Price, Liquidity, Volatility, and Volume of Cross-listed Stocks

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Olga Dodd

Thesis submitted for the degree of
Doctor of Philosophy in Finance

Durham Business School, University of Durham

May 2011

Supervisors: Professor Krishna Paudyal
Dr. Christodoulos Louca
Professor Rob Dixon

Abstract

This thesis examines the possible implications of international cross-listings for the wealth of shareholders, for stock liquidity and volatility, and for the distribution of trading volumes across both the domestic and foreign stock markets where the shares are traded. For the purpose of clarity, these three issues are analysed in three empirical chapters in the thesis.

The first empirical issue examined in this thesis is the effects of international cross-listings on shareholders' wealth. This is discussed in chapter 2. The chapter compares the gains in shareholders' wealth that result from cross-listing in the American, British, and European stock exchanges and then evaluates their determinants by applying various theories on the wealth effects of cross-listing. Moreover, it evaluates how the wealth effect of cross-listing has changed over time reflecting the implications of the significant developments in capital markets that have taken place in recent years. In particular, the effects of the introduction of the Euro in Europe and the adoption of the Sarbanes-Oxley Act in the US are analysed. The findings suggest that, on average, cross-listing of stocks enhances shareholders' wealth but the gains are dependent on the destination market. In addition, the regulatory and economic changes in the listing environment not only alter the wealth effects of cross-listings, but also affect the sources of value creation. Overall, this chapter provides in-depth insights into the motivations for, and the benefits of, cross-listings across different host markets in changing market conditions.

The second empirical issue examined is the impact of cross-listing and multimarket trading on stock liquidity and volatility (chapter 3). Cross-listing leads to additional mandatory disclosure in order to comply with the requirements of the host market. Such requirements are expected to reduce information asymmetry among various market participants (corporate managers, stock dealers, and investors). An enhanced information environment, in turn, should increase stock liquidity and reduce stock return volatility. The findings of this study suggest that the stock liquidity and volatility improves after cross-listing on a foreign stock exchange. Moreover, this study distinguishes between cross-listing and cross-trading. The distinction is important because cross-trading, unlike cross-listing, does not require the disclosing of additional information. Although such a distinction means there is a variation in the information environment of cross-listed and cross-traded stocks, the results do not reveal any significant difference in the liquidity and volatility of the stocks that are cross-listed and cross-traded. This evidence suggests that the improvement in the liquidity and volatility of cross-listed/traded stocks comes primarily from the intensified competition among traders rather than from mandatory disclosure requirements.

The final empirical issue investigated in this thesis (chapter 4) is the identification of the determinants of the distribution of equity trading volume from both stock exchange and firm specific perspectives. From a stock exchange perspective, exchange level analysis focuses on the stock exchange characteristics that determine the ability of a stock exchange to attract trading of foreign stocks. While from a firm perspective, firm level analysis focuses on firm specific characteristics that affect the distribution of foreign trading. The results show that a stock exchange's ability to attract trading volumes of foreign equity is positively associated with a stock exchange's organizational efficiency, market liquidity, and also the quality of investor protection and insider trading regulations. Analysis also reveals the superior ability of American stock exchanges to attract trading of European stocks. Moreover, there is strong evidence suggesting that regulated stock exchanges are more successful in attracting trading of foreign stocks than non-regulated markets, such as OTC and alternative markets and trading platforms. From a firm perspective, the proportion of trading on a foreign exchange is higher for smaller and riskier companies, and for companies that exhibit lower correlation of returns with market index returns in the host market. Also this proportion is higher when foreign trading takes place in the same currency as trading in the firm's home market and increases with the duration of a listing. Finally, the study provides separate evidence on the expected levels of trading activity on various stock exchanges for a stock with particular characteristics.

Overall, the findings of this thesis suggest that international cross-listing is beneficial for both firms and their shareholders but the findings also suggest that there are significant variations in the implications of cross-listings for different firms and from listing in different destination foreign markets. Finally, these implications are not static and respond to changes and reforms in listing and trading conditions.

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Acknowledgements

It is a pleasure to thank those who made this thesis possible.

It is difficult to overstate my gratitude to my primary PhD supervisor, Professor Krishna Paudyal who inspired me to undertake this PhD. With his endless knowledge of finance and his inspiration, he has helped to make finance a fascinating subject for me. I am very grateful for his excellent guidance and invaluable advice and support during my PhD.

I am also very grateful to my second supervisor, Dr. Christodoulos Louca, for his supervision, mentorship and encouragement. I greatly appreciate the time, ideas and advice that he provided throughout my thesis-writing period.

I would like to express my gratitude to Durham University for providing me with a generous scholarship, the Durham University Doctoral Fellowship, throughout the years of my studies. This has enabled me to focus on my research and also has opened up opportunities to present my work and receive feedback at doctoral seminars and conferences around the world.

I would like further to acknowledge with gratitude the fostering research environment provided in the Department of Finance at Auckland University of Technology. Special thanks to Professor Alireza Tourani-Rad, the Chair of Finance, for unlimited support and encouragement during the final stages of this PhD.

Lastly, and most importantly, I would like to thank my family for all their love and patience. For my loving, supportive, and encouraging husband Patrick and my sweet daughter Ailish whose faithful support and patience during this PhD is so appreciated. Thank you.

Author's declaration

This is to certify that:

(i) the thesis comprises only my original work towards the PhD except where indicated,

(ii) due acknowledgement has been made in the text to all other material used,

(iii) the thesis is less than 100,000 words in length, exclusive of table, maps, bibliographies, appendices and footnotes.

Olga Dodd

Chapter 1

Introduction

The liberalization of cross-border capital flows in recent decades has significantly reduced investment barriers between national capital markets and opened up possibilities for companies to raise capital in international markets through listing and trading. In the 1980s and in the first half of the 1990s, the fragmentation of the capital markets was the main motivation for corporate managers to consider an international cross-listing as a means of overcoming investment barriers and making a company's shares accessible to foreign investors.[1] In more recent years, despite the fact that foreign equity markets are now more integrated and more easily accessible to investors, international listing and trading of a company's shares still remains important. This can potentially be attributed to the fact that significant differences across stock exchanges still exist in the level of investor protection, equity trading costs and information costs. Nevertheless, the increased integration and technological sophistication of capital markets, combined with significantly increased costs of foreign listings in the US during the last decade, have fuelled a debate in the media[2] and in academic literature on the net benefits of international cross-listings (Marosi and Massoud, 2008; Litvak, 2008).

International cross-listings have been intensively covered in the literature.[3] However, in light of the important developments that have taken place in capital markets in the last decade many questions remain unanswered. This is essentially because recent developments have potentially affected the motivations for and the costs and benefits of listing a company's shares abroad. First, the regulatory environment of US-listed companies has significantly changed as the result of the adoption of the Sarbanes-Oxley Act of 2002 and this has also affected non-US companies cross-listed in the US. While this law was intended to enhance investor protection and confidence, it has also significantly increased the

[1] Cross-listing is a cross-border listing of shares, i.e. a listing of shares on a stock exchange outside of the country of the company's origin, in addition to the home market listing.

[2] For example, 'Why cross-listing shares doesn't create value', McKinsey Quarterly, (November, 2008); 'Do cross-listings still make sense?', Business Times Singapore, (July, 15, 2010).

[3] Karoly (1998 and 2006) provide a comprehensive review of the literature on cross-listing and its development over time.

costs for companies of listing on US stock exchanges. Second, the trading environment in Europe has been affected by the introduction of the single European currency, the Euro. While the European Monetary Union facilitates cross-border capital flows in Europe due to the elimination of foreign currency risk, it also poses questions about the need to cross-list within increasingly integrated European markets. Third, the global equity trading environment has changed significantly due to considerable advances in technology that have meant securities' trading has moved from the traditional trading floor to electronic trading. In turn, electronic trading, combined with competition pressure in the stock exchange industry, has facilitated the introduction of new types of markets and trading platforms that are generally different from traditional regulated markets in their level of added disclosure requirements.[4] Admission to trade on such markets makes a company's shares available to a wider range of investors at no additional direct costs for the company. Despite the fact that a significant number of stocks are traded on non-regulated markets, current understanding of the implications is very limited. Potentially, admission to trade on a foreign exchange, or cross-trading, could be a substitute for the more costly cross-listing.[5] However, whether the benefits from cross-listing and cross-trading are comparable is an empirical question that needs to be addressed. Moreover, the changes in the global equity trading environment raise questions for stock exchanges on how to compete successfully in attracting and maintaining stock listing and trading.

The literature indicates that potential benefits from international cross-listings are associated with the level of economic and financial development and the regulatory framework of the host market. Existing empirical evidence on the economic consequences of international cross-listings, however, is primarily based on the experience of non-US companies that cross-list on US exchanges. Nevertheless, statistics show that a significant portion of companies also cross-list on European markets (Table 1.1) where the institutional

[4] For example, Open market of Deutsche Börse.

[5] Cross-listing is different from cross-trading in the way that it is initiated by the company's decision to cross-list its shares on a foreign stock exchange and involves a company submitting a listing application and meeting listing and disclosure requirements of the host foreign stock exchange. An admission to trade on a foreign stock exchange, or cross-trading, refers to trading of shares on a stock exchange outside of the country of the company's origin without meeting the stock exchange's disclosure and listing requirements, often without the company even being aware that its stock is cross-traded. Both cross-listing and cross-trading are in addition to the home market listing of the stock.

characteristics differ significantly from those of the US market.[6] Additionally, European markets have been going through significant changes themselves, prompting the need for empirical investigation on the net benefits of foreign listing and trading in these markets.[7]

This thesis aims to address the above gaps in the literature by evaluating the economic consequences of international cross-listing and multimarket trading of equities on various international markets by European companies. The European sample provides an opportunity to evaluate the implications of cross-listing and multimarket trading for stocks from a wide range of home countries; from Western European countries with developed markets to Central and Eastern European countries with emerging markets, and from countries which use common law to those that use civil law. In addition, significant developments in European markets[7] motivate further investigation into how these developments affect the competitiveness of European financial markets vs. the US financial markets. Also, European financial markets are appealing for an investigation into the implications of multimarket trading due to their leadership in technological advances in equity trading. This leadership can be seen in the number of equity trading platforms that have been introduced in recent years (e.g. VIRTX of Swiss stock exchange and Open market of Deutsche Börse). Lastly, the European sample of cross-listed stocks represents a substantial portion of cross-listed stocks worldwide. For example, in 2007 out of the total 341 foreign companies listed on the London stock exchanges 149 companies, or 43.7% of the total number of foreign listed companies, were from European countries.

The thesis examines the impact of cross-listings on shareholders' wealth, on the stock liquidity and volatility, and on the location of trading of cross-listed stocks. Shareholders' wealth maximization is the ultimate goal of corporate financial policies. Whether a cross-listing could help to achieve this goal is examined in the first empirical chapter. In turn, the increase in market valuation of cross-listed stocks could by driven by the improvement in stock liquidity and volatility after cross-listing. The second empirical

[6] Discussion of the differences in the institutional characteristics of major equity markets and stock exchanges is presented in chapter 2, section 2.6.2, and in chapter 4, section 4.6.2.

[7] European regional integration in the recent decade comprises, in addition to the introduction of the Euro, a significant enlargement of the European Union. Also, Poser (2001) and Galati and Tsatsaronis (2003) suggest that capital market financing as opposed to bank-intermediated credit has become more important in Europe. Finally, significant regulatory changes have been taking place in European financial markets such as the adoption of Financial Services Action Plan including the Markets in Financial Instruments Directive (MiFID). However, the full implementation of the MiFID took place at the end of 2007. Thus, analysis of the impact of this regulation is beyond the scope of this thesis.

chapter explicitly examines the impact of cross-listing on stock liquidity and volatility. Finally, a cross-listing is expected to be beneficial only if the cross-listed stock is actively traded on the foreign stock exchanges following the cross-listing. The third empirical chapter addresses the importance of the location of trading of cross-listed stocks and investigates the determinants of the distribution of foreign trading of cross-listed stocks.

This research has important implications for various groups of market participants. First, understanding the potential outcomes of cross-listing and multimarket trading is important for cross-listed companies or companies considering a foreign listing of their shares. Second, it is relevant for investors that trade foreign equity shares. Third, the findings of this research help stock exchanges identify the factors that make them competitive in attracting trading of foreign equities. Finally, the findings of this research should be of considerable importance to financial market regulators. Because the thesis focuses on cross-listing and multimarket trading that takes place in different international markets, the implications of its findings are relevant on an international level.

Cross-listing trends and possible motivations to cross-list are discussed in sections 1.1 and 1.2 respectively. While the individual empirical chapters of this thesis are self contained and include literature specific to the issue discussed in the chapter, a broad review of literature on the economic consequences of international cross-listings and multimarket trading and the contribution this thesis makes to the field are discussed in section 1.3. In particular, section 1.3 covers the impact of cross-listings on shareholders' wealth, on the stock liquidity and volatility and on the location of trading of cross-listed stocks.

1.1 Cross-listing trends

Cross-listing of stocks gained importance in the 1980s facilitated by the liberalization of cross-border capital flows and by the internationalization of companies' operations. Since the 1980s, it has been a widespread corporate strategy to access foreign capital markets, particularly for large companies with an international orientation (Pagano et al, 2002). Historically, the capital markets of the United States have been considered as the ultimate destination for a cross-listing, possibly due to a more liquid trading environment, a

larger investor base and higher availability of equity capital.[8] In recent years, increased capital market integration and significant technological advances in equity trading, such as electronic trading, have made equity trading in foreign markets more feasible for investors and, thus, have potentially reduced the need for companies to cross-list. Despite these significant changes, the numbers of companies that choose to be cross-listed as well as the volumes of foreign trading in cross-listed stocks remain considerable. For example, according to the Bank of New York's 'The Depository Receipts[9] Markets Review 2007' in 2007 there were 2,060 foreign companies from 76 countries cross-listed in the United States providing a total trading volume of nearly $3.3 trillion in 2007.[10]

Clearly, cross-listing is still an important aspect of international financial markets. Statistics on the number of foreign companies listed (Table 1.1) show that the US is an important listing destination for foreign companies. However, it also shows that European exchanges are important host markets. Thus, foreign companies constitute on average 14% of the total number of listed companies in the major American exchanges and on average 19% of the total number of listed companies in the British and other major European exchanges. Moreover, an argument proposed recently suggests that while European markets have improved their quality and attractiveness to foreign companies, the US is potentially losing its competitive edge, particularly after the adoption of the Sarbanes-Oxley Act of 2002 (SOX), which has significantly increased the costs of a US listing[11] (see, for example, Zingales, 2007; Yallapragada et al, 2008). Marosi and Massoud (2008) explicitly argue that foreign companies fled the US market[12] due to reduction in net benefits of a US cross-listing

[8] A number of the US firms chose to cross-list outside of the US in the 1980s and 1990s. However, empirical evidence suggests that a cross-listing by a US firm outside of the US has no conventional advantages for the cross-listing firm such as improved market valuation (Howe and Kelm, 1987; Lee, 1991; Torabzadeh et al, 1992; Varela and Lee, 1993; Lau et al, 1994). In contrast, two more recent studies report that global equity offerings by US firms outperform domestic equity offerings (Chaplinsky and Ramchand, 2000; Wu and Kwok, 2002).

[9] A cross-listing in the US takes place in the form of depository receipt (DR), a negotiable certificate issued by a bank to represent the underlying shares held in trust at a foreign bank, as opposed to direct listing of ordinary shares on a foreign exchange.

[10] To put this number into perspective, the total value of the share trading on the NYSE in 2007 was $29.1 trillion.

[11] King and Mitto (2007) estimate the annual direct costs of SOX compliance to be $2 to $3 million US dollars. An example from industry: British Airways in their press release related to the delisting of its shares from NYSE announced that rising costs of compliance with the Sarbanes-Oxley Act was a primary reason for delisting; this delisting saves the company £10 million British pounds per year. Source: The Evening Standard (April, 25, 2007).

[12] Marosi and Massoud (2008) report that during the period 2002-2006 126 foreign companies voluntary deregistered from US exchanges. Fernandes et al (2010) report that 80 foreign companies

after the adoption of SOX.[13] Overall, there is recent evidence that a significant number of companies still choose to have their shares listed on foreign exchanges and also at the same time, a number of companies choose to delist their shares from foreign exchanges. Such contradictory cross-listing trends call for further research to explore the costs and benefits of international cross-listings in the current conditions for different types of companies.

1.2 Why do companies cross-list?

Managerial surveys[14] and the literature on the determinants of cross-listing decisions (Pagano et al, 2002; Sarkissian and Shill, 2004) indicate that an international cross-listing is often an integrated part of the company's global business strategy (King and Mittoo, 2007). Larger, often recently privatized, and more export-oriented companies choose to list their shares on a foreign exchange to signal to markets, including the consumer market, that the company has become a global player.[15] Furthermore, cross-listing is considered to be a means of internationalizing the investor base in line with the international profile of the firm's operations and thereby accessing the foreign equity capital needed to finance investment opportunities (Bancel and Mittoo, 2001). As confirmation of the importance of access to new equity capital, Reese and Weisbach (2002) report a significant increase in both the number and value of equity offerings following cross-listing in the US. Moreover, a foreign listing can provide the cross-listed company with an acquisition currency, a foreign exchange-listed security that is valid in the foreign country to pay for acquisitions in that

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announced their intention to deregister from US exchanges in the eight months since the rule 12h-6 took effect in 2007 (this rule has made it significantly easier for foreign firms to deregister with the SEC and thus to delist from US exchanges). Additionally, evidence from business press includes: Goodbye, farewell, auf wiedersehen, adieu…, Wall Street Journal, (February, 9, 2005); Delisting European companies should think twice before delisting from the US stock markets, Financial Times, (April, 25, 2005).

[13] Marosi and Massoud (2008) show that SOX has significantly increased the probability of foreign companies delisting from US exchanges. In addition, they show that investor's reaction to a company's decision to delist after SOX is significantly less negative than that before SOX, consistent with investors recognizing the compliance costs of SOX.

[14] Published survey of foreign managers of companies cross-listed in the US include: Mittoo (1992), Fanto and Karmel (1997), Bancel and Mittoo (2001).

[15] Survey of 288 cross-listing announcement statements by European companies obtained from the Factiva news database reveals the following most commonly named reasons to cross-list: foreign operations (named in 50 out of 288 statements); broader investor base (named in 45 out of 288 statements); acquisition plans in the foreign market (named in 42 out of 288 statements); access to capital, enhanced reputation and company profile (named in 29 out of 288 statements); international expansion/growth strategy (named in 20 out of 288 statements); improved company's visibility (named in 20 out of 288 statements).

country.[16] Empirically, there is evidence that non-US firms cross-listed in the US are significantly more active in acquiring US companies (Tolmunen and Torsila, 2005) and compared to their domestically listed peers, pay less by using US-listed equity rather than cash (Burns, 2004). In addition, there is evidence that a US cross-listing facilitates greater access to external financing (Lins et al, 2005), reduces the cost of debt (Ball et al, 2009), which, in turn, contributes to higher firm growth (Khurana et al, 2008) and improved operating performance (Charitou and Louca, 2009).

