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Cross-border mergers and acquisitions for innovation ☆

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ABSTRACT

We propose and empirically examine cross-border mergers and acquisitions (M&As) as an important dimension of firms' innovation strategies. Our empirical analyses, based on a sample of 85,591 M&A deals from 57 countries, show that innovative firms in low innovation countries are more likely to undertake cross-border deals, and select innovative targets when doing so, as compared with innovative firms in high innovation countries. We also find that these cross-border M&As earn higher announcement stock returns when compared to domestic deals. We show that innovative firms from low innovation countries produce more patents, and invest more in research and development (R&D) after they acquire targets in high innovation countries. This study provides new evidence to the absorptive capacity theory from an international perspective.

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1. Introduction

Given the fierce global competition in today's knowledge-based economy, this paper examines the role of innovation as a motivation for cross-border M&As. Cross-border M&As have increased in importance in recent times. For example, in the first half of 2015, cross-border takeovers accounted for 37% of all takeover activities (Mergermarket, 2015). However, cross-border M&As are costly, time-consuming, and can involve difficulties of integrating divisions across borders. This begs the question of why companies might actively engage in cross-border M&A activities.

The prior literature has examined firm-level and country-specific drivers of cross-border M&A activities, such as higher relative acquirer stock value, higher relative country currency, geography (i.e., relative distance), gaining access to better capital markets, and enhancing target firm governance (Erel et al., 2012; Ferreira et al., 2010; Rossi and Volpin, 2004). However, an important, yet untapped, factor is the pursuit of overseas innovation potential and opportunities. R&D has become

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increasingly internationalized within multi-segment firms (D'Agostino et al., 2013; OECD, 2007; UNCTAD, 2005). Further, the acquisition of R&D-intensive or innovative targets can be a motivation for cross-border acquisitions, thereby increasing demand for such deals, especially from countries with relatively lower levels of innovation.[1] Subsequently, innovative acquirers in low innovation countries, who face a dearth of innovative targets from which to choose (only a subset of which might be synergistic), might consider the larger selection of innovative targets overseas. In this paper, we examine the acquisition of innovation as a motive for cross-border M&As.

Absorptive capacity theory suggests that firms' ability to absorb and internalize external knowledge increases with their R&D and innovation capacity (Cohen and Levinthal, 1989). Despite the importance of M&A activities in today's business world, how innovative firms utilize M&As to absorb external knowledge and enhance their technological competence remains underexplored in the literature.[2] In comparison with internal innovation, cross-border acquisitions of innovation offer several advantages. Firms in relatively low innovation countries will likely face greater barriers to obtaining the human capital necessary to generate innovation (Keller, 2004), rendering it comparatively more difficult to generate internal innovation with domestic resources in a low innovation country. Acquiring external innovation opportunities by domestic acquisition could prove difficult as low innovation countries are likely to have fewer targets that are both synergistic and innovative, so a firm (especially an innovative one) in a low innovation country will benefit more by engaging in cross-border takeovers to acquire innovation.[3] Additionally, firms located in lower innovation countries also face poor intellectual property (IP) protection rights, and barriers to enforcing those rights (following He and Su, 2013), which can deter the internal development of innovation due to a higher risk of expropriation (see e.g. Xiao, 2013). On the other hand, acquiring an innovative firm from a country with greater IP protection rights helps reduce the risk of expropriation, as such innovations will be protected by stronger IP laws in the target's country (following Branstetter et al., 2006; Branstetter et al., 2011).

We develop three hypotheses to examine the innovation motive for cross-border M&As. First, given weaker human capital, lower knowledge stock, and weaker IP protection offered in low innovation countries, we expect that acquirers (especially *innovative* ones) in low innovation countries are more likely to make cross-border deals (in comparison to acquirers in high innovation countries). We also expect that, in order to access and explore advanced knowledge and technologies in high innovation countries, acquirers in low innovation countries are more likely to undertake cross-border deals for relatively *more innovative targets*. Moreover, while innovation helps determine firms' short-term profitability and long-term survival, its development and transfer requires adequate knowledge and experience in innovation activities (Cohen and Levinthal, 1989, 1990). We thus anticipate that innovative acquirers in low innovation countries earn higher market valuations from undertaking cross-border deals than they do from undertaking domestic ones.

Despite the aforementioned discussions, integrating R&D staff from different cultural backgrounds and institutional environments could be challenging (Calori et al., 1994; Paruchuri et al., 2006). In addition, innovation can be difficult to manage at a distance (Belderbos et al., 2013; Lutz et al., 2013), and global diversification can be value-destroying (Denis et al., 2002). Nevertheless, firms have become increasingly capable of efficiently managing innovation at a distance or across countries (Castellani et al., 2013). Our study thus provides further evidence to explore if modern firms have learned how to better deal with cross-border M&As in a globalized economy with keen technology competition.

We test our three hypotheses using a sample of 85,591 M&A deals from 57 countries from 1990 to 2010. We collect data on the acquirers' and targets' R&D and patents,[4] and construct several patent-based and non-patent-based proxies for the country's level of innovation, including measures for the country's patent and R&D intensity, as well as its number of researchers. We find empirical evidence that innovative acquirers in low innovation countries are more likely to make cross-border acquisitions. Further, we show that innovative acquirers in low innovation countries undertake cross-border deals for targets with relatively higher innovation than their counterparts from high innovation countries. More importantly, innovative acquirers in low innovation countries earn higher announcement stock returns from cross-border deals than they do from domestic ones. These results support our three hypotheses developed in Section 2 and suggest that firms in low innovation countries can use cross-border deals as a way to access value-creating innovation and growth-prospects. We also support these results, in robustness tests, with tests conducted at the acquirer-country, acquirer/target country-pair, and country-pair-year levels.

We then analyze the consequences of cross-border M&As driven by innovation. We examine acquirers' post-takeover patents and R&D. We find that firms that make cross-border acquisitions and come from less innovative countries are more likely to generate more patents and invest more in R&D activities after acquiring targets from more innovative countries.

[1] Empirical evidence based on U.S. M&A data has confirmed that some deals are driven by the pursuit of innovation opportunities; see Abuja and Katila (2001), Bena and Li (2014), Chen et al. (2020), Phillips and Zhdanov (2013), and Zhao (2009).

[2] In the reviews of Lane, Koka, and Pathak (2006) and Zahra and George (2002), only very few studies examine the role of M&As in absorptive capacity theory (e.g., Ahuja and Katila, 2001; Empson, 2001; Jones, Lanctot, and Teegen, 2001).

[3] Similarly, while firms in low innovation countries could seek a joint venture partner, finding such a partner in an environment with lower IP rights (and development) would be challenging. By contrast, a takeover could be a relatively quick way to acquire innovation.

[4] One issue with the patent-based measures is that the level of IP property protection in a country influences the level of patenting, which can result in some low-protection countries appearing to be associated with even lower innovation on patent-based metrics. However, in our regressions, we control for IP protection of Ginarte and Park (1997) and Park (2008). Further, this is not a major concern for our study, as a lack of IP protection can deter innovative activities (Belderbos et al., 2013; Branstetter et al. 2011; Furman et al. 2002), suggesting that it is plausible, and consistent with our argument, that firms from poor-IP-protection countries might seek to acquire innovation overseas. Moreover, the use of non-patent-based measures of innovation helps to mitigate concerns that the level of patenting might merely reflect the level of property rights protection. There are also other concerns with the use of cross-country patent data, specifically in terms of comparability given different systems used across countries, and quality. We aim to mitigate these issues by using non-patent measures of innovation and by ensuring our results are robust to excluding countries (e.g., China, the US) that might feature disproportionately large degrees of patenting.

These results highlight the role of cross-border takeovers in acquiring technology and talent, and in strengthening firms' technological competence.

This study contributes to the literature in the following ways. First, our investigation of innovative firms' acquisition of overseas targets for new knowledge and innovation opportunities adds to the absorptive capacity theory from the perspective of cross-border M&As. Second, prior literature focuses on the flow of takeover activity from acquirers in developed countries to targets in developing countries, and examines motives, including entering new markets, or obtaining labor. By contrast, we highlight a situation in which the opposite flow can occur for the pursuit of technology and talent. More importantly, such a flow reflects the strategies of innovative firms from developing or less innovative countries to narrow the gap in technology and infrastructure. With the fast growth of technologies in developing economies, such as those of China and India, we would expect cross-border M&As that aim for innovation to become an even more important part of firms' innovation strategies. Third, our results from post-M&A announcement stock returns suggest that firms, even those from developing countries, have become more capable of managing cross-border M&As to create innovation, and thus increase firm value. Overall, this paper presents evidence to support the acquisition of innovation as a motive for cross-border deals, and demonstrates that it can enhance firm value if implemented appropriately.

The structure of this paper is as follows. In Section 2, we develop our hypotheses and discuss the relevant prior literature. In Section 3, we describe our sample construction and provide summary statistics. In Section 4, we contain our multivariate regression analyses and robustness checks. We conclude this paper with Section 5.

2. Previous literature and hypotheses development

In order to survive in highly competitive environments with rapid technological advances, firms must develop their own intellectual property, both internally (i.e., through R&D) and externally (i.e., through acquisitions). Such innovation-directed acquisitions often involve the acquisition of an R&D-intensive target by an acquirer with financial resources. For example, Erel et al. (2015) suggest that cash-rich acquirers can acquire innovation-rich yet cash-poor targets, potentially to facilitate innovation. The literature has also discussed mixed results on the benefits of innovation-through-acquisitions, often showing that its efficacy depends on the characteristics of the acquirer and targets (Ahuja and Katila, 2001; Desyllas and Hughes, 2010; Kapoor and Lim, 2007; Makri et al., 2010). One such characteristic that is important, yet often neglected, is the level of innovation in the acquirer's country.[5]

We expect that acquiring targets in high innovation countries may provide more growth opportunities and higher knowledge stock to acquirers from low innovation countries. High innovation countries are characterized by better infrastructure, institutional design, and human capital pools. The technology-sourcing literature suggests that FDI should flow from low innovation countries to high innovation countries as firms seek to gain access to growth opportunities in high innovation countries (Anand and Kogut, 1997; Girma, 2005; Kogut and Chang, 1991; Neven and Siotis, 1996; Zhang et al., 2010).[6] Relatedly, prior literature suggests that emerging-market firms can increase their knowledge base and organizational learning by interacting with firms in developed markets (Zhong et al., 2013). In addition, high innovation countries are often associated with better IP protection (Furman et al., 2002), which helps to mitigate acquirers' concerns about the leakage and spillover of IP through M&As, and encourage future innovation (Branstetter et al., 2006; Branstetter et al., 2011). Subsequently, for acquirers domiciled in a low innovation country, cross-border M&As could facilitate access to knowledge and growth potential in a high innovation country.

The benefits of engaging in such cross-border deals should be especially strong for innovative firms for two reasons. First, innovative firms are in a better position to assess and acquire new knowledge and technology and thus have stronger absorptive capacity (Cohen and Levinthal, 1989, 1990), which facilitates their M&As for overseas innovation opportunities. Second, innovative firms can pursue a strategy of developing innovation both internally (i.e., through R&D) and externally (i.e., through acquisitions). Both methods can complement one-another (Arora and Gambardella, 1990; Cassiman and Veugelers, 2006), with an innovative acquirer seeking to increase its innovativeness through an acquisition. As the potential target must be technologically compatible to acquirers (Paruchuri et al., 2006), there is (by definition) a relative dearth of targets that are both innovative and synergistic in low innovation countries. By contrast, the pool of such targets is larger in high innovation countries. Thus, an innovative firm in a low innovation country is more likely to engage in cross-border deals than domestic ones relative to an innovative firm in a high innovation country. We capture these predictions in the following hypothesis.

Hypothesis 1. Innovative acquirers in low innovation countries are more likely to engage in cross-border deals than domestic ones when compared with innovative acquirers in high innovation countries.

[5] Macroeconomic effects, including country finance and credit conditions, have been found to influence the decision to undertake cross-border M&As (e.g., Hu et al., 2020; Kandilov et al., 2017; Erel et al., 2012; Ferreira et al., 2010; Rossi and Volpin, 2004).

[6] Such an innovation motive in FDI does not necessarily always flow from low innovation countries to high innovation ones. Chung and Yeaple (2008) show that U.S. multinational firms may initiate FDI in other countries to outsource R&D in order to create synergies in innovation. On the other hand, Chung and Alcácer (2002) examine how foreign pharmaceutical firms decide their locations among U.S. states. Berry (2006) examines Japanese firms' foreign investment in R&D.

Targets' innovation capabilities also merit further investigation. Acquirers in all countries might seek to acquire innovation through acquisitions. However, we expect that acquirers in low innovation countries are more likely to acquire targets with relatively higher levels of innovation. Prior literature suggests that knowledge/innovation-transfers can be a motivation for cross-border acquisitions (Frey and Hussinger, 2011; Sarala and Vaara, 2010), with cross-border buyers often targeting firms with either greater growth prospects (Nagano and Yuan, 2013) or patenting (Ali-Yrkko et al., 2005). These cross-border acquirers also tend to adopt foreign technologies (Guadalupe et al., 2012), and increase R&D expenditure in the target-affiliates that they acquire.[7] Therefore, the innovation capabilities of targets in high innovation countries are critical resources for acquirers in low innovation countries to purchase. We thus form our second hypothesis as follows.

Hypothesis 2 (*deal-level*). Acquirers in low innovation countries will undertake cross-border deals for targets with relatively higher levels of innovation than will their counterparts from high innovation countries.

