

# Where is the Market? Evidence from Cross-Listings in the U.S.

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March 2006

**Acknowledgements.** We thank Gilles Chemla, Hans Degryse, Paul Irvine, Andrew Karolyi, Philip Lane, Michael Lemmon, Mario Padula, Sergei Sarkissian, Martin Weber and Dariusz Wojcik for valuable comments. We thank the participants of seminars at the University of Lisbon, Porto and Zurich, the CCEFM workshop in Vienna, the ECB-CFS Symposium on Capital Market Integration in Frankfurt, the FIRS conference in Capri, the EFA meeting in Maastricht, the ESF Workshop on Economic Geography and European Finance in Oxford and the WFA meeting in Portland. We are grateful to Financial Thomson and, especially to Jennifer Rawlinson-Grillitsch, for their support. We acknowledge financial support from the Jubiläumsfonds of the Österreichische Nationalbank (Austrian Central Bank) under grant no. 8939 and from Fondazione IRI.

# **Where is the Market? Evidence from Cross-Listings in the U.S.**

## **Abstract**

This paper explores two main questions. First, can two markets for a company's shares coexist and what determines the share of overall trading volume captured by the domestic and the foreign market, respectively? For firms cross-listed in the U.S. we find that, overall the U.S. market is able to attract a significant fraction of total trading volume, but that there is significant cross-sectional variation. The U.S. market tends to be more active compared to the domestic market when the company is based in a country that is geographically close, has low degree of financial development and relatively poor anti-insider trading protection. Moreover, the relative size of the U.S. market is larger if the company is small, high-volatility and high-tech.

Second, we analyze whether the development of an active foreign market entails lower trading activity on the domestic market. To the contrary, we find that the domestic turnover ratio increases significantly following a cross-listing. However, the degree of domestic market development matters considerably. For firms based in developed markets, the domestic turnover rate increases in the wake of cross-listing and remains permanently higher. In contrast, emerging market firms tend to experience a decrease in domestic trading activity.

**JEL classification:** G15, G30.

**Keywords:** cross-listing, trading volume, trade creation.

## **1. Introduction**

Several companies list their shares not only on their domestic exchange but also on foreign stock exchanges – a fact for which a variety of reasons have been offered and explored (see Saudagaran 1988, Karolyi 1998, 2006, Pagano, Röell and Zechner 2002, and Sarkissian and Schill 2004, among others). A motive often advanced for this decision is that a foreign listing facilitates trading by foreign investors and therefore tends to attract them into the ranks of the company's shareholders. If this is true, then cross-listings should be followed by reasonably large and persistent trading activity in the foreign market.

This argument contrasts with the tendency towards agglomeration that according to several models is a quintessential feature of trading activity, owing to the positive externalities present in the trading process (Admati and Pfleiderer, 1988, Chowdry

and Nanda, 1991, and Pagano, 1989). This tendency towards agglomeration, coupled with the informational advantages of domestic traders, should create a powerful obstacle to the development of an active foreign market in the wake of a cross-listing. The gravitational pull of the pre-existing domestic market may be counterbalanced only by the presence of trading cost differentials or other frictions that protect the new trading venue.

Whether such frictions enable the survival of an active foreign market after a cross-listing, is an empirical question, and it is the main question that motivates 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 pre-existing domestic market. This need not be the case: under certain circumstances, trading activity on the domestic and on the foreign market are complements rather than substitutes. Again, this is an empirical question. It is the second main question addressed in this paper.

In answering these questions, we do not only rely on the characteristics of the domestic and foreign market (such as trading costs, geographic distance, language differences or anti-insider trading protection). We also exploit the cross-sectional differences between cross-listed companies (for instance, in their size, growth or return volatility). The rationale is that some company characteristics should correlate with trading frictions or informational asymmetries, and therefore affect the distribution of trading between the domestic and the foreign market. Our data span the period between 1980 and 2001, and cover 437 companies based in 34 different countries and cross-listed in U.S. markets.

Typically in our data, the U.S. market for these companies' shares features a considerable volume of trading activity, compared to the domestic one: For the median company, U.S. trading volume is approximately 50% of its domestic counterpart immediately after the cross-listing, although it declines to approximately 25% within a six-year period. But this overall pattern masks considerable diversity across companies and countries.

A cross-listed company has a more active market in the U.S. when the company is based in a country that is geographically close to the U.S., has an underdeveloped capital market and relatively poor anti-insider trading protection. Geographic proximity can be seen as capturing the familiarity of U.S. investors with the company and its country's institutions, implying a lower informational disadvantage for U.S. investors.<sup>1</sup> Similarly, a low degree of domestic capital market development and investor protection confers an advantage to the U.S. market in trading the company's shares.

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<sup>1</sup> The former finding is consistent with Sarkissian and Schill (2004) who demonstrate that investor familiarity affects cross-listing decisions.

Company characteristics also contribute to explain the relative share of trading volume captured by the U.S. market. In this respect, the evidence conflicts with our priors. U.S. trading activity is comparatively high for small, high-volatility and high-tech companies, which we would have expected to be less appealing for foreign investors, being typically more sensitive to inside information. However, it is possible that U.S. investors have a comparative advantage in evaluating small, high-volatility and high-tech firms. Indeed, these firms may cross-list in the U.S. precisely because they expect the local investors to be more skilled in evaluating them than domestic investors. This is consistent with the finding by Pagano, Röell and Zechner (2002) that high-growth and high-tech European companies are more likely to cross-list in the United States than in other European exchanges.

The second major issue investigated in the paper is the impact that cross-listing has on domestic trading activity. On the whole we find that domestic market activity does not suffer when a cross-listing occurs. Quite to the contrary, both around the cross-listing date and in the years thereafter the domestic turnover ratio increases significantly. Also in this case, however, we find a striking difference between the experience of 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. In contrast, emerging market firms tend to experience a decrease in the level of domestic trading activity, a finding that accords with the evidence in Levine and Schmukler (2006).

Our investigation of the distribution of trading volume for cross-listed shares adds to a still small body of research.<sup>2</sup> 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. A more detailed analysis of the influence of trading hours overlap using intraday data is found in Lowengrub and Melvin (2002), and Menkveld (2004). 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, their increased internationalization tends to damage the liquidity of other domestic stocks. Similarly, Karolyi (2004) documents for emerging market companies cross-listed in the U.S. that an increase in ADR activity goes along with a decrease of market capitalization and turnover ratios of purely domestically listed companies.

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<sup>2</sup> 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 U.S. 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. 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.

The plan of the paper is as follows. In Section 2, we outline the hypotheses suggested by the literature about the distribution of trading volume across alternative venues, and use them to draw testable predictions about how company and market characteristics should correlate with foreign trading volume. In Section 3, we describe our data. In Section 4, we document the patterns of foreign trading volume (scaled by its domestic counterpart) after cross-listing and that of domestic trading volume (scaled by capitalization) both before and after cross-listing. In Section 5, we use regression analysis to investigate the determinants of foreign trading activity after a cross-listing. In Section 6 we use the same approach to explore the pattern and determinants of domestic trading activity around the cross-listing date. Section 7 concludes.

## **2. Hypotheses**

In this section we outline the hypotheses suggested by the literature about the geographic distribution of trading volume across alternative trading venues for the same security. We seek guidance from the literature on three sets of questions. First, how does the long-run ratio of trading volume across markets depend on the characteristics of companies and of their home country and market? Second, how does a cross-listing affect the level of domestic trading volume – is it associated with trade creation or trade diversion? Thirdly, what are the dynamics of the distribution of trading volume after a cross-listing and how do they differ across stocks?

### **2.1 Determinants of the level of foreign trading**

When a security is traded simultaneously on two exchanges, trading externalities favor the concentration of trading on a single market, unless some friction prevents this outcome. Positive trading externalities arise from the fact that participation by other investors reduces the adverse price effect of one's orders, in models with imperfectly competitive, risk-averse investors as well as in models with asymmetric information.

Pagano (1989) makes this point in a setting where risk-averse traders perceive their demand for the stock as affecting adversely the market price. A higher number of market participants implies a lower price sensitivity to a trader's net demand, thus increasing the market's liquidity. If a stock can be traded on two distinct auction markets with identical transaction costs, only two types of equilibria are possible: either all traders concentrate in the same market, or a knife-edge equilibrium occurs where traders separate between the two markets and are just indifferent between them. With differential trading costs, instead, a two-market equilibrium is possible where one market features a higher number of traders (and thus lower

price sensitivity to the order flow), greater cross-sectional diversity in the traders' endowments, but higher transaction costs.