On the flip side of the managerial motivation to cross-list, Charitou et al (2008) show that a non-US firm is more likely to cross-list in the US if the CEO has substantial holdings of vested options, which she/he is likely to exercise subsequent to the cross-listing event associated with abnormal positive stock price performance. Ayyagari and Doidge (2010) argue that controlling shareholders of non-US firms use a US listing as a means to decrease the costs of ownership transfer. They provide evidence that controlling shareholders are more likely than controlling shareholders of matched firms that do not cross-list, to sell voting rights and control stakes to foreign investors following a listing in the US.

1.3 Economic consequences of international cross-listings

1.3.1 Shareholders' wealth

Although managers may be motivated by such considerations as the improved prestige, image and visibility of their company to customers and investors (Bancel and Mittoo, 2001), the primary financial objective of a foreign listing is a reduction in the company's costs of capital and, accordingly, improved corporate valuation (Chouinard and D'Souza, 2003-2004). Existing empirical evidence on this issue is provided by three groups of studies that use different methodologies: 1) studies that explicitly examine the changes in the cost of capital after cross-listing, 2) studies that examine the valuation multiples of cross-listed firms relative to those of firms that do not cross-list using cross-sectional analysis, and 3) studies that examine changes in stock price around the announcement of cross-listings and/or around the cross-listing event using the time-series framework.

[16] Creation of acquisition currency, as a benefit of a foreign listing, has long been advocated by practitioners. E.g. J.P. Morgan suggests that a cross-listing 'facilitates merger and acquisition activity by creating a desirable stock-swap acquisition currency'. (Source: www.adr.com).

Studies from the first group report that cross-listing in the US by non-US firms is associated with a significant reduction in the cost of equity capital (Errunza and Losq, 1985; Jorion and Schwartz, 1986; Errunza and Miller, 2000; Koedijk and van Dijk, 2004). In addition, Hail and Leuz (2009) show the reduction in the cost of equity is sustained over a long period of time following the cross-listing event. At the same time, there is no evidence on the changes in the cost of capital after cross-listing in host markets other than the US.

The second group of studies, the cross-sectional studies, estimate the valuation premium of cross-listed firms using valuation multiples, most often Tobin's Q[17], and report that non-US firms that cross-list in the US experience significantly higher valuations compared to firms that do not cross-list (Lang et al, 2003a; Doidge et al, 2004; Hope et al, 2007; O'Connor, 2009; King and Segal, 2009). However, Gozzi et al (2008) show that corporate valuation increases significantly before and during the year of cross-listing and declines afterwards. Such evidence questions the causality of the relationship between cross-listing and firm valuation. Several studies also compare the valuation premium from cross-listing in the US and in the UK. However, the findings are conflicting. Thus, Doidge et al (2009a) find significant valuation premiums for US cross-listings that are persistent over time, while they find no premiums in valuation for UK cross-listings. The authors interpret these findings as consistent with the theory that a stock exchange listing in the US 'has unique governance benefits for foreign firms' (Doidge et al, 2009a, p.235). On the other hand, Bianconi and Tan (2010) find significant valuation premiums for both US and UK cross-listings.

Finally, the third group of empirical studies, the event studies, focuses on the impact of cross-listing on shareholders' wealth and report that, on average, cross-listing in the US results in significant positive abnormal returns both around the announcement of the decision to cross-list (Miller, 1999; Doukas and Switzer, 2000; Lee, 2003) and around the cross-listing event itself (Foerster and Karolyi, 1993 and 1999; Mittoo, 2003; Bris et al, 2007). However, such evidence primarily concerns cross-listings in the US, while the market reaction to cross-listing on a foreign market other than the US has received significantly less attention in the literature. Concerning cross-listing in the UK, prior studies find positive

[17] Tobin's Q is the ratio of the market value of a firm's assets (measured by the market value of its outstanding stock and debt) to the replacement cost of the firm's assets (Tobin, 1959). It provides an indication of the valuation premium that investors assign to the future earnings potential of the firm (King and Mittoo, 2007).

abnormal returns (Serra, 1999; Roosenboom and van Dijk, 2009). In addition, Sarkissian and Schill (2009a) report permanent valuation gains from cross-listing on various host markets and suggest that cross-listing in the US does not offer unique valuation benefits.

Overall, empirical evidence on the effects of international cross-listings arrive at the general consensus that cross-listing in the US has a positive impact on shareholders' wealth. Evidence on the wealth effects of foreign listings in other markets is limited and inconclusive. In addition, significant changes in international capital markets discussed above have potentially altered the net benefits of cross-listings in different markets.

Moreover, there is an ongoing debate in the literature on the sources of value creation around cross-listings. Conventional wisdom has been that cross-listing is a way to overcome investment barriers and make shares accessible to foreign investors (Stapleton and Subrahmanyam, 1977; Errunza and Losq, 1985; Alexander et al, 1987). Accordingly, the reduction in the cost of capital is the result of the increased shareholder base and wider risk sharing (Foerster and Karolyi, 1999; Errunza and Miller, 2000). In the late 1990s, however, despite the increased integration of national capital markets, the number of cross-listings continued to grow and the valuation benefits from cross-listing continued to be significant. This challenged the market segmentation argument and prompted new theories on the valuation impact of cross-listings (Karolyi, 2006). As an alternative explanation, Stulz (1999) and Coffee (1999) initiated the discussion on the legal bonding of the US cross-listing and suggested that the impact on the cost of capital of cross-listed companies might come from the new legal environment that provides better protection to minority shareholders.

In line with the legal bonding explanation of the valuation effects of cross-listing, a number of empirical studies provide evidence that cross-listing in the US is associated with an improvement in corporate governance. Doidge et al (2004 and 2009a) explicitly show that the valuation premium is higher for cross–listings on stock exchanges with stricter disclosure requirements. Additionally, Doidge (2004) and Doidge et al (2009b) argue that a US cross-listing constrains the consumption of private benefits by controlling shareholders. More specifically, Doidge (2004) report that firms that cross-list in the US have significantly lower voting premiums than firms that do not cross-list, which they interpret as evidence of the improved protection of minority investors. Doidge et al (2009b) show that firms that have controlling shareholders with greater ownership of voting are less likely to cross-list in the

US because the controlling shareholders would have to give up more private benefits of control. Charitou et al (2007) and Lel and Miller (2008) also argue that listing on US stock exchanges improves a company's corporate governance. Particularly, Charitou et al (2007) show that cross-listing is associated with more independent boards and audit committees and more dispersed ownership, while Lel and Miller (2008) show that cross-listing improves the ability to terminate poorly performing CEOs, especially for companies from countries with weak investor protection. Finally, Fresard and Salva (2010) suggest that cross-listing in the US mitigates insiders' ability to convert the company's cash holdings into private benefits, evidenced by the differences in valuation of excess cash of cross-listed companies and their non-cross-listed peers.

Based on the argument that improved corporate governance and investor protection are the main sources of benefits from cross-listing, the introduction of the Sarbanes-Oxley Act[18] of 2002 (SOX) in the US was expected to further increase the benefits from cross-listing in the US. However, in sharp contrast to this expectation, financial markets have witnessed a wave of de-listings from US exchanges in recent years (as discussed above in section 1.1). In addition, there is evidence of a negative perception of SOX by investors, arguably due to the significantly increased compliance costs of a US listing (Zhang, 2007; Litvak, 2007). Also Litvak (2008) specifically shows that valuation premiums of US cross-listed companies have declined significantly after the adoption of SOX. Overall, the trend of de-listing from US exchanges and the empirical evidence regarding investors' negative perception of SOX have raised questions about the strength of the legal bonding explanation for the net benefits of cross-listing.

Although financial research has intensively covered the impact of cross-listings on shareholders' wealth, there remain open questions. First, neither of the theories on the valuation effects of cross-listing has been successful in single-handedly explaining cross-listing trends and the net benefits of cross-listing. Second, several important capital market developments, such as the adoption of SOX in the US and the adoption of the single currency in Europe, have raised new questions on the value of cross-listing.[19] Third, since

[18] The Sarbanes-Oxley Act of 2002 has toughened corporate governance requirements for publicly traded companies in order to improve investor confidence and reassure the US capital market integrity (Donaldson, 2005).

[19] According to the 2005 survey by Mazars, a Paris-based auditing firm, only 43% of European companies think the benefits of US cross-listing after the adoption of SOX outweigh its costs, while

the majority of empirical studies provide evidence on the impact of cross-listing in the US, which is significantly different from other major capital markets in terms of disclosure requirements and costs of listing, the sources of the benefits of cross-listing in other markets are still not clear. Chapter 2 of this thesis contributes to the debate on the effects of international cross-listings on shareholders' wealth by addressing these gaps in the literature. In particular, chapter 2 addresses two research questions: 1) Do international cross-listings on various host markets create shareholders' wealth? 2) What are the sources of wealth creation around a cross-listing event? Both the wealth effects of cross-listings and their determinants are compared across various host markets. The determinants of the wealth effects are evaluated with a particular focus on the impact of the recent developments in capital markets on the net benefits of cross-listings and on the sources of these benefits.

The findings of chapter 2 suggest that the impact of cross-listings on shareholders' wealth depends on the destination market. More specifically, cross-listings in the US result in the most significant positive cumulative abnormal returns around the cross-listing announcement, closely followed by cross-listing in the UK, while cross-listings in Europe have no significant impact on the stock's market valuation. More importantly, it is documented that significant developments such as the introduction of Euro in Europe, the introduction of AIM by the London stock exchange and the adoption of SOX in the US have significantly affected the impact of international cross-listings on shareholders' wealth and also the determinants of this impact.

Chapter 2 contributes to literature on the effects of international cross-listings on shareholders' wealth in the following ways. First, it adds to the literature empirical evidence on the experiences of European stocks cross-listed and traded in American, British and European markets in addition to the widely reported evidence on the experiences of foreign stocks cross-listed in the US. Second, it provides evidence on the time variation in the net benefits of international cross-listing. Specifically, it evaluates how important capital market developments in the last decade have altered the impact of cross-listings on shareholders' wealth. Third, it empirically examines potential determinants of the wealth effects of cross-listings on various host markets.

17% are considering delisting to escape the law. Source: Sarbanes-Oxley Goes Global, Forbes Magazine (July, 13, 2006).

1.3.2 Liquidity and volatility and information environment of cross-listed stocks

Along with access to foreign equity markets and a broader shareholders base, enhanced stock liquidity is an important expected benefit of listing on a foreign market (Bancel and Mittoo, 2001; Foerster and Karolyi, 1998; Bris et al, 2007). All else being constant, greater liquidity should translate into a lower cost of equity capital because it reduces the costs of trading for investors and therefore reduces the required illiquidity premium (Amihud and Mendelson, 1986; Brennan et al, 1998; Jacoby et al, 2000). However, empirical evidence on the impact of cross-listing on stock liquidity is mixed. Some studies report an improvement in stock liquidity after cross-listing in terms of reduced trading costs (Foerster and Karolyi, 1998; Domowitz et al, 1998), reduced frequency of zero returns (Bris et al, 2007), and increased trading volumes (Smith and Sofianos, 1997; Foerster and Karolyi, 1998). Other studies, however, report no significant improvement or even deterioration in stock liquidity after cross-listing (Noronha et al, 1996; Domowitz et al, 1998; Silva and Chavez, 2008; Berkman and Nguyen, 2010). Overall, existing empirical evidence on the impact of cross-listing on stock liquidity is not conclusive. In regards to the empirical evidence on the impact of cross-listing on stock return volatility, there is evidence that the increase in trading volume after cross-listing is associated with increased stock return volatility (Barclay et al, 1990; Chan et al, 1996; Werner and Kleidon, 1996; Menkveld, 2008). While this is in line with the literature on the positive relationship between trading volume and volatility (Karpoff, 1987; Jones et al, 1994; Chan and Fong, 2000), it challenges theoretical predictions on the positive effects of cross-listings. This contradiction calls for further investigation of the impact of cross-listings on stock return volatility.

While stock liquidity and volatility are important factors on their own, these stock trading characteristics have also been used in the literature to proxy the quality of the firm's information environment (Leuz and Verrecchia, 2000; Leuz, 2003).[20] Information asymmetry is one of the sources of market segmentation that can be alleviated through cross-listing (Chouinard and D'Souza, 2003-2004). Since cross-listing is associated with additional mandatory disclosure requirements, it is expected to reduce information asymmetry between corporate managers and investors and also among different groups of investors. In turn, an improved information environment reduces an investor's information costs and therefore

[20] The quality of information environment refers to the costs of acquiring and processing relevant information about the firm and reliability of this information.

should lower the cost of equity capital for cross-listed companies (Diamond and Verrechia, 1991). In the case of cross-listing, the theoretical model of Chemmanur and Fulghieri (2006) predicts a positive stock price reaction to the announcement of cross-listing on a foreign exchange that has higher disclosure standards than the home exchange, explained by the reduction in investor's monitoring costs after cross-listing. Empirically, Doidge et al (2004) show that cross-listing on a stock exchange with stricter disclosure requirements results in higher valuation premiums of cross-listed companies. Bris et al (2009) compare the stock price reaction to cross-listing and admission to trade on the London stock exchange. They find strong evidence that additional disclosure requirements associated with a stock exchange listing can explain significantly higher abnormal returns around stock exchange listing vs. admission to trade. Also, Baker et al (2002) and Lang et al (2003a) show that increased production of stock-specific information after cross-listing is associated with higher market valuations.

The quality of the stock's information environment, however, is not straightforward to quantify and test empirically. Several studies provide indirect evidence on the improvement in the stock's information environment. For example, Baker et al (2002) and Lang et al (2003a) show that cross-listing is associated with increased media coverage and improved analyst coverage.[21] Baker et al (2002) find that international cross-listings, including both listings on the New York and London stock exchanges, result in a significant increase in financial analyst coverage and in media attention.[22] Moreover, there is empirical evidence that, in addition to the increase in the number of analysts following the company after cross-listing, cross-listing also results in increased analyst forecast accuracy (Lang et al, 2003a) and greater consensus among financial analysts (Das and Saudagaran, 1998). Fernandes and Ferreira (2008) investigate the change in the quality of the information environment around cross-listings measured by the stock price informativeness, which is measured by firm-specific stock return variation. They find cross-listing in the US improves price informativeness for companies from developed markets but decreases price informativeness for companies from emerging markets. Overall, existing empirical evidence on the change in the quality of the stocks' information environment after cross-listing is

[21] In turn, the level of analyst coverage of the company is positively related to the quality of the information environment (Draper and Paudyal, 2008).

[22] Baker et al (2002) measure stock visibility by the number of analysts following the stock and the number of newspaper articles written about the company.

mainly based on the sample of foreign stocks cross-listed in the US. This fact should prompt an investigation of this issue that would have implications for other international markets.

Chapter 3 of the thesis links the changes in stock liquidity and volatility after cross-listing to the changes in the quality of the firm's information environment. The main research question addressed is: Does cross-listing improve stock liquidity and volatility? An improvement in stock liquidity and volatility is expected since cross-listing enhances the stock's information environment. Chapter 3 provides a comprehensive analysis of the different dimensions of stock liquidity and volatility before and after the cross-listing event. The chapter explicitly addresses the self-selection bias in the cross-sectional analysis of the consequences of cross-listings, which is potentially present due to the endogenous nature of cross-listings. This issue is tackled using several alternative techniques. The impact of cross-listings on liquidity and volatility is evaluated after controlling for the change in stock-specific characteristics after cross-listing, such as company size, accounting practices, analyst coverage and trading activity. The sample includes European stocks cross-listed on various markets. Therefore, the evidence not only complements the existing literature on the consequences of cross-listing in the US but also offers an analysis of how equity market specific factors may shape the effects of cross-listing. Last but not least, chapter 3 distinguishes between cross-listing and cross-trading; this is because cross-trading, unlike cross-listing, does not entail additional disclosure. Thus, the second research question addressed is: Does cross-listing have a more profound impact on the liquidity and volatility than cross-trading? If additional mandatory disclosure is the main channel for improvement in the stock's information environment then the improvement in the information environment and, accordingly, the improvement in stock liquidity and volatility after cross-listing is expected to be more significant than after cross-trading.

The empirical findings of chapter 3 suggest that stock liquidity and volatility improve after listing on a foreign exchange. Yet, contrary to expectations, the difference in the impact of cross-listing and cross-trading on stock liquidity and volatility is not significant. This finding suggests that the improvement in liquidity and volatility of cross-

listed and cross-traded stocks is not due to mandatory information disclosure requirements but rather due to greater information production and intensified competition among traders.[23]

The major contributions of chapter 3 are as follows: First, it provides up-to-date evidence on the liquidity and volatility of stocks cross-listed and cross-traded on various exchanges both relative to stocks that do not cross-list and also relative to the pre-cross-listing period. Second, it distinguishes between cross-listing and cross-trading and compares the consequences of these two types of presence on a foreign stock exchange in terms of stock liquidity and volatility.

1.3.3 Implications of the location of trading

Improvement in transaction costs and stock liquidity after cross-listing can be largely attributed to the global competition for order flow. This competition forces stock exchanges to continuously look for ways to improve market quality[24] in order to attract and maintain trading volumes. This task has become particularly relevant in the current environment, which is characterised by globalization, integration and digitalization of capital markets. In theory, when a stock is listed on multiple markets, traders make decisions on the location of trading based largely on transaction costs (Pagano, 1989; Chowdhry and Nanda, 1991). Accordingly, it is expected that order flow from liquidity traders who seek to attain the highest possible level of liquidity will eventually gravitate to a single market with the lowest possible transaction costs.

Another important consideration for traders is the quality of the market's information environment. Huddart et al (1999) developed a theoretical model where liquidity traders choose to trade only on the exchange with the strictest disclosure requirements because on such exchanges the information advantage of corporate insiders is less. While theoretical predictions on the location of equity trading are straightforward, it is a difficult empirical task to validate those predictions while taking into account significant market

[23] On occasions the information to be disclosed could also differ. This may not, on its own, mean a higher 'level' of disclosure but effectively this brings more information to the market and hence reduces the information asymmetry. It is also possible that the format and regulations pertinent to financial statements may also differ across markets, and hence investors will have information based on two or more accounting practices. This also will lead to lower information asymmetry.

[24] Important aspects of market quality include the level of market liquidity and volatility, operational and informational efficiency, transparency and the level of investor protection and insider trading regulations.

frictions that potentially distort the equilibrium predicted. Existing empirical evidence on the location of trading of cross-listed stocks shows the importance of the following stock exchange characteristics for the ability of a stock exchange to attract foreign equity trading: time zone differences between the home and host markets, transaction costs, the level of insider trading regulation, and the level of economic development of the home market (Pulatkonak and Sofianos, 1999; Halling et al, 2008). Existing literature, however, is solely focused on the distribution of trading volumes between the US market and the stock's home market based on samples of non-US stocks cross-listed in the US. This indicates a considerable gap in the literature on the relative competitiveness of different international stock exchanges in attracting trading volumes of foreign stocks. Evidence from non-US markets would be of significant importance because these markets differ significantly from the US capital market in their institutional characteristics.