The value implications of cross-border M&A deals driven by innovation opportunities have been an important yet under-explored issue (Seth et al., 2002). Prior studies have documented the importance of examining the returns to R&D (and innovation) when analysing innovation-related investments (Eberhart et al., 2004; Hirshleifer et al., 2013, 2018; Li, 2011). Under the resource-based view of the firm, obtaining innovation-related resources is essential for corporate growth, future profitability, and long-term survival (Hsu et al., 2015; Lee et al., 2001). In the domestic-acquisition context, the empirical evidence has shown that innovation-driven acquisitions can generate greater increases in shareholder wealth (i.e. Danzon et al., 2007; Desyllas and Hughes, 2010; Hassan et al., 2007; Makri et al., 2010). Given that firms in low innovation countries likely face limited growth opportunities, their acquisition of innovation through cross-border deals should generate greater shareholder wealth than domestic deals.

The value creation from cross-border acquisitions should be stronger for innovative acquirers. Innovative acquirers may use cross-border acquisitions to expand their knowledge and expertise or to generate economies of scale with respect to R&D costs (Chung and Yeaple, 2008), both of which are conducive to firm value. Moreover, when these acquisitions are driven by innovation opportunities, innovative acquirers have better absorptive ability to access and utilize targets' innovation capabilities (Cohen and Levinthal, 1989, 1990), and are less likely to fail in the integration of knowledge from two organizations (Keller, 2004). This discussion on the value implication for cross-border acquisitions lead to our third hypothesis as follows.

Hypothesis 3. Innovative acquirers in low innovation countries earn higher announcement returns from undertaking cross-border deals than they do from undertaking domestic ones.

3. Data

3.1. M&A sample construction

The sample is based on M&A deal information from 1990 to 2010 from SDC platinum. We exclude LBOs, spin-offs, recapitalizations, self-tender offers, exchange offers, repurchases, partial equity-stake purchases, acquisitions of remaining interest, privatizations, and deals in which the target and acquirer are the same, as well as those which involve a government agency, or those in which a related party is from a financial or utilities industry. We exclude acquisitions involving the financial and utilities industries because they are subject more to government regulations, potentially biasing the results. We impose the sample restrictions that the relevant innovation data (from the World Bank) and the relevant control variables (from the year prior to the acquisition announcement) be available. We do not impose restrictions on the size of the deal; however, the results are robust to requiring that the deal be for at least USD 1 m and at least 1% of the acquirer's size. Countries in which the acquirers only do domestic deals or only do cross-border deals (although the results are robust to removing such observations) are also included. After imposing all sample restrictions, the sample includes 85,591 M&A transactions from 57 countries.

Our goal is to use this dataset to analyse the role of innovation in acquisitions. Specifically, we aim to analyse whether acquirers in low innovation countries are more likely to do cross-border deals, to also analyse the value-implications of such deals, as well as explore whether this is especially the case for innovative acquirers. We also aim to assess the innovativeness of the target that the acquirer obtains. To do this, we collect data on country-level innovation, acquirer/target innovation, acquisition performance, country controls, and deal-level controls. In the rest of this section, we focus on the innovation data and acquisition performance, and leave the descriptions of all control variables to the Appendix A.

3.2. Country-level innovation

Because we are interested in the role of country-level innovation in motivating cross-border M&As, we construct five country-level innovation variables from the World Bank. We construct three patent-based measures of country-level innovation: the natural log of the number of patent applications, the number of patent applications scaled by GDP, and the num-

[7] Bertrand et al. (2012) find supportive evidence in acquisitions by Swedish multinational enterprises (MNEs), although evidence from Germany suggests that foreign acquirers diminish R&D (Stiebale and Feize, 2011).

ber of patent applications scaled by the country's population. The first measure proxies the overall size of patenting activity, while the other two measures take capital and labour costs into account.[8] It is worth mentioning that we use patent applications rather than patent grants because the former better capture the timing of innovative activities while the latter reflects innovation with time lags due to the time required for the examination of patent applications. The other two non-patent measures are the amount of total R&D expenditure to GDP and the intensity of researchers in R&D in a country. The former reflects the total innovation input, while the latter reflects the availability of educated managers and employees who are necessary for innovation (Ayyagari et al., 2012; Keller, 2004). Since firms may be interested in acquiring both existing technology and innovation potential, we expect that these country characteristics will affect a firm's acquisition decision. The corresponding summary statistics by country are reported in Table 1a.

Table 1b shows that we have 57 countries with available patent application data from the World Bank. The number of countries with available R&D/GDP and the data of researchers is 55 and 53, respectively. The average annual number of resident patent applications ranges from 11 to 343,571. Based on this measure, the most innovative countries are Japan, United States, China, Korea, and Germany, while the least innovative counties are Panama, Ecuador, Nigeria, Jamaica, and Kenya. However, the order of innovativeness varies across different country-level innovation measures. For example, the most (least) innovative countries based on R&D/GDP are Israel, Sweden, Finland, Japan, and Switzerland (Indonesia, Peru, Philippines, Ecuador, and Egypt). Therefore, using qualitatively similar but quantitatively different innovation measures helps us to avoid the problem that the results are driven by a particular measure. Further, we also provide the average R&D/Assets ratio (the last column) for all listed firms in a country, and find that countries with higher innovation measures are associated with more innovative firms. This provides some evidence to support the view that in low innovation countries, there is likely to be a relative dearth of innovative targets.

We first examine the relationship between country-level innovation and cross-border M&As in a univariate analysis. In Fig. 1, we present the proportion of deals that are cross-border grouped by whether the acquirer country's aggregate innovation is above or below the median for all countries. We find a consistent pattern across all five country-level innovation measures. Countries with below-median levels of innovation feature a higher proportion of cross-border deals in most years, which provides a strong yet preliminary support to our Hypothesis 1 that innovative acquirers in low innovation countries are more likely to do cross-border deals than domestic ones when compared with innovative acquirers in high innovation countries.

3.3. Acquirer and target innovation

We collect patent and R&D data to measure the innovativeness of acquirers and targets at the firm level. To measure the innovation output of an acquirer/target in every year, we use patent counts and patent citations to measure the acquirer/-target's innovation output from both quantitative and qualitative perspectives (Hall, 1993; Hall et al., 2005a; Harhoff et al., 1999; Griliches, 1981; Trajtenberg, 1990).[9] The first measure is the number of patents that are filed by a firm in a given year. Following the literature, we use patent-application-year (filing year) instead of grant-year because the former better captures the actual time of the occurrence of inventions (Hall et al., 2005b).

For non-U.S. firms, we use the patent record from the REGPAT database (January 2013 edition) from the Organization for Economic Co-operation and Development (OECD), that includes all patents that are filed to the European Patent Office (EPO) or to the Patent Co-operation Treaty (PCT) and are approved by country-level patent offices or the EPO over the period of 1977–2012. The REGPAT database is the most comprehensive data source for international firms, and provides standardized applicant (i.e., firm) names and thus enables us to manually match each standardized applicant name to a non-U.S. public firm, if any exists. We manually match the public firms listed in the Worldscope database to all standardized applicant names that appear in the REGPAT database, using company names, locations, and industry categories. As a result, we obtain the number of patents filed by every non-U.S. public firm in each year, as well as the number of forward citations received by these patents.

For U.S. firms, we combine the NBER patent database and the U.S. Patent Inventor Database of Harvard Business School (Li et al., 2014) to have a complete record of all patents granted to U.S. public firms by the U.S. Patent and Trademark Office (USPTO) from 1976 to 2010.[10] The combination of these two databases allows us to conveniently track the number of patents filed by every U.S. public firm in each year, and also track the number of forward citations received by these patents by the end of 2010.

[8] However, we acknowledge that some countries might merely appear to be low innovation due to low patenting arising from a lack of IP protection (per Da Rin et al., 2006). We will control for IP protection in the regressions.

[9] Since it takes time for a patent to accumulate citations, we adjust the number of citations received by each patent owned by a U.S. public firm using the weighting factor developed by Hall et al (2005b) based on technology categories. For the number of citations received by each patent owned by a non-U.S. public firm, we construct a similar weighting factor using international patent classifications (IPC) in the REGPAT database.

[10] The NBER patent database is first developed by Hall et al. (2005a) and its updated version (1976 to 2006) is available at https://sites.google.com/site/patentdataproject/Home/downloads. The HBS patent database is available at http://hdl.handle.net/1902.1/12367 and covers all patent inventor data for the period 1975–2010.

Table 1a
Panel A: cross-border M&As, country-level innovation and firm-level innovation. This table contains the number of M&As, the ratio of cross-border deals, the five innovation measures, and acquirer firm-level R&D ratio averaged over 1990 to 2010, for each of the 57 countries in the full sample (missing information is left as blank). All country-level variables are from the acquirer country.

Acquirer Country	All Deals	Cross-border Ratio	Patents	Patents/GDP	Patents/Pop	R&D/GDP	Researchers	Acquirer firm-level R&D
Argentina	65	38.11%	828	0.0028	0.0222	0.45%	793	0.15%
Australia	7488	22.26%	2155	0.0052	0.1107	1.82%	3765	2.44%
Austria	509	62.02%	2092	0.0113	0.2594	2.22%	3213	2.25%
Belgium	915	68.56%	628	0.0028	0.0610	1.90%	3071	4.17%
Brazil	551	22.87%	3084	0.0046	0.0176	0.95%	546	0.43%
Bulgaria	24	7.41%	258	0.0158	0.0332	0.47%	1334	0.18%
Canada	14,018	36.52%	3881	0.0054	0.1244	1.91%	3694	4.90%
Chile	10	47.05%	279	0.0035	0.0177	0.53%	487	0.06%
China	1719	20.90%	73,475	0.0353	0.0561	1.04%	688	0.42%
Colombia	43	34.32%	107	0.0010	0.0026	0.16%	119	0.02%
Czech	34	21.56%	638	0.0102	0.0619	1.27%	1761	0.57%
Denmark	905	60.26%	1501	0.0097	0.2809	2.40%	4562	6.13%
Ecuador	1	0.00%	11	0.0005	0.0008	0.14%	71	
Egypt	46	38.26%	484	0.0044	0.0068	0.23%	500	0.02%
Finland	1189	51.00%	2104	0.0184	0.4071	3.34%	7112	3.05%
France	5306	48.18%	13,510	0.0105	0.2206	2.17%	3101	3.68%
Germany	4480	44.96%	43,981	0.0237	0.5372	2.47%	3242	4.19%
Greece	532	22.91%	388	0.0029	0.0353	0.56%	1451	0.71%
Hong Kong	1139	53.14%	83	0.0004	0.0123	0.65%	1998	1.02%
Hungary	71	45.47%	776	0.0160	0.0763	0.86%	1434	3.54%
India	2356	23.24%	3365	0.0059	0.0030	0.74%	125	0.59%
Indonesia	223	23.20%	162	0.0008	0.0007	0.07%	150	0.20%
Ireland	712	75.35%	849	0.0103	0.2187	1.27%	2522	1.75%
Israel	544	58.01%	1312	0.0117	0.2145	4.08%		6.11%
Italy	1329	45.34%	7300	0.0067	0.1261	1.10%	1327	1.91%
Jamaica	1	100.00%	21	0.0020	0.0078			0.00%
Japan	7469	31.48%	343,571	0.0738	2.7164	3.15%	5188	2.25%
Jordan	8	20.83%	54	0.0037	0.0092	0.42%		0.38%
Kenya	10	66.67%	47	0.0028	0.0013	0.42%	56	0.15%
Korea	1699	32.83%	74,780	0.1264	1.5752	2.63%	3178	0.76%
Malaysia	2027	13.06%	401	0.0037	0.0159	0.50%	283	0.32%
Mexico	321	47.44%	554	0.0010	0.0055	0.39%	291	0.19%
Netherlands	3012	59.64%	2194	0.0060	0.1381	1.87%	2751	4.19%
New Zealand	451	35.68%	1467	0.0282	0.3758	1.11%	3402	1.61%
Nigeria	10	28.57%	12	0.0002	0.0001	0.22%	39	0.00%
Norway	1108	49.29%	1143	0.0071	0.2536	1.63%	4640	3.94%
Pakistan	25	9.09%	98	0.0010	0.0006	0.36%	106	0.23%
Panama	5	97.14%	11	0.0010	0.0038	0.31%	109	
Peru	66	29.44%	34	0.0006	0.0013	0.11%		0.70%
Philippines	229	22.67%	171	0.0020	0.0021	0.12%	77	0.78%
Poland	436	10.66%	2428	0.0133	0.0633	0.61%	1521	0.83%
Portugal	214	32.32%	174	0.0015	0.0166	0.90%	2188	0.11%
Romania	8	30.00%	1020	0.0212	0.0471	0.46%	939	0.26%
Russia	639	26.24%	23,688	0.0774	0.1636	1.11%	3341	0.26%
Singapore	1128	47.27%	411	0.0036	0.0945	2.00%	4424	0.99%
Slovakia	17	46.43%	219	0.0059	0.0405	0.53%	2045	2.12%
South Africa	1235	25.35%	818	0.0060	0.0192	0.78%	310	0.45%
Spain	783	39.82%	2664	0.0046	0.0638	1.04%	2136	1.40%
Sri Lanka	17	27.27%	129	0.0066	0.0065	0.15%	129	0.03%
Sweden	3020	55.34%	3300	0.0141	0.3712	3.68%	5121	4.16%
Switzerland	1684	67.47%	2195	0.0090	0.3067	2.76%	3423	4.48%
Thailand	349	19.49%	554	0.0038	0.0085	0.22%	230	0.22%
Turkey	121	13.74%	817	0.0025	0.0119	0.56%	484	0.79%
Ukraine	13	25.00%	2885	0.0610	0.0617	0.95%	1430	0.00%
United Kingdom	6394	35.75%	18,776	0.0134	0.3177	1.78%	3444	4.33%
United States	67,235	18.75%	161,333	0.0164	0.5648	2.63%	4602	7.18%
Venezuela	12	27.27%	149	0.0013	0.0065		107	0.05%

We also consider the innovation input of acquirers and targets and collect firm-level R&D expenditures from the Worldscope. Following the same procedure for patent-based measures, we recode missing R&D values as equal to zero.[11] Summary statistics for firm-level acquirer patent applications and the difference with target patent applications are provided in Table 2.

