead to more inbound FDI in developing countries? Within this research context, we explore (1) how the time spent with an institutional change in IPR policy influences inbound FDI and (2) how more time with this change interacts with the host country's innovation base to further shape inbound FDI.

The application of the institution-based view to MNE strategy centered on IPR protection in host country environments is valuable, given that there exist wide variation in how institutions relate to the governing of IPRs and how uncertainty associated with institutional change affects FDI decisions (Allred & Park, 2007; Peng, 2003; Zhao, 2006). Focusing on the adoption timing and presence of an IPR reform measure at the country level allows for a more direct isolation of an institutional reform with respect to existing country conditions (Mutti & Yeung, 1996). Considering the time spent with new reform allows us to explore unfolding institutional change from the MNE's perspective (Meon, Sekkat, & Weill, 2009).

With these assumptions, we address a critical IPR reform measure that governs how inventions are protected cross-nationally—the Paris Convention for the Protection of Industrial Property (henceforth, Paris Convention). Looking at this reform measure, we contribute to the literature emphasizing how particular institutional elements shape MNE strategies (Lu, Tsang, & Peng, 2008). Because this reform measure has direct implications for how MNE patents are protected according to the host country's institutional environment, we also consider how time with this reform interacts with the host country's domestic innovation base to affect inbound FDI. Building on previous literature that has considered innovation-based antecedents to FDI (Cantwell, 1989; Kuemmerle, 1999), we investigate when and under what levels of a domestic innovation base that a more immediate adoption of stricter IPRs leads to more FDI in developing countries. We address the proposed models by leveraging a longitudinal 14-year database on 18 Latin American and Caribbean countries.

In the remainder of this paper, Section 2 presents research context. Section 3 outlines theoretical arguments. Section 4

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[2] In this article, the term "MNEs" refers to MNEs from developed countries making FDI in developing countries, and "FDI" refers to inbound FDI received by developing countries. We are certainly aware that a new breed of MNEs have risen from developing countries and some of them have made FDI in developed countries (see Luo & Tung, 2007; Peng, Bhagat, & Chang, 2010). However, MNEs from developing countries are outside the scope of this article.

introduces empirical design. Section 5 reports empirical findings. Section 6 discusses the implications of our findings, our contributions, and limitations. Finally, Section 7 presents conclusions.

2. Background

Market-oriented institutional reforms that are designed to protect IPRs are argued to be socially and economically beneficial to developing countries (Anderson & Konzelmann, 2008; Levin, Klevorick, Nelson, & Winter, 1987). Compared to more developed countries, developing countries are more challenged in terms of maintaining institutional environments with adequate IPR protection (Okediji, 2003). For these countries, the daunting challenge to reform IPRs is tempered by their incentive to attract more FDI from MNEs by satisfying their concerns for IPR protection (Seyoum, 1996). Thus, the issue has led to great debate as to whether the adoption of international IPRs in developing countries disproportionately benefits foreign MNEs and their home countries (Feinberg & Majumdar, 2001) or promotes greater societal respect for industrial innovation that benefits host countries (Forero-Pineda, 2006; Maskus, 2000; Meyer & Sinani, 2009; Sherwood, 1997). With the responsibility for helping developing countries assimilate towards international IPR standards, the World Trade Organization (WTO) and World Intellectual Property Organization (WIPO)—as part of the Washington Consensus—uphold this latter, pro-IPR reform, pro-FDI view.

One of the most widely recognized international agreements regarding IPRs is the Paris Convention (Okediji, 2003), which is administered by WIPO. The treaty's provisions have been revised over the years in order to stay in pace with new technological demands.[3] According to WIPO (2009), it was "the first major international treaty designed to help [invention owners from] one country obtain protection in other countries for their intellectual creations in the form of IPRs" and was created "out of fear of inventions being exploited commercially in other countries." With strategic implications for MNEs, convention member countries are required to provide the same protection—technically known as "national treatment"—for foreign invention owners as these countries provide for their own invention owners (WIPO, 2009). Further, in the case of disputes, the national treatment condition prescribes that member host governments must provide foreign MNEs the same legal recourses available to their host country firms and nationals. Thus, this condition facilitates more informed strategic planning for invention owners in the pursuit of foreign market opportunities.

A further critical aspect is the "right of priority" provision, where member host governments must respect the invention application date within other member countries and give priority to this date (WIPO, 2009). Having this right of priority allows MNEs to further invest in commercially pursuing the invention abroad with less uncertainty in the mishandling of IPRs by member host governments. The requirement to respect invention precedent from abroad is one aspect of contention in some developing countries, since many developing countries have relied on imitative research activities of foreign inventions as a means to maintain industrial competitiveness (Kim, 1993). Acknowledging the previous conception of inventions from other treaty members, adopting host countries must also pledge to eliminate any IPR misappropriation that results in unfair competition (e.g. unlawful use, disregard, or misrepresentation of foreign inventions from treaty members).

Thus, through the mutual respect of both foreign and domestic intellectual endeavors, the standards prescribed by the Paris Convention are intended to foster more inventions within a society and limit the risks of overlooking international laws by the host governments responsible for IPR management and those capable of exploiting property rights (i.e. counterfeiters and pirates). Further, delayed or non-adoption of the treaty may have rippling effects, such as levied trade restrictions by developed countries (Correa, 2000; Mutti & Yeung, 1996) or discouragement of inbound FDI (Maskus, 2000; Pinehardt & Hays, 2009).

