

The Determinants of Trading Location of Cross-Listed Stocks

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ABSTRACT

We examine the determinants of the foreign *versus* domestic trading volume of European cross-listed stocks. Stocks that offer greater diversification benefit to foreign investors, are based in domestic countries that have higher execution costs and poorer information environment, and are more visible to foreign investors exhibit more frequent trading in foreign markets compared to domestic markets. In addition, firms that are cross-listed in regulated markets attract a greater fraction of foreign to domestic trading volume than those traded in unregulated foreign markets. Diversification benefit and execution costs are more important determinants of foreign to domestic trading for unregulated markets while the quality of the information environment is more vital for trading in regulated markets.

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1. Introduction

A considerable body of academic literature perceives cross-listings as value-enhancing decisions.¹ However, there is a debate on the sources of the value created through cross-listing (Siegel, 2009; Karolyi, 2012). One of the main sources often cited by corporate managers is the increase in stock liquidity (Bancel and Mittoo, 2001). Consistent with this view, Foerster and Karolyi (1998) report that relative to the trading before cross-listing, both the number and the value of stocks traded increase substantially after cross-listing.² However, not all stocks benefit from increased liquidity. While some stocks display a very active trading in the foreign market, other stocks, exhibit only limited trading (Baruch et al, 2007; Halling et al, 2008). Such considerable diversity in the liquidity of cross-listed stocks highlights for both company managers and the executives of stock exchanges the importance of a thorough understanding of the determinants of the location of trading. For company managers an active trading of stocks in a foreign market reflects the success of the cross-listing decision. Frequent trading in a foreign stock exchange enhances a firm's ability to raise capital and widens its shareholders' base, which in turn, helps increasing firm value through reduced cost of capital. From the perspective of stock exchanges it is an issue of survival. In recent years, stock exchanges are exposed to an unprecedented level of competition. Owing to significant technological and organizational changes, a stock exchange's competitiveness against their industry peers depends on its ability to attract order flows and liquidity to investors (Aggarwal, 2002).³ Only with a comprehensive knowledge of the determinants of the location of trading, the corporate managers can identify the most suitable stock exchanges for listing and the stock market regulators can set up provisions that are attractive to their clients – corporations as well as investors. However, the existing literature tells very little about the determinants of the geographical distribution of trading volume of European stocks that are listed on multiple stock exchanges around the world.

This paper investigates the determinants of the foreign *versus* domestic trading volume, and thus, contributes on two main fronts of the relevant literature. First, prior studies mostly

¹ Gagnon and Karolyi (2010) provide a comprehensive review of the relevant literature.

² More broadly, confirming the importance of stock liquidity as a primary source of cross-listing benefit the global trading volume of foreign listed stocks reached 175 billion depositary receipts with trading value exceeding \$3.8 trillion in 2011 (Bank of New York, 2011).

³ For anecdotal evidence on the importance of trading volume for stock exchanges survival see "Lack of volume brings end to financial chapter", The Boston Globe, (October, 3, 2007).

focus on the distribution of trading volume of cross-listed stocks between the US market and their home market (e.g. Pulatkonak and Sofianos, 1999; Baruch et al, 2007; Halling et al, 2008). However, findings on the determinants of trading in the US markets alone cannot be generalized because US markets differ significantly from other markets in their institutional characteristics and regulations. Therefore, by providing a comparative analysis of trading volume of European stocks that are cross-listed on several foreign markets we present an out-of-sample test of the prior literature results reported on US cross-listings.⁴ Second, unlike previous studies, this paper makes a distinction between the trading on regulated and unregulated markets. This is essential because these markets compete against each other to attract equity trading but differ on their pre-conditions for trading and information environment. The importance of unregulated markets is growing rapidly with the development of alternative markets, such as the Open market of Deutsche Börse, that are characterised by lower costs and limited disclosure requirements. Companies that gain admission to trade on such markets make their stocks available to a wider range of investors at no additional direct costs. Despite the fact that a significant number of stocks are traded on such unregulated markets, the literature on what attracts the investors to trade on unregulated markets, as opposed to regulated markets, is still silent.^{5,6} Therefore, it is important to investigate whether there is a difference between regulated markets and unregulated markets in their ability to attract foreign equity trading and to identify the factors that are responsible in shaping the volume of trade in each type of markets.

Prior studies broadly suggest that the distribution of trading volume of cross-listed stocks relates to fundamental and informational motives (Pagano, 1989; Chowdhry and Nanda, 1991; Huddart et al, 1999). Building on this literature, we utilize a comprehensive set of characteristics of host/home markets and companies, representing the fundamental and informational motives of trading to examine the distribution of trading volume between foreign and home markets. Regarding fundamental motives of trading, the findings suggest that the ratio of foreign to domestic trading volume is larger when the return correlation between host and home market returns is low, that is, when the stock offers diversification benefit to foreign investors. Further, trading volume distributions is significantly affected both by the direct and indirect costs of

⁴ According to the World Federation of Exchanges' statistics, both the US and non-US stock exchanges are important host markets for cross-listed stocks. In particular, in 2007 foreign companies constituted 18% of the total number of listed companies on New York Stock Exchange, 22% on London Stock Exchange, 12% on Deutsche Borse, 19% on Euronext and 25% on SWX. In addition, foreign equity trading contributes significantly to the exchanges' turnover: in 2007 the fraction of foreign equity trading in the total equity trading was 8% on NYSE, 41% on LSE, 8% on Deutsche Borse, 1% on Euronext, and 9% on SWX (data source: <http://www.world-exchanges.org/statistics/>).

⁵ For example, in 2009, less than half of the European equity trading took place on regulated markets and over a third occurred on over-the-counter markets. "Global exchanges—don't panic", Financial Times, 22 Jul 2012.

⁶ An exception is Bris et al. (2012) that compares the valuation effects of a listing on a regulated market of the London stock exchange and of an admission to trade on an unregulated market of the London stock exchange.

trading. Foreign trading is more active when the foreign market has lower direct trading costs and higher market turnover ratio relative to the domestic market and when trading in both foreign and home markets takes place in the same currency, thus when there is neither currency risk nor currency conversion costs. The results also confirm a positive relation between price per share (relative to other stocks) and proportion of trading in foreign markets, consistent with Menyah and Paudyal (2000) that argue that the order processing cost component of bid-ask spread can be lower for stocks with higher price per share. Furthermore, the findings show that the ratio of foreign versus domestic trading volume depends on a stock's risk: the higher risk the more active trading in foreign markets. This evidence complements the findings of Abdallah and Goergen (2008) that riskier stocks are more likely to cross-list to overcome deficiencies of home markets. The share of foreign trading volume is also positively associated with foreign institutional ownership consistent with the view that foreign institutional investors may absorb trading imbalances something that encourages other investors to trade (Dahlquist and Robertsson, 2001). Furthermore, foreign trading volume is inversely related to domestic ownership concentration suggesting that ownership concentration limits the ability of foreign investors to hold stocks (Heflin and Shaw, 2000; Rubin, 2007).

Regarding informational motives of trading, the findings confirm the importance of the quality of legal environment and the cost of acquiring information in explaining the distribution of trading volume between the home and foreign markets. In particular, enforcement of insider trading regulations in the foreign market (relative to the domestic market) provides the foreign market with a competitive advantage in delivering liquidity to investors of cross-listed companies. The results also show that foreign equity market is more active when the host market is geographically closer to the home market, host and home markets share the same language, and a company uses internationally recognized accounting standards. Moreover, the proportion of foreign trading (relative to domestic trading) increases with the duration of trading in the foreign market. This evidence highlights the significance of foreign investors' familiarity with the company (Grinblatt and Keloharju, 2001) and stock visibility (Chordia et al, 2007).

Comparing regulated versus unregulated markets, the results show that regulated markets are significantly more successful than unregulated markets in attracting trading of foreign stocks. This supports the theoretical predictions of Chemmanur and Fulghieri (2006) and Huddart et al. (1999) that a foreign listing on a market with stricter disclosure requirements is more beneficial due to the reduction in investors' monitoring costs and the increase in investor awareness of the stock. Analysis of the determinants of the distribution of trading volume for regulated and unregulated markets reveals that the advantage of regulated markets emerges from higher quality

of legal and information environment and foreign investors' familiarity while the success of unregulated markets in attracting traders comes from diversification benefits and lower trading costs.

The remainder of the paper is organized as follows. Section 2 summarises background theories and develops the hypotheses. Section 3 discusses the data and variables measurement. Section 4 presents and discusses empirical results. Finally, section 5 concludes the paper.

2. The Theories and Testable Predictions

The study focuses on two research questions. First, what determines the distribution of trading volume between foreign and domestic stock exchanges? Second, whether the determinants of the trading volume distribution differ between regulated and unregulated markets. Therefore, based on prior literature, this section first identifies the potential determinants of foreign *versus* domestic trading volume and then discusses how foreign regulated and unregulated markets differentiate themselves in attracting equity trading of cross-listed stocks.

