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ABSTRACT

Cross-Listing, Investment Sensitivity to Stock Price and the Learning Hypothesis*

We show that the sensitivity of corporate investment to stock price is higher for firms cross-listed in the U.S. than for firms that never cross-list. This difference is strong, does not exist prior to the cross-listing date, and does not vanish over time after this date. Moreover, the impact of a U.S. cross-listing on the investment-to-price sensitivity is stronger for firms that rank high on measures of governance quality, which suggests that our finding is not primarily driven by the improvement in corporate governance associated with a U.S cross-listing. Instead, we argue that a cross-listing enhances managers' reliance on stock prices because it makes stock prices more informative to managers. In support of this learning hypothesis, we find that the positive impact of a U.S. cross-listing on the investment-to-price sensitivity is higher when a cross-listing is more likely to stimulate trading based on information new to managers.

JEL Classification: G14, G15, G31 and G39
Keywords: cross-listing, investment-to-price sensitivity, managerial learning and price informativeness

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1. Introduction

Multiple listings of stock is a widespread and enduring phenomenon. For instance, Gagnon and Karolyi (2010) report that about 3,000 firms had two or more listings in 2008 and highlight that managers' appetites for international cross-listings are not fading, despite increasing market integration. The motives and valuation effects of cross-listings have been extensively analyzed.[1] In contrast the consequences of foreign listings for firms' investment decisions have received much less attention.

Our contribution to this question is twofold. First, we show empirically that a U.S. cross-listing is followed by a significant increase in the sensitivity of investment to stock price for cross-listing firms, which suggests that the cross-listing decision has *real* consequences. Second, we provide evidence suggesting that this effect arises because a U.S. cross-listing enhances the amount of information that managers learn from their stock price.

The idea that managers can extract valuable information from the stock market is not new (see for instance Dow and Gorton (1997) and Subrahmanyam and Titman (1999)) and has received empirical support (Durnev, Morck, and Yeung (2004), Luo (2005), Chen, Goldstein, and Jiang (2007), or Bakke and Whited (2010)). By going public, managers encourage investors to collect a myriad of signals about their firm (e.g., its growth opportunities, the value of a new strategy, etc…). As stock prices aggregate these private signals, managers can use this information, in addition to other sources of information, to make their investment decisions.[2]

Foucault and Gehrig (2008) develop the implications of this idea for cross-listings.[3] In their model, a cross-listing helps managers to better identify projects with positive net present values (NPVs), because it makes a firm's stock price more informative. Indeed, a cross-listing expands the set of investors who collect private information about firms' growth prospects in two ways. First, informed investors have more trading venues in which they can exploit their private information when

[1] See Karolyi (2006), Karolyi (2010) and Gagnon and Karolyi (2010) for surveys.

[2] For instance, managers may decide to pursue or give up a major investment plan (e.g., a major acquisition, research and development projects, or diversification into new products and markets) after observing the market reaction to the announcement of this plan. Luo (2005) studies empirically the case of merger announcements and show that managers use the information contained in the stock price reaction to these announcements to cancel or consummate the deal.

[3] Their paper contributes to the growing theoretical literature that analyzes the implications of the informational role of stock prices for managers (e.g., Goldstein and Gümbel (2008), Hennessy (2009), or Dow, Goldstein, and Gümbel (2010)).

the firm is cross-listed. In addition, a cross-listing fosters trading by foreign investors who otherwise would not be able to trade the firm's stock because, for instance, of investment restrictions (e.g., foreign ownership limits), prohibitively high trading costs or lack of transparency on the firm's activities.[4] These trades impound information new to managers in stock prices because some foreign investors have a specific expertise in assessing firms' strategy (as in Chemmanur and Fulghieri (2006)) or a privileged access to relevant information about the prospects of firms' foreign operations (e.g., as suggested by Titman and Subrahmanyam (1999), a firm's foreign customers may be better positioned to evaluate the potential demand for a firm's products).

We refer to the hypothesis that a cross-listing affects managerial decisions because it enhances the informativeness of stock prices for managers as the "learning hypothesis."[5] A key implication of this hypothesis is that a U.S. cross-listing should be associated with an increase in the investment-to-price sensitivity of cross-listed firms. The intuition is as follows (see Foucault and Gehrig (2008) for a formal analysis). Value-maximizing managers should use all relevant available information to forecast the cash-flows of their investment projects when they make capital allocation decisions. Hence, managers' forecasts will depend both on their own private information and their stock price, insofar as investors' private information (reflected into stock prices) is new to managers. Intuitively, these forecasts and the resulting allocation of capital should put more weight on more informative signals. Accordingly, if a cross-listing enhances the informational content of stock prices for managers, it should make cross-listed firms' capital expenditures more sensitive to this signal.

We test and validate this implication using a large sample of foreign firms that cross-list on U.S. exchanges (633 firms from 39 countries) over the period 1989-2006. The investment-to-price sensitivity of cross-listed firms is about twice that of control firms that never cross-list in the U.S. during our sample period (20,027 firms). The economic magnitude of this cross-listing effect is substantial: a one standard deviation increase in price is associated with a 5.9% increase in corporate

[4] Ammer, Holland, Smith and Warnock (2008) find that U.S. holdings in a foreign firm markedly increase upon a cross-listing in the U.S., for firms coming from countries with poor disclosure requirements.

[5] This hypothesis fits within the broader literature showing how a U.S cross-listing affects firms' information environment. Cantale (1996), Fuerst (1998) and Moel (1998) develop theories in which managers' decision to cross-list signals the quality of their investment projects to investors and thereby reduces informational asymmetries between investors and firms. Moreover, Lang, Lins, and Miller (2004) show that a cross-listing enhances analyst coverage and the precision of analyst forecasts. Bailey, Karolyi and Salva (2006) also show that changes in disclosure requirements for U.S. cross-listings (reconciliation with U.S. GAAP) are associated with greater volume and price volatility after earnings announcements.

investment for non-cross-listed firms against an 11.9% increase for cross-listed firms (about 43% of the average level of corporate investment in our sample). Additional specifications show that this effect is robust to various estimation methodologies (including those accounting for selection biases), as well as a host of alternative definitions of corporate investment.

In a second set of tests, we track the investment-to-price sensitivity in event-time around the cross-listing date. The estimated patterns are striking. Until the cross-listing year, the investment-to-price sensitivity of firms that will cross-list on a U.S. exchange is not significantly different from that of control firms. However, in the cross-listing year, this sensitivity experiences a positive and significant jump. Hence, the higher investment-to-price sensitivity of cross-listed firms *follows* the cross-listing decision rather than precedes it, which alleviates concerns about reverse-causality. We also show that the positive effect of a cross-listing on the investment-to-price sensitivity is long-lasting. Even ten years after they list on U.S. markets for the first time, cross-listed firms continue to exhibit a higher investment-to-price sensitivity than their domestic peers.

Next, we analyze the determinants of the cross-sectional variations in the impact of a cross-listing on the investment-to-price sensitivity. The learning hypothesis implies that this impact should be relatively stronger when a cross-listing encourages the production of more information new to managers. We check that this is the case by using various firm-level proxies for the impact of a cross-listing on the informativeness of price to managers (e.g., the fraction of foreign sales for the firm or a measure of the incremental contribution of the U.S. stock market to information about the firm, developed by Baruch, Karolyi and Lemmon (2007)). Consistent with the learning hypothesis, for each proxy, we find that the impact of a U.S. cross-listing on the investment-to-price sensitivity is higher when the cross-listing is more likely to be associated with an increase in the production of private information new to managers.

We also exploit the fact that some firms in our sample cross-list on the U.S. OTC market or as Rule 144a (private placements). The market for these cross-listings is much less liquid and should therefore be less conducive to the production of information new to managers. Thus, the learning hypothesis implies that the effect of a U.S. cross-listing on the investment-to-price sensitivity of these firms should be smaller than for exchange listed firms. This is exactly what we find in our data.

Another implication of the learning hypothesis is that firms should be more likely to select investment projects with positive NPVs after a cross-listing. Indeed, as managers obtain a more precise signal from their stock prices, they better identify good investment projects. This improvement in the efficiency of capital allocation for the firm should translate in better operating performance after a cross-listing and this improvement should be more pronounced for cross-listings that experience a larger increase in the investment-to-price sensitivity. Indeed, other things equal, these are the firms for which the (unobservable) improvement in price informativeness should be the greatest according to Foucault and Gehrig (2008). Our data also support this prediction for various measures of operating performance (return on assets and sales growth).

As documented by prior research, a U.S. cross-listing results in a significant improvement in governance (protection of minority shareholders) and disclosure requirements, especially for firms coming from countries with less developed financial markets or emerging countries. This observation led Stulz (1999) and Coffee (1999) to craft the so called "bonding hypothesis" as an explanation for U.S. cross-listings: firms may choose to cross-list in the U.S. to commit themselves to higher governance and disclosure standards.[6] This improvement in governance and disclosure requirements could increase the correlation between investment and stock prices even if managerial learning plays no role.

We use different tests to assess this possibility. If only stricter governance and disclosure are responsible for our findings, one would expect the effect of a cross-listing effect on the investment-to-price sensitivity to be especially large for cross-listed firms which experience substantial gains in governance and disclosure. We find the opposite. Specifically, using country-level and firm-level proxies for the quality of corporate governance, we find that the impact of a U.S. cross-listing on firms' investment-to-price sensitivity is higher for cross-listed firms originating from countries where minority shareholders are well protected, disclosure requirements are more stringent and economic development is advanced or firms ranking high on firm-level measures of governance quality.

A U.S. cross-listing also relaxes financing constraints (see Reese and Weisbach (2002), Lins, Strickland, and Zenner (2005), Khurana, Martin, and Periera (2008), Hail and Leuz (2009) and

[6] See Karolyi (2010) for a review of the governance implications of U.S. cross-listings.

Doidge, Karolyi, and Stulz (2009)). This effect must work to reduce the investment-to-price sensitivity of cross-listed firms since several studies find a positive association between financial constraints and the investment-to-price sensitivity (see Baker, Stein, and Wurgler (2003) or Campello and Graham (2007)). Yet we find that a cross-listing raises the investment-to-price sensitivity. Hence, for cross-listed firms, another mechanism must countervail the negative effect of the relaxation of financial constraints on the investment-to-price sensitivity. If managerial learning is part of this mechanism, we expect the impact of a U.S. cross-listing on the investment-to-price sensitivity to be significantly higher for firms that face more stringent financial constraints. Indeed, it is more difficult for financially constrained firms to respond to positive stock market signals as this response may require fresh capital. By relaxing financial constraints, a U.S. cross-listing enable firms to be more responsive to these signals. We find evidence consistent with this conjecture: in our sample, the investment-to-price sensitivity is higher for cross-listed firms that are more financially constrained.

Our paper contributes to two different strands of research. First, it advances the vast literature on international cross-listings. To our knowledge we are first to document the positive impact of a cross-listing on the investment-to-price sensitivity and to relate this effect to managerial learning.[7] In this way, we suggest a new source of value creation associated with cross-listings: managers of cross-listed firms better allocate capital amongst investment projects because they receive more informative feedback from the stock market.

Second, our results contributes to the literature that analyzes how stock prices affect corporate investment (pioneered by Barro (1990), Morck, Shleifer and Vishny (1990), and Blanchard, Rhee, and Summers (1993)). A key challenge in this literature is to identify the source(s) of the positive relation between investment and stock prices. Indeed, this association may arise simply because stock prices passively reflect managers' information about their growth opportunities. Also, as explained previously, investment may correlate with stock prices because financially constrained firms can take advantage of high stock prices to tap the equity market, and use the new funds to finance investment (see for instance Stein (1996), Baker, Stein and Wurgler (2003), Campello and Graham (2007) or Polk

[7] Lins, Stickland, and Zenner (2005) study empirically the effect of a cross-listing on the sensitivity of investment to cash flows and find that this sensitivity declines after a cross-listing because a cross-listing relaxes constraints on access to capital for firms. We are not aware of other studies relating capital expenditures to the cross-listing decision.

and Sapienza (2008)). Lastly, a change in stock prices may cause managers to scale up or down their investment because it conveys new information to managers, as formalized by Dow and Gorton (1997) or Subrahmanyam and Titman (1999).

A significant research effort has been made recently to identify this "managerial learning channel" (e.g., Durnev, Morck, and Yeung (2004), Luo (2005), Chen, Goldstein, and Jiang (2007), Bakke and Whited (2010), Frésard (2010), or Durnev (2010)). We contribute to this effort in two ways. Previous studies (Luo (2005) apart) rely on specific measures of the amount of private information in stock prices (firm-specific stock return variation or the PIN measure). One drawback of this approach is that all private information in stock prices is not necessarily new to managers.[8] We avoid this problem by considering a corporate decision (the cross-listing decision) that should foster the production of private information new to managers according to theory (Foucault and Gehrig (2008)). Of course, the limitation of our approach is that we cannot directly test whether a cross-listing has indeed this effect in reality. Second, we document the presence of managerial learning in a sample of international firms. Interestingly, our country-level findings suggest that the extent to which managers rely on stock market feedback is in part determined by the characteristics of their home-market (e.g., its level of financial development). This finding is consistent with Durnev (2010) who finds that in countries where political connections are more important, managers' investment decisions are less guided by their stock price.