[11] The results are also robust to treating missing R&D using the various methods noted in Koh and Reeb (2015), including replacing missing R&D observations with industry average R&D. Koh and Reeb (2015) also note that U.S. firms with missing R&D observations are significantly more innovative than firms with non-missing R&D, where innovation is proxied by firms' patenting activity.

Table 1b
Panel B: other country-level variables. This table contains other acquirer country-level variables averaged over 1990 to 2010, for each of the 57 countries in the full sample.

Acquirer Country	IP Protection	Openness	ICRG	ASDI	Stock Market Return	Currency Appreciation	Capitalization/ GDP	GDP per capita (USD)	GDP Growth
Argentina	2.38	1.04	71.59	0.34	3.34%	−2.42%	27.73%	7641.38	3.28%
Australia	3.57	1.36	81.32	0.76	7.73%	1.41%	110.48%	31568.83	3.36%
Austria	3.85	2.45	84.49	0.21	5.49%	0.47%	27.22%	33377.60	2.50%
Belgium	4.27	2.13	81.90	0.54	4.72%	−1.10%	67.88%	29147.87	2.23%
Brazil	2.08	0.23	68.84	0.27	14.51%	−0.64%	53.22%	6387.17	3.90%
Bulgaria	3.10	0.94	69.43	0.65	16.27%	0.42%	20.51%	4291.67	3.46%
Canada	3.82	2.50	84.26	0.64	8.24%	2.08%	106.90%	31531.79	2.30%
Chile	3.24	1.06	78.61	0.63	13.10%	9.82%	111.12%	7294.71	4.10%
China	2.46	−1.14	77.52	0.76	11.65%	1.78%	81.00%	2671.34	10.74%
Colombia	2.08	−0.28	63.59	0.57	22.17%	−7.55%	28.02%	3461.59	4.17%
Czech	3.55	1.62	77.73	0.33	9.71%	1.89%	29.11%	12564.41	3.78%
Denmark	4.11	2.48	86.08	0.46	8.91%	0.37%	56.32%	38223.54	1.78%
Ecuador	2.16	1.97	64.70	0.08	0.26%	9.13%	8.70%	2750.00	5.74%
Egypt	1.82	2.21	67.70	0.20	7.02%	−6.96%	60.29%	1695.09	5.77%
Finland	3.90	2.43	86.53	0.46	11.77%	−0.58%	122.11%	31712.53	2.78%
France	4.21	2.11	79.53	0.38	8.14%	0.60%	74.15%	28852.09	1.88%
Germany	4.28	2.50	83.54	0.28	6.51%	0.06%	46.21%	29259.30	1.74%
Greece	3.36	1.75	74.38	0.22	2.89%	−3.47%	75.36%	16318.18	3.07%
Hong Kong	3.09	2.50	81.50	0.96	10.70%	0.07%	380.73%	26204.13	3.97%
Hungary	3.59	1.56	74.50	0.18	19.06%	−6.92%	26.78%	9351.13	2.80%
India	1.79	−1.14	69.26	0.58	21.47%	−4.60%	72.80%	831.76	7.79%
Indonesia	1.28	1.42	65.40	0.65	7.67%	−7.18%	28.39%	1533.26	5.49%
Ireland	3.33	2.19	84.19	0.79	4.84%	−0.35%	57.12%	32862.02	5.56%
Israel	3.23	1.43	70.04	0.73	13.60%	−3.17%	71.83%	20216.01	4.55%
Italy	4.14	2.32	78.12	0.42	1.08%	−0.35%	39.84%	25619.72	1.22%
Jamaica	2.89	1.97	71.70	0.35	−0.38%	−22.79%	52.70%	5300.00	−0.54%
Japan	4.10	2.47	84.01	0.50	−1.67%	2.67%	81.18%	35072.25	0.86%
Jordan	1.47	2.50	70.37	0.16	−0.01%	4.76%	151.82%	4010.91	5.03%
Kenya	2.32	1.17	61.87	0.21	0.02%	−9.19%	30.79%	623.80	3.58%
Korea	3.50	−0.03	79.48	0.47	7.16%	−1.78%	75.35%	17075.56	3.97%
Malaysia	2.50	0.44	77.98	0.95	4.40%	−1.51%	158.55%	5037.76	5.52%
Mexico	2.08	1.05	72.91	0.17	17.96%	−9.95%	29.84%	6780.72	2.90%
Netherlands	4.29	2.50	86.03	0.20	8.81%	−0.63%	108.92%	30791.73	2.86%
New Zealand	3.05	2.50	80.16	0.95	4.45%	0.61%	38.96%	22320.62	2.67%
Nigeria	2.57	−0.72	58.74	0.43	0.19%	−15.80%	19.25%	718.36	7.20%
Norway	3.57	2.19	90.28	0.42	12.30%	0.51%	51.05%	55700.00	2.55%
Pakistan	1.47	−1.14	58.11	0.41	8.95%	−12.58%	26.93%	804.56	4.67%
Panama	2.07	2.50	72.89	0.16	−0.16%	0.67%	25.68%	5204.00	7.34%
Peru	1.79	2.47	69.82	0.45	14.50%	2.17%	47.07%	3627.61	5.41%
Philippines	2.87	0.15	69.34	0.22	7.93%	−3.53%	49.46%	1369.00	4.60%
Poland	3.08	−0.10	75.93	0.29	6.66%	1.06%	30.51%	9650.41	4.69%
Portugal	2.82	2.41	78.55	0.44	3.26%	−0.64%	40.79%	15956.07	1.78%
Romania	3.10	1.08	69.80	0.44	24.72%	−13.47%	13.09%	4348.75	5.69%
Russia	2.52	−0.20	73.33	0.44	18.66%	−10.23%	67.34%	7242.61	4.47%
Singapore	2.97	2.42	87.81	1.00	7.91%	1.28%	179.10%	27707.54	6.49%
Slovakia	2.58	0.13	74.39	0.29	0.30%	2.23%	5.97%	10180.00	4.91%
South Africa	3.28	−1.07	70.92	0.81	8.26%	−13.41%	174.52%	3905.95	2.58%
Spain	3.50	2.34	77.60	0.37	6.49%	−0.81%	79.63%	22021.07	3.03%
Sri Lanka	2.90	0.24	61.51	0.39	12.67%	−11.33%	16.17%	1181.24	5.22%
Sweden	4.04	2.36	84.95	0.33	10.38%	0.28%	104.68%	36991.56	2.54%
Switzerland	3.95	2.50	88.99	0.27	5.89%	2.42%	223.05%	46590.14	1.70%
Thailand	1.83	−0.19	71.89	0.81	8.10%	−0.62%	61.26%	2817.34	4.43%
Turkey	2.43	−0.59	61.89	0.43	10.63%	−11.11%	28.10%	7337.85	2.49%
Ukraine	2.12	−1.14	68.55	0.08	0.06%	−12.20%	29.49%	2867.62	2.90%
United Kingdom	4.28	2.50	81.34	0.95	6.67%	1.54%	134.76%	27853.62	2.68%
United States	4.73	2.48	80.35	0.65	10.12%	−0.89%	123.47%	34712.40	2.95%
Venezuela	1.98	0.04	64.35	0.09	16.52%	−25.59%	8.44%	5110.83	0.67%

3.4. Acquisition performance data and other deal-level control variables

We analyse the wealth gains from acquisitions by using the cumulative abnormal return (CAR) surrounding the announcement of the acquisition. We compute the CAR over a 7-day (−3,+3) window by using the ordinary least squares (OLS) estimation of the market model parameters over the period 10 days to 210 days before the announcement of the acquisition (as in Masulis et al., 2007), and by using the relevant country market index from DataStream. We winsorize the CARs at

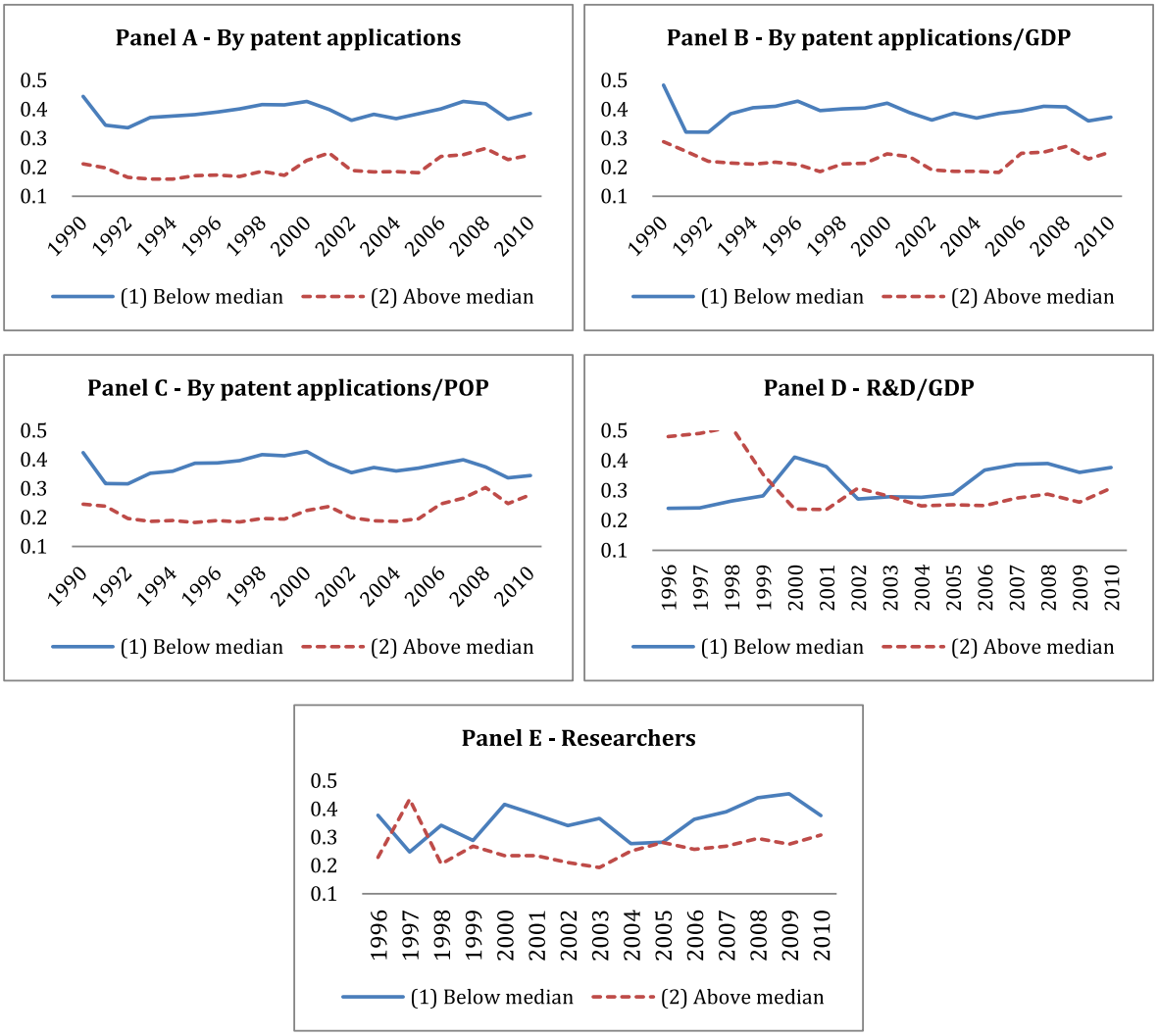


Fig. 1. Cross-border M&As over the 1990–2010 period by innovation, growth and governance measures. This figure presents the ratio of cross-border M&As to the sum of cross-border and domestic M&As in 57 countries over the 1990 to 2010 period. In each of the following panels (A to H), the full sample is divided into two groups by the median of the five country-level innovation measures.

0.5% to prevent outliers from influencing the results, which can otherwise be a concern in M&A studies (Fich et al., 2012; Moeller et al., 2005), particularly those using cross-country data.

Table 2 presents the summary statistics of all related variables at the firm and deal levels that correspond to our regression analyses. For the largest available sample, the average size of the acquirers is $44.5 billion, although this result is skewed, with the median acquirer size being $3.8 billion. This is similar to prior studies (see e.g., Faccio and Masulis, 2005). The average R&D expenditure is about 3% of total assets. An average acquirer has about 14 patents applications and receives about 19 citations for their patents in the past 5 years. For acquisition performance analysis, there are 48.6% private targets and 35.2% subsidiary targets. Also, 14.0% of the deals are settled with stock only, and 70.2% are settled with cash only. Further, 0.9% of deals have competing bidders. Of these deals, 0.3%, 56.4% and 45.8% are defined as hostile, intra-industry, and high-tech deals, respectively. An average target's size is 13.5% of the acquirer's size. On average, the acquirer CAR [−3,+3] is −0.1%, which is slightly negative.

