

Campi, Mercedes; Dueñas, Marco; Barigozzi, Matteo; Fagiolo, Giorgio

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Do intellectual property rights influence cross-border mergers and acquisitions?

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Scuola Superiore
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LEM | Laboratory of Economics and Management

Institute of Economics
Scuola Superiore Sant'Anna

Piazza Martiri della Libertà, 33 - 56127 Pisa, Italy
ph. +39 050 88.33.43
institute.economics@sssup.it

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Mercedes Campi [°]
Marco Dueñas ^{*}
Matteo Barigozzi [¶]
Giorgio Fagiolo [§]

[°] IIEP-Baires, Buenos Aires, Argentina

^{*} Department of Economics and Trade, University of Bogotá Jorge Tadeo Lozano, Colombia

[¶] London School of Economics and Political Science, UK

[§] Institute of Economics, Scuola Superiore Sant'Anna, Pisa, Italy

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Do Intellectual Property Rights Influence Cross-Border Mergers and Acquisitions?

Mercedes Campi*, Marco Dueñas[†], Matteo Barigozzi[‡]

and Giorgio Fagiolo[§]

Abstract

This paper analyses whether the strengthening of intellectual property rights (IPRs) systems affects decisions of cross-border mergers and acquisitions (M&As), and whether their influence is different for developed and developing countries and across industrial sectors. We estimate an extended gravity model to study bilateral flows of M&As using data for the post-TRIPS period (1995-2010) and two different indexes that measure the strength of IPRs systems at the country level. We find that IPRs influence decisions of cross-border M&As and facilitate the creation of investment linkages. However, we detect a heterogeneous impact of IPRs on M&As depending on specificities of countries and sectors.

Keywords: Intellectual Property Rights; Mergers and Acquisitions; Technological Intensity; Gravity Model

JEL Codes: O34; G34; O13; O14

*Instituto Interdisciplinario de Economía Política de Buenos Aires, IIEP-Baires (UBA CONICET). mercedes.campi@fce.uba.ar

[†]Department of Economics and Trade - Universidad de Bogotá Jorge Tadeo Lozano. marcoa.duenase@utadeo.edu.co

[‡]London School of Economics and Political Science. m.barigozzi@lse.ac.uk

[§]LEM & Institute of Economics - Scuola Superiore Sant'Anna. giorgio.fagiolo@sssup.it

1 Introduction

The recent process of harmonization and strengthening of intellectual property rights (IPRs) systems is expected to have implications for global relations among countries (Maskus, 2012). However, the effect of IPRs on international trade, foreign direct investment (FDI), technology transfer, and mergers and acquisitions (M&As) is not clear from a theoretical perspective neither from an empirical point of view (Maskus and Penubarti, 1995; Maskus, 2000; Foley et al., 2006; Campi and Dueñas, 2016).

In the case of cross-border M&As, intellectual property (IP) assets are often a relevant part of the value of the target firm and the desire of a firm to access them may be a significant driving force behind a deal. Nevertheless, from a theoretical perspective, the relation between IPRs and M&As is still ambiguous.

By reducing the risk of imitation, IPRs might affect firms' decisions regarding investment, trade or licensing. But the effect of this lower risk of imitation may depend on the technological level of its products, encouraging firms with knowledge-intensive products to access a foreign market. Nevertheless, this will not necessarily lead to a burst of M&As because the lower imitation risk of licensed technologies might, conversely, reduce incentives for FDI (Yang and Maskus, 2001). Also, the enforcement of IPRs can affect low-technology products, which are easier to be imitated.

Being a relevant part of the general regulatory system, IPRs systems can affect the investment climate (Fink and Maskus, 2005). However, Maskus (2000) argues that IPRs systems alone cannot explain how firms decide to invest, trade or license a product to a certain country, as firms' decisions are influenced by other factors. Indeed, the choice among FDI, licensing, and trade is likely to depend on and interact with internationalization advantages that derive from market power, market size, as well as transportation, transaction, and labor costs. These factors, together with financial variables and the institutional system, are usually different in countries of different development level. Therefore, the effect of IPRs on M&As may also be affected differently by the the level of development of the countries involved in the deals.

In the last decades, the growth of FDI at higher growth rates than trade and GDP has been one of the main characteristics of the process of globalization (Feenstra, 1998; Brakman et al., 2010). Cross-border M&As account for a large share of FDI.¹ Simultaneously, the signing of the agreement on Trade-Related Aspects on Intellectual Property Rights (TRIPS) in 1994 led to a process of global diffusion and tightening of IPRs systems. In this process, developed countries (DC) have increased

¹According to UNCTAD (2001), M&As represented around 80% of the world FDI in 2000.

the level of existing IP protection and developing or less developed countries (LDC) have either adopted new systems or adapted their existing systems to the “minimum standards” demanded by the TRIPS. The scope of IP protection has also been broadened, reaching sectors or products, such as plant varieties, micro-organisms and pharmaceutical products, which were previously excluded from IP protection.

This paper explores whether the strengthening of IPRs systems during the post-TRIPS period (1995-2010) has affected decisions of M&As using an extended gravity model. Our research differs from the existing literature in several aspects. Firstly, most studies that use a gravity model have focused on trade or FDI, while we use a gravity specification to explain M&As. Secondly, most authors addressing the effect of IPRs have focused on FDI. Conversely, we consider the strength of IPRs systems in target countries as a possible determinant of cross-border M&As. Thirdly, while most existing studies focus on single specific determinants of M&As, we consider altogether the more relevant determinants of M&As found in the literature. Finally, we also study whether there is a different impact of IPRs in sectors of different technology intensity, since the effect of IPRs is generally sector-specific.

We use an extended gravity model that includes a set of variables usually considered as determinants of M&As and two different measures of IPRs systems: the index of patent protection of Ginarte and Park (1997) and Park (2008) for the manufacturing sector and the index of IP protection for the agri-food sector, developed by Campi and Nuvolari (2015). In order to take into account a possible differential effect of IPRs for different sectors (Mansfield, 1995; Cohen et al., 2000; Smarzynska, 2004; Nunnenkamp and Spatz, 2004), we split our data on M&As in four groups of different technology content: (i) agri-food; (ii) low-technology industries; (iii) medium-technology industries; and (iv) high-technology industries.

In addition, we consider that the effect of IPRs might also depend on the development level of countries for several reasons. Firstly, in general, LDC have lower imitation abilities. Secondly, the relevance of agriculture and manufactures of different technology content is different for DC and LDC. Thirdly, DC used to have in place strong IPRs systems, while LDC are recently adopting strong IP protection systems. And, fourthly, most studies have found differential effects of IPRs on FDI for DC and LDC (Seyoum, 1996; McManis, 1997; Kalanje, 2002).

Overall, we found that the recent strengthening of IPRs systems increases cross-border M&As. In addition, we found that IPRs facilitate the creation of investment linkages among countries in manufacturing sectors, regardless of their technological content. We also found that the creation of new investment links is more likely when the increase in IPRs takes place in a LDC, and that investment

from DC in some sectors are discouraged from increases in IPRs.

These findings have relevant implications in the context of the global strengthening and harmonization of IPRs systems. In the first place, if IPRs are likely to affect not only firms' decisions related to M&As but also trade and licensing, then, the design of IPRs systems should consider how they may possibly affect these decisions and the implications for different countries. Secondly, since stronger IPRs attract more M&As in LDC, the question arises whether M&As are a desirable form of investment for developing countries. Finally, our findings suggest that there might not be a unique system of IPRs suitable for all countries and sectors.

The remaining of the paper is organized as follows. In the next section, we briefly discuss the possible determinants of M&As, analyses how IPRs can influence firms' decisions of M&As from a theoretical perspective and reviews the empirical evidence. In the third section, we analyze the data. In the fourth section, we explore the effect of IPRs on bilateral flows of M&As. Finally, in Section 5, we discuss the main findings and provide general conclusions.

2 Which factors determine M&As?

A firm that aims to access a foreign market faces different choices. It can export the good, produce it locally by undertaking foreign direct investment (FDI) –which in turn can mean doing a greenfield investment or a M&A–, license the good to a firm in the host country, or undertake a joint venture involving joint production or a technology-sharing agreement (Fink and Maskus, 2005; Helpman, 2006). These decisions are not made independently from each other, nor they are exclusive.