2.1 The determinants of the distribution of trading volume

Theoretical models of multimarket equity trading support the conjecture that trading volume may result either in an equilibrium consisting of full agglomeration in one market or competing markets may coexist (Pagano, 1989; Huddart et al, 1999). Based on these models, the distribution of trading volume of cross-listed stocks across the markets stems from several motives of trading that could be grouped broadly into two main categories: (i) fundamental motives and (ii) informational motives. To identify the determinants that affect the distribution of trading across the markets we examine the role of a number of host and home market characteristics as well as firm characteristics that represent the above two motives of trading. Table I summarizes the possible determinants, their measurement, and their expected impact on the distribution of foreign to domestic trading volume across the markets.

[Insert table I about here]

2.1.1 Fundamental motives of trading

One of the major fundamental driving forces of stock selection is the diversification benefit that foreign investors could receive. Cross-listed stocks that exhibit low return correlation

with host market returns are likely to be appealing to foreign investors as they enable the investors to enhance the risk-return profile of their portfolios. Therefore, the stocks with lower return correlation with host market returns are likely to have higher volume of trade on a foreign market relative to home market.

Another fundamental motive of trading emerges from the theoretical work of Pagano (1989). In particular, when a stock is traded on several exchanges with different levels of execution costs, the trading from other exchanges should migrate to the exchange that have the lowest cost of trading. Accordingly, the difference in the trading costs between foreign and home markets should be inversely related to the distribution of foreign to domestic trading volume. Direct trading costs include explicit costs such as trading commissions and implicit costs such as price impact (Chiyachantana et al, 2004). Beyond direct costs, other indirect trading costs may also arise due to the following reasons: (i) from the order processing cost component of the bid-ask spread when price per share is higher (Menyah and Paudyal, 2000). Consistent with this view, Brennan and Hughes (1991) show that trading costs are inversely related to price per share. Furthermore, in the context of cross-listings, Pulatkonak and Sofianos (1999) confirm that non-US stocks with a higher US dollar price exhibit larger US share of trading volume. Such findings imply that stocks with higher price per share (relative to other stocks in the same market) are likely to trade more than the stocks with lower price per share in a market for the reason of trading costs., (ii) from costs related to short selling and margin trading. Larger and more liquid markets are more likely to reduce such indirect costs, leading to higher trading volume. Consistent with the view that corporate managers care about these costs, Fernandes and Giannetti (2009) provide evidence that host market size and liquidity are positively related to the probability of cross-listing. Therefore, we anticipate a positive relation between the foreign to domestic trading volume ratio and the host to home market ratios of market size and market turnover., (iii) from costs that may emerge from currency conversion and from exposure to exchange rate risk. More specifically, in the models of Chowdhry and Nanda (1991) and Madhavan (1995) informed investors and large liquidity traders benefit by splitting trades across the markets. However, if they have to trade in different currencies the currency fluctuation risk is likely to deter the traders leading to lower trading volume. Therefore, if the host and home markets have the same currency splitting orders between the two markets does not expose the investors neither to exchange rate risk nor to the cost of currency conversion. Consequently, stocks that are traded in the same currencies in foreign and domestic markets are likely to have more trading in foreign markets than the stocks that trade in different currencies in different markets.

Another fundamental factor that is likely to affect the distribution of trading volume is the risk of the stock itself. For foreign investors it is more difficult to acquire relevant and accurate information about a company adding further exposure to risk – this could be more severe in the cases of firms with higher risk. Therefore, foreign investors are likely to be more reluctant to trade on foreign stocks that are more risky. On the other hand, riskier companies have higher levels of prediction error and thus the rebalancing needs of foreign investors goes up leading to more active trading (Chordia et al, 2007). Further, Abdallah and Goergen (2008) show that stocks with higher risk have higher propensity to cross-list in more developed markets, providing indirect evidence of attractiveness of high-risk stocks to foreign investors. Therefore, the direction of the effect of stock risk on the location of trading volume remains an empirical question. The sign could be negative due to the reluctance of foreign investors to trade on high risk assets, positive due to frequent rebalancing needs and neutral (insignificant) when the effects of foreign investors' reluctance to trade and rebalancing need cancel out each other.

Finally, the presence of either foreign institutional investors or controlling shareholders (usually at home market) may also affect the location of trading volume. In particular, foreign institutional investors may enhance the foreign market liquidity by absorbing the supply and demand imbalances. Therefore, the presence of foreign institutional investors may encourage the trading by other investors. Thus, we expect a measure of foreign institutional investors to be positively associated with the volume of trade in foreign markets. On the other hand, the presence of local controlling shareholders is likely to limit the ability of foreign investors to hold the stock (Dahlquist and Robertsson, 2001). Consequently, ownership concentration (domestic) should reduce the stock liquidity (Heflin and Shaw, 2000; Rubin, 2007) making stocks less attractive for foreign investors.

2.1.2 Informational motives of trading

Investors are likely to trade on a market where information is readily available and is transparent rather than where information is obscure and difficult to obtain. In a model of rent-seeking insiders that consider disclosure requirements on trading decisions and liquidity traders that allocate their demands by minimizing trading costs, Huddart et al. (1999) show that in equilibrium, liquidity traders choose to trade only on the exchange with the strictest disclosure requirements because the informational advantage of rent seeking insiders is less in such markets. Nevertheless, they further show that a low disclosure market may remain alive when (i) liquidity traders have incentive to diversify the trades across markets despite some informational disadvantage, and (ii) a stock exchange contains frictions restricting liquidity allocation.

Therefore, the quality of the information environment in host/home markets should affect the location of trading.

The quality of the information environment primarily depends on the quality of the legal environment and the enforcement of regulations (Ball, 2006; Soderstrom and Sun, 2007). A weaker legal investor protection empowers corporate managers to seize private benefits of control and, accordingly, increases the costs of owning and trading the stocks for investors (Shleifer and Vishny 1997). When a stock is traded on more than one market with different levels of investor protection, investors would trade on a market with better legal protection (Huddart et al, 1999). Therefore, the foreign to domestic trading volume should be positively related to the difference in investor protection between host and home markets.

Another important aspect of the legal environment is the presence and the quality of insider trading regulations enforcement. Numerous studies on the effects of insider trading rules provide evidence that insider regulations reduce the amount of trading based on private information (Durnev and Nain, 2007), decrease investors' adverse selection costs (Fischer, 1992), improve investor confidence by providing incentives for corporate managers to disclose information (Maug, 2002), and enhance stock price informativeness and market liquidity (Fernandes and Ferreira, 2009). Along this line, Bhattacharya and Daouk (2002) suggest that it is the enforcement of insider trading regulations, rather than its mere existence, that actually brings positive consequences to capital markets. Therefore, the volume of trade on foreign markets that exhibit better enforcement of insider trading regulations than in home market is expected to be higher.

Domowitz et al. (1998) argue that the location of trading also depends on the cost of investors to acquiring information. Owing to cross-border constraints like differences in languages, geographical distance, and lack of familiarity with the company, foreign investors are likely to have only limited information and face higher cost of access to information than the domestic investors. Pirinsky and Wang (2006) argue that informed trading should concentrate in the market closest to the company's headquarters, that is, the home market, where value-relevant information is more likely to be produced. Similarly, if financial information is first revealed in the home market then local investors may exploit the information in the local market before foreign investors can act on it. In both cases, the cost of acquiring information to foreign investors becomes higher. Therefore, as argued by Coval and Moskowitz (1999), foreign investors tend to invest mainly in stocks that they are familiar with. Similarly, Grinblatt and Keloharju (2001) show that investors are more likely to invest on stocks of companies that

communicate in the investor's native language and that investors' equity trading activity is negatively related to the geographic distance between the investor and the company's headquarter.⁷ Thus, familiarity alleviates the problem of information barrier between host and home markets which, in turn, reduces the informational advantage of domestic traders over foreign traders. The informational advantage of domestic traders, relative to foreign traders, may also become less when value-relevant information is produced abroad. This can happen when a considerable part of current and future cash flows of the company depends primarily on the economic conditions of the foreign market (such as the cases of export oriented companies). Consistent with these views, Sarkissian and Schill (2004) argue that corporate managers anticipate that foreign investors would be reluctant to invest in unfamiliar foreign stocks and, therefore, tend to cross-list in more proximate markets. Hence, a common language, a smaller geographic distance between host and home markets, and higher foreign sales should lead to more active foreign market trading of a cross-listed stock.

Companies motivated to improve their international liquidity may also voluntarily reduce the cost of acquiring information, especially for foreign investors, by reporting financial information using International Accounting Standards (IAS) or US Generally Accepted Accounting Principles (GAAP). Accordingly, companies that prepare financial reports using such accounting standards should be more likely to develop an active foreign market relative to companies that prepare financial statements only under local accounting standards. The cost of acquiring information to foreign investors may also depend on the firm's visibility. Companies' visibility can increase with the duration of trading (Chordia et al, 2007). Therefore, the number of years traded on the foreign exchange should be positively associated with trading in foreign market.