The tendency toward agglomeration in a single market emerges also in models with asymmetric information, as shown by Chowdry and Nanda (1991) in a setting similar to that proposed by Admati and Pfleiderer (1988). In their model, privately informed traders, discretionary and non-discretionary liquidity traders place orders with risk-neutral market makers. In equilibrium, all traders with discretion over their trades' location will place their orders in the market with the largest number of non-discretionary traders. The less liquid market remains active only to the extent that some non-discretionary liquidity traders are trapped there. These traders' lack of discretion over their trading venue can be thought as a reflection of their differential trading costs: for instance, they face prohibitively large trading costs abroad but not at home. Therefore, also in this case, complete 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 outcome is prevented by frictions such as differential transaction costs or a time zone difference that limits the overlap between their active hours.

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

Table 1 summarizes the variables that could affect the volume of trading in foreign markets after cross-listing, and indicates which empirical proxies can be used to measure them. The table partitions the variables in three groups: (i) those relevant for non-information-based trading; (ii) those relevant for information-based trading, and (iii) those measuring trading frictions.

### **2.1.1 Geographic distribution of uninformed trading**

One determinant of the distribution of trading activity is the location of uninformed market participants that are "captive" of a specific trading venue, because of their higher trading costs or complete inability to access foreign markets.

Other things equal, one would expect the presence of these uninformed market participants to be increasing in the **trading volume of the entire stock market**. If so, a cross-listing occurring on a stock exchange with greater overall trading (compared to the domestic one) makes the stock available to a larger number of investors. As a result, such a cross-listing should be followed by more active foreign trading of the corresponding stock (compared to its domestic trading).

By the same token, one would expect uninformed trading to be larger in a more developed financial market, that is, a market with broader and more efficient stock

and credit markets. A country with larger stock market capitalization will feature greater stock market participation and trading. But also access to an efficient credit market may contribute to active stock trading, for instance by facilitating margin trading or short-selling. Thus, if the foreign market exhibits higher **financial development** (as proxied by stock market capitalization or private credit relative to GDP), one would expect stocks that cross-list on that market to be more actively traded, other things equal. To a certain extent, greater financial development may also capture a trading cost advantage of the foreign market relative to the domestic one. As such, its explanatory power may stem also from trading frictions.

The foreign investor base of a stock should also depend on its risk characteristics: stocks with **low correlation** with respect to the foreign market should appeal to foreign investors for portfolio diversification.<sup>3</sup> Other things being equal, these stocks should be in high demand by foreign investors after a cross-listing, implying that their trading volume should also be higher than for other cross-listed stocks.

A large **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 so as to exploit temporary supply and demand imbalances caused by liquidity traders. Therefore their presence can encourage also 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 context of the present study, there is also another reason why the number of foreign institutional investors and their fractional ownership may correlate with foreign trading volume: we cannot directly measure the presence of foreign retail investors, so that the variables referring to foreign institutional investors may also proxy for the presence of foreign retail investors.

### 2.1.2 Geographic distribution of informed trading

Information is another likely driver of the distribution of trade across markets. If traders with privileged access to information exploit it in their local market, the place where such information originates should contribute to determine the location of trading activity. For example, if most privileged information trickles down from the company's headquarters, one could expect informed trading to concentrate in the market closest to the headquarters. Indeed Grinblatt and Keloharju (1999) show that Finnish investors' portfolios overweigh the stocks of geographically close companies, and Coval and Moskowitz (1999) identify a similar bias in the portfolio

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<sup>3</sup> 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), the stock's beta would not add new information.

choices of U.S domestic portfolio funds. Ivkovic and Weisbenner (2005) document that individual investors' preference for local stocks comes from an information advantage rather than a behavioural bias, showing that the local component of investors' portfolios systematically outperforms the rest of their portfolios. Proximity confers an informational advantage also to analysts, as shown by Malloy (2005). This familiarity bias is well-known also to companies, as witnessed by the important role that geographic distance plays in their choice of where to cross-list their shares (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 more easily information-based trades if the foreign market where 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 **geographic distance** and to the presence of a **language difference** between the countries where the domestic and the foreign stock market are located.

The only exceptions to this prediction are instances where a considerable portion of value-relevant information is produced abroad. This can occur when the company exports or produces abroad a large fraction of its output, or when its major suppliers or competitors are located 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, empirically 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 identify how much information is generated on each market where a stock is cross-listed. Baruch, Karolyi, and Lemmon (2003) define a statistical measure that approximates the information generated in the foreign market in addition to the information created in the home market. We call this measure BKL incremental information measure.<sup>4</sup> Following Baruch, Karolyi, and

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<sup>4</sup> The measure is based on the difference in  $R^2$  of two regressions explaining the company's stock return. The first regression uses only the home market index return as explanatory variable. The second regression uses both the foreign and the domestic market index return as explanatory variables. (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.

Lemmon (2003) we expect a higher fraction of trading volume in the foreign market if comparatively more information is generated there (i.e., the BKL incremental information measure is high).

To the extent that most information is produced in the home country, the informational disadvantage of foreign investors depends on the sensitivity of the market price to private information. This is likely to be highest for small companies, which are more informationally opaque and – being also younger – have a shorter track record. As a result, foreign investors' demand should be positively related to **company size**, as measured by sales or total assets, again in line with the findings by Kang and Stulz (1997). The sensitivity to private information should also be high for high-growth companies, whose value lies more in growth opportunities rather than in the existing asset base. Therefore, other things being equal, foreign trading activity after a 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: this characteristic should also be negatively correlated with foreign trading.

Finally, the research published by analysts can increase public information, and therefore should reduce the informational disadvantage of foreign investors (see Lang, Lins and Miller, 2003). The **stock's coverage by analysts** should therefore be positively related to foreign trading volume. For this variable, one faces a potential endogeneity problem, insofar as analyst following could be stimulated by a cross-listing. This problem can be faced by relying on (or instrumenting by) analyst following before the cross-listing.

In principle, also high-tech companies could be classified as more affected by private information (e.g., about patent development, new products and processes, etc.). However, the high-tech sector is generally more export-oriented, which may encourage foreign investors' trading, as discussed above. So it is not a priori clear whether, on balance, **high-tech** companies should be expected to develop a more active foreign market for their shares than low-tech ones.

To the extent that **protection against insider trading** prevents losses by uninformed traders at the advantage of informed ones, for cross-listed stocks investors should tend to trade in the exchange where the rules against insider trading are stricter or more tightly enforced. Foreign trading volume should therefore be larger if the home market has less stringent rules or weaker enforcement of insider trading rules.<sup>5</sup>

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<sup>5</sup> In contrast, one should not expect the relative degree of shareholder protection to affect the ratio between foreign and domestic demand for a company's stocks. While protection against insider trading is determined by the security regulations that apply to the exchange where the stock is traded, the protection against managerial diversion is mainly determined by the corporate law of the country

### 2.1.3 Influence of trade frictions on the distribution of trade

As already argued earlier, an equilibrium with multiple trading venues can arise in the presence of differential trading costs. But in this setting, it is natural to expect the market with **lower trading costs** to attract a higher fraction of total trading. Therefore, for cross-listed stocks the fraction of foreign trading volume should be higher when trading costs on the foreign market are lower than domestically.

Another trading friction arises from the **time zone difference** between the domestic and the foreign market, insofar as this reduces the overlap between foreign trading hours and those of the domestic market. When such overlap is limited or non-existent, the home market is protected from the foreign market's competition, because the latter is open mostly or only when the cross-listed companies headquarters are closed and therefore little price-relevant information is generated. Indeed Pulatkonak and Sofianos (1999) report that the NYSE share of trading volume for cross-listed stocks in 1996 is negatively correlated with the time-zone difference relative to the stocks' domestic markets, implying a positive correlation with time zone overlap.

In principle, the protection from foreign competition that the home market gets from time zone difference is distinct from the foreign investors' informational disadvantage associated with their geographic distance from the home market. Time zone difference generates trade frictions, whereas distance reduces the quality and timeliness of information collection. However, in practice time zone difference is closely correlated with distance, so that it may be difficult to discriminate empirically between these two different explanations of trading volume location.

## 2.2 Spillover effects on the home market

So far, we 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 affects the *level of domestic* trading volume.

Specifically, the cross-listing may induce *trade diversion* away from the home exchange. For instance, foreign investors who used to trade the stock in the domestic market may relocate their trades in the foreign one, to save on trading costs or for convenience (especially if the two markets are in different time zones).

