Peer R&D disclosure and corporate innovation: Evidence from U.S. cross-listed firms

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Abstract:

Studying the effect of R&D disclosures on innovation by peer firms in an industry can specify the information externalities of peer R&D disclosures. A sample of foreign firms cross-listed on U.S. exchanges (American Depositary Receipts [ADRs]) provides the setting for studying a richer peer R&D disclosure environment. The findings reveal that R&D disclosures by ADRs spur innovation for industry peers in the U.S. market, and the effect varies with the home country's legal protection systems and disclosure environments. The results hold even after controlling for endogeneity, using propensity matched samples or first-time ADR R&D disclosers in the focal setting. Cross-sectional analyses indicate that the externalities are more pronounced in industries or firms that rely more on external financing and firms subject to higher financial constraints; disclosures of higher quality appear to promote innovation by ameliorating financing frictions. Overall, this study provides evidence of a market-wide determinant of innovation, thereby contributing to literature on the real effects of peer disclosures.

JEL classifications: O32; G30; M41; G15

Keywords: Research & Development, Peer-Firm Disclosures, Innovation, Cross-Listing

1. Introduction

An emerging research stream addresses the effect of peer disclosures on real corporate decisions (Badertscher et al. 2013; Beatty et al. 2013; Durnev and Mangen 2009), with an underlying assumption that a firm's disclosures provide information about the future cash flows of related firms in the same industry. Such information then may generate externalities for the related firm, enabling it to infer a project's likely payoffs and thus prioritize projects with more positive net present values. We attempt to extend this stream of literature by focusing on a specific type of disclosure, namely, research & development (R&D) disclosures, and their impact on corporate innovation.

In particular, peer disclosures about innovative activities may enable a focal firm to learn about potential new product success rates and future expected cash flows. Even if disclosure by a single firm offers only limited information, in the aggregate, this information enriches the information environment and thus may spur innovation. When more peer R&D disclosures are disseminated in the industry, the firm's assessment of information risks and expected future cash flows improves, which should facilitate more efficient R&D by that firm. Such input is critical, because R&D disclosures are widely underreported. Full expensing of R&D under current U.S. generally accepted accounting principles (GAAP) leads to this underreporting, which can mask firm performance. Furthermore, firms tend to withhold such information to keep proprietary information away from competitors. For example, with a sample of Compustat firms from 1980 to 2006, Koh and Reeb (2015) find that only 58% of firm-year observations have non-missing R&D expenditures, and the average ratio of R&D spending to total assets is 7.3%. Yet non-R&D disclosers file approximately 14 times more patent applications, implying that these innovative firms in particular tend to underreport their R&D. Collectively then, the information environment for R&D disclosures is weak.

We investigate a sample of foreign firms cross-listed on U.S. exchange markets (American Depositary Receipts [ADRs]) to construct our measure of the peer R&D information environment. This setting offers two primary advantages. First, disclosures of foreign cross-listed firms enrich the information environment of the U.S. market, because a foreign firm's decision to cross-list on U.S. exchanges is associated with increased levels of subsequent disclosures. As Bailey et al. (2006) show, earnings announcements by cross-listed firms correlate with higher absolute returns and volume reactions, suggesting investors' more positive perception of such announcements. This evidence also is consistent with research that investigates why firms decide to cross-list on the U.S. market. A bonding hypothesis posits that these firms commit to increased disclosure and scrutiny to comply with U.S. regulations (Coffee 1999, 2002; Stulz 1999); a liquidity hypothesis instead argues that they likely release more disclosures to attract capital in U.S. markets (Merton 1987; Stulz 1981). Exploring disclosure environments, Entwistle (1999) also shows that cross-listing status increases the amount of R&D disclosures in annual reports (proxied by the number of sentences). Notably, the R&D expenditures of cross-listed firms in our sample account for 23.8% of R&D spending by all firms operating in the same industry. Thus, the presence of ADR firms likely is accompanied by more transparent R&D disclosures, which enrich the peer R&D information environment.

Second, the R&D disclosures of foreign cross-listed firms are subject to U.S. regulatory scrutiny but also are shaped by home country institutions, so we can study externalities of R&D disclosures produced under varied legal and disclosure requirement systems in distinct financial markets. Hsu et al. (2014) demonstrate that financial market development affects technological innovation; a strong financial market helps ameliorate financing frictions and lower the cost of external financing. Thus, financial markets should affect each firm's reporting incentives and disclosure quality, and equity cross-listings in the United States cannot completely offset the agency conflicts associated with weak home country institutions (Ball et al. 2018; Lang et al. 2006; Leuz 2006). As such, monitoring mechanisms in the home country market should affect the externalities of the information disseminated in the U.S. market.

Therefore, we start by examining whether R&D disclosures by foreign cross-listed firms affect U.S. peer firms' innovation. To measure the quantity of R&D information disseminated by foreign cross-listed firms, we calculate the percentage of R&D expenditures reported in that industry. Specifically, we retrieve a sample of 382 ADR firms from Compustat North America, representing 33 countries, from 1990 to 2010.[1] We divide the aggregate R&D from these ADRs by the aggregate R&D from all firms in the same industry based on two-digit standard industrial classifications (SIC). A higher ratio implies a better information environment for R&D investments in the industry; the cross-listed firms engage in more R&D-driven innovations and release more R&D-related information. This analysis reveals that U.S. industry peers invest more in R&D when ADR firms make more R&D disclosures. Using patent-based innovation measures, we also document that R&D disclosures by foreign cross-listed firms generate positive spillover effects on U.S. industry peers' innovation quality.

In turn, we investigate whether the externalities of R&D disclosures from foreign cross-listed firms vary with the home country institutions. To capture disparity in these institutions, we focus on legal investor protection systems and their disclosure requirements, in line with evidence that the character of legal rules and law enforcement influence the nature and

[1] We set the sample period based on the availability of patent and citation information in the Google Patents database following prior literature (Kogan et al. 2017).

effectiveness of financial systems (La Porta et al. 1998, 2002, 2013). Legal enforcements affect the development of financial markets, so we expect that information externalities vary with legal enforcement systems, and we conduct a series of cross-sectional analyses to test this prediction.

First, we examine whether home country legal investor protection systems affect R&D production and its information externalities by classifying foreign cross-listed firms as domiciled in countries that adopt either common laws or civil laws. Similarly, to construct a proxy for the peer R&D information environment, we divide the aggregate R&D from each group of firms by the aggregate R&D from all firms in the same industry. The spillover effect emerges as stronger for R&D disclosed by foreign firms from common-law countries, consistent with evidence that shows that legal protections for investors are stronger in common-law countries (La Porta et al. 1998), as is earnings quality (Ball et al. 2000; Leuz et al. 2003b).

Second, we examine the extent to which home country disclosure requirements influence R&D production and its information externalities. La Porta et al. (2006) show that stock market development is associated with laws mandating disclosure. The disclosure should convey a more credible signal if firms are from countries with better securities law enforcement. Using a disclosure requirement index developed in La Porta et al. (2006), we split foreign cross-listed firms at the median of this index to capture the strength of disclosure requirements they face at home.[2] A higher value indicates that the securities law enforcement system likely can deter misaligned interests and prevent managers from exploiting shareholder value by pursuing private gain. Consistent with our conjecture, we find a more pronounced spillover effect among foreign firms from countries with higher disclosure requirement indexes.

[2] The disclosure requirement index reflects the arithmetic mean of six securities law disclosure requirements: (1) prospectus, (2) insiders' compensation, (3) large shareholders, (4) inside ownership, (5) irregular contracts, and (6) related-party transactions.

Third, we examine whether R&D reporting rules have an impact on externalities. A distinctive feature of R&D reporting rules, when we compare U.S. GAAP with International Financial Reporting Standards (IFRS), is that IFRS requires firms to capitalize the development cost of R&D only in the presence of certain criteria (International Accounting Standards [IAS] No. 38). Under U.S. GAAP, all R&D must be expensed immediately (Statement of Financial Accounting Standard [SFAS] No. 2).[3] The capitalization of R&D is widely perceived as a credible signal of success likelihood (Chen et al. 2017; Healy et al. 2002; Oswald 2008; Oswald and Zarowin 2007). It reflects the manager's private information about the feasibility and potential outcomes, but this capitalization also allows managers to use their discretion to influence investors' perception of firm performance. We examine empirically how the reporting rules in a home country affect peer firms' perceptions and the impact on disclosure externalities. A significant wave of IFRS adoption worldwide started in 2005, and foreign cross-listed firms have been allowed to file with the U.S. Securities and Exchange Commission (SEC) using IFRS directly since 2007. Thus, we classify our ADR sample firms into those that adopt IFRS or not after 2007.[4] We construct two industry-level ratios to proxy for the peer R&D information environment: (1) the proportion of R&D expenditures from ADR firms adopting IFRS and (2) the proportion of R&D expenditures from ADR firms that report under U.S. GAAP. We find a stronger spillover effect for information disseminated by IFRS-adopting ADR firms when their home country earns a higher disclosure requirement index, consistent with Zhong's (2018) finding that the mandatory adoption of IFRS promotes innovation.

[3] The only exception is software products, for which development costs may be capitalized after technological feasibility has been established (SFAS 86; Accounting Standard Codification [ASC] 350-40; ASC 985-20). When we exclude firms in this industry (SIC 7370–7372), we find qualitatively similar results.

[4] Before 2007, a foreign firm listed on U.S. exchanges had to file a reconciliation form in its 20-F SEC filing to match its domestic requirements with U.S. GAAP. We use the variable "acctstd" in Compustat to identify foreign firms adopting IFRS, which can be identified only since 2007.

