Where Is the Market? Evidence from Cross-Listings in the United States

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We analyze the location of stock trading for firms with a US cross-listing. The fraction of trading that occurs in the United States tends to be larger for companies from countries that are geographically close to the United States and feature low financial development and poor insider trading protection. For companies based in developed countries, trading volume in the United States is larger if the company is small, volatile, and technology-oriented, while this does not apply to emerging country firms. The domestic turnover rate increases in the cross-listing year and remains higher for firms based in developed markets, but not for emerging market firms. Domestic trading volume actually declines for companies from countries with poor enforcement of insider trading regulation. (*JEL* G15, G30.)

Many companies list their shares not only on their domestic exchange, but also on foreign exchanges—a fact for which several reasons have been offered and explored (see Saudagaran (1988); Karolyi (1998, 2006); Baker, Nofsinger, and Weaver (2002); Pagano, Röell, and Zechner (2002); Doidge, Karolyi, and Stulz (2004); and Sarkissian and Schill (2004), among others). One motive often hypothesized for this decision is that cross-listing facilitates trading by foreign investors. If so, then one would expect cross-listings to be followed by fairly substantial and persistent trading activity in the foreign market.

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This argument contrasts with the tendency toward agglomeration that several models see as a quintessential feature of securities trading (Admati and Pfleiderer (1988); Pagano (1989); and Chowdhry and Nanda (1991)). This tendency, coupled with the informational advantages of domestic traders, should create a powerful obstacle to the development of an active foreign market. The gravitational pull of the preexisting domestic market may be countered only by trading cost differentials or other frictions that protect the new trading venue.

Whether such frictions permit the development of an active foreign market after cross-listing is an empirical question, and it is the main question that we examine in this study. A related but distinct question is whether a foreign market can be developed only at the cost of forgoing some trading activity on the preexisting domestic market. This need not be the case: trading activity on the domestic and on the foreign market may be complements rather than substitutes. Again, this is an empirical issue, and it is the second main question we address.

In answering these questions, we do not simply rely on characteristics of the domestic and foreign countries (such as geographical distance, financial development, or protection against insider trading). We also exploit the cross-sectional differences among cross-listed companies (for instance, in size, growth, or return volatility). The rationale is that some company characteristics should be correlated with trading frictions or informational asymmetries and should therefore be related to the distribution of trading between the domestic and the foreign market. Our data span the period from 1980 to 2001, covering 437 companies based in 34 different countries and cross-listed in US markets.

The US market for these companies' shares attracts a considerable share of trading activity compared to the domestic market. For the median company, US trading volume is about 50% of its domestic counterpart immediately after the cross-listing, declining to 25% within six years. But this overall pattern masks considerable diversity across companies and countries.

We find that the fraction of trades carried out in the US market is larger for companies based in countries that are geographically close to the United States, have underdeveloped capital markets, and afford investors poor protection against insider trading. Geographical proximity can be seen as capturing the familiarity of US investors with the company and its country's institutions, implying a lower informational disadvantage for US investors.[1] Similarly, a low degree of domestic financial development and investor protection gives the US market a comparative advantage in providing liquidity to cross-listed stocks.

This comparative advantage of the US equity market not only appears to differ depending on the financial development of the home market: it also appears to have evolved differently vis-à-vis developed and emerging markets from 1981

[1] The former finding is consistent with Sarkissian and Schill (2004), who demonstrate that investor familiarity affects cross-listing decisions.

to 2001. Our estimates imply that the relative attractiveness of US markets for the trading of cross-listed stocks has decreased over time for developed market companies, while it has increased for emerging market companies, other things being equal. This different pattern is particularly evident and statistically significant for the last years of our sample.

Company characteristics are also a factor in explaining the share of trading volume captured by the US market. US trading activity is comparatively high for small, highly volatile, and technology-oriented companies from developed countries. This may be due to a greater ability of US analysts and investors to evaluate such firms. Indeed, technology-oriented firms may cross-list in the United States for that very reason. This is consistent with the finding of Pagano, Röell, and Zechner (2002) that European high-growth and technology-oriented companies are more likely to cross-list in the United States than elsewhere in Europe. In contrast, foreign trading volume is negatively related to volatility for emerging country companies.

The second major issue investigated in the paper is the impact of cross-listing on domestic trading activity. On the whole, we find that domestic market activity does not suffer from cross-listing. On the contrary, both around the cross-listing date and in subsequent years, the domestic turnover ratio increases significantly. Also in this case, however, we find a striking difference between developed and emerging markets. For firms based in developed markets, the domestic turnover rate increases in the wake of cross-listing and remains permanently higher. No such increase in domestic trading is observed for emerging market firms. An even sharper difference is found when the sample is split according to enforcement of insider-trading rules. In countries where it is effective, domestic trading volume increases after a cross-listing, while in countries with poor insider-trading enforcement, it drops sharply.

Our investigation of the distribution of trading volume for cross-listed shares adds to a modest body of research.[2] Pulatkonak and Sofianos (1999) focus on institutional factors like the time zone difference to explain the distribution of trading volume for stocks cross-listed on the NYSE in 1996. More detailed analyses of the influence of trading hours overlap using intraday data are in Lowengrub and Melvin (2002); and Menkveld (2007). Levine and Schmukler (2006) find that emerging market firms that cross-list their shares abroad tend to experience a drop in domestic trading activity. Moreover, such internationalization tends to damage the liquidity of other domestic stocks. Similarly, Karolyi (2004) finds that for emerging market companies cross-listed in the

[2] Trading volume of cross-listed stocks has been more frequently used as an explanatory variable. For example, Eun and Sabherwal (2003) show for Canadian stocks listed on the TSE and a US exchange that price discovery is affected by the location of trade. They find that the home market generally dominates price discovery. See Grammig, Melvin, and Schlag (2005) for a survey of the evidence. Another strand of literature analyzes the liquidity of cross-listed stocks. Bacidore and Sofianos (2002) find that non-US stocks listed in the United States have wider spreads and less depth than US stocks. Foerster and Karolyi (1998) analyze the effect of cross-listing on domestic liquidity for Canadian stocks. They find that trading costs on the home market decrease for stocks that experience a significant shift of total trading volume to the foreign exchange.

United States an increase in American Depositary Receipts (ADRs) activity goes along with a decrease in market capitalization and turnover ratios of purely domestically listed companies. More generally, Baruch, Karolyi, and Lemmon (2007) show that the distribution of a cross-listed stock's trading volume across exchanges depends on its correlations with other assets traded on the domestic and foreign exchanges, respectively.

The plan of the paper is as follows. In Section 1, we outline the hypotheses suggested by the literature about the distribution of trading volume across alternative venues and use them to derive testable predictions about how company and market characteristics should correlate with foreign trading volume. In Section 2, we describe the data. In Section 3, we document the patterns of foreign and domestic trading volume around the cross-listing date and use regression analysis to investigate their determinants. Section 4 concludes.

1. Hypotheses

Our analysis focuses on two questions. First, how large is trading volume on the foreign market after a cross-listing, compared to domestic trading? Second, how does the level of domestic trading volume itself react to a cross-listing? In both cases, we want to see how the outcome depends on company characteristics and market characteristics. First we look to theory to isolate the relevant company and market variables, and their predicted effect on the distribution of trading volume between venues.

1.1 Determinants of the distribution of trading volume

When a security is traded simultaneously on two exchanges, positive trading externalities favor the concentration of trading on one, because a greater number of participants reduces the price impact of any given order. Pagano (1989) makes this point in a setting where risk-averse traders perceive their demand for the stock as adversely affecting the market price. With more traders, the stock price is less sensitive to the order flow, so that the market is more liquid. If a stock can be traded on two distinct auction markets with identical transaction costs, traders will concentrate in one.[3] If their trading costs differ, the two markets can coexist, however.

The tendency toward concentration in a single market also emerges in models with asymmetric information, as is shown by Chowdhry and Nanda (1991) in a setting similar to that in Admati and Pfleiderer (1988). In their model, privately informed traders and discretionary and nondiscretionary liquidity traders place orders with risk-neutral market makers. In equilibrium, all the traders who can choose their venue will use the market with the most nondiscretionary traders. The less-liquid market remains active only insofar as some nondiscretionary

[3] Apart from a "knife-edge" equilibrium, in which traders allocate themselves across the two markets so as to be exactly indifferent between them.

liquidity traders are trapped there. This lack of discretion over venue can be seen as a reflection of differential trading costs; for instance, these traders may face prohibitively high costs abroad, but not at home. So, in this case too, full agglomeration is blocked only by differential trading costs.

These results suggest that when a company cross-lists its shares on another exchange, trade should tend to concentrate on one of the two markets, unless this is prevented by frictions. Beside differential transaction costs, frictions can consist in time zone differences that create captive clienteles in each market.

This still leaves two important questions open. If after a cross-listing one market tends to attract all trading activity, which one will prevail? If instead competing markets can coexist, what determines the division of trading volume?

In principle, the variables that could affect the distribution of trading volume between two markets belong to three groups: (i) those relevant for non-information-based trading; (ii) those relevant for information-based trading, and (iii) those measuring trading frictions. Now we identify these variables and indicate which empirical measures can be used to proxy them. Table 1 summarizes the variables and their predicted effect on foreign trading volume.

1.1.1 Non-information-based trading. Suppose that each country's investors trade the shares of cross-listed companies only locally because of

Table 1
Determinants of foreign trading volume

Empirical measure	Type	Predicted effect on foreign trading volume
Noninformation-based trading		
Ratio of total volume on US market to total domestic stock exchange volume	M	+
Correlation with the US market	C	−
Presence of foreign institutional investors	C	+
Information-based trading		
Geographical distance	M	−
Language difference	M	−
Fraction of foreign sales	C	+
BKL incremental information measure	C	+
Company size (total assets)	C	+
Company growth rate	C	−
Stock return volatility	C	−
High-tech sector	C	+/−
Analyst following	C	+
Trading Frictions		
Time zone difference	M	−
Domestic financial development	M	−
Protection against insider trading (foreign versus home)	M	+
Domestic investor protection	M	+

This table lists the variables used to measure determinants of foreign trading volume, grouped according to whether they are not information related, information related, or related to the different intensity of trading frictions in the two markets. The Type column indicates whether the variable is measured at market level (M) or at company level (C). The last column indicates the sign of each variable's predicted effect on trading volume in the foreign market, relative to that of the domestic market.

transaction costs or regulatory constraints. When hit by endowment or preference shocks, they will trade their portfolios, including the shares of companies cross-listed on their market. As a result, the foreign trading of cross-listed shares will be proportional to total trading on the host market.[4] Therefore, a company should feature a more active foreign market for its shares if it is cross-listed on an exchange with greater *total trading volume*.

The foreign investor base of a stock—and thus its foreign trading volume—may also depend on its risk characteristics. Stocks featuring *low correlation* with the foreign market should appeal to foreign investors for portfolio diversification.[5] This implies that, other things being equal, the foreign trading volume of these shares should also be higher than that of other cross-listed stocks.