In the next section, we describe the sample and our empirical methodology. In Section 3, we document the positive effect of a U.S. cross-listing on firms' investment-to-price sensitivity and show that this result is consistent with improved managerial learning. We explore alternative explanations in Section 4. We summarize our main findings and discuss some implications for future research in Section 5. All variables used in the paper are defined in the Appendix. A companion Internet

[8] A basic implication of the learning hypothesis is that stock prices should contain more information relevant to managers after a cross-listing. Unfortunately, it is difficult to isolate the component of stock price information that is new to managers since managers' information is not directly observable. Fernandes and Ferreira (2008) find empirically that a cross-listing is associated with an improvement in stock price informativeness, using firm-specific stock return variation as a proxy for price informativeness and their finding also holds in our sample (see Table A.1 in our Internet Appendix). However, Dasgupta, Gan and Gao (2010) obtain the opposite finding for another sample of U.S. cross-listings. In any case, an increase in stock price informativeness is neither necessary, nor sufficient for stock prices to contain more information *new* to managers after a cross-listing.

Appendix (available on the authors' web site) provides additional tests that are mentioned in the paper but not reported here for brevity.

2. Data and Methodology

2.1 Sample and Summary statistics

Our sample construction starts with all non-U.S. firms covered by Worldscope. For each firm, we collect its market value of equity, total assets, capital expenditures, sales, cash flows, and additional variables that serve as proxies for firm profitability and financial policy for the period 1989-2006. We exclude financial firms (SIC codes between 6000 and 6999) and utilities (SIC codes between 9000 and 9999) because their accounting numbers are largely dependent on statutory capital requirements. We also exclude those firms for which information on market value of equity, total assets, sales and capital expenditures is missing, as well as firms with total assets that are inferior to $10 million and firms with negative sales. To reduce the effect of outliers all the ratios are winsorized at 1% in each tail.

In this sample, we identify the firms that are cross-listed in the U.S. We obtain cross-listing information (whether a firm has a foreign listing in the United States at the end of each year and the type of listing) from a variety of sources, including the Bank of New York, JP Morgan, Citibank, the NYSE, the Nasdaq, firms' annual reports and the Center for Research on Security Prices (CRSP). Information from various dataset is manually cross-checked. We only consider each firm once per year, regardless of the number of its cross-listed securities in the U.S. (e.g., if a single firm has simultaneously ordinary and preferred shares issued in the U.S., we count it only once). To mitigate concerns about survivorship bias, we keep track of both active and inactive listings using the data provided by Citibank and CRSP. Moreover, we manually check and complete the listing dates and status by searching on Factiva and Lexis/Nexis.

Our sample of cross-listed firms includes all firms that cross-list on U.S. exchanges (NYSE, Nasdaq, or Amex) via Level 2 or 3 (capital raising) American Depositary Receipts (ADRs), ordinary

listings, or New York Registered Shares.[9] It also includes Level 1 ADRs, which trade over the counter (OTC) either on the OTC Bulletin Board (OTCBB) or as Pink Sheets, and Rule 144a ADRs, which are privately placed to qualified institutions buyers (see Table 1 in Foerster and Karolyi (1999) for a definition of ADR programs). We keep track of changes in listing type for each firm (e.g., upgrades from an OTC to exchange listing) using the information provided by Citibank.

[Insert Table 1 about here]

Table 1 describes the composition of our sample of cross-listed firms and firms that never cross-list ("the control sample"). The sample consists of 633 firms (6,345 firm-years) cross-listed on U.S. stock exchanges, 665 OTC listed firms (6,946 firm-years), and 170 private placements (1,879 firm-years). The control sample contains 20,027 non-cross-listed firms (130,960 firm-years). The sample has considerable geographic dispersion: firms are located in 39 countries, 17 of which are emerging markets according to the classification scheme of the Standard and Poor's Emerging Market Database.[10] Overall our sample comprises 418 cross-listed firms from emerging markets (131 exchange listings, 146 OTC listings, and 141 Rule 144a listings) and 1,050 firms from developed markets (502 exchange listings, 519 OTC listings, and 29 Rule 144a listings). The proportion of firms cross-listed in the U.S. varies widely across countries. Austria and Belgium have one and respectively two firms with a U.S. cross-listing, while Canada, the U.K., and Hong Kong have more than 100 cross-listed companies. The distribution of cross-listed firms in our sample by type (Level 1, 2 etc…) or countries of origin closely matches that of Fernandes and Ferreira (2008) (their sample period is 1980-2003; see their Table 2) or Doidge, Karolyi and Stulz (2007a) (their sample period is 1990-2005; see their Table 3).[11]

[Insert Table 2 about here]

[9]We exclude direct listings from our sample, i.e., foreign firms that are listed in the U.S. but not in their home market, because we want to measure the incremental effect of a U.S. cross-listing on the investment-to-price sensitivity and because we need data on the market value of cross-listed firms before they cross-list.

[10] The Standard and Poor's Emerging Market Database classifies a market as emerging if it meets at least one of two general criteria: (1) it is located in a low- or middle-income economy as defined by the World Bank, and (2) its investable market capitalization is low in relation to its most recent GNP figures. This yields a few situations in which newly rich countries (such as Taiwan and Korea) are categorized as emerging markets. The classification is based on 1998 data.

[11]We have slightly fewer cross-listing firms than in Doidge, Karolyi, and Stulz (2007a) because we use different filters on accounting variables (we eliminate observations when market value of equity, total assets, sales and capital expenditures is missing, as well as firms with total assets that are inferior to $10 million and firms with negative sales).

Table 2 presents the mean, median and standard deviation of the main variables used in the study (all variables used in the paper are expressed in U.S. dollars when relevant and are defined in the Appendix). Consistent with previous studies, we observe that cross-listed firms are bigger than non cross-listed firms in our sample (e.g., the average total assets for exchange listings is almost ten times that of non-cross-listed firms). Also, in line with Doidge, Karolyi, and Stulz (2004), cross-listed firms have markedly higher valuation and sales growth. For instance, the average Tobin's Q (sales growth) is 1.531 (17.9%) for firms that are cross-listed on a U.S. exchange against 1.121 (14.4%) for the control firms. In contrast, as in Lins, Strickland, and Zenner (2005), the ratio of capital expenditure to fixed assets does not appear to differ between cross-listed and control of firms.[12]

The disclosure requirements and trading mechanisms differ significantly for firms cross-listed on U.S exchanges on the one hand and Level 1 or Rule 144A ADRs on the other hand. Specifically, disclosure requirements to the SEC and compliance with U.S. GAAP are much more stringent for exchange listed firms. Moreover, the OTC Bulletin Board or the Pink sheets markets do not provide centralized matching services as exchanges do (see Harris, Panchapagesan, and Werner (2008) for a description of the trading mechanisms on these markets). As a result they are much less liquid than exchanges (Harris, Panchapagesan, and Werner (2008)) and firms cross-listed on these markets are less actively traded by U.S. investors (see, for instance, Ammer, Holland, Smith, and Warnock (2008)). For this reason, we expect the impact of a cross-listing on the informational content of stock prices for managers to be smaller, if not insignificant, for firms cross-listed as Level 1 or Rule 144A ADRs. Hence, we conduct our main tests on the subsample of firms cross-listed on U.S. exchanges and in Section 3.4, we test whether the effect of a U.S. cross-listing on the investment-to-price sensitivity is lower for Level 1 and Rule 144A ADRs.

2.2 Measuring the investment-to-price sensitivity

As explained in the introduction, we test whether managers of cross-listed firms rely more on information conveyed by their stock price by studying the effect of a U.S. cross-listing on the sensitivity of

[12] In the sample used by Lins, Strickland, and Zenner (2005), cross-listed firms do not have a significantly higher ratio of capital expenditure after the cross-listing decision, even after controlling for other variables affecting this ratio (see their Tables 3 and 4).

firms' investment to their stock price. To this end, throughout the paper, we estimate various specifications of the following equation:

$$I_{i,t} = \alpha + \beta_0 Q_{i,t-1} + \beta_1 Exchange_{i,t-1} + \beta_2 Q_{i,t-1} \times Exchange_{i,t-1} + \gamma_1 CF_{i,t-1} + \gamma_2 \log(TA_{i,t-1}) + \varepsilon_{i,t} \quad (1),$$

where the subscripts *i* and *t* represent respectively the firm and the year. The dependent variable $I_{i,t}$ is a measure of corporate investment in year *t*, which, in our baseline specification, is the ratio of capital expenditures in that year scaled by lagged fixed assets (property, plant and equipment). The vector **α** includes a host of dummy variables that capture time-invariant firm heterogeneity (firm fixed-effects), systematic differences in investment policies across countries (country fixed-effects), industries (industry fixed-effects defined at the 2 digit SIC codes level), and time (year fixed-effects). Variable $Q_{i,t-1}$ is the normalized stock price of firm *i* in year *t-1*, and is computed as the market value of equity (stock price times the number of shares outstanding) plus the book value of assets minus the book value of equity, scaled by book assets.

The variable of interest $Exchange_{it}$ is a dummy variable that is equal to one if firm *i* is cross-listed on a U.S. exchange in year *t* and zero otherwise. As explained in the previous section, in our baseline tests, we only include firms that cross-list on a U.S exchange at some point during our sample period and the control firms that never cross-list (without including OTC and Rule 144a cross-listings in the control sample). In estimating equation (1), our primary interest is on the coefficient β_2, which measures the extent to which the association between investment and price differs between exchange-listed firms and control firms. If managers learn more information from observing their stock price once cross-listed in the U.S., and incorporate this information into their investment policy, we expect this coefficient to be positive and significant.

To reliably estimate the combined effect of stock price and cross-listing on investment, we control for variables known to affect investment decisions, which may also indirectly correlate with a firm's stock price and its cross-listing status. We account for the possibility that the investment levels of cross-listed firms may systematically differ from those of non-cross-listed firms by including the variable *Exchange* as a control. We also include the natural logarithm of assets ($\log(TA_{i,t-1})$) to control

for the impact of the size of a firm on its corporate investment decisions. Moreover, to account for the well documented relationship between cash flows and investment, we include cash flow ($CF_{i,t-1}$) as an additional control variable. Last, we allow the error term in equation (1) to be serially correlated for the same firm. Hence, in all estimations, the standard errors are adjusted for heteroskedasticity and within-firm clustering as defined in Petersen (2009).[13]

Chen, Goldstein, and Jiang (2007) estimate an equation similar to equation (1) but for a large sample of U.S. firms only. They show that the investment-to-price sensitivity of these firms increases with measures of private information in stock prices (namely, firm-specific stock return variation as suggested by Roll (1988) and the PIN measure developed by Easley, Kiefer, and O'Hara (1997)). Our methodology is similar in spirit to their approach since the learning hypothesis implies that a U.S. cross-listing improves the amount of information in stock prices that is new to managers.

3. Empirical Findings

3.1 The impact of cross-listing on the sensitivity of investment to stock price

Table 3 displays the relationship between a U.S. exchange cross-listing and firms' investment-to-price sensitivity. In particular, column (1) presents the results obtained from an OLS estimation of our baseline specification (1) with country, industry and year fixed effects. Consistent with previous studies (e.g., Morck, Shleifer and Vishny (1990) or Chen, Goldstein, and Jiang (2007)), firms' investment is positively and significantly related to their stock price. In column (1), the coefficient on $Q_{i,t-1}$ is 0.066 with a *t*-statistic of 34.04.

[Insert Table 3 about here]

More important for our analysis, we observe that the interaction between $Q_{i,t-1}$ and $Exchange_{i,t-1}$ has a positive coefficient of 0.066 and a *t*-statistic of 7.26. This estimate implies that the investment of cross-listed firms is about two times more sensitive to their stock price than that of their non-cross-

[13] In the Internet Appendix (Table C2), we show that the results are robust with other types of clustering for residuals in our regressions.

listed peers.[14] The economic magnitude of this effect is substantial. To see this, consider a one standard deviation increase in *Q* (0.920). This shock raises the investment of non-cross-listed firms and cross-listed firms. However, the effect is much bigger for cross-listed firms since their investment increases by 11.90% (0.920×(0.066+0.066)) on average, about 43% of the sample average ratio of capital expenditures (about 27%, see Table 2). In contrast, the investment of a non-cross-listed firm increases by only 5.95% (0.920×0.066) on average. Overall, a U.S. cross-listing substantially strengthens the link between investment and stock price.

It is also interesting to compare the size of the effect of a U.S. cross-listing on the investment-to-price sensitivity to that of a change in price informativeness in Chen, Goldstein, and Jiang (2007). They find (see their discussion on page 634) that the investment-to-price sensitivity of a firm increases by 20% if its stock price informativeness increases from the 25th percentile to the 75th percentile of the distribution for this variable. In contrast, a cross-listing increases the investment-to-price sensitivity by 100% in our sample, which suggests that the effect of a cross-listing on price informativeness is relatively large. Of course, this comparison must be interpreted cautiously since Chen, Goldstein, and Jiang (2007)'s sample and our sample are very different (in particular, cross-listed firms in our sample have higher capital expenditure ratios and are much bigger in terms of total assets).

The coefficients on the other variables have the expected sign: firms' cash flows are positively related to investment and bigger firms tend to invest significantly less as a percentage of fixed assets. A U.S. cross-listing has a significant negative effect on the level of investment, other things equal. However, cross-listed firms have a higher *Q* on average. Accounting for this difference, the average effect of a U.S. cross-listing is slightly positive. Evaluated at the mean, the investment of the *average* exchange-listed firms turns out to be 1.9% larger than that of the average non-cross-listed firms.[15]

We check the robustness of our results in several ways. First, we alter the baseline specification and estimation methodology. In column (2), we re-estimate equation (1) by replacing country and industry fixed effects with firm fixed-effects to capture time-invariant firm characteristics.

[14] In the Internet Appendix (Table C1), we also include OTC and Rule 144a cross-listings in the control sample. We obtain virtually the same results.

[15] The marginal effect evaluated at the mean corresponds to $\beta_1+\beta_2\times$Average(Q), that is, -0.082 +(0.066*1.531)=0.019, using the estimates reported in Column (1) of Table 3.