Finally, Baruch et al. (2007) argue that the trading activity of cross-listed stocks is related to an information factor that quantifies the marginal contribution of the foreign market's returns in explaining the stock's returns. The fundamental forces underlying this relation, although still remain elusive, are likely to correlate with foreign investor familiarity reflecting on the nature of the firm's business activities related to geography or industry membership. Based on the argument of Baruch et al. (2007), stocks with a higher foreign information factor should have a higher share of trading on the relevant foreign market.

⁷ Geographic distance between the host and home countries is closely related to the difference in time zones between the host and home countries. According to Pulatkonak and Sofianos (1999), the time zone difference is the most significant determinant of foreign trading volume on NYSE. However, in the case of the European stocks traded within continental Europe, the time zone difference is not relevant as all continental Western European countries (with the exception of Portugal) are in the same time zone.

2.2 Regulated vs. unregulated markets

Cross-listed stocks may trade on regulated markets where they are listed or unregulated markets where they are admitted to trade. In regulated markets stocks are subject to compliance with listing requirements. Listing on a regulated market is initiated by the company and is required to submit a listing application and meet listing and disclosure requirements of the host stock exchange. Unregulated markets, where the stock is admitted to trade, do not have any particular disclosure or listing requirements that the company need to comply with. Moreover, admission to trade on an unregulated market is often initiated by a market maker or a dealer. It can take place even without the sponsorship of the company.⁸ Therefore, while an admission to trade on an unregulated market makes the company's shares available to a wider range of traders, it does not entail any changes in the stock's information and legal environment.^{9,10} The higher level of disclosure requirements of regulated markets should increase the level of investor protection and reduce traders' information costs and, thus, should be a more attractive foreign trading venue (Huddart et al, 1999; Chemmanur and Fulghieri, 2006). Moreover, a listing on a regulated market is often accompanied by road shows and other promotional activities aimed to increase the stock's visibility on the foreign market and investors' awareness and familiarity of the stock. Thus, the stocks that are listed in a regulated market, rather than being traded only in unregulated markets, should have wider stock recognition leading to more active trading on foreign exchanges.

⁸ In addition to over-the-counter (OTC) markets, in recent years a number of alternative markets and trading platforms have emerged that are similar to OTC markets in their admission rules. For example, the Open Market of the Deutsche Borse includes the Frankfurt stock exchange and XETRA trading platform. According to the Deutsche Borse's web-site, "the Open Market is not an official market segment, but governed by private law.... The inclusion of securities in exchange trading on the Open Market represents one of the easiest and fastest ways to the stock exchange. ... Issuer must fulfil only few formal inclusion requirements and no follow-up obligations." The "formal inclusion requirement" is that the stock must be listed on a domestic or a foreign "organized market where prices are already fixed for this security". VIRTX is another electronic cross-border share trading platform of the Swiss stock exchange (formally renamed to SWX Europe in 2008). A security can be admitted to trade on VIRTX without any disclosure requirements at no charge of fees if the security has been listed on another EU-regulated Market. Similarly, international segment of Borsa Italiana (Milan) admits to trade "without the requirement to publish a prospectus, shares that have been listed on another European regulated market for at least 18 months. Admission to trading may be requested by any of BorsaItaliana's market intermediaries, by an issuer or by BorsaItaliana itself." (<http://www.borsaitaliana.it>).

⁹ For example, Level I ADRs that are traded on OTC market in the US are exempt from SEC regulation and from compliance with internationally recognised accounting standards. Also, EU investor protection regulations do not apply for securities traded on the Open Market of the Deutsche Borse, because the Open Market is not an EU regulated market (source: <http://www.deutsche-boerse.com>).

¹⁰ Bris et al. (2012) discuss the differences between listing and admission to trade on the London stock exchange.

3. Data and Variables

3.1 Dataset

The sample consists of European companies that are cross-listed on at least one foreign stock exchange during 1990-2007. Data on cross-listings were hand collected from various sources including the stock exchanges' web-sites, Factiva news database, the foreign listings dataset of Sarkissian and Shill (2004), and the databases on depositary receipts from the Bank of New York, Citibank, Deutsche Bank and JP Morgan. Data on trading volume and stock prices were obtained from Datastream. Since the study aims to analyse common equity only, preference shares are excluded. In addition, whenever the company has more than one class of common share (e.g. class A and class B with different voting rights) we include only the major security of the company, as indicated in Datastream. Furthermore, to avoid the implications of unique price pattern and trading behaviour of initial public issues, as in previous studies, we exclude initial public offers made in a foreign market. Finally, we also exclude companies that do not have full information on key variables of interest, such as the distribution of trading volume and their determinants. The final sample consists of 534 European companies from 18 different countries with 1,744 foreign accounts traded on 20 foreign exchanges.

Table II presents the distribution of sample companies by home and host markets.¹¹ The table shows that a large number of the cross-listed companies are based in the United Kingdom (154 or 28.8% of the sample) followed by France (68 companies or 12.7% of the sample) and Germany (52 companies or 9.7% of the sample). More of the foreign trading accounts refer to trading of stocks on unregulated markets (1,273 or 73.0% of the sample) than trading in regulated markets (471 or 27.0% of the sample). Among the stocks that trade on unregulated markets, more than a third (602 accounts or 34.5%) trade on the Open market of Deutsche Bourse including Frankfurt stock exchange and XETRA, and 233 accounts (or 13.4% of the sample) trade on the OTC in the US. Among the firms that are cross-listed in regulated markets 17% trade on the New York Stock Exchange (81 accounts) and another 17% (81 accounts) trade on the main market of the London Stock Exchange. The shares of the rest of the markets are generally randomly distributed without any noticeable concentration.

[Insert table II about here]

¹¹ Note that some companies have more than one foreign account. Thus, the total number of foreign accounts is greater than the number of cross-listed firms in the sample.

3.3 The Measurement of the Variables

In this section, we describe the measurement of the three sets of variables used in the analysis: (i) the dependent variable i.e. foreign to domestic trading volume ratio, (ii) the explanatory variables i.e. the determinants of the distribution of trading volume between foreign and domestic markets, and (iii) the control variables that are known to affect trading activities. Table III presents summary statistics of all the variables.

The Dependent Variable

As the primary objective of the paper is to identify the determinants of the distribution of trading volume between foreign and domestic markets, the dependent variable is measured as the ratio of foreign to domestic trading volume. More precisely, the ratio $(FTV/DTV)_{i,t}$ is defined as the number of shares traded on a foreign market divided by the number of the shares traded on domestic stock exchange as in equation (1):^{12,13}

$$(FTV/DTV)_{i,t} = \frac{NST_{i,n,t}}{NST_{i,d,t}} \quad (1)$$

where $NST_{i,n,t}$ is the number of shares of stock i traded on foreign exchanges n during the month t , and $NST_{i,d,t}$ is the number of shares of stock i traded on the domestic market d during the month t . We also distinguish between foreign to domestic trading volume ratios for listed and traded observations to investigate if there is any difference in the determinants of foreign trading volume across the regulated and unregulated markets.

Results show that the average foreign to domestic trading volume ratio for the full sample is 3.09 (i.e. foreign trading volume is 3 times of the domestic trading volume). However, there is also a significant difference in the distribution by the type of the market – the average foreign to domestic trading volume ratio for regulated markets is 8.75 while it is only 0.14 for unregulated markets. Overall, initial evidence suggests that regulated markets are more successful in attracting and maintaining active trading of foreign stocks than the unregulated markets.

[Insert table III about here]

¹² By using the number of shares traded, instead of the dollar value of the trade, we eliminate potential biases caused by the fluctuations in the rate of exchange between domestic and foreign currency.

¹³ When trading on a foreign market takes place in the form of a depositary receipt (DR), the number of traded shares is adjusted using the DR conversion ratio. We also adjust the number of traded shares, when prompt, for changes in conversion ratios over time.

The Determinants of the Distribution of Trading Volume

Building on the theoretical discussion in section II, this section provides a summary of various proxies of the determinants of the distribution of foreign to domestic trading volume of sample stocks. Appendix A provides detailed definitions and data sources of the variables used in this study.

Fundamental motives of trading:

One of the reasons that an investor trades is to diversify her portfolio. The diversification benefit to foreign investors is measured by the correlation between the weekly returns of the foreign and domestic markets (*return correlation*) over the previous three year period. On average, the return correlation is 0.44 for both the regulated and unregulated markets indicating that foreign investors may improve the risk return trade-off position of their portfolios by investing in cross-listed companies.

The direct trading cost is measured as the *trading costs* in foreign market less the trading cost in home market using information available in Chiyachantana et al. (2004). Results show that the average cost of trading in a foreign market is slightly higher than the cost of trading in the home market, and the difference is larger when the foreign market is regulated rather than unregulated.