The *presence of foreign institutional investors* in a company's shareholder base may also tilt the distribution of trading in favor of the foreign exchange. Institutional investors are likely to supply liquidity by taking market positions to exploit temporary supply and demand imbalances caused by liquidity traders. Their presence can thus encourage trading by other market participants. For cross-listed stocks, foreign institutional investors are likely to contribute chiefly to liquidity and trading volume on the foreign market, where they are more likely to operate. In the case of our data, there is also another reason why the number of foreign institutional investors and their fractional ownership may correlate with foreign trading volume: because we cannot measure the presence of foreign retail investors directly, the variables referring to foreign institutional investors may also proxy for the presence of foreign retail investors.

1.1.2 Information-based trading. Information is another likely driver of the distribution of trading between markets. If traders with privileged information exploit it in their local market, the place where it originates should help determine the location of trading activity. For example, if privileged information mainly "trickles down" from the company's headquarters (see Davis and Henderson (2004); Pirinsky and Wang (2006)), one could expect informed trading to concentrate in the market closest to the headquarters. And in fact, Grinblatt and Keloharju (1999) show that Finnish investors' portfolios overweight the stocks of geographically close companies, and Coval and Moskowitz (1999) detect a similar bias in the portfolio choices of US domestic funds. Brennan et al. (2005) provide further evidence on the informational disadvantage of foreign investors. Using survey data, they find that foreign institutional investors become more bullish about a country as the returns of that country's market portfolio increase, while this is not true of domestic investors. Ivkovic and Weisbenner (2005) document that individual investors' preference for local

[4] This argument assumes that the quantity of cross-listed shares owned by foreign investors equals their demand, which in turn depends on their number and wealth.

[5] Another measure to consider in this context would be a company's beta with respect to the foreign market. However, the beta can be expressed as $\beta_{i,m} = \rho_{i,m}\sigma_i\sigma_m^{-1}$. As we consider the stock's volatility as a distinct explanatory variable (see below), beta would not add new information.

stocks comes from an information advantage rather than a behavioral bias, showing that investments in closer firms systematically outperform those in more distant firms. Proximity gives analysts, too, an informational advantage, as in Malloy (2005). This familiarity bias is well known also to companies, as witnessed by the important role that geographical distance plays in their choice of where to cross-list (Sarkissian and Schill (2004)).

By the same token, if accounting information is initially published in the company's home-country language, informed trading should be initiated by domestic traders. This is consistent with the evidence that language barriers confer an informational advantage to local traders. Hau (2001) documents that in the German electronic stock market Xetra, traders in non-German-speaking locations make lower profits than other traders, and underperform even compared to German traders in the same locations. Similarly, Grinblatt and Keloharju (1999) identify a language bias in the portfolio choices of the Swedish-language minority in Finland.

Therefore, one would expect the domestic market to retain information-based trades more easily if the foreign market in which the company is cross-listed is geographically remote or located in a country with a different language. Foreign trading volume should therefore be inversely related to the *geographical distance* and to the presence of a *language difference* between the countries in which the domestic and the foreign stock markets are located.

The only exceptions to this prediction are instances in which a considerable portion of value-relevant information is produced abroad. This can occur when the company exports or produces a large fraction of its output abroad. For instance, Kang and Stulz (1997) document that foreign investment in Japanese stocks is concentrated in large, export-oriented firms that are presumably more familiar to foreign investors. Therefore, companies should be more likely to develop an active foreign market for their shares if they have a large *fraction of foreign sales*.

In general, it is difficult to determine how much information is generated on each market where a stock is cross-listed. But Baruch, Karolyi, and Lemmon (2007) define a statistical measure of the incremental contribution made by the foreign market to the generation of information about a company—hereafter referred to as the BKL measure of *incremental information*.[6] Following these authors, we expect a higher fraction of trading volume in the foreign market if comparatively more information is generated there—i.e., when the BKL measure is large.

The amount of information-based trading should increase in the sensitivity of the market price to private information. Because most informed trading is

[6] The measure is based on the difference in R^2 of two regressions explaining the company's stock return. One uses only the home market index return as explanatory variable, the other both the foreign and the domestic market index return. (See the Appendix for a more detailed definition.) This measure captures the incremental contribution of foreign market movements in explaining a company's stock price in addition to the information contained in domestic market returns.

likely to be in the home market, the ratio of foreign to domestic trading volume should therefore, decrease with a stock's sensitivity to private information. This is likely to be the case for small companies, which are more informationally opaque and typically younger, hence with less of a track record. As a result, the ratio of foreign to domestic trading volume should be positively related to *company size* (sales or assets), again in line with Kang and Stulz (1997). The sensitivity to private information should also be greater for high-growth companies, whose value lies more in future opportunities than in the present asset base. So foreign trading activity after cross-listing should be negatively related to the *growth rate* of the company. Another measure of the importance of information is the *return volatility* of the company's stock, which should also be negatively correlated with foreign trading.

In principle, technology-oriented companies could be more strongly affected by private information (e.g., about patent development, new products and processes). If domestic investors have an edge in obtaining such information, these stocks should feature relatively low foreign trading volume. Naturally, the argument would be reversed if the informational advantage were enjoyed by foreign investors, which may occur if the foreign market listed many technology-oriented companies together with which similar cross-listed firms can be traded. (In this case, these firms would also feature a high BKL incremental information measure.) In conclusion, being a *technology-oriented company* may lead either to less or to more foreign market trading.

Finally, the research published by analysts (whether foreign or domestic) tends to increase public information and should therefore, reduce the advantage of privately informed investors (see Lang, Lins, and Miller (2003, 2004)).[7] Because in general, domestic investors are more likely to have private information than foreign ones, greater *research coverage by analysts* should be associated with a larger ratio of foreign to domestic trading.

1.1.3 Influence of trade frictions on the distribution of trade. An equilibrium with multiple trading venues can arise in the presence of differential trading frictions. But it is natural to expect the market with lower trading costs to attract more trading. Therefore, for cross-listed stocks, the fraction of foreign trading volume should be higher when trading costs on the foreign market are lower. Empirically, no reliable measure of equity trading costs is readily available for many countries. However, trading costs are likely to be inversely related to the breadth of the equity market, as measured for instance by stock market capitalization scaled by GDP (see Domowitz, Glen, and Madhavan (2001)). The development of the credit market may also reduce trading

[7] Recent empirical evidence indicates that the influence of analysts on a firm's information environment is rather complex. Bailey, Karolyi, and Salva (2006) show that absolute return and volume reactions around earnings announcements increase when a company cross-lists in the United States. Fernandes and Ferreira (2005) show that the increase in analyst following after cross-listing encourages the production of market-wide instead of firm-specific information.

frictions in the equity market: for example, short selling and margin trading are likely to be cheaper when the credit market is sophisticated. In this paper, we take the degree of financial development—as measured by *stock market capitalization and private credit scaled by GDP*—as an inverse measure of trading costs. Accordingly, foreign trading of cross-listed stocks should be negatively correlated with the development of the home capital market, relative to that of the foreign market.

Another trading friction arises from *time zone difference*, to the extent that it reduces the overlap between foreign trading hours and those of the domestic market. On the one hand, a small overlap of trading hours creates a captive clientele for the foreign market, because it enables US investors to trade ADRs during their own business hours. But on the other hand, this convenience value comes at a cost: US investors cannot trade ADRs when the domestic market is open—that is, when most price-relevant information is generated. This puts the foreign market at a disadvantage relative to the home market. Indeed, Pulatkonak and Sofianos (1999) report that the NYSE's share of trading volume for cross-listed stocks in 1996 was negatively correlated with the time zone difference from the stocks' domestic markets.

In principle, the foreign market's disadvantage from a time zone difference is distinct from the foreign investors' informational disadvantage due to geographical distance. Time zone differences generate trade frictions, whereas distance reduces the quality and timeliness of information. In practice, however, time zone differences are closely correlated with distance, so that it may be hard to discriminate between them empirically.

Another potential friction faced by investors is the risk of trading with an insider. To the extent that better protection against insider trading reduces adverse selection costs for market participants, investors should trade on the exchange in which rules against insider trading are stricter or better enforced. Foreign trading volume should therefore be larger when the home market has less stringent *insider trading rules* or weaker *enforcement*.[8]

Managerial diversion is another cost faced by investors, which can be mitigated by shareholder protection as determined by the home country's corporate law. Shleifer and Vishny (1997) show that in countries with poor shareholder protection, domestic investors can enforce their rights more easily than foreign investors. Then foreign investors should be reluctant to own and trade cross-listed stocks originating from a country with poor shareholder protection. As a consequence, the ratio of foreign to domestic trading volume should increase with the *degree of investor protection* in the firm's country of incorporation.[9]

[8] Tribukait-Vasconcelos (2005) illustrates the importance of protection against insider trading. He shows that a firm's price behavior changes after cross-listing in a foreign market with better protection against insider trading. Fernandes and Ferreira (2006) suggest that the effect on stock prices of enforcing insider trading laws may depend crucially on the country's institutions.

[9] The effect of domestic shareholder protection on the distribution of trading volume may be reduced to the extent that cross-listed firms are subjected to the foreign country's regulation. Indeed, several papers surveyed in Karolyi

1.2 Spillover effects on the home market

So far, we have discussed factors that affect the ratio of foreign to domestic volume for cross-listed stocks. However, it is quite possible that opening a new trading venue abroad will affect the level of domestic trading volume. In principle, this effect is ambiguous (Hargis and Ramanlal (1998)). Specifically, the cross-listing may induce trade diversion away from the home exchange. For instance, if the two exchanges are in different time zones, foreign investors who used to trade in the domestic market may shift to the foreign exchange simply for convenience. Similarly, both foreign and domestic investors may switch from the domestic to the foreign market if the latter features stricter protection against insider trading, hence lower adverse selection costs.

Alternatively, a cross-listing may induce extra net trading: rather than coming at the expense of the domestic exchange, new trading abroad may come in addition to or actually prompt an increase in domestic trading. For instance, the liquidity of the domestic market may benefit from competition between foreign and domestic market-makers and from the additional information produced in the foreign market.

The evidence on this issue, limited to emerging markets, indicates that cross-listing in the United States tends to depress domestic trading. See Hargis (1998) for a study that argues otherwise. Domowitz, Glen, and Madhavan (1998) show that the home market liquidity of Mexican companies decreases upon issuing ADRs, and relate this effect to the poor information linkages between the two markets. This company-level evidence is consistent with the finding of Karolyi (2004) based on aggregate data for 12 Latin American and Asian countries from 1976 to 2000. Karolyi shows that domestic trading volume is negatively correlated with the fraction of domestic companies with an ADR program (although it is positively correlated with the liberalization of the domestic stock market). Finally, for a sample of more than 2700 companies from 45 emerging economies, Levine and Schmukler (2006) report a reduction of domestic trading for firms that cross-list in foreign exchanges.[10]

The question is whether the negative effect of cross-listing on domestic trading documented by these studies is confined to emerging markets only or applies universally. It is conceivable that the effect may be absent (or even reversed) if the home country has a sophisticated and well-regulated capital market. For instance, if domestic regulation against insider trading is strictly enforced, investors are less likely to seek execution of their orders in the foreign market. We are able to test this hypothesis.