The R^2 for our regression substantially increases, which suggests the presence of unobserved heterogeneity in the characteristics of firms affecting the investment decision. However, our main result is virtually identical: the coefficient on the interaction between *Q* and *Exchange* remains large and statistically significant (0.057 with a *t*-statistic of 5.06).[16] In column (3), we estimate our investment model using the Fama and Macbeth (1973) approach and in column (4) we re-estimate equation (1) with random country effects. In addition, to rule out the possibility that our results are biased by the comparison of firms with different sizes, columns (5) and (6) display regression results where we consider only firms with total assets greater than $100 million and $1,000 million respectively. Our main result is robust across all these alternative specifications: there is a significant and positive effect of a U.S. cross-listing on firms' investment-to-price sensitivity. The estimates range between 0.032 (*t*-statistic of 3.34) to 0.066 (*t*-statistic of 7.26).[17]

Next, we check that the effect of a cross-listing on the investment-to-price sensitivity is not an episodic phenomenon by estimating equation (1) cross-sectionally, year-by-year. Figure 1 displays the results by showing the yearly estimates of β_0, i.e., the sensitivity of investment-to-stock price, (dark grey bar) and β_2, the effect of a cross-listing on the sensitivity of investment-to-stock price (light grey bar). The figure shows that there is an upward trend in the investment-to-price sensitivity (β_0) of all firms in our international sample. For an average firm, investment is almost three times more sensitive to stock price after 2004 than before 1994. Importantly, the positive effect of a U.S. cross-listing on the investment-to-price sensitivity is pervasive (and significant) throughout the sample period. Across all years, the investment-to-price sensitivity of cross-listed firms appears to be about twice as large as for non cross-listed firms.

[Insert Figure 1 about here]

In Table 4, we check whether our findings are robust to the way investment is measured. In the baseline specification, investment is defined as the ratio of capital expenditure to lagged fixed assets. We re-estimate equation (1) with five alternative measures of investment, namely (a) capital

[16]Given that the inclusion of firm fixed effects does not significantly change the magnitude of the coefficients , we use pooled OLS regressions in the rest of the analysis to preserve the efficiency of our estimates (see Roberts and Whited (2011), p. 94)

[17] In the Internet Appendix, we also check that our results are unchanged when we exclude from our sample cross-listings from countries that account for a large fraction of the cross-listings, namely Canada, UK, Japan, Israel, and the Netherlands (see Table C3).

expenditure scaled by *contemporaneous* and lagged assets, (b) the sum of capital expenditures and R&D expenses, scaled by either lagged fixed assets, or lagged assets, or contemporaneous assets, and (c) the annual change of total assets, scaled by lagged assets.[18] This last measure of investment accounts for corporate investment that takes the form of acquisitions and divestitures (Kumar and Ramchand (2008) find that more than 40% of cross-listed firms in their sample acquire a U.S. firm after they cross-list). Irrespective of the definition of investment, we observe positive and significant coefficients on the interaction between *Q* and *Exchange*.

[Insert Table 4 about here]

3.2 Endogeneity concerns

The previous section establishes that the investment of cross-listed firms is more sensitive to their stock price than the investment of non-cross-listed firms. This finding is consistent with our main hypothesis: a cross-listing increases the sensitivity of investment-to-stock price because it enhances stock price informativeness for managers.

Identification of this *causal* effect is difficult for two reasons. First, the decision to cross-list is endogenous. Thus, samples of cross-listed and non-cross-listed firms are not random, as recognized by recent studies in the cross-listing literature (e.g., Doidge, Karolyi and Stulz (2004) or Hail and Leuz (2009)). In particular, firms with a higher sensitivity of investment to price might be more likely to cross-list on U.S. exchanges. If present, this reverse causality will bias our estimate of the effect a cross-listing on the investment-to-price sensitivity. Second, the positive association between a U.S. cross-listing and the investment-to-price sensitivity may arise even if there is no causal relation between these variables. Indeed, a U.S. cross-listing is often accompanied by many unobservable changes in firms' corporate policies and in their growth opportunities (see for instance Doidge, Karolyi, and Stulz (2009), Lel and Miller (2009) or Frésard and Salva (2010)). These changes are likely to affect both firms' investment decision and their stock price, working alter the correlation between these variables, even though the stock price does not directly affect investment. The inclusion

[18] There are many firms in which R&D information is not provided by Worldscope. For these firms, we set R&D to zero.

of firm-fixed effects or separate intercepts for all exchange-listed firms (*Exchange*) do not fully control for these unobservable changes.

To address these concerns, we first exploit the temporal dimension of our panel and compare the investment-to-price sensitivity for a given firm before and after it cross-lists. By examining whether U.S. cross-listings already have a higher sensitivity of investment *prior to* their U.S. listing, we can directly check whether reverse causality is a problem or not. Moreover, if the effect of a cross-listing on the investment-to-price sensitivity is long lasting, it is unlikely that this effect is driven by transitory changes in financing, growth opportunities, or operating characteristics that occur contemporaneously with the cross-listing.

To perform this analysis, we need to track the year-by-year evolution of the investment-to-price sensitivity of each cross-listed firm. To this end, for each firm, we consider a time window that starts ten years before and finishes ten years after the cross-listing year, with year 0 being the cross-listing year. We then define a set of event-time dummies, $Exchange_{i,t}[\tau]$ and $Exchange_{i,t}[-\tau]$, for τ = 0,1,…,+10. The dummy variable $Exchange_{i,t}[-\tau]$, (respectively $Exchange_{i,t}[\tau]$), is equal to one for firm i in year t if year t is such that the number of years until (respectively since) the listing date is τ. We re-estimate equation (1) with these dummy variables in place of the dummy variable *Exchange*. In this way, we obtain an estimate of the sensitivity of investment-to-price of cross-listed firms for each year over a twenty years window centered on the cross-listing date.[19]

[Insert Figure 2 about here]

Figure 2 depicts the coefficients on the interaction between Q and the event-time dummy variables, as well as their 95% confidence interval. Several interesting patterns emerge. Prior to the cross-listing date, the investment-to-price sensitivity of firms that will cross-list is, in general, not statistically different than the investment-to-price sensitivity of control firms. In contrast, *after* the cross-listing date, the investment-to-price sensitivity of cross-listed firms becomes significantly higher

[19] It is worth stressing that we do not have the same number of observations for each event-time dummy. In particular, we have a smaller number of firm-year observations far before or far after the cross-listing date. We have checked the robustness our conclusions by replicating our analysis with a balanced sample of cross-listed firms for which we have three years of observations before and after the cross-listing date. Our results are unchanged with this sample: the investment-to-price sensitivity of cross-listed firms increases only *after* the cross-listing date (see Figure C in the Internet Appendix).

(at the 5% level) than that of non cross-listed firms. This evolution does not support the scenario in which a cross-listing is positively associated with the investment-to-price sensitivity simply because firms that cross-list already had a relatively high sensitivity prior to the cross-listing date.

Figure 2 also shows that the effect of a cross-listing on the investment-to-price sensitivity is persistent: even ten years after their U.S. listing, cross-listed firms continue to exhibit a significantly higher investment-to-price sensitivity. In contrast, changes in unobservable firms' characteristics (e.g., growth opportunities) are likely to be transient and thus cannot fully explain the persistence in the cross-listing effect documented in Figure 2.[20] We note that these changes may however strengthen the investment-to-price sensitivity around the listing date, which maybe explain why this sensitivity slightly weakens over the cross-listing life-time.

We also address the concern that self-selection could our estimates by implementing Heckman (1979)'s two-stage estimation procedure. For our purpose, the first stage of the estimation consists in modeling a firm's decision to cross-list (selection equation) and the second stage describes the firm's investment decision as in our baseline investment equation (1) (outcome equation). For the first-stage (Probit) estimation, we use both firm-level characteristics (size, leverage, annual sales growth, return on assets, foreign sales, the median market-to-book ratio of the firm's industry, and the dependence on external finance of the firm's industry) and country-level variables (the legal origin and the market capitalization of the firm's home country) as explanatory variables for the decision to cross-list. We select these variables because prior studies on cross-listings (in particular Pagano, Roëll and Zechner (2002), Doidge, Karolyi and Stulz (2004), Fernandes and Ferreira (2008), and Doidge, Karolyi, Lins, Miller, and Stulz (2009)) show that these variables affect firms' decision to cross-list. We also include industry and year fixed effects in our model of the decision to cross-list.

[Insert Table 5 about here]

The first column of Table 5 presents the results of the Probit estimation. Overall, the results support the conclusions of previous research. In particular, large firms and firms with relatively large sales abroad (expressed as a fraction of their total asset) are more likely to cross-list. Moreover, firms

[20]The valuation gains associated with a cross-listing appear to be transitory as shown by Gozzi, Levine, and Schmuckler (2008), King and Segal (2008), or Sarkissian and Schill (2009), maybe because firms' cross-list to take advantage of an episodic change in their growth opportunities.

with large growth opportunities, i.e., with high sales growth or high dependence on external finance (measured as in Rajan and Zingales (1998) by the ratio of capital expenditures minus cash flows from operations to capital expenditures at the industry level) are more likely to cross-list.[21]

More importantly, the second column reports the results of the second-stage. The Inverse Mills ratio is not significant, suggesting that, in our sample, self-selection is not an issue for our inference about the impact of a cross-listing on the investment-to-price sensitivity.[22] Accordingly, the effect of a cross-listing on the investment-to-price sensitivity is very similar to that obtained in the baseline model (0.063 vs. 0.066) and remains statistically significant (*t*-statistic of 6.64).

Overall the different tests in the section confirm the robustness of our main finding: a U.S. cross-listing has a positive and long-lasting effect on firms' investment-to-price sensitivity even after accounting for the endogeneity of the cross-listing decision.

3.3. The learning hypothesis: Cross-sectional evidence

The increase in the investment-to-price sensitivity following a cross-listing is consistent with our hypothesis that a U.S. cross-listing strengthens managers' ability to learn information from their stock price. If this hypothesis is correct, the effect of a cross-listing on the investment-to-price sensitivity should be stronger when stock prices contain more information new to managers after the cross-listing date. Testing this hypothesis is challenging as we cannot isolate the information embedded in stock prices that is new to managers. To overcome this problem, we use various proxies for the magnitude of the informational gains associated with a U.S. listing.

Our first proxy directly derives from Foucault and Gehrig (2008). In their model, the increase in the precision of the signal conveyed by stock prices to managers following a cross-listing is higher when the fraction of "non discretionary liquidity traders" (i.e., investors constrained to trade only in their home market) is more evenly distributed between the foreign and the domestic market. As a result, this improvement is higher when trading volume is more evenly distributed between the home

[21] Our measure of external dependence is measured at the industry level for each country in our sample, rather than in the U.S. as in Rajan and Zingales (1998).
[22] In the Internet Appendix (Table C4), we assess the robustness of this conclusion to the specification of the model of the cross-listing choice (i.e., the first stage of the Heckman procedure). Our results are robust to this specification.

and U.S. markets (see Proposition 8 in Foucault and Gehrig (2008)).[23] Thus, we use the fraction of total trades that takes place on U.S. exchanges (*U.S. trading*) as one proxy for the improvement in price informativeness for managers after a U.S. cross-listing. We expect the positive effect of a cross-listing on the investment-to-price sensitivity to be higher when there is proportionally more trading on U.S. markets.

Baruch, Lemmon, and Karolyi (2007) develop and test a model that explains the distribution of trading volume between the home and the foreign market for cross-listed firms. They predict that the fraction of trading volume on the foreign market is higher when the return of securities in this market are more correlated with the return on the cross-listed firm and find empirical support for this prediction. Hence, cross-listed firms for which the fraction of trading volume in the U.S is high are also more likely to be exposed to risk factors that are similar to those of U.S. firms. Intuitively, U.S. investors have more incentives to acquire information on these factors than domestic investors as they can amortize their information cost over multiple securities. This may be another channel through which a U.S. cross-listing enhances price informativeness for managers.

To provide direct evidence on this channel, we use the "U.S. information factor" (*BKL*) developed by Baruch, Karolyi, and Lemmon (2007) as a proxy for the improvement in price informativeness associated with a U.S. cross-listing. The "U.S. information factor" is constructed as the difference in R^2 of a two-index factor model including the home and U.S.indices (S&P 500) as factors and a single index factor model with just the home index as a factor, adjusted for degrees of freedom (using U.S.-dollar denominated returns for each stock and each home index). Intuitively, as explained by Baruch, Karolyi and Lemmon (2007) (see their Section B), *BKL* measures the relative informativeness of U.S. market movements for a cross-listed stock relative to its home market movements. We expect the investment-to-price sensitivity of firms with a higher value of *BKL* to be higher as U.S. investors are more likely to have private information about these firms.

Regulatory hurdles or trading costs can prevent some U.S informed investors from investing abroad. In this case, a cross-listing is a way to stimulate information production by these investors,

[23] Indeed, in their model, the market share (in terms of trading volume) of the foreign market is entirely determined by the fraction of non-discretionary liquidity traders in this market. Thus, this market share can be used as a proxy for non discretionary liquidity trades in the foreign market.

which magnifies the positive effect of a cross-listing on price informativeness (see Section 3.3 in Foucault and Gehrig (2008)). Institutional investors are regarded as informed investors but U.S. institutional investors often face restrictions on their investment abroad.[24] Thus, we use the fraction of outstanding shares held by U.S. institutional investors given in 13(f) filings (*Institutions*) as another proxy for the improvement in price informativeness associated with a cross-listing. We expect the positive effect of a cross-listing on the investment-to-price sensitivity to be higher when the firm's stock is owned by more U.S. institutional investors.