4. Multivariate regressions

To test our hypotheses, we employ multivariate regressions to examine the unconditional and conditional relationship between innovation and cross-border takeover activity. In this section, we report our main results based on deal-level regressions that examine (1) the impact of country-level innovation on the decision to pursue a cross-border deal, (2) the

Table 2
Summary Statistics. This table contains summary statistics for firm-level and deal-level variables. Panel A contains summary statistics for regressions in Section 4.1. Panel B contains summary statistics for regressions in Section 4.2. Panel C contains summary statistics for regressions in Section 4.3.

Variables	Obs	Mean	Std Dev	25%	Median	75%
Panel A						
Acquirer R&D	85,591	0.03	0.07	0.00	0.00	0.02
Acquirer Size ($mil)	85,591	44,561	181,305	782	3882	19,464
Acquirer Stock Return	85,591	0.18	0.70	−0.13	0.15	0.47
Acquirer M/B	85,591	2.67	6.13	1.14	1.91	3.21
Acquirer Patent Applications (Past 5 years)	85,591	14.43	294.47	0.00	0.00	0.00
Acquirer Patent Citations (Past 5 years)	85,591	18.77	349.11	0.00	0.00	0.00
Panel B						
Target-Acquirer R&D	2726	0.034	0.134	−0.006	0.001	0.042
Target-Acquirer Patent Applications	7365	−10.06	122.71	0	0	0
Ln(Target Patent Applications + 1)-Ln(Acquirer Patent Applications + 1)	7365	−0.19	0.93	0	0	0
Target-Acquirer Patent Applications (Past 5 years)	7365	−46.47	555.79	0	0	0
Ln(Target Patent Applications + 1)-Ln(Acquirer Patent Applications + 1) (Past 5 years))	7365	−0.30	1.30	0	0	0
Panel C						
Acquirer CAR[−3,+3]	18,835	−0.001	0.137	−0.07	0	0.068
Relative Size	18,835	0.135	0.181	0.016	0.059	0.179
Private Target	18,835	0.486	0.5	0	0	1
Subsidiary Target	18,835	0.352	0.478	0	0	1
Stock Only	18,835	0.14	0.347	0	0	0
Cash Only	18,835	0.702	0.457	0	1	1
Competing	18,835	0.009	0.095	0	0	0
Hostile	18,835	0.003	0.055	0	0	0
Intra-industry	18,835	0.564	0.496	0	1	1
High-tech	18,835	0.458	0.498	0	0	1

use of cross-border deals to acquire targets with relatively higher levels of innovation, and (3) the wealth-effects of such deals. These regressions are cross-sectional where the unit-of-analysis is the individual deal.

In robustness tests discussed later in the paper, we also consider three alternative types of regressions using different samples following the approach:[12]

1. Cross-sectional regressions at the acquirer-country-level are used to examine the ratio of cross-border deals from acquirer country *a*. These are cross-sectional regressions where the unit-of-analysis is the acquirer's country.
2. Cross-sectional regressions at the acquirer-target country-pair level are used to examine the ratio of cross-border deals from acquirer country *a* to target country *b*. The regressions are cross-sectional, and the unit-of-analysis is at the country-pair level.
3. Panel-regressions are used to examine the ratio of cross-border deals between acquirer country *a* and target country *b* in year *t*. The sample is a panel (with country-pair/year panels).

4.1. The likelihood of a cross-border acquisition and country-level innovation

We first examine whether the innovativeness of an acquirer's country influences the likelihood that an individual deal is a cross-border one. In these models, we measure country-level variables at the acquirer-country-level. We also control for other acquirer-level factors that might influence the propensity to acquire a target overseas. These include the acquirer's size, its stock return before the takeover announcement, and its market-to-book ratio. In this analysis, we do not require that the acquisition be completed because we are interested in observing the impact of innovation on the strategies that firms attempt to pursue (whether or not they successfully undertake those strategies). The results are robust to requiring deals to be successful. Specifically, we estimate probit regressions of the following form for all M&A deals in our sample:

$$y_j = \alpha + \beta^{(1)} c_{j(a)} + \boldsymbol{z}_j \boldsymbol{\gamma} + \boldsymbol{x}_{j(a)} \boldsymbol{\theta} + \varepsilon_j \quad (1)$$

where, y_j is an indicator that equals one if the deal is cross-border, and $c_{j(a)}$ is one of the five country-level innovation measures in the acquirer's country *a* for deal *j*, including the number of patent applications, the number of patent applications scaled by GDP, the number of patent applications scaled by population, total R&D expenditure to GDP, and the intensity of

[12] We consider different types of regressions because each has advantages and disadvantages (see e.g., Erel et al., 2012). For example, a deal-level analysis allows for a finer-level examination of the role of macroeconomic innovation, while controlling for other firm-specific factors that might motivate takeover activity. However, at the deal level, there can be many confounding motivations for undertaking a deal. A country-level analysis 'averages out' these idiosyncratic deal-motivations and allows for a cleaner examination of the role of innovation (at the expense of losing detail on the individual deals). A pure country-level analysis (i.e., of cross-border deals from acquirer country *a*) will not capture the position of acquirer country *a* relative to target country *b*; hence, the acquirer-target country-pair analysis is needed. Further, to allow for time-variation in innovation and/or in the control variables, we also undertake a country-pair-year panel data analysis.

researchers in R&D. $\boldsymbol{z}_j$ is a set of acquirer-level controls including acquirer size, acquirer stock return, and acquirer market-to-book ratio. $\boldsymbol{x}_{j(a)}$ is a vector of country-level controls from the acquirer's country in deal j, including patent protection index, economic openness, ICRG composite index, stock market return, currency appreciation, stock capitalization over GDP, GDP per capita, and GDP growth. Thus, model (1) examines the impact of country-level innovation on the propensity for individual acquirers to undertake a cross-border acquisition. The models include dummy variables to control for year and industry fixed effects, which help to mitigate concerns that factors such as industry characteristics or specialization might drive takeover activity (see e.g., Fresard et al., 2017). We also use standard errors clustered by acquirer-country.[13]

Table 3 presents the results for model (1) and shows that country-level innovation is significantly and negatively related to the likelihood of pursuing a cross-border deal, consistent with the idea that acquirers from high innovation countries have less need to acquire innovation overseas. These results are also of economic significance. For example, we find that when Ln (Country Patent Applications) decreases by one standard deviation, the probability of a cross-border deal increases by 18.0%; also, when Country Patent Applications/GDP increases by one standard deviation, the probability of a cross-border deal increases by 8.2%. All these results support Hypothesis 1.

We then consider acquirers' innovativeness, as our Hypothesis 1 states that a cross-border acquisition is more likely to occur when acquirers are more innovative. Specifically, we consider the interaction between acquirer-level innovation (as proxied by the acquirer's R&D or patents) and country-level innovation, and estimate probit regressions of the following form for all M&A deals in our sample:

$$y_j = \alpha + \beta^{(1)} f_j + \beta^{(2)} I\left(c_{j(a)} < median\right) + \beta^{(3)}\left(f_j \times I\left(c_{j(a)} < median\right)\right) + \boldsymbol{z}_j\boldsymbol{\gamma} + \boldsymbol{x}_{j(a)}\boldsymbol{\theta} + \varepsilon_j \quad (2)$$

where f_j is a proxy for the acquirer's innovation (measured as R&D or patents), and $I\left(c_{j(a)} < median\right)$ is an indicator variable that equals one if the acquirer's country is below the sample median in country-level innovation.[14] Model (2) examines how country-level innovation interacts with firm-level innovation in influencing cross-border M&A propensity.

Table 4 reports the test results for model (2) using R&D expenses scaled by total assets to measure the acquirer's innovation,[15] and shows that R&D-intensive acquirers are more likely to pursue a cross-border deal if they are from a low innovation country (and conversely, are less likely to pursue a cross-border deal if they are from a high innovation country), supporting Hypothesis 1. In terms of economic significance, we find that when acquirers' R&D intensity increases by one standard deviation, acquirers from low (high) innovation countries (based on ln(Country Patent Applications)) are 3.4% (0.5%) more likely to engage in a cross-border deal. Such a difference highlights that the effect of country-level innovativeness on cross-border M&As is more pronounced among innovative acquirers, supporting Hypothesis 1.

Table 5 reports the results for model (2) based on an acquirer's patent and extends the analysis to examine the acquirer's patenting activity. We measure the acquirer's innovation by using the logarithm of one plus the number of acquirers' patents in Panel A and the logarithm of one plus the number of acquirers' citations in Panel B (details are included in the Appendix A).[16] We find that the more innovative acquirers domiciled in low innovation countries are more likely to undertake a cross-border takeover, consistent with the results in Table 4 based on acquirers' R&D input. In terms of economic significance, we find that when the acquirers' patent level increases by one standard deviation, the acquirers from low (high) innovation countries (based on ln(Country Patent Applications)) are 6.6% more (1.5% less) likely to engage in a cross-border deal. This comparison confirms that the country-level effect on cross-border M&As is more pronounced among innovative acquirers, which lends further support to Hypothesis 1.

4.2. Innovativeness of the target

This section analyses the innovativeness of the targets acquired by acquirers from relatively low innovation countries for Hypothesis 2. We start by examining whether acquirers from relatively low innovation countries use cross-border deals to acquire targets that have relatively higher R&D intensity. To do this, we compute the difference between the target's R&D/Assets and the acquirer's R&D/Assets. Requiring that the target has R&D data significantly reduces the sample size, and restricts the analysis to the acquisition of listed targets. We estimate the following regression model:

$$R\&D\ \ Diff_j = \alpha + \beta^{(1)} I\left(c_{j(a)} < median\right) + \beta^{(2)} cb_j + \beta^{(3)}\left(I\left(c_{j(a)} < median\right) \times cb_j\right) + \boldsymbol{z}_j\boldsymbol{\gamma} + \boldsymbol{x}_{j(a)}\boldsymbol{\theta} + \varepsilon_j \quad (3)$$

where *R&D Diff* denotes the target's R&D intensity (i.e., annual R&D scaled by total assets) less the acquirer's R&D intensity in deal j, cb_j is an indicator that equals one if deal j is a cross-border deal, $I\left(c_{j(a)} < median\right)$ is an indicator that equals one if the level of innovation in the acquirer's country is below the median, and zero otherwise. The main regressor is the interaction of these two indicators, which reflects the pursuit of innovative targets for cross-border acquirers in low innovation countries.

[13] In untabulated robustness tests, we obtain similar results if we use the Ai and Norton (2003) technique for obtaining standard errors in interaction terms or if we use a linear probability model estimated using ordinary least squares (per Cole et al., 2011; Puri et al., 2011). We estimate the linear probability model (LPM) using ordinary least squares (OLS) rather than weighted least squares (WLS) because the LPM model can give misleading inferences if conducted using a WLS model with inaccurate weights (Altonji and Segal, 1996).

[14] The results are robust, although less interpretable, when we use continuous country-innovation measures. The results are also robust when we examine whether the acquirer country's innovation is in the bottom half of all countries (as opposed to the bottom half of the deal-level sample).

[15] It is common in the literature to use total assets to scale R&D (e.g., Hall, 1993; Hou et al., 2016).

[16] We log-linearize the number of patents to mitigate the skewness in patent counts, following Griliches (1979) and Lerner (1994).

Table 3
Deal-level likelihood of cross-border acquisitions (continuous innovation measures). This table contains the partial effects of probit regressions that examine the likelihood that a deal is cross-border. The unit of analysis is at the deal-level. The sample is a cross-sectional sample of takeover deals. The dependent variable is an indicator that equals one if the deal is cross-border. The independent variables are at the acquirer, or acquirer-country, level (as applicable). The models are probit models and use acquirer country clustered standard errors. The models include industry and year dummies. Brackets contain p-values, and superscripts ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Column	[1]	[2]	[3]	[4]	[5]
Ln(Country Patent Applications)	−0.085***				
	(0.000)				
Country Patent Applications/GDP		−3.428**			
		(0.031)			
Country Patent Applications/Pop			−0.156***		
			(0.000)		
Country R&D/GDP				−0.140*	
				(0.064)	
Country Researchers					−0.123**
					(0.016)
IP Protection Index	0.128	−0.167**	−0.162**	−0.141	−0.120
	(0.116)	(0.032)	(0.041)	(0.201)	(0.199)
Openness Index	0.089*	0.078	0.102**	0.122**	0.126**
	(0.067)	(0.147)	(0.034)	(0.022)	(0.015)
ICRG Composite Index	0.005	0.017***	0.017***	0.016**	0.021***
	(0.191)	(0.001)	(0.000)	(0.027)	(0.004)
Anti-self-dealing Index	0.231	0.139	0.144	0.043	0.261
	(0.509)	(0.708)	(0.680)	(0.894)	(0.441)
Stock Market Return	−0.011	0.011	−0.009	0.030	0.059*
	(0.735)	(0.702)	(0.795)	(0.233)	(0.076)
Currency Appreciation	−0.002	−0.036	−0.022	0.054	−0.085
	(0.972)	(0.577)	(0.715)	(0.569)	(0.283)
ln(Capitalization/GDP)	−0.034	−0.037	−0.030	−0.009	−0.031
	(0.435)	(0.363)	(0.459)	(0.859)	(0.499)
ln(GDP per capita)	−0.075	−0.044	−0.055	−0.008	0.089
	(0.359)	(0.590)	(0.481)	(0.931)	(0.415)
GDP Growth	−0.012	−0.011	−0.020	−0.005	−0.005
	(0.339)	(0.459)	(0.166)	(0.774)	(0.745)
Acquirer Size	0.046***	0.043***	0.044***	0.041***	0.041***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acquirer Stock Return	0.009*	0.010*	0.007*	0.009	0.011*
	(0.074)	(0.058)	(0.074)	(0.105)	(0.081)
Acquirer M/B	0.002	0.002	0.002	0.001	0.001
	(0.120)	(0.121)	(0.129)	(0.264)	(0.191)
Observations	85,591	85,591	85,591	67,911	61,166
Pseudo R-squared	0.146	0.118	0.131	0.127	0.148

$\boldsymbol{z}_j$ denotes a set of firm-specific controls, and $\boldsymbol{x}_{j(a)}$ denotes a set of acquirer-country controls. The models are OLS models that include year dummies, as well as acquirer industry dummies and clustered standard errors by acquirer country.