(2006) suggest that cross-listings in countries with higher legal and regulatory standards are a "bonding device" to curtail managerial private benefits (see, for example, the evidence in Reese and Weisbach (2002); and Doidge, Karolyi, and Stulz (2004)).

[10] In fact, they demonstrate that the effect extends even to domestic companies that did not cross-list.

2. Data Description

Our initial sample consists of all companies whose shares were cross-listed in the United States, on NYSE, NASDAQ, or AMEX, at any point in time between 1980 and 2001.[11] If companies list different stock issues on the same exchanges, we treat them separately. This is the case with 13 companies. However, we exclude stock issues with very specific characteristics, such as preference shares.[12] The size of the sample is constrained by data availability—in particular, availability of daily trading volume on the foreign and on the domestic market.

Table 2 and Table 3 describe the sample for which we have trading volume data. Panel A of Table 2 reports summary statistics for the average company within each country; Panel A of Table 3 provides information on the average company for each calendar year. Altogether, the sample for which we have trading volume data includes 437 companies. The home markets from which most cross-listings originate are Canada (205), the United Kingdom (50), Israel (18), the Netherlands (17), Australia (16), and France (15).

The number of companies analyzed increases steadily from 1980 (89 companies) to 1997 (396 companies) before declining slightly in the last four years of our sample period. Although we observe data for at least one company from each country in 2001, countries enter our sample at different points in time. Canada, Israel, Japan, the Netherlands, Philippines, Sweden, and the United Kingdom are present with at least one company since 1980. Companies from Belgium, Portugal, Switzerland, and Taiwan enter only in the second half of the 1990s.

For each cross-listed company, we measure the daily dollar value of domestic and foreign trading volumes (the number of shares traded during the day times the closing price). This definition resolves any problems that ADR denomination may pose for the measurement of trading volume in the United States, because ADR prices reflect the underlying bundling ratios.[13] If a company stock is listed on multiple exchanges in the United States, we add up the daily dollar trading volume across the individual exchanges.

The first part of our empirical analysis focuses on the distribution of trading between the foreign and the domestic markets of cross-listed stocks, as measured by the ratio of foreign to domestic trading. Panel A of Table 2 shows that this ratio varies considerably across countries: the country average tends to be higher for emerging markets (especially South America) than for developed countries (see Table 2, Panel A). In general, no strong trend is detected, although the ratio does tend to be somewhat higher toward the end of our sample

[11] We do not require the cross-listing date to fall in this time interval: some of the companies in our sample had cross-listed before 1980.

[12] Preference shares are frequently viewed as bond substitutes. Their trading volume may therefore be driven by factors relevant for fixed-income securities rather than for common stocks.

[13] We have verified this for each sample company.

Table 2
Cross-sectional summary statistics

Panel A: Company characteristics

Home country	Number of firms	Year of first observation	Foreign to domestic trading volume	Domestic turnover ratio in %	Correlation with US market	Shares Held by US institutional investors in %	Number of US institutional investors	Foreign sales in %	BKL measure	Total assets	Asset growth in %	Volatility in %	High-tech in %	Analysts' forecasts
Argentina	5	1993	8.536	4	0.308	9.2	51	3	1.316	5126	10	5.6	40	180
Australia	16	1986	1.495	7	0.155	0.4	9	42	1.414	4526	13	7.7	13	85
Belgium	1	1995	0.009	0	0.121	0.7	3		0.465	10262	4	4.1	0	210
Brazil	4	1994	4.349	12	0.265	0.2	55		1.633	6399	12	11.4	0	204
Canada	205	1980	2.478	6	0.166	11.2	26	42	1.820	4198	22	9.4	17	66
Chile	12	1993	3.620	3	0.222	2.2	24	26	1.389	3087	21	7.3	0	74
China	3	1994	0.193	3	−0.01	1.6	15	5	1.473	3273	8	6.0	0	164
Colombia	1	1994	6.861		−0.00	9.9	13			2967	17	7.6	0	40
Denmark	2	1981	8.821		0.241	11.8	30	62	2.652	1200	1	8.9	0	168
Finland	2	1983	0.637		0.231	22.9	181	47	0.899	5983	21	5.7	0	382
France	15	1987	1.363	3	0.251	14.6	39	59	2.267	40353	21	7.1	23	244
Germany	7	1993	1.336	1	0.194	7.5	29	44	1.116	41403	9	5.6	12	223
Hong Kong	1	1992	0.529	3	0.117	1.6	9	100	0.529	1031	49	9.3	0	27
Indonesia	1	1994	23.801	9	−0.04	0.0		15	0.613	292	−6	15.4	0	12
Ireland	4	1984	12.589	9	0.407	18.5	49	58	3.520	1840	35	8.2	25	58
Israel	18	1980	5.041	12	0.307	16.6	31	59	1.362	652	16	6.6	50	18
Italy	6	1989	0.504	1	0.230	5.1	31	49	1.802	28239	15	4.9	14	142
Japan	14	1980	0.104	0	0.144	3.3	27	34	1.462	25786	7	5.2	23	104
Mexico	6	1991	3.232	4	0.233	1.6	15	25	1.427	1885	17	7.5	0	159
Netherlands	17	1980	1.838	4	0.322	8.3	43	62	2.452	51472	21	5.1	6	238
New Zeal.	4	1991	0.348	1	0.236	0.0		56	1.478	4246	−2	5.3	25	91
Norway	4	1986	0.831		0.238	18.9	49	61	1.534	4599	15	7.4	0	174
Peru	3	1994	5.464	4	0.114	0.0		12	0.956	4656	15	6.7	33	93
Philippines	2	1980	6.561	1	−0.05	0.0			1.268	116	−6	12.2	0	18
Portugal	1	1997	0.033		0.032	0.0			3.786	13714		4.0	0	142
Singapore	1	1992	4.229	15	0.254	0.0		78	3.157	756	7	8.6	0	189
S. Africa	13	1989	1.239	2	−0.02	1.2	10	10	1.745	1201	11	8.4	0	36
S. Korea	2	1994	0.394	2	0.209	5.2	67		3.644	24122	21	7.8	50	221
Spain	3	1987	0.238	1	0.288	8.7	95	25	1.289	47439	24	4.1	0	273

Sweden	8	1980	0.227	1	0.297	5.8	26	63	1.524	4044	15	7.7	48	115
Switzerland	2	1997	0.173	2	0.261	4.2	5	76	2.291	933	27	6.2	40	101
Taiwan	2	1996	0.167	2	0.192	0.4	60		3.992	4088	34	7.3	50	177
UK	50	1980	1.142	2	0.219	4.6	53	52	1.920	25074	27	5.2	26	124
Venezuela	2	1993	3.151	3	0.145	0.0		10	1.134	335	17	10.1	0	22
Total	437	1980	2.351	4	0.190	8.7	35	43	1.804	12200	20	7.9	18	104

Panel B: Market characteristics

Home country	Ratio of US to domestic total market trading volume	Geographical distance	Domestic financial development	US versus domestic insider trading law enforcement	US versus domestic investor protection
Argentina	146.049	8537	−0.701	0.119	1
Australia	33.190	16005	−0.041	0.367	1
Belgium	412.491	5889	−0.149	0.000	5
Brazil	18.522	6843	−0.611	0.000	1
Canada	1.998	553	0.165	0.012	1
Chile	164.197	8265	−0.071	0.214	1
China	90.264	10449	−0.219	1.000	5
Colombia	2128.181	4310	−0.704	1.000	4
Denmark	2236.189	6191	−0.388	0.557	2
Finland	2060.801	6619	−0.027	0.263	3
France	39.402	5838	−0.073	0.000	3
Germany	11.046	6204	−0.032	0.032	4
Hong Kong	2.955	12968	1.650	0.200	0
Indonesia	85.919	16184	−0.562	0.250	3
Ireland	185.501	5116	−0.135	1.000	2
Israel	7456.177	9120	−0.273	0.245	2
Italy	70.937	6467	−0.383	0.316	5
Japan	1.282	10852	0.774	0.271	1
Mexico	14.937	3370	−0.641	1.000	5
Netherlands	19.725	5866	0.576	0.289	3
New Zeal.	58.836	14420	−0.022	1.000	1

(*Continued*)

Table 2
Continued

Panel B: Market characteristics

Home country	Ratio of US to domestic total market trading volume	Geographical distance	Domestic financial development	US versus domestic insider trading law enforcement	US versus domestic investor protection
Norway	426.011	5916	−0.248	0.063	2
Peru	923.095	5884	−0.725	0.000	2
Philippines	260.089	13684	−0.475	1.000	1
Portugal	457.996	5424	−0.108	1.000	3
Singapore	14.022	15349	0.731	0.000	1
S. Africa	12.962	12853	0.515	1.000	1
S. Korea	5.215	11059	−0.061	0.000	2
Spain	59.212	5772	−0.131	0.713	3
Sweden	119.584	6320	0.241	0.135	3
Switzerland	38.179	6326	1.398	0.000	4
Taiwan	1.849	12542		0.000	2
United Kingdom	7.256	5572	0.665	0.003	1
Venezuela	1317.461	3437	−0.870	1.000	4
Total	326.955	4509	0.169	0.157	1.5

The table reports mean values for company-level variables in Panel A and market-level variables in Panel B. Means are calculated in two steps: first, by averaging the variables over time for each company; second, by averaging company means within each country. The sample period covers 1980 to 2001, but not all companies are either cross-listed or observed during the entire period. The third column states the year of the first observation on cross-listed companies from the corresponding country. Company data extend to 2001 for each country.