We also conduct additional tests to strengthen the inferences associated with these findings. Investment levels might be attributable to growth opportunities in the industry (Badertscher et al. 2013), and similarly, the externalities we document may be driven by industry growth opportunities, such that the presence of more foreign cross-listed firms would be associated with growth opportunities in the industry. Therefore, for each ADR firm, we find a U.S. firm that matches in terms of industry, year, size, and industry Tobin's Q, using propensity score matching, with 0.1 caliper distance and no replacement, to account for industry growth potential. This matched sample design provides consistent support for our predictions. Furthermore, in an untabulated analysis, we restrict our ADR sample to the first year the firm was listed on the U.S. exchanges, as an identification strategy. For this firm-year observation, the information becomes available the first time it enters the U.S. market, so it rules out the possibility that the information externalities come from sources other than information disclosed by foreign cross-listed firms. The results hold for the matched pairs of U.S. counterparts.

Patent-based innovation measures also might not be associated with R&D inputs, because some firms that file and receive patents do not invest in R&D. Therefore, we also examine whether enhanced peer innovation relates to R&D inputs. Following Hirshleifer et al. (2013), we measure innovation efficiency as patent-related innovation measures, scaled by R&D stock. Overall, the evidence is consistent with what we find using patent-based innovation measures, though we cannot entirely exclude the possibility that peer R&D information stimulates firm innovation through other investment forms.

Beyond the information externalities that emerge when managers incorporate peer disclosures in their innovation decisions, peer R&D disclosures disseminated in the market also might reduce industry-level financial frictions, thereby lowering the cost of external financing and spurring innovation. We perform several cross-sectional tests to investigate if the externalities vary with the firm's reliance on external financing or the financing constraints facing the firm. The externalities are more pronounced in industries or for firms that rely more on external financing; these disclosures seemingly might mitigate financing frictions and thereby promote innovation. Moreover, firms with higher financial constraints generate more patent-related innovations with increased amount of R&D disclosures from ADRs in the industry, so firms subject to financial constraints seem to benefit more from these disclosures when they are in the process of prudently evaluating potential innovative opportunities. These results are consistent with Acharya and Xu's (2017) finding that the need for external capital affects a firm's innovation.

With these varied tests and considerations, this study makes several contributions to extant literature. First, we expand understanding of the externalities and peer effects of disclosure. Prior literature has documented intra-industry information transfers, such that one firm's disclosure affects the stock prices of related firms (Foster 1981; Gleason et al. 2008; Pandit et al. 2011). Information transfers also appear in investment decisions by related firms (Badertscher et al. 2013; Beatty et al. 2013; Durnev and Mangen 2009). We focus on innovation, instead of fixed capital investments, as an essential driver of long-term growth. We relate information transfers to R&D disclosures and examine the peer effects on innovation quality. In doing so, we respond to calls for extended insights into disclosure externalities and the real effects of disclosure (Leuz and Wysocki 2016), in the particular case of R&D disclosures that reflect a firm's voluntary reporting choice and innovation potential.

Second, corporate finance literature identifies several mechanisms that can promote or impede innovation, including financial market development (Hsu et al. 2014), analyst coverage

(He and Tian 2013), institutional investors (Aghion et al. 2013; Chemmanur et al. 2014), bank competition (Cornaggia et al. 2015), independent boards (Balsmeier et al. 2017), public equity markets (Acharya and Xu 2017), foreign institutional investors (Luong et al. 2017), regulatory requirements (Gao and Zhang 2018), and a firm's financial reporting system (Miller et al. 2018; Zhong 2018). These mechanisms may promote innovation by alleviating financing frictions and lowering the cost of external financing, yet the inherent uncertainty of innovative activities makes initial evaluations of input particularly crucial. Therefore, managers may hesitate to take on innovative activities in the presence of monitoring mechanisms that prevent their risk taking. By testing the role of peer R&D disclosure, we show that more transparent information environments, marked by greater industry-level peer R&D disclosures, spur innovation.

Third, we extend research on cross-listed firms by studying the externalities of their R&D cost information, moving beyond evidence of the incentives for and consequences of a cross-listing decision. For example, Leuz et al. (2003) show that earnings quality increases for cross-listed firms after they subject themselves to more stringent, regulated financial markets. Cross-listing also is associated with higher analyst following and forecast accuracy (Lang et al. 2003a), a substantial valuation premium (Doidge et al. 2004; Mitton 2002; Fresard and Salva 2010), a lower cost of capital (Errunza and Miller 2000; Hail and Leuz 2009), and better investment decisions and cash utilization (Ghosh and He 2015). To the best of our knowledge, this study is the first to examine externalities of the presence of cross-listed firms, and we document a positive spillover effect of cross-listed firms' R&D information on U.S. industry peers' innovation.

Section 2 summarizes relevant literature, which we use to derive our main hypotheses and predictions. Section 3 describes the research design and sample. After we present the empirical results and robustness analyses in Section 4, Section 5 concludes.

2. Relevant Literature and Hypotheses Development

We start by summarizing three streams of relevant studies, then develop our hypotheses in this section.

2.1 Literature

2.1.1 Innovation

Innovation affects economic growth and is essential to long-term firm value. A rapidly growing stream of corporate finance literature examines the mechanisms by which information frictions can be resolved to stimulate innovation. Unlike fixed capital investments, innovative activities are inherently uncertain and therefore tend to receive insufficient investments. To mitigate this underinvestment issue, mechanisms might seek to resolve information gaps related to external financing. For example, well-developed financial markets allocate capital to firms with the highest potential to innovate (Brown et al. 2009; Comin and Nanda 2014; Hsu et al. 2014; King and Levine 1993a, b). Other mechanisms also enhance corporate governance, such as institutional investors (Aghion et al. 2013), anti-takeover provisions (Atanassov 2013), independent boards (Balsmeier et al. 2017), and transparent financial statements (Zhong 2018). Better corporate governance in turn increases the likelihood of funding innovation, because it mitigates the information frictions between managers and capital providers. However, other monitoring mechanisms can hinder innovation, by dissuading managers from taking risks. For example, He and Tian (2013) find that financial analyst coverage has a negative impact on innovation, and Gao and Zhang (2018) document that Section 404 of the Sarbanes-Oxley Act, introduced to improve the transparency of firms' internal control systems, actually discourages firms from undertaking innovative activities.

Internal incentive problems also affect managers' tendencies to innovate. Holmstrom (1989) indicates that compensation schemes that are less sensitive to performance encourage innovation, because assessments of innovative outcomes usually involve noisy measures. In Manso's (2011) proposed framework, optimal contract designs incorporate both tolerance of failure, so that managers undertake projects with higher failure risks and high innovation potential, and rewards for long-term success. Tian and Wang (2014) find that a venture capital-backed firm's age and experience can predict risk attitudes, suggesting that career concerns might distort a firm's failure tolerance and thus affect its innovation; Zhong (2018) adds that transparency of accounting information mitigates managers' career concerns, so it can promote innovation.

Among these investigations of firm monitoring mechanisms, we find little evidence of how the peer information environment affects innovation. Yet innovative firms in the same industry typically experience similar economic events and consume related financing sources, so peer firm information should influence assessments of a firm's innovative inputs.

2.1.2 Peer Disclosures

Studies of intra-industry information transfers contend that one firm's information can be used to make inferences about characteristics of related firms. For example, Foster (1981) finds that a firm's earnings announcements affect other firms' stock prices in the same industry, and Pandit et al. (2011) identify information externalities between economically related firms in the supply chain, even if they are in unrelated industries. Among firms that restate their earnings, Gleason et al. (2008) document negative market reactions to industry peers' stock prices.

Subsequent work also extends such information externalities to investment decisions. For example, fraudulent financial statements (restatements) affect industry peers' investment decisions (Beatty et al. 2013; Durnev and Mangen 2009). Specifically, industry peers perceive restatements as previously unrevealed private information about a firm's future investment prospects. In a private firm setting, Badertscher et al. (2013) find that disclosure in an industry with more public firms generates positive externalities for private firms that respond to investment opportunities. Using stock prices to measure peer influence, Foucault and Fresard (2014) show that peers' evaluations affect a focal firm's investment.

In the case of innovative activities, underinvestment is a critical problem, because projects with positive net present values can easily be foregone if external capital suppliers lack appropriate information about the projects' value. Higher disclosure quality, in general, resolves both over- and underinvestment due to market frictions (e.g., Biddle et al. 2009; Bushman and Smith 2001; Chen et al. 2011; Goodman et al. 2014; Hope et al. 2013; Verrecchia 2001); in particular, transparent financial reports can mitigate underinvestment and spur innovation (Zhong 2018). These studies focus on firm-level disclosures, but by integrating evidence of information externalities achieved through peer disclosures, we can predict that a firm's disclosures provide externalities to peer firms' real decisions, and the quality of those disclosures influence such externalities.

2.1.3 Cross-Listed Firms

Access to capital is a primary motive for cross-listing on U.S. capital markets (e.g., Doidge et al. 2009; Lins et al. 2005; Reese and Weisbach 2002). Prior literature on cross-listings tends to rely on two underlying hypotheses: the bonding hypothesis (Coffee 1999, 2002; Stulz 1999) and the liquidity hypothesis (Merton 1987; Stulz 1981). According to the former, firms send credible signals to the market that they are committed to maximizing shareholders' welfare when they subject themselves to the U.S capital market and its more stringent regulatory environment and investor protection laws. The latter hypothesis suggests that cross-listed foreign firms disseminate information of better quality to attract capital from U.S. investors. Both hypotheses suggest an improved information environment for cross-listed firms.

In terms of empirical evidence, prior literature reveals a substantial valuation premium when foreign firms list on U.S. exchanges (Doidge et al. 2004; Fresard and Salva 2010; Mitton 2002). In addition, firms cross-listing in the United States exhibit better earnings quality (Lang et al. 2003b), higher analyst following and forecast accuracy (Lang et al. 2003a), a lower cost of capital (Errunza and Miller 2000; Hail and Leuz 2009; Ball et al. 2018), greater investment-to-price sensitivity (Foucault and Frésard 2012), better operating performance after cross-listing (Charitou and Louca 2009), and better investment decisions and cash utilization (Ghosh and He 2015). Thus, prior literature notes the motivations and consequences of a cross-listing decision; its externalities for U.S. peers have not been explored.