Alternatively, the cross-listing may induce net *trade creation*, so that new trading abroad does not occur at the detriment of the domestic exchange, or even a *positive spillover* effect for the domestic exchange, whereby foreign trading activity

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where the company is incorporated, and therefore cross-listing should not make a difference to the degree of protection enjoyed by shareholders, whether domestic or foreign.

increases domestic trading beyond what it would have been otherwise. For instance, competition between foreign and domestic market-makers may enhance the liquidity of the domestic market.<sup>6</sup>

Indeed, using a sample of more than 2,700 companies from 45 emerging economies, Levine and Schmuckler (2006) report a reduction of domestic trading of firms that cross-list in foreign public exchanges.<sup>7</sup> The question is whether this negative effect of cross-listing on home market trading applies universally or rather only to the developing countries analyzed by Levine and Schmuckler (2006). It is conceivable that this effect may be absent or even reversed if the domestic country has a sophisticated capital market, or if it is protected from foreign competition by a limited time zone overlap. In the context of our data set, we shall be able to test these hypotheses.

### 2.3 Trading dynamics after cross-listing

In the short-run, cross-listings may be followed by a temporary surge of foreign trading as a result of a one-off portfolio rebalancing by foreign investors. Suppose that, as in Merton (1987), foreign investors become aware of the existence of the stock when it first becomes listed on their exchange. Then, they may buy the stock to diversify their portfolios and this will generate a temporary rise of trading activity around the cross-listing date. Afterwards, trading activity of foreign investors will revert to the level dictated by their “normal” trading needs – whether these originate from liquidity or information-related motives.

This temporary rise in foreign trading activity can have a mirror image in the domestic market, as financial intermediaries buy the stock in the domestic market and resell it abroad. In this case, a rise in trading activity should occur both in the home and in the foreign market around the cross-listing date.

The “support” activity of investment banks in the foreign market after a cross-listing may concur to generate a temporary rise of trading abroad. The banks that assist the corporation in listing abroad are often willing to maintain a specially liquid market for some time in the foreign exchange. As long as this activity lasts, it may induce higher trading activity by foreign investors.

This short-run increase in trading activity on the foreign market may be followed by a variety of dynamic patterns, as the distribution of trading activity adjusts towards its long-run equilibrium. This equilibrium may feature domestic or foreign-market prevalence, or some intermediate outcome, depending on the company-level and country-level characteristics discussed in the previous sections.

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<sup>6</sup> Domowitz, Glen and Madhavan (1998) show that home-market liquidity may suffer if information linkages between the two markets are poor, and support this point with evidence concerning Mexican companies issuing American Depositary Receipts (ADRs).

<sup>7</sup> In fact, they document that the effect extends even to domestic companies that did not cross-list.

### 3. Data description

Our starting sample consists of all companies whose shares were cross-listed in the U.S., either on the New York Stock Exchange, the NASDAQ or the AMEX. If companies list different stock issues on the same exchanges we treat them separately. However, we exclude stock issues with very specific characteristics like preference shares from our analysis. This sample is reduced for reasons of data availability – most importantly the availability of trading volume data on the foreign and on the domestic market. Table 2 summarizes the sample for which we managed to collect trading volume data. Altogether, Table 2 includes 437 companies that cross-listed on U.S. markets. The home markets from which most cross-listings originate are Canada (205), the United Kingdom (50), Israel (18), Netherlands (17), Australia (16) and France (15).

The variable of interest in our empirical analysis is the ratio of foreign to domestic dollar trading volume. Note that the dollar trading volume equals the amount of shares traded times the price per share. Therefore it resolves any problems related to the denomination of ADRs. If companies have the same stock issues listed on multiple exchanges in the U.S. we add up the dollar trading volume across the individual exchanges. Thus we end up with an estimate for the total dollar trading volume of a firm's stock issue on U.S. markets and on the domestic market.

In addition to the trading volume data we collect explanatory variables to evaluate our hypotheses. Table 2 reports descriptive statistics for the variables included in our empirical analysis. As far as company characteristics are concerned we include total assets, asset growth, high-tech (i.e., industry classification), foreign sales to total sales, stock return volatility, stock correlation with the U.S. market index, BKL incremental information measure, number of analysts' estimates, and institutional ownership by U.S. 13-F institutions. In addition to the company-level variables, we collect market characteristics: geographic distance, financial development, insider trading law enforcement, total market volume, and trading costs. A detailed list of the data, their sources, definitions and frequencies is provided in the Data Appendix.

In Panel A of Table 2 we describe the characteristics of the average company within each country of our sample. The ratio of foreign to domestic trading volume for the average company varies considerably across countries and is higher for companies from emerging markets (especially South America) than for those based in developed countries. Our second dependent variable – the turnover ratio – is much less dispersed and is highest for Singapore, Brazil and Israel.

The average company in our sample has total assets of 12.2 billion U.S. dollars, and it grows at a pace of almost 20% per year. European companies are on average the largest in our sample. 18% of the companies belong to the high-tech sector. The

ratio is highest for Israel, South-Korea and Taiwan, where one out of two firms are high-tech. In general, cross-listing companies are export-oriented, with an average ratio of 43% of foreign sales to total sales. Top exporting companies come from Hong Kong, Singapore and Switzerland. While the average monthly volatility in our sample is 7.9%, the most volatile companies are headquartered in emerging markets. The correlation of the average company with the U.S. market equals 0.2. The average correlations of the companies in our sample with the U.S. markets range from slightly negative (e.g., -0.045 for companies from the Philippines) to positive, the highest value being 0.4 in the case of Ireland. These correlations are generally higher for countries with a high proportion of high-tech companies, possibly a reflection of the importance of the high-tech sector in the U.S. market. A similar pattern can be observed for the BKL incremental information measure, suggesting that the U.S. market is particularly apt at evaluating high-tech companies. In our sample the average company is covered by more than 100 analysts' forecasts per year. The coverage is largest for European companies. Similarly, U.S. institutional investors tend to overweight their stakes in European companies: on average, they hold a stake larger than 10% in cross-listed companies from Finland, Norway, Ireland, Israel, France, Denmark and Canada. In addition to these countries, U.S. institutional investors seem to have particular interest in Spanish, South-Korean, Taiwanese, Brazilian and British companies, as can be seen from the average number of institutional owners.

Panel B describes the geographic distance and other characteristics of the domestic markets in our sample. Switzerland and Hong Kong are, by far, the countries with the most developed financial markets, even compared to the UK. Not surprisingly, South American countries have the least developed financial markets. Most home countries are less effective in enforcing insider trading laws than the U.S. – overall this applies to 84% of our companies. Japan is the most active domestic market: overall trading volume in the U.S. is only 1.3 times that of the Japanese market, whereas it is more than 1000 times larger than the stock markets in Colombia, Denmark, Finland, Israel and Venezuela. Also with respect to trading costs the U.S. stands out as a superior market, followed by France, Israel and the Netherlands.

#### **4. Descriptive evidence**

In this section we start by providing some stylized facts about the distribution of trading volume across the home and the foreign market following a cross-listing, as well as the level of trading activity on the domestic market, both before and after the cross listing.

## 4.1 Distribution of trading volume

We measure the distribution of trading volume by the magnitude of U.S. trading compared to domestic trading. Figure 1 shows the monthly median ratio of U.S. volume to home volume over the first 5 years after cross-listing for the 218 companies for which complete volume data are available for the first five years after the cross-listing, to avoid composition effects. After an initial period of active trading, U.S. volume quickly abates: in the first 6 months, the median ratio of foreign to domestic volume falls from over 50% to less than 35%. In the remaining four and half years, there is a further slight decline, with the ratio stabilizing between 25% and 35% in the last 2 years.

However, this worldwide aggregate pattern hides very large differences across geographic areas. Figure 2 shows the median ratio of U.S. volume to home volume separately for companies based in Europe, in Canada, Asia/Australia and South America/Mexico. The U.S. trading volume of European companies, relative to their home market trading, starts at a lower level and features a more prolonged decline, eventually stabilizing at around 5% in the last three years. So for these companies the home market appears to reassert its dominance.<sup>8</sup> For Asian and Australian companies, instead, U.S. markets appear to retain a roughly stable fraction of trading volume ranging between 10% and 30%, with no clear trend decline. If anything, trading volume is higher in the last three years than in the first two years after cross-listing. No clear time trend emerges for Canadian companies as well, but in this case U.S. relative trading volume is significantly higher than for European and Asian companies, as it ranges between 50% and 80% for most of the time. Finally, South America and Mexico display the most striking results: trading volume in the U.S. starts out at over 6 times home market trading volume, it falls to 1.4 in three months, and then features a trend increase, ranging between 2 and 4 times the home market volume for most observations in the subsequent years.

Even within each of these country groups illustrated in Figure 2 there is large cross-sectional variability in trading patterns. For instance, within the group of European firms one finds patterns as different as those of Nokia, ASM Lithography, and Ahold. Nokia's trading volume in the U.S., initially three times as large as its domestic trading, still exceeded domestic trading six years after cross-listing. For ASM Lithography U.S. trading started at 26 times its domestic trading volume, only to fall to a level close to zero in two years' time. Instead, for Ahold U.S. trading rarely exceeded 5% of the domestic trading level for the first six years after cross-listing, a case which is not uncommon within the group of

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<sup>8</sup> This general pattern is also consistent with the findings by Gagnon and Karolyi (2004), who document the dominance of the home market for a sample of firms that cross-list in the U.S.