From the point of view of a cross-listed company, the benefits of international cross-listings are directly associated with the level of trading activity on the foreign exchange. Thus, there is evidence that more active stock trading on the foreign exchange has several important outcomes: 1) more significant reduction in the bid-ask spread (Foerster and Karolyi, 1998), 2) more significant improvement in the stock market valuation (King and Segal, 2004), and 3) more significant portion of the stock price discovery taking place in the foreign market (Eun and Sabherwahl, 2003). Existing research shows that the distribution of the trading volumes of cross-listed stock varies significantly depending on the stock-specific characteristics (Pulatkonak and Sofianos, 1999; Baruch et al, 2007; Halling et al, 2008). Once again, the evidence is based on the sample of foreign stocks cross-listed in the US and ignores trading of cross-listed stocks in other markets. Thus, such evidence is not useful for companies in understanding potential outcomes from cross-listing in various foreign markets. This understanding is needed in order to for a company to choose the right host market for their stock. Hence, this gap in the literature needs to be addressed.

Chapter 4 of the thesis contributes to the empirical literature on the implications of the location of trading of cross-listed stocks by addressing the following research question: What determines the distribution of trading of cross-listed stocks? This issue is investigated both from the point of view of stock exchanges seeking to attract business from abroad and also from the point of view of corporate managers looking to maximize the liquidity of their

company's stock via listing on a foreign exchange. First, using trading data of cross-listed stocks that trade on various exchanges, chapter 4 compares the ability of the major international stock exchanges to attract trading volumes of foreign stocks and evaluates the stock exchange characteristics that determine this ability. Furthermore, the unique sample includes data on trading on both regulated stock exchanges and non-regulated markets such as OTC markets and alternative trading platforms. This allows a comparison of the ability of these two types of markets, which differ mainly in the level of disclosure required, to attract foreign equity trading. Second, chapter 4 addresses the importance of stock characteristics in explaining the distribution of trading volumes of cross-listed stocks. More specifically, it provides empirical evidence on how firm-specific characteristics affect the level of trading activity on a foreign exchange and also provides evidence, given its characteristics, on which particular foreign stock exchange the stock is likely to experience more active trading.

The findings of chapter 4 reveal the superior ability of the US stock exchanges to attract foreign equity trading of European stocks. The ability of a stock exchange to attract foreign equity trading is found to be positively determined by its organizational efficiency, the level of liquidity, the level of investor protection and the enforcement of insider trading regulation. In line with the predictions of Huddart et al (1999), chapter 4 reports that regulated stock exchanges have a superior ability to attract trading volumes of foreign equity compared to non-regulated markets. Finally, it is found that firm-specific factors, such as currency and duration of trading, company size and stock risk, have significant power in explaining the distribution of trading volumes in multi-market trading.

The major contributions of chapter 4 are as follows: First, it provides evidence on the relative ability of the major stock exchanges to attract trading volumes of foreign equity and factors that affect this ability. Also, it provides evidence on which foreign exchange is more likely to offer higher trading volumes for a company with specific characteristics. Such evidence is particularly relevant for companies looking to maximize stock liquidity and expand their investor base by means of cross-listing.

1.4 Thesis outline

The thesis consists of five chapters. Chapter 2 explores the effects of international cross-listing on shareholders' wealth. Using cumulative abnormal returns around the cross-listing announcement as a measure of the wealth effects of cross-listing, chapter 2 compares the effect of cross-listing on the American, British and European stock exchanges and evaluates the determinants of these effects. Additionally, it examines the impact of significant capital market developments, such as the adoption of the Sarbanes-Oxley Act in the US and the single currency, the Euro, in Europe, on the benefits of cross-listings.

Chapter 3 examines the impact of cross-listing and multimarket trading on stock liquidity and volatility. Furthermore, the study distinguishes between cross-listing and cross-trading, because cross-trading, in contrast to cross-listing, does not entail additional disclosure. Chapter 3 examines and compares the changes in stock liquidity and volatility after cross-listing and cross-trading.

Chapter 4 examines both the stock exchange level and firm level determinants of the foreign trading volume of cross-listed and cross-traded stocks. In particular, it evaluates stock exchange characteristics that affect an exchange's ability to attract and maintain foreign equity trading and, thus, its competitive position in the industry. Furthermore, the unique sample of stocks traded on various stock exchanges allows an evaluation of how successful stock exchanges are in attracting active trading of foreign stocks with particular company characteristics.

Finally, chapter 5 summarizes the findings and their implications.

Table 1.1. Number of listed foreign companies on major American and European exchanges

The table reports the number of listed international companies (absolute number and as percentage of total listed companies) on AMEX, NYSE, NASDAQ, LSE's Main Market and LSE's AIM, Deutsche Borse (Frankfurt stock exchange official regulated market only) and Euronext (consolidated statistics for Paris, Amsterdam, Brussels and Lisbon) for the period of time from 1999 to 2007. The sources of data include: World Federation of Exchanges (http://www.world-exchanges.org), LSE (www.londonstockexchange.com), Deutsche Borse (http://www.deutsche-boerse.com), Euronext (http://www.euronext.com).

	2007	2006	2005	2004	2003	2002	2001	2000	1999
AMEX									
Number of foreign listed companies	104	100	100	73	55	48	48	51	na
% of total listed companies	*17%*	*17%*	*17%*	*13%*	*10%*	*8%*	*8%*	*8%*	*na*
NYSE									
Number of foreign listed companies	421	451	452	459	466	472	461	433	406
% of total listed companies	*18%*	*20%*	*20%*	*20%*	*20%*	*20%*	*19%*	*18%*	*13%*
NASDAQ									
Number of foreign listed companies	307	321	332	340	343	381	445	488	429
% of total listed companies	*10%*	*10%*	*10%*	*11%*	*10%*	*10%*	*11%*	*10%*	*9%*
London SE Main Market									
Number of foreign listed companies	341	330	334	351	381	419	453	501	499
% of total listed companies	*22%*	*21%*	*20%*	*19%*	*20%*	*20%*	*20%*	*21%*	*20%*
London SE AIM									
Number of foreign listed companies	347	306	220	116	60	50	42	31	22
% of total listed companies	*20%*	*19%*	*16%*	*11%*	*8%*	*7%*	*7%*	*6%*	*6%*
Frankfurt SE Official Regulated Market									
Number of foreign listed companies	105	104	116	159	182	177	180	187	192
% of total listed companies	*12%*	*14%*	*15%*	*19%*	*21%*	*26%*	*27%*	*29%*	*30%*
Euronext									
Number of foreign listed companies	225	256	293	334	346	370			
% of total listed companies	*19%*	*21%*	*23%*	*25%*	*25%*	*25%*			
Total: major US exchanges									
Number of foreign listed companies	832	872	884	872	864	901	954	972	
% of total listed companies	*14%*	*15%*	*15%*	*14%*	*14%*	*14%*	*13%*	*13%*	
Total: major European exchanges									
Number of foreign listed companies	1,018	996	963	960	969	1,016			
% of total listed companies	*19%*	*19%*	*19%*	*19%*	*20%*	*20%*			

Chapter 2

International Cross-Listing of Stocks and Shareholders' Wealth

2.1. Introduction

The globalization and integration of the world financial markets, and in particular, significant capital market developments such as the introduction of the Euro in the European Union in 1999, the Sarbanes-Oxley Act of 2002 (SOX) and the introduction of the Alternative Investments Market (AIM) of the London Stock Exchange in 1996, have generated considerable debate among academics and practitioners concerning the motivations for, and the benefits of, cross-listings of European companies on American, British and European stock exchanges.[25] With the introduction of a common currency, the Euro, the European markets have become more integrated, creating doubt as to whether cross-listings within Europe actually add wealth to shareholders. Similarly, SOX is likely to increase the costs of meeting the legal and disclosure requirements of the US Securities and Exchange Commission, making listing in the US markets less desirable.[26] Finally, the introduction of stock exchanges that are characterised by light disclosure requirements and easy access to capital (for example the AIM in London) are likely to affect the geographic trends in cross-listings. The immediate consequence of these developments is that the motivations and the net benefits of cross-listings are likely to change across different listing destination markets and over time. This study contributes to this debate by investigating the effect on the wealth of shareholders in European companies of cross-listing in the American, British and European stock exchanges.

[25] Some anecdotal evidence includes: "Delisting European companies should think twice before delisting from the US stock markets", Financial Times, (April, 25, 2005); "Why cross-listing shares doesn't create value", McKinsey Quarterly, (November, 2008).

[26] In this respect, Zhang (2007) and Litvak (2007) find a negative market reaction for companies that are subject to SOX compliance during key announcements that SOX would fully apply to cross-listed foreign issuers.

The effects of cross-listings on shareholders' wealth have been the subject of intensive theoretical and empirical research (Stapleton and Subrahmanyam, 1977; Alexander et al, 1987; Foerster and Karolyi, 1999; Miller, 1999). Prior studies, on average, uncover positive gains in shareholders' wealth as a result of cross-listings on American stock exchanges. Conventional wisdom attributes gains in shareholders' wealth from cross-listing to market segmentation, liquidity and signalling theories. Market segmentation theory suggests that cross-listing in a foreign market makes a company's stocks accessible to investors who, because of investment barriers, would otherwise find it less advantageous to hold the stocks. This potentially increases the shareholder base and risk sharing, which in turn leads to a lower cost of capital and a higher market valuation (Stulz, 1981; Foerster and Karolyi, 1999; Errunza and Miller, 2000). Liquidity theory postulates that cross-listing in a more liquid market reduces trading costs for investors and increases the company's valuation (Amihud and Mendelson, 1986; Foerster and Karolyi, 1998). Finally, cross-listing may signal the company's high quality and future prospects to the market (Fuerst, 1998).

Later research by Stulz (1999) and Karolyi (2006) challenges the adequacy of the aforementioned theories in explaining the variation of cross-listing valuation effects and the time series pattern of cross-listings. As a result, other promising theories such as bonding, market timing and proximity preference theory were developed. Bonding theory proposes that cross-listing on an exchange with higher legal and disclosure standards 'bonds' the company to better corporate governance practices that limit the ability of managers and controlling shareholders to expropriate minority shareholders rights (Stulz, 1999; Coffee, 1999 and 2002; Doidge et al, 2004). Market timing theory attributes gains in shareholders' wealth from cross-listing to managers' ability to time a cross-listing in relatively 'hot' host markets (Sarkissian and Shill, 2009b). Finally, the wealth effects of cross-listing could be positively related to the level of investors' familiarity with the company measured by geographic, economic, cultural, and industrial proximity between the home and the host markets (Sarkissian and Schill, 2004, 2009a). Overall, these theories explain the effect of cross-listing on shareholders' wealth at a market level. However, the effects on shareholders' wealth may also vary at a company level. Thus, other researchers have proposed business strategy theory. Business strategy theory assumes that a cross-listing decision is associated with a company's global strategy and predicts that gains in shareholder wealth from cross-

listing are a function of company-specific characteristics (Fanto and Karmel, 1997; Bancel and Mittoo, 2001; Pagano et al, 2002).

Empirical evidence on the aforementioned cross-listing theories is mixed. Miller (1999) and Errunza and Miller (2000) provide empirical evidence consistent with market segmentation theory, while Doidge et al (2004) provide empirical evidence consistent with legal bonding theory. Foerster and Karolyi (1999) interpret their findings as consistent with liquidity and investor recognition theories. Baker et al (2002) and Lang et al (2003a) also find evidence consistent with investor recognition theory. Sarkissian and Schill (2009a) and Sarkissian and Schill (2009b) advocate proximity preference theory and market timing theory respectively. Finally, business strategy theory is empirically supported by Bancel et al (2007). Several studies have attempted to test empirically the joint significance of the cross-listing theories. In this vein, Bris et al (2007) suggest that the explanatory power of market segmentation theory is more significant than that of legal bonding theory while Bris et al (2009) find that the explanatory power of the information-based theory of cross-listing is more significant than that of market segmentation and liquidity theories. Overall, the joint significance of the cross-listing theories is still not clear. This study contributes to the debate by providing empirical evidence on the explanatory power of potential determinants of wealth effects of cross-listings on various markets. Potential determinants are identified based on the aforementioned cross-listing theories.

In addition, evidence on the impact of developments in capital markets on the motivations for and net benefits of cross-listings is limited. It is important to consider such developments in order to improve understanding of the relationship between shareholders' wealth gains from cross-listing and their determinants. Furthermore, prior studies largely ignore cross-listings on British and European stock exchanges.[27] Since American, British and European stock exchanges have different characteristics with respect to their level of economic development in terms of capital market size and liquidity, investor protection and accounting standards, the motivations for and the net benefits of cross-listings across these

[27] At the same time, stock exchange industry statistics show that the number of foreign companies listed on British and European stock exchanges is significant compared to the number of foreign companies listed on American exchanges. Thus, in 2007, 688 foreign companies were listed on the London stock exchange, 225 on the Euronext, and 105 on the Frankfurt stock exchange. Meanwhile, in 2007, all together 832 foreign companies were listed on American exchanges including AMEX, NYSE and Nasdaq (Table 1.1 of Chapter 1, discussed in section 1.1 of Chapter 1).

markets are likely to be diverse. In this respect, Roosenboom and van Dijk (2009) compare the sources of value creation around cross-listings in various markets. For US cross-listings they report that the effect on shareholders' wealth is determined by market liquidity, information disclosure and the level of investor protection. For UK cross-listings, they report transparency and investor protection as being significant. However, for Europe and Japan the study finds no significant determinants for the effect of cross-listing on shareholders' wealth, which suggests the need for further theoretical and empirical work in these areas.

This study contributes to the cross-listing literature by investigating the effects of cross-listings on shareholders' wealth for European companies in American, British and European markets, the determinants of these effects and their evolution over time. More specifically, the following research questions are addressed: 1) Do international cross-listings on various host markets create shareholders' wealth? 2) What are the sources of wealth creation around a cross-listing event? To explain the variation in the effects on wealth of cross-listing across various host markets, this study investigates the role of market segmentation, liquidity, information disclosure, legal bonding, market timing, proximity preference, investor recognition, and business strategy theories. Moreover, it considers the role of capital market developments on the motivations for and benefits of cross-listings.

Using a hand-collected dataset of 254 cross-listing announcements from 21 European markets during the period from 1982 to 2007, the results show an average statistically significant cumulative abnormal return of 1.8% around the announcement of an international cross-listing. Mostly, these abnormal returns are contributed by American and British cross-listings (3.3% and 2.7%, respectively), while European listings do not generate any significant abnormal returns. The results show that the introduction of the Euro had no impact on the wealth effects of European cross-listings.

This study provides evidence that the impact of cross-listings on shareholders' wealth is affected by capital market developments such as the introduction of AIM by the London stock exchange and the adoption of SOX in the US. With respect to British cross-listings, the significant abnormal returns can mainly be attributed to the AIM listings, despite the fact that the AIM offers weaker investor protection than the Main Market of the London stock exchange. In turn, higher abnormal returns around the AIM listings are driven by the

smaller size of the companies listing on AIM. The effects on shareholders' wealth of British cross-listings can be explained by proximity preference and business strategy theories.

Finally, regarding American cross-listings, the results are consistent with the argument that the costs from the adoption of SOX outweigh the benefits. More specifically, cross-listings that took place in the US before the adoption of SOX resulted in positive and statistically significant abnormal returns, while cross-listings that took place in the US after the adoption of SOX have produced insignificant abnormal returns. Positive effects on shareholders' wealth before the adoption of SOX are particularly profound for small and growth companies, while after the adoption of SOX they are positive and significant only for large companies and for companies from countries with weaker legal environment. Hence, business strategy can generally explain the effect on shareholders' wealth of international cross-listings in the US market, while the investor recognition theory is also valid in the post-SOX period. The findings on the impact of AIM and SOX on the stock price suggest that investors evaluate the benefits of a foreign listing in conjunction with the costs involved.

On the whole, this study provides insights into the nature of the motivations for, and the benefits of, cross-listings across different host markets and over time. The findings are consistent with the view that the impact of cross-listings on shareholders' wealth depends on the destination market and the time it takes place. Changes in the listing environment not only alter the wealth effects of cross-listings but also affect the sources of value creation around cross-listings.

The remainder of the chapter is organized as follows: Section 2.2 provides an overview of the theoretical and empirical literature on the effects of international cross-listings on shareholders' wealth, section 2.3 develops testable hypotheses on the direction and relative magnitude of the effects on shareholders' wealth of cross-listing and on the potential determinants, section 2.4 and section 2.5 describe the methodology and the sample employed respectively, section 2.6 presents the empirical findings and, finally, section 2.7 concludes the chapter.

2.2 Literature review

2.2.1 Theoretical background on the effects of cross-listings on shareholders' wealth

In perfect markets the decision of in which market shares should be listed would be a source of indifference to companies. In reality, investment barriers such as foreign investment restrictions, transaction costs, taxes, regulatory frictions, incomplete information, and variation in liquidity, investor bases, and levels of investor protection between home and foreign markets might result in differences in a stock's market valuation. The literature offers a number of theories which attempt to explain the impact of an international cross-listing on shareholders' wealth.

Capital Markets Segmentation theory

A cross-listing makes a company's stocks accessible to investors who would otherwise find it less advantageous to hold the stocks because of investment barriers. In turn, improved stock investability after the cross-listing increases the shareholder base and the risk sharing and, thus, leads to a lower cost of capital. The seminal work by Stapleton and Subrahmanyam (1977) offers analysis of the imperfections in international capital markets, including foreign investments restrictions and taxes, and the implication of these imperfections for corporate financial decisions. They show that cross-listing is one of the corporate financial policies that overcome the effects of capital market segmentation and, accordingly, results in a higher price of cross-listed stock.

Studies by Black (1974), Stulz (1981), Errunza and Losq (1985), Eun and Janakiramanan (1986), and Alexander et al (1987) offer theoretical models of equilibrium capital market prices with various investment barriers. Black (1974) and Stulz (1981) show that taxes on asset holdings by foreign investors might explain the deviation of asset prices from the expected level and also the bias of investors towards domestic stocks. Errunza and Losq (1985) examine the impact of regulatory restrictions that result in the inability of some investors to trade a subset of securities (referred to as ineligible securities) and predict super risk premium on ineligible securities, which is a function of the differential risk aversion of restricted and unrestricted investors. Eun and Janakiramanan's (1986) model that incorporates legal foreign ownership restrictions also predicts a risk premium over the 'no-

constrains equilibrium price' for restricted, or domestic, investors and a discount for unrestricted, or foreign, investors. Extending the work of Stapleton and Subrahmanyam (1977), Alexander et al (1987) view a listing of a domestic security on a foreign capital market as the initial stage of capital market integration that produces the so called 'externality effect' of indirectly integrating domestic and foreign capital markets. Their model demonstrates that expected returns are lower when a security is cross-listed under the condition that stock prices are less positively correlated between different countries than they are within a single country.

A number of empirical studies (Alexander et al, 1988; Foerster and Karolyi, 1993; Miller, 1999; Errunza and Miller, 2000) provide empirical evidence consistent with the market segmentation theory on the effects of cross-listings on shareholders' wealth.