2.2 Hypotheses

Peer R&D information should affect the focal firm's innovation inputs and outputs, by reducing managers' career risks and the costs of external financing. That is, peer information gives managers feedback that they can use to evaluate initial and subsequent inputs of innovative activities, especially when the uncertainty surrounding the investment is high. Such feedback can lower the career risks associated with engaging in innovation activities. Innovation also involves multi-stage financing, so innovators exhibit prudence in evaluating projects over multiple stages, and early-stage assessments are especially crucial. Galasso and Simcoe (2011) find that chief executive officers (CEOs) who are more confident about firm performance are more inclined to pursue innovative activities. Therefore, underinvestment might be circumvented through the capacity of peer R&D disclosure to build managers' confidence in undertaking projects with potentially higher risks.

Furthermore, when the industry features more R&D disclosures, financiers have more information to evaluate expected future cash flows for a related firm in the same industry; related firms in the same industry experience similar economic events and growth. An industry with a higher level of R&D disclosures may lower the costs of external financing, because the aggregate information reduces uncertainty and financing frictions.

To measure peer R&D disclosures, we use a group of firms that by definition enrich the disclosure environment: foreign cross-listed firms. The U.S. GAAP represents one of the highest quality financial reporting standards in the world (Bradshaw et al. 2004; Dye and Sunder 2001), so cross-listed foreign firms already have prudently evaluated their R&D investment prospects and potential riskiness when they subject themselves to additional monitoring by cross-listing. According to Foucault and Gehrig's (2008) theoretical framework, a cross-listing enables firms to make better investment decisions, because they obtain more precise information from the stock market about the value of their growth opportunities. Ghosh and He (2015) also find that cross-listed foreign firms increase their capital expenditures, merger and acquisition activities, and investments in R&D after they enter U.S. markets; they also identify better acquisition decisions. Therefore, the R&D information supplied by cross-listed firms should have implications for U.S. industry peers; formally, R&D information from cross-listed foreign firms has externalities for peers' innovative activities.

H1: *The R&D information provided by foreign cross-listed firms enriches the information environment and generates a positive spillover effect for U.S industry peers' innovation activities.*

3. Research Design and Sample

3.1 Research Design

Our hypothesis predicts that R&D disclosure from foreign cross-listed firms provides externalities for innovation by their U.S. industry counterparts, in accordance with the following regression model:

$$INNO_{i,j,t+1} = \beta_0 + \beta_1 PctADR_{RD\,j,t} + \sum \beta_i \times Controls_{i,j,t} + \varepsilon_{j,t}. \quad (1)$$

We omit the subscripts below for ease of exposition. The dependent variable *INNO* is one of five innovation measures, reflecting a firm *i*'s innovative inputs and outputs in industry *j* measured in year *t* + 1: (1) R&D intensity, measured as R&D expenditures deflated by total assets, *RDINT*; (2) the logarithm of 1 plus the number of patents *lnNPAT*; (3) the logarithm of 1 plus the number of citations *lnNCIT*; (4) a logarithm of 1 plus the number of citation-weighted patents *lnCWPAT*; and (5) a logarithm of 1 plus the market value of patents *lnMVPAT*. The first variable captures innovative inputs; the other four measure the outputs and quality of innovative activities. We include *lnCWPAT* and *lnMVPAT* in addition to traditional innovation measures because Kogan et al. (2017) indicate that these measures reflect economic values of each innovation and are more strongly associated with firm growth. For the latter four variables, we follow established procedures to alleviate concerns about the possibility that patent data are right-skewed. First, we replace missing values of patents and citations with 0s for firms without patent or citation information (He and Tian 2013; Tian and Wang 2014). Second, we winsorize these four variables at the 1^{th} and 99^{th} percentiles before taking the natural logarithm. Third, we add 1 to the dependent variables when calculating the natural logarithms to avoid data truncation due to 0 patents or 0 citations.

We use the variable $PctADR_{RD}$, or R&D disclosures supplied by cross-listed foreign firms in an industry j, to proxy for the peer R&D information environment. For each industry in a given year, we calculate the variable $PctADR_{RD}$ as the aggregate R&D expenditures disclosed by foreign cross-listed firms divided by the aggregate R&D expenditures from all firms operating in the same industry j. The variable $PctADR_{RD}$ is an industry-level measure that captures the proportion of R&D disclosures from foreign cross-listed firms in the industry. Our hypothesis predicts that the coefficient β_1 will be positive, indicating that peer firms respond with more innovation activities when there is more R&D disclosure disseminated from cross-listed firms in the same industry.

We control for firm characteristics with a variable $Controls_{i,j,t}$ that reflects potential determinants of innovation. We include firm size (*SIZE*), the natural logarithm of total assets, because large firms may have more resources available for innovative activities. We also include control variables for growth opportunities (Tobin's q *TobinsQ* and sales growth *SaleGrw*), financial constraints (leverage *LEV* and capital expenditure *CAPEX*), a firm's life cycle (*AGE*), and firm performance (*ROA*). All control variables are winsorized at 1% and 99% of their respective distributions to avoid the effect of outliers. When the dependent variable is one of the four innovation output measures, we control for current R&D expenditures (*RDINT0*) and a dummy indicating missing R&D (*RD_MISS*), because firms investing significantly in R&D generally have more patents (Cohen et al. 2013; Hall et al. 2005). We present detailed variable definitions in the Appendix.

We also adopt a lead-lag specification to allow for differences in the timing with which peer R&D information comes into effect. To control for differences in firm investments over time and industries, we include year and industry fixed effects (one-digit SIC code).[5] We also cluster the standard errors at firm levels to allow for residual correlations in firms' innovation outputs over time (Gow et al. 2010; Petersen 2009).

3.2 Sample Selection

To measure the peer R&D information environment, we selected a group of foreign cross-listed firms on U.S. exchange markets, including the NYSE, AMEX, NASDAQ, and OTC, from the Compustat database. Our sample period runs from 1990 to 2010; the end date coincides with the data that are available for innovation measures. This procedure identified 593 firms (5,476 firm-year observations) across 33 countries, among which 382 firms (64.4%) reported R&D expenditures. They constitute the ADR sample for our main independent variables. Table 1 lists the sample distribution by country of domicile, corresponding legal protection systems, and disclosure requirements. Most of our ADR sample firms come from the United Kingdom (21.73%), Japan (7.59%), or France (7.33%). Notably, Japan and the United Kingdom are often identified as leading innovators. Of the 33 countries represented, 8 are common-law nations. We define the level of disclosure requirements using the disclosure index developed by La Porta et al. (2006; for details, see footnote 1). Our definition is based on the median of the index, so half of the countries have higher (lower) disclosure requirements.

In Panel B of Table 1, we also break down the ADR sample according to the Fama-French 12-industry classification. The business equipment, computers, software, and electronic equipment industry accounts for the most significant portion of the sample (0.62%), followed by manufacturing (0.53%) and healthcare, medical equipment, and drugs (0.47%). Overall, we find

[5] Our variable $PctADR_{RD}$ is a two-digit SIC industry-level measure. Although one-digit SIC is a coarse level to control for industry fixed effects, prior literature suggests it may alleviate some concerns about industry effects (Badertscher et al. 2013; Shroff et al. 2017).

an average of 2.92% firm-year observations from ADR firms per industry—a small percentage in terms of the number of firms. However, many of them are R&D-intensive firms, such that overall R&D spending by ADR firms in an industry is 23.8%, so they account for a significant portion of R&D expenditures in the U.S. economy. Industries with higher R&D expenditures include telephone and television transmission (64.3%) and consumer non-durables (37.7%), and firms in software and health industries have higher ratios of R&D to sales (12.4% and 9.7%, respectively).

We then identify a sample of U.S. peer firms from Compustat North American database. We obtain patent and citation information from the Google Patents database (Kogan et al. 2017), which covers all patents awarded by the U.S. Patent and Trademark Office during 1976–2010.[6] We link each patent and its citations to a CRSP firm using PERMNO as a firm identifier, and then relate them to Compustat firms. After deleting firms in financial and utility industries (SIC codes 6000–6999 and 4900–4999), dropping firms without proper identifiers (PERMNO), and eliminating missing values of control variables, our final sample consists of 91,424 U.S. domestic firm-year observations.

Table 1, Panel C, presents the descriptive statistics for both dependent and explanatory variables in our regression model for the sample of U.S. peer firms. These firms, on average, spend 9.1% on R&D expenditures scaled by total assets. The average size (log of total assets) is 4.852, and their return on assets average 8.1%. Thus, our sample firms are profitable.

Table 2 contains the Pearson (Spearman) correlation matrix for each variable. We find that our variable of interest, $PctADR_{RD}$, correlates positively with innovation inputs, R&D

[6] The data set can be downloaded from Noah Stoffman's website: https://kelley.iu.edu/nstoffma/.

intensity (*RDINT*), or the four variables representing the innovation outputs, significant at 1% levels. This preliminary finding supports our hypothesis that aggregate industry R&D disclosures from foreign cross-listed firms are informative for their U.S. peers' innovation activities.

4. Empirical Findings

4.1 Main Prediction

To examine whether the R&D disclosures of cross-listed foreign firms affect their U.S. industry peers' innovative activities, we estimate Equation (1), in which the main dependent variable is R&D intensity (*RDINT*) or patent- or citation-based innovation measures. Using R&D intensity as the dependent variable (Column 1 in Table 3), we find a positive and significant coefficient on $PctADR_{RD}$ at the 1% level; a firm's R&D investment increases when the industry has more R&D-intensive cross-listed firms. Koh and Reeb (2015) similarly find that firms are more likely to report R&D when a high proportion of firms also reports R&D in the same industry.