European companies. We will investigate the determinants of such an impressive cross-sectional diversity using multivariate regression analysis in Section 5.

## 4.2 Domestic trading volume

While Figure 1 and 2 provide descriptive evidence about the relative sizes of the foreign and domestic market, they do not provide any information about the level of trading volume in either market around the cross-listing date. In principle, the opening of a foreign market could be associated either with a decrease or with an increase of domestic trading activity. We start exploring this issue in Figures 3 and 4, which plot the median domestic turnover rate, defined as the ratio between trading volume and stock market capitalization of a company, in a four-year window around the cross-listing date.

Figure 3, which plots the median turnover rate for the whole sample shows that there is a peak in trading activity at the cross-listing date, and that on average, trading activity in the two years after cross-listing exceeds its pre-listing level. Figure 4 confirms this overall finding for Europe and Canada, while documenting a rather different pattern for the companies based in Australia/Asia and South America/Mexico. After cross-listing, the domestic turnover rate actually declines for companies based in Australia/Asia, while it does not change appreciably for companies based in South America/Mexico. This suggests that a cross-listing can have a different impact on domestic trading for developing and emerging country companies, an issue that we shall further investigate by multivariate regressions in Section 6.

## 4.3 Short-term effects around the cross-listing month

As illustrated in Figure 1, shortly after the cross-listing date the foreign market typically features a peak in trading activity relative to the domestic market. But also the domestic market is particularly active around the cross-listing date, as illustrated by the pattern of the median domestic turnover ratio in Figure 3. Taken together, these two findings suggest that both markets – the foreign and the domestic one – are abnormally active at or immediately after the cross-listing date.

Here we document in greater detail this trading surge around the cross-listing dates, on both the foreign and the domestic market. To measure the change in volume immediately after the cross-listing, we calculate the ratio between trading in the three months *after* the cross-listing and the trading volume in the subsequent 3 months, for the home as well as for the foreign market. We denote this “post-listing trading ratio” by  $TR^+$ :

$$TR^+ = \frac{\sum_{i=0}^2 Vol_i}{\sum_{i=3}^5 Vol_i} .$$

We also compute the ratio between trading in the three months *before* the cross-listing and the trading volume in the previous 3 months. Obviously this “pre-listing trading ratio” can be computed only for the home market, and we denote it by  $TR^-$ :

$$TR^- = \frac{\sum_{i=-2}^0 Vol_i}{\sum_{i=-5}^{-3} Vol_i}$$

In both ratios, the denominator is chosen so as to try and capture the “normal” trading activity around the cross-listing. This explains why it refers to trading volume outside the six-months window around the cross-listing (the subsequent three months for  $TR^+$  and the previous three months for  $TR^-$ ).

Figure 5 displays the distribution of the ratios defined above. It shows that  $TR^+$  is significantly above one, confirming that immediately *after* the cross-listing date trading activity is abnormally large *both* in the foreign and in the domestic market. In addition, also  $TR^-$  is significantly above one, which reveals a run-up in domestic trading volume even *prior* to the cross-listing.

## 5. Multivariate regression results

Section 2 presented a number of hypotheses regarding the effects company specificities may have on the distribution of trading across market venues following a cross-listing. In this section we test those hypotheses by estimating multivariate regressions whose dependent variable is the logarithm of the ratio of foreign to domestic trading volume. Table 4 reports the results obtained by three estimation methods: (i) OLS with standard errors adjusted for clustering on companies; (ii) panel regression with random effects, and (iii) panel regression with random effects and an adjustment for autocorrelation of company-specific errors.

We estimate random effect rather than fixed effect models because some important independent variables (high-tech sector, geographic distance, insider trading law enforcement, common language etc.) are constant over time for a given company and therefore would be perfectly collinear with fixed effects. Moreover, the Breusch-Pagan test (Breusch and Pagan, 1980) supports the existence of individual random effects in our data.<sup>9</sup> The reason for adjusting the estimates for autocorrelation in the residuals is that the Baltagi and Wu (1999) Locally Best Invariant test for zero first-order serial correlation leads us to reject the null hypothesis of no autocorrelation in residuals.

Table 3 is composed of three panels, each of which reports a different specification. Panel A contains the basic specification. In subsequent panels,

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<sup>9</sup> A Hausmann specification test turns out to be unreliable in our case, since the variance-covariance matrix underlying the test statistic is usually not positive definite. Furthermore, in many cases our data fails to meet the asymptotic assumptions required by the Hausman test, possibly due to the unbalanced structure of our sample.

company characteristics are interacted with some country characteristics -- geographic distance (Panel B) and an “emerging market” dummy (Panel C) -- so as to allow the coefficients of company characteristics to differ across countries.

The estimates of the basic specification of Panel A show that some, but not all the hypotheses laid out in Section 2, are consistent with the data.<sup>10</sup> The variables that are supposed to capture uninformed foreign trading appear with the right sign and significant coefficients, except for the correlation with the U.S. market, whose coefficient is not significantly different from zero. The fraction of trading volume captured by the U.S. market after cross-listing is higher for companies from countries with relatively small overall trading volume compared to the U.S. and with relatively underdeveloped capital markets. Conversely, foreign trading activity is larger for companies where U.S. institutional investors hold large equity stakes.

Of the variables capturing informed foreign trading, instead, three 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 of unfamiliarity of U.S. investors with the home market shares. Based on the random effects estimates, a 10% increase in the distance between the two markets reduces the ratio between the foreign and the domestic trading volume by approximately 3%. Second, the BKL incremental information measure indicates that foreign trading is larger when the foreign market contributes more to price discovery compared with the home market. Third, better anti-insider trading protection in the U.S. compared with the home market is associated with more active trading in the U.S.. This effect is not precisely estimated in the OLS estimation, but it is in the random effects estimates.

Several other results in Panel A of Table 3 contradict the hypotheses presented in Section 2. Recall that firms that are larger, grow more slowly, have less volatile returns and are followed by more analysts were expected to feature lower informational asymmetries, leading to higher foreign trading activity. In contrast, the results in Table 3 show that foreign trading is negatively and significantly associated with firm size, it is positively and significantly correlated with volatility, and not significantly correlated with analyst following and growth. In addition, foreign trading volume is comparatively larger for high-tech companies. Therefore, information-based trading can be consistent with our evidence only if we assume that the U.S. market has a comparative advantage over the home market in the evaluation of small, fast growing, volatile, and technically sophisticated firms, contrary to our priors.

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<sup>10</sup> We exclude Foreign Sales from the regressions as it would reduce the sample size considerably. However, if we include Foreign Sales in the regressions it does not turn out to be significant.

Next, trading frictions appear to contribute relatively little to explaining the distribution of trading activity. Trading cost difference appears with a significant negative coefficient, as one would have expected, only in the OLS estimates, but it is not significantly different from zero in the random effects estimates. Time zone difference, which is another possible source of trading frictions, is highly collinear with geographic distance and therefore it is omitted from our regression specification. Only if geographic distance is dropped from the specification the time-zone difference coefficient becomes negative and significant.

Finally, the regression also includes the time elapsed since cross-listing as an explanatory variable in order to capture the time variation in the distribution of trading volume in the foreign to domestic market after cross-listing. The coefficient of this variable is positive but not very precisely estimated in the OLS regression, while it is negative and highly significant in the random effects regressions. The latter estimates are consistent with the idea that the home market tends to gradually reassert its dominance over trading activity after the cross-listing.

In Panel B the specification is changed by interacting firm-level characteristics with geographic distance (measured in 1000 km) of the home market from the United States. The hypothesis that we wish to investigate is whether the effect of the variables that are supposed to reflect information based trading changes with the distance between the two markets. Indeed we find this to be the case for volatility and the high-tech sector dummy. Their positive effect on U.S. relative trading volume is weaker for companies whose domestic market is further away from the U.S.. Thus the effect of unfamiliarity partly counterbalances the U.S. market's taste for volatile and high-tech foreign stocks. However, even for the markets which are furthest away from the U.S. (Indonesia) the overall effect of the high-tech dummy and of volatility remains positive.<sup>11</sup>

Table 3, Panel C concludes our multivariate analysis by interacting firm-level characteristics with a dummy variable for emerging market firms: given the many structural differences between developed and emerging markets the distribution of trading between the foreign and the domestic market may respond quite differently to firm-level characteristics across these two groups.<sup>12</sup>

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<sup>11</sup> The specification of Panel B does not include geographic distance as a separate regressor to avoid collinearity, because this variable is highly correlated with some of the interacted variables. However, the results are almost unchanged if one includes this variable as an additional regressor. We also estimated a specification similar to that of Panel B where the variable used for interaction is the dummy variable capturing language differences instead of geographic distance. However, in this modified specification none of the interaction variables appears with a significant coefficient.