Execution costs consist also of indirect trading costs. We measure indirect costs using various variables: First, we use the *price level* on the foreign market as measured by the log of the stock's price converted to British pounds. There is no significant difference in price levels of cross-listed stocks between regulated and unregulated markets. Second, we measure the breadth of the market with the log difference in the *market size* (total market capitalization of stocks in Datastream's Total Market index) between the host and home markets. Both regulated and unregulated host markets, on average, are significantly larger than home markets (about 12 times). Third, we measure differences in market liquidity using the log difference in the *market turnover* ratio of the foreign and home markets. Market turnover ratio is calculated as the ratio of total value of the shares traded to the total market capitalization of the Datastream's Total Market index. On average, the market turnover of the foreign market is 4.04 times of the turnover of the home market and the difference in market turnover is larger for regulated markets compared to unregulated markets (5.33 and 3.37, respectively). Forth, we capture indirect execution costs arising from trading in different currencies within the host/home markets by using a dummy variable '*same currency*' that takes the value of 1 if the foreign and domestic

markets have the same currency, and 0 otherwise. A large portion of the stocks, 47% (40%), have the same currency of trading between host and home markets for regulated (unregulated) markets.

Another factor that may affect the distribution of trading is the risk of a company. We measure *stock risk* with the standard deviation of the stock's weekly returns over the preceding year, calculated for each month. On average, stocks that trade on regulated markets exhibit similar risk relative to stocks traded in unregulated markets.

Finally, the presence of foreign institutional investors and ownership concentration may also affect the distribution of trading. We measure the degree of *foreign institutional investors'* participation in a firm's capital using the percentage of the firm's total shares held by foreign institutional investors. About 7% of the shares outstanding are held by foreign investors. We gauge a company's *ownership concentration* as 1 minus the percentage of the company's shares available to ordinary investors. On average, firms traded on regulated markets exhibit lower ownership concentration relative to firms traded on unregulated markets (24% and 28%, respectively).¹⁴

Informational motives of trading

We capture the various facets of the quality of the information environment of a stock exchange as follows: First, we gauge the level of *investor protection* using the difference between host and home markets of the anti-self-dealing index of Djankov et al. (2008).¹⁵ A positive value for regulated markets indicates that, on average, a regulated foreign market exhibits stronger investor protection compared to the home market. No such evidence exists for unregulated markets. We also employ a dummy variable, *enforced insider trading difference* that takes the value of 1 when there is an enforced insider trading regulations in the host market but not in the home market, and 0 otherwise. About 12% of the listings in regulated markets take place in host markets with stricter enforcement of insider trading regulations relative to the home market while the corresponding figure is only 8% for unregulated markets.

Several proxy measures are employed to capture the impact of the foreign vs. local investor's cost of information acquisition. They include: (i) *common language* – an indicator variable that takes the value of 1 if the host and home markets share a common official language,

¹⁴ Data for the variables foreign investors and ownership concentration are available from Datastream only after 2002.

¹⁵ Anti-self-dealing index from Djankov et al. (2008) enumerates the strength of legal protection of minority shareholders against expropriation by corporate insiders.

and 0 otherwise; (ii) *geographic distance* - measured as the natural logarithm of the kilometres between the capitals of the host and home countries; and (iii) *foreign sales* - defined as the ratio of foreign sales to total sales of the company. A considerable number of cross-listings, 32% (16%), take place in regulated (unregulated) host markets that share the same language as in the home market. The average geographic distance is about 2,222 km, driven mainly by the distance between the firms European home markets and the US host market (average geographic distance between a US market and a European home market is above 6,000 km). Finally, firms that are traded in regulated and unregulated foreign markets are characterised by strong export orientation, as indicated by an average foreign sales ratio of 59% and 56%, respectively.

As an additional proxy for the foreign vs. local investor's cost of acquiring information we use the form of accounting standards that companies utilize in preparing their financial statements. Specifically, the indicator variable, *accounting standards*, takes the value of 1 if a company prepares its financial statements using either IAS or US GAAP, and 0 otherwise. About 55% of the sample firms prepare financial statements using IAS/US GAAP. Interestingly, firms traded in unregulated markets utilize IAS/US GAAP more often than firms listed in regulated markets (46% vs. 59%, respectively). Further, we employ the number of *years traded* in the foreign market. As expected, compared to companies traded in unregulated markets, companies traded in regulated markets seem to have traded for a longer period.

Finally, we use the *foreign information factor* calculated using the method proposed by Baruch et al. (2007) as the difference in R^2 (adjusted for degrees of freedom) of a two-index model including foreign market index and of a single-index model with just the home market index. Foreign information factor is calculated for each stock using weekly returns over the preceding four-year period. The average foreign information factor is 2.47, and it is greater for regulated markets than for unregulated markets (7.18 vs. 4.74).

Control variables

We also include various control variables that likely affect the trading volume, but without clear ex-ante prediction regarding the distribution of foreign to domestic trading volume. First, we include *company size* using the market value of the company's common equity in British pounds. Investors should bear lower cost of acquiring information for larger versus smaller firms since they put more information on public domain, experience more intensive media coverage, have larger advertising budgets, and are followed by more analysts (Bhushan, 1989; Aggarwal et al, 2005). Second, we control for a firm's *growth opportunities* as captured by the market-to-book value ratio. Firms with higher growth opportunities may face larger needs to

raise external capital. Raising capital, however, increases investor base and make a company more visible to investors (Reese and Weisbach, 2002). Generally, larger companies with greater growth opportunities trade more often on regulated markets than unregulated markets (Table III). Third, we account for a potential liquidity premium by including a dummy variable, *Host US*, that takes the value of 1 if the US is the host market and zero otherwise. US cross-listings exhibit a valuation premium relative to non-cross-listed firms (Doidge et al, 2004). Since one important source of valuation effects of cross-listing is stock liquidity, we include host US indicator variable to capture any liquidity premium effect that resides even after controlling for fundamental and informational motives of trading on US stock exchanges. About 28% of observations are contributed by trading in the US markets. Finally, we use an *emerging market* dummy that takes the value of 1 when the home market is an emerging market and 0 otherwise to capture differences in the level of economic development of the home market since the overall execution costs in emerging markets are larger (Baruch et al, 2007). About 0.01% of the unregulated market listings come from emerging markets. In contrast, regulated markets do not host emerging market companies in the sample.

4. Empirical Results

4.1 The Determinants of the Distribution of Trading Volume

This section presents and discusses the results of empirical investigation on the determinants of the distribution of trading volume of the cross-listed stocks between foreign and domestic markets in a multivariate framework. Particularly, we estimate different variants of equation (2) using the ordinary least squares method.

$$\ln(FTV / DTV_{i,t}) = \gamma_0 + \sum_{j=1}^J \gamma_j X_{i,t} + \gamma_{J+1} UN_i + \varepsilon_{i,t} \quad (2)$$

where, the dependent variable is the natural log of the foreign to domestic trading volume ratio as defined in equation (1), $X_{i,t}$ is a vector of explanatory variables representing the potential determinants of the trading volume distribution of cross-listed stocks as identified in the previous section, and UN_i is a dummy variable that takes a value of 1 when cross-listing is on unregulated markets and 0 when it is on regulated markets. All estimations include year fixed effects and the

standard errors are adjusted for heteroscedasticity using White (1980) procedure and are clustered at the stock and exchange level.¹⁶

Table IV reports coefficient estimates of various model specifications of equation (2). Model 1 presents estimates for the full period 1990 - 2007. Model 4 reports estimates after including foreign investors and ownership concentration variables, which are available only since 2003. To assess whether the results are sensitive across time and to the inclusion of foreign investors and ownership concentration variables, models 2 and 3 display estimates for the periods 1990 - 2002 and 2003 - 2007, respectively. The estimates show that most of the variables that represent fundamental and informational motives of trading are statistically significant with theoretically plausible signs.

[Insert table IV about here]

Among the fundamental motives of trading, as anticipated, the ratio of foreign to domestic trading volume is positively associated with the diversification benefit of trading on cross-listed stocks; this relationship has become particularly stronger in recent years (models 3 and 4). Thus, consistent with the findings of Halling et al. (2008) companies that exhibit low return correlation with foreign market returns appeal well to foreign investors. Depending on model specification, an increase in one standard deviation of return correlation explains between 3.8% and 6.2% of the standard deviation of the foreign trading activity, all else being equal.¹⁷ The results also show that in recent years (models 3 and 4) direct trading cost has become an important determinant of foreign trading activity – markets with lower trading costs attract more trading. This finding suggests that investors care more about trading costs in recent years, perhaps due to the fact that other motives of trading, particularly informational, become less important due to an on-going effort by all European Union countries to improve enforcement and governance regimes (Hail and Leuz, 2006). Economically, an increase in one standard deviation of trading cost difference in recent years explains 5.5% of the standard deviation of the foreign trading activity, all else being equal. Consistent findings also appear for indirect trading costs. In particular, the results show that higher priced stocks, stocks with higher foreign to domestic market turnover ratio, and stocks that trade in foreign and domestic markets using the same

¹⁶ Petersen (2009) suggests that this procedure accounts for potential biases in the estimates of standard errors when the residuals are correlated across stock and exchange.