In Titman and Subrahmanyam (1999), a fraction of investors receive information about a firm's investment project by luck, at no cost ("serendipitous information"). They argue that these investors could be, for instance, clients of the firm who learn about the potential demand for its products by consuming it. More serendipitous information will be obtained from investors abroad if a firm realizes a larger fraction of its sales abroad. More generally, investors should have lower cost of information acquisition on the value of projects whose cash-flows are mainly realized in their country. As a result, a U.S. listing should elicit more information that is new to managers if a large fraction of its sales are realized abroad. Based on this reasoning, we consider the fraction of foreign sales (*Foreign Sales*) as an additional proxy for the improvement in the amount of new information conveyed by stock prices to managers.

Chemmanur and Fulghieri (2006) argue that a cross-listing can be a way to access investors with unique evaluation expertise. Intuitively, the U.S. market is likely to feature more investors with unique expertise in evaluating the firm's strategy when this firm has more peers in the U.S. than in its home country. In line with this hypothesis, Halling et al.(2007) find that the fraction of total trading activity that takes place in the U.S. is higher for small and technology oriented cross-listings due to the greater ability of U.S. investors to evaluate these firms. Consequently, we consider the difference in the percentage of the market capitalization of a firm's industry in the United States and its home country (*U.S. Industry Relative*) as a proxy for U.S. based expertise in valuing the firm. We expect managers to receive more informative feedback from stock prices if its industry accounts for a

[24]Grinblatt and Keloharju (2000) provide evidence that foreign institutional investors are better informed than local investors.

relatively larger fraction of market capitalization in the U.S than in its home market (i.e., if *U.S. Industry Relative* is high).

Lang, Lins and Miller (2003, 2004) and Bailey, Karolyi, and Salva (2006) (Table 4) show that a cross-listing has a positive impact on sell-side analyst coverage and the accuracy of analyst forecasts. Intuitively, this effect should have a negative impact on investors' incentives to collect private information about cross-listed firms. Indeed, sell-side analyst forecasts are often public information, which reduce the returns that informed investors can expect by trading on private information. In support of this "crowding out" hypothesis, Easley, O'Hara and Paperman (1998) show that the likelihood of informed trading (evaluated with the PIN measure) is inversely related to analysts coverage. Hence, the amount of private information in stock prices that is new to managers should be inversely related to the level of analyst coverage.[25] In this case, the learning hypothesis implies that the positive effect of a cross-listing on the sensitivity of investment-to-price will be smaller for firms with high analyst coverage or firms that experience a larger increase in analyst coverage after a cross-listing.

For each of these proxies for the size of the informational gain associated with a U.S. cross-listing, we allocate each cross-listed firm in one of two groups (*High* and *Low*), depending on whether the realization of its proxy is above-median (*High*) or below-median (*Low*). Then, we re-estimate our baseline model (1) by interacting *Q* with *High* and *Low*.[26] Table 6 (Columns 1 to 6) reports the results. Across all specifications, we observe clear patterns. First, we observe that the investment-to-price sensitivity is in general higher for cross-listed firms, irrespective of the group to which they belong. The only exception is when we partition firms based on the fraction of shares held by U.S. institutional investors (in this case, the effect of a U.S. cross-listing is not statistically significant for firms with a relatively low fraction of U.S. institutional investors). Second, as expected, the effect of a cross-listing

[25]In line with this conjecture, Fernandes and Ferreira (2008) find that the positive effect of a cross-listing on stock price informativeness is smaller for firms with high analyst coverage.

[26]The advantage of our classification of cross-listed firms in two groups is that it facilitates the comparison of the effect of a cross-listing on the investment-to-price sensitivity across different proxies for the magnitude of the informational gain associated with a cross-listing. Without this binary classification, this comparison is more difficult as the scale and units of measure of the proxies are different. One concern, however, is that our approach may miss effects that can be detected only with a finer partition of cross-listed firms. To address this issue, we also estimated regression (1) with an interaction term between the variable *Exchange* and each proxy used in this section. The results are qualitatively similar to those obtained here (see Table C5 in the Internet Appendix).

on the sensitivity of investment to price is higher when a firm belongs to the group for which the informational gain of a cross-listing is likely to be high. The difference is statistically significant (see the *F*-tests at the bottom of Table 6) at the 5% level or the 10% level (for *BKL* and foreign sales). In all cases the difference in the impact of a cross-listing on the investment-to-price sensitivity between the two groups is economically large. For instance, the effect of a cross-listing on the investment-to-price sensitivity is 0.040 (with a *t*-statistic of 4.62) for firms with a relatively large fraction of their trading in the U.S. and 0.021 (with a *t*-statistic of 2.08) for firms with a relatively small fraction of their trading in the U.S. Similarly, when a firm realizes a large fraction of its sales abroad, a cross-listing raises the sensitivity of investment to price by 0.085 (*t*-statistics of 3.92) against 0.054 (*t*-statistics of 5.75) when a firm realizes a small fraction of its sales abroad.

[Insert Table 6 about here]

Last, column (6) of Table 6 reports the regression results when we partition cross-listed firms based on the number of analysts that have issued earnings forecasts during the previous year (*Coverage*). As expected, a cross-listing has a smaller effect on the sensitivity of investment-to-price for firms with high analyst coverage than for firms with low analyst coverage. As explained previously, this finding is consistent with the notion that the production of public information by analysts reduces the incentives of investors to acquire private information. As a result, stock prices are less informative for managers of firms with relatively high analyst coverage and accordingly managers put less weight on these signals. Interestingly, this finding, combined with our cross-country findings regarding the role of disclosure requirements (see Section 4.1, Table 9), suggests that the improvement in the precision of stock price signals is a phenomenon distinct from other improvements in the information environment of a firm following a cross-listing (such as enhanced disclosure requirements or increased analyst coverage).

3.4. The role of cross-listing types

So far our analysis has focused on the effect of a U.S. cross-listing on the investment-to-price sensitivity for firms cross-listed on U.S. exchanges. As explained in Section 2.1, there are other types of cross-listings, namely Level 1 OTC listings or Rule 144a private placements. The market for these

types of cross-listings is much less liquid than the market for exchange listings. High trading costs in these markets are likely to reduce the incentive of informed investors to acquire private information. In line with this conjecture, Fernandes and Ferreira (2008) show that the effect of an OTC or Rule 144a listing on price informativeness is not significant (see their Table 8, Column 11). In these conditions, we expect the impact of a cross-listing on the informational content of stock prices for managers and therefore the investment-to-price sensitivity to be smaller or even non significant for OTC and Rule 144a listings.

[Insert Table 7 about here]

To test this prediction, we re-run our baseline regression (1) on the entire sample of cross-listed firms allowing the impact of a cross-listing on the investment to price sensitivity to differ according to the type of cross-listings. Table 7 reports the results. In line with our expectation, the cross-listing effect depends on the type of cross-listings. This impact is insignificant for Rule 144a listings in all specifications. For OTC -listings, the impact is positive and significant in only two specifications and in all cases significantly smaller than for exchange listings. Moreover, *F*-tests show that the impact of OTC listings is not significantly different from that of Rule 144a. Overall, the results in Table 7 indicate that the effect of a cross-listing on the investment-to-price sensitivity of firms with OTC ADRs or Rule 144a placements is weak or inexistent.

3.5. Investment-to-price sensitivity and firms' operating performance

If a cross-listing improves the information content of their stock price for managers, it should increase the likelihood that managers identify projects with high positive NPVs. Hence, we expect to observe a positive effect of a cross-listing on ex-post measures of firms' operating performance (a proxy for managers' ability to select successful investment projects, as in Chen, Goldstein, and Jiang (2007) and Durnev (2010)) and this effect should be stronger when stock prices are more informative for managers. We cannot directly measure how much new information is obtained by managers from their stock price after a cross-listing. However, the learning hypothesis implies that the increase in the investment-to-price sensitivity of a given firm should be higher when prices convey more precise information to managers after they cross-list. Thus, we expect the improvement in firm's performance

following a cross-listing to be positively related to the increase in the investment-to-price sensitivity associated with a cross-listing.

To test this claim we need a firm-level measure of the effect of a cross-listing on the investment-to-price sensitivity. This is challenging since, in general, we have too few observations per firm to measure the impact of a cross-listing on the investment-to-price sensitivity of each firm. Hence we follow another approach, similar to that used in Durnev (2010).[27] To identify firms that experience a large increase in their investment-price sensitivity after they cross-list, we re-estimate our baseline regression (1) without controlling for the interaction between stock prices (Q) and the cross-listing dummy (*Exchange*) and we collect the regression residuals for every cross-listed firm in every year. Intuitively, other things equal, cross-listed firms with positive (negative) residuals are those for which investment is more (less) related to stock price. Based on this intuition, in each year t, we define a dummy variable *Pos* which is equal to one for firm-year observations with positive residuals, and zero otherwise. Similarly, we define a dummy variable *Neg* which is equal to one for firm-year observations with negative residuals, and zero otherwise. We expect cross-listed firms for which *Pos* =1 to have better ex-post operating performance than firms for which *Neg=1* since the former should have on average a higher investment-to-price sensitivity.

To test this proposition, we measure firms' operating performance in year $t+1$ and we regress it on *Pos* and *Neg* in year t and a set of control variables. We use two measures of operating performance: firms' returns on assets (*ROA* defined as earnings before interests, taxes and depreciation to total assets) and their sales growth ($\Delta Sales$). Table 8 reports the results.

[Insert Table 8 about here]

As a benchmark, Columns 1 and 3 provides estimates of the impact of a U.S. cross-listing (*Exchange*) on firms' return on assets and sales growth. In line with Charitou and Louca (2009), these estimates show that the average cross-listed firm exhibits a higher performance than control firms (however the effect is statistically significant only for sales growth). In columns 2 and 4, we replace *Exchange* by the two dummy variables *Pos* and *Neg*. Consistent with the learning hypothesis, the

[27] In the internet Appendix (Section B), we conduct Monte-Carlo simulations showing that this methodology performs relatively well in identifying firms with relatively high or low investment-to-price sensitivity.

coefficient estimate on *Pos* is positive and significant for both measures of operating performance. Moreover, it is much larger than the coefficient estimate on *Neg* (about twice as big) and the difference is statistically significant. Interestingly, this difference largely explains the positive effect of a U.S. cross-listing on firms' operating performance. All else equal, an average cross-listed firm exhibits an annual growth in sales that is 6.9% larger than that of control firms (see Column 3). However, this growth rate jumps to 10.9% when cross-listed firms experience a large increase in their investment-to-price sensitivity after cross-listing on a U.S. exchange (Column 4).

In Panel B of Table 8, we perform a similar analysis but we measure operating performance after year *t* by the average annual values of *ROA* and Δ*Sales* over the next three years. In this way, we account for the fact that investment decisions in a given year may take time to materialize into superior performance. The conclusions are virtually identical to those obtained in Panel A: cross-listed firms that experience a relatively large increase in their investment-to-price sensitivity after cross-listing perform better subsequently.

4. Alternative explanations

Our results are consistent with the hypothesis that a cross-listing affects managers' investment decisions because it enhances the amount of stock price information new to managers. Of course, there might be other plausible explanations for our findings. In this section we study two other possible mechanisms through which a cross-listing could change firms' investment-to-price sensitivity: (i) an improvement in corporate governance and (ii) a relaxation of financing constraints.

4.1. The impact of better governance and disclosure

Firms that are cross-listed firms on U.S. exchanges must subject themselves to the regulatory oversight of the SEC and U.S. securities laws, which involve better legal protection for minority shareholders. Also, they have to adopt most U.S. disclosure and reporting requirements (e.g., they must disclose the identity of majority shareholders and reconcile their net income statement with U.S. GAAP). Thus, one potential benefit of a U.S. cross-listing is that it "bonds" firms to more effective governance and disclosure standards (Stulz (1999) or Coffee (1999)). In this way, firms can then raise

capital at cheaper cost. This "bonding hypothesis" has received strong empirical support (see for instance Reese and Weisbach (2002), Doidge, Karolyi and Stulz (2004, 2009), Hail and Leuz (2009), Lel and Miller (2009) and Karolyi (2010) for a survey) but is still debated (see Karolyi (2010), Section 3 for a review of dissent empirical findings).

The bonding hypothesis and the learning hypothesis are not mutually exclusive. In fact, as suggested by Fernandes and Ferreira (2008), an improvement in governance may stimulate investors' incentives to collect private information and can thereby work to make stock prices more informative. Moreover, an improvement in governance can induce managers to rely more on the stock market as a source of information in order to better select their investment projects. In turn, an improvement in price informativeness may be one channel through which a cross-listing attenuate agency problems between managers and shareholders.[28] Thus, although the bonding hypothesis and the learning hypothesis describe distinct mechanisms by which a cross-listing can enhance firm value, these two mechanisms can operate simultaneously and reinforce each other.

However, an improvement in firms' governance and disclosure environment could strengthen their investment-to-price sensitivity even if managers do not rely on stock market prices to make their decisions. For instance, a stricter governance could induce managers to make investment choices that are more in line with their firm's growth opportunities, and less guided by the extraction of private benefits (as found for instance in Bohren, Cooper, and Priestley (2009) or Frésard and Salva (2010)). A U.S. cross-listing could then increase the correlation between firms' investment and their stock price since a firm's stock price carries information about growth opportunities. Alternatively, the association between price and investment could be higher after a cross-listing because more stringent disclosure requirements enable investors to better forecast the cash-flows implications of firms' investment decisions. To assess whether these explanations drive our results, we conduct both country- and firm-level tests.