<sup>12</sup> As in Panel B, the specification in Panel C does not include the dummy variable for emerging markets to avoid collinearity.

Interestingly, the coefficients of the interacted variables indicate that the influence of size and volatility is quite different for companies from emerging markets: The overall effect of firm size on foreign trading volume is positive for companies from emerging markets, while it is negative for companies from developed markets. Thus, for emerging markets, our initial prior that larger companies may be more attractive for foreign investors is borne out by the data, probably because of the greater informational problems that affect small companies from emerging markets. Similarly, the positive effect of volatility on foreign trading volume is significantly lower for firms from emerging markets although it does not switch sign.

## **6. Evidence on domestic trading volume**

The analysis in Section 5 has focused on the relative shares of foreign and domestic trading in the wake of a cross-listing. However, it did not investigate how the level of trading activity reacts to a cross-listing. The development of an active foreign market may divert trading activity away from the domestic market or it may stimulate trading activity also at home, for instance by increasing analyst following also domestically.

To investigate this issue, we are going to analyze the behavior of the domestic turnover rate (defined as the ratio between trading volume and stock market capitalization of a company) around the cross-listing date. In Table 4 we report regressions of the logarithm of the domestic turnover rate on four time dummies: one corresponding to the year before cross-listing, one for the cross-listing year, one for the year after cross-listing and another for all subsequent years.<sup>13</sup> As a result, the coefficient of the constant 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 used in Section 5, 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. Panel A reports the estimates of the basic specification; in Panel B, instead, the time dummies are allowed to have different coefficients depending on whether the firm originates from a developed or an emerging market. As in Table 3, both panels show both OLS estimates with robust standard errors and random effects estimates, without and with a correction for AR(1) disturbances respectively.

The estimates reported in Panel A indicate that domestic trading activity increases in the cross-listing year and in the subsequent year. The random effect estimates (though not the OLS ones) show that there is also a significant long-term increase

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<sup>13</sup> The logarithmic transformation of the variable was made to eliminate the skewness of the dependent variable.

in domestic trading activity. These results confirm the visual impression conveyed by Figure 3: for the sample as a whole, cross-listing does not appear to depress but rather to foster domestic trading activity, controlling for company and country characteristics.

However, Panel B shows that these conclusions do not apply to the whole sample, but only to firms based in developed markets. For firms based in emerging markets, if anything, a cross-listing in the U.S. is correlated with lower domestic trading volume: this negative effect is significant only in the OLS estimates, for the year before the cross-listing and for the period starting one year after the cross-listing. But the imprecision of the estimates is most likely a reflection of the paucity of observations for emerging market firms: we observe only 12 such companies in the year before the cross-listing, 13 in the cross-listing year, and 20 in the year after the cross-listing. Our evidence for emerging market companies accords with that reported by Levine and Schmukler (2006), who find for a sample of 45 emerging markets that trading volume migrates from the domestic to the foreign market after a cross-listing.

The estimated coefficients of company and country characteristics reported in Table 4 are of independent interest. Focusing on the random effect estimates in panel B, we see that the turnover rate is significantly higher for larger companies, which presumably are more liquid than smaller ones, and for those that receive more attention from analysts, whose reports probably feed the trading interest of investors. The results also point to the presence of positive spillover effects: the domestic turnover rate of a company is positively correlated with the aggregate trading volume of the corresponding market and with the development of the domestic capital markets.<sup>14</sup>

## 7. Conclusions

This paper has explored two main issues. First, what enables the survival and growth of an active foreign market for a company's shares in the wake of a cross-listing? We find that the foreign market for the shares of a cross-listed company tends to be more active compared to the domestic market when the company is based in a country that is geographically close to the foreign market, has low degree of financial development and relatively poor anti-insider trading protection. Moreover, the relative size of the foreign market is larger if the company is small, high-volatility and high-tech.

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<sup>14</sup> These results do not change if we add variables specific to the target market of the cross-listing (e.g., correlation with the U.S. market, and the BKL incremental information measure), interacted with an appropriate dummy variable (0 before the cross-listing and 1 from the cross-listing year onwards). The coefficients of these variables turn out to be statistically insignificant.

Second, does the development of an active foreign market entail lower trading activity on the domestic market? On the whole, our answer is negative: we find that domestic market activity does not suffer when a cross-listing occurs. Quite to the contrary, the domestic turnover ratio increases significantly. Also in this case, however, we find that the degree of domestic market development matters considerably. For firms based in developed markets, the domestic turnover rate increases in the wake of cross-listing and remains permanently higher. In contrast, emerging market firms tend to experience a decrease in domestic trading activity.

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## 9. Data Appendix

**Table A1. Variable Definitions and Sources**

Variable	Source and/or Definition
Trading Volume in Dollars	<b>Source:</b> Financial Thomson Datastream, Reuters Equity 3000. The Swiss Exchange was formed in 1996 as a merger of the Geneva, Basle, and Zurich exchanges. Before the merger we aggregate data from these three exchanges. For German cross-listings we add up the time series for XETRA and the Frankfurt stock exchange. Volume counting conventions may differ across exchanges. In particular, counting conventions generally favor high volume on dealer markets due to multiple inventory adjustments triggered by an initial trade. However, the use of a panel regression framework tends to mitigate the influence of this measurement issue. <b>Frequency:</b> daily, monthly and yearly (1980-2001)
Trading Volume in Shares	<b>Source:</b> Financial Thomson Datastream, Reuters Equity 3000 <b>Frequency:</b> daily, monthly and yearly (1980-2001)
Stock Prices in Dollars	<b>Source:</b> Financial Thomson Datastream, Reuters Equity 3000 <b>Frequency:</b> daily, monthly and yearly (1980-2001)
Ratio Foreign to Domestic Volume	Trading volume on foreign exchange divided by domestic trading volume.
Market Value in Dollars	<b>Source:</b> GlobalVantage and Worldscope. <b>Frequency:</b> yearly (1985-2001).
Monthly Turnover Ratio	Monthly Trading Volume in Dollars divided by market value in Dollars
Geographic Distance	Geographic distance is measured in km between the capitals of the foreign and domestic market.
Total Market Volume in Dollars	<b>Source:</b> Financial Thomson Datastream. <b>Frequency:</b> daily, monthly and yearly (1980-2001)
Ratio Foreign to Domestic Total Market Volume	Total trading volume in Dollars on foreign exchange divided by domestic total trading volume in Dollars.
Financial Development	The Financial Development Variable is for each domestic market based on the sum of the capitalization of the stock and credit market normalized by GDP. We then use the percentage difference between the home country's financial development and the average financial development of the sample countries in every year in our analysis.
Total Assets (million dollars)	<b>Source:</b> GlobalVantage and Worldscope. <b>Frequency:</b> yearly (1985-2001).
Foreign Sales, percent	<b>Source:</b> Worldscope. <b>Frequency:</b> yearly (1985-2001).
Asset Growth, percent	<b>Source:</b> Worldscope. <b>Frequency:</b> yearly (1985-2001).
High Tech Sector	Dummy variable equaling 1 for high-tech companies and 0 otherwise. We use the same definition as applied in Pagano, Röell, and Zechner (2002). This definition is based on SIC Code provided by GlobalVantage and Worldscope.

Variable	Source and/or Definition
Correlation with Foreign/Domestic Market	Yearly 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. <b>Frequency:</b> yearly (1983-2001).
Volatility	Volatility is calculated annually as the standard deviation of weekly stock returns. <b>Frequency:</b> yearly (1983-2001).
Baruch-Karolyi-Lemmon (BKL) incremental information measure	We use this information measure as introduced in Baruch, Karolyi, and Lemmon (2003). The measure is based on the difference in $R^2$ of two regressions using weekly company and index returns and is calculated in the following way: $BKL = \frac{(R_A^2 - R_B^2)/2}{(1 - R_A^2)/(n - 3)}$ Regression A is a regression that explains the company returns using foreign and domestic index returns. Regression B is a regression that explains the company returns using only domestic index returns. $n$ is the sample size (at least 52 in our case).
Trading Costs	Trading Costs are calculated as the sum of commissions and fees in a given market based on global trading data from 135 institutional investors ( <b>source:</b> Elkins/McSherry Co., Inc.). Missing values have been replaced by extrapolation. <b>Frequency:</b> yearly (1985-2000)
Difference in Trading Costs between Foreign and Domestic Exchange (b.p.)	Difference in trading costs is calculated as the difference between trading costs in the foreign and domestic market. <b>Frequency:</b> yearly (1985-2000)
Number of Forecasts	The number of analysts' forecasts for a company in a specific calendar year aggregated from the I/B/E/S International Database. <b>Frequency:</b> yearly (1985-2000)
Shares held by institutional investors and number of institutional investors after cross-listing, percent	We aggregate data on shares held by institutional investors and the number of institutional investors in companies listed on U.S. exchanges from the Financial Thomson Shareworld Database. Note further that missing information on shares held by institutional investors and on the number of institutional investors is replaced by zero because this data must be reported by appropriate institutions. <sup>15</sup> <b>Frequency:</b> yearly (1985-2001)
Insider Trading Law Enforcement	Dummy variable that equals 1 if insider trading laws have been enforced, and 0 otherwise based on Bhattacharya and Daouk (2002). <b>Frequency:</b> yearly

<sup>15</sup> Note, however, that our multivariate results do not qualitatively change if we only estimate our regressions with the sub-sample of companies for which we have positive information on ownership by U.S. 13-F institutions.

