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**Working Paper**

## The impacts of intellectual property rights protection on cross-border M&As

Bank of Finland Research Discussion Papers, No. 17/2017

**Provided in Cooperation with:**

Bank of Finland, Helsinki

*Suggested Citation:* Hasan, Iftekhar; Khalil, Fahad; Sun, Xian (2017) : The impacts of intellectual property rights protection on cross-border M&As, Bank of Finland Research Discussion Papers, No. 17/2017, ISBN 978-952-323-174-0, Bank of Finland, Helsinki, <https://nbn-resolving.de/urn:nbn:fi:bof-201708071456>

This Version is available at:

<https://hdl.handle.net/10419/212388>

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# **The Impacts of intellectual property rights protection on cross-border M&As**



Bank of Finland Research  
Discussion Paper  
17 • 2017

## **The Impacts of Intellectual Property Rights Protection on Cross-Border M&As**

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# **The Impacts of Intellectual Property Rights Protection on Cross-Border M&As**

## **Abstract**

We investigate the impacts of improved intellectual property rights (IPR) protection on cross-border M&A performance. Using multiple measures of IPR protection and based on generalized difference-in-differences estimates, we find that countries with better IPR protection attract significantly more hi-tech cross-border M&A activity, particularly in developing economies. Moreover, acquirers pay higher premiums for companies in countries with better IPR protection, and there is a significantly higher acquirer announcement effect associated with these hi-tech transactions.

**Keywords:** Intellectual Protection Reforms, Property Rights, Cross-Border M&As, Emerging Markets.

**JEL Classification Numbers:** G32; G34; O31; O34; F43; C23.

## 1. Introduction

In recent decades, we have witnessed rapid growth in technology-oriented industries and cross-border investment activities, including M&As, Greenfield investments, outsourcing, and so on. Accordingly, the concept of intellectual property rights (IPR) has captured significant attention from companies, domestic and foreign, as well as from many government agencies. The wide variance in levels of IPR development and enforcement across countries is particularly notable; although studies suggest a positive relationship between patent protection and innovation (Gilbert and Shapiro, 1990; Scotchmer and Green, 1990), an emerging body of evidence shows that the strength of patent protection actually has little impact on innovation (Qian, 2007; Bessen and Meurer, 2008; Lerner, 2009; Mokyr, 2009). Furthermore, although there is a growing consensus that institutional factors matter to economic growth (e.g., Bowen and Clercq, 2008), a debate remains on the impact of IPR reforms on local economies (see Helpman, 1993; Lanjouw, 1998; McCalman, 2001; Glass and Saggi, 2002; Gould and Gruben, 1996; Kanwar and Evenson, 2003; Markusen, 2001; Branstetter, Fisman, and Foley, 2006). It thus remains a challenge to reconcile the evidence with theoretical predictions that stronger IPR encourages innovation and economic growth.

Innovation is more of a business process that turns an invention into a commodity with commercial value (Miller and Morris, 1999). It is therefore possible to measure the outcome of innovation in ways other than by considering the quantity of patent applications.<sup>1</sup> In this paper, we measure the effects of improved IPR protection by analyzing cross-border M&As, which are potentially significant due to their increased number. Studies show that the transfer of technical and managerial skills and/or capital from acquiring firms to target firms creates value (e.g. Francis, Hasan, and Sun, 2008)<sup>2</sup>. Successful transfers of knowledge, however, depend on many factors such as enhanced IPRs (Branstetter, Fisman, and Foley, 2006). We argue that strengthening IPR

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<sup>1</sup> For example, Moser (2005) uses a large sample from nineteenth-century World Fairs to show that patent laws affect the direction of technological change. Cohen et al. (2002) study how patent law affects R&D intra-industry spillover. Allred and Park (2007) analyze effects of IPR protections on R&D.

<sup>2</sup> Song and Shin (2008) show that MNCs have set up R&D labs overseas and outsource knowledge from the host countries of their labs.

in host countries encourages cross-border M&As, especially the transactions in the hi-tech sector, in which intellectual property is of prime importance.<sup>3</sup>

The primary goal of this paper, therefore, is to examine whether strengthened IPR drives the frequency of cross-border hi-tech M&As and the corresponding benefits provided to the acquirers and target firms as measured by the premiums they receive.<sup>4</sup> We expect that the effects of improved IPR protection vary depending on the host country's level of economic development and institutional quality. Lerner (2002) reaches a similar conclusion, finding that improvements in patent protection have greater effects in nations with weaker institutions and greater economic development. Several recent studies present results supporting this observation (e.g., Qiang, 2008; Awokuse and Yin, 2010; Branstetter and Saggi, 2011; Kanwar, 2012). Therefore, we contend that improving IPR has more significant effects on hi-tech, cross-border M&As in developing economies with weaker IPR.

Our research also sheds light on cross-border M&As, an important form of foreign direct investment and a major corporate activity that has been studied extensively. Recent studies show that cross-border M&As have brought value to acquiring firms (e.g., Allen and Pantzalis, 1996, Doukas and Lang, 2003, Doukas and Kan, 2006), especially those buying targets in developing markets since the late 1990s (Francis, Hasan, and Sun, 2008; Chari, Ouimet, and Tesar, 2010). Such value-adding transactions, however, only account for a small proportion of cross-border M&As because of the host countries' less developed institutional infrastructure such as legal and law enforcement. If host countries can mitigate such concerns and thereby encourage more cross-border M&As especially in the hi-tech field, the market should recognize such benefits. We examine this hypothesis by studying the announcement effects of those cross-border deals.

The measurement of the quality of intellectual property rights would be crucial in answering our research questions. Acknowledging the challenge of measuring IPR protection empirically, we use three measures of IPR to test our hypotheses. The first is based on the events that enhance host countries' IPR protections significantly. Specifically, using the list constructed

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<sup>3</sup> Institutional changes often echo with economic growth that will likely contribute to higher number of cross-border M&As in general. To test the impact of IPRs in particular, we study the change in the components of cross-border M&As, rather the change in the volume of all cross-border M&As.

<sup>4</sup> Note that in contrast to Ferreira, Massa, and Matos (2010), who study the likelihood of a firm becoming a target in a cross-border deal, we are interested in testing the effects of IPR reforms on the patterns of cross-border M&As in target countries at the country level.

by Branstetter, Fisman, and Foley (2006) and the adoption of the Paris Convention (Khoury and Peng, 2010),<sup>5</sup> we identify 28 countries that experienced significant IPR reforms recently. The second measure is the adoption of Trade-Related Aspects of Intellectual Property Rights (TRIPS). The World Trade Organization (WTO) requires its members to comply with minimum copyright, trademark, and patent protection regulations as specified by the Agreement on TRIPS. By the end of 2008, WTO had accepted 154 members since its establishment in 1995, all of whom are required to comply with TRIPS at various times, depending on the economic development of the member country. The fact that countries comply with TRIPS at different times provides a natural environment in which to test the effects of IPR on cross-border, hi-tech M&As. Kyle and McGahan (2012) use TRIPS as a measurement of patent protection and find that the impact of TRIPS on R&D in new drugs varies depending on whether the host country is a developed or developing country. The third measure we use is the Ginarte-Park index as a more nuanced measure (Ginarte-Park, 1997).

We are aware that one of the common drawbacks of all these measures is the lack of enforcement components of IPR protection. Ostergard (2000) argues that the scarcity of quantitative research in the enforcement measurements of IPR protection makes the research in the effects of IPR protection challenging. IPR protection therefore may be overestimated by the measures that do not take enforcement into account. This measurement issue, however, has downward bias on our hypothesis because we would not be able to capture any IPR effect on cross-border M&As if the measures we use are all overestimated. To mitigate such concerns though, we manually collect the list of countries identified by the “Special 301” report, which is the result of the annual review of the state of IPR protection and enforcement in U.S. trading partners around the world as conducted by the Office of the United States Trade Representative. We are able to collect data for 76 countries from 1988 to the current year. The correlation analysis of this measure with our measurements of IPR protections shows that countries on the U.S.’s watch list have a positive correlation (0.263) with our first measure and are significant at 1% level, suggesting that countries identified by the U.S. as weak IPR protection countries are more likely to experience significant IPR reforms recently. There are negative correlations with both the TRIPS and the Ginarte-Park index (-0.163 and -0.072, respectively, significant at 1% level), suggesting that those

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<sup>5</sup> Khoury and Peng (2010) document that the adoption of the Paris Convention leads to more inbound FDI in Latin America and the Caribbean.

countries on the U.S. watch list are less likely to have yet adopted TRIPS and have lower Ginarte-Park index value. These results confirm that although our measurements of IPR protection miss the precise measurements of IPR enforcement, they correctly reflect the target countries IPR protection states.

The summary analysis of the cross-border transactions involving targets from countries with significant IPR reforms shows that the target countries experience significantly more M&A activity involving hi-tech firms after IPR reforms occur. Specifically, before IPR reforms, only about 9.2% of the deals (including incomplete ones) involve hi-tech targets. The proportion increases significantly to 16.4% after IPR reforms. The same pattern remains for completed deals. One may argue that economic growth (and by extension, the propensity of hi-tech companies) may drive an increase in hi-tech cross-border M&As.<sup>6</sup> To address this concern, we take two main approaches to identify the impact of IPR reforms.