The improvement in the protection of minority shareholders associated with a U.S cross-listing is arguably greater for firms incorporated in countries with weaker standards in terms of

[28] For instance, Lel and Miller (2009) finds that cross-listed firms originating from countries in which stock prices are more informative are more likely to change their CEOs after a poor performance.

corporate governance and disclosure. Thus, if this improvement drives our result, we should observe a higher effect of a cross-listing on the investment-to-price sensitivity for these firms. To test this proposition, we split cross-listed firms in two groups according to standard measures of the quality of governance in their country of origin: the anti-self dealing index from Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008) (a measure of minority shareholders protection against consumption of private benefits by controlling shareholders) and the index of disclosure requirements from La Porta, Lopez-de-Silanes, and Shleifer (2006). Higher values of these indexes are associated with better standards for corporate governance. For each index, we split firms according to whether their primary listing is in a country where the index is below or above its median value. Prior research shows that countries with a common law legal tradition offer stronger investor protection than countries with a civil-law legal tradition (La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997)). Thus, we also partition cross-listed firms in two groups according to their country legal tradition. Finally, we partition firms in two groups based on the level of economic and financial development of the country for their primary listing (measured by the country's GDP per capital and stock market capitalization, respectively).

[Insert Table 9 about here]

For each of these country characteristics, we re-estimate equation (1) for each group separately using a Seemingly Unrelated Regression (SUR) system.[29] In this way, we can obtain the joint variance-covariance matrix for the effect of a cross-listing on the investment-to-price sensitivity in each group and then test whether this effect differs between groups. Table 9 presents the results of these tests. We find a positive and significant effect of a U.S. cross-listing on the sensitivity of firms' investment to their stock price, whether firms come from countries that rank low or high on the proxies for governance or financial development. However, the cross-listing effect is more than two times higher for firms ranking high on measures of governance quality or incorporated in countries with developed financial markets and high GDP per capita. For each country characteristic, the difference in the impact of a cross-listing on the investment-to-price sensitivity between the two

[29] As for our tests in Section 3.3, we have checked that our conclusions are unchanged when we run our regressions by interacting the dummy variable *Exchange* with each country characteristics. For brevity we report the results of this robustness check in the Internet Appendix (see Table C.6 in the Internet Appendix).

groups of firms is statistically significant and economically large. A one standard deviation increase in *Q* triggers an increase in investment that ranges between 2.9% and 4.1% for the groups of cross-listed firms incorporated in countries with low governance standards, whereas it ranges between 6.7% and 8.9% for the cross-listed firms incorporated in countries with high governance standards.[30]

Overall, Table 9 reveals that the positive effect of a U.S. cross-listing on the investment-to-price sensitivity is higher when cross-listed firms originate from countries where minority shareholders are well protected, disclosure requirements are high, and financial and economic development is advanced. These patterns do not support the notion that a U.S. cross-listing enhances the investment-to-price sensitivity simply because it improves firms' governance and disclosure environment.

As noted by Aggarwal, Erel, Stulz and Williamson (2010), governance depends on both country-level and firm level mechanisms and Doidge, Karolyi, and Stulz (2007b) show that variables that characterize the legal environment of a country explain only a small fraction of the variations in firm-level ratings of corporate governance. Hence, the country characteristics considered in Table 9 may not adequately measure the improvement in corporate governance associated with a cross-listing.

To address this concern we build a firm-level corporate governance index using data provided by RiskMetrics (formerly Institutional Shareholder Services, ISS). RiskMetrics compiles governance attributes from firms' annual reports, web sites, and regulatory filings. These attributes are used and described in Doidge, Karolyi and Stulz (2007b), Aggarwal, Erel, Stulz, and Williamson (2009) and Aggarwal, Erel, Ferreira and Matos (2010). They are available for non-U.S firms only since 2003 and for a subset of countries (22, including the U.S.). As a result, we can obtain firm-level governance attributes for a subsample of 222 cross-listed firms and 1,045 control firms over the period 2003-2006 (the final year in our sample). We refer to this restricted sample as the "RiskMetrics sample." In the Internet Appendix (Table C9), we present the geographical breakdown of the firms in this sample. In contrast to the unrestricted sample, almost all firms in the RiskMetrics sample come from developed

[30]The standard deviation of *Q* within each group of firms varies according to the country characteristic used to classify cross-listed firms. We account for this in our calculations. That is, for each group of firms, the effect of a one standard deviation increase in *Q* is obtained by multiplying the coefficient (β_2) on the interaction between *Q* and the dummy variable *Exchange* by the standard deviation for *Q* within this group.

countries (the exceptions are Greece and China which are designated as emerging markets by Standard and Poor's Emerging Market Database).

Following Aggarwal, Erel, Ferreira, and Matos (2010), we use 41 firm-level governance attributes to compute a governance index (*GOV*) for each firm in the RiskMetrics sample. These attributes cover four broad categories: (i) board (24 attributes), (ii) audit (3 attributes), (ii) anti take-over provisions (six attributes), and (iv) compensation and ownership (8 attributes; see Aggarwal, Erel, Ferreira, and Matos (2010) for a description of these categories and the corresponding attributes). For each attribute, we assign a score of one to a firm if it meets minimally acceptable requirements on this attribute and zero otherwise. A firm's governance index is the sum of the score received on each attribute normalized by the number of attributes (41). We then classify cross-listed firms in two groups depending on whether their governance index is above or below the median value of the index or whether the average change in the value of this index (ΔGOV) over the period 2003-2006 is above or below the median value of this change.[31] Finally, we run our baseline regression with an interaction term between *Q* and a dummy variable (*Low* or *High*) for each group of firms.

[Insert Table 10 about here]

Table 10 (Columns 1 and 2) reports the results for these regressions. In the first column, we observe that the impact of a cross-listing on the investment-to-price sensitivity is significantly positive both for firms with a low governance index and firms with a high governance index. Moreover, the effect appears to be lower for firms with a low value of the governance index. However, the difference in the size of the effect between firms with a high and a low governance index is not statistically significant. The results in the second column show that the impact of a cross-listing on the investment-to-price sensitivity is significantly positive irrespective of the change in firms' governance index *(ΔGOV*) over the 2003-2006 period. However, this impact is significantly higher for this second group of firms. Again, this result does not support the view that our findings are primarily driven by the improvement in governance associated with a U.S. cross-listing.

[31] Over the 2003-2006 period, firms experience an increase in governance quality on average. See Figure 1 in Aggarwal, Erel, Ferreira and Matos (2010).

In a last set of tests, we use the concentration of ownership as a firm-level proxy of the quality of governance. Specifically, we use the item "closely-held shares" (*CHS*) in Worldscope to measure the extent to which a firm's ownership is in the hands of a few controlling shareholders.[32] The advantage of this approach is that this information is available for a wider set of firms and over a longer period of time than the RiskMetrics data. Doidge, Karolyi and Stulz (2007b) show that an increase in the fraction of closely held shares is associated with a decline in governance ratings based on RiskMetrics data in 2003 (See Table 2, Panel c in Doidge, Karolyi and Stulz (2007b)). Hence, *CHS* is inversely related to the quality of governance for a given firm and a larger change in *CHS* over time is associated with a deterioration of governance. We then re-run the regressions of Table 10 with *CHS* in place of *GOV* as a measure of governance quality.

The results of these regressions are presented in the two last columns of Table 10. They mirror those obtained with the RiskMetrics sample. The effect of a cross-listing on the investment-to-price sensitivity is positive and significant irrespective of *CHS* and the size of the effect is stronger for firms with better governance (lower value of *CHS*) or with a smaller increase in the quality of their governance over time (smaller change in *CHS*). However, the difference in the size of the effect between firms with relatively low concentration of ownership and high concentration of ownership is not statistically significant.

Overall, the country-level and firm-level tests in this section point in the same direction: the size of the impact of a cross-listing on the investment-to-price sensitivity is either unrelated or positively (resp. negatively) related with measures of governance quality (resp. changes in governance quality) for cross-listed firms. These findings indicate that the improvement in governance associated with a U.S. cross-listing cannot be the primary driver of the effects described in this paper, as otherwise the biggest effect should be concentrated in the groups of firms whose governance is the most affected by a U.S. cross-listing.

[32]Worldscope defines closely-held shares as the percentage of shares held by senior corporate officers and directors, and their immediate families ("insiders"); shares held in trusts; shares held by another corporation (except shares held in a fiduciary capacity by financial institutions); shares held by pension and benefit plans; and shares held by individuals who hold 5 percent or more of shares outstanding.

There is an interesting contrast between the country-level findings reported in Table 9 and previous research on cross-listings. Indeed, the cross-listing literature traditionally finds that the benefits of a U.S. cross-listing are higher for firms incorporated in emerging countries with poor standards in terms of governance and disclosure. In particular, these firms experience larger valuation gains when they cross-list on U.S. exchanges compared to firms coming from countries with a good institutional environment and developed financial markets (see, for instance, Doidge, Karolyi and Stulz (2004) and Hail and Leuz (2009)). In contrast, the impact of a cross-listing on the investment-to-price sensitivity appears much lower for firms coming from countries that rank low on measures of corporate governance. This observation suggests that the learning hypothesis may provide an explanation for why firms from countries with similar levels of development and institutional quality as the United States find a U.S cross-listing attractive.[33] A full examination of this conjecture is beyond the scope of this paper but it points to a promising direction for future research.

4.2 The role of financing constraints

Financing constraints can induce a positive association between investment and prices (see Baker and Wurgler (2002) and Baker, Stein, and Wurgler (2003)). Indeed, if stock prices deviate too much from fundamentals, overvalued firms can take advantage of irrationally low discount rates to issue securities at a cheaper cost of capital. Firms facing financial constraints are more likely to have unexploited projects with positive NPVs and therefore to channel the newly issued funds into investment. Thus, the combination of mispricing and financial constraints generates a positive linkage between stock prices and corporate investment. Consistent with this mechanism, Baker, Stein, and Wurgler (2003) report that firms facing more stringent financing constraints exhibit a higher investment-to-price sensitivity.

Extant research shows that a U.S. cross-listing tends to relax financing constraints. For instance, Reese and Weisbach (2002), Lins, Strickland, and Zenner (2005), and Doidge, Karolyi, and

[33] Lins, Strickland and Zenner (2005) find that a U.S. cross-listing reduces the sensitivity of investment to cash-flows for firms from emerging countries but that it has no effect on this sensitivity for firms from developed countries (see their Table 4). In contrast, we find that a cross-listing increases the investment-to-price sensitivity and that this effect is stronger for firms from developed countries.

Stulz (2009) report that firms increase their capital raising activity following their U.S. cross-listing. In a similar spirit, Hail and Leuz (2009) and Ball, Hail, and Vasvari (2009) show that cross-listed firms benefit from a lower cost of capital. As a result, if financing constraints alone explain the relation between investment and stock prices, one should expect firms' investment-to-price sensitivity to *decrease* following their U.S. cross-listing. But we observe the exact opposite, which suggests that another mechanism is at work.

To further understand the relation between financing constraints, managerial learning and a U.S. cross-listing, we examine how the positive effect of a cross-listing on the investment-to-price sensitivity depends on firms' financial constraints. To this end, we use three firm-level proxies for the severity of financing constraints. First, we use firm size (total assets) since, according to Hadlock and Pierce (2010), larger firms are generally much less financially constrained than smaller firms. Second, we use the index of financial constraints proposed by Whited and Wu (2006) (WW). The WW index is a linear combination of six factors: cash flow, dividend payments, leverage, size, industry sales growth, and firm sales growth. A larger value of this index indicates that a firm faces more severe financing constraints. For each proxy, we define two dummy variables *Constrained* and *Unconstrained* that are, respectively, equal to one for a cross-listed firm if the value of the financial constraints proxy for this firm is above the median or below the median value of the proxy over cross-listed firms, and zero otherwise. Last, we consider whether a firm pays a dividend or not as another indicator for the severity of financial constraints. Indeed, financially constrained firms have lower payout ratio as shown by Fazzari, Hubbard, Petersen (1988), among others. Thus, in a last set of test, we set the dummy *Constrained* equal to one in a given year for a cross-listed firm when the firm does not pay a dividend in that year whereas the dummy *Unconstrained* is equal to one otherwise.

[Insert Table 11 about here]

Table 11 presents estimations of our baseline regression (1) in which we interact Q with the *Constrained* and *Unconstrained* dummy variables (instead of *Exchange*) for the three proxies used for financial constraints. The effect of a cross-listing on the investment-to-price sensitivity is significantly positive for both constrained and unconstrained cross-listings. However, this effect is significantly stronger for firms that are *more* financially constrained. While the estimates of the impact of a cross-

listing on the investment-to-price sensitivity range between 0.037 and 0.055 for the less constrained cross-listed firms, they are comprised between 0.064 and 0.082 for the more financially constrained firms.

This finding does not preclude the possibility that, other things equal, the lessening of financing constraints following a cross-listing does exert a negative effect on the investment-to-price sensitivity of some cross-listed firms. But the increase in investment-to-price sensitivity due to the accrued reliance of firms' managers on market prices dominates this effect. This possibility is plausible. Intuitively, financing constraints prevent firms from fully exploiting information conveyed by their stock prices.[34] Hence, firms that are the most financially constrained before a cross-listing should experience a large change in their investment-to-price sensitivity upon a cross-listing as this event enables firms to better respond to market signals by easing financial constraints.

5. Conclusion

In this paper, we test the hypothesis that a cross-listing affects corporate investment because it enables managers to obtain more informative feedback from the stock market. To this end, we use a large sample of U.S. cross-listings from 39 countries over the period 1989-2006. Consistent with the learning hypothesis, we find that cross-listed firms have a higher sensitivity of corporate investment to stock price than non cross-listed firms. Moreover, this difference does not exist before the cross-listing date and does not vanish over time after this date.