IPRs systems may affect these decisions on several ways. For example, from the domestic firms perspective, a weak IPRs system may allow them to imitate technologies possibly leading to productivity and economic growth. From the foreign firm perspective, given the higher risk of imitation, a weak IPRs system might discourage FDI or exports to that economy. However, imitation abilities depend not only on IP protection but most importantly on the capabilities of firms to master new technologies and both tacit and codified knowledge. Therefore, the effect of IPRs system has to be considered taking into account imitation abilities of the target countries.

In fact, when imitation abilities are low, weak IPRs could be beneficial for both partners because this combination may encourage foreign firms to engage in joint-ventures and license agreements with domestic firms, and also simply trade, promoting technology transfer to the domestic market. However, the market power

that derives from IPRs may induce firms to reduce sales and increase prices, and it may also prevent access to new technologies, negatively affecting further innovation. How IPRs influence decisions of firms is mediated by several other trade-offs, which explains the difficulty to predict their effect *a priori*.

Which factors affect decisions of M&As is an issue that has caught the attention of economists. The literature focuses mainly on the macroeconomic causes of FDI and the obstacles to capital flows (such as financial markets failures and asymmetric information), and on specific features of countries (such as GDP, development level, quality of institutions, and openness to trade) (Hyun and Kim, 2010).

The empirical studies find that the more relevant determinants of M&As are: 1) GDP and market size (Brakman et al., 2010); 2) geographical distance as a proxy of transportation and transaction costs (Brakman et al., 2010); 3) cultural differences (Erel et al., 2012); 4) financial market development (Di Giovanni, 2005); 5) openness to trade and economic integration (Cuevas et al., 2005; Hyun and Kim, 2010); 6) quality of institutions (Hur et al., 2011; Hyun and Kim, 2010; Courdacier et al., 2009); and 7) exchange rates volatility (Blonigen, 1997).

Recently, a part of the empirical literature has started using gravity specifications to explain cross-border M&As because market size, trade barriers, and economic distance are critical for understanding FDI and trade patterns (see, for example: Brakman et al., 2010; Di Giovanni, 2005; Courdacier et al., 2009). Also, gravity models allow for the consideration of other possible determinants at the country level. Given the volatility of M&As time series, explaining them with gravity specifications might be more challenging than in the case of trade (Herger et al., 2008; Wong, 2008). However, several studies have succeeded in fitting and predicting M&As reasonably well with a gravity model (Blonigen, 2005).

2.1 General determinants of M&As

The literature that focuses on macroeconomic volatility as a determinant of FDI and M&As finds mixed evidence. These studies use the coefficient of variation of the exchange rate as a proxy of macroeconomic stability. For example, Blonigen (1997) finds that the appreciation of the exchange rate in the US has a significant effect on cross-border M&As of Japanese firms, but the impact of the variability of exchange rates is ambiguous. Brakman et al. (2010) find that exchange rate volatility does not affect the value of cross-border M&As.

Several authors provide empirical evidence of the effect of financial market development on M&As. Using a gravity model, Di Giovanni (2005) studies the distribution and evolution of worldwide cross-border M&As, finding that domestic

financial deepening affects firms' decisions of investing abroad and that deep financial markets in the target country also play a relevant role. Brakman et al. (2010) show that financial openness is a prerequisite to attract cross-border M&As. They also argue that the market-seeking motive is an important determinant of M&As and that market size variables related to the target increase the value of M&As.

Other authors explore the effect of openness to trade and regional trade agreements on M&As. Cuevas et al. (2005) conclude that the North American Free-Trade Agreement has a significant positive effect on FDI flows, especially for the smaller members of the agreement. However, Di Giovanni (2005) argues that custom unions and free trade agreements decrease cross-border M&As, while service agreements increase them.

Several scholars analyze whether the quality of the legal and regulatory framework of countries affect M&As. Rossi and Volpin (2004) show that differences in laws and enforcement explain the intensity and the pattern of cross-country M&As: countries with higher accounting standards and stronger shareholder protection receive more M&As. Using a gravity model, Hyun and Kim (2010) find that, in addition to economic integration and geographic characteristics, the quality of the institutions and financial market development are key determinants of M&As. Also, Hur et al. (2011) argue that the quality of institutions is a relevant determinant of M&As. They attribute the disparities observed in cross-country M&As inflows to DC and LDC to the difference in the quality of their institutions.

2.2 The influence of IPRs on M&As

Intangible assets such as patents, trademarks, and trade secrets, are a part of the value of the target firm in M&As. Therefore, several scholars agree that a relevant driving force behind M&As deals is the acquirer's desire to obtain the target's IP assets (Bryer and Simensky, 2002; Marco and Rausser, 2002). For example, Marco and Rausser (2002) show that M&As of major agricultural business suppliers are designed to expand the intellectual property rights portfolio. This is not surprising if we consider certain behaviors related with IPRs such as patent blocking or the creation of patent thickets, which can create incentives for firms to acquire other firms that hold strategic IPRs (Bessen, 2003; Cohen et al., 2000). Then, we might expect that not only access to IPRs assets but also IPRs systems protecting these assets might induce M&As.

Theoretically, the relation between IPRs and FDI, including M&As, is ambiguous. Strong IPRs may encourage firms with IPRs assets or knowledge intensive products to trade, invest, and license because IP protection reduces the risk of imitation. But

the effect of lower imitation risk of licensed technologies may reduce incentives for FDI and, instead, increase incentives to trade (Yang and Maskus, 2001). Being a relevant part of the general regulatory system, weak IPRs systems may adversely affect the investment climate, discouraging FDI (Fink and Maskus, 2005). However, Maskus (2000) argues that IPRs systems alone cannot explain how firms decide to invest, trade, or license a product. The choice between the different options is likely to depend on internationalization advantages. Thus, there is an interplay between IPRs and market power, market size, transportation and labor costs, transaction costs, and other country specificities. Moreover, trade, licensing, and FDI can be complementary rather than substitutes for each other.

The effect of IPRs on M&As has been less thoroughly studied. The available evidence is not conclusive and it is mostly gathered from FDI. Several authors find a positive effect of IPRs on FDI. Using a gravity model, Smith (2001) finds a positive link between IPRs and both FDI and licensing of US firms, although this holds for middle-income countries and large LDC, but not for small and low-income countries. Adams (2010) argues that the strengthening of IPRs in LDC has a positive effect on FDI, especially after the signing of the TRIPS agreement. Lesser (2002) finds a positive correlation among IPRs and FDI inflows to LDC. Foley et al. (2006) study the effect of IPRs reforms on US multinationals, finding that stronger IPRs increase technology transfer together with the level and growth rate of non-resident patenting.

On the contrary, other authors find a negative or not significant correlation between IPRs and FDI. Seyoum (1996) explores the relation between IPRs and FDI for 27 countries. He finds that, in the case of LDC, there is no significant effect of IPRs systems on investment decisions, while for DC there is a positive effect of trademarks and copyrights but a negative effect of patent protection. Fink (2005) investigates the effect of IPRs on exports, FDI, and licensing arrangements made by Germany and American multinationals. He finds no effect of stronger IPRs systems, except for a negative link between IPRs and sales in the chemical industry. He concludes that variables other than IP protection are explaining the cross-country activity of multinationals. Nicholson (2007) estimates the impact of IPRs on the composition of sector-specific multinational activity. He argues that firms in industries with high capital costs are more likely to maintain control over production knowledge through FDI in countries with weak IP protection. Conversely, firms in industries that are intensive in research and development (R&D) are more likely to engage in licensing when IPRs systems are strong.

As noted above, the effect of IPRs usually depends on the sector considered. Mansfield (1995) provides empirical evidence that firms in the chemical, pharmaceutical,

electrical equipment, and machinery sectors are more likely to be affected by IPRs. Smarzynska (2004) argues that weak IPRs systems have the largest deterring effect on FDI in four technology-intensive sectors: drugs, cosmetics and health care products, chemicals, machinery and equipment, and electrical equipment.