The first approach is the Lerner (2009) test. Following Lerner (2009), we analyze hi-tech cross-border M&As in the IPR countries by adjusting the changes in the overall proportions of hi-tech firms in the non-IPR countries. Basically, the idea is that because the increased proportions of hi-tech deals may be due to overall propensity changes over time, we adjust the trend by controlling for the proportion of hi-tech M&As in countries without IPR reforms. The results show that target countries with significant IPR reforms still experience significantly higher-than-expected growth in hi-tech, cross-border M&As. The significance, however, disappears among the IPR countries' domestic M&As and outbound M&As. This confirms that IPR reforms change the amount of inbound, cross-border, hi-tech M&As in target countries.

The second approach is a generalized difference-in-differences (DID) regression analysis. Since Ashenfelter and Card (1985), the DID method has become an increasingly popular way to

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<sup>6</sup> One may argue that the percentage of high-tech firms in a country grows after an IPR event due to better protection and the percentage of hi-tech M&As will increase mechanically. We think that this may not be the case for the following reasons. The percentage of cross-border M&As, especially hi-tech related ones, in less developed countries is not a majority. The host countries' institutional development is often cited as the main reason. It is therefore not because of lack the potential targets that slows the hi-tech related cross-border M&As. We conjecture that without IPR improvement, the increase in the number of hi-tech related firms in host countries will not necessarily lead to more hi-tech related M&As. Furthermore, tighter IPRs do not lead to higher percentage of high-tech firms unambiguously, given the debate on the effects of IPRs on local economies. For example, Helpman (1993) argues that the innovation rate actually decreases, not increases, in the long-run after the tightening of IPRs. The percentage of hi-tech firms may actually reduce after tighter IPRs in less developed countries. This is because it becomes more costly to imitate externally developed technology and it costs significantly more to produce innovation internally. Many hi-tech firms depending on imitation may not be able to survive after tighter IPRs.



estimate causal relationships. In this study, we construct an extensive database that contains cross-border deals involving targets from countries all over the world with significant IPR reforms. Using country-by-year data over 29 years, we apply a standard DID analysis to compare the percentage of hi-tech, cross-border M&As before and after IPR reforms. Controlling for country-fixed effects, the results show that IPR reforms do promote hi-tech cross-border M&As and that the effect is stronger in nonadvanced economies. The results hold even after we include other country factors that have been shown to impact the likelihood of mergers between two countries (Erel, et al., 2012), such as economic growth and trade openness.<sup>7</sup>

The results of the country-fixed regression analysis shows that both TRIPS and the Ginarte-Park index increase a country's hi-tech cross-border M&As significantly. This pattern is particularly strong in nonadvanced economies and in countries with weaker shareholder protections, suggesting that improved IPR mitigates acquirers' concerns about hi-tech targets in countries with relatively weak institutions. These results remain when we include the growth of hi-tech M&As caused by economic propensity (measured by growth of the hi-tech M&As in US), the domestic economic growth (measured by target country's GDP), and trade policies (measured by the target country's trade openness), and when we control for country heterogeneity.

To examine the value IPR reforms bring to individual targets, we analyze the premiums targets receive. Using a sample of cross-border transactions in 71 countries for which premium information is available, we find that targets in countries with IPR reforms obtain significantly higher premiums than those in countries without IPR reforms. This pattern is particularly significant for hi-tech targets in nonadvanced countries, confirming our argument that the value of innovation increases through the transfer of intangible assets and/or investment in hi-tech projects.

When examining how target countries' IPR reforms affect acquiring firms' valuations, we focus on cross-border M&As conducted by U.S. acquirers because of the completeness and convenience of the data, and because the U.S. is one of the most active countries in cross-border transactions.<sup>8</sup> Using the standard event study method, we find that hi-tech transactions drive the higher announcement effects in emerging markets. Specifically, the average announcement effect for acquirers buying hi-tech targets in nonadvanced economies is 5.691%, which is significantly

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<sup>7</sup> The untabulated results show a similar pattern among deals without transfers of controlling interests (acquirers thus have less control over the outcomes of their investments).

<sup>8</sup> It accounts for about 18% of all cross-border M&As (in terms of value) during the sample period of 1980 to 2008 (according to SDC Platinum).

higher than the 1.053% associated with similar deals involving targets in advanced economies. When cross-border transactions are not hi-tech deals, no significant difference in acquiring firms' announcement effects exists, regardless of the target's home economy. This is consistent with Errunza and Senbet (1981), who argue that cross-border M&As facilitate the transfer of intangible assets, such as technology and managerial skills.

More important, the significantly higher announcement effect associated with hi-tech targets from nonadvanced economies is only evident in countries with IPR reforms. Specifically, the average announcement effect for deals involving hi-tech targets from nonadvanced economies with IPR reforms is 10.287%<sup>9</sup> (and it is 6.863% if the acquirers are hi-tech), significantly higher than similar transactions in nonadvanced economies without IPR reforms and in advanced economies. Therefore, transfers of intangible assets are more likely to occur if the market is confident that the transferred technology will be protected at a certain level. Acquirers that conduct hi-tech M&As in nonadvanced economies without IPR reforms experience insignificant negative returns. The univariate results remain after we control for firm and country specific factors and replace the IPR reforms with TRIPS and the Ginarte-Park index.

In sum, our study contributes to the IPR literature and the cross-border M&As literature by showing that target countries create a win-win situation when they implement or improve their protection of intellectual property rights. The reforms not only promote more hi-tech transactions in target countries, but also increase the premiums target firms receive and create value for the foreign acquirers. Our results thus provide an alternative way to examine the effects of IPR reforms on local economies and firms. Furthermore, we propose a key explanation of why transactions involving targets from emerging markets have significantly higher abnormal returns: stronger IPR protection in emerging markets drives the value creation in cross-border M&As involving hi-tech targets from emerging markets. Thus, besides identifying the sources of value creation in cross-border M&As (technology transfer), we identify the environment in which such synergy is likely to occur by showing that institutional factors such as IPR play a significant role in the value chain of cross-border M&As.

The remainder of the paper is organized as following. Section 2 reviews data sources and hypotheses design. Section 3 discusses the impact of IPR reforms on trends in cross-border M&A

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<sup>9</sup> It is 3.996% for large acquirers and 17.571% for small acquirers.

activities and the premiums targets receive. Section 4 presents the impact of IPR reforms on the announcement effects for acquirers. Section 5 concludes.

## **2. Related Literature and Hypotheses**

Although there is a growing consensus that institutional factors matter to economic growth (e.g., Bowen and Clercq, 2008), a debate remains on the impact of IPR reforms on local economies. For example, some argue that tighter intellectual property rights only benefits the large companies based in industrial countries by strengthening their monopoly power, to the detriment of the less developed countries (Helpman, 1993). Competing manufacturers in less developed countries (LDCs) with poor IPRs may benefit from imitating successful innovations. Their access to technologies and cost advantages enable LDCs to compete in the product market. This advantage, however, diminish with the tighter IPRs because the reallocation of the manufacturing towards higher priced patented products.

Whether the tighter IPRs will result in accelerated rate of innovation is also not conclusive. Helpman (1993) shows that the rate of innovation actually declines in the long-run after the tightening of IPRs even though it may rise initially. Chin and Grossman (1990) and Deardorff (1992) also show formally that the innovations created by the additional IPRs may be incremental and negligible given that patents are already available to protect much of the global market.

With the presence of active FDI, however, the developed countries may gain from the tighter IPRs in the less developed countries (Helpman, 1993). FDIs had focused on labor-intensive industries because of the concerns of poor institutional development such as the law of property rights and its enforcement. The trend clearly shows that the majority of the cross-border deals are between developed markets (e.g., about 83.8% of transactions by U.S. acquirers are in advanced economies). Many factors may contribute to the relatively small number of transactions involving targets from LDCs, and IPR protection is a significant one. For example, hi-tech acquirers may be afraid of jeopardizing core technology when working with targets in countries with poor IPR protection. Coeurderoy and Murray (2008) and Maekelburger et al. (2012) show that institutional safeguards such as IPR protection determine entrepreneurial firms' choice of foreign market entry modes. Hagedoorn et al. (2005) document that IPR protection is a significant factor for a firm's choice of international R&D partner.

Multinationals can benefit more from the tighter IPRs in LDCs by shifting more technology intensive production to take the advantage of the lower labor cost in the host countries while avoiding the spillover of the fruit of their R&D. Thus the tighter IPRs in LDCs may encourage more FDIs, especially in the high-tech oriented industries. Cross-border M&A is an important form of FDI. Our first objective, therefore, is to examine whether the tighter IPRs in LDCs result in more inbound cross-border M&As in LDCs.