These findings are strong and robust to various controls, e.g., whether firms are financially constrained or not. As implied by the learning hypothesis, the positive effect of a U.S. cross-listing on the investment-to-price sensitivity increases with proxies for the incremental information that managers can glean from their stock price after they access the U.S. markets. Moreover, the increase in investment-to-price sensitivity following a U.S. cross-listing is not primarily driven by the improvement in corporate governance that is associated with this event since this increase is smaller

[34]In line with this intuition, Chen, Goldstein and Jiang (2007) find that the impact of an improvement in price informativeness on the investment-to-price sensitivity is smaller when firms are more financially constrained. In our framework, a cross-listing enhances price informativeness and relaxes financial constraints simultaneously. If managers learn information from price, we conjecture that easing financing constraints strengthen the investment sensitivity-to-price as it enables managers to be more responsive to market signals.

for firms that experience the largest improvement in corporate governance upon cross-listing. This observation offers an intriguing counter-point to the recent literature on cross-listings, which usually finds that the valuation gains associated with a U.S. cross-listing are stronger for firms incorporated in poor quality countries (e.g., Doidge, Karolyi and Stulz (2004) or Hail and Leuz (2009)).

These findings provide a new perspective on cross-listings and raise several questions for future research, two of which we outline here. First, the recent period has witnessed a substantial deceleration of the U.S. cross-listing activity as a large number of foreign firms have decided to delist from the U.S. markets. Analyzing this phenomenon, Doidge, Karolyi and Stulz (2010) report that firms terminate their U.S. cross-listing mainly because they no longer have valuable growth opportunities to finance. In light of our results, it would be interesting to also examine whether firms delist because their need to learn from the U.S. stock market has decreased.

From a related perspective, it would be interesting to analyze how managers' incentive to use stock price information affects the choice of a cross-listing venue and depends on this choice. Pagano, Roell, and Zechner (2002) indicate that the choice of cross-listing market primarily reflects industry specificities while Sarkissian and Schill (2004) document that geographic, cultural, and economic proximity play a dominant role in the choice of overseas venue. According to our findings, an additional determinant could be related to managers' need to obtain information from their *host* stock market. These and other related questions we leave to future research.

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Figure 1: The effect of cross-listing on the investment-to-price sensitivity year-by-year

This figure reports the results from year-by-year OLS regressions of the effect of a U.S. cross-listing on the investment-to-price sensitivity (equation (1)). The dark-grey bars correspond to the investment-to-price sensitivity for all firms in our sample (β_0). The light-grey bars correspond to the incremental investment-to-price sensitivity for firms that are cross-listed on a U.S. exchange (β_2). The sample period is from 1989 to 2006. All estimations include country and industry fixed effects.

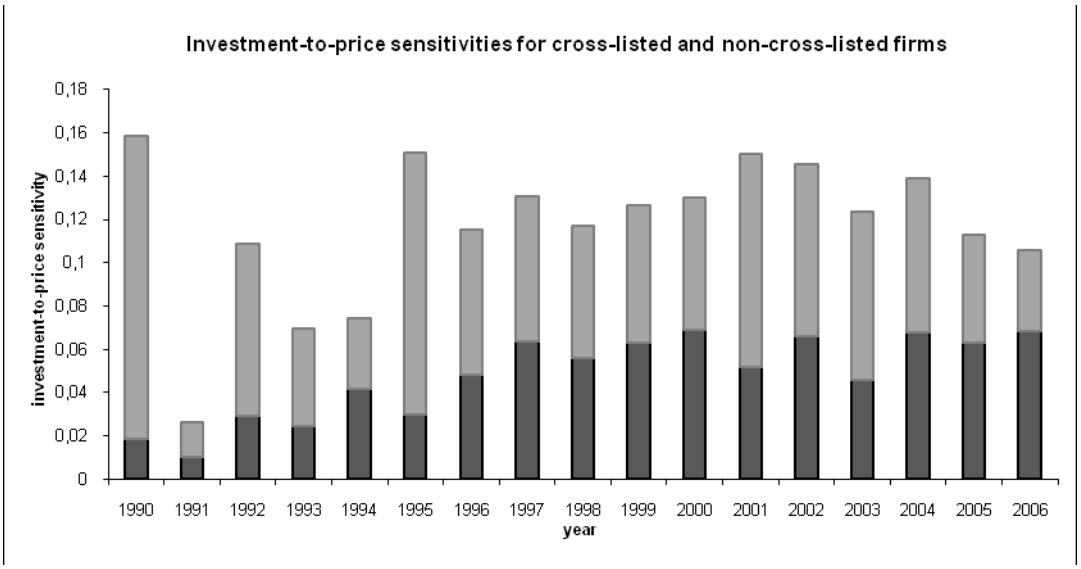

Figure 2: The effect of cross-listing on the investment-to-price sensitivity in event time

This figure reports results from an event-time analysis of the effect of a U.S. cross-listing on the investment-to-price sensitivity. Specifically, we re-estimate the investment model given in equation (1) by replacing the dummy variable *Exchange* with a set of dummy variables that keep track of the number of years until or since the cross-listing date for each cross-listed firm in our sample. These dummy variables are defined over a time window of twenty-years centered on the cross-listing year (year 0) for a given firm. The figure reports the coefficient estimates on the interaction between Q and each dummy variable as well as their 95% confidence interval. The sample period is from 1989 to 2006. All estimations include country, year and industry fixed effects. The standard errors used to compute the confidence bounds are adjusted for heteroskedasticity and within-firm clustering.

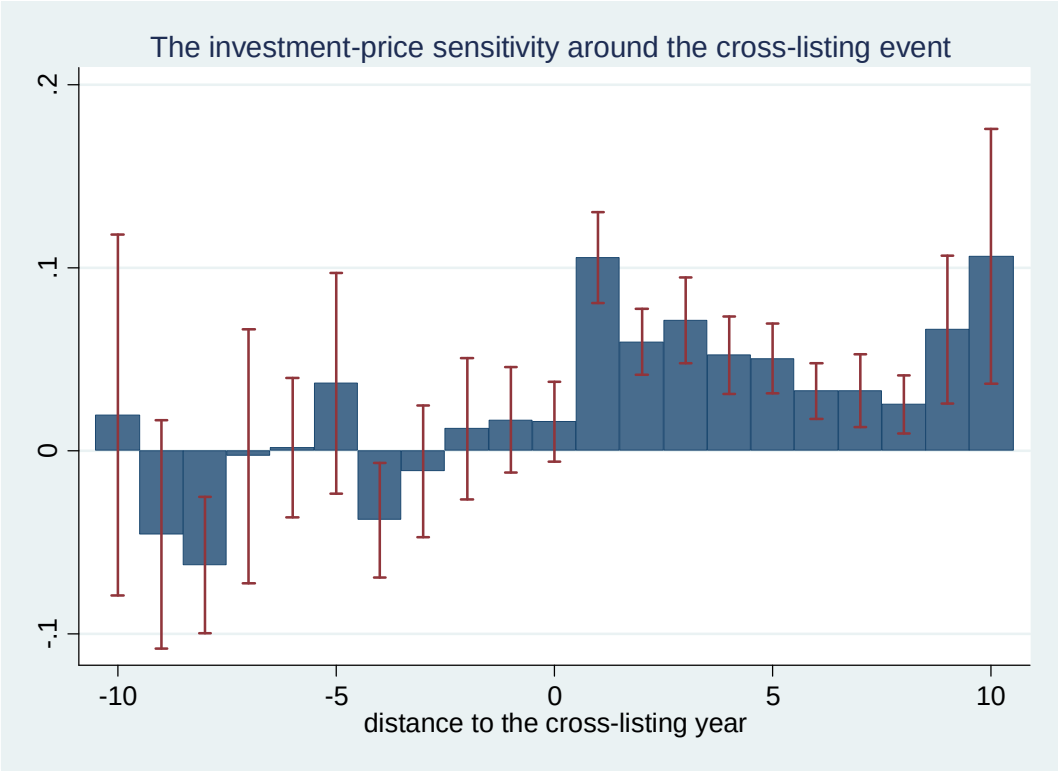

Table 1: Sample Description

This table describes the number of cross-listed firms ("#firms") and the number of firm-year observations ("obs.") in our sample classified by country of origin and type of cross-listing. It also reports the number of firms and firm-year observations in the control sample. Exchange firms are firms that are listed on a U.S. exchange (Level 2 and 3 ADRs and ordinary listings). OTC firms are firms that are listed over-the-counter as Bulletin Board or Pink Sheet issues. Rule 144a firms are firms that are listed via Rule 144a (private placement). Control firms are firms that never had stocks cross-listed in the U.S. The sample period is from 1989 to 2006. Symbol $^{+}$ denotes a country designated as an emerging market by Standard and Poor's Emerging Market Database.

	Exchange		OTC		Rule 144a		Control	
	#Firms	obs.	#Firms	obs.	#Firms	obs.	#Firms	obs.
Argentina+	7	78	1	12	5	57	57	370
Australia	20	184	10	71	3	36	931	4,830
Austria	1	7	3	11	0	0	124	1,020
Belgium	2	26	0	0	0	0	140	1,219
Brazil+	21	223	3	18	3	35	298	1,972
Canada	184	1,590	148	1,265	0	0	1,076	5,476
Chile+	12	163	6	62	1	14	123	1,096
China+	12	86	20	186	4	42	1,510	7,165
Denmark	4	53	2	30	0	0	184	1,768
Finland	3	36	4	53	2	30	162	1,447
France	29	359	25	350	2	25	1,003	7,349
Germany	23	236	30	367	3	41	851	6,948
Greece+	2	15	2	10	3	19	250	826
Hong Kong	11	90	90	989	2	17	638	4,057
Hungary+	1	10	5	48	3	27	29	185
India+	9	94	5	32	45	523	572	3,396
Ireland	7	81	7	60	0	0	77	615
Israel	54	294	4	30	0	0	106	528
Italy	8	97	4	52	6	70	322	2,441
Japan	29	408	42	535	1	8	3,857	28,117
Korea+	7	66	5	32	12	131	960	6213
Mexico+	29	316	23	257	5	66	90	584
Netherland	31	306	19	207	1	4	221	1862
NewZeeland	4	53	8	80	2	26	263	1608
Norway	5	52	1	6	0	0	105	727
Peru+	2	25	3	27	1	14	66	424
Philipines+	3	41	6	80	5	62	122	842
Portugal	2	22	4	46	2	24	79	575
Poland+	1	7	3	26	5	44	172	725
Russia+	6	38	25	127	2	11	40	82
Singapore	6	44	17	210	0	0	568	3,450
South Africa+	11	144	26	295	4	48	376	2,232
Spain	5	60	3	33	1	10	185	1,652
Sweden	9	113	9	115	1	12	363	2,519
Switzerland	8	83	5	76	1	17	240	2,188
Taiwan+	7	75	12	83	38	398	1,380	6,927
Turkey+	1	6	1	5	5	52	190	1151
UK	54	734	76	977	1	8	2,286	16,327
Venezuela+	3	30	8	83	1	8	11	47
All countries	**633**	**6,345**	**665**	**6,946**	**170**	**1,879**	**20,027**	**130,960**

Table 2: Descriptive statistics

This table reports the mean, median and standard deviation of the main variables used in our analysis. All variables are defined in the Appendix. We provide these statistics separately for exchange, OTC, Rule 144a and control firms. Exchange firms are firms that are listed on a U.S. exchange (Level 2 and 3 ADRs and ordinary listings). OTC firms are firms that are listed over-the-counter as Bulletin Board or Pink Sheet issues. Rule 144a firms are firms that are listed via Rule 144a (private placement). Control firms are firms that never had stocks cross-listed in the U.S. The sample period is from 1989 to 2006.

	Exchange			
Variables	Mean	Median	Std Dev	Firm-year
Total Assets (TA)	10,860.489	2,008.245	25,048.135	6,345
Q	1.531	1.136	1.219	6,345
Capex/PPE(t-1)	0.287	0.197	0.354	6,345
CF/TA	0.105	0.122	0.144	6,345
Δ*Sales*	0.179	0.108	0.449	6,086
	OTC			
Variables	Mean	Median	Std Dev	Firm-year
Total Assets (TA)	6,430.973	1,656.225	14,020.308	6,976
Q	1.241	0.972	0.949	6,976
Capex/PPE(t-1)	0.248	0.169	0.331	6,976
CF/TA	0.111	0.116	0.115	6,976
Δ*Sales*	0.147	0.093	0.410	6,293
	Rule 144a			
Variables	Mean	Median	Std Dev	Firm-year
Total Assets (TA)	3,588.729	1,088.569	8,735.453	1,879
Q	1.197	0.926	0.868	1,879
Capex/PPE(t-1)	0.264	0.169	0.340	1,879
CF/TA	0.128	0.124	0.082	1,879
Δ*Sales*	0.169	0.111	0.383	1,838
	Control			
Variables	Mean	Median	Std Dev	Firm-year
Total Assets (TA)	951.151	176.195	4,163.270	130,960
Q	1.121	0.854	0.920	130,960
Capex/PPE(t-1)	0.278	0.158	0.412	130,960
CF/TA	0.095	0.100	0.119	130,960
Δ*Sales*	0.144	0.080	0.419	128,968