3. Theoretical development

3.1. IPR reform and inbound FDI

Existing theories of MNE strategy point out the wide breadth of factors that drive FDI (Dunning, 1993). While not the only source of concern, institutional differences are typically one of the leading sources of concern (Dunning & Lundan, 2008; Peng & Khoury, 2009; Peng et al., 2008, 2009). Specifically, to embark on FDI strategies and reconcile contracts that support investment, MNEs must account for the institutional differences between host and home countries (Brouthers, 2002; Farashahi & Hafsi, 2009; Kuemmerle, 1999; Pajunen, 2008). Within developing countries, institutional differences that affect FDI are subject to change and may be manifested through the adoption of reform (Pinehardt & Hays, 2009). More commonly, MNEs benefit from more market-oriented reforms, and invest more within developing countries that prioritize these institutional reforms (Kim, 1993; Loree & Guisinger, 1995; Ramamurti & Doh, 2004). A critical market-oriented reform that is capable of influencing FDI lies in the institutional development of a formal credible IPR policy (Ferrantino, 1993).

The stance and credibility of a host country's IPRs may be captured in various ways (Sherwood, 1997). From the MNE's perspective, this policy boils down to the statutory guidelines for respecting IPRs and the quality of IPR laws to address the misappropriation of IPRs (Levin et al., 1987). In detailing the various institutional factors that compromise IPRs, Ginarte and Park (1997, pp. 290–292) find that most institutional inadequacies relate to the statutory governing of patent laws, where a lack of membership to the Paris Convention serves as a major deterent for FDI in developing countries. Without the presence of institutional mechanisms that intermediate between home and host country environments, such as the Paris Convention's prescription for the reciprocal respect of foreign MNEs' IPRs, MNEs face heightened transaction costs in the ways of increased enforcement, monitoring, and contracting costs (Peng, 2003). According to Williamson (1991), these additional transaction costs discourage investment, since the risk of IPR misappropriation is derived from both the host country firms and government.

While weak protection for IPRs may deter FDI, conversely, the perception of commitment to IPRs may lead to greater FDI. With specific regard to innovation-related reforms, patent laws that respect foreign IPRs (1) provide the critical "incentive structure" for MNEs to obtain a reasonable return on their investment and (2) help seed the development of an "invention industry" (North, 1990, p. 75). There also exist greater learning opportunities for MNEs from the host country innovation base, since the strength of a nation's IPR laws increases the propensity to patent and furthers the national innovation base (Sherwood, 1997). In contrast to North's (1990) proposition that risks germane to the host country's flawed institutions may deter inbound FDI, Zhao (2006) finds that MNEs may be able to combat IPR risks in developing countries by more strategic investment in R&D subsidiaries that will counter dangerous knowledge leaks. While Zhao's (2006) findings are interesting, we argue that such a strategy may offer only a partial

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[3] Its last formal change was the Stockholm Revision of 1967, requiring members to renew their commitment and intention to undertake its most recent provisions (Okediji, 2003; WIPO, 2009).

and temporary solution to the misappropriation of IPRs in weak IPR countries, because the risk of unauthorized imitation can be ongoing (Glass & Saggi, 2002). The approach suggested by Zhao (2006) may not necessarily translate across all developing country institutional environments. Further, this strategy may only be applicable to "certain firms possessing the right capabilities" (Zhao, 2006, p. 1197) in managing R&D in weak IPR countries. Therefore, weak IPR countries will continue to deter a large number of MNEs that do not possess certain capabilities.

Further, the host government's commitments to enforce stricter IPRs are more apt to be perceived as credible if there has been more time spent under the reformed institutional system (Williamson, 1991). MNEs interpret changes to IPR policies as being more or less credible based on the host government's experience with the reform measure (Henisz & Williamson, 1999, p. 265). Given the cross-national variation in IPR management (Ginarte & Park, 1997), MNEs are more likely to invest in developing countries, as opposed to developed countries, whose host governments have demonstrated a greater tenure in respecting foreign IPRs. With the signal sent by host governments of a more immediate pledge to uphold stricter IPRs and demonstrating more time spent managing a new standard, the MNE's differential risk between home and host country environments may be decreased (Allred & Park, 2007). With less concern for IP misappropriation through more time under reformed host country rules, the institutional deterrents to FDI are further relieved. Thus, the longer the time spent with an IPR reform that confronts misappropriation, the more inbound FDI a host country can attract. Specifically:

Hypothesis 1. A country's history (length of time) of adopting an IPR reform measure favored by MNEs is positively correlated with the amount of inbound FDI.

3.2. Interaction between IPR reform and innovation base on inbound FDI

Inbound FDI does not take place independent of a host country's domestic capabilities such as its innovation base. A host country's innovation base is captured by its production of assets derived from knowledge-based endeavors, such as the production of patent applications and scientific publications (Furman, Porter, & Stern, 2002; Gittelman, 2006; Shane, 1992). A host country may attract FDI through its existing innovation base, since this provides an incentive for MNEs to invest in potential learning opportunities (Dunning, 1993). The incentive for MNEs to invest in developing countries, in part, lies in the innovative productivity of the indigenous labor force (Kuemmerle, 1999) and the potential for host country spillover effects that may exist (Costa & Robles Reis de Queiroz, 2002; Meyer & Sinani, 2009).

Government policy plays a direct role in facilitating innovation activities and the capability for greater economic prosperity (Lu et al., 2008; Puffer & McCarthy, 2007). It is within host countries that have a substantive innovation base that the reform of IPRs may conceivably have greater economic impact in influencing FDI decisions (Maskus, 2000; Sherwood, 1997), as this provides MNEs greater assurance that their IPRs will be respected (Forero-Pineda, 2006). Thus, the incentive for MNE investment related to the protection of innovation is more likely to be enhanced through the presence of policies that offer greater protection of innovations through patenting (Allred & Park, 2007), such as the Paris Convention.