The results are presented in Table 6. The results from the positive and (usually) significant interaction terms indicate that acquirers from relatively low innovation countries (i.e. countries with below-median innovation) use cross-border deals to acquire targets with a comparatively higher level of innovation intensity. The significantly positive coefficient on the interaction term of cb_j and $I(c_{j(a)} < median)$suggests that when an acquirer is from a low innovation country and commits to a cross-border deal, it is more likely to pursue more innovative targets. In terms of economic significance, when an acquirer is from a low (high) innovation country, its cross-border target's R&D intensity is 1.8% higher (2.0% lower) than domestic targets. The difference of 3.8% is economically substantial. This is consistent with our main argument about the use of cross-border deals to acquire innovation.

We further analyse the target's patenting activity relative to that of the acquirer and present the results in Table 7. We calculate the difference between the target's patents and the acquirer's patents and the natural log of the ratio of the target's patents to the acquirer's patents. Missing values are recoded as zeros. We construct these variables for both the prior year (of the acquisition) and for the past five years prior to the acquisition. We then estimate regressions where this relative patenting activity is the dependent variable, and include all controls as in Table 6. Results reported in Table 7 highlight that acquirers in low innovation countries tend to acquire targets that are more active in patenting than do their counterparts in high innovation countries (as indicated by the positive, and often significant, coefficient on the interaction terms). This result is consistent with the expectation that acquirers in low innovation countries would seek to acquire an innovative target overseas. Tables 6 and 7 thus collectively support Hypothesis 2.

Table 4
Deal-level likelihood of cross-border acquisitions (dummy innovation measures). This table contains the partial effects of probit regressions that examine the relationship between acquirer-level R&D, country-level-innovation, and the propensity to pursue a cross-border deal. The sample is a cross-sectional sample of takeover deals. The dependent variable is an indicator that equals one if the deal is cross-border. The independent variables are at the acquirer, or acquirer-country, level (as applicable). The models include industry and year dummies. Brackets contain acquirer country clustered p-values, and superscripts ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Column	[1]	[2]	[3]	[4]	[5]
a: Acquirer R&D	0.073	0.000	0.069	0.160	0.133
	(0.301)	(1.000)	(0.440)	(0.224)	(0.265)
b: ln(Country Patent Applications) (below median)	0.384***				
	(0.000)				
c: Country Patent Applications/GDP (below median)		0.181***			
		(0.000)			
d: Country Patent Applications/Pop (below median)			0.295***		
			(0.000)		
e: Country R&D/GDP (below median)				0.270***	
				(0.001)	
f: Country Researchers (below median)					0.281***
					(0.001)
a * b	0.488***				
	(0.000)				
a * c		0.477**			
		(0.015)			
a * d			0.414***		
			(0.001)		
a * e				0.237**	
				(0.035)	
a * f					0.434***
					(0.000)
IP Protection Index	0.011	−0.146*	−0.103	−0.144*	−0.145*
	(0.890)	(0.076)	(0.169)	(0.087)	(0.080)
Openness Index	0.086**	0.109**	0.106**	0.130**	0.153***
	(0.039)	(0.023)	(0.018)	(0.012)	(0.010)
ICRG Composite Index	−0.000	0.008	0.002	0.009	0.010
	(0.846)	(0.209)	(0.591)	(0.154)	(0.106)
Anti-self-dealing Index	0.178	0.164	0.081	0.049	0.181
	(0.474)	(0.643)	(0.772)	(0.860)	(0.521)
Stock Market Return	−0.035	0.006	0.011	0.007	−0.019
	(0.344)	(0.823)	(0.718)	(0.774)	(0.620)
Currency Appreciation	−0.080**	−0.084	−0.068	0.091	−0.126
	(0.045)	(0.197)	(0.179)	(0.234)	(0.146)
ln(Capitalization/GDP)	0.048	−0.018	−0.001	0.038	−0.006
	(0.116)	(0.677)	(0.990)	(0.392)	(0.884)
ln(GDP per capita)	−0.005	−0.027	0.006	−0.020	0.009
	(0.944)	(0.753)	(0.944)	(0.821)	(0.926)
GDP Growth	−0.002	−0.008	−0.007	−0.003	0.002
	(0.816)	(0.634)	(0.580)	(0.820)	(0.859)
Acquirer Size	0.045***	0.044***	0.045***	0.044***	0.045***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acquirer Stock Return	0.010**	0.011*	0.008*	0.008	0.008
	(0.050)	(0.075)	(0.087)	(0.201)	(0.117)
Acquirer M/B	0.002*	0.002	0.002	0.001	0.001
	(0.098)	(0.115)	(0.108)	(0.250)	(0.203)
Observations	85,591	85,591	85,591	67,911	61,166
Pseudo R-squared	0.171	0.124	0.147	0.149	0.164

4.3. Wealth effects of acquisitions

The next models examine the market's assessment of the wealth effects of these acquisitions for Hypothesis 3. We examine the cumulative abnormal returns ('CARs') around the announcement of acquisitions as defined in Section 3.4. We examine CARs from three days before to three days after the acquisition announcement (although the results are robust to wider or shorter windows, and are stronger in longer windows). We compute the CARs using an OLS estimation of the market model with parameters estimated over the period 10 days to 210 days before the acquisition announcement.[17] We interact the acquirer-level innovation variable (R&D) with indicators for whether the acquirer country's innovation is in the bottom 50%, 25%, or 10% of the sample. We only examine completed deals for which acquirer-level R&D data are available.

[17] We use total market country indices constructed by DataStream. A total market country index represents all the stocks trading in a country's stock market and can be retrieved by using "Totmk + Country code" in DataStream.

Table 5
Acquirer patent innovation, country innovation, and the likelihood of a cross-border deal. This table contains the partial effects of probit regressions that examine the relationship between acquirer-level patenting activity, country-level-innovation, and the propensity to do a cross-border deal. The sample is a cross-sectional sample of takeover deals. The dependent variable is an indicator that equals one if the deal is cross-border. The independent variables are at the acquirer, or acquirer-country, level (as applicable). The regressions include all control variables as in Table 4 (suppressed for brevity's sake) as well as industry and year dummies. Parentheses contain p-values, and superscripts ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Panel A: Acquirer innovation is Patent apps prior 5 years					
a: Acquirer Innovation	−0.009**	−0.017*	−0.011**	−0.013	−0.015**
	(0.023)	(0.098)	(0.050)	(0.103)	(0.048)
b: ln(Country Patent Applications) (below median)	0.377***				
	(0.000)				
c: Country Patent Applications/Pop (below median)		0.175***			
		(0.000)			
d: Country Patent Applications/GDP (below median)			0.288***		
			(0.000)		
e: Country R&D/GDP (below median)				0.267***	
				(0.001)	
f: Country Researchers (below median)					0.278***
					(0.001)
a * b	0.040***				
	(0.001)				
a * c		0.031**			
		(0.014)			
a * d			0.029***		
			(0.000)		
a * e				0.009	
				(0.340)	
a * f					0.016**
					(0.026)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	85,591	85,591	85,591	67,911	61,166
Pseudo R-squared	0.171	0.125	0.147	0.149	0.164
Panel B: Acquirer innovation is Patent cites prior 5 years					
a: Acquirer Innovation	0.026***	0.018*	0.023**	0.016	0.010
	(0.009)	(0.067)	(0.040)	(0.193)	(0.271)
b: ln(Country Patent Applications) (below median)	0.391***				
	(0.000)				
c: Country Patent Applications/Pop (below median)		0.183***			
		(0.000)			
d: Country Patent Applications/GDP (below median)			0.298***		
			(0.000)		
e: Country R&D/GDP (below median)				0.270***	
				(0.000)	
f: Country Researchers (below median)					0.284***
					(0.000)
a * b	0.007				
	(0.641)				
a * c		0.047***			
		(0.000)			
a * d			0.029**		
			(0.026)		
a * e				0.017	
				(0.306)	
a * f					0.017
					(0.248)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	85,591	85,591	85,591	67,911	61,166
Pseudo R-squared	0.171	0.126	0.148	0.149	0.163

We also include deal-level factors that might influence takeover returns. These include: acquirer size (Moeller et al., 2004), the acquirer's stock run-up, method-of-payment and target-incorporation status (Chang, 1998; Fuller et al., 2002), acquirer valuation (Fu et al., 2013), relative deal size, the presence of a competing bidder, deal hostility, and whether the deal is intra-industry. The following equation summarizes the model:

$$CAR_j = \alpha + \beta^{(1)} I(c_{j(a)} < median) + \beta^{(2)} f_j + \beta^{(3)} cb_j + \beta^{(4)} (I(c_{j(a)} < median) \times f_j) + \beta^{(5)} (cb_j \times f_j) + \beta^{(6)} (c_{j(a)} \times cb_j) + \beta^{(7)} (f_j \times I(c_{j(a)} < median) \times cb_j) + \boldsymbol{z_j}\boldsymbol{\gamma} + \boldsymbol{x}_{j(a)}\boldsymbol{\theta} + \varepsilon_j \quad (4)$$

where CAR_j is the acquirer's cumulative abnormal return earned around the announcement of the deal, $c_{j(a)}$ is an indicator that equals one if the country-level innovation measure of the acquirer country is below the median (and zero otherwise), f_j is the acquirer's level of innovation (proxied by its R&D), cb_j is an indicator that equals one if the deal is cross-border, $\boldsymbol{z_j}$

Table 6
Cross-border acquisitions and relative target to acquirer innovation (R&D). This table examines the relationship between cross-border deals, country-level innovation, and the innovativeness of the acquired target. The dependent variable is the difference between the target's R&D/Assets and the acquirer's R&D/Assets, as sourced from WorldScope. The independent variables are at the acquirer, or acquirer-country, level (as applicable). The sample is a cross-sectional sample of takeover deals. The OLS regressions include industry and year dummies. Brackets contain acquirer country clustered p-values, and superscripts ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

	[1]	[2]	[3]	[4]	[5]
a: Cross-border	−0.020***	−0.016*	−0.018**	−0.012	−0.014*
	(0.004)	(0.094)	(0.029)	(0.327)	(0.050)
b: Ln(Country Patent Applications) (below median)	0.004				
	(0.695)				
c: Country Patent Applications/GDP (below median)		0.008			
		(0.315)			
d: Country Patent Applications/Pop (below median)			0.008		
			(0.358)		
e: Country R&D/GDP (below median)				0.009*	
				(0.091)	
f: Country Researchers (below median)					0.006
					(0.467)
a * b	0.018***				
	(0.000)				
a * c		0.014**			
		(0.048)			
a * d			0.015**		
			(0.019)		
a * e				0.002	
				(0.862)	
a * f					0.010*
					(0.061)
IP Protection Index	−0.015	−0.014*	−0.014	−0.029**	−0.048***
	(0.113)	(0.098)	(0.122)	(0.032)	(0.009)
Openness index	0.006	0.006	0.006	0.007	0.005
	(0.176)	(0.240)	(0.296)	(0.282)	(0.338)
ICRG composite Index	−0.001	−0.001	−0.001	−0.000	−0.001
	(0.363)	(0.335)	(0.302)	(0.675)	(0.153)
Anti-self-dealing Index	0.020	0.015	0.017	0.014	0.016
	(0.256)	(0.366)	(0.306)	(0.448)	(0.369)
Stock Market Return	0.002	0.003	0.002	0.005	−0.012
	(0.834)	(0.839)	(0.884)	(0.712)	(0.471)
Currency Appreciation	−0.080***	−0.086***	−0.083***	−0.105***	−0.079***
	(0.004)	(0.002)	(0.002)	(0.002)	(0.008)
ln(Capitalization/GDP)	0.006	0.003	0.005	0.008	0.001
	(0.463)	(0.744)	(0.569)	(0.436)	(0.915)
ln(GDP per capita)	0.017*	0.018*	0.019*	0.025*	0.043**
	(0.075)	(0.079)	(0.075)	(0.064)	(0.011)
GDP Growth	0.002	0.002	0.001	0.003	0.004*
	(0.464)	(0.449)	(0.513)	(0.242)	(0.097)
Acquirer Size	0.000	0.000	0.000	0.001	0.002
	(0.996)	(0.985)	(0.977)	(0.830)	(0.557)
Acquirer Stock Return	0.009**	0.009**	0.009**	0.007*	0.010***
	(0.034)	(0.033)	(0.037)	(0.077)	(0.001)
Acquirer M/B	0.001**	0.001**	0.001**	0.000	0.001
	(0.011)	(0.012)	(0.012)	(0.207)	(0.132)
Constant	−0.108	−0.107	−0.113	−0.213*	−0.239**
	(0.166)	(0.152)	(0.148)	(0.067)	(0.037)
Observations	2,726	2,726	2,726	2,302	2,077
R-squared	0.052	0.053	0.053	0.054	0.052

represents a set of deal/acquirer level controls, and $\boldsymbol{x}_{j(a)}$ represents a set of country-level controls. We expect a positive and significant coefficient on the triple interaction term (i.e. $\beta^{(7)}$), which suggests higher stock returns for innovative acquirers in low innovation countries that engage in cross-border deals.