The tighter IPRs in LDCs may not lead to more hi-tech related M&As in the local economies though. The domestic R&D spillover can be achieved through many mechanisms, and probably less costly ones, other than M&As. For example, the private knowledge created by individual firms can be spilled over to the other firms in the industry by interaction and movement of people (Feinberg and Majumdar, 2001).

On the other hand, the increased cross-border M&As may also benefit the target firms. Although the tighter IPRs increase the attractiveness of the LDCs to multinational firms, not all firms in the host country are equal. Even in economies with weak IPRs, only those firms who have invested in the creation of knowledge in a particular area have the capabilities to recognize and realize the value of externally-generated knowledge and thus can successfully make use of those innovations of others from positive R&D spillover. These firms with such capacity will become the most attractive potential targets in cross-border M&As. To compete for the best targets and benefit from the positive FDI spillover due to the tighter IPRs in the host countries, acquirers may be willing to pay a premium to those targets to recognize their technology capabilities. We next examine whether acquirers pay a premium to the targets from countries with tightened IPRs.

Lastly but not the least, we examine whether acquirers gain from the cross-border M&As in LDCs with tighter IPRs. M&A studies show that the transfer of technical and managerial skills and/or capital from acquiring firms to target firms creates value (Errunza and Senbet, 1981, Francis, Hasan, and Sun, 2008; Chari, Ouimet, and Tesar, 2010, and Bena and Li, 2013). Successful transfers of knowledge, however, depend on many factors. For instance, Branstetter, Fisman, and Foley (2006) show that enhanced IPR accelerates technology transfer within multinational firms. The tighter IPRs in the host countries may enable more value creating cross-border M&As that increase acquirer shareholders' value.

### **3. Measurements of IPR Protection**

Many countries improved their intellectual property rights (IPR) in the past two decades. To quantify this improvement, we use three measures from the literature: whether the country experiences significant IPR events, whether the country joins WTO and therefore complies with TRIPS, and how well the country implements and enforces IPR. We explain these measures in detail.

### **3.1 Significant IPR Events**

To determine whether a country experienced significant IPR reforms, we first use the measurements created by Branstetter, Fisman, and Foley (2006). They identify 16 countries that undertook significant IPR reforms between 1982 and 1999.<sup>10</sup> Six attributes of patent reform, identified by Branstetter et al. (2006), determine the significance of such reforms: an expansion in the range of goods under IPR protection, an expansion in the effective scope, an increase in the patent-protection length, improvements in enforcement, and improvements in the administrative system. They do not include the adoption of the Paris Convention as a significant event.

The Paris Convention is one of the first intellectual property treaties, signed in 1883. It currently has 173 contracting member countries, some of which joined when the convention was first signed, while others joined recently. One of the world's most widely adopted treaties, the Paris Convention seems to matter more for developing countries whose IPR institutions are generally weaker. For example, Khoury and Peng (2011) document that the adoption of the Paris Convention leads to more inbound FDI in Latin America and the Caribbean countries.

We utilize both the measurement from Branstetter, et al. (2006) and the Paris Convention to identify whether a target country in a cross-border M&A transaction experienced significant IPR reforms recently. We identify 28 countries. Table 1 presents the names of these countries and the years of their reforms.<sup>11</sup>

[INSERT TABLE 1 HERE]

### **3.2 TRIPS**

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<sup>10</sup> Please refer to Table 2 of Branstetter, Fisman, and Foley (2006).

<sup>11</sup> When a country adopts the Paris Convention and undertakes significant IPR recently, we use the year of the significant IPR. For example, Brazil adopted the Paris Convention in 1992 but undertook significant IPR in 1997. Therefore, 1997 is recorded in our sample for Brazil.

The WTO requires its members to comply with Trade-Related Aspects of Intellectual Property Rights (TRIPS), which establishes minimal levels of intellectual property protection. For example, the minimum term of patent protection is 20 years, and member states must grant patents for both products and processes in most areas of technology. Established in 1994 during the Uruguay Round of the General, TRIPS also provides trading privileges to WTO member countries. The timing of adoption, however, may vary depending on the economic development of the participating country.<sup>12</sup> The rationale is that TRIPS “attempts to strike a balance between the long-term social objective of providing incentives for future inventions and creation, and the short-term objective of allowing people to use existing inventions and creations...” The WTO had 154 members by the end of 2008.

Based on the WTO agenda, we estimate the dates of compliance for every country in our sample. Specifically, developed countries that joined WTO in 1995 are considered compliant in 1995; developed countries that join WTO after 1995 are considered compliant as of their membership dates. WTO originally required members identified as “least-developed” to comply by 2005, but the WTO extended the deadline to 2016 during the Doha round. For developing countries that were WTO members in 1995, their compliance date is 2000 (see footnote 9). For developing countries that joined after 1995, the compliance date is the membership date unless indicated otherwise on WTO website.<sup>13</sup>

### **3.3 The Ginarte-Park Index**

The third measure is the Ginarte-Park Index,<sup>14</sup> used in several studies (e.g., Ginarte-Park, 1997). Briefly, the index is constructed for each of the 110 countries in the sample, quinquennially from 1960 to 2005. The index incorporates five characteristics of patent laws: extent of coverage, membership in international agreements, provision for loss protection, enforcement mechanisms, and duration of protection. Each of those categories is scored from 0 to 1 and therefore the index

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<sup>12</sup>According to WTO, “When the WTO agreements took effect on 1 January 1995, developed countries were given one year to ensure that their laws and practices conform with the TRIPS agreement. Developing countries and (under certain conditions) transition economies were given five years, until 2000. Least-developed countries have 11 years, until 2006—now extended to 2016.”

<sup>13</sup> Due to space constraints, we do not include the list of all countries’ compliance dates. All the information we use to estimate the compliance date is publicly available on WTO’s website (Sander et al. 2016 and Khoury and Peng, 2010).

<sup>14</sup> Walter Park generously shares this index of IP protection and enforcement compliance on his website, updated until 2005.

ranges from 0 to 5, with higher values indicating stronger levels of protection. Although there is some overlap among the Ginarte-Park Index, IPR reforms, and TRIPS, the index is continuous and more nuanced.

We are aware that one of the common drawbacks of all these measures is the lack of enforcement components of IPR protection. Ostergard (2000) argues that the scarcity of quantitative research in the enforcement measurements of IPR protection makes the research in the effects of IPR protection challenging. IPR protection therefore may be overestimated by the measures that do not take enforcement into account. This measurement issue, however, has downward bias on our hypothesis because we would not be able to capture any IPR effect on cross-border M&As if the measures we use are all overestimated. To mitigate such concerns, we manually collect the list of countries identified by the “Special 301” report, which is the result of the annual review of the state of IPR protection and enforcement in U.S. trading partners around the world as conducted by the Office of the United States Trade Representative. We are able to collect data for 76 countries from 1988 to the current year. The correlation analysis of this measure with our measurements of IPR protections shows that countries on the U.S.’s watch list have a positive correlation (0.263) with our first measure and are significant at 1% level, suggesting that countries identified by the U.S. as weak IPR protection countries are more likely to experience significant IPR reforms recently. There are negative correlations with both the TRIPS and the Ginarte-Park index (-0.163 and -0.072, respectively, significant at 1% level), suggesting that those countries on the U.S. watch list are less likely to have yet adopted TRIPS and have lower Ginarte-Park index value. These results confirm that although our measurements of IPR protection miss the precise measurements of IPR enforcement, they correctly reflect the target countries IPR protection states.

#### **4. Data Sources and Hypotheses Development**

We utilize several databases and large data sets to examine our research questions. Specifically, to test the impact of strengthened IPR on hi-tech, cross-border M&As and on target premiums, we use cross-country data for cross-border M&As in all countries. To test the announcement effects of acquiring firms, we focus on U.S. acquirers.

#### **4.1 Data for Analyzing the Trends in Hi-Tech, Cross-Border M&As and the Premiums in Countries with IPR Reforms**

To examine how strengthened IPR affects hi-tech, cross-border M&As, we retrieve all of the inbound, cross-border transactions in all countries during the sample period of 1980 to 2008. All M&A information is from the Worldwide M&A section of SDC platinum. We exclude “rumors”<sup>15</sup> and deals involving financial acquirers or financial targets (SIC codes 6000 to 6999). The final sample includes 18,549 deals and involves acquirers from 112 countries. The United States accounts for the highest number and value of these deals. Our hi-tech definition is consistent with Chan, Martin, and Kensinger (1990). It includes companies in the pharmaceutical, electronics, information processing, instruments, semiconductor, and telecommunications industries.

Economic growth (and by extension, a higher proportion of hi-tech companies) may drive the observed increase in hi-tech, cross-border M&As. To address this concern, we take two approaches to examining the significance of the impact of IPR reforms.

The first approach is the Lerner (2009) test. Specifically, we create a benchmark of M&A deals following Lerner (2009) from countries without IPR reforms. The countries in the benchmark include tech-intensive countries such as the United States, the UK, and Canada, and less tech-intensive countries such as Jordan and Slovenia. The benchmark sample includes 115 countries during the period of 1980 to 2008. The growth in the proportion of hi-tech companies in countries without IPR reforms should explain the growth of hi-tech, cross-border M&As in IPR countries due to overall propensity changes. We attribute the remaining portion of the growth to shocks brought on by IPR reforms.