Table 3
Time-series summary statistics

Panel A: Company characteristics (full sample)

Year	Number of firms	Foreign to domestic trading volume	Domestic turnover ratio in %	Correlation with US market	Shares Held by US institutional investors in %	Number of US institutional investors	Foreign sales in %	BKL measure	Total assets	Asset growth in %	Volatility in %	High-tech in %	Analysts' forecasts
1980	89	3.485	0.022	0.559	6.0	30	47		2511	20	6.2	8	2
1981	91	1.552	0.017	0.439	8.5	33	46	1.334	2749	15	5.7	8	4
1982	92	0.358	0.012	0.414	8.9	33	45	1.417	3235	13	5.6	8	6
1983	92	0.816	0.012	0.393	10.2	36	47	1.058	3135	7	5.0	10	5
1984	96	0.775	0.015	0.348	8.9	33	53	1.481	3213	19	5.0	10	10
1985	112	1.223	0.024	0.248	8.5	32	51	1.195	3222	21	5.7	14	28
1986	123	1.518	0.024	0.217	13.8	34	51	1.541	6527	20	5.5	13	41
1987	144	1.032	0.033	0.401	11.2	38	51	2.313	7566	29	6.5	14	67
1988	149	1.431	0.018	0.411	10.6	40	47	2.631	8283	15	6.3	13	113
1989	199	0.875	0.017	0.349	7.6	37	46	2.336	8657	21	6.5	12	94
1990	201	1.605	0.026	0.172	7.2	38	47	1.811	9387	13	7.1	12	95
1991	211	1.349	0.025	0.179	7.4	40	45	2.227	9392	8	7.7	14	96
1992	235	1.198	0.026	0.159	7.4	37	46	1.944	8399	14	7.7	16	96
1993	255	1.725	0.032	0.135	9.5	40	48	2.059	12005	20	7.3	18	102
1994	293	2.159	0.033	0.125	10.1	41	45	1.644	12941	20	6.9	19	108
1995	325	2.667	0.034	0.130	11.3	41	44	1.289	13779	20	6.3	18	109
1996	370	2.770	0.040	0.157	12.6	40	45	1.418	15317	25	5.9	19	115
1997	396	2.697	0.043	0.184	9.4	39	46	1.445	15780	20	6.2	21	130
1998	384	2.255	0.045	0.236	9.9	40	47	1.852	16206	16	6.9	22	139
1999	375	2.014	0.035	0.222	9.5	46	50	1.675	19069	16	7.7	22	151
2000	362	2.134	0.070	0.216	8.1	48	54	2.127	7776	20	8.1	22	91
2001	354	1.536	0.040	0.232	9.1	49	51	2.203	8231	7	8.3	13	81

Table 3
Continued
Panel B: Market characteristics (full sample)

Year	Ratio of US to domestic total market trading volume	Domestic financial development	US versus domestic insider trading law enforcement
1980	2	0.266	0.444
1981	2	0.189	0.368
1982	22	0.225	0.375
1983	18	0.230	0.415
1984	33	0.260	0.458
1985	43	0.294	0.385
1986	93	0.294	0.368
1987	43	0.350	0.333
1988	353	0.365	0.330
1989	166	0.350	0.317
1990	186	0.369	0.229
1991	139	0.307	0.230
1992	81	0.274	0.221
1993	3717	0.214	0.249
1994	55	0.177	0.210
1995	86	0.181	0.188
1996	125	0.174	0.117
1997	78	0.170	0.116
1998	34	0.141	0.098
1999	62	0.116	0.092
2000	106	0.107	0.090
2001	103	0.117	0.089

The table reports mean values for company-level variables in Panel A and market-level variables in Panel B. Geographic distance and US versus domestic investor protection are excluded from Panel B, as these variables do not vary over time. Means are calculated in two steps: first, higher-frequency data are aggregated to yearly measures (means); second, all the variables are averaged across companies per year.

period (see Table 3, Panel A). This slight trend might also reflect a composition effect: more companies from emerging markets enter the sample over time.

The second issue addressed in this study is how domestic trading activity changes after a cross-listing. We measure domestic trading activity by the turnover ratio of the home market, calculated as the domestic daily dollar trading volume divided by the company's daily dollar market value. This variable is far less variable than the ratio of foreign to domestic trading. Its country average is highest in Singapore, Brazil, and Israel. Its yearly overall average almost doubles over the sample period, as shown in Panel A of Table 3.

Our empirical analysis relates these two measures of trading activity to several company- and market-specific explanatory variables that proxy for determinants of the amount of trading in cross-listed stocks. Recall that in Section 1, these determinants were classified in three groups, respectively related to uninformed trading, informed trading, and trade frictions, as summarized in Table 1. The Data Appendix lists definitions and sources for all the variables.

The variables that should capture the determinants of uninformed trading are the total trading activity of the foreign exchange relative to the home exchange, the company's return correlation with the foreign market, and the presence of foreign institutional investors in its shareholder base. We measure the first variable by the daily ratio of trading volume of the entire US stock market to the trading volume of the entire domestic stock market. As shown in Panel B of Table 2, this indicator varies widely across countries: overall trading in the United States is more than 1000 times that of Colombia, Denmark, Finland, Israel, or Venezuela, but only 1.3 times that of Japan.[14]

The correlation of cross-listed companies with the US market is measured over a three-year moving window of weekly returns. The correlation of the average company with the US market is 0.2, with country averages ranging from slightly negative (e.g., −0.045 for the Philippines) to a maximum of 0.4 for Ireland. These correlations tend to be higher for countries with a high proportion of technology-oriented companies, possibly because of the importance of the high-tech sector in the US market. Table 3 also documents that the correlation of the average company decreases by more than 50% over the sample period, presumably reflecting the increasing portion of companies from emerging markets.

Institutional ownership is measured by the number of US 13-F institutions that invest in the cross-listed company and the fraction of shares they hold. Apart from the effect of certain individual companies (such as Nokia in Finland), US institutional investors would appear to prefer cross-listed stocks from Canada,

[14] Conventions for measuring trading volume may differ across exchanges. Counting conventions tend to result in larger reported trading for dealer markets, in which a customer order typically triggers a sequel of dealer inventory adjustments. However, the use of country-fixed effects in our panel regressions mitigates the influence that international differences in counting conventions may have on our estimates.

France, the Netherlands, Israel, and the United Kingdom. On average, US institutional investors hold a fairly constant share of cross-listed companies over time, even though the average number of institutions that invest in cross-listed stocks increases by 70%.

Turning to information-based trading, in Section 1, we argued that investors' familiarity with a company or a company's home market may help determine the trading venue. We measure US investors' unfamiliarity with a given company by the distance in kilometers between the location of the company's home exchange and New York.

Section 1 makes it clear that the location of information-based trading also depends on the amount of information generated in the foreign market and on the information sensitivity of the stock price. We measure the former by the company's degree of export orientation (ratio of exports to total sales) and by its BKL information measure. Cross-listing companies tend to be export-oriented (exports average 43% of total sales) and this is quite stable over time (with the fraction of exports ranging from 44% in 1995 to 54% in 2000). The BKL measure for the US market appears to be correlated with technological intensity: it tends to be high for countries with a large fraction of technology-oriented cross-listed companies, probably reflecting a comparative advantage of US investors and analysts in generating and processing information concerning such companies.

A company's sensitivity to new information should instead be decreasing in its size, and increasing in growth, monthly volatility of stock returns, and technology orientation. We measure the first by total assets, the second by the rate of increase in assets, the third by a three-year moving variance of weekly returns, and the fourth by a dummy for technology-oriented sectors. The average company has total assets of 12.2 billion US dollars and grows by almost 20% per year (see Table 2, Panel A). Volatility is the highest for companies headquartered in emerging markets and is very stable over time. The variability of the idiosyncratic component of total return volatility is an alternative measure of a company's sensitivity to information that filters out the volatility due to market-wide news. In the empirical analysis, we also experiment with this alternative measure to test the robustness of our results.

Overall, 18% of the companies are technology-oriented, the highest fraction—one of every two—being in Israel, South Korea, and Taiwan. From 1980 to 2000, the fraction of such firms in our sample nearly tripled from 8 to 22%—which is consistent with other evidence that cross-listings in the United States have been especially attractive to technology-oriented companies (Pagano, Roell, and Zechner, 2002).

Analyst coverage is another company-specific variable that may affect the distribution of information-based trading. We measure analyst coverage of a company by the total number of forecasts reported per unit of time. The average company in our sample gets more than 100 analyst forecasts per year.

Coverage is greatest for European companies; and except for the last two years, the number increases over the sample period.

The third group of explanatory variables captures trade frictions. A broad proxy for trading costs is the level of financial development of a country, as measured by the sum of stock market capitalization and private credit normalized by GDP. Because we are interested in differential trading costs, we calculate the percentage difference between the home country's financial development and its average value for all the sample countries in every year. Switzerland and Hong Kong are, by far, the countries with the most developed financial markets, even compared to the United Kingdom, while South American countries exhibit the lowest degree of financial development. From Table 3, Panel B, the degree of financial development appears to converge somewhat over time.

As discussed in Section 1, the costs of insider trading and managerial diversion to investors can be regarded as an additional friction—and one that arguably affects foreign investors more severely than domestic ones. Thus, strong investor protection should be associated with more active foreign markets. We measure insider trading protection by a dummy variable set to zero before insider trading laws are enforced and one thereafter, using the data in Bhattacharya and Daouk (2002). Shareholder protection, instead, is measured on a discrete scale between zero (lowest protection) and six (highest protection), and is drawn from La Porta et al. (1998).[15] As we can see in Panel B of Table 2, most countries have weaker enforcement of insider trading laws and less shareholder protection than the United States.

3. Results

In this section, we report the results for our two variables: the ratio of foreign to domestic trading volume and the domestic turnover ratio. For each, we first document some stylized facts and then test the hypotheses outlined in Section 1 by multivariate regressions.

3.1 Distribution of trading volume

Figure 1 shows the cross-sectional median monthly ratio (averaged from daily dollar trading data) of US to home-country dollar trading volume in the first five years after cross-listing. The graph covers 218 companies for which complete trading data are available for the first five years after the cross-listing, to avoid composition effects. After an initial period of active trading, US volume quickly abates: in the first six months, the median ratio of foreign to domestic volume falls from over 50% to less than 35%. In the remaining four and a half years, there is a slight further decline, with the ratio stabilizing between 25% and 35% in the last two years.

[15] Djankov et al. (2006) propose a new investor protection index. We repeated our analysis using their index and our results did not change.

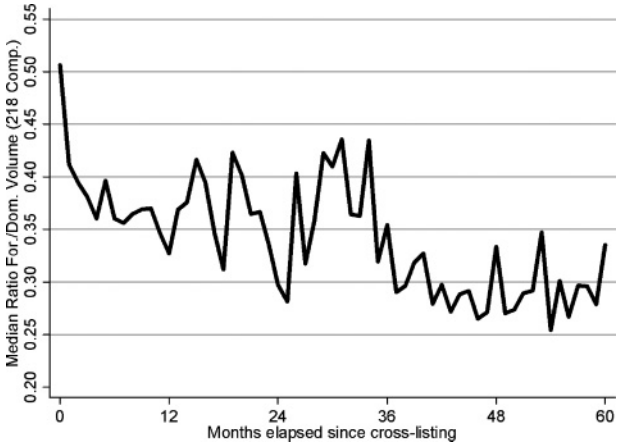


Figure 1
Median monthly ratio of foreign to domestic volume in the five years after cross-listing

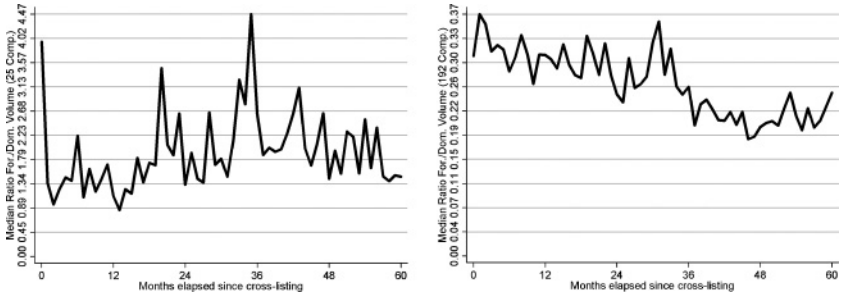


Figure 2
Median monthly ratio of foreign to domestic volume in the five years after cross-listing for companies from emerging (left graph) and developed (right graph) countries

However, this overall pattern conceals considerable geographical differences. Figure 2 shows the median ratio of US to home volume separately for companies from emerging markets and developed countries. The shares of emerging market companies typically trade more actively in the United States (relative to their domestic trading) than those of developed market firms. For the former, foreign volume ranges between 80% and 450% of domestic trading volume, for the latter only between 20% and 40%. The figure also shows that the decline in the relative importance of foreign trading is observed only for firms from developed and not from emerging markets.[16]

Even within each of the two samples illustrated in Figure 2, there is large cross-sectional variability in trading patterns. For instance, within the group of

[16] This visual impression is confirmed by the estimates of trends in the median ratios of foreign to domestic trading shown in Figures 1 and 2. The overall median ratio and the median ratio of companies from developed countries feature a negative and statistically significant time trend, whereas no significant trend is found for emerging market companies. Furthermore, *t*-tests show that average ratios across the samples of developed and emerging market firms differ significantly.

firms from developed countries, one finds patterns as different as those of Nokia, ASM Lithography, and Ahold. Nokia's trading volume in the United States, initially three times its domestic trading, still exceeded domestic trading six years after cross-listing. For ASM Lithography, US trading started at 26 times domestic volume, but fell to almost nothing in two years' time. By contrast, Ahold's trading volume in the United States rarely exceeded 5% of the domestic level throughout the first six years after cross-listing.