In Columns 2–5 in Table 3, we detail how a firm's innovation outputs are associated with the proportion of R&D disclosure by cross-listed foreign firms in the industry. Regardless of how we define innovation outputs, the coefficients on $PctADR_{RD}$ are positive and significant at 1%, which means that the amount of industry R&D disclosure by foreign cross-listed firms correlates positively with peer firm innovation quality. These coefficients are also economically meaningful: The incremental effect of a 1% change in the proportion of R&D disclosure by ADRs is 0.133×1% on the increased innovation when the dependent variable is *lnNPAT*. In turn, $PctADR_{RD}$ is associated with 19.3% increases in *lnNCIT* and 20.9% in *lnMVPAT*. Collectively, R&D disclosures of foreign cross-listed firms help reduce uncertainty surrounding innovative activities and thus generate externalities for their U.S. peer's innovation quality. Among the control variables, consistent with previous studies, we find a positive and significant coefficient of *SIZE*; larger firms have more resources to produce better innovation outcomes. The coefficient on *Salesgrw* is negative and significant, meaning that firms experiencing negative sales growth need more innovation to prevent their bankruptcy. The negative and significant coefficient of *LEV* implies that financial constraints hinder innovation; the positive, significant coefficient of *AGE* indicates that older firms have different technological search habits.

4.2 Tests of Home Country Institutions

In Tables 4–6, we examine whether the externalities of the R&D disclosure from cross-listed foreign firms are conditional on the specific home country institutions that the foreign firms face. We first consider legal investor protections; the externalities could be more pronounced when cross-listed foreign firms domicile in countries with better investor protections. We thus categorize foreign cross-listed firms as coming from countries with either common laws or civil laws. We then construct two variables to proxy for the peer R&D information environment: (1) $PctADR_{CM}$, which is industry aggregate R&D reported by ADR firms domiciled in common-law countries, divided by the aggregate reported R&D of all firms operating in the same industry, and (2) $PctADR_{CD}$, or the aggregate industry R&D reported by ADR firms domiciled in civil-law countries, divided by the aggregate reported R&D of all firms operating in the same industry. We then estimate the following regression:

$$INNO_{i,j,t+1} = \beta_0 + \beta_1 PctADR_{CM\,j,t} + \beta_2 PctADR_{CD\,j,t} + \sum \beta_i \times Controls_{i,j,t} + \varepsilon_{i,j,t} \qquad (2)$$

Table 4 shows the results conditional on the cross-listed foreign firms' investor protection environment. All coefficients for $PctADR_{CM}$ are positive and significant, regardless of how we define the dependent variable, and the coefficients are significant at the 1% level when the dependent variable is the patent- or citation-based innovation measure. The coefficients for

$PctADR_{CD}$ are positive and significant at 1% when the dependent variable is *lnNPAT* or *lnMVPAT*. The magnitude of the coefficients is greater for $PctADR_{CM}$ than for $PctADR_{CD}$, which implies that R&D produced in common-law countries has a greater impact on U.S. peer innovation. The tests of differences for the coefficients of $PctADR_{CM}$ and $PctADR_{CD}$ also show that they are significant at the 10% level when the dependent variable is *lnNPAT* or *lnMVPAT*, consistent with prior evidence that firms in common-law countries enjoy stronger investor protections and receive higher valuations (La Porta et al. 1998, 2002).

We also examine the extent to which home country disclosure requirements affect these externalities. La Porta et al. (2006) indicate that a country's financial market development is shaped by securities law requirements. We suspect that information produced in a country with more securities law disclosure requirements sends a more credible signal to industry peers. We thus apply the following regression model:

$$INNO_{i,j,t+1} = \beta_0 + \beta_1 PctADR_{HIDIS\,j,t} + \beta_2 PctADR_{LODIS\,j,t} + \sum \beta_i \times Controls_{j,t} + \varepsilon_{j,t}, \quad (3)$$

where $PctADR_{HIDIS}$ is the industry aggregate R&D reported by ADR firms domiciled in countries with a higher disclosure index, divided by the aggregate reported R&D of all firms operating in the same industry, and $PctADR_{LODIS}$ is the aggregate industry R&D reported by ADR firms domiciled in countries with a lower disclosure index, divided by the aggregate reported R&D of all firms operating in the same industry. The disclosure index is defined as in La Porta et al. (2006). We present the results in Table 5. All the coefficients of $PctADR_{HIDIS}$ are positive and significant at the 1% level. For $PctADR_{LODIS}$, they are mostly insignificant. Therefore, information externalities appear to exist only when the home country of the foreign firms requires more stringent disclosures in financial reports.

Unlike U.S. GAAP that require all R&D to be expensed immediately, IFRS requires firms to capitalize development costs when certain criteria are met (IAS 38). Chen et al. (2017) find that reporting of development costs in particular generates significant positive externalities and consequences among a sample of Israeli firms. Therefore, the R&D reporting rule may imply a different disclosure environment for cross-listed firms that reside in countries adopting IFRS. We test the following regression:

$$INNO_{i,j,t+1} = \beta_0 + \beta_1 PctADR_{IFRS\,j,t} + \beta_2 PctADR_{GAAP\,j,t} + \sum \beta_i \times Controls_{j,t} + \varepsilon_{j,t}, \quad (4)$$

where $PctADR_{IFRS}$ is the industry aggregate R&D reported by ADR firms under IFRS, divided by the aggregate reported R&D of all firms operating in the same industry, and $PctADR_{GAAP}$ is the aggregate industry R&D reported by ADR firms under U.S. GAAP, divided by the aggregate reported R&D of all firms operating in the same industry.[7] Table 6, Panel A, reports the results. We limit the sample to observations after 2007 because ADR firms were not allowed to file reports under IFRS with the SEC until this year. In general, R&D information externalities are more pronounced when foreign cross-listed firms adopt IFRS. The coefficients for $PctADR_{IFRS}$ are positive and significant at the 5% level when the dependent variable is *lnNPAT* or *lnMVPAT*. We also consider whether the R&D reporting rule is subject to the disclosure requirements in the home country. In Panel B of Table 6, we divide the variable $PctADR_{HIDIS}$ into two ratios: (1) the proportion of ADR firms adopting IFRS in the industry, $PctADR_{HIDIS\_IFRS}$, and (2) the proportion of ADR firms adopting U.S. GAAP in the industry, $PctADR_{HIDIS\_GAAPt}$. We find that peer effects exist when the IFRS-adopting ADRs are from countries with higher disclosure requirements, suggesting that R&D reporting rules may constitute second-order effects.

[7] We classify ADR firms that report under IFRS, according to their SEC filings. This information is available to their U.S. peers and thus we do not classify IFRS-adopting ADRs based on the reporting in their domestic countries.

4.3 Additional Analyses

4.3.1 Propensity-Matched Sample and Identification Strategy

We conduct several additional tests to affirm and strengthen our inferences. Industry growth may drive our results, such that they might simply capture how industry growth attracts more foreign cross-listed firms into the U.S. market. We construct a matched sample to circumvent this issue. We match each ADR firm with a U.S. firm, on the basis of their industry, year, size, and industry Tobin's Q (*IndustryQ*). The results in Table 7, Panel A, show that the mean of *IndustryQ* is 4.076 for ADR firms and 4.079 for the U.S. counterparts, so these firms function in industries with superior growth potential. In Panel B of Table 7, the mean of $PctADR_{RD}$ is 32.7%, which represents a substantial portion of industry-aggregate R&D expenditures. The results in Table 7, Panel C, suggest that in general our hypothesis continues to hold when we use a matched sample research design. We do not find that the R&D information externalities are stronger for foreign cross-listed firms adopting IFRS for innovation outputs, yet the spillover effect is stronger when these firms are domiciled in a country with a higher disclosure index. Therefore, the externalities appear driven mostly by the home country disclosure requirements instead of financial reporting rules, when we control for industry growth potential.

In untabulated analyses, we also restrict our sample to the firm-years that represent the foreign firms' first year being listed on the U.S. exchanges. The information thus becomes available for the first time in the U.S. market, such that it serves as an exogenous shock (identification strategy) and precludes the possibility that the information externalities come from sources other than information produced by foreign cross-listed firms. We identify 57 ADRs for this analysis. To increase the sample size for inferences, we use a one-to-five match and the same matching criteria for the propensity matching procedures, which yields 285 firm-year observations of U.S. peers. The results continue to hold for the matched pairs. The coefficient for $PctADR_{RD}$ is 0.15 (t-statistic = 2.04) when the dependent variable is *RDINT*, and it becomes 0.06, 0.15, and 0.04 (t-statistic = 1.65, 1.86, and 2.05), respectively, when the dependent variable is *lnNPAT*, *lnCWPAT*, or *lnMVPAT*.

4.3.2 Innovation Efficiency

We next examine whether the spillover effect influences innovation efficiency. Following prior literature (Hirshleifer et al. 2013; Zhong 2018), we define innovation efficiency as patent-based outputs scaled by R&D capital, and we calculate R&D capital using R&D expenditures in the previous five years, assuming five-year straight-line depreciation rates. Patents usually are approved with two-year application-grant lags, so we use $t + 3$ to measure the numerators (patent measures).

Table 8 contains the results when we use innovation efficiency as the dependent variable. We find a positive and significant coefficient at the 10% level on $PctADR_{RD}$ when the dependent variable is innovation efficiency, measured as the number of patents scaled by past five-year R&D capital with a 20% depreciation rate. Using the market value of patents in the numerator to measure innovation efficiency, we again find a positive and significant coefficient at the 5% level for $PctADR_{RD}$. Hirshleifer et al. (2013) show that these measures of innovative efficiency are indicators of superior future operating performance, market valuation, and stock returns. Thus, the positive externalities from cross-listed foreign firms' R&D information are associated with the peers' R&D-related innovative activities. We run the analyses for our cross-sectional tests in Tables 4–6, and the results are mostly similar.