The results are reported in Table 8. In summary, the key result is that four (of five) triple interaction terms, $f_j \times I(c_{j(a)} < median) \times cb_j$, are positive and significant, highlighting that innovative firms in low innovation countries are expected to gain more (or at least lose less) from cross-border deals than from domestic deals. More specifically, the results indicate that acquirers who are more innovative are expected by the market to gain more when making M&As, but that this effect is reversed when they make cross-border deals, as indicated by the negative and sometimes significant double interaction terms for $cb_j \times f_j$. However, this effect is not reversed if acquirers are from low innovation as opposed to high inno-

Table 7
Cross-border acquisitions and relative target to acquirer innovation (Patents). This table analyzes innovativeness of the targets in cross-border acquisitions relative to the innovativeness of acquirers. The dependent variables denote differences (or ratios) of targets to acquirer patenting. The independent variables are at the acquirer, or acquirer-country, level (as applicable). The regressions are cross-sectional regression and include the same controls as in Table 6, including year and industry fixed effects. The sample is restricted to the set of deals involving publicly listed targets and publicly listed acquirers (so that we have patent data). Parentheses contain p-values, and superscripts ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Dependent Variable	Tgt Patents - Acq Patents	Ln(Tgt Patents + 1)-Ln(Acq Patents + 1)	Tgt Patents - Acq Patents Past 5 Years	Ln(Tgt Patents + 1)-Ln(Acq Patents + 1) Past 5 Years
Panel A				
a: Cross-border	−58.630***	−1.058***	−286.414***	−1.634***
	(0.000)	(0.000)	(0.000)	(0.000)
b: Ln(Country Patent Applications) (below median)	−18.888**	−0.104	−89.024**	−0.127
	(0.012)	(0.238)	(0.013)	(0.275)
a * b	61.207***	1.045***	299.393***	1.575***
	(0.000)	(0.000)	(0.000)	(0.000)
Controls, Year FE, Industry FE	Yes	Yes	Yes	Yes
Observations	7,365	7,365	7,365	7,365
R-squared	0.067	0.166	0.067	0.199
Panel B				
a: Cross-border	−55.902***	−0.727***	−274.814***	−1.149***
	(0.000)	(0.008)	(0.000)	(0.007)
c: Country Patent Applications/GDP (below median)	−12.102***	−0.082	−60.318***	−0.125
	(0.000)	(0.353)	(0.001)	(0.319)
a * c	61.456***	0.604***	305.539***	0.949***
	(0.000)	(0.001)	(0.000)	(0.001)
Controls, Year FE, Industry FE	Yes	Yes	Yes	Yes
Observations	7,365	7,365	7,365	7,365
R-squared	0.069	0.129	0.069	0.155
Panel C				
a: Cross-border	−61.601***	−0.838***	−302.346***	−1.310***
	(0.000)	(0.001)	(0.000)	(0.001)
d: Country Patent Applications/Pop (below median)	−11.022***	−0.086	−54.725***	−0.114
	(0.001)	(0.361)	(0.002)	(0.379)
a * d	67.234***	0.753***	332.866***	1.156***
	(0.000)	(0.000)	(0.000)	(0.000)
Controls, Year FE, Industry FE	Yes	Yes	Yes	Yes
Observations	7,365	7,365	7,365	7,365
R-squared	0.072	0.141	0.072	0.169
Panel D				
a: Cross-border	−55.123**	−0.840***	−258.494**	−1.201***
	(0.013)	(0.009)	(0.013)	(0.009)
e: Country R&D/GDP (below median)	−19.372**	−0.096	−88.024**	−0.124
	(0.013)	(0.255)	(0.012)	(0.275)
a * e	48.419**	0.645***	229.772**	0.898***
	(0.015)	(0.008)	(0.014)	(0.007)
Controls, Year FE, Industry FE	Yes	Yes	Yes	Yes
Observations	5,875	5,875	5,875	5,875
R-squared	0.069	0.143	0.065	0.155
Panel E				
a: Cross-border	−56.701***	−0.871***	−280.484***	−1.258***
	(0.008)	(0.002)	(0.008)	(0.003)
f: Country Researchers (below median)	−25.236**	−0.130*	−120.226**	−0.171
	(0.019)	(0.071)	(0.019)	(0.101)
a * f	53.884***	0.735***	270.961***	1.038***
	(0.006)	(0.001)	(0.005)	(0.002)
Controls, Year FE, Industry FE	Yes	Yes	Yes	Yes
Observations	5,262	5,262	5,262	5,262
R-squared	0.072	0.141	0.068	0.155

vation countries, as evident from the positive and significant triple interaction terms.[18] This highlights the role of innovation in motivating value-creating cross-border deals. Table 8 thus supports Hypothesis 3.

One interesting result is that the significance of the cross-border dummy varies across models, which is consistent with prior evidence that the value implications of cross-border deals depend on the nature of those deals (Conn et al., 2005; Danbolt and Maciver, 2012; Seth et al., 2002). The coefficients on the control variables are mostly consistent with expecta-

[18] In general, the coefficient of $f_j \times I(c_{j(a)} < median) \times cb_j$ is positive enough to cover the negative coefficient of $cb_j \times f_j$.

Table 8
Wealth effects of cross-border acquisitions. This table contains regressions that examine the cumulative abnormal returns around acquisitions. The sample is a cross-sectional sample of acquisition deals. We only include completed acquisitions for which acquirer-level R&D data is available. The dependent variable is the acquirer's cumulative abnormal return earned around the acquisition announcement, with returns cumulated over a 7-day (-3,+3) window, and based on a market model computed over the period 11-days to 210-days before the acquisition announcement. The independent variables are at the acquirer, or acquirer-country, level (as applicable). The OLS regressions include industry and year dummies. Brackets contain acquirer country clustered p-values, and superscripts ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Dependent Variable	CAR				
	[1]	[2]	[3]	[4]	[5]
a: Cross-border	0.004	0.007	0.005	0.007**	0.010
	(0.527)	(0.157)	(0.286)	(0.048)	(0.135)
b: Acquirer R&D/Assets	0.022	0.033	0.035	0.026	0.003
	(0.258)	(0.226)	(0.223)	(0.282)	(0.843)
a * b	−0.053**	−0.028	−0.024	−0.054*	−0.013
	(0.040)	(0.165)	(0.383)	(0.066)	(0.593)
c: Ln(Country Patent Applications) (below median)	0.059***				
	(0.010)				
b * c	−0.050*				
	(0.071)				
a * c	−0.035***				
	(0.005)				
a * b * c	0.102**				
	(0.032)				
d: Country Patent Applications/GDP (below median)		0.072***			
		(0.000)			
b * d		−0.090**			
		(0.012)			
a * d		−0.039***			
		(0.008)			
a * b * d		0.073***			
		(0.005)			
e: Country Patent Applications/Pop (below median)			0.083***		
			(0.000)		
b * e			−0.099**		
			(0.013)		
a * e			−0.041***		
			(0.003)		
a * b * e			0.079***		
			(0.004)		
f: Country R&D/GDP (below median)				0.053***	
				(0.002)	
b * f				−0.110***	
				(0.003)	
a * f				−0.032**	
				(0.015)	
a * b * f				0.155***	
				(0.000)	
g: Country Researchers (below median)					0.055***
					(0.004)
b * g					−0.035
					(0.330)
a * g					−0.034**
					(0.048)
a * b * g					0.057
					(0.322)
IP Protection Index	−0.008	−0.008	−0.002	−0.025	−0.052**
	(0.644)	(0.573)	(0.905)	(0.143)	(0.036)
Openness Index	0.020	0.009	0.008	0.009	0.016
	(0.425)	(0.621)	(0.648)	(0.699)	(0.501)
ICRG Composite Index	−0.006***	−0.006***	−0.006***	−0.005***	−0.007***
	(0.007)	(0.002)	(0.001)	(0.005)	(0.002)
Anti-self-dealing Index	−0.058	−0.063	−0.069	−0.090*	−0.082
	(0.301)	(0.219)	(0.193)	(0.068)	(0.109)
Stock market Return	0.020***	0.018**	0.014*	0.039***	0.027**
	(0.004)	(0.018)	(0.078)	(0.000)	(0.027)
Currency Appreciation	0.026*	0.009	0.012	0.053***	0.023*
	(0.089)	(0.520)	(0.396)	(0.003)	(0.091)
ln(Capitalization/GDP)	0.011	0.005	0.005	0.024	0.018
	(0.324)	(0.691)	(0.677)	(0.108)	(0.277)
ln(GDP per capita)	0.036	0.043**	0.047**	0.042	0.057*
	(0.170)	(0.035)	(0.023)	(0.137)	(0.067)

Table 8 (*continued*)

Dependent Variable	CAR				
	[1]	[2]	[3]	[4]	[5]
GDP Growth	0.010***	0.009***	0.008***	0.010**	0.011***
	(0.007)	(0.008)	(0.010)	(0.021)	(0.006)
Acquirer Size	−0.009***	−0.009***	−0.009***	−0.010***	−0.010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acquirer Stock Return	−0.010***	−0.011***	−0.011***	−0.011***	−0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acquirer M/B	−0.000**	−0.000*	−0.000*	−0.000	−0.000
	(0.048)	(0.062)	(0.060)	(0.133)	(0.298)
Relative Size	0.026**	0.027**	0.027**	0.025*	0.024**
	(0.034)	(0.047)	(0.044)	(0.076)	(0.048)
Private Target	0.012***	0.013***	0.013***	0.012***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)
Subsidiary Target	0.017***	0.016***	0.016***	0.015***	0.013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
Stock Only	−0.008***	−0.007***	−0.007***	−0.010***	−0.012***
	(0.003)	(0.002)	(0.004)	(0.001)	(0.003)
Cash Only	−0.006	−0.004	−0.004	−0.005	−0.004
	(0.405)	(0.448)	(0.458)	(0.375)	(0.442)
Competing	−0.000	−0.002	−0.002	−0.011	−0.007
	(0.994)	(0.808)	(0.859)	(0.275)	(0.513)
Hostile	−0.006	−0.003	−0.005	0.000	0.000
	(0.497)	(0.717)	(0.559)	(0.996)	(0.997)
Intra-industry	0.005**	0.005**	0.005**	0.004	0.003
	(0.027)	(0.019)	(0.020)	(0.186)	(0.276)
High-tech	0.003	0.003	0.003	0.003	0.002
	(0.347)	(0.295)	(0.322)	(0.442)	(0.583)
Constant	0.207	0.178	0.127	0.127	0.210
	(0.321)	(0.224)	(0.377)	(0.500)	(0.272)
Observations	18,835	18,835	18,835	15,234	13,726
R-squared	0.079	0.088	0.090	0.082	0.085

tions. Larger acquirers earn relatively lower CARs (as in Moeller et al., 2004). Higher-valued acquirers earn lower returns, consistent with the idea that the managers of higher-valued acquirers might use their highly valued stock to engage in self-interested deals (Fu et al., 2013). Acquisitions of unlisted targets generate higher returns (as per Faccio et al., 2006).

We also test Equation (4) by estimating probit models in which the dependent variable is an indicator that equals one if the CAR is positive. Table 9 contains the results of these models (with control variables suppressed, for brevity's sake). The main finding is that the triple interaction term is positive and significant (in most models), as in Table 8. We obtain similar results if we estimate linear probability models or use the Ai and Norton (2003) method to compute standard errors for interaction terms. Overall, these results suggest that cross-border deals can help create value for innovative firms in low innovation countries, which further supports Hypothesis 3.

4.4. Acquirers' post-deal innovation

We then examine the effect of acquirers' cross-border deals on their technology competence by examining the number of patents and R&D investments after M&A deals. Following Hypotheses 1 to 3, we expect that firms that make cross-border acquisitions and come from low innovation countries are more likely to generate more patents and invest more in R&D activities after the completion of the deal. In addition, the relation between cross-border deals and post-acquisition innovation is more pronounced when the target country is more innovative than the acquirer country, as acquirers are expected to benefit more from technology diffusion available in more innovative countries. Table 10 investigates these relations by examining acquirers' post-deal innovation (patents and R&D), conditional on deal types (cross-border or domestic), as well as by examining country innovativeness and controlling for both lagged innovation and other firm characteristics, based on a sample of all M&A deals.

We consider two measures for acquirers' post-deal innovation as the dependent variable: we use the natural log transformed total number of acquirer patent applications in the next two years after the completion of a deal in Panel A, and the average R&D ratio (i.e., R&D expenditures scaled by total assets) in the next two years after the completion of a deal in Panel B. To control for the persistence in these two innovation measures, we include the total number of patent applications and R&D ratio in year *t*.