We investigate the determinants of this substantial diversity through regression analysis, using the hypotheses outlined in Section 1 regarding the effect of company and country characteristics on the geographical distribution of trading after a cross-listing. We test these hypotheses by estimating multivariate panel regressions (see Baltagi (2001)) whose dependent variable is the logarithm of the monthly ratio of foreign to domestic trading volume. Our company-specific explanatory variables are available at different frequencies. Firm balance sheet data are observed yearly, institutional ownership quarterly, analyst following monthly, and the remaining variables daily. So we can perform the estimation yearly by aggregating higher-frequency data, or monthly setting the variables measured less frequently at constant monthly values. Because the results turn out to be robust to the frequency chosen, we report only the estimates for the monthly regressions. Our data set becomes an unbalanced panel of 22,550 company-month observations for 326 cross-listed companies.

The estimation is performed with random effects rather than fixed, because some important independent variables (high-tech sector, geographical distance, insider trading law enforcement, common language, etc.) are constant over time for each company and would therefore be perfectly collinear with company-fixed effects. Moreover, the Breusch–Pagan (1980) test supports the existence of individual random effects in our data.[17] The estimates are adjusted for autocorrelation, because the hypothesis of no autocorrelation of company-level residuals is rejected.[18] We also adjust for the unbalanced sample, using the generalized least squares procedure of Baltagi and Wu (1999). Finally, as a robustness check, we also estimate random-effects models without adjustment for autocorrelation and pooled OLS regressions with robust standard errors. For brevity, the tables report only the results from the random-effects model with adjusted standard errors; the text specifies when these other two estimation methods generate substantially different results.

Table 4 has three panels, for three different samples: the entire sample in Panel A, developed market companies in Panel B, and emerging country companies in Panel C. Each panel contains three specifications. Column 1

[17] In our case, we cannot rely on a Hausmann specification test, because our random-effect models include variables that cannot be used in fixed-effect regressions. Therefore, the rank of the variance-covariance matrix of the differences between coefficients of random- and fixed-effect models does not equal the number of coefficients being tested.

[18] We test the null hypothesis of no first-order autocorrelation in the residuals by the Locally Best Invariant test of Baltagi and Wu (1999).

Table 4
Regressions of the ratio of foreign to domestic trading volume

Panel A: Results for the entire sample

	(1)	(2)	(3)
LN (Ratio total foreign market to total domestic market trading volume)	0.058***	0.061***	0.059***
Correlation with US market	−0.172	−0.424***	−0.444***
Institutional ownership in %	0.832***	0.864***	0.868***
Number of institutional owners	0.005***	0.005***	0.005***
Dummy if home country is a developed country	−0.555***	−0.592***	−1.507***
LN (Geographic distance)	−2.586***	−2.619***	
BKL Incremental information measure	0.011	0.012	0.013
LN (Total assets)	−0.150***	−0.137***	−0.140***
Asset growth	0.000	0.000	0.000
Volatility	2.752***	3.574***	3.640***
High-tech sector	0.623***	0.756***	0.776***
Number of forecasts	0.000	0.000	0.000
Domestic financial development	−0.336***	−0.554***	−0.493***
Insider trading enforcement	0.267***	0.191***	0.218***
Low investor protection in home country	−0.31	−0.189	−0.008
Time elapsed since cross-listing	−0.004***	0.001	0.001
Region dummy: Europe + Israel			0.178
Region dummy: Canada			1.785***
Region dummy: South America + Mexico			1.876***
Year effects		Fixed	Fixed
Constant	6.003***	6.125***	−0.184
Number of company months	22550	22550	22550
(Companies)	(326)	(326)	(326)
R^2	0.30	0.38	0.40

Panel B: Results for companies from developed countries

	(1)	(2)	(3)
LN (Ratio total foreign market to total domestic market trading volume)	0.076***	0.082***	0.085***
Correlation with US market	−0.092	−0.341***	−0.343***
Institutional ownership in %	0.857***	0.890***	0.890***
Number of institutional owners	0.005***	0.005***	0.005***
LN (Geographic distance)	−0.581***	−0.606***	
BKL Incremental information measure	0.009	0.010	0.010
LN (Total assets)	−0.173***	−0.161***	−0.155***
Asset growth	0.000	0.000	0.000
Volatility	3.604***	4.437***	4.459***
High-tech sector	0.563***	0.686***	0.716***
Number of forecasts	0.000	0.000	0.000
Domestic financial development	−0.212**	−0.416***	−0.389***
Insider trading enforcement	0.376***	0.282***	0.281***
Low investor protection in home country	−0.166	−0.081	0.079
Time elapsed since cross-listing	−0.003***	0.002**	0.002**
Region dummy: Europe + Israel			0.089
Region dummy: Canada			1.782***
Year effects		Fixed	Fixed
Constant	3.550***	3.899***	−1.977***
Number of company months	20031	20031	20031
(Companies)	(274)	(274)	(274)
R^2	0.27	0.36	0.36

(*Continued*)

Table 4
Continued

Panel C: Results for companies from emerging markets

	(1)	(2)	(3)
LN (Ratio total foreign market to total domestic market trading volume)	−0.032	−0.001	−0.003
Correlation with US market	−1.479***	−1.399***	−1.390***
Institutional ownership in %	−0.997	−0.846	−0.869
Number of institutional owners	0.011***	0.009***	0.009***
LN (Geographic distance)	−0.120	−0.219	
BKL Incremental information measure	0.033	0.062**	0.062**
LN (Total assets)	0.004	0.115	0.109
Asset growth	0.001	0.000	0.000
Volatility	−1.551***	−1.516***	−1.502***
High-tech sector	0.612	0.715	0.695
Number of forecasts	−0.014	−0.021**	−0.021**
Domestic financial development	−1.525***	−2.548***	−2.551***
Insider trading enforcement	−0.290	−0.183	−0.173
Low investor protection in home country	−1.358***	−1.545***	−1.412***
Time elapsed since cross-listing	−0.007***	−0.001	−0.001
Region dummy: South America + Mexico			0.167
Year effects		Fixed	Fixed
Constant	2.681	0.747	−1.346
Number of company months	2519	2519	2519
(Companies)	(52)	(52)	(52)
R^2	0.35	0.37	0.38

The dependent variable is the log of the ratio of foreign trading volume to domestic trading volume. We use the log-transformation in the case of the dependent variable, the ratio of total foreign market to total domestic market trading volume, the geographic distance, and total assets to improve the statistical characteristics of these variables. The regressions are estimated with random effects and a correction for AR(1) disturbances on a panel of monthly data. The Baltagi and Wu (1999) generalized least squares procedure is used to take into account that the panel is unbalanced. Explanatory variables are lagged by one period, except for the high-tech sector dummy, insider trading law enforcement, investor protection, the time elapsed since cross-listing, the developed market dummy variable, and geographical distance. We trim extreme positive outliers of asset growth, volatility, and the Baruch–Karolyi–Lemmon incremental information measure at the 1st and 99th percentile. Column (1) reports the basic specification, column (2) includes year-fixed effects, and column (3) includes both year- and region-fixed effects. The base year in specification (2) and (3) is the earliest year in each sample, and the base region in specification (3) is Australia and Asia. Panel A is based on the entire sample, Panel B on the subset of developed market companies, and Panel C on emerging market companies.
*** denotes statistical significance level at 1% or lower. ** denotes statistical significance level between 1% and 5% and * denotes statistical significance level between 5% and 10%.

reports the estimates of our baseline specification, which includes the company and market characteristics identified in Section 1. The specification in column 2 also includes year-fixed effects, that in column 3 both year- and region-fixed effects.

The estimates of the baseline specification in column 1 of Panel A show that the data are consistent with some—but not all—of the hypotheses laid out in Section 1. The variables that are supposed to capture uninformed foreign trading appear with the right sign and significant coefficients. The fraction of trading captured by the US market after cross-listing is higher for companies from exchanges whose overall trading volume is small compared to that of the United States and for companies in which US institutional investors hold large equity stakes. Specifically, increasing the number of institutional investors holding

a cross-listed stock by one standard deviation—i.e., by 47—is predicted to increase the ratio of foreign to domestic trading by 61 percentage points relative to its (unconditional) mean (i.e., 235 percentage points), keeping everything else equal. Similarly, if US institutional investors increase their share of a cross-listed company's stock by one standard deviation—i.e., by 11 percentage points—the company's ratio of foreign to domestic trading is estimated to rise by 24 percentage points relative to the mean. Consequently, the number of US institutional investors has a stronger influence on the ratio of foreign to domestic trading volume than the share held by US institutional investors. Furthermore, trading abroad is comparatively low for companies whose returns are highly correlated with US stock market returns.

Of the variables designed to capture informed foreign trading, two appear with the predicted sign. First, the development of an active foreign equity market is negatively correlated with the distance from the home market, which we interpret as a proxy for unfamiliarity. A 10% greater distance from the United States is associated with a decrease of the US to domestic trading volume by 47 percentage points relative to the mean. Second, the BKL incremental information measure indicates that US trading is larger when the US market contributes more to price discovery compared with the home market, although this effect is not precisely estimated.[19]

Other results in Panel A of Table 4 contradict the hypotheses presented in Section 1, according to which firms that are larger and feature slower growth, less volatile returns, and greater analyst following should have less informed trading, and thus a higher fraction of foreign trading activity. Instead, the table shows that foreign trading is negatively and significantly correlated with firm size (a 10% increase in firm size being associated with a reduction in the trading volume ratio by three percentage points relative to the mean), positively and significantly correlated with volatility,[20] and not significantly correlated with analyst following and growth. In addition, technology-oriented companies have an 86% higher ratio of foreign to domestic trading, all else being equal. Therefore, theories of information-based trading could be reconciled with our evidence only by assuming that the US market has a comparative advantage over other equity markets in the evaluation of small, volatile, and technologically sophisticated firms. At least for technology-oriented companies, this is consistent with their comparatively high BKL measure.