Legal bonding theory

Stulz (1999) and Coffee (1999) initiated the discussion on whether the impact on the market valuation of cross-listed companies might come from the new legal environment that provides better protection to minority shareholders. Thus, a cross-listing on an exchange with stricter legal and disclosure requirements compared to those of the home market is a way to 'bond' the company to better corporate governance practices, which limit the ability of managers and controlling shareholders to take excessive private benefits. Doidge et al (2004) compare the valuation of foreign companies listed in the US to the valuation of those not listed in the US and report that at the end of 1997, the valuation premium of companies cross-listed in the US was on average 16.5%, with the premium being higher for companies cross-listed on major American exchanges, compared to companies with Rule 144a private placements and OTC listings. Based on their findings, Doidge et al (2004) argue that an American listing reduces the extent to which controlling shareholders can engage in expropriation, and this increases the company's ability to take advantage of growth opportunities.

Signalling theory

Legal bonding theory is closely related to signalling theory in terms of the effects of foreign listings on shareholders' wealth. Fuerst (1998), in an attempt to explain the increase in the number of listings by foreign companies on American stock exchanges with strict

disclosure requirements in the 1990s, developed a theoretical model that rationalises the choice to cross-list on exchanges with high disclosure levels. Fuerst (1998) argues that voluntarily bonding to higher levels of disclosure via a cross-listing is a way for managers to convey information to the market about the firm's future prospects and quality. Since a cross-listing on an exchange with strict disclosure requirements signals superior operating performance in the future, the market reaction to the cross-listing decision is predicted to be strongly positive.

Liquidity

Amihud and Mendelson (1986) highlight the importance of market microstructure and, in particular, liquidity in pricing assets and show that expected asset returns is an increasing and concave function of the bid-ask spread. Thus, financial policies that improve stock liquidity, such as a cross-listing, are expected to result in increased firm valuation. Empirically, Kadlec and McConnell (1994) find that Amihud and Mendelson's (1986) liquidity factor can partly explain the value effects of listings on the New York Stock Exchange by over-the-counter (OTC) stocks. They find that abnormal returns around a NYSE listing are higher for firms that experience a reduction in bid-ask spreads following the listing. Foerster and Karolyi (1999) provide an indirect test of liquidity theory using the case of non-US companies cross-listing on American exchanges. They report that abnormal returns during the listing week, after controlling for the difference in shareholder base, are positive and significant for NYSE listings and negative for AMEX and NASDAQ listings. Based on the assumption that NYSE is the most liquid market in this case, the findings are interpreted as being consistent with the liquidity theory of the effects of cross-listings on shareholders' wealth.

Investor Recognition theory

The classic assumption of asset pricing is that markets are efficient, i.e. all information is costless and immediately available to all investors. However, in reality the process of the acquisition and dissemination of information in financial markets is complicated and costly. To address this shortcoming, Merton (1987) developed a model of capital market equilibrium with incomplete information that relaxes the assumption of equal information availability and assumes that investors know only about a subset of securities. In this case, expected returns depend not only on market risk but also on the costs of incomplete

information. The Sharpe-Lintner CAPM does not price firm-specific risk since it can be eliminated via diversification. On the other hand, in Merton's model investors are not aware of some stocks, making complete diversification impossible. Thus, returns are expected to be higher when the firm's specific risk is higher and the size of the firm's investor base is smaller (investor base is referred to as 'degree of investor recognition'). Accordingly, an increase in the investor base will result in a higher valuation of the firm and the benefits are expected to be greater for firms that are less well known by investors. Merton (1987) suggests that firms should make efforts to expand their investor base in order to improve their valuation, for example, by increasing a firm's visibility via advertising and public relations or by making the stock available to investors who would be unable to invest otherwise because of regulatory constraints, for example, by an exchange listing. Kadlec and McConnell (1994) provide empirical support for investor recognition theory in terms of the effects on shareholders' wealth. They show that greater abnormal returns around an NYSE listing announcement by OTC stocks is associated with a greater increase in the number of shareholders. Extending the application of Merton's (1987) model to the case of a foreign listing, Foerster and Karolyi (1999) show that the share price reaction around American listings by non-US firms can partly be explained by an increase in the investor base. They suggest that a larger shareholder base after the cross-listing results in wider risk sharing and, thus, in a reduction in the risk premium.

By listing shares on a foreign exchange, companies increase investor awareness abroad and make information about the company more easily accessible by foreign investors, which significantly reduce investors' monitoring costs. Chemmanur and Fulghieri's (2006) theoretical model predicts a positive effect on shareholders' wealth from a cross-listing decision, given that following the cross-listing, investors can produce information about the company at a lower cost. Empirical evidence on the information environment of cross-listed companies shows that non-US companies cross-listed in the US enjoy an increase in media attention, analyst coverage and forecast accuracy following the cross-listing and the increase in visibility is associated with a decrease in the cost of capital after the cross-listing. (Baker et al, 2002; Lang et al, 2003a; Bailey et al, 2006).

Proximity preference theory

Sarkissian and Schill (2004) argue that corporate financing decisions, like portfolio investments decisions, are biased towards domestic assets, i.e. they exhibit a 'home bias'. More specifically, Sarkissian and Schill (2004) show that geographical, economic, cultural, and industrial proximity measures are important determinants of the corporate decision to cross-list. Furthermore, Sarkissian and Schill (2009a) provide evidence that wealth benefits are higher for cross-listings on markets that are already familiar with the company's home market's products (measured by cross-border export) and that are relatively close geographically (measured by the distance between the capitals).

The expectations of the impact of a cross-listing on shareholders' wealth based on proximity preference theory are the opposite of the expectations that arise from investor recognition theory. While investor recognition theory implies the greatest wealth gains for shareholders' occur when the host market is least familiar, due to the need to overcome higher information barriers, proximity preference theory implies the greatest benefits occur when the host market is most familiar.

Market timing theory

Corporate managers time the company's listing on a foreign exchange to take advantage of high market valuation at the stock-level, i.e. listing following a strong stock performance on the home market. Also managers time a foreign listing at the market-level, in other words, listing during a 'hot' market period. Ndubizu (2007) presents evidence in favour of a company-level window-of-opportunities theory that a cross-listing company's performance (measured by ROA and cash flows) peaks in the year of the cross-listing and falls significantly in subsequent years. Also, King and Segal (2009) and Gozzi et al (2008) report that relative company valuation measured by Tobin's Q peaks around the cross-listing and reduces significantly in the following years. Sarkissian and Shill (2009a) provide evidence of the transitory nature of the effects of cross-listing on shareholders' wealth, i.e. they document positive abnormal returns prior to the cross-listing and significantly negative abnormal returns after the cross-listing.

Henderson et al (2006) evaluate how market-level conditions affect corporate capital raising decisions and find evidence that companies issue equity in 'hot' markets in order to

take advantage of soaring market valuations. Sarkissian and Shill (2009b) show that companies tend to cross-list in 'hot' host markets, i.e. when the host market outperforms other markets economically (in terms of GDP growth) and financially (in terms of growth in market capitalization-to-GDP ratio).

Business strategy theory

Business strategy theory predicts the impact of cross-listing on shareholders' wealth to be a function of company-specific factors, because companies make the decision to cross-list for reasons related to their global corporate strategy. Pagano et al (2001) report that companies tend to cross-list on markets where their industry peers are listed, which can be attributed to cross-listing companies attempting to strengthen their competitive position in their industry (Pagano et al, 2002). Surveys of corporate finance managers on the benefits of cross-listings by Fanto and Karmel (1997) and Bancel and Mittoo (2001) reveal that industry-specific reasons and a company's global business strategy are among the main reasons to cross-list. Bancel et al (2007) provide empirical evidence that emphasises the importance of the business strategy theory in explaining the stock performance of cross-listed companies.

Overall, predictions of legal bonding, liquidity and investor recognition theories are similar as they all suggest that a cross-listing in a better quality market than the home market is beneficial for investors. In each theory, however, market quality is assessed from a different angle: legal bonding theory addresses the level of investor protection, liquidity theory the level of market liquidity, and investor recognition theory the quality of the information environment. Empirically, more developed financial markets offer high levels of investor protection, liquidity and information availability, and, ultimately lower transaction costs. This fact makes an empirical test of joint significance of the theories related to the effects of cross-listings on shareholders' wealth a challenging task.

Nevertheless, it is interesting to note that market segmentation and proximity preference theories make opposite predictions. Market segmentation theory suggests that the benefits of cross-listing would be higher because of the need to overcome more significant levels of segmentation between the home and the host markets. In contrast, proximity preference theory expects that the benefits would be higher from cross-listings in host markets that have a high level of similarities and connections with the home market. Lastly,

market timing and business strategy theories predict a significant variation in the effects of cross-listings on shareholders' wealth based on both market conditions and company-specific factors.

2.2.2 Empirical evidence on the effects of cross-listings on shareholders' wealth

The empirical evidence on the effects of cross-listing on shareholders' wealth suggests that in the 1980s and the 1990s non-US companies listing in the US, on average, experienced significant positive abnormal returns, while the evidence on the effects of cross-listings on non-US exchanges on stock price is mixed.

Cross-listings in the US

Listing in the US by a foreign company usually takes place in the form of an American Depository Receipt (ADR). American exchanges offer listing companies a number of benefits including high liquidity, a large investor base, analyst and media coverage, greater access to capital and a high level of investor protection. Not surprisingly, the empirical evidence shows that in the 1980s and 1990s non-US companies listing in the US, on average, experienced a significant positive abnormal return.

Miller (1999) examines the stock price reaction around the cross-listing announcement dates for 181 companies from 35 countries that instituted their first Depository Receipt programme over the period 1985-1995. Miller (1999) finds a positive abnormal return of 1.15% for a 3-day (-1,+1) event window around the announcement of an ADR-issuance. Importantly, the stock price reaction is determined by the listing venue (exchange vs. OTC), home market (emerging vs. developed), and avenues for raising capital (public or private). Abnormal return is found to be higher for companies from emerging markets (1.54%) and significantly higher for exchange listings (2.63%) compared to OTC listings and private placements. Miller (1999) interprets his findings as being consistent with the argument that higher liquidity and a larger shareholder base increase shareholder wealth. Later, Coffee (2002) interprets the findings of Miller (1999) as evidence for the legal bonding theory. Coffee (2002) argues that this difference in price reaction on the announcement day of different type of listings is important evidence because exchange

listings, Rule 144a private placements and OTC listings have critical differences in legal and reporting requirements.

Lee (2003) reports significant abnormal returns of 1.7% for a 3-day (-1, +1) event window and 3.3% for a 7-day (-5, +1) event window for a sample of 69 companies from 11 Asian and Latin emerging markets that cross-listed in the US via ADR programs from 1991 to 2001. Lee (2003) shows that the excess returns are unrelated to the degree of integration between a company's home stock market and the US stock market and argues that the value effects are mostly due to an improvement in the company's ability to take advantage of growth opportunities.

Foerster and Karolyi (1999) examine stock price behaviour around the first-time US listings of 153 companies from Canada, Europe and the Asia-Pacific Basin region from 1976 to 1992. Foerster and Karolyi (1999) find a prelisting run-up in prices, defined as the average daily abnormal returns for the (-49, -10) days event period, are 0.095 % (t=2.28). Around the day of listing the average daily abnormal returns are as high as 0.35 %. Overall, cross-listing companies earn CARs of 19% during the year before listing, and an additional 1.20% during the listing week, however, they incur a loss of 14 percent during the year following the listing. In general, the findings of Foerster and Karolyi (1999) are consistent with the liquidity and investor recognition theories on the effects of cross-listings on shareholders' wealth. A more recent study by Bris et al (2007) uses a relatively small sample of 20 non-US companies with dual-class shares cross-listed in the US and reports positive and significant annualized average daily abnormal return of 1.32% for the domestic share class and 0.62% for the US-listed share class during the 50 day period prior to the cross-listing event. The findings of Bris et al (2007) mainly support market segmentation theory.

A number of studies examine listings in the US by Canadian companies. Canadian companies list on the US exchanges directly as opposed to issuing ADRs. Moreover, the Canadian and the US markets have been geographically, economically and culturally integrated for some time. Despite this perceptible market integration, the studies of Doukas and Switzer (2000) and Mittoo (2003) report that Canadian companies experience significant positive price effects from a cross-listing in the US. Doukas and Switzer (2000) conduct a joint test of changes in the degree of capital market integration through time and of changes in risk premium for the sample of 79 Canadian stocks over the period 1985-1996. They find

significant positive announcement effects during the (-120;+60) day period around a US listing announcement. Significant abnormal performance is observed mainly in the listing announcement period and, particularly, during the 60 trading days prior to the listing (31.06% on an annualized basis), whereas no significant effects on shareholders' wealth are found around the listing dates. Doukas and Switzer (2000) argue that their findings are consistent with the view that an international listing increases the investor base of the firm with beneficial effects on its cost of capital.

Mittoo (2003) investigates short- and long- run effects on shareholders' wealth of direct listings in the US of 56 Canadian companies over the period of 1976-1990 and of 108 companies over the period of 1991-1999. The short-run performance analysis for the 7-day (-3,3) day event window around the listing date provides evidence of positive price effects, with the price effects being smaller in the post-1990 period compared to the pre-1990 period. The long-run performance analysis shows that cross-listed companies significantly under-perform Canadian market indices, yielding negative cumulative abnormal returns of -10.53% during the three years subsequent to a US listing. Mittoo (2003) provides evidence that the determinants of the effects of a US listing including liquidity and industry factors, vary cross-sectionally and over time.

Cross-listings outside of the US

Since the US market differs significantly from other international financial markets by size, liquidity and regulatory environment, the implications from cross-listings in other markets could differ significantly from cross-listings in the US. Nevertheless, only a few studies look at cross-listings on exchanges outside of the US.

A number of earlier empirical studies investigated the consequences for shareholders' wealth of international cross-listings of US companies (Howe and Kelm, 1987; Lee, 1991; Torabzadeh, Bertin and Zivney, 1992; Varela and Lee, 1993; Lau, Diltz and Apilado, 1994). As trading volumes of US cross-listed stocks are generally concentrated in the US, even after a cross-listing on a foreign exchange (Karolyi, 1998), it would be unreasonable to anticipate significant effects of a cross-listing for US companies. In fact, the empirical evidence on the subject shows that the price effects for US companies listing on major non-US exchanges are negligible.

Serra (1999) was one of the first to compare the stock price impact of cross-listings by non-US companies in the US and in the UK. The study examines the stock returns of 70 companies from 10 emerging markets and a control sample of 65 European companies from mature markets, around cross-listings in the US (NYSE & NASDAQ) and London (SEAQ-I) over the period 1991-1995. The study provides evidence that there are significant positive abnormal returns before listing and a significant decline in returns over the first five weeks following the listing. Overall, the evidence provided could be supportive of market segmentation theory. This study reports that, for companies from emerging markets, listing in the UK has the same effects on shareholders' wealth as listing in the US. However, for companies from mature markets, the positive impact on shareholders' wealth is limited to NYSE listings.

Bris et al (2009) investigate abnormal returns around cross-listings on the London stock exchange. Using a sample of 273 stocks including both stocks listed on the LSE and stocks admitted to trade on SEAQ, this study finds positive significant abnormal returns for the period (-20, 20) days around the listing/trading date for the stock exchange listings but not for the admissions to trade. Bris et al (2009) argue that the main source of value creation around cross-listings is greater information disclosure.

Sarkissian and Schill (2009a) examine monthly stock returns during (-120 months; +120 months) around foreign listings for more than 1500 listings placed in 25 host countries based on the listing status as of December 1998. Firstly, they control for the order of the firm's foreign listing and report that the first listing is associated with unique effects on shareholders' wealth (at least transitory) while multiple listings yield diminishing gains. Secondly, they report substantial stock price run-up prior to cross-listing and a profound post-listing decline in returns in the long run, which is consistent with market timing theory. Nevertheless, they find a permanent change in a firm's cost of capital of about 2 percent that can be predominantly explained by cross-product market trade and investor familiarity. In other words, the long-term gains from a foreign listing are greater for firms listing on foreign markets that are geographically, economically, and culturally closer to their home market. The authors suggest that listing on American exchanges does not offer unique benefits to foreign firms in terms of shareholders' wealth.

Roosenboom and van Dijk (2009) compare the stock price reaction to cross-listing on eight major stock exchanges controlling for country-specific and firm-level characteristics. They report that abnormal returns around the day of the announcement of cross-listing is highest for American listings, followed by British and then by European listings while it is insignificant for Tokyo listings. This study identifies significant determinants for the effect on shareholders' wealth that results from cross-listing in the US and in the UK but finds no significant determinants for either Europe or Japan.

Overall, there is empirical evidence that, on average, international cross-listings create wealth for shareholders. However, the evidence on the sources of the net benefits of cross-listings, particularly on markets outside of the US, is inconclusive.

2.3 Testable hypotheses

2.3.1 The effects of cross-listings on shareholders' wealth

Based on the theoretical argument that a cross-listing improves stock accessibility to foreign investors (Merton, 1987; Errunza and Miller, 2000) and stock liquidity (Foerster and Karolyi, 1999), and in line with empirical evidence of Miller (1999), Serra (1999), and Roosenboom and Van Dijk (2009), international cross-listings are expected to generate positive abnormal returns.

H1: An international cross-listing is associated with positive abnormal stock returns.

2.3.2 Variation in the wealth effects by host and home markets

Theoretically, companies from 'low quality' markets should experience gains in shareholders' wealth upon cross-listing on a 'higher quality' market. The quality of the market is characterised by, among other things, the level of capital market development, investor base size, liquidity, investor protection, and information environment. The markets of the US, UK and continental Europe differ from each other in terms of the market qualities named above and these differences may potentially cause the diverse effects from cross-

listings experienced on these markets. The US and the UK are common-law countries that focus on resolution of information asymmetry and have market-oriented financial systems (Guenther and Young, 2000). In contrast, the countries of continental Europe are civil-law countries with bank-oriented financial systems.

Doidge et al (2004) argue that the US market provides a high level of liquidity, extremely good investor protection, and the highest disclosure standards compared to the rest of the world. Coffee (2002) specifies that companies cross-listed in the US are committed to respecting minority investor rights and to increasing disclosure as they subject themselves to increased enforcement by the Securities and Exchange Commission, to a more demanding litigation environment and to reconciliation of financial statements in accordance with US GAAP. At the same time, European laws, according to Coffee (1999), do not even remotely parallel the US securities laws in terms of their attempt to reduce agency costs and improve the protection of minority shareholders.[28] An important factor influencing cross-border listings within the European Union is the mutual recognition principle incorporated in European laws regarding cross-listings (Coffee, 1999), according to which EU companies do not need to meet any additional legal and disclosure requirements to cross-list within the European Union.[29]

Additionally, a cross-listing in the US results in increased attention from financial analysts. Lang et al (2003a) and Bailey et al (2005) report a significant increase in analyst coverage following a cross-listing in the US. As to the British market, Baker et al (2002) report that companies that cross-list in London also experience growth in visibility, but the increase in the level of analyst and press attention is significantly less compared to that which occurs after a cross-listing on the NYSE.