¹⁷ Similar to Bris et al. (2007) we estimate the economic significance of each variable as the product of the coefficient estimate with the standard deviation of the explanatory variable deflated by the standard deviation of the dependent variable. For dummy variables, we assign the value of one to the standard deviation of the variable. Economic significance indicates the percentage of standard deviations of the dependent variable explained by a one standard deviation change in the explanatory variable, keeping all else equal.

currency, exhibit more active foreign markets. Generally, indirect costs are more important in recent years. An exception is the difference in foreign and domestic market size that is an important determinant of the distribution of trading volume only for the period 1990-2002 (model 2). Among variables that capture indirect trading costs, differences in foreign to domestic market turnover ratio has the strongest influence on the distribution of trading volume. An increase by one standard deviation of the difference in market turnover ratio explains between 8.5% and 21.0% of the standard deviation of the foreign to domestic trading volume ratio, all else being equal. Other results suggest that higher risk stocks demonstrate higher fraction of foreign to domestic trading volume. This finding may imply that riskier companies have higher levels of prediction error and thus the rebalancing needs of foreign investors goes up leading to more active trading (Chordia et al, 2007). Depending on model specification, increasing the risk by one standard deviation explains between 12.4% and 18.6% of the standard deviation of the foreign trading activity, all else being equal. Finally, the results support the conjecture that a higher fraction of foreign institutional ownership and less concentrated ownership assures a larger foreign to domestic trading volume ratio (model 4). It also worth noting that the inclusion of foreign investor and ownership concentration variable has no substantial impact on the coefficient estimates of other variables (models 3 and 4).

In regards to informational motives of trading, the estimates confirm that the distribution of foreign to domestic trading volume depends on the comparative quality of information environment between the foreign market and home market as well. In particular, host markets with enforced insider trading regulations relative to domestic market attract more active foreign equity trading. This finding, consistent with the theoretical model of Huddart et al. (1999), suggest that investors trade more on foreign markets that exhibit strictest disclosure requirements because the informational advantage of rent seeking insiders is less. Depending on model specification, the presence of enforced insider trading regulation in the host but not in the home market explains between 8.5% and 31.8% of the standard deviation of the foreign trading activity, all else being equal. The results also provide support to other informational motives of trading that arise from differences in the cost of acquiring information in the host relative to the home market. More specifically, the foreign to domestic trading volume ratio is positively related to common language, accounting standards, years traded, and negatively related to geographic distance.¹⁸ Such evidence suggests that the level of trading activity in a foreign stock

¹⁸ Note that our finding that foreign trading increases over time differs from evidence of Halling et al. (2008). In particular, Halling et al. (2008) report a negative relationship between the fraction of trading in the US and the number of years since cross-listing, suggesting that over time the US market has lost some trading volume of cross-listed stocks. Our distinct findings on multi-market trading in various foreign markets (not just the US market) indicate that there may be differences in foreign trading volume trends between the US and non-US host markets.

market relates to foreign investors' familiarity with the company (Coval and Moskowitz, 1999, Grinblatt and Keloharju, 2001) and company visibility (Chordia et al, 2007; Pulatkonak and Sofianos, 1999). Among those variables, common language and years traded are the strongest explanatory variables of the distribution of foreign to domestic trading volume. Finally, the effect of the foreign information factor articulated by Baruch et al. (2007) remains insignificant in explaining the distribution of trading volume across the markets.

A comparison of the ability of regulated versus unregulated markets to attract trading volume of foreign stocks reveals that unregulated markets are less successful than regulated markets. All else being equal, relative to a listing in a regulated market an admission to trade on an unregulated market explains between 21.5% and 47.3% of the standard deviation of the foreign to domestic trading volume ratio depending on model specification.

Finally, among control variables, the results indicated that 'Host US' dummy has a positive and significant in all specifications. This can be interpreted as the 'US trading premium' similar to the US cross-listing valuation premium of Doidge et al. (2004).

4.2 The Determinants of the Distribution of Trading Volume: Comparison between Regulated and Unregulated Markets

To identify the factors that contribute to attracting the trades to regulated foreign markets *versus* the unregulated markets we estimate equation (2) separately for these two types of markets. Table V reports estimates in the spirit of Table IV for regulated and unregulated markets. The coefficient estimates of the factors representing the fundamental motives of trading exhibit interesting patterns. First, the coefficient of return correlation is negative and significant for unregulated markets, but not for regulated markets. Thus, benefits arising from portfolio diversification appear to drive foreign trading activity in unregulated markets but not in regulated markets. Second, the direct indirect costs of trading and seem to be significant determinants of trading activity in unregulated markets. In particular, for unregulated markets, trading cost is negative and significant while price level and same currency of trading are positive and significant. Such findings suggest that unregulated markets may attract more trading by facilitating trade at lower execution costs. No such evidence exists for regulated markets. The estimates also reveal a significant and positive relationship between foreign institutional investors and trading activity in regulated markets but its role remains insignificant in unregulated markets. Finally, the results show a negative relation between ownership

concentration and foreign trading activity for unregulated markets suggesting that some of the foreign investors are reluctant to trade on stocks that have high ownership concentration at home.

[Insert table V about here]

The results also confirm that the factors representing information environment are more important for regulated markets. In particular, enforced insider trading regulations is a major factor for regulated markets, but it is insignificant for unregulated markets. In addition, factors that represent market familiarity such as common language and geographic distance have much larger coefficient estimates and statistical significance for regulated than unregulated markets. These results can be interpreted as evidence that the quality of the information environment and foreign investor familiarity provides regulated markets a comparative advantage over unregulated markets in offering liquidity to cross-listed companies. Remarkably, the coefficient estimate for years traded variable is positive and much larger for unregulated markets. Evidence from the role of ‘years traded’ is consistent with the idea that the unregulated markets gradually attract more trade from domestic markets.

In summary, trading activity in a foreign host market is positively associated with greater diversification opportunity offered by cross-listed firms, relatively lower execution costs, superior information environment as compared to the home market of cross-listed firms, and greater firms’ familiarity and/or visible to the investors. Foreign trading activity is also dependent on whether it takes places on regulated or unregulated markets. Regulated markets attract significantly greater fraction of trading volume than unregulated markets. The quality of information environment and foreign investor familiarity are more important determinants of foreign trading activity for regulated markets than for unregulated markets. In contrast, for companies admitted to trade on unregulated markets, diversification benefits and execution costs are important determinants of trading volume but not for companies listed in regulated markets.

5. Conclusions and Implications

This study examines the factors that affect the distribution of trading volume of European cross-listed stocks between home and foreign stock exchanges. The ratio of foreign to domestic trading volume is modelled as a function of factors that represent company and market fundamentals and information motives. The paper also distinguishes the cases of trading in regulated and unregulated foreign host markets, shading lights on what the regulators of these markets need to do to attract trading of foreign stocks in their markets. The findings that are

controlled for the effects of all known factors that are likely to influence the foreign vs. domestic distribution of trading volume suggest that, on average, cross-listed stocks are traded more frequently in foreign markets than in home markets. Moreover, we find strong empirical evidence that regulated markets are significantly more successful in attracting foreign trading of cross-listed stocks than unregulated markets, confirming theoretical predictions of the Chemmanur and Fulghieri (2006) and Huddart et al. (1999) that regulated markets have a competitive advantage over unregulated markets due to lower information costs. Therefore, a foreign listing on a regulated market (as opposed to an admission to trade on an unregulated market), despite relatively higher fees and disclosure requirements, should be regarded as a preferable option for companies that are looking to improve their stock liquidity.

Based on the theoretical models of multi-market trading, we identify and empirically test a number of potential determinants of the foreign *versus* domestic trading volume of cross-listed stocks. The findings highlight the significance of the fundamental motives of trading, including greater diversification benefits and lower trading costs, and of the informational motives of trading, including better legal protection, and greater stock's familiarity and visibility to foreign investors. Finally, we find significant differences in the determinants of the ability of regulated vs. unregulated markets to attract foreign equity trading. While regulated markets compete for equity trading by offering investors greater investor protection and foreign investor's familiarity and visibility, unregulated markets compete by offering lower costs of trading.

The findings have two important practical implications. First, for stock exchange executives and regulators it shows how they could model their stock exchange should they wish to attract cross-listing of foreign firms and enhance trading volume. In other words, it shows what makes a stock exchange more competitive as compared to others in attracting foreign equity trading. Second, for corporate managers seeking to improve their company's stock liquidity, it shows what type of foreign market with what kind of features has the most potential to maximize the stock's liquidity.