<b>Variable</b>	<b>Source and/or Definition</b>
Difference in Insider Trading Law Enforcement between U.S. and domestic markets	We define the difference in insider trading law enforcement in the following way in each year: it equals zero if the dummy variable for insider trading law enforcement is the same in the U.S. and the domestic market, it equals one if the dummy is higher for the U.S. market and -1 if it is higher for the domestic market.

**Table 1 Determinants of Foreign Trading Volume**

<b>Explanatory variables</b>	<b>Empirical measure</b>	<b>Predicted effect on foreign trading volume</b>
Uninformed foreign trading	Ratio of total volume on U.S. market to total domestic stock exchange volume	+
	Correlation with the U.S. market	-
	Development of domestic capital market	-
	Presence of foreign institutional investors	+
Informed foreign trading	Geographic distance	-
	Different language	-
	Fraction of foreign sales	+
	Company size (total assets)	+
	Company growth rate	-
	Variability of stock return	-
	BKL incremental information measure	+
	Analyst following	+
	High-tech sector	+/-
	Insider trading protection (foreign vs. home)	+
Trading frictions	Trading costs (foreign vs. home)	-
	Time-zone difference	-

**Table 2 Means of Important Variables by Home Country**

Table 2 shows means for our dependent and explanatory variables, which are calculated in a two step procedure. First, we calculate simple averages of the variables over time for each company. Second, we average company means within each country. Panel A describes the company characteristics, whereas Panel B summarizes market characteristics.

**Panel A: Company Characteristics**

Home Country	Number of Firms	Foreign to Domestic Trading Volume	Domestic Turnover Ratio	Total Assets	Asset Growth	High-Tech	Foreign Sales	Volatility	Correlation with U.S. Market	BKL Measure	Analysts' Forecasts	Shares Held by U.S. Institutional Investors	Number of U.S. Institutional Investors
Argentina	5	8.536	0.042	5126.31	10.444	0.400	2.785	0.056	0.308	1.316	180.129	0.092	50.935
Australia	16	1.495	0.071	4526.43	13.274	0.133	41.752	0.077	0.155	1.414	85.163	0.004	9.406
Belgium	1	0.009	0.000	10262.29	3.805	0.000		0.041	0.121	0.465	209.667	0.007	3.000
Brazil	4	4.349	0.123	6398.56	12.005	0.002		0.114	0.265	1.633	203.833	0.002	55.375
Canada	205	2.478	0.057	4197.82	22.172	0.172	41.845	0.094	0.166	1.820	65.905	0.112	26.294
Chile	12	3.620	0.029	3086.62	21.237	0.000	26.030	0.073	0.222	1.389	74.074	0.022	23.504
China	3	0.193	0.034	3273.12	7.840	0.000	4.890	0.060	-0.008	1.473	163.801	0.016	15.375
Colombia	1	6.861		2966.73	17.124	0.000		0.076	-0.003		39.875	0.099	13.429
Denmark	2	8.821		1200.28	1.115	0.000	62.346	0.089	0.241	2.652	168.111	0.118	29.760
Finland	2	0.637		5983.08	20.631	0.000	46.918	0.057	0.231	0.899	381.652	0.229	180.635
France	15	1.363	0.028	40352.95	20.714	0.227	59.340	0.071	0.251	2.267	243.580	0.146	38.570
Germany	7	1.336	0.009	41403.19	8.572	0.119	44.257	0.056	0.194	1.116	223.321	0.075	29.056
Hong Kong	1	0.529	0.027	1031.06	48.520	0.000	100.000	0.093	0.117	0.529	27.200	0.016	9.100
Indonesia	1	23.801	0.089	291.57	-5.553	0.000	14.903	0.154	-0.036	0.613	12.250		
Ireland	4	12.589	0.087	1839.80	34.977	0.250	58.191	0.082	0.407	3.520	58.220	0.185	49.146
Israel	18	5.041	0.117	652.27	15.601	0.500	58.571	0.066	0.307	1.362	18.283	0.166	30.903
Italy	6	0.504	0.007	28238.82	15.331	0.143	49.251	0.049	0.230	1.802	142.049	0.051	31.417
Japan	14	0.104	0.003	25785.82	6.918	0.231	33.582	0.052	0.144	1.462	104.093	0.033	27.376
Mexico	6	3.232	0.036	1885.38	16.727	0.000	24.532	0.075	0.233	1.427	158.972	0.016	14.591
Netherlands	17	1.838	0.037	51472.20	20.830	0.055	62.183	0.051	0.322	2.452	237.633	0.083	43.143
New Zeal.	4	0.348	0.011	4245.93	-1.606	0.250	56.048	0.053	0.236	1.478	91.467		
Norway	4	0.831		4598.91	15.391	0.000	60.837	0.074	0.238	1.534	173.913	0.189	48.696
Peru	3	5.464	0.035	4655.92	15.391	0.333	11.870	0.067	0.114	0.956	93.109		
Philippines	2	6.561	0.014	116.25	-5.669	0.000		0.122	-0.045	1.268	18.045		
Portugal	1	0.033		13714.04		0.000		0.040	0.032	3.786	142.250		
Singapore	1	4.229	0.151	756.09	7.345	0.000	77.743	0.086	0.254	3.157	188.800		
S. Africa	13	1.239	0.015	1200.80	11.127	0.000	10.318	0.084	-0.017	1.745	36.412	0.012	10.033
S. Korea	2	0.394	0.015	24122.45	21.224	0.500		0.078	0.209	3.644	221.354	0.052	66.750
Spain	3	0.238	0.009	47439.23	23.934	0.000	24.964	0.041	0.288	1.289	273.045	0.087	95.019
Sweden	8	0.227	0.012	4043.73	14.711	0.478	62.698	0.077	0.297	1.524	114.807	0.058	26.070
Swiss	2	0.173	0.017	932.94	26.590	0.400	76.025	0.062	0.261	2.291	100.875	0.042	4.800
Taiwan	2	0.167	0.016	4088.25	34.489	0.500		0.073	0.192	3.992	177.183	0.004	59.750
UK	50	1.142	0.021	25073.83	27.296	0.258	52.170	0.052	0.219	1.920	123.595	0.046	53.271
Venezuela	2	3.151	0.025	335.33	17.065	0.000	10.136	0.101	0.145	1.134	22.472		
<b>Total</b>	<b>437</b>	<b>2.351</b>	<b>0.044</b>	<b>12199.88</b>	<b>19.753</b>	<b>0.184</b>	<b>42.839</b>	<b>0.079</b>	<b>0.190</b>	<b>1.804</b>	<b>103.639</b>	<b>0.087</b>	<b>34.523</b>