We also argue that the impact of IPR reforms should be particularly strong for inbound cross-border M&As in those countries, but not necessarily for their domestic or outbound M&As. To test this argument, we collect data for all the domestic and outbound M&As for firms from the IPR countries. The sample of the domestic M&As includes 43,804 deals, and the sample of the outbound M&As includes 9,602 deals. We expect no significant unexpected growth in hi-tech, domestic M&As and outbound M&As after IPR reform.

The second approach to testing whether changes in general economic conditions actually drive the increase in hi-tech, cross-border M&As is a generalized difference-in-differences (DID) regression analysis. This analysis identifies a specific intervention or treatment (such as IPR

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<sup>15</sup> SDC labels some deals as “rumors” and the deal status is not completed. We exclude those deals.



reform) and then compares the outcomes before and after the intervention for the groups affected by the intervention (i.e., cross-border M&As after IPR reforms) to the outcomes for the unaffected groups (i.e., cross-border M&As before IPR reforms, or transactions in countries without IPR reforms).

To conduct the DID analysis, we collect an extensive dataset of cross-border deals involving targets from all over the world, in countries with and without significant IPR reforms. This dataset includes 38,135 completed cross-border M&As in 141 countries during 1980–2008. We then construct balanced panel data for the 141 countries over the 29-year period, resulting in 4,089 country-year observations. We calculate the proportion of cross-border M&As involving hi-tech targets for each country-year observation, ranging from 0 to 1. Annual country characteristics, such as GDP and trade openness, are from Penn World Tables.<sup>16</sup> Notably, trade liberalization may drive both IPR reforms and cross-border M&As (e.g., South Korea and Taiwan), but trade openness itself is probably not a primary driver of hi-tech, cross-border M&As. We accordingly include *Trade Openness* as a control variable. We also incorporate the target country's status as a tax haven.<sup>17</sup>

Last, to show the benefits that IPR reforms bring to targets, we analyze the premiums targets receive. The premium is the difference between the transaction value and the target's market value four weeks prior to the transaction announcement (of the acquired shares), divided by the market value of the acquired shares.<sup>18</sup> We collect data for all the completed cross-border M&As involving the purchase of a controlling interest of a public target that has market values available four weeks prior to the transaction. Due to information availability, the final sample falls to 2,648 transactions meeting our selection criteria from 1986 to 2008, covering 71 countries.

## 4.2 Data for the Announcement Effects of Acquirers

To study how target countries' IPR reforms affects acquirers' valuations, we focus on cross-border M&As conducted by U.S. firms. Specifically, our data includes all international M&As conducted by nonfinancial U.S. firms from 1980 to 2008, including incomplete deals. The initial sample includes 15,984 deals involving 159 target countries. We obtain the identities of the firms, the

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<sup>16</sup> The share of exports and imports in total GDP, measured at current international prices using the variable *openc*.

<sup>17</sup> We identify the tax-haven countries according to Desai et al. (2006).

<sup>18</sup> The target's market value four weeks prior to the transaction is provided by SDC.

status of the transactions (completed or not), the transaction values, the deal attitudes (friendly or hostile), the primary four-digit SIC codes for the firms, the tender-offer flag, the payment methods, the number of SIC codes in which the targets are active, the number of shares acquired owned by the acquirer after the deal, and the market value of the target firms four weeks prior to the announcement.

## **5. The Impact of IPR Reforms on Trends in Cross-Border M&As and the Premiums**

First, we analyze the impact of strengthened IPR on the trend of hi-tech, cross-border M&As. We present the summary statistics in Table 2. Columns 1 to 3 present the cross-border M&As involving targets from IPR countries. There are 1,449 deal attempts (meaning some may be incomplete) before the IPR reforms and 17,100 attempts after. Of these 17,100 attempts, 16.4% involve hi-tech targets, 18.0% involve hi-tech acquirers, and 13.2% involve both hi-tech acquirers and targets. These proportions are significantly larger than before the IPR reforms: 9.2%, 10.1%, and 7.2%, respectively.

[INSERT TABLE 2 HERE]

This proportion pattern also appears in the group of completed deals. Although the overall completion ratio goes down slightly after IPR reforms (to 71.0% from 73.8%), the completion ratio for hi-tech M&As increases significantly after IPR reforms (from 63.5% to 75.3%). Deals that may lead to more technology transfer are more likely to close after IPR reforms. In columns 4 to 6 and columns 7 to 9, we also present the domestic and outbound M&As conducted by the firms in the IPR countries. The increase in hi-tech transactions is also present in these two groups of M&As.

The univariate results suggest that strengthened IPRs are related to a higher number of hi-tech, cross-border M&As and faster growth of such transactions. It is possible, however, that improved IPR encourages domestic hi-tech M&As for similar reasons. The changes are also likely due to overall propensity changes. As explained, we test these hypotheses in the next section by adjusting the overall propensity factor.

### **5.1 Controlling for Overall Propensity Changes**

Hi-tech cross-border M&As in host countries could increase when there are more hi-tech acquirers or there are more demand for hi-tech targets globally. If this is the case, then the percentage of hi-tech related cross-border M&As will increase even when the host countries' IPRs remain the same. In order to control for the impact of the global propensity changes (not the host countries' propensity changes), we examine the co-movement of the hi-tech cross-border M&As and the global trend of hi-tech M&As. We follow the method in Lerner (2009) to control for the impact of global propensity changes. Lerner's test allow us to determine whether the observed increase in the target countries' hi-tech cross-border M&As is driven by the global increase in hi-tech cross-border M&A or by the target countries' improvements in IPR. If we find that the positive effect of IPR on target countries' hi-tech cross-border M&As remains significant after controlling for the global trend and such unexpected increase can be explained by the event of IPR, then we have more confidence to conclude that IPR motivates more cross-border M&As in the hi-tech industries.

Specifically, we regress the IPR countries' annual hi-tech M&A ratios (inbound, domestic and outbound, respectively) against the non-IPR countries' annual average domestic hi-tech M&A ratios.<sup>19</sup> Coefficients before and after the IPR reforms are in Panel A of Table 3. The coefficient before IPR reforms for the inbound, cross-border M&As is negative and insignificant, meaning the changes in the proportion of hi-tech M&As in the IPR countries have little to do with the trends in the rest of the world before IPR. Not surprisingly, the adjusted  $R^2$  is also low. After the IPR reforms, this relationship becomes positive and significant, suggesting that the overall propensity changes positively influence the changes in the target countries' hi-tech M&As after IPR reforms. Panel A also shows the coefficients for the domestic M&As and outbound M&As. The coefficients for the domestic M&As are insignificant both before and after IPR reforms, suggesting that changes in the proportion of hi-tech M&As in IPR countries are not related to the trend in non-IPR countries. The coefficient for domestic outbound M&As before IPR reforms is negative and significant at the 10% level, but it is not significant after IPR reforms. Interpreting the sign and significance of beta of IPR countries' outbound hi-tech M&As before the IPR reforms is difficult, however, because those IPR countries conduct few outbound M&As before the IPR reforms.

[INSERT TABLE 3 HERE]

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<sup>19</sup> Results remain qualitatively the same when using weighted averages.

More importantly, Panel B of Table 3 reports the adjusted percentage of hi-tech deals before and after IPR reforms. Specifically, we use the estimated coefficient to determine the expected percentage of hi-tech M&As. The expected value denotes what the value would be if there were no IPR reforms. We then deduct the expected value from the actual percentage of hi-tech M&As. The results in Panel B show that for inbound hi-tech M&As, countries experience a higher-than-expected percentage of such deals after IPR reforms. The difference is at the 5% significance level. This result suggests that the impact of IPR reforms remains after controlling for the overall propensity influence.

In sum, the propensity analysis confirms that IPR reforms increase the proportion of a country's inbound hi-tech M&As significantly. In sum, the results in Table 3 suggest two findings. First is that hi-tech related cross-border M&As in host countries with tighter IPRs are more sensitive to the global trend of hi-tech M&As. This means that when there is a higher demand of hi-tech targets, acquirers will consider firms from the host countries with tighter IPRs as potential targets. Second, which is more relevant to our test, is that there is an abnormal increase in the hi-tech related cross-border M&As that cannot be explained by the global trend after IPRs, suggesting the significant impact of IPR reforms on the pattern of the host countries' hi-tech related deals. A similar pattern, however, does not exist for the domestic M&As and outbound M&As in those IPR countries.