The estimates in Panel A of Table 4 accord with our hypotheses in Section 1 regarding the effects of proxies for trading frictions. The fraction of trading in

[19] Foreign sales were also discussed in Section 1 as a possible determinant of informed trading. We exclude this variable from the regressions because it would sharply reduce sample size, especially for the subsample analyses reported below. However, if we include Foreign Sales in the baseline specification, it appears with the expected positive coefficient and other results remain unchanged.

[20] As a robustness check, we replicate the estimates after replacing the home market correlation with the US market by its beta with respect to the US market, and total return volatility by its firm-specific component. The results are qualitatively unchanged, though the coefficients of the beta and firm-specific volatility are estimated less precisely than those of the correlation and total volatility.

the United States is negatively correlated with domestic financial development and positively with the relative degree of insider trading protection in the United States vis-à-vis the home market.[21] Similarly, the coefficient of the dummy indicating low investor protection in the domestic market is negative, though insignificant.[22]

Finally, the regressions include the time elapsed since cross-listing as an explanatory variable for changes in the distribution of trading after the cross-listing. The coefficient is negative and highly significant in the baseline specification, consistent with the idea that the home market gradually reasserts its dominance.

Almost all the results discussed so far are robust to the inclusion of calendar year and region-fixed effects, as can be seen from columns 2 and 3 in Panel A of Table 4.[23] The coefficients of the calendar year dummies are themselves of interest, because they can be seen as a time-varying measure of the ability of US markets to offer liquidity to cross-listed companies. Figure 3, Panel A, displays the estimated coefficients of the year dummies, together with their 95% confidence bounds. Although the coefficients are not significantly different from zero for the early years in our sample period, they become negative from 1991 onwards and significantly different from zero in most years between 1995 and 2001. This is consistent with the view that the US market has been facing increased competition for trading volume from domestic markets, especially since the early 1990s, as documented in Zingales (2006).

In Panels B and C of Table 4, we estimate the same specifications discussed so far separately for companies from developed countries and for those from emerging markets. The estimates for developed countries conform with the results for the overall sample, which probably reflects the prevalence of developed country firms in the overall sample. In contrast, the results in Panel C show several interesting differences for emerging market companies.

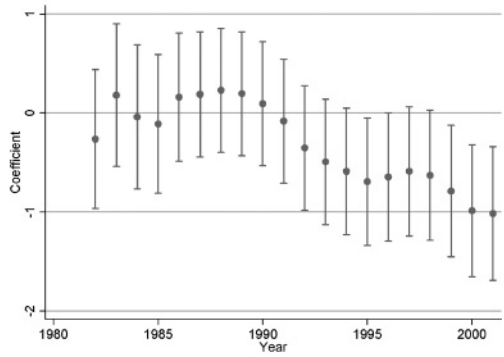
First, the coefficient of stock return volatility has opposite signs in the two samples, and is significantly different from zero in both cases. The coefficient is positive for firms based in developed markets, negative for those in emerging markets. Thus, for emerging market firms, the evidence fits our hypothesis that

[21] Unreported results show that this effect is also present in the random-effects model without adjustment for autocorrelated errors. In the OLS model, the sign of the coefficient also conforms to our hypothesis, but is estimated imprecisely.

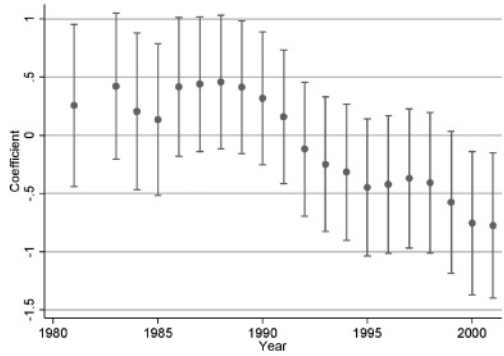
[22] We also estimated a specification that includes commissions and fees as an explicit measure of trading costs, drawn from Elkins/McSherry's survey of 135 institutional investors. This measure turned out to be highly collinear with other explanatory variables, such as total market trading volume and financial development. In unreported regressions excluding the latter variables, trading costs contribute relatively little to explaining the distribution of trading activity. A similar problem arises with time zone difference, which is another possible source of trading frictions. This variable is highly collinear with geographical distance and so is omitted from our specifications. In unreported regressions that exclude geographic distance, the time zone difference coefficient is negative and significant, as predicted.

[23] One of the few differences is that in those columns, the effect of time elapsed since cross-listing disappears, because of its collinearity with year-fixed effects. Similarly, extreme collinearity problems prevent us from including geographic distance together with region-fixed effects in the specification of column 3.

Panel A: Estimates for the entire sample



Panel B: Estimates for developed market companies



Panel C: Estimates for emerging market companies

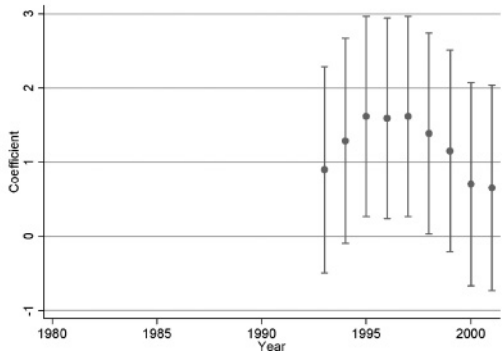


Figure 3
Coefficients of calendar year dummies
The figure plots the estimated coefficients and their 95% confidence intervals of the calendar year dummies estimated in Table 4, for the specification reported in column 3. Panel A is based on the entire sample, Panel B on the sample of developed market companies, and Panel C on that of emerging market companies.

foreign investors are more reluctant to trade cross-listed stocks with higher return volatility, which we regard as more sensitive to private information generated in the home market. This is consistent with the positive coefficient of the BKL incremental information measure, which indicates that foreign trading is relatively greater for stocks for which more information is generated in the foreign market. The coefficient of this variable is significant in two out of the three specifications.

Second, the coefficient of investor protection in the domestic market is high and significant for firms from emerging markets, and not significant for those from developed countries. Thus, poor domestic investor protection appears to act as a particularly significant constraint on foreign trading activity for emerging market companies. Moreover, the degree of financial development has a much higher coefficient in the regression for emerging than for developed market companies.

Another striking difference between developed and emerging markets emerges from Figure 3. For developed country companies, the estimated coefficients of the calendar year dummies—shown in Panel B of the figure—are consistently positive up to 1991 and negative thereafter (significant in the last two years). In contrast, for emerging market companies, these coefficients are positive and significantly different from zero in nearly half the years for which they could be estimated. These results can be interpreted as evidence that lately the US equity market has lost some trading volume vis-à-vis the domestic developed markets, but that it has maintained or even increased it vis-à-vis the domestic emerging markets.

Finally, several explanatory variables whose coefficients are significantly different from zero in the regression for developed countries' firms appear with imprecisely estimated coefficients in the sample for developing market firms. This is probably due to the small size of the latter sample, not to structural differences between the two samples.[24]

To summarize, trading in the United States tends to be large compared with domestic trading for companies from countries that are geographically close to the United States, feature low financial development, and offer poor protection against insider trading. For emerging market firms, the investor protection and domestic financial development variables appear to be particularly important to the creation of an active foreign market. As for company-specific characteristics, trading in the United States tends to be greater for stocks with a large presence of US institutional investors and with low correlation with the US market. For other characteristics, the effects differ depending on whether the company is based in a developed or an emerging market. In the former case, the relative amount of US trading volume is larger if the company is small,

[24] Surprisingly, in the regression for the emerging market sample, the number of analysts following has a negative coefficient, while the coefficient of size is not significant. Given that company size and analyst following have a correlation of 0.44 in this sample, the number of analysts following the stock may simply capture the negative relationship between relative foreign trading volume and size found for the other samples.

Figure 4
Median monthly turnover ratio on the domestic market in a four-year window around the cross-listing

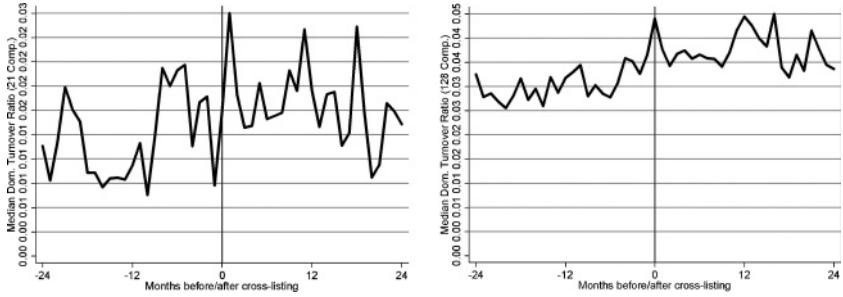


Figure 5
Median monthly turnover ratio on the domestic market in a four-year window around the cross-listing for companies from emerging countries (left graph) and developed countries (right graph)

volatile, and technology-oriented. In the latter, instead, US trading volume is negatively related to volatility and technological intensity.

3.2 Domestic trading volume

Although the results reported so far provide evidence on trading activity on the foreign market relative to the domestic one, they do not tell us how domestic trading itself behaves around the cross-listing date. In principle, the opening of a foreign market could be associated with either a decrease or an increase of trading activity in the home market. Figure 4 and Figure 5 allow a preliminary analysis of this issue: they plot the median monthly domestic turnover rate, defined as the ratio between trading volume and stock market capitalization of a company, over a four-year window around the cross-listing date.

Figure 4, which displays the median monthly turnover rate for the whole sample, reveals that trading activity on the home market peaks at the

cross-listing date,[25] and that on average trading activity in the two years after cross-listing exceeds its prelisting level. Figure 5 indicates that this pattern is common to companies in developed and in emerging markets alike.[26] However, this overall pattern may hide considerable variation across firms: depending on their characteristics, for some companies the development of an active foreign market may divert trading activity away from the domestic market, while for others it may stimulate it. Therefore, in Table 5 we use multivariate regressions to explore whether the relation between domestic turnover ratio and cross-listing is affected by company characteristics.

We analyze the behavior of the monthly domestic turnover ratio (defined as the average daily ratio between dollar trading volume and dollar stock market capitalization of a company) around the cross-listing date. In Table 5, we report regressions of the logarithm of the domestic turnover rate on four time dummies: one for the year before cross-listing, one for the cross-listing year, one for the year after cross-listing, and another for all subsequent years.[27] The coefficient of the constant thus, effectively captures the level of domestic turnover rate for the period ending one year before the cross-listing. In the regression, we also control for most of the company and country characteristics specified in Table 4, on the assumption that they may also affect the domestic turnover rate and not only the distribution of trading activity between the foreign and the domestic market.[28] Furthermore, we control for year- and region-fixed effects. Table 5 reports the estimates for the entire sample as well as separate estimates for emerging and developed market companies and "high protection" versus "low protection" companies.

The estimates for the entire sample indicate that domestic trading activity increases in the year before the cross-listing, in the year of the cross-listing, and in subsequent years, compared with its previous level.[29] These results confirm the visual impression conveyed by Figure 4: for the sample as a whole, cross-listing does not appear to depress but rather to stimulate domestic trading activity, controlling for company and country characteristics as well as for region- and year-fixed effects.