Since the effect of IPRs remains ambiguous, we contribute to this literature with further empirical evidence on whether IPRs systems in target countries affect decisions of M&As. Our main goal is to use a gravity model to explain cross-border M&As including IPRs systems to study their effect on M&As. To our knowledge, this is the first study that considers the strength of IPRs systems in target countries as a possible determinant of M&As using a gravity specification for a large set of countries. Also, while most studies focus on a few variables that affect M&As, we aim to include a set of variables which are considered determinants of M&As in the related literature. In addition, we want to assess the effect of IPRs on M&As in sectors with different technology content and for countries at different development stages.

3 Data

Data of M&As in nominal yearly values are from Worldwide Mergers, Acquisitions, and Alliances Databases SDC Platinum (Thomson Reuters). We deflated cross-border flows of M&As using the US imports price index provided by the US Bureau of Labor Statistics.² Thus, we use M&As in constant 2000 dollars. In addition, the database reports the number of M&As.

We consider different sub-samples of M&As in four sectors of different technology content for DC and LDC (see the Appendix for the list of countries).³ Following the classification of Lall (2000) and OECD (2011) as a baseline, we have classified our data in four groups of M&As: (i) agri-food; (ii) low-technology industries; (iii) medium-technology industries; and (iv) high-technology industries.

There are several ways of categorizing industries by technology intensity. Pavitt (1984) made a relevant effort, distinguishing between resource-based, labour-intensive, scale-intensive, differentiated and science-based manufactures. Lall (2000) improved this classification, arguing that the analytical distinctions of Pavitt are unclear and present large overlaps among categories. The OECD (2011) uses four categories:

²<http://www.bls.gov/web/ximpim/beaexp.htm>, accessed on February 2015.

³The classification of countries is based on the World Bank and United Nations. See: <http://data.worldbank.org/about/country-and-lending-groups> and http://www.un.org/en/development/desa/policy/wesp/wesp_current/2012country_class.pdf (accessed on March 2015).

high-, medium-high, medium-low, and low technology. This classification is based on direct R&D intensity, and R&D embodied in intermediate and investment goods (Hatzichronoglou, 1997).

Table 1: Technological Classification of Industries

Classification	Industrial Sectors - Products	SIC Codes
Agri-food		
-Agricultural Products	Crops, livestock and animal specialties, agricultural services, forestry	01, 02, 07, 08
-Food	Food and kindred products, preparation of meats/fruits, beverages, vegetable oils, tobacco manufacturing	20, 21
Low-technology industries		
-Textile/fashion cluster	Textile fabrics, clothing, headgear, footwear, leather manufactures, travel goods	22, 23, 31
-Other low technology	Pottery, simple metal parts/structures, wood products, furniture, jewellery, toys, plastic products	24, 25, 26, 27, 30 (except 3011, 3087, 3089), 3631, 3652, 39
Middle-technology industries		
-Automotive products	Transportation equipment, passenger vehicles and parts, commercial vehicles, motorcycles and parts	37 (except 3721, 3724, 3728, 3761, 3764, 3769)
-Medium-technology process industries	Synthetic bres, chemicals and paints, fertilizers, plastics, iron, pipes/tubes, petroleum refining and related industries	28 (except: 2833-2836), 29, 32, 33, 34
-Medium-technology engineering industries	Engines, motors, industrial machinery, pumps, switch-gear, ships, watches	3011, 3087, 3089, 35 (except 3511, 3571, 3572, 3575, 3577), 36 (except 3631, 3652, 3663, 3669, 3671, 3672, 3674-3676, 3679), 3821
High-technology industries		
-Electronics and electrical products	Office/data processing/telecommunications equipment, TVs, transistors, turbines, power-generating equipment	3511, 3571, 3572, 3575, 3577, 3661, 3663, 3669, 3671, 3672, 3674-3676, 3679
-Other high-technology	Pharmaceuticals, aerospace, optical/measuring instruments, cameras	2833-2836, 38 (except 3821), 3721, 3724, 3728, 3761, 3764, 3769

Our classification combines the classifications of Lall (2000) (which is based Pavitt' work) and that of the OECD (2011). We must highlight that Lall (2000) considers the technological content of products while our classification is for industrial sectors. In order to create our groups, we first connected the sectors identified by SIC codes in the M&As database and the groups defined by the OECD (2011) that correspond to the ISIC Rev.3.⁴ As both Lall (2000) and the OECD (2011) warn, there is a certain amount of subjectivity in assigning industries to categories

⁴To do this, we applied a concordance between the ISIC and the NAICS and between the NAICS and the SIC codes, since there is no direct concordance between the SIC and the ISIC. See: <http://www.mcalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/TradeConcordances.html>, accessed on December 2015.

since the technology-intensity classification is relative. For example, high-technology industries can produce a variety of products ranging between low-tech and high-tech. Also, countries might have slightly different classifications using the same method. However, all these possible drawbacks are present in any given classification and are not expected to affect our research. Table 1 displays the final classification.

Figure 1 depicts the evolution of the volumes in millions (MM) of US dollars (left axis) and the number of total cross-border M&As (right axis) between 1995 and 2010 (including data from our four sectors).

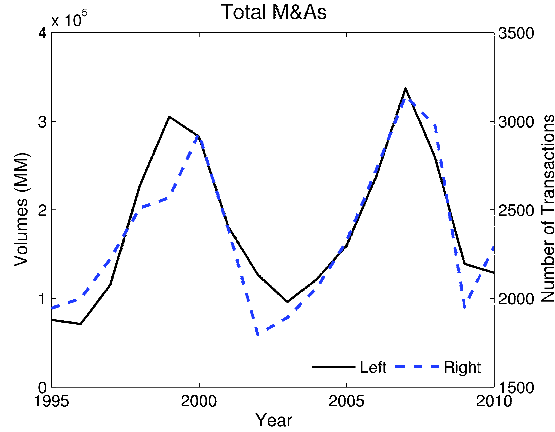


Figure 1: Evolution of Total Cross-Border M&As

The time series displays two peaks, which derive from the “wave-like” behaviour of cross-border M&As, characterized by substantial variation over time, produced by periods of rapid growth and periods of rapid decline (Brakman et al., 2010). In our period of study, cross-border M&As increased between 1995 and 2000, and then decreased until 2003. After this downturn, M&As recovered until 2007 and decreased thereafter. This behaviour characterizes the evolution of both the number and the value of transactions.

Some interesting facts emerge if we discriminate by development level of the target countries and sectors. Figure 2 shows the inflows of M&As to DC and LDC. We observe that inflows of M&As to DC almost replicate the behaviour of total M&As and that inflows to LDC have been increasing, especially since 2003, with the beginning of the second wave.

Figure 3 shows the inflows of M&As by sector and development level of the target countries. We observe the two waves pattern in all the sectors, although for LDC the first wave is less pronounced. Not surprisingly, DC –that attract and do more M&As– display a more similar pattern to the one shown in Figure 1.

In all the sectors, we observe a similar trend for the number of deals and for the

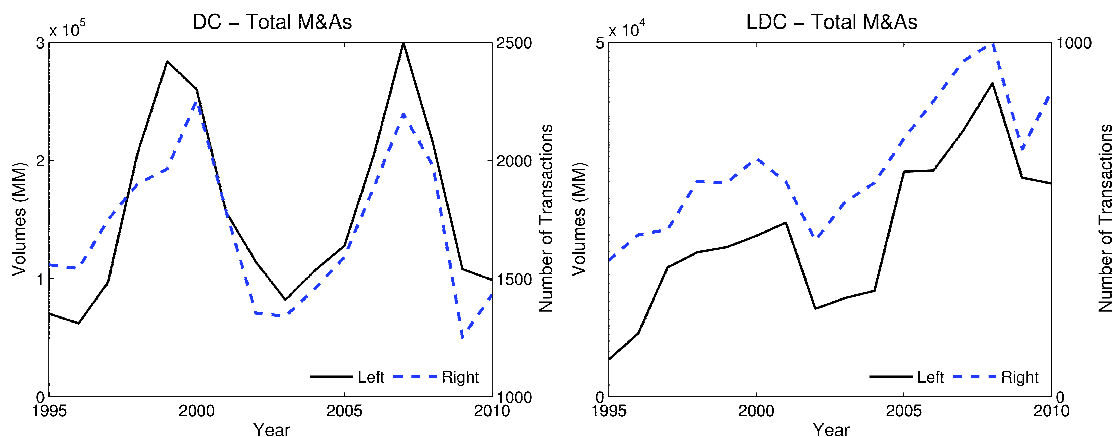


Figure 2: Evolution of Total Inflows of M&As by Development Level

volumes of M&As. The inflows of M&As in volumes directed to DC are in most sectors much higher when compared to LDC. However, the number of transactions do not show such a big difference, although they are still greater in DC than in LDC. This implies that M&As in DC are related to high-valued enterprises.