From the perspective of host government policy makers, the commitment to uphold IPRs related to innovation can be wielded to draw greater inbound FDI (Glass & Saggi, 2002). Accordingly, the

management of stricter IPR policies related to patent reform may have a broader impact in host countries that patent more than in host countries that patent less (Maskus, 2000). From the MNE's perspective, the adoption of stricter IPRs in developing countries complements the presence of a stronger innovation base in providing dual signals from the host country of engaging in knowledge-based endeavors and the host government's recognition that the resulting IPRs from these endeavors need protection. Thus, the host country's IPR policies and domestic innovation base may interact to influence FDI.

Within developing countries, there may exist great challenges in fully implementing institutional changes in a timely manner (Meon et al., 2009). When a host country has spent more time implementing IPR policy change, MNEs can more accurately judge the credibility and degree of implementation of new legal boundaries (Henisz & Williamson, 1999), such as changes in patent law that govern the innovation strategies of host country firms.

Thus, developing countries that offer IPR-related incentives for MNEs to invest based on their innovation base may be able to attract more inbound FDI. With more time, it is more viable for host governments to (1) encourage more domestic invention owners to embark on innovation-based strategies (Ginarte & Park, 1997; Mutti & Yeung, 1996) and (2) increase the costs related to unauthorized imitation, which discourages the exploitation of foreign IPRs. Therefore, we argue that it is the dual presence of a host country's innovation base and its commitment to uphold sufficient IPR protection (via longer membership to an IPR reform measure) that may attract more FDI. Thus:

Hypothesis 2. There is an interaction between a host country's innovation base (in terms of patenting and scientific publishing) and a longer history as member to an IPR reform that favors MNEs, such that for higher innovation bases, more FDI will flow to countries with longer membership to the IPR reform.

4. Methodology

4.1. Sample and data

Our sample is a panel of 18 Latin American and Caribbean countries over the 14-year period of 1990–2003 (inclusive), which amounts to 209 country-years after accounting for missing values. Assembling the data with this specific, under-researched region is motivated by three reasons. First, this region shares commonalities in religion, culture, and political dynamism (Bruton, Ahlstrom, & Yeh, 2004). This offers some control for latent influences (Pinehardt & Hays, 2009). Since most MNE strategies are often regional—as opposed to pure global—in nature (Peng et al., 2010; Qian, Khoury, Peng, & Qian, 2010), focusing on one region helps us control for this regional effect. Second, using this region provides reasonable variance in the dependent variable and also within the focal independent variables, namely, the year of adopting the last amended version of the Paris Convention (Stockholm Revision in 1967).[4] Third, there are significant policy debates in this region regarding the pros and cons of FDI. Despite such policy importance, concrete empirical evidence is rare, thus motivating our efforts to probe into the important and complex dynamics behind IPRs and

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[4] This justification is backed by previous qualitative research in this region, which indicates a checkered history of confrontation with adopting similar market-oriented reforms (Dahlman & Frischtak, 1993), especially IPR reforms (Gadbaw & Richards, 1988; Watal, 1999). Beyond Latin America, there existed a small number of other late adopting countries of the Paris Convention. However, more complete data on these countries for the critical variables are unavailable for the relationships pursued in this research. To include all convention members leaves little variance in the adoption reform variable, since all developed and several other developing countries promptly adopted the Stockholm Revision.

Table 1
Adoption of Paris Convention's 1967 amendment in sample region.

Country	Adoption year	Inbound FDI (US$ millions)[a]	Patent applications[a,b]	Scientific publications[a]
Argentina	1967	6,053.6	822	3868
Bolivia	1993	467.6	35	74
Brazil	1992	12,941.9	2,714	9,089
Chile	1991	3,461.6	350	1,848
Colombia	1996	1921.2	98	487
Ecuador	1999	685.8	44	101
El Salvador	1994	197.9	17	10
Guatemala	1998	174.4	31	67
Honduras	1994	125.6	8	22
Jamaica	1999	322.7	7	319
Mexico	1976	11,083.9	491	3,934
Nicaragua	1996	130.4	6	21
Panama	1996	487.6	18	156
Paraguay	1994	115.5	10	24
Peru	1995	1,773.9	36	211
Trinidad and Tobago	1988	532.7	12	102
Uruguay	1979	167.2	111	257
Venezuela	1995	2,375.1	171	905

[a] Denotes annual average based on panel period of 1990–2003.
[b] Patent applications refer to applications at each country's domestic patent office.

FDI. Table 1 shows the adoption years for the Paris Convention and the mean values of the hypothesized variables for each country in our sample.

4.2. Variables

The sources of all variables and their definitions used to assemble the longitudinal country-year database are summarized in Table 2.

4.2.1. Dependent variable

The dependent variable, collected from the UNCTAD's (2005) World Investment Report, is the natural log of inbound FDI (millions of US$) that flows into a country in the subsequent year of the panel year corresponding to the independent variables.

4.2.2. Independent variables

Committing to stricter IPRs is designated by the time in years following the adoption of the Paris Convention. For the adoption year, this variable would take on a '1', and for each panel year following adoption, another year is added. All observations before the adoption year are denoted as a zero.