Table 3: The impact of cross-listing on the investment-to-price sensitivity

This table presents the estimation of equation (1) with various estimation techniques. The dependent variable is investment, defined as capital expenditures divided by lagged property, plant and equipment (PPE). *Exchange* is a dummy variable that is equal to one if the firm is cross-listed on a U.S. exchange, and zero otherwise. Other explanatory variables are defined in the Appendix. In column (1), we estimate equation (1) with pooled OLS regressions with country, year and industry fixed effects. In column (2), we reestimate equation (1) with firm fixed effects and without country and industry fixed effects. In column (3), we estimate equation (1) using Fama and MacBeth (1973)'s methodology. In column (4), we estimate equation (1) by including country random effects. In columns (5) and (6), we include only firms with total assets (*TA*) greater than 100$ mio and $1,000 mio, respectively. The sample period is from 1989 to 2006. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. Symbols ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Investment (capex over lagged PPE)					
	Baseline	Firm FE	F-M	Country RE	TA>100$	TA>1,000$
	(1)	(2)	(3)	(4)	(5)	(6)
Exchange	-0.082**	-0.063**	-0.047**	-0.051**	-0.052**	-0.031*
	[6.75]	[3.19]	[4.69]	[5.33]	[4.21]	[2.57]
Q	0.066**	0.051**	0.057**	0.076**	0.061**	0.031**
	[34.04]	[19.74]	[8.28]	[69.01]	[21.68]	[5.67]
Q × *Exchange*	0.066**	0.057**	0.060**	0.055**	0.051**	0.032**
	[7.26]	[5.06]	[7.74]	[10.08]	[5.52]	[3.34]
CF/TA	0.312**	0.425**	0.425**	0.311**	0.415**	0.505**
	[20.77]	[22.07]	[9.87]	[40.23]	[18.73]	[10.67]
log(TA)	-0.024**	-0.076**	-0.028**	-0.028**	-0.027**	-0.028**
	[24.44]	[16.81]	[10.41]	[43.86]	[20.88]	[10.00]
Country FE	Yes	No	Yes	No	Yes	Yes
Industry FE	Yes	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	Yes
Firm FE	No	Yes	No	No	No	No
# Firm-years	131,463	131,479	131,479	131,479	87,430	23,920
R^2/*Pseudo* R^2	0.15	0.49	0.09	*0.20*	0.17	0.18

Table 4: The impact of cross-listing on the investment-to-price sensitivity: Robustness

In this table we estimate equation (1) with pooled OLS regressions with various measures of investment. In columns (1) and (2) investment is defined as capital expenditures divided by lagged and contemporaneous total assets, respectively. In columns (3) investment is defined as capital expenditures plus R&D expenses divided by lagged PPE. In columns (4) and (5) investment is defined as capital expenditures plus R&D expenses divided by lagged and contemporaneous total assets, respectively. Finally, in column (6) investment is defined as the annual change in total assets divided by lagged total assets. Across all specifications, *Exchange* is a dummy variable that is equal to one if the firm is cross-listed on a U.S. exchange, and zero otherwise. All other explanatory variables are defined in the Appendix. The sample period is from 1989 to 2006. All estimations include country, year and industry fixed effects. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. Symbols ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Investment (various measures)					
	(1)	(2)	(3)	(4)	(5)	(6)
Exchange	-0.016**	-0.009**	-0.171**	-0.016**	-0.004	-0.042**
	[4.23]	[3.25]	[3.70]	[3.20]	[0.98]	[3.33]
Q	0.007**	0.004**	0.176**	0.015**	0.010**	0.050**
	[15.52]	[11.56]	[26.50]	[22.67]	[20.03]	[28.39]
Q × *Exchange*	0.011**	0.006**	0.247**	0.022**	0.011**	0.038**
	[4.05]	[3.07]	[5.62]	[5.65]	[4.13]	[3.73]
CF/ TA	0.157**	0.089**	-0.309**	0.123**	0.049**	0.859**
	[44.61]	[34.88]	[6.45]	[25.80]	[13.28]	[68.69]
log(TA)	-0.002**	-0.000*	-0.045**	-0.003**	-0.001**	-0.019**
	[9.32]	[2.00]	[20.81]	[10.37]	[3.34]	[29.20]
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
# Firm-years	136,899	136,899	131,463	136,899	136,899	149,353
R^2	0.22	0.20	0.17	0.20	0.17	0.23

Table 5: The impact of cross-listing on the investment-to-price sensitivity: self-selection

In this table we estimate the investment equation (1) with the Heckman (1979) two-stage estimation procedure. The first column reports the results of the (first-stage) probit estimation where the dependent variable is *Exchange*, a dummy variable that is equal to one if the firm is cross-listed on a U.S. exchange, and zero otherwise. The second column reports the (second-stage) OLS estimates of equation (1) in which the dependent variable is investment defined as capital expenditures divided by lagged property, plant and equipment (PPE) and in which we include the *Inverse Mills Ratio* computed using the first-stage probit estimates to account for self-selection. All other explanatory variables are defined the Appendix. The sample period is from 1989 to 2006. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. Symbols ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Heckman	
	(First-stage) Probit	Second stage
Exchange		-0.087**
		[4.25]
Q		0.064**
		[32.61]
Q × *Exchange*		0.063**
		[6.64]
CF / TA		0.348**
		[23.14]
log(TA)	0.359**	-0.023**
	[64.05]	[20.83]
Debt / TA	-0.197**	
	[3.05]	
External Dependence	0.002*	
	[2.37]	
Δ*Sales*	0.057**	
	[2.69]	
Median Industry Q	-3.894**	
	[3.68]	
ROA	-0.348**	
	[5.07]	
Foreign Sales	1.101**	
	[39.07]	
Common Law	0.790**	
	[35.96]	
Market Capitalization	-0.360**	
	[20.00]	
Inverse Mills Ratio		0.007
		[0.77]
Industry and Year FE	Yes	Yes
# Firm-years	156,982	131,221
PseudoR2/R2	*0.41*	0.15

Table 6: Managerial learning and the impact of cross-listing on the investment-to-price sensitivity

In this table we estimate the investment equation (1) adding two interaction terms between Q and two dummy variables *Low* and *High* with pooled OLS regressions and we report *F*-tests that evaluate whether the coefficients on $Q \times High$ and $Q \times Low$ are equal. The dependent variable is investment, defined as capital expenditures divided by lagged property, plant and equipment (PPE). *Exchange* is a dummy variable that is equal to one if the firm is cross-listed on a U.S. exchange, and zero otherwise. *Low* (resp. *High*) is a dummy variable equal to one in year *t* for a cross-listed firm if the value of a proxy that measures the informational content of stocks prices for managers is below (resp. above) the median value of this proxy for all cross-listed firms. We use six different firm-level variables as proxies of the informational content of stock prices for managers of cross-listed firms: (1) *Foreign sales* measures the fraction of sales realized abroad; (2) *Inst.Holdings* is the fraction of U.S. institutional holdings to total shares outstanding; (3) *U.S. trading* is the fraction of trading that takes place on U.S. exchanges; (4) *BKL* is the "U.S. information factor" developed by Baruch et al. (2007); (5) *U.S. Rel.Ind* is the difference in the percentage of the market capitalization of a firm's industry located in the U.S. and the percentage of industry market capitalization for a firm's industry in its home country; (6) *Coverage* is the average number of analysts issuing forecasts over a given year. The sample period is from 1989 to 2006. All other explanatory variables are defined in the Appendix. All estimations include country, year and industry fixed effects. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. Symbols ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Investment (capex over lagged PPE)					
	Foreign Sales	Ins. Holdings	U.S. Trading	BKL	U.S. Rel.Ind.	Coverage
	(1)	(2)	(3)	(4)	(5)	(6)
Exchange	-0.071**	-0.023	-0.042**	-0.078**	-0.077**	-0.097**
	[5.33]	[1.76]	[3.37]	[6.24]	[6.79]	[6.61]
Q	0.065**	0.065**	0.065**	0.066**	0.066**	0.065**
	[33.65]	[33.13]	[33.52]	[33.94]	[34.02]	[33.72]
$Q \times Low$ (a)	0.054**	0.004	0.021*	0.056**	0.055**	0.080**
	[5.75]	[0.55]	[2.08]	[5.44]	[6.02]	[6.09]
$Q \times High$ (b)	0.085**	0.038**	0.040**	0.070**	0.077**	0.035**
	[3.92]	[2.85]	[4.62]	[6.94]	[7.42]	[3.18]
CF/ TA	0.315**	0.321**	0.318**	0.310**	0.312**	0.316**
	[20.63]	[20.72]	[20.87]	[20.57]	[20.71]	[20.77]
log(TA)	-0.024**	-0.024**	-0.024**	-0.024**	-0.024**	-0.024**
	[23.91]	[23.50]	[23.94]	[24.32]	[24.34]	[24.19]
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
# Firm-years	129,834	127,703	130,199	131,116	131,469	130,588
R^2	0.15	0.15	0.15	0.15	0.15	0.15
(a)=(b) (*p*-val.)	0.10	0.01	0.01	0.07	0.02	0.00

Table 7: The impact of different cross-listing types on the investment-to-price sensitivity

In this table we estimate the investment equation (1) adding two interaction terms between Q and two dummy variables *OTC* and *144a* to assess whether the effect of a cross-listing on the investment-to-price sensitivity depends on the cross-listing type. The dependent variable is investment, defined as capital expenditures divided by lagged property, plant and equipment (PPE). *Exchange* is a dummy variable that is equal to one if a firm is cross-listed on a U.S. exchange and zero otherwise. *OTC* is a dummy variable that is equal to one if a firm is cross-listed on the U.S. OTC market and zero otherwise. *144a* is a dummy variable that is equal to one if a firm is cross-listed in the U.S. via a Rule 144a placement. All other variables are defined in the Appendix. In column (1), we estimate equation (1) with pooled OLS regressions with country, year and industry fixed effects. In column (2), we reestimate equation (1) with firm fixed effects and without country and industry fixed effects. In column (3), we estimate equation (1) using Fama and MacBeth (1973)'s methodology. In column (4), we estimate equation (1) by including country random effects. In columns (5) and (6), we include only firms with total assets (*TA*) greater than 100$ mio and $1,000 mio, respectively.The sample period is from 1989 to 2006. We report *F*-tests that evaluate whether the coefficients on *Q×Exchange*, *Q×OTC*, or *Q×144a* are equal. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. Symbols ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Investment (capex over lagged PPE)					
	Baseline	Firm FE	F-M	Country RE	TA>100$	TA>1,000$
	(1)	(2)	(3)	(4)	(5)	(6)
Exchange	-0.082**	-0.065**	-0.048**	-0.051**	-0.053**	-0.035**
	[6.82]	[3.29]	[4.81]	[5.43]	[4.36]	[2.90]
OTC	-0.027**	-0.044*	0.002	-0.021	-0.006	-0.026
	[2.60]	[2.15]	[0.03]	[1.72]	[0.56]	[1.57]
144a	0.031*	-0.032	-0.032	0.038*	0.024	0.001
	[2.07]	[0.70]	[0.58]	[2.45]	[1.58]	[0.06]
Q	0.066**	0.050**	0.057**	0.077**	0.061**	0.030**
	[34.65]	[19.59]	[8.16]	[70.51]	[22.00]	[5.63]
Q × *Exchange* (a)	0.065**	0.058**	0.059**	0.054**	0.050**	0.033**
	[7.19]	[5.25]	[7.51]	[10.03]	[5.53]	[3.46]
Q × *OTC* (b)	0.019*	0.038**	-0.003	0.012	0.003	0.019
	[2.19]	[3.09]	[0.34]	[1.29]	[0.41]	[1.31]
Q × *144a* (c)	-0.001	0.005	0.007	-0.008	-0.003	0.006
	[0.13]	[0.24]	[0.92]	[0.73]	[0.28]	[0.38]
CF/TA	0.315**	0.426**	0.429**	0.314**	0.425**	0.516**
	[21.34]	[22.61]	[10.04]	[41.59]	[19.71]	[11.51]
log(TA)	-0.024**	-0.076**	-0.027**	-0.027**	-0.026**	-0.027**
	[24.91]	[17.15]	[10.79]	[44.92]	[21.35]	[10.34]
Country FE	Yes	No	Yes	No	Yes	Yes
Industry FE	Yes	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	Yes
Firm FE	No	Yes	No	No	No	No
# Firm-years	137,142	137,158	137,158	137,158	92,589	26,961
R^2	0.15	0.49	0.09	0.21	0.17	0.18
(a)=(b) (p-val.)	0.00	0.11	0.00	0.00	0.00	0.41
(a)=(c) (p-val.)	0.00	0.03	0.01	0.00	0.00	0.10
(b)=(c) (p-val.)	0.16	0.21	0.36	0.16	0.64	0.54

Table 8: Investment-to-price sensitivity and ex-post performance

This table presents the results of OLS regressions of the effect of a U.S. cross-listing on firms' ex-post performance. Performance is defined as one year ahead (three years ahead) return on asset (*ROA*) or sales growth (Δ*Sales*). *Exchange* is a dummy variable that is equal to one if the firm is cross-listed on a U.S. exchange, and zero otherwise. *Pos* (*Neg*) is a dummy variable that equals one if firms that cross-list on a U.S. exchange experience an increase (decrease) in their investment-to-price sensitivity after their U.S. cross-listing. The Internet Appendix details the computation of these two dummy variables. All variables are defined in the Appendix. The sample period is from 1989 to 2006. We report the *F*-tests that evaluate whether the coefficients on *Pos* and *Neg* are equal. All estimations include year and firm fixed effects. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. Symbols ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Panel A: Performance (next year)				**Panel B: Performance (average of next 3 years)**			
	ROA		Δ*Sales*		*ROA*		Δ*Sales*	
	(1)		(2)		(3)		(4)	
Exchange	0.012		0.069**		0.012		0.037*	
	[1.94]		[3.09]		[1.82]		[2.15]	
Pos (a)		0.032**		0.109**		0.017*		0.064**
		[4.45]		[4.03]		[2.32]		[3.27]
Neg (b)		0.002		0.048*		0.009		0.022
		[0.26]		[2.07]		[1.40]		[1.30]
log(TA)	-0.030**	-0.030**	-0.145**	-0.145**	-0.036**	-0.036**	-0.175**	-0.175**
	[20.94]	[20.97]	[27.21]	[27.22]	[24.03]	[24.03]	[39.62]	[39.65]
Debt / TA	-0.009	-0.009	-0.028	-0.027	0.037**	0.037**	0.011	0.011
	[1.86]	[1.77]	[1.54]	[1.49]	[7.69]	[7.72]	[0.78]	[0.83]
Cash /TA	0.072**	0.071**	0.149**	0.149**	0.034**	0.034**	0.168**	0.168**
	[9.78]	[9.74]	[5.45]	[5.43]	[4.61]	[4.60]	[8.33]	[8.31]
PPE /TA	0.005	0.005	-0.023	-0.023	0.022**	0.022**	-0.008	-0.008
	[0.74]	[0.75]	[0.86]	[0.85]	[3.45]	[3.45]	[0.38]	[0.38]
Firm/Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Firm-years	131,153	131,153	130,089	130,089	124,799	124,799	126,545	126,545
R^2	0.56	0.56	0.35	0.35	0.74	0.74	0.60	0.60
(a) = (b) (*p*-val.)		0.00		0.00		0.05		0.00