To measure the strength of IPRs systems, we consider the widely used patent protection index of Ginarte and Park (1997) and Park (2008) for the manufacturing sector; and a yearly index developed by Campi and Nuvolari (2015) for the agri-food sector. Both indexes aggregate different components that indicate the strength of each country's IP protection system.

The index of Ginarte and Park (1997) considers five categories of the patent laws in each country: (i) extent of coverage, (ii) membership in international patent agreements, (iii) provisions for loss of protection, (iv) enforcement mechanisms, and (v) duration of protection. Similarly, the index of Campi and Nuvolari (2015) consists of five components that define the strength of IP protection in the agricultural sector: (i) ratification of UPOV Conventions; (ii) farmers' exception; (iii) breeder's exception; (iv) protection length; and (v) patent scope.

In both indexes, each of the categories or components were scored with a normalized value ranging from 0 to 1. The unweighted sum of these five values constitutes the overall score of each of the indexes, which range from zero to five. Higher values of the indexes indicate stronger levels of IP protection.⁵ The main advantage of using these two indexes is that they provide a yearly measure of the

⁵Given that the index of Ginarte and Park (1997) is available at five-year intervals, we have assumed that the index remains unchanged during the five-year interval and replicated the values for the missing years. For example, we have used the value of the index in 1990 for all the years between 1990 and 1994.

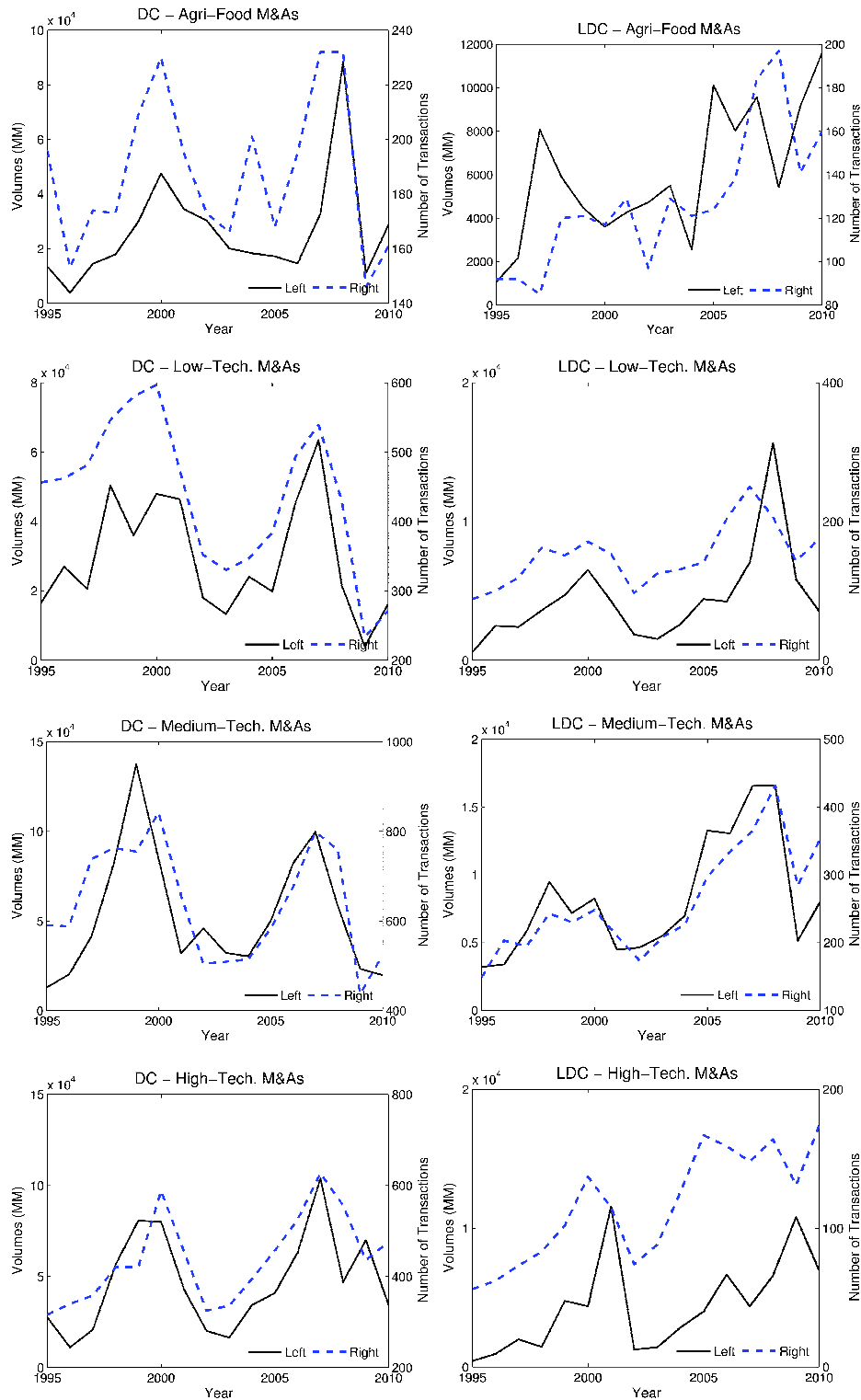


Figure 3: Patterns of Total Inflows of M&As by Sector and Development Level

strength of IP protection for a large sample of countries.

Table 2: Average Value of Intellectual Property Protection

	Agriculture			Manufacture		
	All countries	DC	LDC	All countries	DC	LDC
1995-1999	1.81(0.99)	2.31(0.89)	1.46(0.91)	2.58(1.09)	3.90(0.76)	2.17(0.82)
2000-2004	2.60(1.01)	2.93(0.83)	2.36(1.08)	3.06(1.01)	4.19(0.54)	2.72(0.85)
2005-2009	3.05(0.92)	3.20(0.78)	2.94(1.01)	3.37(0.89)	4.38(0.34)	3.05(0.76)

Note: Standard deviations in parenthesis.

Table 2 shows an increase in the average values of the indexes over time. IPRs in LDC have been increasing at higher growth rates and, although the gap between the level of IPRs in DC and LDC has narrowed, the last five-years period still shows a higher average level of IP protection in DC. This evolution reflects the process of strengthening and harmonization of IPRs systems. Since we are interested in whether IPRs attract M&As, we consider the indexes of the target countries.

In the following section, we carry out a regression using a gravity model extended with measures of IPRs systems. We include the usual variables for a gravity equation that denote market size, geographical distance and transaction costs, and a set of control variables that might influence M&As: the volatility of the bilateral exchange rate, openness to trade, financial openness, human capital, and political system as a proxy of institutional factors.

The coefficient of variation of the bilateral exchange rates is computed yearly using monthly data of bilateral exchange rates and we use it as an indicator of macroeconomic volatility. Openness to trade may both increase or decrease M&As given that it also affects firms' exports decisions. Financial openness is an index that measures the degree of capital account openness of a country. It is based on binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions (Chinn and Ito, 2008, 2014). Human capital is an index that considers the average years of schooling and the return to education. We use it as an indicator of the capabilities of a country and as a proxy of imitation abilities. Finally, political system is an indicator that measures the degree of democracy versus autocracy and we use it as a proxy of the quality of institutions.