For the measure of innovation base within a country, two different measures are adopted. First, we measure the annual number of patent applications by domestic applicants filed with the domestic patent office. The use of patent statistics as a measure for innovation endeavors has been well established in the literature (Acs & Audretsch, 1989; Gittelman, 2006).[5] Such data are acquired from WIPO. As discussed by Yang (2008, p. 1040), WIPO-collected data offer the benefits of "systematic global comparisons" to be made, yet these data also bear a weakness in that it is aggregated by country and unable to account for any self-reported questionnaire biases from host countries or the specific technological area of the invention application.

Data for the second measure, the annual number of domestically produced scientific publications, are obtained from RICYT.

Both domestic patenting and scientific publishing can serve as a country-based signal for the societal emphasis on such intellectual endeavors (Gittelman, 2006; Shane, 1992). First, patenting is an innovation-based strategy that reveals the overall attempts to invent and secure exclusive ownership of IP (Acs & Audretsch, 1989). Second, disclosing a novel idea within a scientific publication can also be used to challenge the right of priority for a subsequent patent application (Parchomovsky, 2000).[6] Because the two domestic innovation variables are highly correlated with one another (0.83) with variance inflation factors (VIF) at 7.44 (natural log values of scientific publications) and 7.25 (natural log values of domestic patent applications), we conduct principal component analysis (PCA) between these variables. In using PCA as a means to counter multicolinearity issues, we produce a time-varying country-level composite index out of both innovation variables, which we refer to as the innovation base index.

4.2.3. Control variables

A total of eight control variables are used to ensure that relevant factors that can influence inbound FDI decisions are accounted for. A country's capacity in terms of human resource endowments is measured with the size of the labor force (labor force size, natural log value of millions). Second, it is vital to protect foreign IP within the host country's IPR system if it is either produced or consumed within the host country. With the investment in foreign patents, it is conceivable that further FDI be dedicated to protect or commercialize an invention. Thus, we also control for the number of patent applications from foreign applicants applied for in the host country (Yang, 2008). Third, because more recent IP treaties have been explicitly tied to multilateral trade agreements (Okediji, 2003; Watal, 1999), we control for annual total trade.[7]

Relevant to IPR policy, we also control for aspects specifically related to the political and legal dimensions of the institutional environment (Anderson & Konzelmann, 2008). Following Pajunen (2008), our fourth control variable accounts for a country's regard for political rights, where a lower number indicates a greater respect for rights (that is, '1' equals the highest respect, '7' as the lowest). Fifth, to capture the quality of the national legal system, we use the Fraser Institute's 10-point scale index (Gwartney & Lawson, 2006), in which a more credible legal system takes on a higher number ('10' as the highest, '1' as the lowest).[8] The sixth control variable is a 21-point scaled index that captures the operating political system during the panel year. These values are a rescaling of Marshall and Jaggers' (2002) '−10' (more totalitarian-oriented) to '10' (highly democratic-oriented) scale for ease of interpretation. Seventh, the prospective market opportunity is measured according to the natural log of GDP per capita (Allred & Park, 2007; Loree & Guisinger, 1995). Eighth, due to the segmentation of our developing country panels being grouped into either lower-middle-income and upper-middle-income econ-

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[5] In this study, the critical data are the patent applications made to the adopting country's patent office, not USPTO applications. Applications are used over granted patents, since the issuance of a patent comprises both actions taken by invention owners and the patent office. Issued patents more aptly measure patent office throughput, rather than a host country's invention productivity.

[6] In securing IP ownership via the patent process, temporal precedence occurs when a patent application filing is pursued. This establishes the legal ownership of a disclosed idea as IP and this is eventually made public to what becomes known as prior art. The establishment of prior art has strategic value in that it becomes a new comparative standard for what can be determined as novel, non-obvious, and useful to society. Under conventional patent law, the publication serves the same purpose as a patent in formally preventing unlawful exploitation (Parchomovsky, 2000). Because one's publication can block the patent opportunities of others, accounting for this IP strategy within the host country innovation base is meaningful.

[7] We use total trade, not the natural log of total trade, due to the multicolinearity problems this introduces to our regressions.

[8] Data for these indices are available for the years 1990, 1995, and 2000–2003. For the two periods unreported (1991–1994 and 1996–1999), we adopt the indices of 1990 and 1995, respectively. Research personnel at the Fraser Institute, per private communication, also advised using this approach. The individual indices that make up this measure are: judiciary independence, impartialness of courts, general IP protection, the presence of military in politics, and the broader perception of "law and order".

Table 2
Variables, definitions, and data sources.

Dependent variable	Definition (time-varying, per year)	Sources[a]
Inbound FDI (ln)	Natural log of total inbound FDI received by a country, millions of U.S. dollars	UNCTAD (2005)
Independent Variables		
Time with IPR reform	Number of years the country was party to the Stockholm Amendment of the Paris Convention; '0' for the adoption year and years outside the convention	WIPO: www.wipo.int
Innovation base index	The host county's innovation base is created from principal component analysis of two variables: the natural log of the number of patent applications from domestic invention owners in the country's patent office and the natural log of scientific publications from within the country.	RICYT; (scientific publications) www.ricyt.org; WIPO (patent applications)
Control variables		
Foreign patent applications	Number of patents filed by foreign invention owners within the host country	WIPO: www.wipo.int
Labor force size (ln)	Natural log of millions of people in the labor force	RICYT: www.ricyt.org
Total trade	Total combined imports and exports, thousands of U.S. dollars	World Bank, World Development Indicators 2006
Political system	Level of autocracy in the political system. 0 (autocratic) to 20 (democratic)	www.cidcm.umd.edu/polity/data
Legal system	Strength of legal system, from 0 (weak) to 10 (strong)	Fraser Institute: www.freetheworld.com
Political rights	Index of political rights, from 1 (high regard) to 7 (low)	Freedom House: www.freedomhouse.org
GDP per capita	Market opportunity according to the natural log of gross domestic product per capita in U.S. dollars (PPP adjusted)	ECLAC: www.eclac.cl
Upper income country	Dummy variable equal to 1 for countries designated by the World Bank as Upper income countries	World Bank, www.web.worldbank.org
Year dummies	Dummy variable used for years 1991–2002	–

[a] *Note*: All electronic sources accessed on August 12, 2006, except Upper Income Country data, which was accessed on December 6, 2009.