4.3.3 External Finance Dependence and Financing Constraints

The need for and access to external capital likely affect corporate innovation. If financiers have more information to evaluate potential success rates for innovative endeavors, inventors with greater potential to succeed are more likely to obtain access to external capital. In other words, more disclosures of better quality help resolve financing frictions in the industry, which facilitates resource allocations and encourages innovation.

We conduct several cross-sectional tests to explore whether the effect of peer R&D disclosures varies with external financing needs. We first construct a firm-level external financial dependence measure, *EXFIN* (Rajan and Zingales 1998; Xiao 2013), as the sum of capital expenditures and R&D expenditures minus the sum of income before extraordinary items and depreciation and amortization of the previous fiscal year, divided by the sum of capital expenditures and R&D expenditures. In addition, we construct an indicator variable, *INDEXFIN*, based on the firm-level measure partitioned at the median for each two-digit SIC industry-year. We include the main effect of *EXFIN* (*INDEXFIN*) and an interaction term $PctADR_{RD}$**EXFIN* ($PctADR_{RD}$**INDEXFIN*) in the empirical model. If external finance dependence is high, we expect a positive, significant coefficient for the interaction term. As we report in Panel A of Table 9, with these alternative patent-based measures, we find positive and significant coefficients for the interaction term. Consistent with Acharya and Xu (2017), these findings suggest that R&D disclosures by ADR firms affect peer firms' innovation more when those firms operate in industries with higher external finance dependence or rely more on external finance.

If financing is an essential driver of innovation, we expect to observe a more pronounced effect of peer R&D disclosure for firms that are subject to financial constraints. These firms have limited resources to develop and carry out innovative endeavors and likely evaluate projects more cautiously. Therefore, peer R&D disclosure may help eliminate uncertainty to a greater degree. To examine whether financial constraints affect the impact of peer R&D disclosures on innovation, we follow Whited and Wu (2006) and calculate financial constraints as (-0.091*Cash flow + 0.062*Dividend dummy + 0.021*Long-term debt – 0.044* Size + 0.102* Industry sales growth – 0.035* Sales growth). We convert this measure into a ranked variable and define the top quintile (bottom four quintiles) as high (low) financial constraints. The results in Panel B of Table 9 show that information externalities are stronger for firms with higher financial constraints. Almeida et al. (2013) document that financial constraints may benefit innovation by improving innovation efficiency; our findings add that the association between innovation and financial constraints may be conditional on the quality of the peer R&D disclosure environment.

5. Conclusion

We study the peer effects of R&D disclosures on a firm's innovation activities. The presence of foreign firms in the U.S. market entails increased R&D disclosures, so we investigate whether these disclosures generate externalities to the innovation activities of their industry peers. We predicted that cross-listed firms disseminate more information in the industry, thereby reducing uncertainty and risks associated with evaluating new product pipelines and innovation inputs. In addition, the cost of external financing decreases with greater disclosures. Accordingly, more R&D information supplied by cross-listed firms may stimulate innovation by U.S. firms in the same industry.

In the cross-section, we explore the extent to which the externalities vary with the legal investor protection systems and disclosure environments of these foreign firms' home countries. Peer R&D disclosures generate externalities to a greater degree when the foreign firms are from common-law countries or countries with more disclosure requirements in their securities laws. Thus, home country institutions affect the quality of the R&D information provided by cross-listed firms and in turn influence the extent to which information externalities exist. We also find that information externalities are more pronounced for industries or firms that rely more on external finance, suggesting that by reducing financing frictions in the industry, disclosures can stimulate innovation.

We extend prior literature on disclosure by recognizing that disclosures not only resolve information asymmetry between managers and capital providers for the focal firm but also provide industry-relevant information to peers and thus promote their innovation. Our analyses suggest that cross-listed firms' R&D disclosures help reduce uncertainty and financing costs related to innovative activities in an industry, so they encourage peer innovation. Overall, we identify peer R&D disclosure as a market-wide factor that determines firm innovation activities and efficiency.

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Appendix. Variable Definitions

Variable	Definition
INNO	One of five innovation measures: *RDINT*, *lnNPAT*, *lnNCIT*, *lnCWPAT*, and *lnMVPAT*;
RDINT	R&D intensity in year *t*+1, namely R&D expenditures divided by total assets in year *t*+1;
lnNPAT	log of one plus number of patents in year *t*+1;
lnNCIT	log of one plus number of citations in year *t*+1;
lnCWPAT	log of one plus citation-weighted patent values in year *t*+1;
lnMVPAT	log of one plus market value of patents in year *t*+1;
IEPAT	innovation efficiency, defined as the number of patents in year *t* + 3 divided by the sum of 100%, 80%, 60%, 40%, and 20% of R&D expenses in year *t*, *t* – 1, *t* – 2, *t* – 3, and *t* – 4, respectively;
IEMVP	alternative measure of innovation efficiency, which replaces the numerator of *IEPAT* with market value of patents in *t* + 3;
$PctADR_{RD}$	the aggregate R&D expenditures reported by ADR firms in one industry, divided by the aggregate R&D expenses reported by all firms operating in the same industry in year *t*;
$PctADR_{CM}$	the aggregate R&D expenditures in one industry reported by ADR firms from common law countries, divided by the aggregate R&D disclosure of all firms in the same industry in year *t*;
$PctADR_{CD}$	the aggregate R&D expenditures in one industry reported by ADR firms from civil law (code law) countries, divided by the aggregate of R&D disclosure of all firms in the same industry in year *t*;
$PctADR_{HIDIS}$	the aggregate R&D expenditures in one industry reported by ADR firms from countries with higher disclosure index, divided by the aggregate R&D disclosure of all firms operating in the same industry in year *t*;
$PctADR_{LODIS}$	the aggregate R&D expenditures in one industry reported by ADR firms from countries with lower disclosure index, divided by the aggregate R&D disclosure of all firms operating in the same industry in year *t*;
$PctADR_{IFRS}$	the aggregate R&D expenditures of ADR fillings with SEC under IFRS in one industry, divided by the aggregate R&D disclosure of all firms operating in the same industry in year *t*;
$PctADR_{GAAP}$	the aggregate R&D expenditures of ADR fillings with SEC under U.S. GAAP in one industry, divided by the aggregate R&D disclosure of all firms operating in the same industry in year *t*;
SIZE	log of total assets in year *t*;
TobinsQ	book-to-market ratio at beginning of year *t*;
SaleGrw	sales growth of last year, which equals sales of year *t* divided by sales of year *t* – 1;
LEV	leverage at the beginning of year *t*;
CAPEX	capital expenditure as a proportion of total assets in year *t*;
AGE	log of number of years since the first year of data availability on Compustat to year *t*;
ROA	return on assets in year *t*;
RDINT0	R&D intensity in year *t*, namely R&D expenditures divided by total assets in year *t*;
RD_MISS	an indicator equals to one if a firm does not report R&D expenditures in year *t*, and zero otherwise;
IndustryQ	Tobin's q at the industry level in year *t* based on two-digit SIC code;
EXFIN	external financial dependence defined in prior literature (Rajan and Zingales 1998; Xiao 2013), calculated as the sum of capital expenditures and R&D expenditures in year *t* minus the sum of income before extraordinary items and depreciation and amortization of the previous fiscal year, divided by the sum of capital expenditures and R&D expenditures in year *t*;
INDEXFIN	an indicator equal to one if a firm-year's external financial dependence (*EXFIN*) is greater than the median of *EXFIN* in year *t*, and zero otherwise;
WWFC	an indicator based on White and Wu's (2006) index of financial constraint, which equals one if a firm-year's financial dependence is in the top quintile and zero if the index is in the bottom four quintiles in year *t*;

Table 1. Descriptive Statistics

Panel A: Sample Distribution of Foreign Cross-Listed R&D Disclosers

Country	Country Code	Number of Firms	Firm-Year Observations	Legal Origin	Disclosure Index
Argentina	ARG	3	7	Civil	Low
Australia	AUS	23	166	Common	High
Belgium	BEL	4	12	Civil	Low
Brazil	BRA	9	71	Civil	Low
Chile	CHL	5	24	Civil	Low
China	CHN	16	92	Civil	Low
Columbia	COL	1	2	Civil	Low
Denmark	DNK	2	26	Civil	Low
Finland	FIN	8	72	Civil	Low
France	FRA	28	282	Civil	High
Germany	DEU	24	195	Civil	Low
India	IND	10	53	Common	High
Indonesia	IDN	3	17	Civil	Low
Ireland	IRL	15	135	Common	High
Israel	ISR	8	73	Common	High
Italy	ITA	9	69	Civil	High
Japan	JPN	29	417	Civil	High
Korea	KOR	11	74	Civil	High
Luxemburg	LUX	6	29	Civil	Low
Mexico	MEX	8	48	Civil	Low
Netherland	NLD	20	178	Civil	Low
New Zealand	NZL	6	43	Common	High
Norway	NOR	7	68	Civil	Low
Philippine	PHL	1	9	Civil	High
Russia	RUS	2	8	Civil	Low
Singapore	SGP	2	18	Common	High
South Africa	ZAF	5	49	Common	High
Spain	ESP	2	27	Civil	Low
Sweden	SWE	15	149	Civil	Low
Switzerland	CHE	9	77	Civil	High
Taiwan	TWN	7	69	Civil	High
United Kingdom	GBR	83	723	Common	High
Venezuela	VEN	1	1	Civil	Low
Total		382	3,283		