4 IPRs and M&As: a gravity model

In this section, we perform a gravity model (GM) estimation to explore the possible implication of IPRs on decisions of M&As. This model has been largely used to explain bilateral trade flows using the GDP and the geographical distance between two countries as the main explanatory variables (see: Anderson, 2011, for a review). Other variables are trade barriers, openness to trade, cultural differences, trade agreements, and transaction and transportation costs. Although less frequently, the GM has also been used to estimate bilateral FDI and M&As flows considering other specific explanatory variables. We use as our benchmark specification the following equation:

$$MA_{ij,k}(t) = \exp\{x_{ij,k}(t) \cdot \beta_k\} \eta_{ij,k}(t), \quad (1)$$

where $MA_{ij,k}(t)$ denotes the flow of M&As from the acquirer country i to the target country j , in sector k , in the year t , and

$$x_{ij,k}(t) = \{Z_i, Z_j, D_{ij}, IP_{j,k}, W_i, W_j, XR_{ij}, \gamma\}; \quad (2)$$

$i, j = 1, \dots, N$; $Z = \{\log(\text{GDP}), \log(\text{pop}), \text{landl}\}$ is a vector containing country-specific variables including GDP, total population, and a dummy variable to indicate whether the country is landlocked; $D = \{\log(\text{dist}), \text{contig}, \text{comlang}, \text{comcol}, \text{colony}\}$ is a vector with link-specific variables that includes geographical distance (dist), and variables indicating geographical, economic and cultural barriers (contiguity, common language, common colonizer, colonial link) between both countries; and $IP_{j,k} = \{\text{IPR}_{j,k}\}$ includes the index of IP protection of the target country for sector k . To control for other determinants of M&As, we use $W = \{\log(\text{open_tra}), \text{fin_open}, \text{h_cap}, \text{polity}\}$, which is a vector with country-specific variables that includes openness to trade, an index of financial openness, human capital, and political system; and $XR = \{xr\}$ is the coefficient of variation of the bilateral exchange rate. Finally, γ is a set of time dummies and it is assumed that $E[\eta_{ij}|Z_i, Z_j, D_{ij}, \dots] = 1$. Table 3 describes the variables and data sources.

The estimation of Equation (1) involves some econometric challenges mainly derived from its non-linearity. Borrowing from the empirical evidence on international trade, difficulties might be due to heteroscedasticity (Santos Silva and Tenreyro, 2006), endogeneity and omitted-variable bias (Baldwin and Taglioni, 2006), and the need of a special treatment for zero-valued flows (Santos Silva and Tenreyro, 2006; Baldwin and Harrigan, 2007). These difficulties rule out OLS estimates given that they require a log-linearization of the gravity equation that, in principle, might lead to biased and inefficient estimations.

Table 3: Variables Employed in the Gravity Estimations

Label	Related to	Description	Source
<i>MA</i>	Link	Flows of M&As in millions of constant US dollars	SDC Platinum (Thomson Reuters)
GDP	Country	Gross domestic product	Feenstra et al. (2013)
pop	Country	Country population	CEPII (http://www.cepii.fr/)
dist	Link	Distance between two countries, based on bilateral distances between the largest cities of those two countries, weighted by the share of the city in the overall country's population	CEPII (http://www.cepii.fr/)
contig	Link	Contiguity dummy equal to 1 if two countries share a common border	CEPII (http://www.cepii.fr/)
comlang	Link	Dummy equal to 1 if both countries share a common official language	CEPII (http://www.cepii.fr/)
comcol	Link	Dummy equal to 1 if both countries have had a common colonizer	CEPII (http://www.cepii.fr/)
colony	Link	Dummy equal to 1 if both countries have ever had a colonial link	CEPII (http://www.cepii.fr/)
landl	Country	Dummy variable equal to 1 for landlocked Countries	CEPII (http://www.cepii.fr/)
IPR	Country	Index of agricultural IPRs	Campi and Nuvolari (2015)
IPR	Country	Index of patent protection	Ginarte and Park (1997); Park (2008)
xr	Link	Bilateral exchange rate coefficient of variation	International Financial Statistics of the IMF (http://www.imf.org/en/Data)
fin_open	Country	Index of financial openness	Chinn and Ito (2008, 2014)
open_tra	Country	Openness to trade (Trade % of GDP)	WDI (http://databank.worldbank.org/)
h_cap	Country	Index of human capital	Feenstra et al. (2013)
polity	Country	Political System	Systemic Peace (http://www.systemicpeace.org/)

One possible source of endogeneity may be IPRs systems. However, there are no theoretical reasons either to believe that the indexes are not independent from the level of M&As, or that M&As are likely to cause the level of IPRs. Several authors agree that the increase in IP protection after the signing of the TRIPS agreement can be considered exogenous (Ivus, 2010; Delgado et al., 2013). The main reason is that the TRIPS agreement was included in a package of agreements whose acceptance was a compulsory requirement of the World Trade Organization (WTO) membership. Thus, the decision of signing the TRIPS and the implications on IPRs systems might not be seen as determined at the country level, but rather by an external body. In this sense, IPRs systems in the post-TRIPS period might be reasonable regarded as “exogenous” (Delgado et al., 2013).

Thus, endogeneity is not a problem up to a certain extent. In fact, the TRIPS agreement establishes certain minimum standards –which are quite high compared

to the previous systems— and gives countries the freedom to choose the final design of their IPRs systems. This implies that there are individual reasons for countries to adopt a certain level of IP protection. Thus, in order to control for this possible source of endogeneity and also to reduce the probability of omitted variable bias, we have added several time varying covariates, which are theoretically expected to influence M&As. Additionally, in order to reduce omitted variable bias, we perform robustness exercises using different specifications in order to check if coefficient estimates are stable. In this exercise, we also use origin and destinations dummies, since countries might have individual reasons to adopt stronger IPRs.

In order to consider the heteroscedasticity and the high number of zero bilateral flows in the M&As database, we adopted a Zero-Inflated Count Data Model (see: Long, 1997, for details).⁶ This estimation consists of two estimation stages that must be jointly analyzed. In the first stage, zero flows are treated with a logit model in which the dependent variable takes the value of one for those country dyads that report any transaction and zero otherwise. The main goal behind this stage is to derive the probability of having M&As among any couple of countries. In the second stage, the intensity of the observed interactions is fitted using a count data model restricted only to positive flows. The statistical tests determined that the negative binomial (NB) estimation performs better than the Poisson pseudo maximum likelihood (PPML) estimation for all sectors and specifications.⁷ Then, we have estimated Equation (1) using a Zero-Inflated Negative Binomial (ZINB) method for the four samples of M&As classified according to technology intensity. In order to simplify the analysis of our results, we first present the NB estimations and then we show the results of the logit estimations.

4.1 ZINB estimation results

Table 4 displays the results of the NB estimations for each of the four groups of M&As. We must recall that this part of the ZINB estimation is restricted to the links with positive values ($MA_{ij,k} > 0$). Thus, the dependent variable is the volume of the positive flows.

We have estimated two models for each of the four sectors.⁸ In model (1), we used the baseline specification of the gravity model extended with the IPRs indexes.

⁶The Vuong test allowed us to determine the superiority of zero-inflated count models with respect to their non-zero-inflated analogs. This was confirmed in all sectors.

⁷The over-dispersion parameter (α) of the NB estimation was always statistically greater than zero. Therefore, the NB estimation method is preferred instead of the PPML.

⁸We have also estimated the model for the aggregate manufacturing sector finding similar results, which are available upon request.