Table 3
Descriptive statistics and correlation coefficients.

	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Inbound FDI (ln US$ millions)	6.39	1.79	1.00												
(2) Political system	17.43	2.26	−0.10	1.00											
(3) Legal system	4.72	1.17	0.39***	0.23***	1.00										
(4) Upper income country	0.61	0.49	0.60***	0.12*	0.45***	1.00									
(5) Political rights	2.55	1.03	0.002	−0.70***	−0.43***	−0.19***	1.00								
(6) Labor force size (ln millions)	15.24	1.29	0.74***	−0.30***	0.04	0.35***	0.25***	1.00							
(7) Total trade (US$ thousands)	2.66 E07	5.59 E07	0.62***	−0.12*	0.17**	0.33***	0.05	0.64***	1.00						
(8) Foreign patent applications (ln)	5.88	1.75	0.81***	−0.12*	0.34***	0.59***	0.03	0.81***	−0.46***	1.00					
(9) Time with IPR reform (years)	6.31	8.37	0.43***	0.06	0.40***	0.37***	−0.22***	0.32***	−0.28***	0.65***	1.00				
(10) GDP per capita	2864.12	1903.64	0.56***	0.20***	0.58***	0.69***	−0.32***	0.21***	−0.26***	0.48***	0.72***	1.00			
(11) Innovation base index	0.00	1.00	0.61***	0.02	0.32***	0.76***	−0.05	0.69***	−0.29***	0.40***	0.32***	0.33***	1.00		
(12) Domestic patent applications (ln)	3.92	1.94	0.83***	0.04	0.45***	0.32***	−0.13*	0.73***	−0.48***	0.61***	0.52***	0.64***	0.98***	1.00	
(13) Scientific publications (ln)	5.33	1.97	0.73***	−0.03	0.41***	0.05	−0.10	0.79***	−0.48***	0.44***	0.46***	0.50***	0.71***	0.83***	1.00

* denotes significance at 10%; ** at 5%; *** at 1%.

omies according to the World Bank, we create a dummy variable, upper income country, equal to '1' if a country falls under the latter group and zero otherwise.[9] Finally, to control for latent disturbances due to contemporaneous effects, we include 12 year-dummies, representing all but one of the dependent variable's observation years.

4.3. Analytical methods

4.3.1. Correlations and multicolinearity
Table 3 provides basic statistics. All independent and control variables are lagged by one year relative to the dependent variable. In performing tests to account for the most appropriate econometric model, we consider the possibility of multicolinearity. With the creation of the innovation base index from PCA, we incorporate this variable and the variables used to create it (domestic patent applications and scientific publications) in our pair-wise correlation matrix.

There are particularly large, positive, and significant ($p < 0.01$) correlations between FDI and, respectively, foreign patent applications (0.81) and labor force size (0.74). There are also high correlations between the labor force size and foreign patent applications (0.81) and between the labor force size and the innovation base index (0.69). The largest VIFs based on all of our models exist for labor force size (10.4) and foreign patent applications (10.1), indicating a relatively high level of colinearity. All other VIF values are less than seven with a mean VIF value equal to 3.5.

Based on our theoretical model, applying PCA to these two variables—labor force size and foreign patent applications—does not make theoretical sense and PCA is not adopted. As robustness tests for this decision, we create and test models with either one or both of these two variables orthogonalized and find little to no change in the VIFs. In other tests, we find that omitting the foreign patent applications variable from the regression model reduces all VIFs to be below six, but removal does not qualitatively impact our findings. Thus, we opt to keep the foreign patent applications variable, given its relevance to our proposed framework. In sum, evidence of multicolinearity in the dataset is addressed by (1) applying PCA to the innovation base variables, (2) testing

[9] Trinidad and Tobago is designated by the World Bank to be a high-income economy, a '1' is assigned for this variable.

Table 4
Results for hypothesis tests.

	(1)	(2)	(3)
Dependent variable	Inbound FDI (1 year forward, ln US$ millions)		
Control variables			
Political system	−0.080**	−0.094**	−0.089**
	(0.037)	(0.039)	(0.038)
Legal system	0.148*	0.181**	0.272***
	(0.076)	(0.083)	(0.084)
Upper income country	0.950***	0.726***	0.754***
	(0.177)	(0.191)	(0.188)
Political rights	−0.169	0.213	0.221
	(0.151)	(0.146)	(0.144)
Labor force size (ln millions)	0.727***	0.830***	0.865***
	(0.097)	(0.128)	(0.123)
Total trade	2.310E−09***	3.380E−09***	3.010E−09**
	(8.550E−10)	(9.850E−10)	(1.170E−09)
Foreign patent applications (ln)	0.061	0.030	0.020
	(0.075)	(0.081)	(0.079)
GDP per capita	4.890E−05	2.074E−04***	2.347E−05***
	(5.755E−05)	(7.803E−05)	(8.086E−05)
Independent variables			
Time with IPR reform (years)		−0.038***	−0.070***
		(0.013)	(0.017)
Innovation base index		−0.104	−0.483***
		(0.091)	(0.152)
Time with IPR reform × Innovation base index			0.048***
			(0.015)
Constant	−5.400***	−6.755***	−7.755***
	(1.503)	(1.999)	(1.987)
Year dummies	Yes	Yes	Yes
Observations	209	209	209
R^2	0.795	0.804	0.82
Adjusted-R^2	0.774	0.781	0.798
F-statistic	79.16	68.94	60.42

Robust standard errors in parentheses; * denotes significance at 10%; ** at 5%; *** at 1%. All independent variable values are lagged one year behind the dependent variable.

orthogonalized conversions of unique constructs that are collinear, and (3) running separate models without the foreign patent applications as a robustness procedure.