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Table I. Potential determinants of the foreign trading distribution

The table presents the list of potential determinants of the foreign trading distribution, empirical measures employed to proxy each of the determinants and the sign of the predicted impact: '+' positive impact or '-' negative impact.

| Motives of trading | Empirical measure | Variable level | Expected impact on the foreign trading share |
|----------------------------------|-------------------------------------|-----------------------|---|
| <i>Fundamental factors</i> | | | |
| Diversification | Return correlation | Stock level | - |
| Direct trading cost | Trading cost difference | Market level | - |
| Indirect trading costs | | | |
| Price per share | Price level | Stock level | + |
| Market size | Market size difference | Market level | + |
| Market liquidity | Market turnover difference | Market level | + |
| Currency of trading | Same currency indicator | Stock level | + |
| Stock risk | St deviation of stock return | Stock level | +/- |
| Foreign institutional investors | Foreign institutional investors | Stock level | + |
| Controlling shareholders | Ownership concentration | Stock level | - |
| <i>Informational factors</i> | | | |
| Legal environment | Investor protection difference | Market level | + |
| Legal environment | Enforced insider trading difference | Market level | + |
| Information barrier | Common language | Market level | + |
| Information barrier | Geographic distance | Market level | - |
| Familiarity with the company | Foreign sales | Stock level | + |
| Cost of acquiring information | Accounting standards | Stock level | + |
| Stock visibility | Years traded | Stock level | + |
| Foreign information factor | Foreign information factor | Stock level | + |
| Regulated vs. unregulated market | Unregulated market indicator | Market level | - |

Table II. Distribution of Cross-listed firms by home and host markets

The table reports the distribution of the sample firms by home country and of the sample foreign accounts by home and host markets. The sample includes 534 firms from 18 different European countries with 1,744 foreign accounts traded on 20 foreign exchanges.

| Home country | N firms | | N foreign accounts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|------------|-------------------|----------------------------------|-----------|----------|-----------|----------------|----------|-----------|----------|-----------|-----------|-----------|-----------|----------|------------------------------------|-------------------------|--------|--------|-------|--------|--------|-----------|-------|----------------------------|---------------------------|------------|-----------|----------|------------|-----------|------------|------------|-------------|-----|-----|----|----|----|----|----|----|
| | N firms | % of total sample | Including regulated host markets | | | | | | | | | | | | | Including unregulated host markets | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | Total N foreign accounts | Amsterdam | Brussels | Dublin | Deutsche Borse | Helsinki | Lisbon | London | Madrid | Nasdaq | NYSE | Paris | Swiss SE | Vienna | Total Regulated Markets | Berlin | London | Milan | Munich | US OTC | Stuttgart | VIRTX | Deutsche Borse Open market | Total unregulated Markets | | | | | | | | | | | | | | | | |
| Austria | 17 | 3.2% | 38 | | | | 3 | | | | | | | | 1 | 1 | | | | | | | | | | 4 | | | | | | 8 | | | | | 10 | | | | 16 | 34 |
| Belgium | 10 | 1.9% | 32 | 2 | | | 4 | | | | | | | | 1 | 3 | | | | | | | | | | | 10 | | | | | | 5 | | | | 2 | | 1 | 14 | 22 | |
| Czech Rep | 3 | 0.6% | 6 | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | | | | | | | | | | 6 | 6 | | |
| Denmark | 11 | 2.1% | 27 | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | | | | | | 5 | 1 | 1 | 17 | 27 | | | |
| Finland | 11 | 2.1% | 44 | 2 | | | | | | | | 1 | 1 | 2 | | | | | | | | | | | | 7 | | | | | | 1 | 6 | 1 | 1 | 6 | 1 | 21 | 37 | | | |
| France | 68 | 12.7% | 318 | 10 | 10 | | 17 | | | 8 | 3 | 2 | 11 | | 4 | | | | | | | | | | | 65 | 2 | 50 | 10 | 1 | | 39 | 4 | 27 | 120 | 253 | | | | | | |
| Germany | 52 | 9.7% | 166 | 11 | 7 | | | | | 10 | 2 | 4 | 8 | 14 | 21 | 6 | | | | | | | | | | 83 | | 26 | 9 | | 24 | | 24 | 0 | 83 | | | | | | | |
| Greece | 8 | 1.5% | 27 | | | | | | | 2 | | | 3 | | | | | | | | | | | | 5 | | | | | 4 | | 1 | 17 | 22 | | | | | | | | |
| Ireland | 44 | 8.2% | 87 | | | | | | | | | | | | | | | | | | | | | | 45 | 4 | 8 | | | 12 | 2 | 1 | 15 | 42 | | | | | | | | |
| Italy | 26 | 4.9% | 82 | 2 | | | 6 | | | | | 1 | 4 | 4 | | | | | | | | | | | 17 | | 19 | | | 7 | 2 | 2 | 37 | 65 | | | | | | | | |
| Netherlands | 38 | 7.1% | 199 | | 12 | | 17 | | | 7 | 1 | 3 | 7 | 14 | 9 | 1 | | | | | | | | | 71 | 3 | 36 | 3 | 1 | 17 | | 15 | 53 | 128 | | | | | | | | |
| Norway | 19 | 3.6% | 53 | | | | 1 | | | 4 | | 1 | 1 | 1 | 1 | | | | | | | | | | 9 | 2 | 4 | | | 7 | 1 | 2 | 28 | 44 | | | | | | | | |
| Poland | 4 | 0.7% | 4 | | | | 0 | | | | | | | | | | | | | | | | | | 0 | | | | | | | | | | | 4 | 4 | | | | | |
| Portugal | 4 | 0.7% | 13 | | | | 0 | | | | | | 1 | | | | | | | | | | | | 1 | | 1 | | | 1 | 1 | | | | | 8 | 12 | | | | | |
| Spain | 13 | 2.4% | 60 | 4 | | | 4 | | | 4 | | 3 | 2 | | 3 | 3 | | | | | | | | | 19 | | 10 | 3 | | 2 | | 2 | 24 | 41 | | | | | | | | |
| Sweden | 21 | 3.9% | 83 | 1 | | | 4 | 2 | | 9 | | 5 | 1 | 3 | 3 | | | | | | | | | | 28 | 3 | 11 | | | 10 | 1 | 3 | 27 | 55 | | | | | | | | |
| Switzerland | 31 | 5.8% | 103 | 1 | | | 9 | | | 1 | | 1 | 6 | 2 | | | | | | | | | | | 20 | 2 | 19 | 1 | | 9 | 2 | | 50 | 83 | | | | | | | | |
| UK | 154 | 28.8% | 402 | 8 | 1 | 5 | 11 | | | | | 12 | 30 | 17 | 3 | | | | | | | | | | 87 | 17 | | | 3 | 78 | 5 | 25 | 187 | 315 | | | | | | | | |
| Total | 534 | 100% | 1744 | 41 | 5 | 71 | 2 | 3 | 81 | 7 | 32 | 81 | 63 | 43 | | | | | | | | | | | 471 | 35 | 206 | 27 | 5 | 233 | 18 | 105 | 602 | 1273 | | | | | | | | |

Table III. Summary statistics of variables of interest

The table reports summary statistics of the foreign to domestic trading volume ratio and of the potential determinants of trading distribution for (i) the full sample of 534 companies with 1,744 foreign accounts traded from 1990 to 2007, (ii) sub-sample of 268 companies with 471 foreign listings on regulated foreign host markets, (iii) sub-sample of 468 companies with 1,273 foreign accounts traded on unregulated foreign host markets. Additionally the table reports the differences in the means of the variables between regulated and unregulated markets and its statistical significance based on t-test for difference in means with unequal variances. ‘***’ indicates significance at 1% and ‘**’ indicates significance at 5%. The determinants are defined in Appendix A.

| Variable | Full sample | | | Regulated market | Unregulated market | Difference in means: Regulated vs. Unregulated market |
|-------------------------------------|-------------|--------|----------|------------------|--------------------|---|
| | Mean | Median | St. Dev. | Mean | Mean | |
| Panel A. Dependent variable | | | | | | |
| FTV/DTV ratio | 3.09 | 0.001 | 404.7 | 8.75 | 0.14 | 8.62** |
| Panel B. Determinants | | | | | | |
| <i>Fundamental factors</i> | | | | | | |
| Return correlation | 0.44 | 0.44 | 0.2 | 0.44 | 0.44 | 0.00 |
| Trading cost difference | -0.01 | 0.05 | 0.2 | -0.02 | -0.003 | -0.01*** |
| Price level | 19.97 | 11.37 | 67.5 | 20.08 | 19.92 | 0.16 |
| Market size difference | 11.76 | 2.48 | 32.1 | 11.81 | 11.74 | 0.07 |
| Market turnover difference | 4.04 | 0.80 | 12.5 | 5.33 | 3.37 | 1.96*** |
| Same currency indicator | 0.42 | 0.00 | 0.5 | 0.47 | 0.40 | 0.07*** |
| Stock risk | 0.05 | 0.04 | 0.0 | 0.046 | 0.045 | 0.001*** |
| Foreign institutional investors | 0.07 | 0.02 | 0.1 | 0.07 | 0.07 | 0.00 |
| Ownership concentration | 0.27 | 0.24 | 0.2 | 0.24 | 0.28 | -0.05*** |
| <i>Informational factors</i> | | | | | | |
| Investor protection difference | -0.01 | -0.05 | 0.4 | 0.03 | -0.03 | 0.06*** |
| Enforced insider trading difference | 0.09 | 0.00 | 0.3 | 0.12 | 0.08 | 0.04*** |
| Common language | 0.22 | 0.00 | 0.4 | 0.32 | 0.16 | 0.16*** |
| Geographic distance, 000' km | 2,222 | 528 | 2,556 | 2,376 | 2,142 | 234*** |
| Foreign sales | 0.57 | 0.60 | 0.3 | 0.59 | 0.56 | 0.03*** |
| Accounting standards | 0.55 | 1.00 | 0.5 | 0.46 | 0.59 | -0.14*** |
| Years traded | 5.57 | 4.75 | 4.0 | 7.18 | 4.74 | 2.44*** |
| Foreign information factor | 2.47 | 1.52 | 3.8 | 2.58 | 2.41 | 0.17*** |
| Unregulated market indicator | 0.66 | 1.00 | 0.5 | | | |
| <i>Control variables</i> | | | | | | |
| Company size, mln GBP | 14,427 | 6,369 | 20,605 | 17,164 | 13,002 | 4,162*** |
| Growth opportunities | 3.63 | 2.27 | 11.5 | 3.86 | 3.51 | 0.35*** |
| Host US | 0.28 | 0.00 | 0.5 | 0.33 | 0.26 | 0.07*** |
| Emerging market indicator | 0.00 | 0.00 | 0.1 | 0.00 | 0.01 | -0.01*** |
| N observations | | 88,846 | | 30,418 | 58,428 | |
| N foreign accounts | | 1,744 | | 471 | 1,273 | |