Table 4: Negative Binomial Estimations of the Value of Cross-border M&As

Sector	Agri-food		Low-technology		Medium-technology		High-technology	
Model	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
IPR _j	0.156*	0.167*	0.492***	0.377*	-0.024	-0.009	0.411**	0.602**
	(0.089)	(0.096)	(0.182)	(0.197)	(0.133)	(0.182)	(0.162)	(0.242)
ln(GDP _i)	0.684***	0.420***	0.850***	0.157	0.749***	0.324***	0.893***	0.131
	(0.075)	(0.158)	(0.084)	(0.183)	(0.061)	(0.110)	(0.087)	(0.145)
ln(GDP _j)	0.040	0.606**	0.077	0.028	0.514***	0.307	0.677***	0.217
	(0.158)	(0.240)	(0.172)	(0.226)	(0.128)	(0.234)	(0.153)	(0.263)
ln(pop _i)	-0.541***	-0.253	-0.640***	-0.162	-0.442***	-0.031	-0.628***	0.367**
	(0.083)	(0.186)	(0.084)	(0.174)	(0.058)	(0.111)	(0.085)	(0.166)
ln(pop _j)	0.247	-0.393	0.056	-0.156	-0.221**	0.102	-0.417***	0.205
	(0.167)	(0.277)	(0.160)	(0.232)	(0.111)	(0.218)	(0.131)	(0.240)
ln(dist)	-0.202***	-0.139*	-0.002	-0.123*	-0.182***	-0.364***	-0.146**	-0.280***
	(0.074)	(0.084)	(0.061)	(0.071)	(0.060)	(0.067)	(0.068)	(0.077)
contig	-0.235	0.041	-0.173	-0.216	-0.119	-0.428*	-0.151	-0.684***
	(0.205)	(0.207)	(0.163)	(0.168)	(0.210)	(0.226)	(0.237)	(0.238)
comlang	0.035	0.063	0.355***	0.283**	-0.018	-0.119	0.354**	0.487***
	(0.159)	(0.162)	(0.131)	(0.140)	(0.153)	(0.163)	(0.151)	(0.151)
comcol	-0.697	-0.052	-0.753**	0.079	-0.656**	-0.157	0.161	-0.146
	(0.532)	(0.726)	(0.309)	(0.421)	(0.276)	(0.323)	(0.328)	(0.469)
colony	0.416**	0.247	-0.170	-0.235	0.215	0.607***	-0.031	-0.172
	(0.211)	(0.215)	(0.164)	(0.162)	(0.180)	(0.201)	(0.196)	(0.188)
landl _i	-0.936***	-0.579	-0.241	0.055	-0.195	-0.814***	0.294	-0.254
	(0.263)	(0.434)	(0.254)	(0.376)	(0.199)	(0.218)	(0.235)	(0.379)
landl _j	1.236***	-0.686	-0.175	-1.078***	0.653**	0.081	1.509***	0.350
	(0.287)	(0.590)	(0.232)	(0.296)	(0.302)	(0.459)	(0.399)	(0.529)
xr		2.494		2.287		2.029		1.511
		(1.875)		(1.919)		(1.691)		(2.610)
fin_open _i		0.747***		1.880***		0.664***		1.584***
		(0.257)		(0.346)		(0.251)		(0.320)
fin_open _j		-0.208		1.032**		0.043		1.443***
		(0.443)		(0.424)		(0.374)		(0.520)
ln(open_tra _i)		0.227		-0.729***		-0.309**		0.288
		(0.207)		(0.165)		(0.138)		(0.222)
ln(open_tra _j)		-0.266		-0.996***		0.056		0.070
		(0.232)		(0.173)		(0.152)		(0.208)
h_cap _i		-0.072		0.287		0.757***		0.938***
		(0.244)		(0.197)		(0.192)		(0.240)
h_cap _j		-1.054***		-0.431*		0.663***		0.046
		(0.309)		(0.235)		(0.230)		(0.283)
polity _i		0.045**		-0.009		0.015		0.042*
		(0.023)		(0.019)		(0.015)		(0.022)
polity _j		0.064*		-0.024		-0.011		0.003
		(0.034)		(0.027)		(0.024)		(0.025)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,320	1,036	2,008	1,592	2,678	2,088	1,837	1,353

Note: The dependent variable is the log of the value of M&As. Standard errors are in parenthesis. Significance level: *** p<0.01, ** p<0.05, * p<0.10.

In model (2), we also included the set of control variables that influence M&As. Note that, in all the estimations, we used the index of IPRs of Campi and Nuvolari (2015) for the agri-food sector, and the index of (Ginarte and Park, 1997) for the

manufacturing sectors.

The estimated coefficients of IPRs in the baseline specification (1) show that the strengthening of IPRs systems increases the value of M&As, except in the sector of medium-technology manufactures. It is interesting to note that when we include the set of control variables in model (2), the effect of IPRs is still positive and significant in the same sectors. This implies that the interaction of IPRs with other factors such as institutions, financial variables, human capital and openness to trade, affects the investment climate of countries (Maskus, 2000).

In both specifications, we observe that most of the usual variables related to the gravity equation are significant and present the expected signs. A higher GDP, which is an indicator of market size, leads to a higher value of M&As, especially the GDP of the acquirer. M&As decrease when population increases, in particular, when the population of the acquirer grows. The distance between two countries lowers M&As and, conversely, common language, an indicator of cultural proximity, is positively related with M&As. Regarding other link-specific variables indicating barriers to trade, in some specifications, we found that contiguity is not statistically significant, sharing a common colonizer decreases M&As holding colonial links (colony) in the past increases M&As. If the acquirer is landlocked, M&As decrease in the case of agri-food, and increase in medium-technology manufactures. Meanwhile, when the target country is landlocked, M&As increase in all sectors, except in low-technology manufactures. This could be explained by the fact that a landlocked country has higher transportation costs, which can discourage trade and, on the contrary, encourage M&As.

The control variables also present the expected signs. Like Brakman et al. (2010), we observe that the coefficient of variation of the bilateral exchange rates is not significant. In line with the findings of Di Giovanni (2005), we observe that an improvement in the index of financial openness of the acquirer boosts M&As. Thus, more financially open countries seem to invest more abroad. Also, financial openness in the target countries increases M&As in the low- and high-technology sectors. Conversely, openness to trade decreases M&As in the sectors of low- and medium-technology. This could indicate that a firm might decide to export to a more open country rather than investing in it. An increase in the level of human capital of the acquirer increases M&As in medium- and high-technology manufactures, while an increase in the level of human capital of the target decreases M&As in the agri-food and low-technology sectors and increases M&As in medium-technology manufactures. This suggests that the effect of human capital is relevant for sectors that demand more capabilities. Also, an increase in imitation abilities of the target

countries discourage M&As. Finally, the index of political system displays positive estimated coefficients in agri-food and high-technology, meaning that an improvement in political institutions fosters M&As. This agrees with Hur et al. (2011), who argue that the quality of institutions is a relevant determinant of M&As.

Table 5 displays the results of the logit estimations, which estimates the probability that a M&A occurs for a given dyad (ij) in sector k . The dependent variable takes the value 1 if $MA_{ij,k} > 0$, and zero otherwise.

As before, most of the explanatory variables are significant and the signs of the estimated coefficients are similar to the ones reported in the NB estimations. We observe no significant effect of IPRs in the agri-food sector, but a positive and significant effect on manufacturing sectors, regardless of their technological content and model specification. Therefore, in the manufacturing sector, an increase in IPRs generates an extension of new bilateral M&As, which implies that countries with stronger IPRs systems have a higher probability of receiving investment in the manufacturing sector from new partner-countries.

Finally, in order to deal with a possible omitted variables bias, we also performed an estimation of the GM using origin and destination fixed effects, which also indicate that IPRs foster M&As. Notwithstanding, the variables that are country-specific are relatively less stable because country fixed effects are able to capture, up to a certain extent, their effect.⁹

4.2 Interactions between IPRs and development

In this section, we explore possible heterogeneity on the effect of IPRs depending on the development level of countries. To do this, we estimated a new specification of the model that includes two interaction variables.

The main idea behind the interaction variables is to control for possible link specificities that may derive from some stylized facts of the data, such as: (i) most cross-country investments are done by developed economies, (ii) since 2003, investments towards LDC have been increasing, and (iii) after the signing of the TRIPS, IP protection has been increasing at higher growth rates in LDC.

In order to consider the possible implications of these features, we included two interaction variables: the first one ($LDC_j * IPR_j$) is meant to capture the effect of strengthening IPRs in LDC independently on the level of development of the acquirer country. This aims to answer the question of whether LDC attract more investments as a consequence of a tightening of their IPRs system. The second interaction variable ($DC_i * IPR_j$) aims to detect whether any target country receives more investments

⁹The results of the estimations with country dummies are available upon request.