For the sample of emerging market companies, however, the estimated coefficients of all four-time dummies are negative, though not significantly different

[25] This is confirmed also by monthly data for domestic trading volume immediately after the cross-listing and in the run-up to it. We have calculated the ratio between domestic trading volume in the three months *after (before)* the cross-listing and the domestic trading volume in the subsequent (preceding) three months. The medians of these ratios are significantly above one, confirming that immediately *before* and *after* the cross-listing date, trading activity is abnormally intense in the domestic market.

[26] These observations are confirmed by *t*-tests that compare the pre- and post-listing means of median turnover ratios. These tests identify significant increases in average domestic turnover ratios around the cross-listing date.

[27] The logarithmic transformation of the variable was made to eliminate the skewness of the dependent variable.

[28] Investor protection is excluded from the regression because it is collinear with insider trading enforcement, financial development, and total market trading volume.

[29] This is one of the rare occasions in which the OLS estimates do not fully correspond with the random effects estimates. In the OLS specification, there is no significant long-term increase in domestic trading activity.

Table 5
Regressions of the domestic market turnover ratio

	Entire sample	Firms from emerging countries	Firms from developed countries	Low protection sample	High protection sample
Ln (Domestic market volume)	0.036**	0.075*	−0.038*	0.153***	−0.034
Correlation with home market	0.12	0.591	0.010	0.855***	−0.001
Dummy if home country is a developed country	−0.311			−0.520	−0.264
LN (Total assets)	0.056**	−0.198**	0.079***	0.047	0.073***
Asset growth	0.001**	0.003*	0.000	0.002	0.000
Volatility	1.150	3.050*	0.973	1.013	1.530**
High-tech sector	−0.235	−0.934**	−0.147	−0.562*	−0.166
Number of forecasts	0.000	0.069***	−0.001	−0.001	0.000
Domestic financial development	−0.044	−0.095	−0.333**	0.201	−0.330*
Insider trading enforcement	0.050	0.228	0.256***	0.275***	0.036
Time dummy					
Year before CL	0.153***	−0.168	0.190***	−0.306**	0.242***
CL Year	0.289***	−0.018	0.299***	−0.286**	0.370***
Year 1 after CL	0.276***	−0.040	0.270***	−0.443***	0.349***
Year x > 1 after CL	0.199***	−0.379	0.240***	−0.834***	0.354***
Region dummy					
Europe + Israel	0.817***		0.621*	0.506	1.101**
Canada	0.157		0.049		0.418
South America, Mexico	−1.150**	−1.328***		−1.378**	−1.077
Year effects	Fixed	Fixed	Fixed	Fixed	Fixed
Constant	−5.290***	−3.985***	−5.108***	−6.076***	−4.652***
Number of company years (Companies)	18289	2285	16004	4133	14156
	(169)	(27)	(142)	(39)	(130)
R^2	0.17	0.15	0.10	0.38	0.11

The dependent variable is the log of the domestic turnover ratio. We use the log-transformation in the case of the dependent variable, the domestic market trading volume, and total assets to improve the statistical characteristics of these variables. The low (high) protection sample is obtained by splitting the sample as follows: if a company's home country enforced anti-insider trading laws before the cross-listing year, the company is assigned to the high protection sample; otherwise, the company is assigned to the low protection sample. The regressions are estimated with random effects and a correction for AR(1) disturbances on a panel of monthly data. The Baltagi and Wu (1999) generalized least squares procedure is used to take into account that the panel is unbalanced. Explanatory variables (defined in the Data Appendix) are lagged by one year, except for the high-tech sector dummy, the developed country dummy, and insider trading enforcement. We curtail extreme positive outliers of asset growth and volatility at the 1st and 99th percentile. The base year in the specifications is the earliest year in each sample, and the base region is Australia/Asia.
*** denotes statistical significance level at 1% or lower. ** denotes statistical significance level between 1% and 5% and * denotes statistical significance level between 5% and 10%.

from zero. So, unlike developed country companies, emerging market companies do not experience increased trading activity in their home market. If anything, their domestic trading is less active after cross-listing in the United States, consistent with the findings of Domowitz, Glen, and Madhavan (1998); Karolyi (2004); and Levine and Schmukler (2006). The imprecision of the estimates may reflect the paucity of observations: we observe only 12 emerging market companies the year before, 13 in the cross-listing year, and 20 in the year after.

Finally, we investigate whether different sample splits yield different results regarding the effect of cross-listing in the United States on domestic trading volume. The fact is that the distinction between developed and emerging markets is based on a conventional definition that may not adequately capture the differences that determine whether trading expands or contracts in the home market in the wake of a cross-listing. Economically more meaningful differences may be those in the degree of financial development, investor protection, and insider trading protection. We therefore, use these variables alternatively to split our sample and reestimate the regressions for domestic turnover ratios for the relevant subsamples.

We find that even splitting the sample by degree of financial development or investor protection, the effect of cross-listing on domestic trading is imprecisely estimated for countries with low financial development or poor investor protection. By contrast, anti-insider protection discriminates very well between markets with trade diversion and those with trade creation, as shown by Table 5 (columns 5 and 6).

For companies from countries whose anti-insider protection was poor in the cross-listing year, cross-listing is associated with a significant reduction in domestic trading: the decline actually starts in the year before cross-listing, continues in the year of cross-listing, and becomes strongest in subsequent years. And the Insider Trading Enforcement variable has a large, positive, and precisely estimated coefficient in the subsample of companies in which insider trading protection was low before cross-listing. This indicates that an improvement in anti-insider protection after cross-listing is associated with higher domestic turnover, although not enough to offset fully the diversion effect of the foreign market. Interestingly, the results are quite different for companies from countries whose anti-insider protection was high in the cross-listing year, for which cross-listing leads to significant trade creation.[30]

To summarize, the evidence is that for companies based in developed countries, a cross-listing in the United States is accompanied and followed by an increase in domestic trading, while no such increase is seen on average for companies in emerging markets. A distinct decrease in domestic trading is found for companies in countries that had poor anti-insider trading protection prior to the cross-listing date. This suggests that in countries with poor enforcement (and only there), home market liquidity is vulnerable to the opening of a new trading venue in a more investor-friendly legal environment, such as that offered by US markets.

4. Conclusion

For an international panel of companies with a US cross-listing, we find that the fraction of trading in their shares carried out in the United States is larger

[30] Also, greater overall trading in the domestic exchange has a positive effect only for companies in the Low Protection subsample.

for companies based in countries that are geographically close to the United States, that have underdeveloped capital markets, and that fail to enforce insider trading regulation effectively. Moreover, the relative attractiveness of US markets for the trading of cross-listed stocks appears to have decreased over time for developed market companies, while it has increased for emerging market companies. As for company-specific characteristics, trading in the United States tends to be more active for stocks with a large presence of US institutional investors and with low correlation with the US market. For other characteristics the effects differ by country. Companies based in developed markets can expect a more active US market if they are small, volatile, and technology-oriented. For emerging market companies, by contrast, US trading volume is negatively related to volatility and technological intensity.

We also investigate the response of the domestic turnover rate to the cross-listing. Here too, the evidence differs sharply depending on the degree of financial development of the home country. Domestic trading increases in the cross-listing year and remains more active afterwards for firms based in developed, but not emerging markets. The difference is even sharper when the sample is split on the basis of enforcement of insider-trading rules. Where enforcement is effective, domestic trading volume increases after a cross-listing; in countries with poor insider-trading enforcement, it drops sharply.

These results shed new light on the decision to cross-list. Although on average, the cross-listings in our sample are followed by a substantial amount of trading volume in US markets, this does not hold for many companies from developed countries, especially from Europe. For them, a cross-listing appears, if anything, to contribute to domestic trading activity. In these cases, clearly, cross-listing in the United States aimed not at developing an active market there, but at other purposes—such as enhanced access to local equity issuance, bonding to the stricter corporate governance rules of the US market, expansion by mergers and acquisitions in the US market, or simply greater product market visibility (see Merton (1987)) and reputation.

Conversely, for companies from less-developed countries, the evidence is consistent with foreign market liquidity being a key driver of the cross-listing decision. However, when the home country is also characterized by poor protection against insider trading, cross-listing appears to become detrimental to home market liquidity. This has important implications for the competition between stock exchanges. While the liquidity of exchanges in developed countries benefits, on average, from international cross-listings of domestic companies, the liquidity of emerging markets is threatened.

An open question is whether these international differences in the effects of cross-listings are present also for other measures of market liquidity besides trading volume, such as bid-ask spreads and measures of price impact based on high-frequency price and quote data from the relevant markets.

Data Appendix

Table A1
Variable definitions and sources

Variable	Source and/or Definition
Trading volume in shares	Source: Financial Thomson Datastream, Reuters Equity 3000 Frequency: daily Definition: Share price of home listings in domestic currency and of ADRs in US dollars.
Stock price	Source: Financial Thomson Datastream, Reuters Equity 3000 Frequency: daily Definition: Exchange rates between domestic currencies and US dollars.
Exchange rates	Source: Financial Thomson Datastream, Reuters Equity 3000 Frequency: daily
Trading volume in dollars	Definition: Daily dollar value of trading volume, obtained by multiplying the number of shares traded during the day by the closing share price. Monthly trading volume in dollars is calculated as the average daily trading volume in dollars. Frequency: daily
Ratio foreign to domestic volume	Definition: Trading volume in dollars on foreign exchange divided by domestic trading volume in dollars. Frequency: daily Definition: Company shares outstanding at the end of the year.
Shares outstanding	Source: GlobalVantage, Worldscope Frequency: yearly
Market value of company	Definition: Shares outstanding at the end of the year times stock price of company stock on the domestic exchange in dollars. Frequency: daily
Turnover ratio on the domestic exchange	Definition: Daily domestic trading volume in dollars divided by daily market value in dollars. Monthly turnover ratios are calculated as average daily ratios. Frequency: daily
Total market volume in dollars	Definition: Aggregated measure of the total trading volume on a specific market Source: Financial Thomson Datastream. Frequency: daily
Ratio of foreign to domestic total market volume	Definition: Total market-trading volume in dollars on foreign exchange divided by domestic total market trading volume in dollars.
Correlation with foreign/domestic market	Definition: Monthly correlation estimates are calculated using weekly stock returns and weekly foreign/domestic market index returns. We use a three-year estimation window. We set the correlation to not available when fewer than 52 observations are available. Frequency: monthly
Shares held by US institutional investors and number of institutional investors	Definition: Shares held by US institutional investors (in percent) after cross-listing and number of US institutional investors after cross-listing. Missing data on both variables are replaced by zeroes because this data must be reported by institutional investors that exercise investment discretion over accounts holding certain equity securities having an aggregate fair market value of at least $100 million. Source: Financial Thomson Shareworld Database Frequency: quarterly
Geographical distance	Definition: Distance between the location of the domestic exchange and New York.
Foreign sales, percent	Source: Worldscope. Frequency: yearly
Baruch–Karolyi–Lemmon (BKL) incremental information measure	Definition: Information measure introduced in Baruch, Karolyi, and Lemmon (2007), based on the difference in R^2 of two regressions using weekly company and index returns and calculated as follows: $BKL = \frac{\left(R_A^2 - R_B^2\right)/2}{\left(1-R_A^2\right)/(n-3)}$