Panel B: Industry Distribution of Foreign Cross-Listed R&D Disclosers

Industry (Fama-French 12 industries)	*PctADR$_{RD}$* Mean	*PctADR$_{RD}$* Median	R&D/Sales Mean	R&D/Sales Median	Firm-Year Observations Prop.	Firm-Year Observations Obs.
Consumer Non-Durables	0.377	0.305	0.015	0.007	0.19	210
Consumer Durables	0.291	0.289	0.034	0.037	0.16	176
Manufacturing	0.254	0.244	0.039	0.018	0.53	587
Oil, Gas, and Coal Extraction and Products	0.142	0.068	0.009	0.006	0.22	252
Chemicals and Allied Products	0.298	0.308	0.043	0.034	0.13	148
Business Equipment, Computers, Software & Electronic Equipment	0.265	0.210	0.124	0.092	0.62	700
Telephone and Television Transmission	0.643	0.728	0.017	0.008	0.25	283
Wholesale, Retail, and Some Services	0.080	0.000	0.042	0.020	0.13	148
Healthcare, Medical Equipment, & Drugs	0.264	0.294	0.097	0.105	0.47	529
Other	0.194	0.011	0.019	0.008	0.22	250
Total	0.238	0.176	0.083	0.029	2.92	3,283

Panel C: Summary Statistics of the U.S. Industry Peers

Variable						
Innovation measures	Obs.	Mean	Std. Dev.	Q1	Median	Q3
RDINT	91,424	0.091	1.927	0.000	0.000	0.067
lnNPAT	91,424	0.448	1.026	0.000	0.000	0.000
lnNCIT	91,424	0.861	1.836	0.000	0.000	0.000
lnCWPAT	91,424	0.577	1.274	0.000	0.000	0.000
lnMVPAT	91,424	0.599	1.546	0.000	0.000	0.000
Foreign cross-listed firms R&D disclosure						
PctADR$_{RD}$	91,424	0.238	0.241	0.004	0.176	0.345
Control variables						
SIZE	91,424	4.852	2.221	3.226	4.718	6.367
TobinsQ	91,424	0.553	0.687	0.090	0.396	0.880
LEV	91,424	0.192	0.629	0.001	0.101	0.284
AGE	91,424	2.354	0.937	1.792	2.398	3.091
CAPEX	91,424	0.061	0.089	0.017	0.038	0.074
SaleGrw	91,424	0.021	3.769	-0.022	0.064	0.202
ROA	91,424	0.081	0.780	-0.029	0.054	0.110

This table presents descriptive statistics for our sample firms, covering 91,424 firm-year observations during 1990 to 2010. Panel A reports the sample distribution of the foreign cross-listed R&D disclosers. Panel B shows the proportion of the foreign cross-listed R&D disclosers in each industry based on Fama French 12-industry classification. Panel C presents the descriptive statistics for all variables in our regression model. All variables are defined in the Appendix.

Table 2. Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RDINT	1		**0.416**	**0.393**	**0.403**	**0.392**	**0.372**	**0.375**	**0.297**	**-0.204**	**0.329**	**-0.056**	**-0.310**	**-0.135**	**-0.118**	**-0.240**	**-0.146**
lnNPAT	2	0.004		**0.767**	**0.779**	**0.777**	**0.801**	**0.801**	**0.180**	**0.251**	**0.151**	**-0.026**	**-0.055**	**0.015**	**0.124**	**0.048**	**-0.142**
lnNCIT	3	*0.005*	**0.738**		**0.880**	**0.868**	**0.659**	**0.660**	**0.169**	**0.239**	**0.135**	**-0.032**	**-0.047**	**0.022**	**0.134**	**0.050**	**-0.138**
lnCWPAT	4	0.005	**0.802**	**0.864**		**0.894**	**0.677**	**0.679**	**0.176**	**0.250**	**0.135**	**-0.041**	**-0.049**	**0.009**	**0.147**	**0.045**	**-0.143**
lnMVPAT	5	0.002	**0.884**	**0.845**	**0.905**		**0.674**	**0.677**	**0.173**	**0.273**	**0.140**	**-0.038**	**-0.040**	**0.013**	**0.158**	**0.058**	**-0.140**
IEPAT	6	-0.001	**0.158**	**0.100**	**0.127**	**0.145**		**0.998**	**0.179**	**0.261**	**0.118**	**-0.044**	**-0.034**	0.003	**0.248**	**0.079**	**-0.134**
IEMVP	7	-0.001	**0.098**	**0.069**	**0.085**	**0.120**	**0.589**		**0.165**	**0.241**	**0.101**	**-0.045**	**-0.003**	-0.005	**0.253**	**0.076**	**-0.133**
PctADR$_{RD}$	8	**0.013**	**0.085**	**0.079**	**0.083**	**0.075**	**0.032**	**0.033**		**-0.091**	**0.106**	**-0.052**	**-0.110**	**-0.130**	**-0.012**	**-0.086**	**-0.111**
SIZE	9	**-0.043**	**0.353**	**0.289**	**0.333**	**0.431**	**0.072**	**0.056**	**-0.043**		**-0.131**	**0.044**	**0.367**	**0.201**	**0.343**	**0.428**	**-0.028**
TobinsQ	10	**0.045**	**0.097**	**0.109**	**0.101**	**0.116**	*0.009*	**0.020**	**0.051**	**-0.199**		**0.242**	**-0.239**	**0.062**	**-0.205**	**0.076**	**0.034**
SaleGrw	11	-0.012	0.004	0.004	0.004	0.004	0.002	0.002	**-0.010**	**0.030**	**-0.022**		**-0.210**	**-0.042**	**-0.012**	**0.367**	**0.093**
LEV	12	**0.010**	**-0.028**	**-0.035**	**-0.031**	**-0.019**	0.004	0.002	*0.007*	**0.041**	**-0.012**	**-0.017**		**0.169**	**0.167**	**0.114**	**-0.051**
CAPEX	13	*-0.008*	**-0.040**	**-0.035**	**-0.044**	**-0.033**	-0.012	**0.003**	**-0.072**	**0.031**	**0.048**	**0.179**	0.026		-0.080	**0.215**	**-0.119**
AGE	14	**-0.016**	**0.185**	**0.149**	**0.182**	**0.225**	**0.045**	**0.030**	0.002	**0.364**	**-0.213**	**-0.175**	**0.045**	**-0.013**		**0.180**	**-0.119**
ROA	15	**-0.084**	**0.048**	**0.041**	**0.041**	**0.059**	*0.007*	0.005	**-0.044**	**0.283**	**-0.260**	**0.111**	**-0.115**	**-0.055**	**0.077**		**0.015**
IndustryQ	16	0.002	**-0.079**	**-0.075**	**-0.081**	**-0.065**	*0.006*	*0.008*	**-0.015**	**-0.040**	**0.042**	**0.013**	**-0.020**	**-0.164**	**-0.086**	-0.005	

This table reports cross-sectional correlation coefficients for the period 1990–2010. Spearman correlations are in the upper diagonal, and Pearson correlations are in the lower diagonal. The correlation coefficient, followed by a two-sided *p*-value, is reported in each cell. Numbers reported in **bold** represent strong ($p < 0.01$) levels of significance, and those in *italics* indicate weak ($p < 0.05$ or $p < 0.1$) significance. All variables are defined in the Appendix.

Table 3. Cross-Listed R&D Disclosure and U.S. Peer Innovation

	Dependent Variable				
	RDINT	*lnNPAT*	*lnNCIT*	*lnCWPAT*	*lnMVPAT*
$PctADR_{RD}$	0.078***	0.133***	0.193***	0.135***	0.209***
	(2.36)	(3.43)	(3.12)	(2.93)	(3.52)
SIZE	0.013*	0.212***	0.341***	0.252***	0.366***
	(1.85)	(26.94)	(31.15)	(28.38)	(30.10)
TobinsQ	0.050***	0.169***	0.297***	0.203***	0.374***
	(4.68)	(14.54)	(15.68)	(14.52)	(19.13)
SaleGrw	-0.177***	-0.002**	-0.004**	-0.003**	-0.003*
	(-3.07)	(-2.15)	(-2.14)	(-2.16)	(-1.78)
LEV	0.016	-0.042**	-0.082**	-0.054**	-0.057**
	(0.73)	(-2.03)	(-2.19)	(-2.09)	(-1.96)
CAPEX	-0.171***	0.051	0.193**	0.081	-0.052
	(-2.78)	(1.01)	(2.24)	(1.34)	(-0.67)
AGE	-0.003	0.102***	0.186***	0.136***	0.193***
	(-0.73)	(9.74)	(11.30)	(11.13)	(12.31)
ROA	-0.177***	-0.022***	-0.019*	-0.024***	-0.055***
	(-3.07)	(-3.40)	(-1.77)	(-2.98)	(-5.24)
RDINT0		0.051**	0.139***	0.078**	-0.041
		(1.96)	(2.84)	(2.27)	(-1.50)
RD_MISS		-0.462***	-0.862***	-0.589***	-0.609***
		(-25.16)	(-28.12)	(-26.64)	(-21.32)
FE: Year & Industry	Yes	Yes	Yes	Yes	Yes
Std. Err. Clustered by firm	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.112	0.340	0.314	0.330	0.373
Observations	91,424	91,424	91,424	91,424	91,424

This table presents the results of regressions of firm innovation on peer R&D disclosure by ADR firms and control variables. All explanatory variables are lagged by one period. The sample covers the years 1990–2010. All variables are defined in the Appendix. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 (two-tailed) levels, respectively.