We then design several dummy variables for deal types (cross-border or domestic) and country innovativeness as follows. In columns 1, 3, 5, 7, and 9 of both panels, we use three dummy variables: *Low Cross-border,* which equals one if a cross-border deal is made by an acquirer from a lower-than-median innovativeness country; *High Cross-border,* which equals

Table 9
Logit models predicting likelihood of a value-creating deal. This table contains probit regressions that examine the determinants of whether a deal earns positive cumulative abnormal returns (CARs). The sample is a cross-sectional sample of acquisition deals. We only include completed acquisitions for which acquirer-level R&D data is available. The dependent variable is an indicator for whether the acquirer's cumulative abnormal return earned around the acquisition announcement is positive, with returns cumulated over a 7-day (-3,+3) window, and based on a market model computed over the period 11-days to 210-days before the acquisition announcement. The independent variables are at the acquirer, or acquirer-country, level (as applicable). The models include industry and year dummies and control variables from Table 8 (unreported). Brackets contain acquirer country clustered p-values, and superscripts ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

	[1]	[2]	[3]	[4]	[5]
a: Cross-border	0.009	0.007	0.018	0.015*	0.027**
	(0.572)	(0.662)	(0.181)	(0.093)	(0.024)
b: Acquirer R&D/Assets	0.024	0.026	0.036	0.066	−0.006
	(0.528)	(0.660)	(0.502)	(0.231)	(0.832)
a * b	−0.280***	−0.179***	−0.265***	−0.228**	−0.242***
	(0.000)	(0.005)	(0.001)	(0.018)	(0.000)
c: Ln(Country Patent Applications) (below median)	0.197***				
	(0.000)				
b * c	−0.235*				
	(0.050)				
a * c	−0.134***				
	(0.005)				
a * b * c	0.511**				
	(0.027)				
d: Country Patent Applications/GDP (below median)		0.205***			
		(0.000)			
b * d		−0.195***			
		(0.001)			
a * d		−0.109**			
		(0.031)			
a * b * d		0.294**			
		(0.022)			
e: Country Patent Applications/Pop (below median)			0.231***		
			(0.000)		
b * e			−0.250***		
			(0.000)		
a * e			−0.152***		
			(0.003)		
a * b * e			0.470**		
			(0.018)		
f: Country R&D/GDP (below median)				0.147***	
				(0.001)	
b * f				−0.366***	
				(0.000)	
a * f				−0.100**	
				(0.037)	
a * b * f				0.521***	
				(0.004)	
g: Country Researchers (below median)					0.138***
					(0.004)
b * g					−0.042
					(0.526)
a * g					−0.122**
					(0.019)
a * b * g					0.378**
					(0.032)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	18,833	18,833	18,833	15,231	13,723
Pseudo R-squared	0.039	0.041	0.041	0.039	0.039

one if a cross-border deal is made by an acquirer from a country with innovativeness above the median; and *High Domestic*, which equals one if a domestic deal is made by an acquirer from a country with innovativeness above the median. We find that the coefficients on *Low Cross-border* are significantly positive in all related columns in Panel A and in columns 1, 3, and 5 in Panel B. [19]In addition, the coefficients on *Low Cross-border* are higher than those on *High Cross-border* and *High Domestic*. These findings offer general support to our first proposition that firms that come from low innovation countries and make cross-border deals are more likely to generate more patents and invest more in R&D activities after deal completion.

[19] The R-squares of all models in this table are very similar because (i) our main explanatory variables are dummies based on different country-level innovation measures, and the subsample composition based on different country-level innovation measures does not change much; and (ii) our dependent variables (R&D and patents) are zero for most firms.

Table 10
Acquirers' Post-deal Innovation. This table analyzes the innovativeness of the acquirer after completion of a deal. The dependent variables in Panel A and Panel B are the natural log transformed total number of acquirer patent applications and average R&D ratios in the next two years after the completion of a deal, respectively. Deals are separated into a few groups based on the innovativeness of acquirer (and target) countries and whether the deal is cross-border or domestic. The innovativeness of the country-level effect (country-level innovation) is measured by five variables at the country level: ln(Patent Applications), Patent Applications/GDP, Patent Applications/Pop, R&D/GDP, and Researchers. *Low Cross-border* is a dummy variable that equals one if a cross-border deal is made by an acquirer from a lower-than-median innovativeness country. *High Cross-border* is a dummy variable that equals one if a cross-border deal is made by an acquirer from a higher-than-median innovativeness country. *High Domestic* is a dummy variable that equals one if a domestic deal is made by an acquirer from a higher-than-median innovativeness country. *Higher Relative Innovation* is a dummy variable that equals one if the innovativeness of the acquirer country is higher than that of the target country. *Lower Relative Innovation* is a dummy variable that equals one if the innovativeness of the acquirer country is lower than that of the target country. The regressions are cross-sectional and include the same controls as in Table 8, including year and industry fixed effects. The sample is restricted to the set of completed deals involving publicly listed acquirers (so that we have patent data). Parentheses contain p-values, and superscripts ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Panel A: The natural log transformed total number of post-acquisition patent applications as the dependent variable

Country-level Innovation	(1) ln(Patent Applications)	(2)	(3) Patent Applications/GDP	(4)	(5) Patent Applications/Pop	(6)	(7) R&D/GDP	(8)	(9) Researchers	(10)
Low Cross-border	0.043***		0.043***		0.048***		0.044***		0.041***	
	(0.014)		(0.009)		(0.011)		(0.013)		(0.012)	
High Cross-border	0.019		0.037***		0.013		0.040*		0.035*	
	(0.025)		(0.014)		(0.017)		(0.023)		(0.019)	
High Domestic	0.017		0.031**		0.016		0.035		0.032*	
	(0.021)		(0.013)		(0.017)		(0.021)		(0.016)	
Lower Relative Innovation		0.028*		0.016*		0.030***		0.005		0.006
		(0.014)		(0.009)		(0.011)		(0.013)		(0.015)
Higher Relative Innovation		0.011		0.016*		0.010		0.011		0.005
		(0.008)		(0.008)		(0.008)		(0.008)		(0.007)
Acquirer Patent (t)	1.127***	1.127***	1.127***	1.127***	1.127***	1.127***	1.127***	1.128***	1.127***	1.128***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Acquirer R&D (t)	−0.043	−0.042	−0.043	−0.040	−0.042	−0.043	−0.043	−0.037	−0.041	−0.037
	(0.036)	(0.035)	(0.034)	(0.034)	(0.035)	(0.036)	(0.034)	(0.033)	(0.034)	(0.033)
Controls, FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,050	17,050	17,050	17,050	17,050	17,050	17,050	17,050	17,050	17,050
R-squared	0.888	0.888	0.888	0.888	0.888	0.888	0.888	0.888	0.888	0.888

Panel B: Post-acquisition R&D ratio as the dependent variable

Country-level Innovation	(1) ln(Patent Applications)	(2)	(3) Patent Applications/GDP	(4)	(5) Patent Applications/Pop	(6)	(7) R&D/GDP	(8)	(9) Researchers	(10)
Low Cross-border	0.004**		0.004***		0.003*		0.002		0.001	
	(0.002)		(0.001)		(0.002)		(0.002)		(0.001)	
High Cross-border	0.002		0.002		0.003		0.004		0.003	
	(0.002)		(0.002)		(0.002)		(0.003)		(0.003)	
High Domestic	−0.000		−0.001		−0.000		−0.001		−0.002	
	(0.003)		(0.003)		(0.003)		(0.003)		(0.002)	
Lower Relative Innovation		0.005***		0.004**		0.005***		0.005***		0.003
		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)
Higher Relative Innovation		0.002		0.003		0.002		0.003		0.004*
		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)
Acquirer Patent (t)	0.001*	0.001	0.001*	0.001*	0.001*	0.001	0.001**	0.001*	0.001*	0.001*
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acquirer R&D (t)	0.610***	0.610***	0.609***	0.610***	0.610***	0.609***	0.610***	0.610***	0.610***	0.610***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Controls, FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,050	17,050	17,050	17,050	17,050	17,050	17,050	17,050	17,050	17,050
R-squared	0.542	0.543	0.543	0.542	0.542	0.543	0.543	0.543	0.543	0.543

In columns 2, 4, 6, 8, and 10 of both panels in Table 10, we use two dummy variables: *Lower Relative Innovation,* which equals one if the innovativeness of the acquirer country is lower than that of the target country; and *Higher Relative Innovation,* which equals one if the innovativeness of the acquirer country is higher than that of the target country. We find that the coefficients on *Lower Relative Innovation* are significantly positive in columns 2, 4, and 6 in Panel A, as well as in columns 2, 4, 6, and 8 in Panel B. In addition, the coefficients on *Lower Relative Innovation* are higher than those on *Higher Relative Innovation*. These findings support the second proposition in this subsection: that firms making cross-border deals for targets in more innovative countries benefit more from technology diffusion and thus generate more patents and invest more in R&D activities.

All results presented in Table 10 collectively support the positive influence of cross-border M&As on firms' technology competence. The pattern that firms from low innovation countries produce more patents and invest more in R&D after they acquire targets in high innovation countries is consistent with the innovation motive we propose.

4.5. Robustness tests

We undertake several tests to ensure that the results are robust to model specifications and sample construction concerns. These tests include undertaking analyses at the acquirer country, country-pair, and country-pair-year level. These go along the lines of a gravity model, such as those used to analyse flows of imports between countries. Because our innovation measures are time-varying, we can include relevant country or country-pair fixed effects, and still report the innovation measures' coefficients.

4.5.1. Acquirer-country analysis

We first test whether low innovation in the home country encourages cross-border takeovers. The first tests do this at the acquirer country level. To do this, we construct the proportion of all takeovers done by acquirers in country *a* that are cross-border over the whole sample period (which we call y_a). We next undertake tobit regressions to analyse the relationship between country-innovation and cross-border takeover activity. We use tobit (rather than OLS) because the dependent variable is bounded between zero and one.[20] The unit-of-analysis in this regression is the acquirer country (giving 57 overall observations in the regression). The explanatory variable, country-level innovation, is the time-series average of one (out of five) innovation measure of each country. Related variables are also controlled for in the regression.

The regression results are in the Online Appendix, Table OA1. We find that the proportion of cross-border acquisitions is lower in more innovative countries, as the coefficients of country-level innovation are significantly negative in general. This finding holds across four of our five innovation proxies, with those four having a 5% statistical significance. Put differently, in lower innovation countries, a relatively higher proportion of acquirers undertake cross-border deals (as compared to acquirers in higher innovation countries), which supports Hypothesis 1.

4.5.2. Country-pair analysis

We next analyse the flow of takeover activity between two countries. We do this by constructing the variable y_{ab}, which we define as the proportion of deals (over the whole sample period) by acquirers in country *a* of targets in country *b* scaled by the total number of deals completed by acquirers in country *a*. We then run a regression to analyse how differences in innovation between those countries influence takeover flows. The explanatory variables are the differences in the average level of innovation over the whole sample period. We construct the control variables similarly. Because the dependent variable is bounded between zero and one, we use a tobit model.

The results are provided in Table OA2. The coefficients on the innovation-difference variables are negative and significant for all innovation-proxies. This implies that firms in low (high) innovation countries are more (less) likely to acquire targets in high (low) innovation countries. This is consistent with Hypothesis 1. The result suggests that firms in relatively low innovation countries are more likely to undertake cross-border M&As in order to acquire innovation, whereas firms in high innovation countries have less need to do so.

4.5.3. Country-pair panel data analysis

We next use a panel data approach to allow for time-variation in the number of cross-border deals and in the control variables. We do this by looking at the proportion of all deals done by acquirers in country *a* that are for targets in country *b* in a given year. In this regression, our innovation variables are the differences in innovation between country *a* and *b* in that year. We construct the control variables similarly.[21]

The results are in Table OA3. The key result is that the coefficients for the five country-level innovation measures are negative and statistically significant. This result suggests that acquirers in higher innovative countries are significantly less likely to acquire targets in low innovation countries. Conversely, acquirers in less innovative countries are significantly more likely to acquire targets in high innovation countries. These results support Hypothesis 1.

4.5.4. Other robustness tests

We take several steps to mitigate econometric concerns. For brevity's sake, some of the robustness results are untabulated but are available upon request.

Endogeneity concern: Though we have controlled for as many country-level variables that may affect the tendency to complete cross-border M&As as possible, it is still possible that our results are driven by something else other than country-level innovation. To address this issue, we apply instrumental variable analyses to our baseline model. Following Acemoglu et al. (2001), we use the mortality rate of Europeans in their colonies as an instrumental variable to country-

[20] The results are also robust to using an OLS regression instead of a tobit regression.

[21] We use the same set of control variables as in the foregoing analysis (though we now examine the differences between the acquirer's country and the target's country in each year, as opposed to over the whole sample). However, since the anti-self-dealing index is time-invariant, we omit it in the panel analysis.

level innovation. Acemoglu et al. (2001) argue that Europeans set up different institutional policies in different colony countries due to different mortality rates in those countries. We expect that a country's innovativeness may also be determined by the mortality rate faced by Europeans. Thus, we use the morality rate as an instrumental variable for the innovativeness of a country. In the first stage, the mortality rate is negatively and significantly related to each of the country-level innovation measures. In the second stage, country-level innovation measures instrumented by mortality rate and acquirer controls are negatively and significantly related to the tendency to do cross-border deals. These results are reported in Table OA4 and are consistent with our baseline tests.