## 5.2 Generalized Difference-in-Differences Regression Analysis

In this section, we apply a more formal analysis of the impact of IPR reforms on the trend of cross-border hi-tech M&As by applying a difference-in-differences approach. We estimate the following country-level regression:

$$HitechRatio_{jt} = \alpha_j + \beta_t + \delta * IPR_{jt} + \gamma * X_{jt} + \varepsilon_{jt}, \quad (1)$$

where  $j$  indexes for country and  $t$  for year. Country and year fixed effects are denoted by  $\alpha_j$  and  $\beta_t$ .  $HitechRatio_{jt}$  is the proportion of hi-tech targets among completed cross-border M&As in which acquirers own over 50% of the target after the transaction.  $IPR$  is a dummy variable equal to 1 if the observation is constructed for the years after the identified IPR event and 0 otherwise. When we measure a target country's IPR by its compliance with WTO's TRIPS,  $TRIPS$  replaces variable

*IPR* and it is a dummy variable equal to 1 if the observation is after the identified compliant year. When we measure a target country's IPR protection by the Ginarte-Park Index, *Ginarte-Park Index* replaces variable *IPR* and it is a continuous measurement ranging from 0 to 5. The  $\delta$  variable therefore is the coefficient of interest; it measures the sensitivity of the dependent variable to a target country's IPR protections. We also include macroeconomic control variables such as *GDP*, *Trade Openness*, and *Tax Haven*. To control for the impact of the overall propensity changes, we include the variable *LogUSHitech*, which measures the dollar amount of domestic M&As involving hi-tech targets in the United States.<sup>20</sup>

As Meyer (1995) suggests, for the DID analysis to be meaningful, a similarity should exist between comparison groups (the control group without IPR and the treatment group with IPR). Because our data only accounts for recent IPR events, we face the problem of treating a developed country (such as the United Kingdom) the same as a developing country (such as Algeria) because neither has experienced a recent significant IPR event by either measurement. Besides, Lerner (2002) shows that the impact of patent protection should be greater in nations with weaker institutions and greater economic development. Therefore, to make the comparisons more meaningful, we conduct the DID regression analysis on advanced economies and nonadvanced economies separately, and on common law and non-common law countries separately. We use the International Monetary Fund's definitions to gauge economic development.<sup>21</sup>

Table 4 presents the results from the DID regressions. The observations for this analysis include 2,306 country-year observations from 80 nonadvanced economies and 848 observations from 30 advanced economies for the years 1980–2008, including completed M&As involving controlling interests. Because macro information and the Ginarte-Park Index are not available for some country-year observations, the sample size varies when those factors are examined. Models 1 to 3 report results for nonadvanced economies; models 4 to 6 report results for advanced economies; models 7 to 9 report results for common law countries; and models 10 to 12 report results for non-common law countries. The results suggest that *IPR* (measuring significant IPR events), *Ginarte-Park Index* (measured by the Ginarte-Park Index), and *TRIPS* (measured by WTO compliance) increase the proportion of a country's hi-tech cross-border M&As significantly. The

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<sup>20</sup> The results hold if we use worldwide domestic deals.

<sup>21</sup> <http://www.imf.org/external/pubs/ft/weo/2009/01/weodata/groups.htm#ae>

magnitude and significance of the IPR impact, however, is particularly strong among nonadvanced economies and non-common law countries.<sup>22</sup>

[INSERT TABLE 4 HERE]

The results of the DID analysis confirm the patterns in the univariate tests and are consistent with the results of the Lerner (2009) test. Because we run the DID by using a country-fixed effects model that controls for unobserved country heterogeneity, we are more confident that strengthened IPR promotes more hi-tech, cross-border M&As.

### 5.3 Premium Analysis

To study the benefits IPR reforms bring to target countries, we examine the premiums that targets receive. The results are in Table 5. Due to information availability, the number of observations in the final sample reduces significantly to 2,648 transactions meeting our selection criteria for 1986–2008 and covers 71 countries.

[INSERT TABLE 5 HERE]

Columns 1 to 3 present the results of the regression analysis of the target premiums for transactions in nonadvanced economies. Targets from countries with IPR reforms experience significantly higher premiums than those from countries without IPR reforms, suggesting that IPR reforms not only attract more acquirers, but also make them willing to pay higher prices. If this is the case because of the value created through the transfer of intangible assets and/or investment in hi-tech projects, the effect should be more evident among hi-tech targets but not necessarily among manufacturing targets. Indeed, the interaction of *IPR* and *Hi-tech* is significant and positive.

The interaction variable of *Ginarte-Park Index* and hi-tech targets also has significant and positive impact on target premiums. The coefficient of the interaction variable *TRIPS* and *Hi-tech* is positive, too; however, it is not as significant as the other two proxies of IPR protection. This is

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<sup>22</sup> We also conduct the DID analysis in a group of completed but uncontrolled M&As. If acquirers value IPR, such an impact should also exist among the deals that do not involve transfers of ownership control, in which case the acquirers have less control over their investments. The untabulated results show that IPR reforms increase the proportion of noncontrolled, hi-tech cross-border M&As, too, although not to the same degree and significance.

consistent with the limitation of TRIPS, in that it does not capture the actual IPR protection in a country.

We include control variables from existing literature. For example, Rossi and Volpin (2004) show that shareholder protection plays a significant role in explaining M&A trends. We report that targets from common law countries, which should have better shareholder protections, receive higher premiums. However, this is only true for targets from advanced economies, in which the general institutional quality is stronger. We also find that when the target firm is in a tax-haven country, the premium is lower. These results suggest that although tax-haven countries may attract acquirers, the targets in those countries do not necessarily receive higher premiums.

## **6. The Impact of IPR Reforms on Announcement Effects for Acquirers**

In this section, we provide evidence that strengthened IPR affects acquirers' valuations. Because this analysis requires detailed financial and stock information for the acquiring firms, we focus on cross-border M&As conducted by U.S. firms, which account for the highest value of cross-border M&As in those IPR countries.

### **6.1 Announcement Effects**

There are several studies regarding the positive announcement effects for acquiring firms in cross-border M&As involving financially segmented markets or emerging markets (Francis, Hasan, and Sun, 2008; Chari, Ouimet, and Tesar, 2010). Beyond finding positive announcement effects, we also identify the significant impact of strengthened IPR on the important role of hi-tech M&As.

We use the standard event-study approach. Table 6 presents the three-day cumulative abnormal returns (CARs) of acquiring firms. To be comparable with the existing literature, we include completed transactions and exclude deals with transaction values that are less than 1% of the acquirer's market value four weeks prior to the acquisition announcement. This reduces the total number of observations to 2,930. The results show that, consistent with previous studies, acquirers of targets from nonadvanced economies experience a 2.551% CARs (column 5), which is significantly higher than the 1.116% (column 1) CARs for acquirers of targets in advanced economies. The difference is at the 1% significance level. These findings are consistent with Francis et al. (2008) and Chari et al. (2010), which find that acquirers from developed markets

experience significantly higher announcement effects when buying targets from developing markets.

[INSERT TABLE 6 HERE]

Importantly, the results in column 9 of Table 6 indicate that deals involving hi-tech firms drive the significantly higher announcement effects involving targets from nonadvanced economies. For example, the average announcement effect for U.S. acquirers of hi-tech targets from nonadvanced economies is 5.691% (column 5), which is 4.638% higher than for U.S. acquirers of hi-tech targets from advanced economies. When the cross-border transactions do not involve hi-tech targets, there is no significant difference between the announcement effects for acquirers of targets in nonadvanced economies and acquirers of targets in advanced economies. A similar pattern holds when splitting the sample into large and small acquirers. These results support Errunza and Senbet (1981) in that a major benefit of cross-border M&As is the transfer of acquirers' technology to target firms, especially those in economies with inferior products and labor markets.

Acquirers and investors may not realize the potential synergy, however, if they are not confident that the transferred technology will be protected. We find that when acquirers conduct hi-tech, cross-border deals in countries without IPR reforms, the announcement effect is insignificant. Columns 6 to 8 show that hi-tech deals (especially ones involving the purchase of a controlling interest) in countries with recent IPR reforms drive the higher announcement effects in nonadvanced economies. Those U.S. acquirers that conduct hi-tech deals in countries without IPR reforms experience negative or insignificant returns.

The results in columns 10 and 11 confirm that hi-tech deals in countries with IPR reforms drive the significant difference in acquirers' announcement effects. For deals that do not involve hi-tech companies, and for hi-tech deals that do not involve IPR reforms, the difference in announcement effects between buying targets in advanced economies and nonadvanced economies is not statistically significant.

We also present the results of similar tests for large and small acquirers in Table 6. Acquirer size has a significant impact, statistically and economically, on M&A announcement effects (Moeller, Schlingemann, and Stulz, 2004). Furthermore, Francis, Hasan, and Sun (2008) show that



large acquirers benefit most from transactions involving targets from emerging markets. Thus, we classify firms as *Large (Small)* acquirers if their market capitalization is greater (equal to or less) than the market capitalization of the 25th percentile of NYSE firms in the acquisition year. The previous patterns remain for both groups, suggesting that target countries' IPR is a significant factor for the shareholders of acquiring firms, regardless of the size of the acquirer.