4.3.2. Analytical models and robustness tests

The data are structured as a time-series, cross-sectional format. Following the Breusch–Pagan test, we find there is evidence of heteroscedasticity and correct for this issue by employing STATA's Huber–White sandwich heteroscedasticity-consistent variances and standard errors. In testing for serial autocorrelation, there is evidence of a first-order correlation within panels. To test the proposed models, we follow Beck and Katz (1995) and use an OLS estimator with panel-corrected standard errors, based on our 18 panels of 14 observation years. This method provides more robust variances and standard errors in the presence of *within*-panel (e.g. "within-country") autocorrelation and cross-panel heteroscedasticity (Beck & Katz, 1995), which is common in cross-country data.[10]

We identify outliers within our sample using STATA's *hadimvo* command, which reveals 59 outliers (28% of our sample size), where 47 of these observations are largely comprised from the panels represented by Argentina, Brazil, Mexico and Uruguay. In running the models without these leveraging panels, our results are qualitatively similar for many of the estimates, but find less stability for the interaction model results. Thus, using a separate approach described by Neter, Kutner, Nachtsheim, and Wasserman (1996, pp. 417–426), we analyze each model using an iteratively reweighted least squares robust regression (IRLS) since it does not compromise the sample size or require the elimination of entire country panels. This approach uses multiple iterative estimations by placing less

weight on a gross outlier based on the residual for that case and revising the weighted influence with each iteration until reaching a robust estimation (Neter et al., 1996). We find that all estimates from these tests are consistent with the reported results.

As a separate robustness test, we also consider a two-stage Heckman selection model to account for a potential sample selection bias that may exist within our models (Heckman, 1979), since countries that adopted the convention earlier may face unique pressures that late adopters do not face. We first create a binary variable equal to one for country-years that the country is member to the treaty and zero for all others to reflect which countries within our period favored early adoption versus later adoption. In the first stage of the model we conduct a probit regression with this newly created binary adoption measure as the dependent variable and regress this variable on the country-level variables legal system, political rights, labor force size, total trade, foreign patent applications, and GDP per capita. From this first stage regression, we calculate the inverse Mills ratio and include this variable in our second stage OLS regression analyses as a correction term. In sum, we do not find selection bias to be a problem and find the results of these models to be qualitatively consistent with the heteroscedasticity and autocorrelation corrected OLS models presented in the paper. These various robustness tests are available by request from the authors.

5. Results

Table 4 presents results for testing the hypotheses with all dependent variables lagged one year behind the independent variable.[11] Model 1 tests the control variables only, Model 2 tests

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[10] With fewer panels and larger time periods (and a larger overall sample size), a feasible generalized least squares (FGLS) estimator could be considered. According to Beck and Katz (1995), OLS with panel-specific corrected standard errors leads to less biased estimates, versus FGLS, and is better suited for our data.

[11] For robustness, all models are also considered without lagged variables in each case, the coefficients are consistent with Table 4's results, yet the adjusted-R^2 values are less than that shown in Table 4.
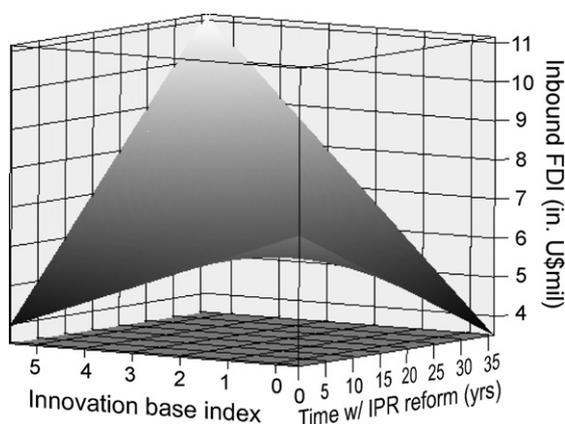
Fig. 1. Interaction between time spent with Paris Convention IPR reform and host country innovation base on inbound FDI.

Hypothesis 1, and Model 3 tests the interaction model of Hypothesis 2. Overall, we observe that the models exhibit high adjusted-R^2 values (0.77 for Model 1, 0.78 for Model 2, and 0.80 for Model 3). However, the greatest change in adjusted-R^2 (0.03) occurs between Model 1's control variables and the addition of the focal variables to test the interaction relationship in Model 3.

There is good consistency among the control variables across each model. To summarize, we find that host countries with a greater labor force size ($p < 0.01$), upper-middle-income designation ($p < 0.01$), larger GDP per capita ($p < 0.01$, with the exception of GDP per capita in Model 1 versus Models 2 and 3), greater total trade ($p < 0.01$ for Models 1 and 2, and $p < 0.05$ for Model 3), a higher regard for political rights ($p < 0.05$), and a stronger legal system ($p < 0.10$ in Model 1, $p < 0.02$, in Model 2, $p < 0.01$ in Model 3) are all associated with more inbound FDI. We find that with each point increase towards democratic-oriented polity there is a 0.08% decrease in FDI per Model 1 ($p < 0.05$) and 0.09% decrease per Models 2 and 3 ($p < 0.01$).