***Sample composition**:* The deal-level results are robust to sample-construction issues. They are robust to the definition of takeover returns, using shorter event-horizons (i.e. 3-day or 5-day event-periods) and longer event periods (i.e. 11-day event periods). The results are also qualitatively similar whether the CARs-regressions (i.e. Table 8) are based on the sample of completed deals, whether they are both completed and withdrawn deals, whether the set of acquirers have non-missing R&D data, whether the set of all acquirers with missing R&D data are replaced with a zero-value, and whether CARs are winsorized at 1% on both sides. When we use industry-adjusted measures of R&D, as opposed to firm-level measures, our findings do not change.

Sample period selection: Our results may be driven by a particular sample period selection. To alleviate this concern, we first apply similar sample selection criteria in the paper and review SDC data to identify the proportion of cross-border deals from 1990 to 2019. We find that the ratio of cross-border deals by total value or total number since 2010 does not change dramatically over time. We also carry out another set of robustness tests by splitting the full sample into the pre-2003 period (i.e., 1990–2002) and the post-2002 period (2003–2010), and repeat our main analyses for these two subsample periods separately. We choose 2002 so that the two subsample periods have a similar number of observations. Though the sample size for each subperiod is smaller and, in turn, may weaken the statistical power of the tests, we find that for each subsample period, our findings remain qualitatively similar to those in the full sample. We cautiously conclude that the main conclusions in our study are not sensitive to different sample periods and are generalizable across different sample periods.

***Systematic differences and sample selection issues**:* The deal-level (i.e. CARs) results are qualitatively robust to addressing concerns about systemic differences between cross-border acquirers and domestic acquirers. One potential concern is that cross-border acquirers might be larger companies and might be systemically different from domestic acquirers. We address this in two ways.

The first method uses a propensity score matching approach. We adopt a radius-type propensity score matching method (Caliendo and Kopeinig, 2008; Dehejia and Wahba, 2002). First, we estimate a probit model to predict the likelihood that a particular deal is cross-border (as a function of the control variables in Table 4). Second, we obtain the propensity scores from this model and construct a distribution of propensity scores for the set of cross-border deals. We obtain the scores that mark the 5th percentile and 10th percentile of this distribution. Third, we check that the results are robust to excluding any non-cross-border deal whose propensity score is below this 5th percentile or below the 10th percentile. The results are qualitatively similar to taking this approach. We report the results in the Online Appendix, Table OA5. The main finding is that the core results (i.e. the triple interaction terms) remain positive and significant as in the baseline models.

The second method uses a weighting approach (Busso et al., 2014). In this approach, we estimate the same first-stage probit model as above. We then compute the weighting variable as $Weight = Cross\text{-}border + (1\text{-}Cross\text{-}border) \times \Pr(Cross\text{-}border)/(1 + \Pr(Cross\text{-}border))$, where Cross-border represents an indicator that equals one if the deal is cross-border and $\Pr(Cross\text{-}border)$ represents the probability that the deal is cross-border from the first-stage model. We report the results in the Online Appendix, Table OA6. The key result is that the triple interactions are positive and significant in these models, as in the main reported regressions.

***Additional interactions in firm-level models**:* One concern is that the interaction terms involving the acquirer's R&D may simply reflect an interaction with other bidder-level variables. However, in untabulated robustness tests, we find that the core results are qualitatively similar if we also control for the interaction of the acquirer's R&D with other control variables.

***Change in corporate risk**:* An additional concern is that the higher CARs attributable to the deals arise because of an increase in corporate risk in the acquirer. To mitigate this concern, we re-compute CARs by using a beta obtained from the post-acquisition period (11 days to 210 days after the acquisition), which would capture any increase in risk. The results (untabulated) are qualitatively similar when using these CARs.

***U.S. firms**:* The results are robust in ensuring that no individual country dominates the sample. One concern with the deal-level results is that countries with a significant number of acquirers (i.e. the U.S.) might dominate the sample. A priori, this is unlikely to bias the results, given that the deal-level results are consistent with country-level results, which would not be biased by the number of deals in an individual country (as each country counts for one observation in those models). Nonetheless, we also ensure that the deal-level results are robust to omitting acquisitions by firms based in the U.S.

Large versus small economies: In countries with larger economies, such as Germany, Japan, the UK, and the US, firms, on average, are less constrained and so could more easily invest in domestic acquisitions, while firms in smaller economies (e.g., Peru, Denmark, Greece) would likely face greater constraints, on average. This raises the potential for the results to stem from mechanical relations in the sample. Since countries with larger (smaller) size may face less (greater) domestic acquisition constraints, we further exclude 25% of the observations at both sides of the sample based on GDP, and obtained qualitatively similar results. This suggests that countries with larger or smaller economies do not drive our results.

***Europe**:* One concern is that firms in European countries are subject to similar regulations and operate within a common market; as a result, cross-border deals between European countries are distinguishable from those between other countries.

Nonetheless, the results are qualitatively similar if we omit from our sample observations for which both the target and the acquirer are based in the EU.

***Sovereign governance measures**:* The results are robust when we use different measures of sovereign governance. The reported models include the anti-self-dealing index, the openness index, and the ICRG composite risk index. The results are also robust when we use the anti-director-rights index, and its revised version in Spamann (2010).

***Deal size**:* One concern, especially with the deal-level regressions, is that small acquisitions bias the sample. It is not clear, ex-ante, whether and in what direction this might bias the results. Nonetheless, we find that our results are qualitatively similar if we omit deals with transaction value below USD 1 m or where the transaction value is under 1% of the acquirer's market capitalization. For brevity's sake, we do not report all the results, and instead report in the Online Appendix the main deal-level results: regressions predicting the likelihood of a cross-border deal (Table OA7); regressions analysing the determinants of acquirer CARs (Table OA8); and regressions looking at the relative innovativeness of the target in terms of patents (Table OA9). The results are similar to those reported in the foregoing regressions.

5. Conclusion

In this paper, we focus on one particular channel through which firms develop their technology competence and pursue innovation opportunities: cross-border mergers and acquisitions (M&As). Cross-border M&As could be an efficient way for firms to gain access to knowledge and technologies in other countries, and have become increasingly common due to not only a surge of emerging economies, but also reduced barriers to international business activities.

Our empirical analyses based on 85,591 M&A deals suggest that acquiring innovation is an important driver of cross-border M&As, and that innovation-driven, cross-border M&As strengthen acquirers' technology positions. Acquirers in low innovation countries are more likely to engage in cross-border M&As. Innovative firms in low innovation countries also tend to pursue cross-border deals with targets that have relatively higher levels of innovation. Further, innovative acquirers in low innovation countries generate significantly higher stock returns from cross-border deals than from domestic deals. This result suggests that such deals can generate value-creating growth opportunities, and supports significant returns to this type of foreign direct investment. Last, firms from low innovation countries produce more patents and invest more in R&D after they acquire targets in high innovation countries. Overall, our results contribute to the literature by highlighting the increasingly important role of cross-border M&As in firms' innovation strategies.

CRediT authorship contribution statement

Po-Hsuan Hsu: Conceptualization, Methodology, Data curation, Writing - review & editing. **Peng Huang:** Conceptualization, Methodology, Formal analysis, Data curation, Writing - review & editing. **Mark Humphery-Jenner:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. **Ronan Powell:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing.

Appendix A. Variable definitions

This table provides definitions and data sources for country-level and acquirer- and deal-level variables used in the regressions. Independent variables are measured in the year before deal announcement dates. In country-pair examinations, country variables are measured as the difference between an acquirer and its target country.

Variables	***Definition***
Panel A: Country-level Variables	
Cross-border	Dummy variable that equals 1 if the acquirer and target country differ, and 0 otherwise. (SDC)
Cross-border ratio (Acquirer)	The percentage of all cross-border M&As to the sum of all cross-border and domestic M&As made by the acquirer country from 1990 to 2010. (SDC)
Cross-border ratio (Country pairs)	The percentage of all cross-border M&As between acquirer country A and target country B to the sum of this number and the domestic M&As made by acquirer country A from 1990 to 2010. (SDC)
Cross-border ratio (Annual pairs)	The percentage of all cross-border M&As between acquirer country A and target country B to the sum of this number and the domestic M&As made by acquirer country A in year t. (SDC)
Country Patent Application	There are three patents based on proxies for country-level innovation activity: natural logarithm of patent application, patent application divided by GDP and patent application divided by population. Patent application is the total number of resident

Variable definitions (*continued*)

Variables	*Definition*
	patent applications in the year. (World Bank). All patent data is provided at country level (not the firm level)
Country R&D/GDP	Patent application divided by GDP Current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including the knowledge of humanity, culture, and society, as well as the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development. Data is provided at the country level. (World Bank)
Country Researchers.	The number of professionals (per million population) engaged in the conception or creation of new knowledge, products, processes, methods, or systems and in the management of the projects concerned. Postgraduate PhD students engaged in R&D are included. Provided at the country level. (World Bank)
IP Protection Index	The most recent patent rights index of a country in a year, obtained from Ginarte and Park (1997) and Park (2008)
Capitalization/GDP	Also known as market value, is the sum of share price times the number of shares outstanding for listed domestic companies excluding investment companies, mutual funds, or other collective investment vehicles, divided by gross domestic product in the year. (World Bank)
GDP per capita	The natural logarithm of gross domestic product divided by midyear population in current US$. (World Bank)
GDP Growth	Annual percentage growth rate of GDP at market prices based on constant local currency. (World Bank)
Openness Index	An index measuring a country's degree of capital account openness. Lower value of the openness index implies more restrictions on cross-border financial transactions. (Chinn and Ito, 2006)
Composite Risk Rating	An overall measure of a country's risk, which equals 50%*political risk rating + 25%* (financial and economic risk ratings). Political risk rating is a measure of the political stability of the countries covered by ICRG on a comparable basis. Economic risk rating is a measure of a country's current economic strengths and weaknesses. Financial risk rating is a measure assessing a country's ability to pay its way, particularly a country's ability to finance its official, commercial, and trade debt obligations. A country's risk is lower when the value of this variable is higher. (ICRG)
Anti-self-dealing Index (ASDI)	A survey-based measure of the legal protection of minority shareholders against expropriation by corporate insiders. (Djankov et al., 2008)
Currency Appreciation	The annual percentage change of real effective exchange rate in the year before the M&A announcement. It is calculated from world exchange rate data drawn from DataStream
Stock Market Return	The annual percentage change of stock market valuation in the year before the M&A announcement. It is calculated from world stock market data drawn from DataStream
Geographic Distance	The natural logarithm of the weighted average distance in kilometers between major cities of two countries (CEPII). Reported as kilometers in Table 2
Same Official Language	Dummy variable equal to 1 if the official language between the acquirer and target country is the same, and 0 otherwise. (CEPII)
Panel B: Acquirer- and Deal-level Variables	
Acquirer Size	Natural log of acquirer total asset value in the year before the M&A announcement, in million USD (WorldScope)
Acquirer M/B	Market-to-book ratio, a proxy for the firm's growth opportunity. (WorldScope)
Acquirer Stock Return	Annual stock return in the year before the M&A announcement. (WorldScope)
Acquirer(Target) R&D	R&D expenditure divided by total assets (WorldScope). We recode missing R&D values as equal to zero
Patent Applications	The number of patent applications filed by the acquirers over the past five years
Patent Citations	The number of forward citations that are made by other patents granted by the end of 2012 and that are received by the acquirer's patents over the past five years
Relative Size	Deal value divided by acquirer total assets, in US$. (SDC and WorldScope)
Private Target	Dummy variable that equals 1 if the target is a private company, and 0 otherwise. (SDC)

(*continued on next page*)

Variable definitions (*continued*)

Variables	*Definition*
Subsidiary Target	Dummy variable that equals 1 if the target is a subsidiary, and 0 otherwise. (SDC)
Stock Only	Dummy variable that equals 1 if the deal is paid with only stock, and 0 otherwise. (SDC)
Cash Only	Dummy variable that equals 1 if the deal is paid with only cash, and 0 otherwise. (SDC)
Completed	Dummy variable that equals 1 if the deal is completed, and 0 otherwise. (SDC)
Competing	Dummy variable that equals 1 if there are competing bids for the same deal, and 0 otherwise. (SDC)
Hostile	Dummy variable that equals 1 if the deal is hostile, and 0 otherwise. (SDC)
Intra-industry	Dummy variable that equals 1 if the acquirer and target are from the same industry based on two-digit primary SIC, and 0 otherwise. (SDC)
High-tech	Dummy variable that equals 1 if the acquirer and target are from the high-tech industry as defined by SDC, and 0 otherwise. (SDC)
Acq Patent App - Country Ave Patent App (Past 1 yr)	The acquirer's patent applications less the country average patent applications over the past year. Missing values are recorded as zeros
ln*(Acq Patent App (Past 1 yr) + 1)* - ln*(Country Ave Patent App (Past 1 yr) + 1)*	The natural log of an acquirer's patent applications less the natural log of the country average patent applications over the past year. Missing values are recorded as zeros
Acq Patent App - Country Ave Patent App (Past 5yrs)	The acquirer's patent applications less the country average patent applications over the past five years. Missing values are recorded as zeros
ln*(Acq Patent App (Past 5yrs) + 1)* - ln*(Country Ave Patent App (Past 5yrs) + 1)*	The natural log of an acquirer's patent applications less the natural log of the country average patent applications over the past five years. Missing values are recorded as zeros

Appendix B. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jimonfin.2020.102320.

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