Table IV. Determinants of the trading volume ratio

The table reports the OLS estimates of equation (2): $Ln(FTV / DTV_{i,t}) = \gamma_0 + \sum_{j=1}^J \gamma_j X_{i,t} + \gamma_{J+1} UN_i + \varepsilon_{i,t}$

where $Ln(FTV/DTV_i)$ is the log of the foreign to domestic trading volume ratio, calculated as the total monthly number of shares traded on the foreign market divided by the total monthly number of shares traded on the home market; $X_{i,t}$ is a vector of variables that proxy for potential determinants of the foreign trading volume distribution; UN_i is a dummy variable that takes a value of 1 when cross-listing is on unregulated markets and 0 when it is on regulated markets. Explanatory and control variables are defined in Appendix A. Output additionally includes the economic significance (econ sgn) of the variables calculated as the product of the coefficient estimate and the variable's standard deviation (or one for dummy variables) divided by the standard deviation of the dependent variable. Reported t-statistics is heteroskedasticity consistent (White, 1980) and adjusted for clustering at the foreign account level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

| Variable | Exp. sign | Model (1): 1990-2007 | | | Model (2): 1990-2002 | | | Model (3): 2003-2007 | | | Model (4): 2003-2007 | | |
|-------------------------------------|-----------|----------------------|--------|----------|----------------------|--------|----------|----------------------|--------|----------|----------------------|--------|----------|
| | | est | t-stat | econ sgn | est | t-stat | econ sgn | est | t-stat | econ sgn | est | t-stat | econ sgn |
| <u>Fundamental factors</u> | | | | | | | | | | | | | |
| Return correlation | - | -0.80** | -2.10 | 3.8% | -0.21 | -0.37 | | -1.19*** | -2.73 | 5.6% | -1.32*** | -2.98 | 6.2% |
| Trading cost difference | - | -0.76 | -1.56 | | 0.03 | 0.04 | | -1.17** | -2.40 | 6.1% | -1.07** | -2.17 | 5.5% |
| Price level | + | 0.14* | 1.81 | 4.2% | 0.02 | 0.17 | | 0.19** | 2.25 | 5.5% | 0.24*** | 2.78 | 6.9% |
| Market size difference | + | 0.16 | 1.51 | | 0.39*** | 2.91 | 17.7% | 0.01 | 0.11 | | 0.02 | 0.13 | |
| Market turnover difference | + | 0.29*** | 6.69 | 17.1% | 0.20*** | 3.40 | 8.5% | 0.33*** | 6.63 | 21.0% | 0.32*** | 6.36 | 20.3% |
| Same currency indicator | + | 0.55*** | 3.12 | 13.9% | -0.22 | -0.84 | | 0.72*** | 4.01 | 9.0% | 0.77*** | 4.26 | 19.6% |
| Stock risk | +/- | 22.8*** | 8.41 | 15.1% | 23.27*** | 6.58 | 18.6% | 20.64*** | 6.52 | 13.4% | 19.11*** | 6.18 | 12.4% |
| Foreign institutional investors | + | | | | | | | | | | 1.60*** | 2.92 | 4.7% |
| Ownership concentration | - | | | | | | | | | | -0.84** | -2.34 | 4.7% |
| <u>Informational factors</u> | | | | | | | | | | | | | |
| Investor protection difference | + | 0.18 | 0.58 | | 1.25*** | 3.17 | 11.1% | -0.12 | -0.33 | | -0.05 | -0.14 | |
| Enforced insider trading difference | + | 0.76** | 2.01 | 19.3% | -0.54 | -1.31 | | 1.21*** | 2.60 | 8.5% | 1.25*** | 2.67 | 31.8% |
| Common language | + | 0.67*** | 2.89 | 17.0% | 1.05*** | 3.33 | 26.5% | 0.59** | 2.41 | 6.0% | 0.64*** | 2.59 | 16.3% |
| Geographic distance | - | -0.39** | -2.24 | 12.1% | -0.30 | -1.20 | | -0.39** | -2.30 | 11.6% | -0.31* | -1.79 | 9.2% |
| Foreign sales | + | 0.25 | 1.00 | | 0.49 | 1.48 | | 0.16 | 0.60 | | 0.18 | 0.65 | |
| Accounting standards | + | 0.57*** | 3.14 | 14.5% | 0.53* | 1.92 | 13.4% | 0.56*** | 3.25 | 6.4% | 0.51*** | 2.89 | 13.0% |
| Years traded | + | 0.20*** | 9.87 | 20.1% | 0.13*** | 4.95 | 11.4% | 0.23*** | 10.50 | 23.1% | 0.23*** | 10.29 | 23.1% |
| Foreign information factor | + | -0.01 | -1.01 | | -0.01 | -0.32 | | -0.01 | -0.58 | | -0.01 | -0.52 | |
| Unregulated market indicator | - | -1.64*** | -8.72 | 41.6% | -1.23*** | -4.91 | 31.1% | -1.90*** | -9.65 | 21.5% | -1.86*** | -9.39 | 47.3% |
| <u>Control variables</u> | | | | | | | | | | | | | |
| Company size | + | -0.03 | -0.50 | | 0.01 | 0.14 | | -0.05 | -0.83 | | -0.04 | -0.74 | |
| Growth opportunities | + | 0.01 | 1.46 | | 0.01* | 1.87 | 3.9% | -0.01* | -1.94 | 1.7% | -0.01* | -1.68 | 1.7% |
| Host US | + | 2.64*** | 5.68 | 67.0% | 1.48** | 2.10 | 37.4% | 2.93*** | 6.32 | 32.4% | 2.84*** | 6.07 | 72.2% |
| Emerging market indicator | + | -0.79 | -0.54 | | 0.15 | 0.13 | | -0.76 | -0.50 | | -0.72 | -0.43 | |
| Intercept | | -3.33*** | -2.70 | | -3.56** | -2.10 | | -6.82*** | -5.67 | | -7.33*** | -5.96 | |
| Year-fixed effects | | | YES | | | YES | | | YES | | | YES | |
| N of observations | | | 88,846 | | | 28,564 | | | 60,282 | | | 59,011 | |
| Adj. R-sq | | | 0.418 | | | 0.390 | | | 0.420 | | | 0.426 | |

Table V. Determinants of the trading volume distribution: Regulated markets vs. Unregulated markets

The table reports the OLS estimates of equation (2): $Ln(FTV / DTV_i) = \alpha_0 + \sum_{j=1}^J \gamma_j X_{i,j} + \varepsilon_i$

where $Ln(FTV/DTV_i)$ is the log of the foreign to domestic trading volume ratio, calculated as the total monthly number of shares traded on the foreign market divided by the total monthly number of shares traded on the home market; $X_{i,j}$ is a vector of variables that proxy for potential determinants of the foreign trading volume distribution. Explanatory and control variables are defined in Appendix A. Output additionally includes the economic significance (econ sgn) of the variables calculated as the product of the coefficient estimate and the variable's standard deviation (or one for dummy variables) divided by the standard deviation of the dependent variable. Reported t-statistics is heteroskedasticity consistent (White, 1980) and adjusted for clustering at the foreign account level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