Since we observe an *opposite* effect of IPR reform on inbound FDI, Hypothesis 1 is not supported. Hypothesis 2 is supported ($p < 0.01$ for time with IPR reform, innovation base index and the interaction term). From these tests, two valuable findings emerge: (1) longer time spent with the Paris Convention IPR reform, on average, is correlated with less inbound FDI; (2) with longer time spent with the Paris Convention IPR reform (via an earlier adoption of the convention) and the presence of a strong innovation base, more FDI follows.

The time with IPR reform variable in Models 2 and 3 is negative and highly significant ($p < 0.01$) and nearly doubles in coefficient magnitude when the interaction effect is tested in Model 3. This finding is counter to Hypothesis 1, meaning that with each year membership to the convention, FDI *decreases* by about 0.04% in accounting for the marginal effect of reform time.

Model 3 shows that the interaction term (Time with IPR reform × Innovation base index) is positive and highly significant ($p < 0.01$). The coefficient for the innovation base index is also highly significant ($p < 0.01$), albeit negative. Based on Model 3, we find evidence of a strong interaction effect between the time spent with IPR reform and the host country innovation base that, when considered jointly is positive on the influx of FDI, yet these conditions taken separately exhibit negative relationships within the sample. Based on this finding, we graph the Model 3's estimation results in Fig. 1 to better illustrate the saddle-shaped signature of the interaction relationship using the panel's actual ranges of values for the focal variables and the mean values for all others.

Looking at the extremes on the graph, it can be seen that extremely low levels of innovation with no participation in the

Paris Convention yield considerably more FDI than countries with either: (1) a strong innovation base and no participation time with this IPR reform, or (2) a low innovation base and the maximum potential time with the reform. FDI is highest for host countries with a larger innovation base and having adopted the reform promptly. Further, it can be seen that with each year as member to the convention, the slope between innovation base and FDI becomes increasingly more positive. Perhaps, it is only at these higher innovation levels that the conditions for FDI make sense to foreign MNEs, and it *only* makes sense with the host government signal of respecting foreign IP through longer participation in the convention.

6. Discussion

6.1. Implications

In operationalizing the novel *time spent with an institutional change* in our research design, there are challenges for the direct comparisons to prior studies. Interestingly, addressing whether earlier adoption of stronger IPR protection leads to more inbound FDI in developing countries, we do not find support for this claim, unless there exists a strong domestic innovation base. With more years of participation in the Paris Convention and all else equal, less inbound FDI flows into the reforming country. For late adopters of the treaty that maintain vulnerable IPR environments for MNEs, we find results that contextualize previous findings by Zhao (2006), where for these countries more FDI only goes to those with small innovation bases. We discuss the implications and managerial relevance of these findings in detail.

6.1.1. Implications of IPR reform for Latin America and Caribbean countries

Our findings offer direct implications to Latin American and Caribbean IPR policy reform. Despite the Washington Consensus view espoused by the WTO and WIPO, we do not observe that a stronger innovation base is followed by more FDI. Yet we do observe that, on average, those countries that adopted the Paris Convention at its earliest offering found that less FDI followed with each year member to the convention. Rather, more FDI is consistent with the strongest innovation bases along with maximized time with the Paris Convention. We infer that if countries such as Columbia, Ecuador, or Uruguay can increase their domestic innovation base by approximately two to three orders of magnitude, they may realize the FDI inflow associated with early participation in the Paris Convention. For those with the lowest innovation bases, such as El Salvador, Honduras, and Paraguay, early adoption of the IPR reform—in contrast to the Washington Consensus view—is not *universally* beneficial to increasing the level of inbound FDI.

6.1.2. Implications for public policy

Developing countries often struggle to stay in harmony with international treaties that are designed as "one-size-fits-all" (Okediji, 2003). The challenge of implementation is, in part, why policy may lag behind international standards, as grafting these rules into the existing institutional environment is left to governments that routinely contend with flawed market-oriented institutions (Correa, 2000; Watal, 1999). However, if increasing inbound FDI can spark economic growth, then a policy of reluctant adoption of similar IPR reform measures may potentially favor growth in FDI (Meyer & Sinani, 2009). Given the history of subsequent amendments to this convention over the past century, FDI-seeking developing countries may be behooved to delay participation with the convention offering. Thus, beyond the domestic *social* benefits that follow higher rates of innovation

(Maskus, 2000), there is a potential for economic benefits to be realized through increased FDI. However, such economic benefits drawn from greater innovation are contingent on having a longer history of respecting foreign IPRs with the Paris Convention.

Connecting our findings to national competitiveness, domestic policies that encourage the pursuit of more innovation among host country firms may eventually or simultaneously encourage more inbound FDI. Within our sample region, the requisite innovation base levels that domestic industries are collectively tasked to produce are on the order of thousands of patents or scientific publications. Both patenting and publishing are indicative of a country's innovation base and they represent potential opportunities for knowledge spillovers (Furman et al., 2002; Gittelman, 2006; Shane, 1992), yet they propose differing levels of strain on legal institutions.

Only a patent can provide the monopoly rights for a firm to commercially pursue an invention. To grant such rights, invention owners are dependent on the quality of their patent office, which are typically very understaffed in developing countries (Gadbaw & Richards, 1988; Sherwood, 1997). The resources necessary to scrutinize the innovative quality of patent applications at a reasonable throughput require a broad and deep representation of expert knowledge within the national patent office (Sherwood, 1997).