(*Continued*)

Table A1
Continued

Variable	Source and/or Definition
	Company returns are regressed on foreign and domestic index returns in regression A, and only on domestic index returns in regression B, with n being the sample size. Frequency: monthly
Total assets (million dollars)	Source: Global Vantage and Worldscope. Frequency: yearly
Asset growth, percent	Source: Worldscope. Frequency: yearly
Volatility	Definition: Volatility is calculated monthly as the standard deviation of weekly stock returns. Frequency: monthly
High-tech sector	Definition: Dummy variable equaling 1 for technology-oriented companies and 0 otherwise. We use the same definition as applied in Pagano, Röell, and Zechner (2002). This definition is based on SIC Codes provided by GlobalVantage and Worldscope. Frequency: yearly
Number of forecasts	Definition: Number of analysts' forecasts for a company in a specific month. Source: I/B/E/S International Database. Frequency: monthly
Stock market capitalization to GDP	Definition: Value of listed shares to GDP Source: Beck, Demirgüc-Kunt, and Levine (2000), as updated in Ross Levine's Web site. Frequency: yearly
Domestic financial development	Definition: Percentage difference between the financial development of country i and the average financial development of sample countries in year t, in which financial development is measured as the sum of stock market capitalization and private credit market capitalization to GDP. Frequency: yearly
Insider trading law enforcement	Definition: Dummy variable that equals 1 in year t and country i if insider trading laws were enforced in that country before or in year t, and 0 otherwise. Source: Column 8 of Table 1 in Bhattacharya and Daouk (2002). Frequency: yearly
Difference in insider trading law enforcement between US and domestic markets	Definition: Difference between the dummy variable for Insider Trading Law Enforcement in the United States and the same variable in country i. Frequency: yearly
Shareholder protection	Definition: Value from 0 (low) to 6 (high) measuring anti-director rights. Source: Table 2, La Porta et al. (1998) Frequency: constant values
US versus domestic shareholder protection	Definition: Difference between the Anti-director Rights index in the United States and in country i. Frequency: constant values
Low investor protection	Definition: Dummy that equals 1 if shareholder protection is below 4 and 0 otherwise. Frequency: constant values

This table provides detailed information on the definitions, sources, and frequencies of our variables. Per variable, we report the highest frequency available. The sample period spans 1980 to 2001.

References

Admati, A., and P. Pfleiderer. 1988. A Theory of Intraday Patterns: Volume and Price Variability. *Review of Financial Studies* 1(1):3–40.

Bacidore, J., and G. Sofianos. 2002. Liquidity Provision and Specialist Trading in NYSE-Listed Non-U.S. Stocks. *Journal of Financial Economics* 63:133–58.

Bailey, W., G. A. Karolyi, and C. Salva. 2006. The Economic Consequences of Increased Disclosure: Evidence from International Cross-Listings. *Journal of Financial Economics* 81:175–213.

Baker, H. K., J. R. Nofsinger, and D. G. Weaver. 2002. International Cross-Listing and Visibility. *Journal of Financial and Quantitative Analysis* 37(3):495–521.

Baltagi, B. H. 2001 *Econometric Analysis of Panel Data*, New York: Wiley.

Baltagi, B. H., and P. X. Wu. 1999. Unequally Spaced Panel Data Regressions with AR(1) Disturbances. *Econometric Theory* 15:814–23.

Baruch, S., A. Karolyi, and M. L. Lemmon. 2007. Multi-market Trading and Liquidity: Theory and Evidence. Working Paper, University of Utah. *Journal of Finance* 62(5):2169–2200.

Beck, T., A. Demirgüc-Kunt, and R. Levine. 2000. A New Database on Financial Development and Structure. *World Bank Economic Review* 14:597–605.

Bhattacharya, U., and H. Daouk. 2002. The World Price of Insider Trading. *Journal of Finance* 57:75–108.

Brennan, M. J., H. H. Cao, N. Strong, and X. Xu. 2005. The Dynamics of International Equity Market Expectations. *Journal of Financial Economics* 77:257–88.

Breusch, T. S., and A. R. Pagan. 1980. The Lagrange Multiplier Test and Its Applications to Model Specification in Econometrics. *Review of Economic Studies* 47:239–53.

Chowdhry, B., and V. Nanda. 1991. Multimarket Trading and Market Liquidity. *Review of Financial Studies* 4(3):483–511.

Coval, J., and T. J. Moskowitz. 1999. Home Bias at Home: Local Equity Preference in Domestic Portfolios. *Journal of Finance* 54:2045–73.

Davis, J., and J. V. Henderson. 2004. The Agglomeration of Headquarters. Working Paper, Brown University.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. Shleifer. 2006. The Law and Economics of Self-Dealing. Working Paper, Harvard University; forthcoming in *Journal of Financial Economics*.

Doidge, C., G. A. Karolyi, and R. Stulz. 2004. Why Are Foreign Firms That Are Listed in the U.S. Worth More? *Journal of Financial Economics* 71:205–38.

Domowitz, I., J. Glen, and A. Madhavan. 1998. International Cross-listing and Order Flow Migration: Evidence from an Emerging Market." *Journal of Finance* 53:2001–27.

Domowitz, I., J. Glen, and A. Madhavan. 2001, Liquidity, Volatility, and Equity Trading Costs Across Countries and Over Time. *International Finance* 4(2):221–55.

Eun, C. S., and S. Sabherwal. 2003. Cross-Border Listing and Price Discovery: Evidence from U.S.-Listed Canadian Stocks. *Journal of Finance* 58(2):549–75.

Fernandes, N., and M. A. Ferreira. 2005. Does International Cross-Listing Improve the Information Environment? Working Paper, Universidade Catolica Portuguesa: forthcoming in the *Journal of Financial Economics*.

Fernandes, N., and M. A. Ferreira. 2006. Insider Trading Laws and Stock Price Informativeness. Working Paper, Universidade Catolica Portuguesa; forthcoming in *Review of Financial Studies*.

Foerster, S. R., and G. A. Karolyi. 1998. Multimarket Trading and Liquidity: A Transactions Data Analysis of Canada-U.S. Interlistings. *Journal of International Financial Markets, Institutions, and Money* 8:393–412.

Grammig, J., M. Melvin, and C. Schlag. 2005. The Role of U.S. Trading in Pricing Internationally Cross-Listed Stocks. Working Paper, University of Tuebingen.

Grinblatt, M., and M. Keloharju. 1999. The Investment Behavior and Performance of Various Investor Types: A Study of Finland's Unique Data Set. *Journal of Financial Economics* 55:43–67.

Hargis, K. 1998. Do Foreign Investors Stimulate or Inhibit Stock Market Development in Latin America? *Quarterly Review of Economics and Finance* 38:303–18.

Hargis, K., and P. Ramanlal. 1998. When Does Internationalization Enhance the Development of Domestic Stock Markets? *Journal of Financial Intermediation* 7:263–92.

Hau, H. 2001. Location Matters: An Examination of Trading Profits. *Journal of Finance* 56(5):1959–83.

Ivkovic, Z., and S. Weisbenner. 2005. Local Does as Local Is: Information Content of the Geography of Individual Investors' Common Stock Investments. *Journal of Finance* 60(1):267–306.

Kang, J., and R. Stulz. 1997. Why Is There a Home Bias? An Analysis of Foreign Portfolio Equity Ownership in Japan. *Journal of Financial Economics* 46:3–28.

Karolyi, G. A. 1998. Why Do Companies List Shares Abroad? A Survey of the Evidence and Its Managerial Implications. *Financial Markets, Institutions and Instruments* Vol. 7: New York University Salomon Center.

Karolyi, G. A. 2004. The Role of American Depositary Receipts in the Development of Emerging Markets. *Review of Economics and Statistics* 86(3):670–90.

Karolyi, G. A. 2006. The World of Cross-Listings and Cross-Listings of the World: Challenging Conventional Wisdom. *Review of Finance* 10(1):99–152.

Lang, M. H., K. V. Lins, and D. P. Miller. 2003. ADRs, Analysts and Accuracy: Does Cross-Listing in the U.S. Improve a Firm's Information Environment and Increase Market Value? *Journal of Accounting Research* 41(2):317–45.

Lang, M. H., K. V. Lins, and D. P. Miller. 2004. Concentrated Control, Analyst Following, and Valuation: Do Analysts Matter Most When Investors Are Protected Least? *Journal of Accounting Research* 42(3):589–623.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny. 1998. Legal Determinants of External Finance." *Journal of Finance* 52(3):1131–50.

Levine, R., and S. L. Schmukler. 2006. Internationalization and Stock Market Liquidity. *Review of Finance* 10(1):153–87.

Lowengrub, P., and M. Melvin. 2002. Before and After International Cross-listing: An Intraday Examination of Volume and Volatility. *Journal of International Financial Markets, Institutions, and Money* 12:139–55.

Malloy, C. J. 2005. The Geography of Equity Analysis. *Journal of Finance* 60(2):719–55.

Menkveld, A. J. 2007. Splitting Orders in Overlapping Markets: A Study of Cross-Listed Stocks. Working Paper, Vrije Universiteit Amsterdam; forthcoming in *Journal of Financial Intermediation*.

Merton, R. C. 1987. A Simple Model of Capital Market Equilibrium with Incomplete Information." *Journal of Finance* 42(3):483–510.

Pagano, M. 1989. Trading Volume and Asset Liquidity." *Quarterly Journal of Economics* 104(2):255–74.

Pagano, M., A. A. Röell, and J. Zechner. 2002. The Geography of Equity Listing: Why Do Companies List Abroad? *Journal of Finance* 57(6):2651–94.

Pirinsky, C., and Q. Wang. 2006. Does Corporate Headquarters Location Matter for Stock Returns? Working Paper, Texas A&M University. *Journal of Finance* 61(4):1991–2015.

Pulatkonak, M., and G. Sofianos. 1999. The Distribution of Global Trading in NYSE-Listed Non-U.S. Stocks. NYSE Working Paper 99-03.

Reese, W. A. J., and M. S. Weisbach. 2002. Protection of Minority Shareholder Interests, Cross-Listings in the United States, and Subsequent Equity Offerings. *Journal of Financial Economics* 66:65–104.

Sarkissian, S., and M. J. Schill. 2004. The Overseas Listing Decision: New Evidence of Proximity Preference." *Review of Financial Studies* 17:769–809.

Saudagaran, S. M. 1988. An Empirical Study of Selected Factors Influencing the Decision to List on Foreign Stock Exchanges. *Journal of International Business Studies* 19(1):101–27.

Shleifer, A., and R. W. Vishny. 1997. A Survey of Corporate Governance. *Journal of Finance* 52(2):737–83.

Tribukait-Vasconcelos, H. 2005. Cross-Country Evidence of the Impact of ADRs and Institutions on Stock Price Behavior. Working Paper, Cornerstone Research.

Zingales, L. 2006. Is the U.S. Capital Market Losing its Competitive Edge? Working Paper, University of Chicago; forthcoming in *Journal of Economic Perspectives*.