Table 7 presents the regression analysis of acquiring firms' announcement effects. The dependent variable is the three-day CARs of acquiring firms. Models 1 to 3 include all acquirers with targets from nonadvanced economies. Models 4 to 6 include transactions in advanced economies. We examine the interaction variables of IPR measures and the *Hi-tech* variable. The results of models 1 to 3 show that U.S. acquirers with targets from nonadvanced economies experience significantly higher announcement effects when target countries strengthen their IPR protections. This positive impact is even more pronounced and significant when using significant IPR events and *Ginarte-Park Index* to measure IPR (these proxies capture the quality of IPR in a host country more accurately).

In sum, the results are largely consistent with the univariate analysis. IPR significantly increases acquirers' announcement effects, and its significant impact remains after controlling for other influential variables. Note that we focus on the market reaction to the announcement deal and examine the value impact of acquiring firms' shareholders. Examine whether the perceived value realizes afterwards is interesting too, however, challenging. For example, the pre-merger information is not available for many private targets, which consists the majority of the cross-border deals. Several studies void this issue by considering only the ex post change in performance of acquirers (Hoberg and Phillips, 2012; Francis et al., 2016; and Fresard et al., 2016). We leave the post-merger performance test to future study. We could however gain some insights from Branstetter, Fisman, and Foley (2006), who show that enhanced IPR accelerates technology transfer within multinational firms by using divisional data.

[INSERT TABLE 7 HERE]

## 6.2 Acquirers' Net Returns

*Net Return* is the difference between the dollar amount of abnormal returns and the transaction value, divided by the transaction value. It measures the dollar return on investment from the

market's perspective. Table 8 presents the results. The results show that acquiring firms experience significantly higher net returns when taking over targets from nonadvanced economies if the target country has implemented IPR reforms. The difference is especially evident for hi-tech firms. For acquirers entering nonadvanced economies without IPR reforms, the average net return is negative.

[INSERT TABLE 8 HERE]

Such patterns are even more significant for large acquirers, though the announcement effects do not reveal the scale of the economic impact. Specifically, the shareholders of large acquirers gain \$94.070 million on average when their companies buy hi-tech targets in countries with IPR reforms; conversely, they lose \$46.720 million on average if those targets are in countries without IPR reforms.

Consistent with Francis et al. (2008), Table 8 shows that the shareholders of small acquirers gain on average when they buy targets in advanced economies. Furthermore, the net returns are significantly higher if those advanced economies experience significant IPR reforms. The value created from combining U.S. acquirers and targets in nonadvanced economies, however, seems too small to cover small acquirers' costs of managing a multinational firm. For smaller U.S. firms, shareholders seem to benefit more from buying minority interests when entering nonadvanced economies.

## **7. Summary**

In the last two decades, many developing countries implemented significant IPR reforms. Although there are plenty of theoretical arguments about the positive and negative impacts of such reforms on local economies, empirical evidence on whether and how these reforms create value for the host countries and the countries they do business with is limited, especially at the firm level. We attempt to find new evidence through the analyses of cross-border M&As conducted by U.S. firms, which are an important form of foreign direct investment.

We find that IPR significantly affects the patterns of cross-border M&As. Specifically, countries with significant IPRs attract more cross-border M&As, especially hi-tech M&A activity. Deals involving targets from nonadvanced economies and hi-tech industries drive these findings

in particular. Acquirers of such targets experience significantly higher announcement effects, and the target firms also obtain higher premiums after they implement IPR reforms.

Overall, the evidence suggests that improving IPR, whether measured by significant events, WTO compliance, or enforcement, can benefit both acquirers and targets, and especially targets in nonadvanced economies. This finding has important implications for firms in nonadvanced economies, which experience many financial, product, and labor market constraints. Although the existing literature indicates that cross-border M&As could mitigate such constraints at the firm level, cross-border M&As between advanced economies and nonadvanced economies are still very limited. We show that improving the environment for IPR protection can promote such activities and create value for participating firms.

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**Table 1**  
**Year of IPR Significant Reforms by Country**

To determine whether a country experiences significant IPR reforms, we first use the measurements created by Branstetter, Fisman, and Foley (2006). Six attributes of patent reforms determine the significance of such reforms and do not include the adoption of the Paris Convention. We utilize both the measurement from Branstetter, et al. (2006) and the adoption of the Paris Convention in identifying whether the target country in a cross-border M&A transaction experienced significant IPR reforms recently.

Nation	IPR
Uruguay	1979
Spain	1986
Taiwan	1986
Japan	1987
South Korea	1987
Trinidad & Tobago	1988
Chile	1991
Mexico	1991
Indonesia	1991
Thailand	1992
Portugal	1992
China	1993
Bolivia	1993
Colombia	1994
Venezuela	1994
Honduras	1994
Paraguay	1994
El Salvador	1994
Turkey	1995
Peru	1995
Argentina	1996
Panama	1996
Nicaragua	1996
Brazil	1997
Philippines	1997
Guatemala	1998
Ecuador	1999
Jamaica	1999



**Table 2**  
**M&As in Countries with Significant IPR Reforms**

This table details transactions involving targets in countries with significant IPR reforms and acquirers from all over the world during the sample period of 1980 to 2008. We include incomplete deals but exclude rumored deals and those involving financial acquirers or financial targets (SIC codes 6000 to 6999). The subsample of the inbound cross-border M&As includes 18,549 attempts by acquirers from 112 countries. The subsample of the domestic M&As in those IPR-reform countries includes 43,804 attempts, and the subsample of the outbound cross-border M&As includes 9,602 attempts.

	<u>Foreign Acquirers</u>			<u>Domestic Acquirers &amp; Targets</u>			<u>Domestic Acquirers &amp; Foreign Targets</u>		
	Before IPR	After IPR	Diff.	Before IPR	After IPR	Diff.	Before IPR	After IPR	Diff.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Including Incomplete M&As									
All (\$ million)	103.457 (n=1,449)	109.647 (n=17,100)	6.190	154.769 (n=766)	71.983 (n=43,038)	-82.786***	84.683 (n=432)	163.542 (n=9,170)	78.859***
Target Hi-Tech (% of all)	9.2%	16.4%	7.2% ***	9.0%	19.1%	10.1% ***	17.6%	21.4%	3.8% ***
Acquirer Hi-Tech (% of all)	10.1%	18.0%	7.9% ***	7.8%	19.2%	11.4% ***	12.7%	21.0%	8.3% ***
Hi-Tech M&As (% of all)	7.2%	13.2%	6.0% ***	6.7%	13.8%	7.1% ***	8.8%	15.9%	7.1% ***
Completed M&As									
Completed (\$ millions)	87.535	116.153	28.617	154.533	77.934	-76.599***	83.808	166.176	82.368
Completion Ratio	73.8%	71.0%	-2.8% **	75.8%	68.8%	-7.0% ***	70.4%	72.1%	1.7%
Hi-Tech M&A Completion Ratio	63.5%	75.3%	11.8% ***	78.4%	70.8%	-7.6%	65.8%	71.7%	5.9%
Target Hi-Tech (% of completed)	8.3%	17.1%	8.8% ***	9.3%	19.8%	10.5% ***	18.8%	21.6%	2.8%
Acquirer Hi-Tech (% of completed)	8.9%	18.6%	9.7% ***	8.1%	20.1%	12.0% ***	12.2%	20.6%	8.4% ***
Hi-Tech M&As (% of completed)	6.2%	14.0%	7.8% ***	6.9%	14.2%	7.3% ***	8.2%	15.8%	7.6% ***

**Table 3**  
**M&As in Countries with Significant IPRs:**  
**Coefficients before IPR and after IPR**

This table shows whether target countries experience unexpected growth of hi-tech related M&As by the adoption of stronger IPR. The expected growth of hi-tech related M&As is estimated by using a group of benchmark countries without significant IPR changes including tech-intensive nations such as the United States, the UK, and Canada; low-tech countries include Jordan and Slovenia, among others. The benchmark sample includes 115 countries in total during the period of 1980 to 2008. We first estimate the percentage of the completed deals involving hi-tech targets for inbound, domestic and outbound M&As, respectively. We regress the IPR countries' annual hi-tech ratios against the annual average of non-IPR countries' hi-tech ratio. The betas are reported in Panel A. Panel B reports the unexpected percentage of hi-tech deals before and after IPR reforms. Specifically, we use the estimated coefficient to determine the expected percentage of hi-tech M&As. The expected value denotes what the value would be if there were no IPR reforms. We then deduct the expected value from the actual percentage of hi-tech M&As. The difference between the unexpected ratio of hi-tech related M&As is also reported.