Overall, there is evidence that the American, British and European markets differ by the standards of corporate disclosure, investor protection, and information environment. Empirically, several studies provide evidence on the effects of cross-listings on shareholders'

[28] Investor protection regulation in Europe will be subject to significant change after the Market in Financial Instruments Directive becomes effective in 2004; the ultimate aim of MiFID is investor protection (Moloney, 2007). However, the full implementation of the MiFID is scheduled for November 2007, and the sample of European cross-listing events in this study after November 2007 is insufficient to evaluate impact of the MiFID on the market reaction to cross-listing in Europe.

[29] The mutual recognition principle, enforced by EU's Financial Services Action Plan of 1999, states: "what is sufficient for a company to list in one member country should be sufficient in any other member country" (Wojcik et al, 2005).

wealth on various host markets. Mostly, foreign companies that list in the US experience significant positive abnormal returns (Foerster and Karolyi, 1999; Miller, 1999; Bris et al, 2007). However, evidence on the effect on shareholders' wealth of foreign listings in British and European stock markets is still limited. Serra (1999) and Salva (2003) document significant abnormal returns around the announcement of cross-listings on the London stock exchange, whereas Roosenboom and van Dijk (2009) find weaker abnormal returns on several European stock exchanges.

> *H2.1:* Cross-listing in American markets results in the highest positive abnormal returns, followed by cross-listings in the British and other European markets respectively.[30]

In addition to the impact of the host market on the effects of cross-listings on shareholders' wealth, the home capital market and country-level characteristics may also determine the consequences of cross-listings. Two important country factors that might affect the impact of international cross-listings on shareholders' wealth are the origin of a country's legal system and the level of economic development. According to La Porta et al (1998, 2002), the origin of a country's legal system determines the level of investor protection and, consequently, affects corporate valuation. The level of economic development can be interpreted as a proxy for the level of capital market segmentation (Bekaert and Harvey, 1995) and also as a proxy for the level of investor protection (La Porta et al, 2000). Thus, cross-listing companies from emerging markets overcome more significant investment barriers and less efficient investors' protection in their home countries than cross-listing companies from developed markets. Empirically, Miller (1999) and Serra (1999) show that emerging market stocks experience higher positive abnormal returns around cross-listing when compared to stocks from developed markets. Similarly, the improvement in the level of investor protection after cross-listing would be more significant for stocks from civil-law countries than for stocks from common-law countries that already have high levels of investor protection (La Porta et al, 1998). In turn, more significant improvements after cross-listing should result in higher gains for shareholders.

[30] This hypothesis, however, could be challenged by proximity preference theory. According to proximity preference theory, more significant positive impact on shareholders' wealth is expected from cross-listings in host markets that are closer geographically, i.e. within European markets in the context of this study. Which theory can best explain the patterns in the wealth effects of cross-listings is an empirical question. Forthcoming Hypothesis H4.5 addresses the Proximity preference argument.

H2.2: Cross-listings by firms based in emerging markets result in highest positive abnormal returns, followed by cross-listings by firms based in civil-law and common-law countries respectively.

2.3.3 Change in the effects of cross-listings on shareholders' wealth over time

This debate on the net benefits of cross-listing in recent years was fuelled by developments in financial markets such as the introduction of the Euro in Europe, the adoption of the Sarbanes-Oxley Act of 2002 in the US and the introduction of AIM in 1996 in the UK.[31] Arguably, the introduction of the Euro makes cross-listings on European stock exchanges unnecessary due to increased integration of financial markets within the Euro zone. SOX, on the other hand, imposes onerous costs of meeting the legal and disclosure requirements of the US Securities and Exchange commission, making American listings less desirable. Finally, the introduction of AIM on the London stock exchange facilitates easier access to capital for small companies and offers new investment products to a group of investors that do not place much value on regulation and disclosure (Jenkinson and Ramadorai, 2007). Consequently, these capital market developments may affect shareholders' wealth gains from cross-listings and also firm's motivations for cross-listing.

The level of global financial market integration and, particularly the level of integration within European Union, has increased significantly over time, particularly after the introduction of a single European currency in 1999 (Fratzscher, 2002; Baele et al, 2004b; Baele, 2005). The introduction of the Euro has eliminated currency risk and encouraged cross-border equity trading within the Euro zone, which has resulted in more integrated European markets (Fratzscher, 2002; Galati and Tsatsaronis, 2003; Allen and Song, 2005; Hardouvelis et al, 2006). On the other hand, the United Kingdom, an EU country that opted not to join the European Monetary Union, is significantly less integrated with European financial markets (Fratzscher, 2002; Fraser and Oyefeso, 2005; Hardouvelis et al, 2006).

[31] There are other second tier markets in Europe that are similar to the Alternative Investment Market (AIM) of the London stock exchange. For example, Alternext market of Euronext. However, the sample does not include Alternext or any other second-tier market listings due to the unavailability of data. Such data are not available for the sample period because these markets were opened only in recent years. For example, Alternext was opened in May 2005. By the end of 2007 there were only a small number of foreign companies listed on Alternext, for which stock price data were not available in Datastream.

H3.1: The introduction of the Euro has reduced the benefits of cross-listing within the Euro zone markets.

In contrast to the Main Market of the London stock exchange, AIM of the London Stock Exchange, a successful new market for smaller companies, imposes significantly reduced disclosure requirements and, thus, offers weaker protection for investors.[32]

H3.2: Abnormal returns around the announcement of cross-listings on the Main Market are significantly higher compared to abnormal returns around the announcement of cross-listing on AIM.

In the US, the level of investor protection increased after the adoption of SOX in 2002 as it imposed even stricter disclosure and listing requirements for US public companies as well as for non-US companies that have chosen to list on a US exchange.

H3.3: Abnormal returns around a cross-listing on the US stock exchanges have increased after the adoption of SOX in 2002.

2.3.4 The determinants of the effect of cross-listing on shareholders' wealth

This section develops testable propositions for the potential determinants of the effects of international cross-listings on shareholders' wealth. The focus is on the following theories: market segmentation, legal bonding, liquidity, investor recognition, proximity preference, market timing, and business strategy.

Market segmentation: Stulz, (1981), Foerster and Karolyi, (1999) and Errunza and Miller (2000) argue that improved stock investability after a cross-listing increases the shareholder base and risk sharing and, thus, leads to lower cost of capital. Improvement in stock investability due to cross-listing, in turn, is related to the level of market segmentation between the home and host markets. In this respect, Baele et al (2004a, 2004b) and Baele (2005) document an increasing level of global and particularly regional integration of European financial markets over time.

[32] While some larger companies choose to list on AIM to avoid the regulatory burden of the Main Market (Jenkinson and Ramadorai, 2007), AIM is still predominantly the market for smaller and younger companies that are not qualified to list on the Main Market.

H4.1: The higher the market segmentation between home and host markets the higher the gains from the announcement of cross-listing.

Legal bonding: Cross-listings on an exchange with stricter legal and disclosure standards "bond" the companies to respect minority shareholders' rights (Coffee, 1999; Stulz, 1999), resulting in lower cost of capital for cross-listing companies.[33] Doidge (2004) provides empirical support for bonding theory by showing that the voting premiums of cross-listed companies with dual shares are 43% lower than those of non-cross-listed companies. The level of legal protection and the quality of disclosure standards vary in the international capital markets. As discussed above, US cross-listings are subject to increased enforcement by the US Securities and Exchange Commission, a more demanding litigation environment (Coffee, 2002). British cross-listings must comply with London Stock Exchange rules that are arguably less strict compared to those of the NYSE (Baker et al, 2002). Finally, European cross-listings are subject to European legal and disclosure requirements that are considered the least strict (Coffee, 1999). In this respect, Roosenboom and van Dijk (2009) find that the level of investor protection is a significant determinant of stock price reaction for both the US and UK cross-listings but not for European cross-listings.

H4.2: The larger the difference in the level of investor protection between home and host markets the higher the gains from the announcement of cross-listing.

Liquidity: A listing on a more liquid stock exchange enhances stock liquidity and, accordingly, improves a stock's market valuation (Amihud and Mendelson, 1986; Foerster and Karolyi, 1998). In this vein, King and Segal (2004) link the enduring wealth gains of shareholders' in Canadian companies cross-listed in the US, to the changes in stock liquidity after the cross-listing. In contrast, Roosenboom and van Dijk (2009) find no relationship between market-level liquidity and market reaction to foreign listings in any of the host markets examined. Empirical evidence suggests that liquidity in international capital markets varies widely. Spreads in the US equity market are significantly lower than spreads in the British equity market (Huang and Stoll, 2001) and other European markets (Venkataraman, 2001). Moreover, liquidity, approximated by transaction costs, is particularly poor in the emerging markets of Central and Eastern Europe (Domowitz et al, 2001).

[33] Legal bonding theory has been a subject to criticism by Siegel (2005) and Burns et al (2007). In particular, Siegel (2005) argues that the Securities and Exchange Commission does not effectively enforce the law against cross-listed foreign companies.

H4.3: The larger the difference in market liquidity between the host and home markets the higher the gains from the announcement of cross-listing.

Investor recognition: According to Merton (1987), a stock's market valuation is positively related to the number of investors that are aware of the company. Cross-listing facilitates easier access to a company's information and enhances a company's recognition abroad, which results in an increased stock price for the cross-listing company (Chemmanur and Fulghieri, 2006). The level of investor recognition and stock visibility is directly related to the intensity of analyst coverage since, according to Baker et al (2002), analyst reports are the main source of firm-specific information for investors. Empirical evidence suggests that a cross-listing results in the increased attention from financial analysts for the US host market (Lang et al, 2003a; Bailey et al, 2005) as well as for the UK host market although to a lesser degree (Baker et al, 2002).

H4.4: The higher the difference in the intensity of analyst coverage between the host and home markets the higher the gains from the announcement of cross-listing.

Proximity preference: Sarkissian and Schill (2004) show that geographic, economic, cultural, and industrial proximities are the important determinants of the corporate decision to cross-list. Furthermore, Sarkissian and Schill (2009a) report that a permanent decrease in the cost of capital after cross-listing is largely explained by a higher level of investor familiarity with the home market's products and also by geographical proximity. Geographic distance between the host and home markets is a distinctive characteristic of US, British and European cross-listings by European companies. While continental European markets are geographically concentrated, with less than 200 km between the capitals of some European countries, the US market is more than 6,000 km away from the European markets. Thus, geographic distance is a potential determinant of the effects on wealth around cross-listing and is particularly relevant for European companies.

H4.5: The smaller the geographical distance between the host and home markets the higher the gains from the announcement of cross-listing.

Market timing: Market timing theory suggests that corporate finance managers time the company's listing on a foreign exchange to take advantage of higher equity valuations in the host market. Relatively higher equity valuations in the host market may represent

differences in the level of economic development between the host and home countries. Indeed, Rajan and Zingales (2003) provide evidence that all countries exhibit uneven economic development over time, while Sarkissian and Shill (2009b) establish empirically the link between the frequency of international cross-listings and the level of economic and financial outperformance of the host country relative to the home country.

H4.6a: The larger the difference in the level of economic performance between the home and host markets the higher the gains from the announcement of cross-listing.

Furthermore, it is likely that both host and home markets exhibit high equity valuations over certain periods of time. Thus, international stock markets were particularly 'hot' in the late 1990s, a period known as the dot-com bubble (Ljungqvist and Wilhelm, 2003; Ofek and Richardson, 2003; Derrien, 2005). I examine the incremental impact of cross-listings on shareholders' wealth during the dot-com bubble as an additional test of market timing theory.

H4.6b: Cross-listing events during the bullish stock market period of the dot-com bubble of the late 1990s are associated with particularly high abnormal returns.

Business strategy: If a cross-listing decision is related to a global corporate strategy then the impact of cross-listings on shareholders' wealth should be a function of company-specific characteristics. One of the primary company characteristics, industrial affiliation, is named as being among the main motivations to cross-list (Fanto and Karmel, 1997; Bancel and Mittoo, 2001). Failure to follow cross-listed industry peers may put a company at a competitive disadvantage (Pagano et al, 2001; Pagano et al, 2002; Mittoo, 2003). In this vein, the economic press argue that technology companies potentially obtain higher market valuations by listing on the NASDAQ. A cross-listing, however, may entail more significant costs for some companies than for others. Indeed, Mittoo (2003) finds significant industry variation in the effects on wealth of US cross-listings for Canadian companies.

H4.7a: There is industry variation in abnormal returns around the announcement of cross-listing.

Other company characteristics that are likely to affect the wealth of shareholders after a cross-listing are growth opportunities and the need for external financing. Doidge et al (2004) find a significant positive association between companies' valuation, growth

opportunities and their cross-listing status. Growth opportunities should be particularly pronounced if cross-listing companies raise new equity capital. In this respect, Charitou and Louca (2009) provide ex post evidence that capital-raising cross-listed companies outperform both the control sample of non-cross-listed companies and the sample of cross-listed companies in the pre-cross-listed period.

H4.7b: Abnormal returns around the announcement of cross-listing are positively related to the cross-listing company' growth.

H4.7c: Abnormal returns around the announcement of cross-listing are higher for cross-listings that raise new equity capital.

Table 2.1 summarizes the potential determinants of the effects of cross-listings and their expected impact of shareholders' wealth.

2.3.5 Control variables

Company size is positively related to stock liquidity and visibility to investors.[34] As such, a smaller company that makes a commitment to cross-list experiences larger incremental improvement in the level of liquidity and the quality of the information environment compared to a larger cross-listing company. Similarly, the first foreign listing yields more significant incremental change in stock's accessibility to foreign investors compared to consequent foreign listings, which is empirically confirmed by Sarkissian and Shill (2009a). Consequently, company size and listing order are expected to be inversely related to the impact of cross-listings on shareholders' wealth. Lastly, often US OTC-traded[35] foreign stocks that are already accessible to US investors choose to upgrade to a US stock exchange listing in order to improve stock liquidity, visibility to investors, prestige, and the level of investor protection and, ultimately, the stock's market valuation. However, a

[34] Company size is a distinct feature of cross-listed companies (Pagano et al, 2002). Taking into account the fixed costs associated with listing on a foreign exchange and the minimum issue size requirement by stock exchanges, it is not surprising that mainly large companies choose to list on foreign exchanges. For example, a listing on the main market of LSE costs at least £500,000 in professional fees and requires the minimum ADRs issue size of £700,000 (source: www.londonstockexchange.com).

[35] Level 1 ADRs or over-the-counter (OTC) listing is the easiest and fastest way to gain entry to the US capital market. The main difference between OTC and exchange listings is the level of disclosure: an OTC listing requires neither full SEC registration and disclosure nor US GAAP reporting.

US exchange listing involves substantial additional costs compared to an OTC listing. Accordingly, an upgrade from a US OTC to a US stock exchange listing should result in a positive change in stock's market valuation, however, to a lesser degree than a US listing without prior OTC.

2.4 Methodology

This section first discusses the measurement of two categories of variables: (i) the effect on shareholders' wealth from cross-listings, as the dependent variable and (ii) the determinants of the effects of cross-listing on shareholders' wealth, as the explanatory variables. The variable description is followed by an overview of the methods of univariate analysis and multivariate regression analysis used to evaluate the effect of international cross-listings on shareholders' wealth and its determinants.

2.4.1 The effects of cross-listings on shareholders' wealth

The wealth effects around the announcement of cross-listing

The effects of international cross-listings on shareholders' wealth are measured by cumulative abnormal returns over the 21-day (-10, 10) period around the announcement of the cross-listing.[36] As a robustness test, cumulative abnormal returns are additionally estimated for alternative event windows: (-5, 5) days, (-3, 3) days and (-1, 1) days around the announcement of cross-listing. Abnormal returns are defined as market-adjusted returns estimated using a modified market model[37]: $AR_{i,t} = R_{i,t} - R_{m,t}$ (1.1)

[36] Under the assumption of market efficiency, stock prices incorporate all information available on the market and stock price adjustment to cross-listing accrues when the news about a company's intention to cross-list is released to the market. Thus, the wealth effects of cross-listings are expected to be concentrated around the cross-listing announcement.

[37] Market-adjusted returns are used in order to avoid loss of observations due to unavailability of pre-cross-listing returns that would be required in order to use conventional methods of estimation of abnormal returns (Brown and Warner, 1985). Brown and Warner (1980), however, show that for short-run analysis, adjustment for the stock's systematic risk does not significantly affect the estimated excess returns. Also, Draper and Paudyal (2006) show that the abnormal return estimates for event window are not sensitive to the choice of return benchmark.

where $AR_{i,t}$ are abnormal returns of company i on day t; $R_{i,t}$ is return of company i on day t; $R_{m,t}$ is market return on day t. Market returns are the corresponding Datastream Total Market index local currency returns for developed countries and Poland, and the S&P/IFC market index local currency returns for the rest of the emerging countries in the sample. The cumulative abnormal returns (CARs) are the sum of abnormal stock returns over the event window: $CAR_i = \sum_t AR_{i,t}$, where $t=\{-10, +10\}$. The even window (-10, 10) days around the announcement of cross-listing is chosen for analysis to capture potential time lag in the announcement of cross-listing in the home country and internationally. Analysis of daily abnormal returns shows that stock price adjustment begins more than one week before the announcement of cross-listing and continues after the announcement for more than one week (Figure 2.0).

Robustness test: The wealth effects around the cross-listing event date

While most of the price reaction is expected around the announcement of the event, previous research suggests that there is stock price- sensitive information both around the announcement as well as around the cross-listing event itself (Foerster and Karolyi, 1999). As a robustness test, I additionally evaluate excess returns during a three-month (-2,0) event window around the cross-listing date.[38] To overcome the limitations of the traditional event-study methodology[39], an alternative method of estimating abnormal returns, the Jensen's alpha approach (as in Draper and Paudyal, 2006), is used. The advantage of this method is that it does not require return data availability for a long estimation period prior to the event. Additionally, this approach allows estimation of excess returns with a multifactor asset pricing model accounting for size (SMB) and book-to-market (HML) risk factors (Fama and

[38] (-2,0) months event window around the cross-listing date is motivated by the fact that the median distance between the announcement date and the cross-listing date in the sample is 33 days. Thus, (-2,0) months event window around the cross-listing, on average, covers the cross-listing announcement date and the listing event date.

[39] Market-adjusted abnormal returns for longer event windows such the event window (-2,0) months around cross-listing are not reliable since this approach disregards risk factors. The conventional event-study methodology (Brown and Warner, 1985) with a market model as a benchmark also has a number of limitations. First, the market model fails to control for additional market risk factors such as size and book to market (Fama and French, 1996). Second, this approach requires estimation of model parameters using return data over a rather long (approximately five years based on monthly data frequency for stable and reliable parameter estimates) estimation period, which must be independent of the event. In case of cross-listing, companies often choose to list on a foreign exchange within a few years after listing on a home exchange. Consequently, in many cases home market stock price data is available for a limited time period prior to cross-listing and using a conventional event-study approach would cause the sample to be reduced by more than half.