Table 5: Logit Estimations of the Value of Cross-border M&As

Sector	Agri-food		Low-technology		Medium-technology		High-technology	
Model	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
IPR _j	0.025 (0.033)	0.061 (0.041)	0.498*** (0.074)	0.698*** (0.106)	0.293*** (0.059)	0.401*** (0.092)	0.157** (0.080)	0.468*** (0.132)
ln(GDP _i)	0.273*** (0.038)	0.043 (0.077)	0.678*** (0.036)	0.745*** (0.084)	0.776*** (0.033)	0.709*** (0.075)	1.221*** (0.049)	1.172*** (0.131)
ln(GDP _j)	1.560*** (0.063)	1.617*** (0.143)	1.165*** (0.066)	0.792*** (0.107)	1.475*** (0.058)	1.369*** (0.107)	1.740*** (0.083)	1.425*** (0.161)
ln(pop _i)	0.151*** (0.034)	0.233*** (0.077)	-0.079** (0.031)	-0.127 (0.080)	-0.105*** (0.027)	0.027 (0.067)	-0.517*** (0.041)	-0.385*** (0.119)
ln(pop _j)	-1.062*** (0.062)	-1.097*** (0.149)	-0.675*** (0.061)	-0.239** (0.102)	-0.829*** (0.053)	-0.555*** (0.099)	-1.047*** (0.073)	-0.577*** (0.149)
ln(dist)	-0.684*** (0.037)	-0.784*** (0.050)	-0.749*** (0.030)	-0.737*** (0.041)	-0.583*** (0.027)	-0.514*** (0.036)	-0.486*** (0.031)	-0.542*** (0.047)
contig	0.104 (0.126)	0.235* (0.141)	0.166 (0.105)	0.258** (0.122)	0.297*** (0.103)	0.346*** (0.127)	-0.251* (0.128)	-0.241 (0.150)
comlang	1.375*** (0.088)	1.570*** (0.101)	1.445*** (0.073)	1.546*** (0.096)	1.206*** (0.068)	1.214*** (0.089)	1.782*** (0.077)	1.895*** (0.104)
comcol	0.480** (0.243)	-0.163 (0.326)	0.675*** (0.173)	0.331 (0.270)	0.990*** (0.151)	0.956*** (0.233)	1.232*** (0.165)	1.154*** (0.270)
colony	0.406*** (0.105)	0.357*** (0.126)	0.469*** (0.093)	0.430*** (0.113)	0.311*** (0.094)	0.167 (0.111)	0.331*** (0.106)	0.384*** (0.130)
landl _i	-0.531*** (0.140)	-0.704*** (0.214)	-0.519*** (0.119)	-0.587*** (0.172)	-0.289*** (0.101)	-0.475*** (0.146)	-0.125 (0.130)	-0.377* (0.196)
landl _j	-0.741*** (0.148)	-2.141*** (0.422)	-0.809*** (0.132)	-1.094*** (0.197)	-0.662*** (0.110)	-1.422*** (0.202)	-0.281** (0.133)	-0.829*** (0.245)
xr		0.417 (0.731)		-2.165*** (0.739)		-1.467** (0.625)		2.252** (1.133)
fin_open _i		-0.262 (0.164)		-0.083 (0.159)		-0.029 (0.139)		0.103 (0.235)
fin_open _j		0.886*** (0.260)		0.808*** (0.193)		0.494*** (0.171)		0.730** (0.294)
ln(open_tra _i)		-0.777*** (0.110)		-0.031 (0.092)		0.176** (0.079)		0.206** (0.103)
ln(open_tra _j)		-0.242* (0.125)		0.114 (0.098)		0.411*** (0.087)		0.349*** (0.114)
h_cap _i		0.826*** (0.124)		0.075 (0.110)		0.277*** (0.094)		0.375*** (0.138)
h_cap _j		-0.357** (0.174)		-0.185 (0.121)		-0.077 (0.112)		0.262* (0.153)
polity _i		-0.015* (0.009)		-0.003 (0.008)		0.036*** (0.007)		-0.002 (0.011)
polity _j		-0.075*** (0.019)		0.002 (0.013)		0.002 (0.010)		-0.026* (0.015)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	44,828	24,339	45,155	26,004	50,246	28,225	28,260	17,423

Note: The dependent variable is the log of the value of M&As. Standard errors are in parenthesis. Significance level: *** p<0.01, ** p<0.05, * p<0.10.

from a DC when it increases the level of IPRs. In other words, this also reflects whether a DC finds attractive an increase in the level of IPRs of any target country.

Table 6: Negative Binomial and Logit Estimations of the Value of Cross-border M&As.
Interactions of IPRs with Level of Development

Sector	Agri-food		Low-technology		Medium-technology		High-technology	
Model	(NB)	(Logit)	(NB)	(Logit)	(NB)	(Logit)	(NB)	(Logit)
IPR _j	0.274** (0.111)	-0.005 (0.050)	0.244 (0.203)	0.667*** (0.109)	0.195 (0.193)	0.338*** (0.095)	0.644*** (0.222)	0.457*** (0.140)
LDC _j *IPR _j	0.113 (0.144)	0.097** (0.047)	0.279** (0.109)	0.062* (0.033)	-0.164** (0.071)	0.109*** (0.029)	0.293*** (0.081)	0.142*** (0.043)
DC _i *IPR _j	-0.214*** (0.076)	0.056 (0.040)	-0.065 (0.061)	0.026 (0.029)	-0.200*** (0.056)	0.053** (0.025)	-0.143** (0.066)	-0.001 (0.034)
ln(GDP _i)	0.555*** (0.167)	-0.009 (0.086)	0.209 (0.182)	0.718*** (0.090)	0.469*** (0.123)	0.646*** (0.081)	0.239 (0.151)	1.167*** (0.137)
ln(GDP _j)	0.641** (0.262)	1.722*** (0.156)	0.318 (0.241)	0.851*** (0.113)	0.095 (0.225)	1.484*** (0.112)	0.517** (0.248)	1.533*** (0.166)
ln(pop _i)	-0.403** (0.192)	0.279*** (0.083)	-0.188 (0.166)	-0.104 (0.085)	-0.146 (0.120)	0.081 (0.072)	0.282* (0.167)	-0.383*** (0.125)
ln(pop _j)	-0.448 (0.285)	-1.175*** (0.156)	-0.458* (0.239)	-0.289*** (0.105)	0.315 (0.212)	-0.649*** (0.103)	-0.036 (0.227)	-0.666*** (0.153)
ln(dist)	-0.203** (0.087)	-0.778*** (0.050)	-0.181** (0.072)	-0.738*** (0.042)	-0.440*** (0.067)	-0.516*** (0.038)	-0.333*** (0.078)	-0.561*** (0.048)
contig	-0.153 (0.215)	0.247* (0.141)	-0.336* (0.172)	0.257** (0.122)	-0.520** (0.223)	0.346*** (0.127)	-0.551** (0.247)	-0.251* (0.150)
comlang	0.062 (0.163)	1.551*** (0.102)	0.259* (0.136)	1.528*** (0.097)	-0.108 (0.163)	1.187*** (0.089)	0.213 (0.158)	1.856*** (0.104)
comcol	-0.078 (0.654)	-0.255 (0.332)	-0.004 (0.442)	0.275 (0.280)	-0.313 (0.296)	0.857*** (0.244)	-0.325 (0.466)	0.968*** (0.286)
colony	0.380* (0.219)	0.365*** (0.125)	-0.150 (0.159)	0.441*** (0.113)	0.635*** (0.202)	0.187* (0.111)	0.052 (0.193)	0.404*** (0.130)
landl _i	-0.499 (0.427)	-0.754*** (0.218)	0.107 (0.363)	-0.616*** (0.174)	-0.659*** (0.220)	-0.544*** (0.149)	-0.157 (0.369)	-0.388** (0.197)
landl _j	-0.606 (0.509)	-2.098*** (0.423)	-1.045*** (0.291)	-1.055*** (0.199)	0.025 (0.436)	-1.340*** (0.204)	0.565 (0.525)	-0.735*** (0.248)
xr	2.403 (1.964)	0.471 (0.731)	1.397 (1.860)	-2.171*** (0.749)	1.477 (1.688)	-1.475** (0.632)	2.094 (2.538)	2.052* (1.137)
fin_open _i	0.960*** (0.269)	-0.321* (0.172)	1.993*** (0.352)	-0.129 (0.167)	0.986*** (0.256)	-0.111 (0.144)	1.844*** (0.331)	0.098 (0.242)
fin_open _j	0.026 (0.470)	0.969*** (0.265)	1.659*** (0.503)	0.907*** (0.196)	-0.385 (0.386)	0.662*** (0.175)	1.975*** (0.489)	0.949*** (0.303)
ln(open_tra _i)	0.196 (0.212)	-0.774*** (0.111)	-0.701*** (0.163)	-0.024 (0.092)	-0.341** (0.136)	0.182** (0.080)	0.281 (0.225)	0.202* (0.103)
ln(open_tra _j)	-0.323 (0.229)	-0.235* (0.126)	-1.120*** (0.166)	0.106 (0.097)	0.095 (0.147)	0.389*** (0.086)	-0.011 (0.202)	0.314*** (0.116)
h_cap _i	0.066 (0.256)	0.832*** (0.125)	0.341* (0.193)	0.069 (0.110)	0.905*** (0.195)	0.268*** (0.094)	0.997*** (0.242)	0.386*** (0.138)
h_cap _j	-0.996*** (0.310)	-0.402** (0.176)	-0.425* (0.227)	-0.192 (0.120)	0.844*** (0.220)	-0.092 (0.110)	-0.088 (0.275)	0.252* (0.151)
polity _i	0.053** (0.023)	-0.018** (0.009)	-0.003 (0.018)	-0.006 (0.009)	0.033** (0.016)	0.030*** (0.007)	0.060** (0.024)	-0.003 (0.011)
polity _j	0.077* (0.041)	-0.063*** (0.019)	0.035 (0.035)	0.011 (0.014)	-0.044 (0.028)	0.017 (0.010)	0.045* (0.027)	-0.006 (0.017)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,036	24,339	1,592	26,004	2,088	28,225	1,353	17,423