Table 9: The impact of cross-listing on the investment-to-price sensitivity: Cross-country evidence

This table presents the estimates of OLS regressions of the effect of a U.S. cross-listing on firms' investment-to-price sensitivity (equation (1)) separately for different groups of countries. The dependent variable is investment, defined as capital expenditures divided by lagged property, plant and equipment (PPE). *Exchange* is a dummy variable that is equal to one if the firm is cross-listed on a U.S. exchange, and zero otherwise. We partition countries based on the following five variables: the Anti-self-dealing, disclosure and legal origin indices from Djankov, La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2008), the GDP per capital and the market capitalization from the Worldbank. For each variable, we assign a country to the *Low* group if it has a value below the sample median for this variable and to the *High* group otherwise. We estimate the investment equation (1) via a seemingly unrelated regression (SUR) system that combines the *Low* and *High* subgroups with country, year and industry fixed-effects. All explanatory variables are defined in the Appendix. The SUR estimation provides the joint-variance-covariance matrix that we use to test the cross-equation restrictions that appear in the two last lines of the table (we report the p-value of these tests). The sample period is from 1989 to 2006. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Quality of institutions						**Economic and financial development**			
	Anti-Self-Dealing		Disclosure		Legal Origin		GDP per capita		Market Capitalization	
	Low	High	Low	High	Code Law	Common Law	Low	High	Low	High
Exchange	-0.048**	-0.099**	-0.053**	-0.094**	-0.055**	-0.098**	-0.067**	-0.082**	-0.055**	-0.089**
	[3.27]	[7.92]	[3.64]	[7.24]	[4.16]	[6.79]	[3.84]	[7.39]	[3.75]	[7.03]
Q	0.066**	0.064**	0.066**	0.070**	0.061**	0.066**	0.041**	0.071**	0.056**	0.070**
	[37.91]	[42.27]	[36.00]	[45.50]	[42.59]	[34.83]	[18.30]	[53.65]	[34.20]	[43.86]
Q × *Exchange*	0.032**	0.080**	0.042**	0.075**	0.040**	0.081**	0.043**	0.068**	0.036**	0.075**
	[3.27]	[12.17]	[4.56]	[11.14]	[4.51]	[11.02]	[3.84]	[11.03]	[3.72]	[11.02]
CF / TA	0.398**	0.259**	0.351**	0.247**	0.458**	0.177**	0.562**	0.245**	0.445**	0.246**
	[32.18]	[25.69]	[27.98]	[24.09]	[43.40]	[14.91]	[37.54]	[27.08]	[36.88]	[23.87]
log(TA)	-0.020**	-0.029**	-0.023**	-0.026**	-0.018**	-0.038**	-0.016**	-0.026**	-0.016**	-0.031**
	[21.78]	[30.22]	[23.77]	[28.52]	[22.14]	[31.47]	[10.86]	[34.45]	[17.41]	[33.41]
country/industry/ year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Firm-years	63,749	67,056	61,138	63,436	86,559	44,246	32,781	98,688	61,470	69,335
R^2	0.18	0.13	0.16	0.15	0.17	0.13	0.13	0.16	0.16	0.15
Low - High : *Q (p-val.)*	0.43		0.18		0.14		0.00		0.00	
Low - High : *Q* × *Exchange (p-val.)*	0.00		0.01		0.00		0.06		0.00	

Table 10: Cross-listing, the investment-to-price sensitivity and governance quality

In this table we estimate the investment equation (1) with pooled OLS regressions adding interaction terms between Q and two dummy variables *High* and *Low* that measure the quality of corporate governance for cross-listed firms. The dependent variable is investment, defined as capital expenditures divided by lagged property, plant and equipment (PPE). *Exchange* is a dummy variable that is equal to one if the firm is cross-listed on a U.S. exchange, and zero otherwise. *Low* (resp. *High*) is a dummy variable equal to one in year *t* for a cross-listed firm if the value of a proxy that measures the quality of governance for this firm is below (resp. above) the median value of this proxy for all cross-listed firms. We use four different firm-level variables as proxies for governance quality for firms cross-listed on U.S. exchanges: (1) *GOV*, a governance index built using 41 governance attributes from the RiskMetrics database (see the text); (2) Δ*GOV*, which represents the average change of *GOV* over the period 2003-2006; (3) *CHS*, the data item "closely-held shares" in Worldscope and (iv) Δ*CHS,* the average annual change in *CHS* for firms that are cross-listed on a U.S. exchange. All other variables are defined in the appendix. When we use *GOV* or Δ*GOV* (columns 1 and 2), we use only the sample of cross-listed firms cover by Riskmetrics over the period 2003-2006 (the period over which we have access to the Riskmetrics data). In the last line of the table, we test whether the coefficients on *Q* × *High* and *Q* × *Low* are equal using an F-test and report the p-values for this test. All estimations include country, year and industry fixed effects. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. Symbols ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Investment (capex over lagged PPE)			
	GOV	ΔGOV	CHS	ΔCHS
	(1)	(2)	(3)	(4)
Exchange	-0.094**	-0.080**	-0.078**	-0.061**
	[2.97]	[2.71]	[5.20]	[3.88]
Q	0.047**	0.050**	0.062**	0.062**
	[5.05]	[5.44]	[23.51]	[23.64]
Q × *Low (a)*	0.060*	0.086**	0.065**	0.041**
	[2.40]	[2.82]	[5.63]	[3.58]
Q × *High (b)*	0.075**	0.044*	0.055**	0.056**
	[2.82]	[2.00]	[4.58]	[4.58]
CF/ TA	0.194**	0.200**	0.314**	0.312**
	[2.76]	[2.95]	[14.83]	[14.74]
log(TA)	-0.020**	-0.020**	-0.025**	-0.024**
	[3.89]	[3.83]	[15.93]	[2.26]
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
# Firm-years	3,799	3,799	64,272	64,272
R^2	0.22	0.22	0.15	0.15
F-test: *(a)-(b)(p-val.)*	0.37	0.04	0.33	0.17

Table 11: Cross-listing, the investment-to-price sensitivity and financing constraints

In this table we estimate the investment equation (1) with pooled OLS regressions adding interaction terms between Q and two dummy variables *Unconstrained* and *Constrained* that measure the intensity of financial constraints for cross-listed firms. The dependent variable is investment, defined as capital expenditures divided by lagged property, plant and equipment (PPE). *Exchange* is a dummy variable that is equal to one if the firm is cross-listed on a U.S. exchange, and zero otherwise. *Unconstrained* (resp. *Constrained*) is a dummy variable equal to one in year *t* for a cross-listed firm if the value of a proxy that measures the intensity of financial constraints for this firm is below (resp. above) the median value of this proxy for all cross-listed firms. We use three different firm-level variables as proxy for the intensity of financial constraints: (1)firm size (total asset), (ii) the Whited and Wu (2006) index (*WW*) of financial constraint; and (3) a dummy variable (*DIV*) equal to 1 in year *t* if a firm does not pay a dividend in this year and zero otherwise. In the last line of the table, we report the p-value of a *F*-test that evaluates whether the coefficients on *Q* × *Constrained* and *Q* × *Unconstrained* are equal. All variables are defined in the Appendix. All estimations include country, year and industry fixed effects. The standard errors used to compute the *t*-statistics (in brackets) are adjusted for heteroskedasticity and within-firm clustering. ** and * indicate statistical significance at the 1% and 5% levels, respectively.

	Investment (capex over lagged PPE)		
	Size	WW	DIV
	(1)	(2)	(3)
Exchange	-0.082**	-0.058**	-0.064**
	[7.01]	[5.06]	[5.91]
Q	0.066**	0.066**	0.066**
	[34.01]	[34.12]	[33.98]
Q × *Unconstrained* (a)	0.055**	0.037**	0.035**
	[6.67]	[4.56]	[4.72]
Q × *Constrained* (b)	0.082**	0.064**	0.082**
	[6.82]	[6.38]	[8.29]
CF/ TA	0.313**	0.311**	0.315**
	[20.78]	[20.60]	[20.90]
log(TA)	-0.024**	-0.024**	-0.024**
	[23.94]	[24.08]	[23.98]
Country FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
# Firm-years	131,469	131,469	131,469
R^2	0.15	0.15	0.15
F-test: (a)-(b) (*p*-val.)	0.01	0.00	0.00

Appendix: Definitions and sources of the variables

This table provides definitions and sources of all the variables used in the analysis.

Variables	Definition	Source
Firm-level variables		
Exchange	Dummy variable that takes one if a firm is cross-listed on a U.S. exchange (level 2 and 3 ADR and ordinary listings) and zero otherwise	Various sources (See Section 2)
OTC	Dummy variable that takes one if a firm is cross-listed over-the-counter (level 1 ADR) and zero otherwise	Various sources (See Section 2)
144a	Dummy variable that takes one if a firm is cross-listed via a Rule 144a (Private placement) and zero otherwise	Various sources (See Section 2)
Capex	Capital expenditures (in million USD)	Worldscope
(Tobin's) Q	(Book value of assets – book value of equity + market value of equity) / book value of assets	Worldscope
PPE	Property, Plant and Equipment	Worldscope
Total assets (TA)	Book value of total assets	Worldscope
CF/TA	Cash flows from operations over total assets	Worldscope
Δ*Sales*	Percentage change in (inflation-adjusted) sales over year *t-2* to *t*	Worldscope
R&D	R&D expenses. Set to zero if missing	Worldscope
Debt	Total debt (long term plus short term)	Worldscope
Cash	Sum of cash and short term investments	Worldscope
ROA	Sum of earnings before interest, taxes, depreciation, and amortization over total assets	Worldscope
Foreign Sales	Proportion of sales generated from operations in foreign countries over total sales	Worldscope
Ins. Holdings	Proportion of shares held by U.S. institutions as a fraction of common shares outstanding	CDA/Spectrum (SEC 13(f) filings)
U.S. Trading	Proportion of the total volume that takes place on U.S. markets defined as the trading volume ($) on U.S. exchange divided by the total (domestic and U.S.) volume ($)	Datastream and CRSP
BKL	"U.S. information factor" developed by Baruch, Karolyi, and Lemmon (2007)	Datastream and CRSP
Coverage	Number of analysts issuing at least one earnings forecasts over the year	I/B/E/S International summary files
GOV	Governance index based on 41 attributes on board, audit, anti-takeover, compensation and ownership developed by	RiskMetrics (sample restricted to the 2003-

	Aggarwal, Erel, Stulz, and Williamson (2009)	2006 period)
ΔGOV	Average annual change in *GOV* for cross-listed firms over the 2003-2006 period	
CHS	Proportion of closely held shares as a fraction of common shares outstanding. These includes shares held by senior corporate officers and directors, and their immediate families; shares held in trusts; shares held by another corporation (except shares held in a fiduciary capacity by financial institutions); shares held by pension and benefit plans; and shares held by individuals who hold 5% or more	Worldscope
ΔCHS	Average of the annual change of *CHS* after firms cross-list on a U.S. exchange	Worldscope
WW	Index measuring the severity of financial constraints developed by Whited and Wu (2006)	Worldscope
Dividend payer	Dummy variable that equals one if a firm pays dividend and zero otherwise	Worldscope
Industry-level variables		
External Dependence	Industry technological dependence on external finance based on Rajan and Zingales (1998). Following their methodology, the external finance dependence measure is computed as the industry (4 digits SIC codes) median value of the difference between capital expenditures and cash flow from operations, divided by capital expenditures	Worldscope
Median Industry Q	(Country) Industry (2digit SIC code) median of *Q*	Worldscope
U.S. Rel. Ind.	Difference in the percentage of the market capitalization of a firm's industry located in the U.S. and the percentage of industry market capitalization for a firm's industry in its home country	Worldscope
Country-level variables		
Common Law	Dummy variable that equals one for common law countries and zero otherwise	Djankov et al.(2008)
Market Capitalization	Total market capitalization	The Worldbank
Anti-Self-Dealing	Index measuring shareholder rights. The index ranges from 0 to 6.	Djankov et al. (2008)
Disclosure	Index measuring the reliability of accounting numbers. The index ranges from 0 to 90.	Djankov et al.(2008)
GDP per capita	Domestic growth domestic product per capital	The Worldbank
French Law	Dummy variable that equals one for civil law countries and zero otherwise	Djankov et al.(2008)
Scandinavian Law	Dummy variable that equals one for scandinavian law countries and zero otherwise	Djankov et al.(2008)

Judicial Efficiency	Index measuring the efficiency and integrity of the legal environment as it affects business and particularly foreign firms. The index ranges from 0 to 10.	Djankov et al.(2008)