French, 1996). For each event window, Jensen's alpha α_i is estimated with the following cross-sectional regression: $R_i - R_f = \alpha_i + \beta_{1i}(R_m - R_f) + \beta_{2i}SMB + b_{3i}HML + \varepsilon_i$ (1.2) where α_i is Jensen's alpha for the event window; $(R_i - R_f)$ is cumulative risk premium for company *i* for the event window; $(R_m - R_f)$ is cumulative market risk premium for the event window; *SMB* is cumulative difference in value-weighted returns between small market cap stocks and large market cap stocks for the event window; *HML* is cumulative difference in value-weighted returns between value (high book-to-market ratio) stocks and growth (low book-to-market ratio) stocks for the event window. The risk factors are calculated for all markets in the sample that contribute at least ten cross-listing events to the sample. SMB is the difference between monthly value-weighted (based on the market value at the end of December of the previous year) average returns of two portfolios ranked by size: bottom 50% 'small' and top 50% 'big'. HML is the difference in value-weighted returns between MSCI Value (high book-to-market ratio stocks) and Growth (low book-to-market ratio stocks) country indices (in local currency). Jensen's alpha indicates whether a cross-listing company experienced statistically significant positive or negative abnormal returns around the cross-listing event. In order to limit the impact of outliers, estimations of Jensen's alpha are done using trimmed (~5% of extreme observations on each end) sample and subsamples.

2.4.2 Univariate analysis of abnormal returns around cross-listing

Abnormal returns around the announcement of cross-listing and around the cross-listing event are estimated for a number of subsamples motivated by the research questions:

(1) by host markets: the US, UK and Europe, and by home markets classified based on the home country's legal origin and the level of development, the UK and Ireland, continental Europe (excluding CEE) countries and countries of Central and Eastern Europe (CEE).

(2) over time: (2.1) European cross-listings: before the introduction of the Euro vs. within the Euro zone[40], (2.2) British cross-listings: Main Market vs. AIM, (2.3) American cross-listings: prior and post Sarbanes-Oxley Act of 2002.

[40] The members of the Euro zone are: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Slovenia, and Spain. The Euro was introduced from 1 Jan

(3) by company characteristics: (3.1) company size and (3.2) industry affiliation.

(4) by listing characteristics: (4.1) by listing order, (4.2) capital raising activity, and (4.3) American cross-listings: upgrade from OTC vs. stock exchange listings without prior OTC.

Table 2.2 provides the definition and data sources of the variables that proxy company size, industry affiliation, capital raising activity, order of foreign listing and presence of OTC trading prior to the US exchange listing. The difference in mean CARs for different subsamples is evaluated using t-statistics of the two-sample t-test with unequal variances. The inequality of estimated Jensen alphas for different subsamples is evaluated using a Wald test.

2.4.3 The determinants of the effects of cross-listings on shareholders' wealth

Explanatory variables that proxy for each hypothesis include three main groups: country, company and listing related characteristics. Each of these groups potentially affects the net benefits of an international cross-listing. Sarkissian and Shill (2004) and Doidge et al (2004) show the importance of the country-level factors, while Pagano et al (2002) show the significance of company characteristics for the implications of a cross-listing. Additionally, I use important capital market developments to capture the time varying cross-listing effects on shareholders' wealth. Table 2.2 contains definitions and data sources for all the variables.

Consistent with Sarkissian and Schill (2004) and Roosenboom and van Dijk (2009), the level of market segmentation between the home and host markets is measured using the correlation of the host and home market returns. In addition, the increased level of market integration in Europe after the introduction of the Euro is captured by a dummy variable that represents cross-listings within the Euro zone.

Evidence of legal bonding can be assessed by the improvement in accounting standards and the level of investor protection. First, I use country-level accounting standards index from La Porta et al (1998). Second, I calculate legal index as the product of the anti-director rights index from Djankov et al (2008) multiplied by the rule-of-law index from

1999 in all Eurozone countries except for Greece, where it was introduced from 1 Jan 2001, and Slovenia, where it was introduced from 1 January 2007.

Kaufmann et al (2005). Durnev and Kim (2005) argue that the legal index is a superior measure of the level of investor protection compared to the anti-director rights index, as it reflects both de jure, which by itself is not sufficient, and de facto aspects of investor protection.

Market-level liquidity is measured by the market turnover ratio, i.e. the ratio of the value of the Datastream Total Market index's trading volume to the index's market capitalization. Investor recognition is measured by the intensity of country-level analyst coverage, estimated as the average number of analysts per company for each country-year in the sample. Geographic proximity is quantified by the distance in kilometres between the capital cities of the host and home markets as in Sarkissian and Shill (2004). Similar to Sarkissian and Shill (2009b), marking timing is tested by whether the impact of a cross-listing on shareholders' wealth is related to the difference in the level of economic performance between the host and home countries. Economic performance is measured by the 3-year moving average of the GDP per capita using data obtained from the United Nations statistics division web-site. Additionally, I evaluate whether a cross-listing during the dot-com bubble had any valuation premium due to the high level of investor sentiment (Baker and Wurgler, 2007), as predicted by the market timing theory. In line with Ljungqvist and Wilhelm (2003) and Ofek and Richardson (2003), a 'bubble' dummy variable is used for cross-listings that took place in 1999 and at the beginning of 2000. To test business strategy theory, several firm-level variables are obtained. First, a company's industry is defined based on FTSE/DJ industry firm-level classification obtained from Datastream. In order to reduce the number of industry-based sub-groups with a small number of observations, companies from Basic materials, Consumer goods, or Industrial industry groups are combined into one group 'Manufacturers', and Oil & Gas and Utilities are also combined into one group 'Natural resources'. Second, company growth is measured by the three-year sales growth preceding the cross-listing. Lastly, motivated by the findings of Foerster and Karolyi (1999) and Bancel et al (2007), data on capital raising activity on the foreign market following cross-listing are obtained from several sources including BNY and Citibank ADRs databases and Thomson One Banker Equity Deals database. This data are used to evaluate the impact of the issue of new equity on the foreign market on shareholders' wealth. Finally, I use three control variables: 1) company size, which is measured by the company market capitalization, 2) listing order, which is represented by the first foreign listing dummy variable, and 3)

presence of an OTC listing prior to a US stock exchange listing, which is represented by prior-OTC dummy variable.

2.4.4 Multivariate regression analysis

Since the sample includes cross-listing events on various foreign host markets, it is essential to control for the difference in host market characteristics. European, British and American capital markets not only differ significantly by the level of liquidity, economic development, legal and information environment, but also attract for listing different types of foreign companies (Pagano et al, 2002). In particular, host market-driven variation in the size of cross-listing companies could be explained by the significant difference in listing requirements and, accordingly, costs of foreign listing on European, British and American stock exchanges. Also, geographic distance from home European countries to the US, UK and continental Europe is profoundly different depending on the destination market. In order to account for the difference in host market characteristics and for the difference of characteristics of companies cross-listing in Europe, the US and UK, host-market-adjusted variables are estimated as the residuals from the following regression:

$$Var_j = \Sigma_{n=EU,UK,US}\, \beta_n Host_n + \varepsilon_j \qquad (1.3)$$

where Var_j are explanatory variables, home market characteristics (market correlation, accounting standards, investor protection, market liquidity, analyst coverage intensity, geographic distance, and GDP per capita) and cross-listing company characteristics (company size and growth); $Host_n$ is host market dummy variable. The error term ε_j is the host-market-adjusted variable, i.e. the variation that is not captured by the host market variable.

The above procedure removes host-market-specific variation among the explanatory variables and, thus, reduces to some degree correlations among the variables. Nevertheless, it is important to acknowledge that multicollinearity is still potentially a problem in multivariate analysis due to significant correlations among country-level variables such as the level of liquidity, investor protection and economic development (more economically developed countries are likely to have more liquidity financial markets and better investor

protection). The variance inflation factor (VIF) criterion[41] is used to verify that the level of correlations among the variables is sufficiently low for multivariate analysis.

The following regression is estimated to evaluate the explanatory power of the determinants of the effects of cross-listing on shareholders' wealth and their variation across host markets:

$$CAR_i = \Sigma_{n=EU,UK,US}\, \beta_n\, Host_n + \beta_{j,} X_{i,j} + \beta_{j,n}\, Host_n\, X_{i,j} + \varepsilon_i \qquad (1.4)$$

where $X_{i,j}$ are the explanatory variables. Explanatory variable is host-market-adjusted, i.e. it is the residual from regression (1.3), for the following variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth.

Impact of the significant capital market developments

In order to evaluate the impact of the important changes in the listing environment on the effects of cross-listings on shareholders' wealth and on the explanatory power of the determinants of these effects, I estimate regressions that include interaction variables of the explanatory variables with a time-specific dummy variable, specifically, the Euro for European cross-listings, and SOX for American cross-listings. Such analysis on the impact of AIM would be statistically unreliable due to the limited number of AIM cross-listing events in the sample.

Impact of the introduction of the Euro:

$$CAR_i=\Sigma_{n=EU,UK,US}\beta_n Host_n+ \beta_j X_{i,j} +\beta_{1j} X_{i,j} D_{beforeeuro}+\beta_{2j} X_{i,j} D_{eurozone} + \varepsilon_i \qquad (1.5)$$

Impact of the adoption of SOX:

$$CAR_i=\Sigma_{n=EU,UK,US}\beta_n Host_n+ \beta_j X_{i,j} +\beta_{1j} X_{i,j} D_{beforesox}+\beta_{2j} X_{i,j} D_{sox} + \varepsilon_i \qquad (1.6)$$

where $X_{i,j}$ are the explanatory variables; $D_{beforeeuro}$ is dummy variable that equals one if cross-listing takes place in Europe before the introduction of the Euro; D_{euro} is dummy variable that equals one if cross-listing takes place within the Euro zone after the introduction of the Euro; $D_{beforeSOX}$ is dummy variable that equals one if cross-listing takes place in the US before the adoption of SOX; $D_{afterSOX}$ is dummy variable that equals one if cross-listing takes place in

[41] VIF quantifies the severity of the multicollinearity in OLS regression analysis and provides an index that measures how much the variance of the parameter estimates is inflated due to multicollinearity. VIF index of 10 or below indicates that multicollinearity does not significantly affect the estimation results (Wooldridge, 2009).

the US after the adoption of SOX. Explanatory variable is host-market-adjusted, i.e. it is the residual from regression (1.3), for the following variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth.

Finally, variance inflation factors (VIF) are estimated for each coefficient estimate in the regressions (1.4), (1.5) and (1.6) in order to check whether multicollinearity affects the variables estimates and their significance.[41]

2.5 The sample

The sample consists of American, British and European cross-listings of European companies during the period from 1982 to 2007. The initial dataset includes companies from all European markets available in Datastream that have their stock listed on one or more stock exchanges outside of their home market. This dataset is cross-checked and supplemented by cross-listing data from major stock exchange web-sites that attract listings of European companies: NYSE, NASDAQ, AMEX, LSE (including Main Market and AIM), Euronext (including Paris, Amsterdam, Brussels, and Lisbon stock exchanges), the Frankfurt stock exchange, the Irish stock exchange, the Swiss stock exchange, Borsa Italiana, and the Luxembourg stock exchange. Data on ADRs comes from the Bank of New York and Citibank ADR databases. The sample is also supplemented with information on foreign listings from Sarkissian and Shill (2004, 2009b) and the Factiva news database. Based on this sample, I searched for the cross-listing announcements in the Factiva news database.[42] Cross-listing events without cross-listing announcements are used only for a robustness test of the excess returns around the cross-listing event.[43] Preference stock listings are excluded

[42] The availability of the announcement date in the earlier years of the 1980s is limited due to data availability in the Factiva news database. For example, one of the main sources of announcement information, the Reuters Financial Services, is available only from 1987.

[43] Since I examine excess returns around two events: the cross-listing announcement and the cross-listing event itself (robustness test), effectively there are two samples: (1) the sample of cross-listing announcement events and (2) the sample of cross-listing events. The sample of the cross-listing announcement events is smaller due to the unavailability of announcement dates for some of the cross-listing events.

from the analysis. Also, to make the results comparable between US and European listings, OTC and Portal listings are excluded, i.e. the sample consists of stock exchange listings only. Finally, I exclude direct IPOs in a foreign country and companies without return data 10 days before and 10 days after the announcement date available in Datastream.

The final sample consists of 254 cross-listing announcements by 210 companies[44] that took place on three US exchanges (AMEX, NASDAQ, and NYSE), two markets of the UK's LSE (Main Market and AIM) and seventeen other European exchanges. Table 2.3 presents the frequency distribution of the cross-listing announcement events in the sample by host and home country and by the period of time. The US host market cross-listings constitute 40.9% of the sample, while the UK host market cross-listings 18.9%. Three largest home markets presented are the UK (20.1% of the sample observations), Germany (14.6%) and France (9.8%); the primary cross-listing destination market for these home markets is the US. The UK host market is the main listing venue for companies from Ireland and Russia.

44.9% of the cross-listing announcement events in the sample take place in the 1990s (Table 2.3). Additionally, Figure 2.1 presents the number of cross-listing announcement events in the sample by host country and by the year of cross-listing announcement. The number of cross-listing events within Europe had an upward trend in the late 1980s and reached its peak in 1991; in the 1990s it stayed relatively low with the exception of 1995 and 1999. In recent years the number of new cross-listing events within Europe still remains significant. British cross-listings are distributed relatively evenly across the years with the peak in 2005. Overall, there is evidence that the UK as a host market became more popular in the 2000s, which might be related to the introduction and rapid growth of AIM. The number of US cross-listing events is high in the second half of the 1990s peaking in 2000 and beginning to decline afterwards. Two possible explanations for the sharp decline in the number of cross-listing companies in 2003 are 1) the dot-com bubble burst (year 2000-2001) and 2) the change in regulatory environment (Sarbanes-Oxley Act of 2002).

[44] The number of companies is less than the number of events because some companies have more than one foreign listing.

2.6 Empirical Results

2.6.1 The effects of cross-listings on shareholders' wealth

Panel A of Table 2.5 and Table 2.6 report that, on average, European companies experience a positive market reaction around the announcement of a cross-listing. In particular, in the event window (-10, 10) days CARs are 1.8% (significant at 1%), with 52.0% of the announcement events resulting in positive CARs. The results for alternative event windows are similar. In the event window (-5, 5) days CARs are 2.0% (significant at 1%), in the event window (-3, 3) days CARs are 1.5% (significant at 1%), and in the event window (-1, 1) days CARs are 0.8% (significant at 5%). In similar lines, Panel B of Table 2.6 reports that excess returns during the (-2,0) months around the cross-listing event are 1.2% on average, and statistically significant at the 5% level. Generally, the magnitude of abnormal returns around the announcement of a cross-listing detected in this study is lower than reported in earlier studies that used samples of American cross-listing events that took place before 2000.[45] Abnormal returns are concentrated around the announcement and not around the cross-listing date. This is implied by the lower magnitude and statistical significance of excess returns during the three months around the cross-listing event compared to those during the 21-day (-10,10) period around the announcement of the cross-listing and the insignificant abnormal returns during the 21-day (-10,10) period around the cross-listing event.[46] This finding can be attributed to the efficiency of financial markets. Overall, the results are in line with existing empirical evidence (Miller, 1999; Foerster and Karolyi, 1999; Roosenboom and van Dijk, 2009) and are also consistent with the hypothesis *H1* that a cross-listing increases shareholders' wealth.

2.6.2 Variation in the wealth effects by host and home markets

Host market characteristics. The effects of cross-listings on shareholders' wealth for various host markets are expected to vary due to the differences in host market characteristics. Accordingly, before examining the variation in the effects on shareholders'

[45] For example, Foerster and Karolyi (1999) report the average daily abnormal returns of 0.35% around the cross-listing day. Also, Miller (1999) reports a positive abnormal return of 2.63% on the announcement of a US stock exchange listing.

[46] Findings on the abnormal returns during (-10,10) days around cross-listing event are not reported in this study but available upon request.

wealth around cross-listings by host markets, it is necessary to empirically compare market characteristics of the host markets in the sample. Table 2.4 reports capital market size, liquidity, the level of the information environment, disclosure, legal protection and economic development for the three sets of host markets: Europe (excluding the UK), the UK and the US. As expected, the US market stands out for its superior level of economic development, stock market size, liquidity, and analyst coverage intensity. The UK follows the US in terms of the level of economic development and by stock market size and liquidity. In contrast to the argument of Doidge et al (2004) and Coffee (2002) that the US has the highest level of disclosure and investor protection, it is found that, based on the accounting index from La Porta et al, the anti-director rights index from Djankov et al (2008), and the rule-of-law index from Kaufmann et al (2005), the UK has a higher level of disclosure and investor protection compared to the US. European markets (excluding the UK), on average, are significantly smaller, less liquid, with lower levels of economic development and lower quality of accounting disclosure compared to both the UK and the US markets. The quality of the information environment, proxied by analyst coverage intensity, however, is lowest in the UK, while the high levels of analyst coverage intensity in France, Germany and the Netherlands contributes to the higher quality of the average information environment in Europe relative to the UK.

The wealth effects by host market. Table 2.6 reports excess returns around the announcement of a cross-listing and around the cross-listing event for the subsamples by host and home markets. Figure 2.0 plots the CARs for a period of 10 days before and after the announcement of European, British and American cross-listings. Cross-listings within Europe do not have an impact on stock price either around the announcement or around the cross-listing event. British cross-listings have a positive impact on the stock price: CARs during the 21 days around the announcement of cross-listing are 2.7%, significant at 5%. American cross-listings result in positive and statistically significant excess returns around the announcement of cross-listing (mean 3.3%) and during the three-month (-2,0) event window around the cross-listing event (mean 1.8%). These findings are consistent with hypothesis H2.1 that American cross-listings have the most profound positive impact on stock price, followed by British cross-listings and then by other European cross-listings. These results are in line with the findings of Roosenboom and van Dijk (2009). Also the results on the effects of British cross-listings are consistent with findings of Serra (1999).

The wealth effects by home market. Table 2.6 reports that, in line with expectations (Hypothesis H2.2) and existing empirical evidence of Miller (1999) and Serra (1999), the magnitude of excess returns around the announcement of a cross-listing and around the cross-listing event is the highest for stocks from the emerging markets of Central and Eastern Europe. However, the excess returns of CEE stocks are not statistically significant, which can be explained by the small sample size and large variation in excess returns within the subsample. More specifically, cross-listings of companies from two major CEE markets, Russia and Hungary, that together contribute around 80% of observations from emerging markets, have different effects on shareholders' wealth: it is positive for Russian companies (8.1% around the announcement and 5.9% around the cross-listing event), and negative for Hungarian companies (-11.0% around the announcement and -10.1% around the cross-listing event). The difference in the effect of international cross-listings on shareholders' wealth for Russian and Hungarian companies can be explained by the difference in the level of integration of the Russian and Hungarian capital markets with other European capital markets.[47] Furthermore, it is found that stocks from common-law countries, such as the UK and Ireland experience larger CARs around cross-listings compared to stocks from civil-law countries, i.e. continental Europe, which is contrary to the theoretical expectation (Hypothesis H2.2).

2.6.3 Change in the effects of cross-listings on shareholders' wealth over time

Table 2.7 reports excess returns around the announcement of a cross-listing and around the cross-listing event for the subsamples by different periods of time.