Table 4. Cross-Listed R&D Disclosure and U.S. Peer Innovation, Conditional on the Home Country Investor Legal Protection Environment

	Dependent Variable				
	RDINT	*lnPNAT*	*lnNCIT*	*lnCWPAT*	*lnMVPAT*
$PctADR_{CM}$	0.269**	0.155***	0.237***	0.139***	0.344***
	(2.15)	(2.87)	(3.40)	(2.68)	(3.95)
$PctADR_{CD}$	0.025*	0.126***	0.032	0.120*	0.172***
	(1.83)	(2.91)	(0.33)	(1.80)	(2.66)
SIZE	0.013*	0.213***	0.341***	0.252***	0.366***
	(1.85)	(26.95)	(31.15)	(28.38)	(30.11)
TobinsQ	0.049***	0.169***	0.297***	0.203***	0.374***
	(4.59)	(14.53)	(15.70)	(14.52)	(19.13)
SaleGrw	0.005**	-0.002**	-0.004**	-0.003**	-0.003*
	(2.42)	(-2.15)	(-2.13)	(-2.16)	(-1.78)
LEV	0.015	-0.042**	-0.082**	-0.054**	-0.057**
	(0.73)	(-2.03)	(-2.19)	(-2.09)	(-1.96)
CAPEX	-0.166***	0.051	0.190**	0.081	-0.049
	(-2.74)	(1.02)	(2.20)	(1.34)	(-0.63)
AGE	-0.003	0.102***	0.186***	0.136***	0.192***
	(-0.79)	(9.74)	(11.32)	(11.13)	(12.30)
ROA	-0.176***	-0.022***	-0.018*	-0.023***	-0.055***
	(-3.07)	(-3.42)	(-1.74)	(-2.98)	(-5.26)
RDINT0		0.051*	0.142***	0.079**	-0.043
		(1.95)	(2.88)	(2.27)	(-1.58)
RD_MISS		-0.462***	-0.862***	-0.589***	-0.609***
		(-26.95)	(-28.11)	(-26.64)	(-21.33)
Test of difference	0.244**	0.029	0.205*	0.019	0.172*
t-value	(2.02)	(0.47)	(1.88)	(0.25)	(1.88)
FE: Year & Industry	Yes	Yes	Yes	Yes	Yes
Std. Err. Clustered by firm	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.095	0.340	0.314	0.330	0.373
Observations	91,424	91,424	91,424	91,424	91,424

The table presents the impact of peer R&D disclosure by ADR firms on firm innovation, conditional on the home country investor legal protection system of foreign cross-listed firms. All explanatory variables are lagged by one period. The sample covers the years 1990–2010. All variables are defined in the Appendix. Standard errors are robust and clustered by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 (two-tailed) levels, respectively.

Table 5. Cross-Listed R&D Disclosure and U.S. Peer Innovation, Conditional on the Home Country Disclosure Requirements

	Dependent Variable				
	RDINT	*lnPNAT*	*lnNCIT*	*lnCWPAT*	*lnMVPAT*
$PctADR_{HIDIS}$	0.145***	0.155***	0.281***	0.183***	0.223***
	(2.65)	(3.67)	(3.92)	(3.59)	(3.38)
$PctADR_{LODIS}$	-0.033	0.091	0.039	0.049	0.178*
	(-1.19)	(1.36)	(0.39)	(0.64)	(1.86)
SIZE	-0.014*	0.212***	0.340***	0.251***	0.366***
	(-1.88)	(26.80)	(30.98)	(28.23)	(30.01)
TobinsQ	0.049***	0.168***	0.296***	0.202***	0.374***
	(4.51)	(14.43)	(15.59)	(14.42)	(19.06)
SaleGrw	0.004**	-0.002**	-0.004**	-0.003**	-0.003*
	(2.41)	(-2.16)	(-2.16)	(-2.18)	(-1.78)
LEV	0.016	-0.042**	-0.081**	-0.053**	-0.057**
	(0.74)	(-2.03)	(-2.19)	(-2.09)	(-1.96)
CAPEX	-0.169***	0.051	0.195**	0.082	-0.052
	(-2.76)	(1.01)	(2.26)	(1.35)	(-0.67)
AGE	-0.003	0.102***	0.186***	0.136***	0.192***
	(-0.73)	(9.74)	(11.30)	(11.13)	(12.31)
ROA	-0.177***	-0.022***	-0.020*	-0.025***	-0.055***
	(-3.08)	(-3.45)	(-1.88)	(-3.05)	(-5.25)
RDINT0		0.050*	0.135***	0.076**	-0.042
		(1.92)	(2.77)	(2.21)	(-1.53)
RD_MISS		-0.461***	-0.860***	-0.588***	-0.609***
		(-25.09)	(-28.05)	(-26.57)	(-21.28)
Test of difference	0.178***	0.064***	0.242**	0.134**	0.045**
t-value	(2.63)	(2.99)	(2.07)	(2.41)	(2.25)
FE: Year & Industry	Yes	Yes	Yes	Yes	Yes
Std. Err. Clustered by firm	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.095	0.340	0.314	0.330	0.373
Observations	91,424	91,424	91,424	91,424	91,424

The table presents the impact of peer R&D disclosure by ADR firms on firm innovation, conditional on the home country disclosure requirements of foreign cross-listed firms. All explanatory variables are lagged by one period. The sample covers the years 1990–2010. All variables are defined in the Appendix. Standard errors are robust and clustered by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 (two-tailed) levels, respectively.

Table 6. Cross-Listed R&D Disclosure and U.S. Peer Innovation, Conditional on the Home Country R&D Reporting Rule

Panel A: Impact of R&D Reporting under IFRS and U.S. GAAP

	Dependent Variable				
	RDINT	*lnPNAT*	*lnNCIT*	*lnCWPAT*	*lnMVPAT*
$PctADR_{IFRS}$	0.122***	0.172**	0.269*	0.139	0.330**
	(3.74)	(2.03)	(1.83)	(1.37)	(2.48)
$PctADR_{GAAP}$	-0.093	-0.074	0.046	0.046	-0.085
	(-0.73)	(-0.58)	(0.47)	(0.29)	(-0.43)
Control Variables	Yes	Yes	Yes	Yes	Yes
FE: Year & Industry	Yes	Yes	Yes	Yes	Yes
Std. Err. Clustered by firm	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.108	0.337	0.298	0.330	0.383
Observations	11,143	11,143	11,143	11,143	11,143

Panel B: Impact of R&D Reporting under IFRS and U.S. GAAP, Conditional on Home Country Disclosure Requirements

	Dependent Variable				
	RDINT	*lnPNAT*	*lnNCIT*	*lnCWPAT*	*lnMVPAT*
$PctADR_{HIDIS\_IFRS}$	0.166***	0.691***	1.160***	1.071***	1.087***
	(2.72)	(3.47)	(5.01)	(4.44)	(3.69)
$PctADR_{HIDIS\_GAAP}$	0.254	0.027	0.210	0.037	0.201
	(1.15)	(1.23)	(1.52)	(1.26)	(1.02)
$PctADR_{LODIS}$	-0.060	-0.029	0.007	-0.076	-0.047
	(-1.43)	(-0.30)	(0.07)	(-0.65)	(-0.31)
Control Variables	Yes	Yes	Yes	Yes	Yes
FE: Year & Industry	Yes	Yes	Yes	Yes	Yes
Std. Err. Clustered by firm	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.100	0.336	0.300	0.331	0.383
Observations	11,143	11,143	11,143	11,143	11,143

The table presents the impact of peer R&D disclosure by ADR firms on firm innovation, conditional on the reported accounting standards in the U.S. and home country disclosure requirements of foreign cross-listed firms. All explanatory variables are lagged by one period. The sample covers the years 2007–2010. All variables are defined in the Appendix. Standard errors are robust and clustered by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 (two-tailed) levels, respectively.

Table 7. Cross-Listed R&D Disclosure and U.S. Peer Innovation: Matched Sample Design

Panel A: Sample Characteristics

	ADR = 1 (obs. = 3,974)			U.S. matched firms (obs. = 3,974)		
Variable	**Mean**	**Median**	**Std.Dev**	**Mean**	**Median**	**Std.Dev**
RDINT0	0.040	0.001	0.109	0.043	0.000	0.170
SIZE	1.392	1.052	1.048	1.285	1.090	1.039
IndustryQ	4.076	3.672	2.259	4.079	3.696	2.134

Panel B: Descriptive Statistics

Variable (obs. = 3,974)	Mean	Std. Dev.	Q1	Median	Q3
RDINT	0.043	0.170	0.000	0.000	0.034
lnNPAT	1.067	1.747	0.000	0.000	1.609
lnNCIT	1.742	2.695	0.000	0.000	3.556
lnCWPAT	1.281	2.032	0.000	0.000	2.287
lnMVPAT	1.747	2.784	0.000	0.000	3.152
$PctADR_{RD}$	0.327	0.290	0.098	0.273	0.496
$PctADR_{CM}$	0.083	0.173	0.001	0.011	0.111
$PctADR_{CD}$	0.244	0.271	0.009	0.185	0.403
$PctADR_{IFRS}$	0.028	0.103	0.000	0.000	0.000
$PctADR_{GAAP}$	0.298	0.282	0.054	0.237	0.436
$PctADR_{HIDIS\_IFRS}$	0.017	0.078	0.000	0.000	0.000
$PctADR_{HIDIS\_GAAP}$	0.224	0.249	0.013	0.166	0.303
$PctADR_{LODIS}$	0.084	0.140	0.000	0.027	0.124
SIZE	7.305	1.991	6.046	7.588	8.784
TobinsQ	0.515	0544	0.144	0.396	0.769
SaleGrw	0.072	0.401	-0.001	0.054	0.139
LEV	0.235	0.209	0.067	0.214	0.341
CAPEX	0.062	0.063	0.024	0.046	0.078
AGE	2.794	0.968	2.079	2.890	3.714
ROA	0.035	0.308	0.021	0.073	0.114

(continued)