Panel A: Betas						
	Inbound M&As		Domestic M&As		Outbound M&As	
	Coefficient	Adjusted R <sup>2</sup>	Coefficient	Adjusted R <sup>2</sup>	Coefficient	Adjusted R <sup>2</sup>
Before IPR	-0.570	0.008	0.290	0.001	-0.446*	0.005
After IPR	0.769***	0.038	0.218	0.003	0.120	0.000

Panel B: Unexpected transactions involving hi-tech targets

	Inbound M&As			Domestic M&As			Outbound M&As		
	Before IPR	After IPR	Diff.	Before IPR	After IPR	Diff.	Before IPR	After IPR	Diff.
Target Hi-Tech (% of completed)	-1.2%	1.0%	2.2% **	0.4%	0.5%	0.1%	0.2%	0.5%	0.3%

**Table 4**  
**Regressions of Hi-Tech Cross-Border M&As: Country-Fixed Effect Models**

The table reports the country-fixed regression results of the impact of IPR reforms on the country-level proportion of hi-tech targets in cross-border M&As. The dependent variable is the proportion of hi-tech targets of completed and controlled (shares acquired > 50%) cross-border M&As, excluding transactions in financial industries. Because macro information is not available for some country-year observations, the sample size varies when those factors are included. Year fixed effects are controlled for all regressions. *IPR* is a dummy variable equal to 1 if the observation is constructed for the years after the identified IPR event and 0 otherwise. When we measure a target country's IPR by its compliance with TRIPS, *TRIPS* replaces *IPR* and is a dummy variable equal to 1 if the observation is after the identified compliant year. When we measure a target country's IPR protection by the Ginarte-Park Index, *Ginarte-Park Index* replaces *IPR* and is a continuous measurement ranging from 0 to 5. Errors are clustered by country.

	Country FE: Completed and Controlled Hi-Tech M&As											
	Nonadvanced Economies			Advanced Economies			Common Law			Non-Common Law		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>IPR</i>	<b>0.413***</b> (0.000)			<b>0.295***</b> (0.000)			<b>0.558***</b> (0.000)			<b>0.360***</b> (0.000)		
<i>Ginarte-Park Index</i>		<b>0.244***</b> (0.002)			<b>0.007</b> (0.724)			<b>0.045*</b> (0.088)			<b>0.018**</b> (0.020)	
<i>TRIPS</i>			<b>0.028*</b> (0.090)			<b>-0.043</b> (0.319)			<b>0.034</b> (0.430)			<b>0.048***</b> (0.030)
<i>LogUSHitech</i>	0.031** (0.035)	0.035* (0.058)	0.046*** (0.001)	0.186*** (0.000)	0.121*** (0.009)	0.137*** (0.007)	0.017 (0.668)	0.003 (0.945)	-0.005 (0.918)	0.038*** (0.008)	0.039** (0.029)	0.024 (0.133)
<i>GDP</i>	0.052*** (0.008)	0.030 (0.220)	0.062*** (0.003)	-0.106* (0.086)	0.019 (0.786)	0.033 (0.603)	0.160*** (0.003)	0.155*** (0.009)	0.188*** (0.001)	0.057*** (0.003)	0.063*** (0.008)	0.088*** (0.000)
<i>Trade Openness</i>	-0.001 (0.263)	0.001 (0.768)	-0.001 (0.458)	-0.001 (0.997)	-0.001 (0.565)	-0.001 (0.583)	-0.001 (0.918)	0.001 (0.612)	0.001 (0.516)	-0.001 (0.123)	-0.001 (0.347)	-0.001* (0.084)
<i>Year Effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Country Effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.214	0.102	0.099	0.347	0.295	0.294	0.325	0.241	0.236	0.230	0.143	0.136
N	2,306	1,616	2,306	848	802	848	476	476	476	2,678	1,942	2,678

**Table 5**  
**Regressions of Premiums Received by Targets**

This table presents the regression analysis of target premiums. *Premium* is the difference between the transaction value and the market value of a target four weeks prior to the acquisition announcement, divided by the market value. This sample includes controlled and completed M&As with all public targets that have market values available four weeks prior to the transaction. Due to information availability, the number of observations reduces significantly. The final sample includes those transactions meeting our selection criteria from 1986 to 2008, covering 71 countries. *IPR*, *TRIPS*, and *Ginarte-Park Index* are same as defined in Table 4. *Hitech* is a dummy variable that equals 1 if a target is active in the hi-tech industries defined by Chan et al. (1990). *All Cash* is a dummy variable that equals 1 when the payment method is 100% cash. *Tender* is a dummy variable that equals 1 if SDC identifies the deal as a tender offer. *Friendly* is a dummy variable that equals 1 if SDC identifies the deal attitude as friendly. *LnTran* is the natural logarithm of the transaction value. *Trade Openness* is from Penn World Tables. We identify the tax-haven countries according to Desai et al. (2006) and common-law countries according to La Porta et al. (1998). Constants are not reported. *Nonadvanced* is a dummy variable that equals 1 if the IMF does not identify the target country as an advanced economy. *Common Law* equals 1 if the La Porta et al. (1997) identifies the target country as a common-law country. The reported p-values in the parentheses reflect White's heteroskedasticity correction.

	OLS: Completed and Controlled Hi-Tech M&As											
	Nonadvanced Economies			Advanced Economies			Common Law			Non-Common Law		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>IPR*Hitech</i>	<b>1.829*</b> (0.079)			<b>0.281</b> (0.622)			<b>0.671</b> (0.414)			<b>0.601</b> (0.307)		
<i>IPR</i>	<b>0.222</b> (0.377)			<b>0.129</b> (0.524)			<b>-0.081</b> (0.775)			<b>0.220</b> (0.246)		
<i>TRIPS*Hitech</i>		<b>0.908</b> (0.237)			<b>0.245*</b> (0.075)			<b>0.090</b> (0.516)			<b>0.687**</b> (0.025)	
<i>TRIPS</i>		<b>-0.283</b> (0.492)			<b>-0.629</b> (0.268)			<b>-0.704</b> (0.102)			<b>0.242</b> (0.417)	
<i>Ginarte-Park Index *Hitech</i>			<b>0.966**</b> (0.031)			<b>-0.099</b> (0.723)			<b>0.148</b> (0.142)			<b>-0.501</b> (0.405)
<i>Ginarte-Park Index</i>			<b>-0.324</b> (0.136)			<b>0.096</b> (0.305)			<b>0.116</b> (0.207)			<b>-0.316</b> (0.214)
<i>Hitech</i>	-0.171 (0.482)	-0.391 (0.539)	-2.738** (0.029)	0.085 (0.174)	-0.112 (0.325)	0.515 (0.691)	0.007 (0.911)	-0.058 (0.623)	-0.666 (0.137)	0.228 (0.121)	-0.272 (0.293)	2.442 (0.363)
<i>All Cash</i>	0.003 (0.988)	-0.124 (0.592)	-0.027 (0.907)	-0.218*** (0.000)	-0.226*** (0.000)	-0.223*** (0.000)	-0.229*** (0.001)	-0.242*** (0.000)	-0.234*** (0.000)	-0.108 (0.397)	-0.101 (0.421)	-0.107 (0.382)
<i>Tender</i>	-0.597** (0.014)	-0.567** (0.025)	-0.636** (0.011)	-0.028 (0.585)	-0.028 (0.595)	-0.017 (0.739)	-0.038 (0.552)	-0.017 (0.787)	-0.023 (0.716)	-0.182 (0.141)	-0.199 (0.111)	-0.161 (0.200)
<i>Friendly</i>	0.783*** (0.002)	0.756*** (0.003)	0.819*** (0.001)	0.043 (0.642)	0.046 (0.626)	0.070 (0.402)	0.044 (0.583)	0.055 (0.497)	0.026 (0.749)	0.317* (0.091)	0.309* (0.100)	0.386** (0.024)
<i>LnTran</i>	0.071 (0.159)	0.086* (0.081)	0.090* (0.087)	0.022 (0.132)	0.020 (0.164)	0.023 (0.110)	0.020 (0.204)	0.022 (0.180)	0.017 (0.287)	0.053* (0.082)	0.060* (0.051)	0.064** (0.026)
<i>Trade Openness</i>	-0.001 (0.618)	-0.001 (0.564)	-0.001 (0.866)	0.001 (0.277)	0.001 (0.471)	0.001 (0.202)	-0.001 (0.694)	-0.001 (0.412)	0.001 (0.870)	0.002 (0.165)	0.001 (0.479)	0.001 (0.405)
<i>Tax Haven</i>	0.142 (0.633)	0.125 (0.693)	0.204 (0.673)	-0.407** (0.017)	-0.421*** (0.010)	-0.362** (0.030)	-0.138 (0.591)	-0.107 (0.669)	-0.175 (0.484)	-0.226* (0.076)	-0.257** (0.031)	-0.321** (0.014)
<i>Nonadvanced</i>							-0.005 (0.972)	-0.100 (0.403)	0.188 (0.224)	0.344* (0.066)	0.551** (0.026)	0.246 (0.418)
<i>Common Law</i>	-0.116 (0.625)	-0.280 (0.292)	-0.511* (0.059)	0.196*** (0.045)	0.165*** (0.010)	0.174*** (0.003)						
<i>Year Dummy</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Obs.</i>	0.113	0.088	0.095	0.033	0.295	0.295	0.037	0.043	0.040	0.056	0.051	0.063
<i>Adjusted R<sup>2</sup></i>	368	368	368	2,280	2,280	2,280	1,782	1,782	1,782	866	866	866

**Table 6**  
**Announcement Effects of U.S. Acquirers**

M&As in this table exclude deals with transaction values less than 1% of acquirers' market value. All numbers are reported as percentages. Controlled M&As refer to deals in which acquirers own over 50% of the targets after the transaction. We classify acquirers as *Large* (*Small*) if their market capitalizations are greater (equal to or less) than the market capitalization of the 25th percentile of NYSE firms in the acquisition year.