European cross-listings. Cross-listings within Europe have no positive effects for shareholders' wealth either before or after the introduction of the Euro. The results are also robust to different methods of estimating excess returns (Table 2.7). European cross-listings within the Euro zone are associated with significant negative returns (median) with only

[47] The Russian capital market is the most segmented CEE market with foreign equity ownership restrictions still in place. ADR/GDR program or a direct listing on a foreign exchange is a real opportunity for a Russian company to make its shares accessible to foreign investors. On the other hand, the Hungarian capital market is substantially more integrated with European capital markets, particularly, after Hungary joined European Union in 2004. Thus, the Budapest Stock Exchange is integrated with XETRA, the electronic trading platform of Deutsche Börse, allowing a significant number of Hungarian stocks to be traded on Deutsche Borse's Open market.

45.5% of cross-listing stocks experiencing positive returns during the 21 days around the announcement of cross-listing. The difference in cumulative abnormal returns around cross-listings before and after the introduction of the Euro is statistically insignificant.

Figure 2.2 illustrates the changes in shareholders' wealth that occur as a result of the announcement of cross-listing by host market and over time. It plots 3-year moving-average cumulative abnormal returns during a 21-day (-10, 10) period around the announcement of cross-listing for each host market. Figure 2.2 shows that a cross-listing in Europe yields positive abnormal returns before 1985 and during the period from 1993 to 1996. After 1995 CARs decline sharply, possibly, in anticipation of the introduction of the single European currency, the Euro, and remain negative until 2001. In recent years, the effects on shareholders' wealth of European cross-listings vary significantly with a positive spike in 2002.

British cross-listings. Contrary to Hypothesis H3.2, CARs around the announcement of cross-listing on the AIM are 8.4%, significant at 10%, while CARs around the announcement of a cross-listing on the Main Market are insignificant (Table 2.7). Similarly, monthly risk-adjusted excess returns around the Main Market listing are insignificant while excess returns around a listing on the AIM are 10.3%, significant at 10%. Wald statistics suggest that the difference in estimated excess returns for AIM and the Main Market listings is significant at 10%. The difference in types of companies that list on the AIM and the Main Market is striking: the average company value of an AIM company in the sample is £17 million, while the average market value of a Main Market company is £844 million. Thus, potentially, the difference in excess returns between AIM and Main Market listings is driven by company size. Furthermore, the direct costs of listing as well as indirect costs of compliance with the listing requirements are significantly less for AIM listings compared to Main Market listings. Accordingly, the finding that the AIM listings are associated with higher positive abnormal returns can be interpreted as the higher-level regulation being evaluated by investors in conjunction with the costs involved, in line with Jenkinson and Ramadorai (2007) who document significant positive long-term excess stock returns of British companies that switch their listing from the Main Market of the LSE to AIM. This is because investors that are comfortable with lower levels of regulation and disclosure become the dominant investors of the AIM-listed companies (Jenkinson and Ramadorai, 2007).

Figure 2.2 shows that British cross-listings yielded the highest impact on shareholders' wealth in the period from 1984 to 1987 when the so-called 'Big Bang' took place in London (change in trading technology and, consequently, trading costs).[48] The periods of 1990-1992 and 1996-1998 are characterized by negative cross-listing announcement CARs. Starting from 1999, positive abnormal returns are experienced by companies cross-listing in London, which is possibly related to the introduction and rapid growth of AIM in the second half of the 1990s.

American cross-listings. Analysis of the CARs before and after the introduction of SOX reveals that US cross-listings before the adoption of SOX yield positive abnormal returns of 3.4%, significant at 1% (Table 2.7). For the post-SOX subsample cross-listing announcement CARs are positive but insignificant, with a negative median of -0.8%, significant at the 5% level. This finding contradicts theoretical predictions (Hypothesis H3.3) that SOX increases the benefits from US cross-listings due to enhanced investor protection. Monthly analysis of excess returns for three months around the cross-listing fails to find a difference in excess returns for subsamples of the cross-listing events that take place prior to and post SOX adoption. While SOX improves minority investor protection, it also significantly increases the costs for listing companies, which explain the negative contribution of SOX to the impact of American cross-listings on shareholders' wealth. In this vein, Zhang (2007) and Litvak (2007) find significant negative abnormal returns around events leading to the passage of SOX and around announcements indicating that the Act will apply to cross-listed foreign companies. Also the findings are in line with the argument of Zingales (2007) that for many foreign companies' the disclosure and compliance costs after the adoption of SOX outweigh the benefits from a cross-listing in the US. Due to significant fixed costs associated with a US cross-listing after the adoption of SOX it is possible that the negative effect of SOX is more profound for smaller companies. The forthcoming section 2.6.4 addresses the variation in abnormal returns by company size.

Figure 2.2 shows that 3-year average CARs around American cross-listing announcements are positive for all periods except for the most recent period. Particularly high CARs are in the period from the late 1980s to early 1990s and in the second half of the 1990s. The obvious observation from Figure 2.2 is the increased variation of CARs starting

[48] The number of observations for this period of time is limited.

from year 2002 when, as discussed above, significant changes in the US regulatory environment took place.

Overall, there is strong empirical support for the hypothesis that the effects on wealth of cross-listings on various host market vary over time. The results highlight the relevance of changes in the listing environment in explaining the wealth benefits of cross-listings. The forthcoming section 2.6.5 on the change in the explanatory power of the determinants of the effects of cross-listings over time continues the discussion on how the introduction of the Euro in Europe and the adoption of SOX in the US have affected the sources of wealth creation around cross-listings.

2.6.4 The determinants of the effects of cross-listings on shareholders' wealth

This section discusses the findings on the potential determinants of the effects of cross-listings on shareholders' wealth that are derived from various theoretical explanations. The expected impact of the determinants is summarised in Table 2.1, while the variables are defined in Table 2.2. The section begins with the review of the summary statistics of the variables that proxy for the potential determinants.

The summary statistics

Panel B of Table 2.5 reports summary statistics: number of observations, mean, median, and percentage of positive observations for the explanatory and control variables. As expected, the correlation between the host and home market returns, which is the measure of market segmentation, is the highest for cross-listings within Europe (mean 0.66). Companies from countries with weaker investor protection, less liquid capital markets and lower level of economic development, on average, choose to cross-list in the UK while companies from countries with stronger investor protection, more liquid capital markets, better information environment and higher level of economic development, on average, choose to cross-list in the US. Regarding geographic proximity between the host and home markets, the US host market stands out for the average geographic distance between the capitals of the host and home markets: 6,286 km vs. 632 km and 707 km are for European and British cross-listings respectively. 8% of European cross-listings and 12% of American cross-listings in the sample take place during the dot-com bubble.

Regarding business strategy, cross-listing companies, on average, experience significant growth preceding the cross-listing: mean and median corporate sales growth for the total sample is 68% and 27% respectively. Also, on average, 22% of cross-listings involve raising new equity capital. The percentage of capital-raising cross-listings is the highest for the US subsample (30%). Company size, measured by market capitalization, varies widely from 3.75 million GBP to 85.4 billion GBP. As expected, larger companies cross-list in the US (2.45 billion GBP median company size), while smaller companies choose the UK (0.6 billion GBP median company size). Furthermore, 53% of the cross-listing events in the sample are the first foreign listings (as opposed to consequent listings). The percentage of the first foreign listings is the highest for the UK subsample (69%). Lastly, Table 2.5 indicates that 28% of American listings have had OTC trading in the US prior to the US stock exchange listing.

The determinants: A univariate analysis

Univariate analysis is performed for company-level and listing-specific variables. In particular, it covers the following proxies for business strategy theory: company's industry affiliation and capital raising activity around cross-listing. Also it covers the following control variables: company size, listing order and indicator of US OTC trading prior to a stock exchange listing.

Variation in abnormal returns by industry

Table 2.8 reports CARs around cross-listing for sub-samples by industry membership classified into six industry groups. The highest positive and statistically significant excess returns around cross-listing are experienced by natural resources (oil & gas and utilities) companies. This result is particularly strong for European and American cross-listings: announcement mean returns of 4.2%, significant at 5%, and 7.8%, significant at 5%, respectively. This result is in contrast to the existing evidence by Foerster and Karolyi (1993) and Mittoo (2003) that Canadian resource stocks have a significantly lower price impact around cross-listing in the US than Canadian non-resource stocks. The positive impact of the announcement of cross-listing on shareholders' wealth for manufacturing companies (1.8%, significant at 5%) is driven mostly by cross-listings in the US (5.6%, significant at 5%). Overall, it is empirically shown that there is a significant variation in the

effects of cross-listing on shareholders' wealth subject to the company's industrial affiliation (Hypothesis H4.7a), which is in line with findings of Bancel et al (2007) and is supportive of business strategy theory.

Variation in abnormal returns by capital raising activity

Table 2.9 reports that, overall, the effects of a cross-listing are positive and statistically significant for both capital raising and non-capital raising cross-listings. However, the effects of capital raising cross-listings on shareholders' wealth are higher (CARs 3.9% vs. 1.2%), consistent with Hypothesis 4.7c. However, in contrast to the hypothesis that CARs are higher for cross-listings that raise new equity capital, it is found that a US cross-listing yields positive significant CARs when it does not raise new equity (around 3%, significant at least at 5%).

Variation in abnormal returns by company size

Table 2.10 reports that small companies experience the highest announcement CARs and monthly risk-adjusted returns: 2.7%, significant at 5%, and 4.3%, significant at 1%, respectively. As company size increases, excess returns decrease in magnitude and become insignificant. Overall, consistent with the theoretical predictions, there is empirical evidence of a negative relationship between the effects of cross-listings on shareholders' wealth and company size. This is also consistent with empirical evidence of Roosenboom and van Dijk (2009) that company size is a negative and significantly determinant of abnormal returns around international cross-listings. Additionally, Table 2.10 reports cumulative abnormal returns around the cross-listing by size and by host market. Small companies that cross-list within Europe gain positive, although, statistically insignificant abnormal returns. CARs around British cross-listings depend on the destination market: large companies experience positive and significant abnormal returns around the announcement of the Main Market cross-listing (4.1%, significant at 5%) while small companies experience positive and significant abnormal returns around the announcement of the AIM cross-listing (8.4%, significant at 10%). Before the introduction of SOX in the US it held that smaller companies had a greater boost in shareholders' wealth following an American cross-listing. However, after the introduction of SOX this relationship no longer holds. This finding is in line with evidence reported by Doidge et al (2009) that company size becomes a significant positive determinant of the cross-listing valuation premium after the adoption of SOX. This is in line

with the argument that SOX significantly reduces the benefits of cross-listing particularly for smaller companies due to high fixed costs involved (Litvak, 2008).

Variation in abnormal returns by listing order

Table 2.9 reports that the first foreign listing has a stronger impact on shareholders' wealth than consequent foreign listings: the announcement CARs for a first foreign listing is 2.9%, significant at 5%, while mean CARs for a consequent cross-listing are around zero. The difference in mean CARs between first and consequent listings is 2.4%, significant at 10%. This result holds for American cross-listings: the announcement of a first foreign listing in the US yields 5.3%, while consequent American cross-listings have no significant impact on shareholders' wealth. This result is consistent with theoretical expectations and with existing empirical evidence (Sarkissian and Shill, 2009a).

Variation in abnormal returns of American cross-listings: prior OTC trading

The difference in cumulative abnormal returns for American cross-listings with and without an OTC trading prior to the exchange listing, is statistically significant both for the announcement CARs and for monthly risk-adjusted excess returns (Table 2.9). Stocks that did not have an OTC listing prior to the stock exchange listing in the US experience positive excess returns (4.4% CARs, significant at 1%, around the announcement of cross-listing and 2.6% excess returns during three months around the cross-listing), while stocks that upgrade from an OTC to an exchange listing do not experience abnormal returns around the upgrade. Overall, this finding challenges legal bonding theory because it shows that additional listing and disclosure requirements from a stock exchange listing are not compensated via an increase in shareholders' wealth.

The determinants: A multivariate framework

This section discusses the results of the regression analysis of the potential determinants of the effects of cross-listing on shareholders' wealth. Table 2.11 reports coefficient estimates of regressions of CARs for a 21-day (-10, 10) event window around the announcement of a cross-listing on a number of potential determinants of the effects of cross-listings on shareholders' wealth. The choice of the set of determinants in each model specification is motivated by the need to minimize the impact of multicollinearity on the estimation results and by the objective of maximizing adjusted *R*-squared. In order to check

whether multicollinearity causes biases in the standard errors estimation, I estimate variance inflation factors[41] on the explanatory variables (Appendices 2.1 – 2.3). The following variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth, are substituted with the host-market-adjusted variables, i.e. the residuals from the regressions of the variable on the host market dummy variables (model (1.3), section 2.4.4). Table 2.11 reports estimation results for the base model specification (models 1 and 2) and the extended specifications, which include interaction variables of the explanatory variables with host market dummy variables (models 3, 4 and 5). Also Table 2.11 reports *R*-squared and adjusted *R*-squared for each of the regressions. *R*-squared are within the range from 0.1186 to 0.2073 while adjusted *R*-squared are within the range from 0.0309 to 0.1239. Such low *R*-squared and adjusted *R*-squared measures are consistent with the literature. For example, Roosenboom and van Dijk (2009) report *R*-squared of similar regression specifications of abnormal returns around cross-listing on the potential determinants that are within the range from 0.029 to 0.096 (Tables 4, 5 and 6 in Roosenboom and van Dijk, 2009), while this study does not report adjusted *R*-squared.

Market segmentation. Table 2.11 reports that the market correlation between the host and home market returns is negatively related to the effects of cross-listings on shareholders' wealth. However, this relationship is not statistically significant for the total sample (model 1). For European cross-listings, market correlation is a positive and significant determinant of CARs (model 3) while for American cross-listings it is negative and statistically significant (model 5). The result for American cross-listings is consistent with the theoretical argument related to international portfolio diversification benefits and market segmentation theory (Hypothesis H4.1), while the result for European cross-listings is in line with proximity preference theory rather than with market segmentation theory.

Legal bonding. The quality of legal environment of the home country, proxied by accounting standards, is a positive and statistically significant determinant of CARs only for American cross-listings (model 5).

Liquidity. According to liquidity theory of the effects of cross-listings on shareholders' wealth, improvement in market liquidity should be associated with positive

abnormal returns. However, empirical evidence does not support hypothesis H4.3 since the market liquidity variable has insignificant coefficient (model 1).

Investor recognition. Also the evidence does not support Hypothesis H4.4, since the analyst coverage variable has insignificant coefficients (models 1 and 2).

Proximity preference. Supportive of Hypothesis H4.5, geographic distance is a negative and significant determinant of CARs around the announcement of cross-listing. This relationship is particularly strong for British cross-listings (model 4). For European cross-listings, however, the interaction variable of geographic distance and host Europe variables has a positive and significant coefficient estimate that cancels out the positive coefficient on the geographic distance variable (model 3).

Market timing. The coefficient estimate of GDP per capita variable is statistically insignificant while the estimate of dot-com bubble is marginally positive for all sub-samples, except for European cross listings (model 3). This evidence provides weak support for market timing theory (hypotheses H4.6a and H4.6b).

Business strategy. Consistent with expectations (Hypothesis H4.7a) and the findings of the univariate analysis (section 2.6.4), Table 2.11 reports that there is a significant variation in CARs depending on the company's industry. Companies from the natural resources sector experience positive and statistically significant CARs around cross-listing in all model specifications. Sales growth is positive but insignificant determinant of CARs around the announcement of cross-listing. Table 2.11 also reports that capital raising activity in the foreign market is only positively and statistically significantly associated with CARs for British cross-listings (model 4), consistent with Hypothesis H4.7c.

Other determinants. Consistent with expectations and the findings of the univariate analysis (section 2.6.4), Table 2.11 reports that smaller companies experience larger CARs around the announcement of cross-listing. Contrary to expectations and the findings of the univariate analysis, the first foreign listing variable is insignificant in the multivariate regressions (model 1). Finally, the prior-OTC variable, which indicates that the stock had been traded on the OTC market in the US prior to the exchange listing, has a negative coefficient, in line with expectations, but statistically insignificant.

To summarize, analysis of the potential determinants of the effects of cross-listings on shareholders' wealth shows that for the total sample company's affiliation with the

natural resources industry is positive and significant determinant, while geographic distance and company size are negative and significant determinants. Therefore, there is empirical support for the following theories on the effects of cross-listings: proximity preference and business strategy.

Even after controlling for the potential determinants, host UK and host US dummy variables have positive and statistically significant coefficient estimates that can be interpreted as being in line with the signalling theory of the effects of cross-listings on shareholders' wealth (Fuerst, 1998). Multivariate analysis of the determinants by host market shows that a correlation between the host and home market returns is a positive and significant determinant of CARs around a European cross-listing. Capital raising activity (positive) and geographic distance and company size (negative) are significant determinants of CARs around British cross-listings. Thus, there is empirical support for proximity preference and business strategy explanations for the effects of British cross-listings on shareholders' wealth. Finally, correlation between the host and home market returns is significant negative determinants of CARs around American cross-listings. In other words, the effects of American cross-listings on shareholders' wealth can be explained by market segmentation theory.

2.6.5 Change in the explanatory power of the determinants over time

Arguably, significant capital market developments, such as the introduction of the Euro in the EU and the adoption of SOX in the US, have changed the net benefits of cross-listing and have affected the determinants of the effects of cross-listing on shareholders' wealth. In addition to the univariate analysis of the variation of excess returns over time (section 2.6.4), the impact of Euro and SOX is evaluated using multivariate regression analysis.[49] The output is reported in Tables 2.12 and 2.13 accordingly.

[49] Multivariate regression analysis on the impact of AIM would be statistically unreliable due to the limited number of AIM listing events in the sample.

Impact of the Euro on the determinants of the wealth effects of European cross-listings

Table 2.12 reports that mostly the determinants of the effects of cross-listings on shareholders' wealth do not differ for European cross-listings that took place before and after the introduction of the Euro. The only significant difference is that the improvement in information environment, measured by analyst coverage, becomes a significant determinant of higher CARs around the announcement of cross-listing within the Euro zone after the introduction of the Euro.

Impact of SOX on the determinants of the wealth effects of American cross-listings

The significant determinants of CARs around the announcement of American cross-listing before the introduction of SOX were company growth and company size with smaller high-growth stocks experiencing larger abnormal returns around cross-listing (Table 2.13). Also the quality of the home country's accounting standards is a positive and significant determinant of CARs before the adoption of SOX. The determinants of the effect of an American cross-listing on shareholders' wealth after the adoption of SOX are different. Larger companies from countries with weaker accounting standards are more likely to experience positive abnormal returns around the announcement of a cross-listing in the US after the adoption of SOX. This is in line with findings of Litvak (2008) that SOX affects smaller and riskier companies and companies from countries with strong investor protection particularly negatively. Also, the improvement in the quality of information environment is a positive and significant factor contributing to cross-listing CARs after the adoption of SOX. Finally, a stock exchange listing in the US that takes place after the adoption of SOX negatively affects stock price for companies that have had their stock traded in the US OTC market prior to the exchange listing, as suggested by the negative and significant coefficient estimate on the 'prior US OTC' dummy variable.