Pursuing a scientific publication of a breakthrough creation establishes an intellectual precedent of *prior art* and may feasibly provide the strategic benefits of preventing others from the unauthorized commercial pursuit of the creation (Parchomovsky, 2000). Thus, seeking a publication, if relevant to the firm's interests, may offer comparable strategic value as pursuing a patent in more technologically intensive industries. The publication poses less (or no) resource strain to the domestic patent office since it is granted by an external body of scholarly peers, who are typically not connected with this office. Beyond posing fewer growing pains to patent offices undergoing reform, publications are typically faster and cheaper than the time and expense to obtain a patent. Within certain industries, such as biotechnology, this may offer entrepreneurial firms a more economically feasible, albeit defensive, strategy to pursue by blocking others from commercial pursuit of the same creation (Parchomovsky, 2000).

6.2. Implications for management practice

In accounting for the interests of foreign MNEs, our findings reveal that investment could be conserved when countries adopt the Paris Convention in its immediate offering. Early adoption may send a signal of respect for foreign IPRs. Our finding of a negative relationship for Hypothesis 2 lends support to this perspective. The change in MNE investment behavior as a response to engaging with host countries with stronger IPRs may be explained by the need for less investment when there is less perceived risk in IPR misappropriation. Thus, the additional transaction costs—as a part of the required investment—to protect MNEs from misappropriation are diminished when stronger institutions are in place in terms of providing favorable IPRs.

MNE managers, when, moving into countries that are late to adopt such international treaties and have lower innovation bases must account for more investment dedicated to entering these countries where IPRs are weaker. Such costs may be necessary due to the presence of higher legal and administrative costs related to non-standard contracting, monitoring, and enforcing an MNE's IPRs (Williamson, 1991). Similarly, further investment is needed where innovation bases are lower, since there may exist a more pervasive disregard for others' IPRs in countries where innovation practices are less prevalent and less cultivated.

6.3. Contributions

In our view, at least two contributions—one theoretical and one empirical—emerge. Theoretically, this article enriches the institution-based view (Dunning & Lundan, 2008; Lu et al., 2008; Peng & Khoury, 2009; Peng et al., 2008, 2009), by strengthening our understanding of how institutions associated with IPR protection matter for FDI decisions. Emphasis on innovation-based antecedents to FDI is well established in the literature (Cantwell, 1989; Dunning, 1993; Kuemmerle, 1999). However, the various institutional elements that interact with innovation, such as a country's experience with adopting an IPR policy reform, have not been previously considered. Using the adoption of the Paris Convention, this article makes a theoretical contribution by uncovering the caveats of institutional reform with respect to innovation factors and reform timing.

Empirically, this article contributes to the literature by focusing on how IPR reform matters to the rarely considered regions of Latin America and the Caribbean. We find that despite the Washington Consensus view espoused by the WTO and WIPO, joining the Paris Convention does not universally benefit the adopting countries. On the other hand, the Washington Consensus view is not refuted. The general policy advice for better IPRs that will result in more FDI still holds, as long as host countries can foster a strong domestic innovation base. Also rarely considered, our research design contributes by placing emphasis on the effects of an unfolding institutional change in policy reform (Meon et al., 2009).

6.4. Limitations and future research

Limitations to this study may offer opportunities for further research. While institutional changes, such as IPR reform, call for a national view of competition policy and its FDI impact, our research design bears an assumption of homogeneity in terms of how prospective foreign investors, in overall terms, interpret and respond to the institutional change towards reformed IPRs. This limitation is largely inherent in the use of aggregated annual, country-level data. Future studies may benefit from finer levels of analysis that consider industry, firm, or investment levels as a means to help confirm aggregated responses to IPR reform (Peng et al., 2008, 2009). With the creation of new technological and intellectual breakthroughs, IPR reforms will continue to evolve and proliferate, which offers future research opportunities at various levels of analysis.

Beyond the aggregate structure of our annual country-level sample, our analysis uncovers the presence of multicolinearity within our data. We have addressed this issue through the incorporation of PCA for our innovation-related variables and through various alternative model specifications for robustness, but our findings may be limited by this methodological concern. Further, we also uncover the presence of outliers in our data, which may influence our estimated results. With access to a considerably larger dataset, we could pursue sensitivity analyses and further explore the interaction relationships by analyzing unique sub-samples without compromising our adopted econometric model specification or the quantity of relevant controls considered in this study.

Finally, our findings are limited to a sample based on one region over a 14-year period. Expanding the generalizability beyond this sample may be resolved in future work. Future work may explore the economic or social effects of different IPR reforms in other regions or contexts. Accounting for other outcomes of IPR-related issues, such as changes in industrial pirating or legal actions initiated towards IPR infringements, would offer a greater understanding of issues related to policy efficacy or enforcement.

7. Conclusion

Drawing from a 14-year panel of 18 Latin American and Caribbean countries, this article advances theory in understanding how institutions, expressed by unfolding IPR policy reform, matter in developing countries. To further research on the institution-based view, this work untangles the connections between IPR reform via the participation in the Paris Convention and the inbound FDI effects. A crucial insight from this work is that IPR reform without a substantial domestic innovation base does not lead to more inbound FDI. Rather, more FDI is associated with the simultaneous presence of a large domestic innovation base and MNE-supportive IPR policies. With this finding, we challenge the prescriptions of IPR reform advocates in terms of the merit of reform in developing countries and the reform's intended economic consequences.

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