| Variable | Exp. Sign | Regulated markets | | | | | | | | | Unregulated markets | | | | | | | | |
|-------------------------------------|-----------|------------------------|--------|----------|------------------------|--------|----------|------------------------|--------|----------|------------------------|--------|----------|------------------------|--------|----------|------------------------|--------|----------|
| | | Model (1.1): 1990-2007 | | | Model (1.2): 1990-2002 | | | Model (1.3): 2003-2007 | | | Model (2.1): 1990-2007 | | | Model (2.2): 1990-2002 | | | Model (2.3): 2003-2007 | | |
| | | est | t-stat | econ sgn | est | t-stat | econ sgn | est | t-stat | econ sgn | est | t-stat | econ sgn | est | t-stat | econ sgn | est | t-stat | econ sgn |
| <u>Fundamental factors</u> | | | | | | | | | | | | | | | | | | | |
| Return correlation | - | -0.47 | -0.81 | | -0.24 | -0.34 | | -0.23 | -0.31 | | -1.12*** | -2.59 | 5.7% | -0.41 | -0.56 | | -1.52*** | -3.03 | 7.8% |
| Trading cost difference | - | -0.10 | -0.14 | | -0.81 | -0.68 | | 0.39 | 0.53 | | -1.68*** | -2.61 | 8.7% | -0.93 | -0.72 | | -1.42** | -2.27 | 8.0% |
| Price level | + | -0.17 | -1.25 | | 0.01 | 0.07 | | -0.34** | -1.98 | 9.6% | 0.23** | 2.52 | 7.5% | -0.08 | -0.60 | | 0.41*** | 4.52 | 13.5% |
| Market size difference | + | 0.23 | 1.60 | | 0.34** | 2.15 | 17.8% | 0.09 | 0.47 | | -0.16 | -1.22 | | -0.07 | -0.37 | | -0.18 | -1.26 | |
| Market turnover difference | + | 0.32*** | 5.33 | 17.4% | 0.20** | 2.41 | 7.8% | 0.40*** | 5.98 | 23.9% | 0.40*** | 7.03 | 25.7% | 0.33*** | 4.24 | 15.3% | 0.40*** | 6.03 | 27.7% |
| Same currency indicator | + | 0.31 | 0.94 | | -0.62 | -1.34 | | 0.63* | 1.80 | 16.1% | 1.11*** | 5.45 | 30.6% | 0.65** | 2.14 | 15.9% | 1.11*** | 5.45 | 31.9% |
| Stock risk | +/- | 19.62*** | 4.25 | 13.7% | 27.62*** | 4.97 | 20.0% | 9.62* | 1.91 | 6.5% | 20.35*** | 6.74 | 14.9% | 13.77*** | 3.16 | 11.7% | 20.74*** | 5.99 | 15.0% |
| Foreign institutional investors | + | | | | | | | 2.93*** | 3.27 | 8.6% | | | | | | | 0.84 | 1.37 | |
| Ownership concentration | - | | | | | | | -1.03 | -1.55 | | | | | | | | -0.99** | -2.55 | 6.3% |
| <u>Informational factors</u> | | | | | | | | | | | | | | | | | | | |
| Investor protection difference | + | 0.76 | 1.56 | | 1.84*** | 3.46 | 14.9% | 0.04 | 0.06 | | -0.06 | -0.17 | | 1.19** | 2.31 | 11.5% | -0.29 | -0.70 | |
| Enforced insider trading difference | + | 1.51*** | 2.62 | 41.4% | 0.33 | 0.72 | | 2.13** | 2.24 | 54.4% | 0.11 | 0.23 | | -0.99 | -1.50 | | 0.61 | 1.26 | |
| Common language | + | 0.80** | 2.46 | 21.9% | 0.83** | 2.34 | 23.3% | 0.93** | 2.14 | 23.8% | 0.48 | 1.64 | | 1.07** | 2.21 | 26.2% | 0.47* | 1.65 | 13.5% |
| Geographic distance | - | -1.10*** | -3.67 | 40.2% | -0.74** | -2.10 | 26.6% | -1.16*** | -3.39 | 37.6% | -0.14 | -0.75 | | -0.02 | -0.08 | | -0.04 | -0.19 | |
| Foreign sales | + | 0.23 | 0.52 | | -0.29 | -0.61 | | 0.46 | 0.88 | | 0.49* | 1.74 | 3.8% | 1.25*** | 3.08 | 9.6% | 0.21 | 0.73 | |
| Accounting standards | + | 1.10*** | 4.45 | 30.2% | 0.55* | 1.70 | 15.4% | 1.54*** | 5.53 | 39.3% | 0.47** | 2.17 | 13.0% | 0.51 | 1.28 | | 0.37* | 1.88 | 10.6% |
| Years traded | + | 0.06** | 2.47 | 7.8% | 0.06** | 2.25 | 6.3% | 0.05 | 1.60 | | 0.34*** | 10.68 | 29.9% | 0.24*** | 5.30 | 15.5% | 0.36*** | 11.40 | 32.0% |
| Foreign information factor | + | 0.01 | 1.28 | | 0.04 | 1.04 | | 0.01** | 2.06 | 1.7% | 0.00 | -0.23 | | -0.08 | -1.49 | | 0.02 | 0.72 | |
| <u>Control variables</u> | | | | | | | | | | | | | | | | | | | |
| Company size | + | -0.20** | -2.18 | 10.1% | -0.07 | -0.62 | | -0.34*** | -3.32 | 16.7% | 0.06 | 1.00 | | 0.05 | 0.57 | | 0.06 | 0.91 | |
| Growth opportunities | + | 0.00 | 1.16 | | 0.01 | 1.60 | | -0.01 | -0.96 | | 0.01 | 0.73 | | 0.02*** | 3.04 | 6.2% | -0.01*** | -2.67 | 1.8% |
| Host US | + | 5.89*** | 8.12 | 161.5% | 3.94*** | 4.03 | 110.6% | 6.75*** | 8.45 | 172.4% | 1.93*** | 3.77 | 53.3% | 0.59 | 0.73 | | 1.99*** | 3.88 | 57.3% |
| Emerging market indicator | + | | | | | | | | | | 0.00 | 0.00 | | 1.85 | 1.26 | | -0.11 | -0.07 | |
| Intercept | | 1.32 | 0.67 | | -1.20 | -0.55 | | 1.84 | 0.79 | | -4.86*** | -3.41 | | -4.18* | -1.82 | | -12.73*** | -9.29 | |
| Year-fixed effects | | | YES | | | YES | | | YES | | | YES | | | YES | | | YES | |
| N of observations | | | 30,418 | | | 13,867 | | | 16,052 | | | 58,428 | | | 14,697 | | | 42,959 | |
| Adj. R-sq | | | 0.498 | | | 0.468 | | | 0.558 | | | 0.321 | | | 0.359 | | | 0.304 | |

Appendix A
Variables definitions and data sources

| Variable | Definition | Data source |
|-------------------------------------|--|--------------------------------------|
| <i>Fundamental factors</i> | | |
| Return correlation | correlation coefficient of weekly stock returns and foreign index returns over preceding 36 (at least 24) months, computed for each month | Datastream |
| Trading cost difference | the difference in total trading costs, including explicit costs (commissions) and implicit costs (price impact), between the host and home markets | Chiyachantana et al. (2004), Table V |
| Price level | the natural logarithm of the stock price on a particular exchange converted to British pounds | Datastream |
| Market size difference | the log-difference between total market capitalization of the host and home markets | Datastream |
| Market turnover difference | the log-difference between the market turnover ratio of the host and home markets | Datastream |
| Same currency indicator | dummy variable =1 if foreign trading takes place in the same currency as home trading; =0 otherwise | Datastream |
| Stock risk | standard deviation of stock's weekly returns over the preceding 12 months, calculated for each month | Datastream |
| Foreign institutional investors | the percentage of total shares held by an institution domiciled in a country other than that of the company at the end of the preceding year | Datastream |
| Ownership concentration | calculated as one minus the percentage of total shares available to ordinary investors at the end of the preceding year | Datastream |
| <i>Informational factors</i> | | |
| Investor protection difference | the difference in the anti-self-dealing index between the host and home countries | Djankov et al. (2008) |
| Enforced insider trading difference | dummy variable =1 if insider trading laws have been enforced in the foreign country but not in the home country; =0 otherwise | Bhattacharya and Daouk (2002) |
| Common language | dummy variable =1 if the host and home countries share a common official language; =0 otherwise | Sarkissian and Shill (2004) |
| Geographic distance | the natural logarithm of the geographic distance in kilometres between capitals of the host and home countries | Sarkissian and Shill (2004) |
| Foreign sales | the fraction of foreign sales in company's total net sales in the preceding year | Datastream |
| Accounting standards | dummy variable =1 if the company used international accounting standards or US GAAP at the end of the preceding year; =0 otherwise | Datastream |
| Year traded | the number of years a stock has been listed or traded on a particular exchange | dataset |
| Foreign information factor | calculated using methodology of Baruch et al. (2007) as the difference in R2 (adjusted for degrees of freedom) of a two-index model including foreign market index and of a single-index model with just the home market index. It is computed for each month for each stock using weekly returns over preceding 48 (at least 36) months | calculated |
| Unregulated market indicator | dummy variable =1 if trading takes place on the US OTC, London OTC, Open market of Deutsche Bourse, VIRTX or Milan stock exchange; =0 otherwise | dataset |
| <i>Control variables</i> | | |
| Company size | the natural logarithm of the market value of the company's common equity at the end of the preceding year | Datastream |
| Growth opportunities | price-to-book value ratio at the end of the preceding year. If not available from Datastream, it is calculated as the ratio of the stock price to the company's book value per share | Datastream |
| Host US | dummy variable =1 if trading takes place on the NYSE, Nasdaq or US OTC; =0 otherwise | dataset |
| Emerging market indicator | dummy variable =1 if the stock is from emerging market; =0 otherwise | MSCI list |