Panel B: Market Characteristics

Home Country	Number of Firms	Geographic Distance	Financial Development	U.S. vs. Domestic Insider Trading Law Enforcement.	Ratio of U.S. to Domestic Total Market Trading Volume	U.S. minus Domestic Trading Cost
Argentina	5	8537	-0.701	0.119	146.049	-29.803
Australia	16	16005	-0.041	0.367	33.190	-34.073
Belgium	1	5889	-0.149	0.000	412.491	-10.843
Brazil	4	6843	-0.611	0.000	18.522	-22.188
Canada	205	553	0.165	0.012	1.998	-13.292
Chile	12	8265	-0.071	0.214	164.197	-23.252
China	3	10449	-0.219	1.000	90.264	
Colombia	1	4310	-0.704	1.000	2128.181	-37.675
Denmark	2	6191	-0.388	0.557	2236.189	-13.742
Finland	2	6619	-0.027	0.263	2060.801	-14.056
France	15	5838	-0.073	0.000	39.402	-9.269
Germany	7	6204	-0.032	0.032	11.046	-10.328
Hong Kong	1	12968	1.650	0.200	2.955	-36.070
Indonesia	1	16184	-0.562	0.250	85.919	-67.575
Ireland	4	5116	-0.135	1.000	185.501	-90.419
Israel	18	9120	-0.273	0.245	7456.177	-9.702
Italy	6	6467	-0.383	0.316	70.937	-11.721
Japan	14	10852	0.774	0.271	1.282	-17.732
Mexico	6	3370	-0.641	1.000	14.937	-20.609
Netherlands	17	5866	0.576	0.289	19.725	-9.718
New Zeal.	4	14420	-0.022	1.000	58.836	
Norway	4	5916	-0.248	0.063	426.011	-15.255
Peru	3	5884	-0.725	0.000	923.095	-38.251
Philippines	2	13684	-0.475	1.000	260.089	-91.514
Portugal	1	5424	-0.108	1.000	457.996	-20.740
Singapore	1	15349	0.731	0.000	14.022	-46.840
S. Africa	13	12853	0.515	1.000	12.962	-25.344
S. Korea	2	11059	-0.061	0.000	5.215	-45.606
Spain	3	5772	-0.131	0.713	59.212	-17.621
Sweden	8	6320	0.241	0.135	119.584	-11.664
Swiss	2	6326	1.398	0.000	38.179	-15.020
Taiwan	2	12542		0.000	1.849	-39.665
UK	50	5572	0.665	0.003	7.256	-25.956
Venezuela	2	3437	-0.870	1.000	1317.461	-89.142
<b>Total</b>	437	4509	0.169	0.157	326.955	-18.688

**Table 3 Multivariate Regressions for the ratio of foreign to domestic trading volume**

We remove extreme positive outliers from the following explanatory variables: asset growth, volatility and the Baruch-Karolyi-Lemmon incremental information measure. Explanatory variables (see the Data Appendix for their detailed definitions) are lagged by one period, except for the high-tech sector dummy, insider trading enforcement, the time elapsed since cross-listing, the “Non-English speaking” dummy variable and the geographic distance.

Panel A: No Interacted Variables

<b>Dependent Var.:</b> $\ln\left(\frac{Vol_{foreign}}{Vol_{domestic}}\right)$	Pooled OLS with Robust SE	Random Effects	Random Effects with AR(1) Disturbances
LN(Ratio total foreign market to total domestic market trading volume)	0.169**	0.108**	0.089*
Correlation with U.S. market	0.825	-0.094	-0.017
Development of Domestic Capital Market	-0.673**	-0.347**	-0.391**
Institutional Ownership in %	2.253***	1.524***	0.914***
Number of Institutional Owners	0.008***	0.005***	0.005***
Ln(Geographic Distance)	-0.500***	-0.275**	-0.324***
Non-English Speaking	0.375	0.026	0.216
LN(Total Assets)	-0.255***	-0.221***	-0.279***
Asset growth	0.002	0.000	0.001
Volatility	9.812***	2.981**	2.115
BKL Incremental Information Measure	0.150***	0.01	0.013
Number of forecasts	-0.001	0.000	0.000
High tech sector	0.475*	0.597**	0.547**
Insider trading enforcement	0.411	0.375***	0.342***
Trading cost difference	-0.033**	0.003	-0.005
Time elapsed since cross-listing	0.014	-0.043***	-0.019**
Constant	1.753*	1.981**	2.459***
Number of observations (groups)	1942 (307)	1942 (307)	1942 (307)
R <sup>2</sup>	0.368	0.248	0.288

Panel B: Interaction variables between company characteristics  
and Geographic Distance

<b>Dependent Var.:</b> $\ln\left(\frac{Vol_{foreign}}{Vol_{domestic}}\right)$	Pooled OLS with Robust SE	Random Effects	Random Effects with AR(1) Disturbances
LN(Ratio foreign to domestic market trading volume)	0.082	0.091**	0.061
Correlation with U.S. market	0.863	-0.068	-0.012
Development of Domestic Capital Market	-1.039***	-0.422***	-0.477***
Institutional Ownership in %	2.531***	1.550***	0.946***
Number of Institutional Owners	0.008***	0.005***	0.005***
Non-English Speaking	0.083	-0.14	0.005
LN(Total Assets)	-0.249***	-0.227***	-0.270***
<b>INT:</b> LN(TA)	-0.001	-0.001	-0.003
Asset growth	0.001	-0.001	0.000
<b>INT:</b> Asset growth	0	0.000**	0.000
Volatility	13.374***	3.507***	2.816**
<b>INT:</b> Volatility	-0.165***	-0.101*	-0.096*
BKL Incremental Information Measure	0.131***	0.01	0.015
<b>INT:</b> BKL Incremental Information Measure	0.000	0.000	-0.001
Number of forecasts	0.002	0.000	0.000
<b>INT:</b> Number of forecasts	0.000	0.000	0.000
High tech sector	0.905**	1.234***	1.169***
<b>INT:</b> High-tech sector	-0.101	-0.143*	-0.143**
Insider trading enforcement	0.335	0.347***	0.333**
Trading cost difference	-0.026**	0.003	-0.004
Time elapsed since cross-listing	0.020*	-0.044***	-0.019**
Constant	-1.834***	0.057	0.163
Number of observations	1942	1942	1942
(groups)	(307)	(307)	(307)
R <sup>2</sup>	0.378	0.247	0.288

Panel C: Interaction variables between company characteristics  
and the “Home Market is an Emerging Market” Dummy Variable

<b>Dependent Var.:</b> $\ln\left(\frac{Vol_{foreign}}{Vol_{domestic}}\right)$	Pooled OLS with Robust SE	Random Effects	Random Effects with AR(1) Disturbances
LN(Ratio foreign to domestic market trading volume)	0.145**	0.082*	0.033
Correlation with U.S. market	0.7	-0.091	-0.059
Development of Domestic Capital Market	0.256	-0.129	-0.043
Institutional Ownership in %	2.458***	1.611***	1.046***
Number of Institutional Owners	0.008***	0.005***	0.005***
LN(Total Assets)	-0.266***	-0.231***	-0.276***
<b>INT: LN(TA)</b>	<b>0.303***</b>	<b>0.382***</b>	<b>0.399***</b>
Asset growth	0.001	0	0.001
<b>INT: Asset growth</b>	<b>0.006</b>	<b>0.004</b>	<b>0.001</b>
Volatility	11.337***	2.978**	2.436*
<b>INT: Volatility</b>	<b>-2.598***</b>	<b>-1.848**</b>	<b>-1.744***</b>
BKL Incremental Information Measure	0.145***	0.019	0.018
<b>INT: BKL Incremental Information Measure</b>	<b>-0.223*</b>	<b>-0.109**</b>	<b>-0.059</b>
Number of forecasts	0	0	0
<b>INT: Number of forecasts</b>	<b>0.005*</b>	<b>0.002</b>	<b>0.001</b>
High tech sector	0.372	0.656***	0.595***
<b>INT: High-tech sector</b>	<b>0.552</b>	<b>0.162</b>	<b>0.413</b>
Insider trading enforcement	0.346	0.361***	0.271**
Ln(Geographic Distance)	-0.533***	-0.416***	-0.462***
Non-English Speaking	-0.07	-0.449	-0.185
Trading cost difference	-0.011	0.008*	0.002
Time elapsed since cross-listing	0.016	-0.040***	-0.018**
Constant	2.002**	2.931***	3.352***
Number of observations (groups)	1942 (307)	1942 (307)	1942 (307)
R <sup>2</sup>	0.454	0.357	0.378

**Table 4 Multivariate Regressions for the turnover ratio on the home market**

Panel A: Basic Specification

<b>Dependent Var.:</b> $\ln(TO_{domestic})$	Pooled OLS with Robust SE	Random Effects	Random Effects with AR(1) Disturbances
LN(Total Assets)	0.065	0.122**	0.142**
Asset growth	-0.004	0.032*	0.034**
Number of forecasts	0.156**	0.152***	0.141***
Volatility	0.009	0.01	-0.062**
Correlation with home market	0.008	-0.056*	-0.071**
Financial Development of Domestic Market	0.220***	0.119**	0.092*
Ln(Domestic market volume)	0.211***	0.213***	0.173***
Trading Costs	-0.007*	-0.004	-0.002
High tech sector	-0.069	-0.16	-0.108
Insider Trading Enforcement	-0.220*	0.008	0.019
<b>Dummy in the year before Cross-Listing</b>	0.079	0.104	0.104
<b>Dummy for Cross-Listing Year</b>	0.273***	0.343***	0.313***
<b>Dummy for year 1 after Cross-Listing</b>	0.211**	0.264***	0.239**
<b>Dummy for year x&gt;1 after Cross-Listing</b>	-0.044	0.161**	0.179*
Constant	-5.517***	-5.986***	-5.561***
Number of observations	1512	1512	1512
(groups)	(167)	(167)	(167)
R <sup>2</sup>	0.107	0.085	0.079