Panel C: Regression Results

	Dependent Variable				
	RDINT	*lnPNAT*	*lnNCIT*	*lnCWPAT*	*lnMVPAT*
Table 3 (obs. =3,974)					
$PctADR_{RD}$	0.020[#]	0.443**	0.670**	0.536**	0.937***
	(1.44)	(2.29)	(2.42)	(2.49)	(3.49)
Table 4 (obs. =3,974)					
$PctADR_{CM}$	0.046[#]	0.674***	0.893**	0.821***	1.581***
	(1.53)	(3.15)	(2.48)	(3.19)	(4.46)
$PctADR_{CD}$	0.011	0.372*	0.601*	0.448*	0.738**
	(1.18)	(1.69)	(1.93)	(1.83)	(2.46)
Test of difference	0.035	0.302*	0.292*	0.373**	0.843**
t-value	(1.42)	(1.89)	(1.74)	(2.09)	(2.21)
Table 5 (obs. =3,974)					
$PctADR_{HIDIS}$	0.030*	0.667***	1.013***	0.809***	1.296***
	(1.82)	(3.26)	(3.23)	(3.44)	(4.29)
$PctADR_{LODIS}$	-0.001	-0.039	-0.072	-0.053	0.161
	(-0.11)	(-0.12)	(-0.17)	(-0.15)	(0.37)
Test of difference	0.031**	0.706**	1.085**	0.862**	1.135**
t-value	(1.97)	(2.05)	(2.31)	(2.29)	(2.30)
Table 6A (obs. =565)					
$PctADR_{IFRS}$	0.151**	0.458	0.268	0.555	1.349[#]
	(2.35)	(0.75)	(0.39)	(0.78)	(1.41)
$PctADR_{GAAP}$	-0.212**	0.542	1.083	1.022	1.027
	(-2.21)	(0.65)	(1.09)	(0.97)	(0.71)
Test of difference	0.363**	-0.084	-0.815	-0.467	0.322
t-value	(2.52)	(-0.07)	(-0.60)	(-0.32)	(0.16)
Table 6B (obs. =565)					
$PctADR_{HIDIS\ IFRS}{}^{a}$	0.118*	1.496*	2.225**	2.361**	2.765**
	(1.66)	(1.85)	(2.19)	(2.36)	(2.16)
$PctADR_{HIDIS\ GAAP}{}^{b}$	0.086	0.589	0.108	0.545*	1.419
	(1.57)	(0.95)	(0.15)	(1.74)	(1.34)
$PctADR_{LODIS}$	0.013	0.121	0.425	0.386	0.655
	(0.23)	(0.16)	(0.51)	(0.44)	(0.52)
Test of difference between *a* and *b*	0.032**	0.907*	2.117*	1.816**	1.346**
t-value	(2.19)	(1.80)	(1.92)	(2.10)	(2.25)

This table presents the results of the main analyses from Table 3 to 6 based on the propensity-score matched sample. All variables are defined in the Appendix. Standard errors are robust and clustered by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 (two-tailed) levels, respectively. # indicates significance at 0.1 (one-tailed) level. The regression model includes control variables and year and industry fixed effects.

Table 8. Cross-Listed R&D Disclosure and U.S. Peer Innovation Efficiency

	Dependent Variable									
	IEPAT	*IEMVP*	*IEPAT*	*IEMVP*	*IEPAT*	*IEMVP*	*IEPAT*	*IEMVP*	*IEPAT*	*IEMVP*
$PctADR_{RD}$	1.408*	0.678**								
	(1.91)	(2.18)								
$PctADR_{CM}$			1.423*	0.688**						
			(1.73)	(2.12)						
$PctADR_{CD}$			1.353	0.641*						
			(1.59)	(1.91)						
$PctADR_{HIDIS}$					1.520	0.903*				
					(1.50)	(1.74)				
$PctADR_{LODIS}$					0.079	0.549				
					(0.33)	(1.35)				
$PctADR_{IFRS}$							3.819*	0.545*		
							(1.70)	(1.80)		
$PctADR_{GAAP}$							2.134	0.449		
							(1.64)	(1.64)		
$PctADR_{HIDIS\ IFRS}$									0.071	0.037**
									(1.58)	(2.40)
$PctADR_{HIDIS\ GAAP}$									0.019	0.106
									(1.10)	(1.18)
$PctADR_{LODIS}$									-0.011	-0.006
									(-0.70)	(-0.62)
SIZE	0.360***	0.125***	0.360***	0.125***	0.357***	0.126***	0.961*	0.125**	0.029***	0.018***
	(3.78)	(3.31)	(3.78)	(3.31)	(3.67)	(3.27)	(1.89)	(2.29)	(2.68)	(3.73)
TobinsQ	0.395*	0.183**	0.395*	0.183**	0.421*	0.185**	1.284**	0.248**	0.034**	0.026**
	(1.86)	(2.14)	(1.84)	(2.13)	(1.91)	(2.09)	(2.40)	(2.30)	(2.27)	(2.43)
SaleGrw	-0.002	-0.002	-0.002	-0.002	0.002	-0.002	-0.070	-0.008	-0.026	-0.016
	(-0.09)	(-1.23)	(-0.09)	(-1.23)	(0.60)	(-1.18)	(-0.80)	(-0.75)	(-1.29)	(-1.53)
LEV	-0.120	-0.052	-0.120	-0.052	-0.099	-0.052	-1.470	-0.182	-0.192***	-0.105***
	(-1.49)	(-1.57)	(-1.49)	(-1.57)	(-1.48)	(-1.57)	(-1.20)	(-1.43)	(-3.21)	(-3.17)
CAPEX	-0.562**	-0.532*	-0.564**	-0.533*	-0.103	-0.539*	0.322	-0.136	0.009	0.035
	(-1.98)	(--1.73)	(-2.05)	(-1.74)	(-0.73)	(-1.76)	(0.51)	(-0.78)	(1.01)	(0.62)
AGE	0.288***	0.082***	0.288***	0.082***	0.233***	0.082***	1.702	0.219*	0.234**	0.149
	(3.31)	(3.00)	(3.31)	(3.00)	(3.14)	(3.01)	(1.50)	(1.84)	(2.48)	(1.30)
ROA	-0.141***	-0.041***	-0.141***	-0.041***	-0.133***	-0.040***	-0.329	-0.030	-0.028*	-0.015
	(-3.71)	(-3.24)	(-3.72)	(-3.24)	(-3.04)	(-3.20)	(-0.97)	(-0.84)	(-1.65)	(-1.38)
Std. Err. Clustered by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE: Year & Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.106	0.099	0.106	0.099	0.092	0.101	0.171	0.221	0.170	0.283
Observations	73,212	73,212	73,212	73,212	73,212	73,212	3,324	3,324	3,324	3,324

This table presents the effect of peer R&D disclosure by ADR firms on firm innovation efficiency. We partition the aggregate industry R&D of ADR firms by their home country legal investor protection system, home country disclosure requirements, and their accounting standards reported in the U.S. market. We take *t*+3 to construct innovation efficiency measures when all explanatory variables are measured at year *t*. All variables are defined in the Appendix. Standard errors are robust and clustered by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 (two-tailed) levels, respectively. The regression model includes control variables and year and industry fixed effects.

Table 9. Cross-Listed R&D Disclosure and U.S. Peer Innovation

Panel A: Reliance on External Financing

	Dependent Variable						
	RDINT	*lnNPAT*	*lnNCIT*	*lnCWPAT*	*lnMVPAT*	*IEPAT*	*IEMVP*
External Finance Dependent Industries							
$PctADR_{RD}$	0.023	0.047	0.429	0.058	0.014**	0.298	0.295
	(1.59)	(1.11)	(1.39)	(1.11)	(2.21)	(1.41)	(1.33)
INDEXFIN	0.018	0.108***	0.087***	0.149***	0.165***	0.083	0.119*
	(1.57)	(5.92)	(2.80)	(6.67)	(5.89)	(0.89)	(1.92)
$PctADR_{RD}$*INDEXFIN*	0.079*	0.254***	0.109	0.268***	0.311***	0.167*	0.585**
	(1.88)	(4.45)	(1.25)	(3.87)	(3.64)	(1.92)	(2.12)
Control & FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.091	0.342	0.258	0.332	0.375	0.109	0.101
Observation	91,424	91,424	91,424	91,424	91,424	73,212	73,212
External Finance Dependent Firms							
$PctADR_{RD}$	0.065**	0.129***	0.236*	0.168***	0.161***	0.131	0.289
	(2.36)	(3.46)	(1.76)	(3.62)	(2.59)	(0.48)	(1.25)
EXFIN	0.035***	0.133***	0.119***	0.179***	0.167***	0.130	0.070*
	(2.75)	(8.52)	(3.10)	(9.50)	(6.82)	(1.21)	(1.84)
$PctADR_{RD}$*EXFIN*	0.014*	0.337***	0.185***	0187***	0.148***	0.206**	0.187**
	(1.72)	(7.97)	(2.63)	(7.64)	(7.13)	(2.26)	(2.52)
Control & FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.095	0.346	0.329	0.336	0.378	0.112	0.106
Observation	91,424	91,424	91,424	91,424	91,424	73,212	73,212

Panel B: Financing Constraint

	Dependent Variable						
	RDINT	*lnNPAT*	*lnNCIT*	*lnCWPAT*	*lnMVPAT*	*IEPAT*	*IEMVP*
$PctADR_{RD}$	0.088**	0.086**	0.182	0.182*	0.116**	1.030*	1.085
	(2.00)	(2.37)	(0.92)	(1.80)	(2.17)	(1.71)	(1.57)
WWFC	0.024	0.007	0.030*	-0.010	0.025	0.491	0.236**
	(1.02)	(1.37)	(1.69)	(-0.48)	(0.09)	(1.53)	(2.15)
$PctADR_{RD}$*WWFC*	0.025	0.103*	0.193**	0.077*	0.208**	1.315*	1.356**
	(1.60)	(1.92)	(1.96)	(1.87)	(2.50)	(1.94)	(2.37)
Control & FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-square	0.094	0.339	0.308	0.329	0.372	0.121	0.115
Observation	91,424	91,424	91,424	91,424	91,424	73,212	73,212

The *INDEXFIN* and *EXFIN* measures indicate external financial dependence at the industry and firm levels (Rajan and Zingales 1998; Xiao 2013), respectively. *WWFC* is an indicator of high financial constraints based on Whited and Wu's (2006) index. All explanatory variables are lagged by one period. The detailed variable definitions are in the Appendix. Standard errors are robust and clustered by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 (two-tailed) levels, respectively. All regression models include control variables and year and industry fixed effects.