Note: The dependent variable is the log of the value of M&As. Standard errors are in parenthesis. Significance level: *** p<0.01, ** p<0.05, * p<0.10.

Table 6 displays the results of the ZINB estimations. Firstly, we analyze the results of the NB estimations. In the agri-food sector, a strengthening of IPRs systems seems to increase M&As. But, considering the interaction terms ($DC_i * IPR_j$), M&As from DC are discouraged by an increase in IPRs in the target countries. In the low-technology sector, we found that a LDC that increases its level of IPRs will receive more investments ($LDC_j * IPR_j$). In the medium-technology sector, both interaction variables are negative, meaning that an increase in IPRs reduces M&As in LDC and also that an increase in IPRs of any type of country discourages investments from DC. For the high-technology sector, we found that IPRs increase M&As, especially in LDC. But, the strengthening of IPRs systems reduces M&As from DC.

The logit estimations show that the probability of creating new investment links increases with IPRs in the manufacturing sectors, regardless of their technological content. In addition, LDC increase their probability of receiving M&As by tightening their IPRs systems in all sectors, including agri-food.

5 Concluding remarks

Considering the recent global process of strengthening and harmonization of IPRs systems and the significance of cross-border M&As as the most relevant form of FDI, we have studied for the post-TRIPS period whether IPRs affect how firms decide to undertake M&As.

The results of the gravity estimations confirm that market size, geographical factors, trade barriers, and cultural differences among countries are important determinants of cross-border M&As. The strengthening of IPRs systems increases M&As in the agri-food, low-technology and high-technology manufacturing sectors. This is not surprising given that access to IP assets was found to be one of the driving forces for firms to engage in M&As. Then, IPRs systems protecting these IP assets also affect decisions on cross-border M&As. Moreover, stronger IPRs systems seem to facilitate the creation of investment linkages among countries in the manufacturing sector regardless of the technological content, especially in LDC. Conversely, in some cases, we have found that stronger IPRs discourage M&As from DC. Therefore, our exercises suggest that the effect of IPRs depends on technological specificities of sectors and development level of countries. These results are robust to different specifications controlling for other possible determinants of M&As.

Overall, we have shown that several country features influencing or creating an attractive investment environment, are relevant to explain M&As. Some of these features are geography, market size, human capital, openness to trade, financial

openness, and also IPRs systems. This finding suggests that the choice between FDI, trade and licensing is likely to depend on, and interact with, country characteristics.

Our exercises have some relevant implications for the design of IPRs systems, especially for developing countries. Firstly, given that our results point out different effects for DC and LDC, they suggest that IPRs systems should consider specificities of countries and that there might be no unique system suitable for all countries. Secondly, considering that stronger IPRs are increasing M&As directed to the developing world, one should examine whether it is beneficial for LDC to attract more investments in the form of M&As. Finally, we must recall that IPRs systems are likely to affect not only decisions of firms related to M&As but also trade and licensing. Therefore, the design of IPRs systems should also consider how they may possibly affect these decisions and what are the implications for countries in terms of innovation, technology transfer and development.

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6 Appendix

List of Acquirer Countries

Developed Countries

Australia; Austria; Bermuda; Canada; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Italy; Japan; Latvia; Liechtenstein; Lithuania; Netherlands; New Zealand; Norway; Poland; Portugal; Slovak Republic; Slovenia; Spain; Sweden; United Kingdom

Developing Countries

Albania; Angola; Antigua and Barbuda; Argentina; Armenia; Azerbaijan; Bahamas, The; Bahrain; Bangladesh; Barbados; Belarus; Belize; Bolivia; Bosnia and Herzegovina; Brazil; Brunei Darussalam; Bulgaria; Cambodia; Cameroon; Cape Verde; Central African Republic; Chad; Chile; China; Colombia; Costa Rica; Côte d'Ivoire; Croatia; Cyprus; Dominican Republic; Ecuador; Egypt, Arab Rep.; El Salvador; Fiji; Gabon; Georgia; Ghana; Guatemala; Guinea; Honduras; Hong Kong SAR, China; India; Indonesia; Iran, Islamic Rep.; Israel; Jamaica; Jordan; Kazakhstan; Kenya; Korea, Rep.; Kuwait; Kyrgyz Republic; Lao PDR; Lebanon; Macao SAR, China; Macedonia, FYR; Malawi; Malaysia; Mauritania; Mauritius; Mexico; Moldova; Mongolia; Morocco; Mozambique; Nepal; Nigeria; Oman; Pakistan; Panama; Paraguay; Peru; Philippines; Puerto Rico; Russian Federation; Rwanda; Saudi Arabia; Senegal; Sierra Leone; Singapore; South Africa; Sri Lanka; Taiwan; Tajikistan; Tanzania; Thailand; Trinidad and Tobago; Tunisia; Turkey; Uganda; Ukraine; Uruguay; Uzbekistan; Venezuela, RB; Vietnam; Zambia; Zimbabwe

List of Target Countries

Developed Countries

Australia; Austria; Belgium; Canada; Czech Republic; Denmark; Estonia; Finland; France; Germany; Hungary; Iceland; Ireland; Italy; Japan; Latvia; Lithuania; Netherlands; New Zealand; Norway; Poland; Portugal; Slovak Republic; Slovenia; Spain; Sweden; Liechtenstein; United Kingdom

Developing Countries

Albania; Argentina; Azerbaijan; Belarus; Bolivia; Brazil; Bulgaria; Chile; China; Colombia; Costa Rica; Croatia; Dominican Republic; Ecuador; Israel; Jordan; Kenya; Korea, Rep.; Macedonia, FYR; Mexico; Moldova; Morocco; Nicaragua; Panama; Paraguay; Peru; Puerto Rico; Romania; Russian Federation; Singapore; South Africa; Trinidad and Tobago; Tunisia; Turkey; Ukraine; Uruguay; Uzbekistan; Vietnam