	Advanced Economies				Nonadvanced Economies				Differences		
	Total	Significant IPR Reforms	No Significant IPR Reforms	Diff. (2)-(3)	Total	Significant IPR Reforms	No Significant IPR Reforms	Diff. (6)-(7)	(5)-(1)	(6)-(1)	(7)-(1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A: All Complete M&As											
All (n=2,930)	1.116***	1.377**	1.104***	0.273	2.551***	3.471***	1.258***	2.213**	1.435***	2.355***	0.142
Hi-Tech Target (n=1,147)	1.053***	1.037*	1.054***	0.017	5.691***	10.287***	-0.019	10.306***	4.638***	9.234***	-1.072
Hi-Tech Acquirers (n=1,273)	1.289***	1.077*	1.300***	-0.223	3.680***	6.863***	0.253	6.610***	2.391**	5.574***	-1.036
Not Hi-Tech (n=1,494)	1.060***	1.568**	1.035***	0.533	1.412***	1.228***	1.682***	-0.454	0.352	0.168	0.622
<i>Large</i>											
All (n=2,116)	0.639***	0.876*	0.627***	0.248	1.545***	1.789***	1.174*	0.615	0.906**	1.149**	0.535
Hi-Tech Target (n=762)	0.428*	0.349	0.432	-0.083	2.101**	3.996**	0.205	3.790*	1.672*	3.567**	-0.223
Hi-Tech Acquirers (n=841)	0.708***	0.182	0.735***	-0.553	2.311**	3.987**	0.829	3.158	1.603*	3.279**	0.121
Not Hi-Tech (n=1,163)	0.703***	1.452*	0.662***	0.790	1.137***	1.032***	1.319**	-0.287	0.434	0.329	0.616
<i>Small</i>											
Controlled M&A (n=814)	2.376***	3.318**	2.343***	0.975	4.830***	7.724***	1.422	6.302**	2.454**	5.348***	-0.954
Hi-Tech Target (n=385)	2.317***	2.931*	2.295***	0.636	10.957***	17.571***	-0.568	18.039**	8.640***	15.255***	-2.785
Hi-Tech Acquirers (n=432)	2.439***	3.257**	2.405***	0.852	5.777***	10.345**	-0.900	11.245**	3.338*	7.906***	-3.339
Not Hi-Tech (n=331)	2.375***	2.430	2.373***	0.057	2.171*	1.927	2.407	-0.480	-0.204	-0.448	0.032

**Table 7**  
**Regression Analysis of U.S. Acquirers' Announcement Effects**

This table presents the results of the regression analysis of acquirers' announcement effects, which is measured as the three-day cumulative abnormal returns (-1, 1). Note that this table includes only controlled M&As with transaction values larger than 1% of the acquirers' market value. *IPR* is a dummy variable equal to 1 if the observation is constructed for the years after the identified IPR event and 0 otherwise. When we measure a target country's IPR by its compliance with TRIPS, *TRIPS* replaces *IPR* and is a dummy variable equal to 1 if the observation is after the identified compliant year. When we measure a target country's IPR protection by the Ginarte-Park Index, *Ginarte-Park Index* replaces *IPR* and is a continuous measurement ranging from 0 to 5. *Large* refers to those acquirers with market values higher than the 25% of the public firms in the observation. *LnTran* is the natural logarithm of the transaction value. *Hitech* is a dummy variable that equals 1 if a target is active in the hi-tech industries defined by Chan et al. (1990). *Public Target* is a dummy variable that equals 1 if SDC identifies the target as a public company. *All Cash* is a dummy variable that equals 1 when the payment method is 100% cash. *Friendly* is a dummy variable that equals 1 if SDC defines the deal attitude as friendly. *Tender* is a dummy variable that equals 1 if SDC identifies the deal as a tender offer. *Toehold* is the amount of shares acquirers own before the focal M&A transaction. It is the difference between the number of shares owned after the transaction and the number of shares acquired in the transaction. SDC provides both. *Advanced Economy* is a dummy variable that equals 1 if the IMF identifies the target country as an advanced economy. Constants are not reported. The reported p-values in the parentheses reflect White's heteroskedasticity correction.

	Nonadvanced Economy				Advanced Economy		
	(1)	(2)	(3)		(4)	(5)	(6)
<i>IPR*Hitech</i>	<b>0.111**</b> (0.031)				<b>-0.007</b> (0.567)		
<i>IPR</i>	<b>0.057</b> (0.221)				<b>0.083***</b> (0.000)		
<i>Ginarte-Park Index *Hitech</i>		<b>0.063***</b> (0.006)				<b>0.013*</b> (0.100)	
<i>Ginarte-Park Index</i>		<b>-0.019</b> (0.220)				<b>-0.010</b> (0.170)	
<i>TRIPS*Hitech</i>			<b>0.051*</b> (0.099)				<b>0.002</b> (0.784)
<i>TRIPS</i>			<b>0.009</b> (0.753)				<b>0.010</b> (0.411)
<i>Hitech</i>	0.021 (0.370)	-0.130* (0.091)	-0.003 (0.865)		0.001 (0.712)	-0.053 (0.110)	-0.001 (0.933)
<i>Large</i>	-0.031* (0.072)	-0.034** (0.047)	-0.027* (0.067)		-0.026*** (0.000)	-0.026*** (0.000)	-0.026*** (0.000)
<i>LnTran</i>	0.004 (0.453)	0.004 (0.482)	0.010** (0.0441)		0.005*** (0.000)	0.005*** (0.000)	0.005*** (0.000)
<i>Public Target</i>	-0.014 (0.518)	-0.013 (0.462)	-0.015 (0.295)		-0.019*** (0.005)	-0.020*** (0.005)	-0.020*** (0.005)
<i>All Cash</i>	-0.007 (0.646)	-0.009 (0.472)	-0.003 (0.794)		-0.001 (0.921)	-0.001 (0.995)	-0.001 (0.907)
<i>Friendly</i>	0.040 (0.165)	0.006 (0.813)	0.024 (0.290)		-0.003 (0.811)	-0.004 (0.747)	-0.003 (0.818)
<i>Tender</i>	-0.054* (0.091)	-0.043* (0.088)	-0.045* (0.065)		0.010 (0.171)	0.010 (0.170)	0.010 (0.169)
<i>Toehold</i>	0.001**	0.001	0.001		0.001	0.001	0.001

	(0.048)	(0.225)	(0.184)		(0.438)	(0.574)	(0.439)
<i>Tax Haven</i>					0.046*** (0.008)	0.055*** (0.003)	0.046*** (0.008)
<i>Common Law</i>	-0.027 (0.792)	-0.079 (0.087)	0.067 (0.485)		0.052*** (0.000)	0.016 (0.776)	0.052*** (0.000)
<i>Trade Openness</i>	0.001 (0.792)	-0.001 (0.650)	-0.001 (0.184)		-0.001 (0.636)	-0.001 (0.714)	-0.001 (0.593)
Year Dummy	Yes	Yes	Yes		Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes		Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.339	0.350	0.207		0.040	0.040	0.040
Obs.	257	226	252		2,513	2,492	2,513

**Table 8**  
**Net Return to U.S. Acquirers**

This table presents results of the net return analysis of acquiring firms. This sample only includes controlled M&As with transaction values larger than 1% of the acquirers' market values and includes the same observations as the announcement-effect analysis. Net return is the difference between the dollar amount of abnormal returns and the transaction value, divided by the transaction value. It measures the return on investment from the market's perspective. Please refer to previous tables for the definitions of other variables. Dollar values are in millions.

Advanced Economy				Nonadvanced Economy		
	Significant IPR Reforms	No Significant IPR Reforms	Diff.	Significant IPR Reforms	No Significant IPR Reforms	Diff.
All (n=2,930)	23.910	7.591	16.319	30.594	-0.175	30.769**
Hi-Tech Target (n=1,212)	27.243	7.634	19.609	45.556	-30.842	76.398**
Hi-Tech Acquirers (n=2,009)	11.645	13.887	-2.242	41.070	-16.999	58.069*
<i>Large (n=2,345)</i>						
All M&A (n=2,116)	17.789	8.613	9.176	40.368	-0.729	41.097**
Hi-Tech Target (n=762)	8.057	6.831	1.226	94.070	-46.720	140.790***
Hi-Tech Acquirers (n=841)	-14.410	15.914	-30.324	83.343	-20.816	104.159**
<i>Small (n=876)</i>						
All (n=814)	47.628	4.930	42.698*	5.881	0.910	4.971
Hi-Tech Target (n=385)	80.006	9.237	70.769*	-10.619	0.915	-11.534
Hi-Tech Acquirers (n=432)	75.155	9.912	65.243*	-10.103	-9.366	0.737



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