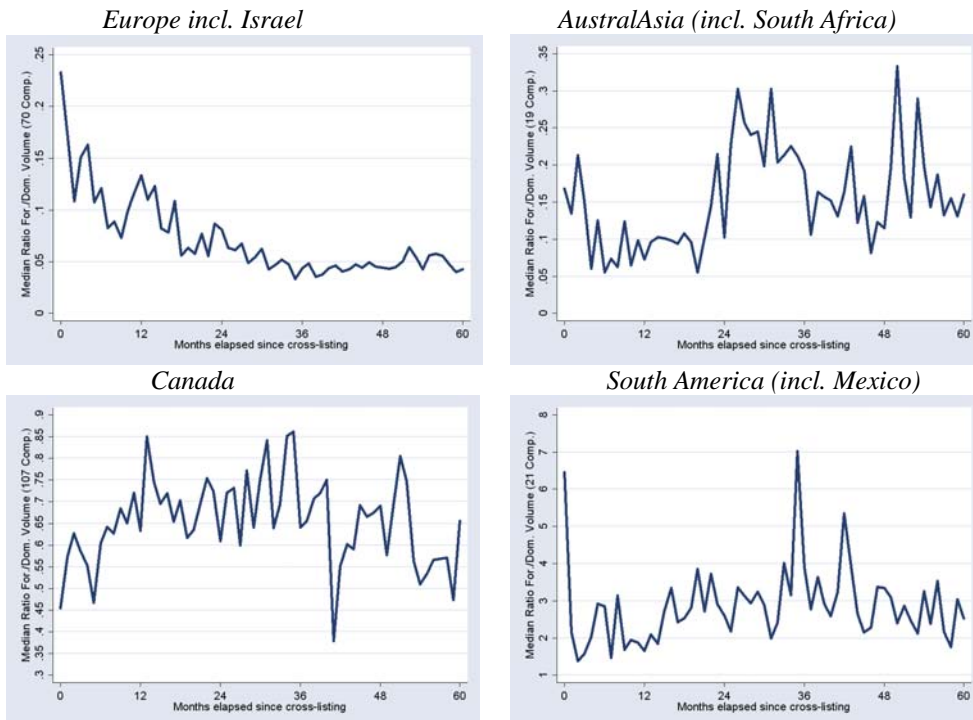
Panel B: Separation of Emerging and Developed Domestic Markets

<b>Dependent Var.:</b> $\ln(TO_{domestic})$	OLS with Robust SE	Random Effects	Random Effects with AR(1) Disturbances
LN(Total Assets)	0.075	0.122**	0.141**
Asset growth	-0.001	0.03	0.032*
Number of forecasts	0.151**	0.152***	0.141***
Volatility	0.032	0.02	-0.051
Correlation with home market	0.012	-0.035	-0.051
Financial Development of Domestic Market	0.150**	0.074	0.042
Ln(Domestic market volume)	0.179***	0.189***	0.147***
Trading Costs	-0.002	-0.003	-0.001
High tech sector	-0.06	-0.165	-0.113
Insider Trading Enforcement	-0.234*	0.05	0.046
<b>Developed Countries:</b> Dummy in the year before Cross-Listing	0.172	0.142	0.156*
<b>Developed Countries:</b> Dummy for Cross-Listing Year	0.302***	0.333***	0.320***
<b>Developed Countries:</b> Dummy for year 1 after Cross-Listing	0.246**	0.254***	0.250**
<b>Developed Countries:</b> Dummy for year $x > 1$ after Cross-Listing	0.023	0.224***	0.260***
<b>Emerging Countries:</b> Dummy in the year before Cross-Listing	-0.652*	-0.264	-0.32
<b>Emerging Countries:</b> Dummy for Cross-Listing Year	-0.085	0.286	0.16
<b>Emerging Countries:</b> Dummy for year 1 after Cross-Listing	-0.15	0.183	0.071
<b>Emerging Countries:</b> Dummy for year $x > 1$ after Cross-Listing	-0.489**	-0.25	-0.293
Constant	-5.413***	-5.844***	-5.422***
Number of observations (groups)	1512 (167)	1512 (167)	1512 (167)
R <sup>2</sup>	0.118	0.096	0.092

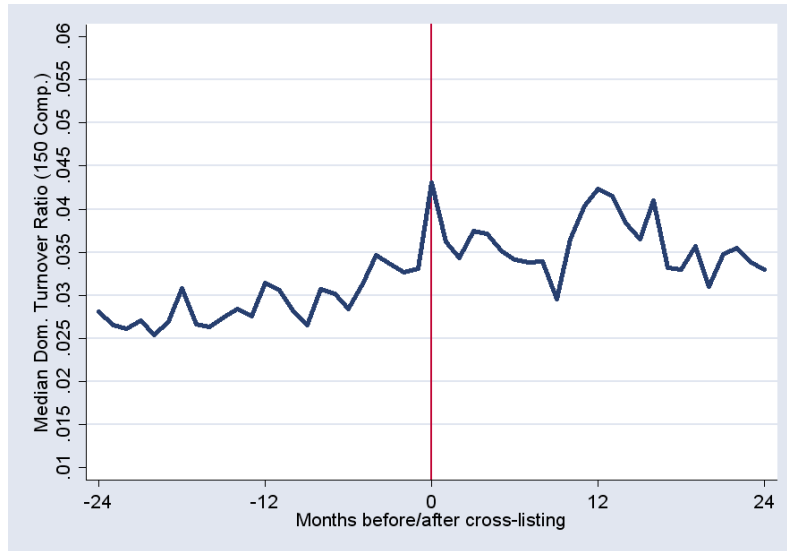
**Figure 1 Median Monthly Ratio of Foreign to Domestic Volume in the 5 Years after Cross-Listing**



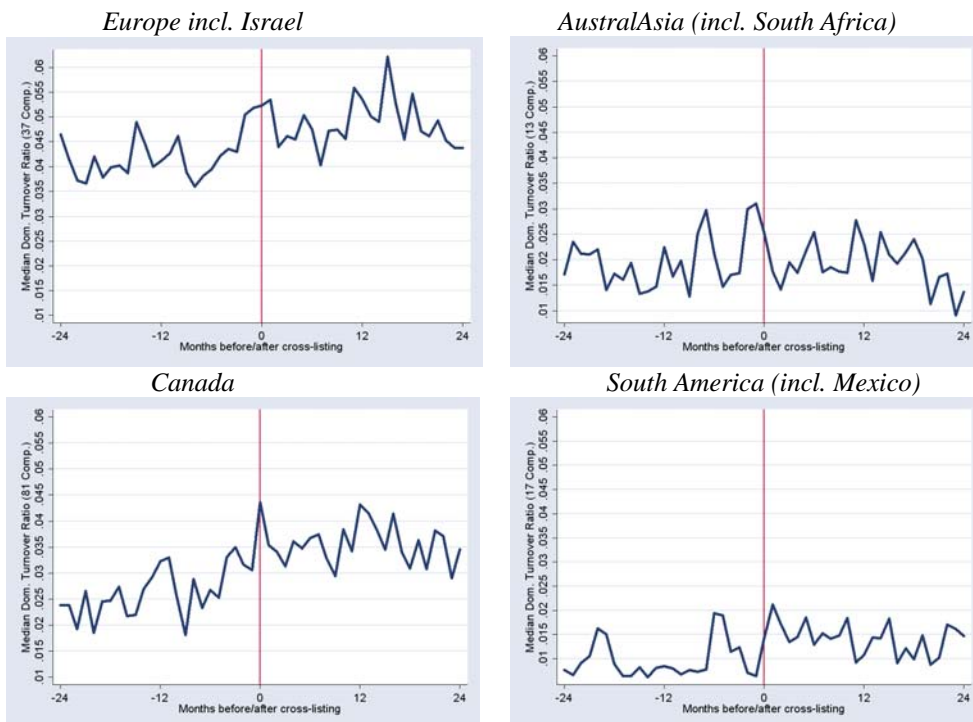
**Figure 2 Median Monthly Ratio of Foreign to Domestic Volume in the 5 Years after Cross-Listing per Continent**



**Figure 3 Median Monthly Turnover Ratio on the Domestic Market in a 4 Years Window around the Cross-Listing**



**Figure 4 Median Monthly Turnover Ratio on the Domestic Market in a 4 Years Window around the Cross-Listing**



**Figure 5** Box Plots of Trading Pattern immediately before and after the Cross-listing.

The first two boxes describe the pre-listing and post-listing trading ratio on the home market. The third box describes the post-listing effect on the foreign market. Values above 1 indicate above-average trading activity. Statistical tests reveal at the 99%-level that the median values are above 1.