Overall, the empirical evidence suggests that the effects of international cross-listings on shareholders' wealth change over time subject to important capital market developments that affect the listing and trading environment. More specifically, the effects of cross-listing on shareholders' wealth and the explanatory power of its determinants are

affected by the introduction of the Euro for European cross-listings, the introduction of AIM[50] for British cross-listings and the adoption of SOX for US cross- listings.

Multivariate analysis of the determinants: Summary of the findings

The empirical results indicate the following. Market segmentation theory gets support only for American cross-listings. In line with the legal bonding theory, the improvement in investor protection contributes to the positive abnormal returns around an American cross-listing after the adoption of SOX. The degree of improvement in market liquidity cannot explain the effects of a cross-listing on shareholders' wealth, i.e. there is no empirical support for liquidity theory for either of the host markets in the sample. In line with investor recognition theory, an improvement in the information environment determines the positive effects of cross-listing on shareholders' wealth for European cross-listings within the Euro zone and for American cross-listings after the adoption of SOX. Geographic distance is a significant negative determinant of the effects of cross-listing on shareholders' wealth, in line with the proximity preference theory, particularly, for British cross-listings. The findings provide weak empirical support for market timing theory. In line with business strategy theory, the results show that a significant variation in the abnormal returns around a cross-listing can be explained by firm-specific factors: companies associated with natural resources industry and companies that raise new equity capital in the UK experience higher positive returns around the announcement of cross-listing. Finally, company size is found to be a significant negative determinant of abnormal returns around cross-listing, particularly for American cross-listings before the adoption of SOX. Noticeably, company size becomes a positive determinant of the effects of cross-listing on shareholders' wealth for American cross-listings that take place after the adoption of SOX, which can be attributed to the relatively higher costs of compliance with SOX for smaller companies. In the same way, higher listing and compliance costs of the US exchange listing after the adoption of SOX can explain the negative contribution to shareholders' wealth that occurs as a result of an upgrade from an OTC listing to an exchange listing in the US.

[50] The impact of AIM is evaluated using unvariate analysis only due to an insufficient number of observations for multivariate analysis. Accordingly, no conclusions on the impact of AIM on the explanatory power of the determinants of the value effects of cross-listing can be drawn.

2.7 Conclusion

This chapter compares the effects on shareholders' wealth of cross-listings by European companies in the US, in the UK and within Europe and examines the determinants of the cross-sectional variation of these effects. First, it is empirically shown that international cross-listings have a positive and significant impact on shareholders' wealth of about 1.8% cumulative abnormal returns during the 21-day period around the announcement of cross-listing. The positive excess returns around a cross-listing are robust to different estimation methods. Second, it is shown that the effects of cross-listing on shareholders' wealth vary significantly among destination markets. A cross-listing in the US market, which is the most economically and financially developed, liquid and information-rich market in the sample, results in the largest stock price increase: around 3.3% CARs during the 21 days around the announcement of cross-listing. This is followed by a cross-listing in the UK, which results in, on average, 2.7% CARs around the announcement. A cross-listing within Europe, on the other hand, has an insignificant effect on the stock price.

Third, the study contributes to the literature by evaluating how the effects on shareholders' wealth around cross-listings change over time. Time-specific variation in the effects on shareholders' wealth is driven by the significant capital market developments in Europe, the UK and the US. More specifically, the introduction of the Euro in the EU potentially makes a cross-listing within the Euro zone redundant. The introduction of the AIM to the London stock exchange in the UK offers new capital market opportunities for smaller companies and for risk-seeking investors. The adoption of SOX in the US aims to enhance investor protection but also dramatically increases the costs of cross-listing in the US. Empirically, no evidence is found that the introduction of the Euro affects the impact on shareholders' wealth of a cross-listing within Europe. Contrary to expectations, it is found that significant positive excess returns around British cross-listings in recent years are driven by the excess returns around AIM listings, while the excess returns around Main Market listings are insignificant. Lastly, contrary to the legal bonding argument, it is found that SOX negatively affects shareholders' wealth arising from cross-listings in the US.

Finally, this study evaluates potential determinants that arise from various theories on the effects of international cross-listings on shareholders' wealth. The results show that the explanatory power of the determinants varies over time subject to important changes in

the cross-listing environment such as the adoption of SOX in the US. Empirical results are supportive to some extend of the market segmentation, investor recognition and proximity preference theories. Also strong empirical support is found for business strategy theory.

To conclude, while, on average, the cross-listing of a European company is a wealth-enhancing corporate event for shareholders, there is large variation in market reaction to an international cross-listing. A company that is deciding to list on a foreign exchange in order to improve stock shareholders' wealth must take into account market conditions, industry-specific trends and more importantly, carefully weigh the listing costs, both direct and indirect, against potential benefits.

Figure 2.0 Cumulative abnormal returns around European, British and American cross-listings

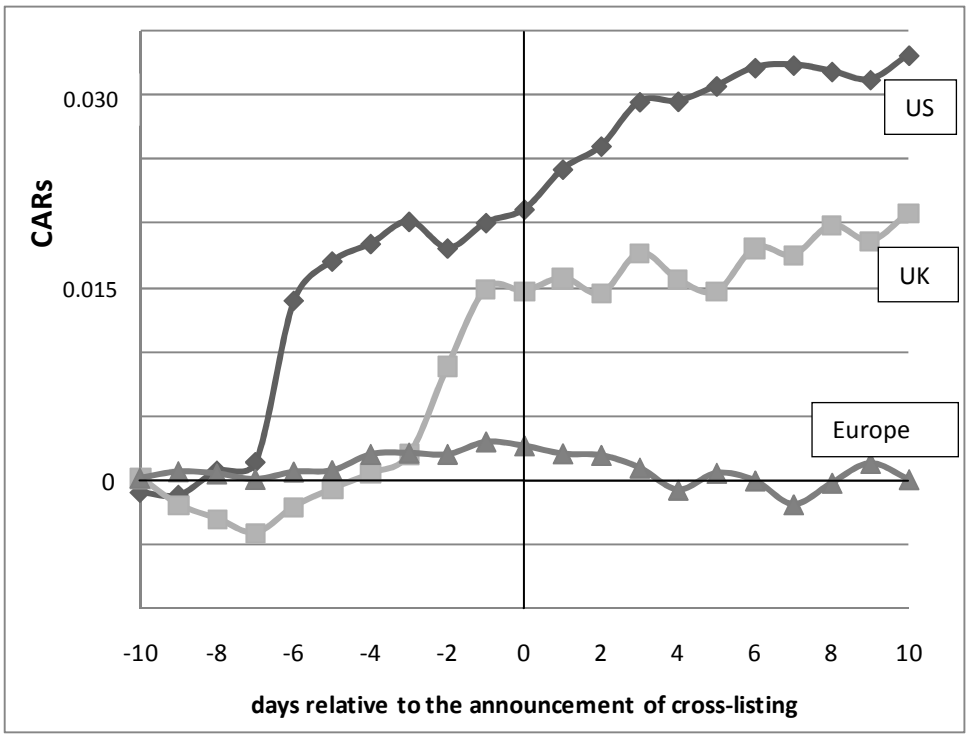


Figure 2.1 Number of cross-listing announcement events by host market and by year

This figure exhibits the number of cross-listing announcement events in the sample by host market and by year. Out of total 254 cross-listing announcement events in the sample 104 are announcement of listing in the US, 48 in the UK and 102 in Europe.

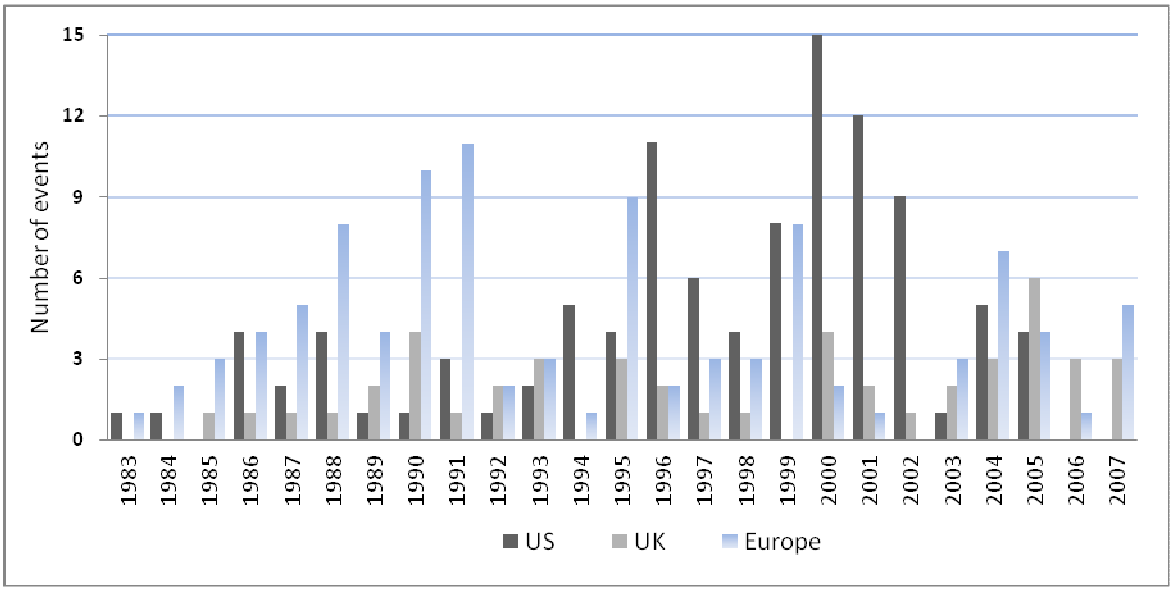


Figure 2.2 CARs around the announcement of European, UK and American listings

This figure presents 3-year moving average cumulative abnormal returns 21-day (-10, 10) event window around announcement of cross-listing in the US, UK and Europe by year of cross-listing announcement. 3-year moving-average CARs are calculated as follows: mean CARs for each year are cumulated for 3-year period (a year before, during and after cross-listing) and then divided by three.

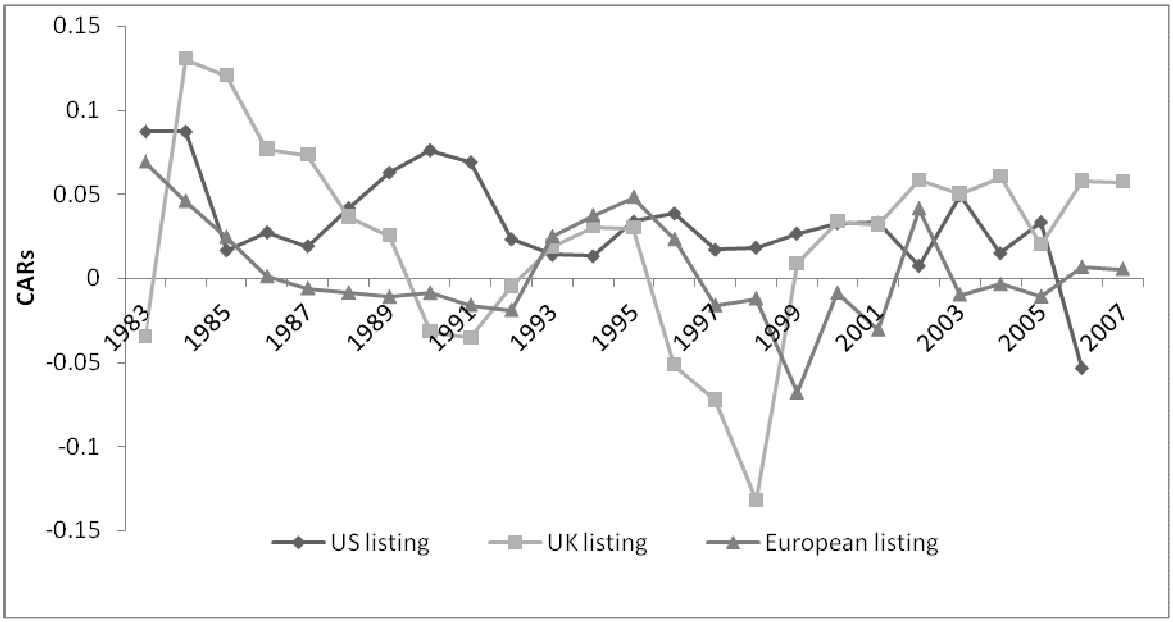


Table 2.1 Potential determinants of the effects of cross-listing on shareholders' wealth

Proxy variable	Level of the variable	Expected impact on the stock price
Market segmentation		
Correlation of the host and home market index returns	country-specific	-
Legal bonding		
Accounting standards (home country)	country-specific	-
Investor protection (home country)	country-specific	-
Liquidity		
Market liquidity (home country)	country-specific	-
Investor recognition		
Analyst coverage (home country)	country-specific	-
Proximity preference		
Geographic proximity (distance in km)	country-specific	-
Market timing		
GDP per capita (home country)	country-specific	-
Dot-com bubble	time-specific	+
Business strategy		
Sales growth	company-specific	+
Industry	company-specific	variation
Capital raised	listing-specific	+
Other determinants		
Company size	company-specific	+
First foreign listing	listing-specific	+
US listings: prior OTC listing	listing-specific	-

Table 2.2 Explanatory and control variables

Proxy variable	Variable level	Definition	Data source
Market segmentation			
Correlation of the host and home market index returns	Country-specific	Correlation of the home and host market returns is calculated using monthly return of DS Total Market indices over 3 years before the cross-listing event	DS Total Market indices return data are from Datastream
Eurozone listings: before and after introduction of Euro	Time-specific	dummy variable =1 if the listing takes place within Eurozone, i.e. both host and home markets are within the Eurozone after Euro introduction; =0 otherwise	Euro introduction dates are from European Commission (1)
Legal bonding			
Accounting standards	Country-specific	Accounting standards index	La Porta et al (1998)
Investor protection	Country-specific	Legal index calculated as the product of the anti-director rights index and the rule-of-law index	Anti-director-rights index is from Djankov et al (2007), the Rule-of-law index is from Kaufmann et al (2005)
UK listings: Main Market listings vs. AIM listings	Time-specific	dummy variable =1 if the listing takes place in the UK on AIM of LSE; =0 otherwise	London stock exchange
US listings: before and after SOX adoption	Time-specific	SOX dummy variable =1 if the host market is the US and the listing that takes place in year 2002 or after; =0 otherwise	dataset
Liquidity			
Market liquidity	Country-specific	Market turnover ratio calculated as the value of all trades of the DS Total Market index over the total market capitalization of the index for the year preceding the cross-listing. In regression analysis natural logarithm of market turnover ratio is used.	Market capitalization and turnover by value for DS Total Market indices data are from Datastream
Investor recognition			
Analyst coverage	Country-specific	Analyst coverage intensity is calculated as the number of 1-year EPS analyst estimates per company for each country-year proceeding cross-listing. In regression analysis natural logarithm of analyst coverage is used.	Data on 1-year EPS analyst forecasts are from I/B/E/S database
Proximity preference			
Geographic distance	Country-specific	The distance in km between the capital cities of host and home markets. In regression analysis natural logarithm of distance is used.	Sarkissian and Schill (2004)
Market timing			
GDP per capita	Country-specific	GDP per capita is calculated as 3-year moving average of GDP per capita in current international dollars for 3 years proceeding cross-listing. In regression analysis natural logarithm of GDP per capita is used.	GDP per capita in current international dollars data are from UN statistics
Dot-com bubble	Time-specific	Dummy variable that equals one if the listing takes place during the period of time from Jan 1999 to Mar 2000 and zero otherwise	dataset

Table 2.2 continued

Business strategy			
Sales growth	Company-specific	Company total sales (revenue) 3-year growth for the preceding year	Company total sales data are from DataStream
Industry	Company-specific	Industry dummy variables based on the FTSE/DJ Industry Classification; Basic Materials, Consumer Goods, or Industrials are further combined into industry group 'Manufacturers'; Oil & Gas and Utilities are further combined into industry group 'Natural resources'	Stock level FTSE/DJ Industry Classification data are from DataStream
Capital raised	Listing-specific	Dummy variable that equals one if the cross-listing involves issue of new equity and zero otherwise	Data on capital raising activity is from BNY and Citibank ADRs databases and Thomson One Banker Equity Deals database
Other determinants			
Company size	Company-specific	Log of the company's market capitalization (market value of common equity) in GB pounds prior to the cross-listing	Market capitalization and exchange rates to GB pounds data are from Datastream
First foreign listing	Listing-specific	Dummy variable that equals one if the listing is the first foreign listing by the company and zero otherwise	dataset
Control variables			
For US listings - prior OTC listing	Listing-specific	Dummy variable that equals one if the listing takes place in the US and the company has had US OTC trading prior to the cross-listing and zero otherwise	dataset

(1) http://ec.europa.eu/economy_finance/euro/index_en.htm

Table 2.3 The sample description

This table provides sample distribution by host and home countries and by host country and period of time. Home country is the country of domicile of the cross-listing company. Host country is the cross-listing destination country. The total sample consists of 254 cross-listing announcement events.

	Host country																				
	AUSTRIA	BELGIUM	BULGARIA	DENMARK	FINLAND	FRANCE	GERMANY	IRELAND	ITALY	LUXEMBURG	NETHERLANDS	NORWAY	POLAND	PORTUGAL	SPAIN	SWEDEN	SWITZERLAND	UK	US	TOTAL	*% of Total*
Home country:																					
AUSTRIA	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	1	0	5	*2.0*
BELGIUM	0	0	0	0	0	2	0	0	0	3	3	0	0	0	0	0	0	1	1	10	*3.9*
CZECHREP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	*0.4*
DENMARK	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3	5	*2.0*
FINLAND	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	3	5	*2.0*
FRANCE	0	5	0	0	0	1	1	0	1	0	0	0	0	0	1	1	2	2	11	25	*9.8*
GERMANY	3	0	1	0	0	4	0	0	3	0	1	0	0	0	3	1	0	6	15	37	*14.6*
GREECE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	*1.2*
HUNGARY	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	1	0	4	*1.6*
IRELAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	3	18	*7.1*
ITALY	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	4	7	*2.8*
LUXEMBURG	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	*0.8*
NETHERLANDS	0	3	0	0	0	2	4	0	0	0	0	0	0	0	0	0	3	2	7	21	*8.3*
NORWAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	6	10	*3.9*
POLAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	*0.4*
RUSSIA	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	8	2	12	*4.7*
SPAIN	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	1	2	6	*2.4*
SWEDEN	0	1	0	3	1	1	1	0	0	0	1	1	0	0	0	0	3	1	3	16	*6.3*
SWITZERLAND	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	3	8	14	*5.5*
TURKEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	*0.4*
UK	0	1	0	0	0	6	3	4	0	0	3	0	0	0	0	0	1	0	33	51	*20.1*
Period of Time:																					
1982-1989	0	3	0	1	1	7	7	0	0	0	1	1	0	0	0	3	3	7	13	47	*18.5*
1990-1999	3	7	0	2	1	5	9	2	5	3	6	0	0	0	4	1	4	17	45	114	*44.9*
2000-2007	1	0	1	0	0	7	2	2	1	1	1	0	3	2	0	0	2	24	46	93	*36.6*
TOTAL	4	10	1	3	2	19	18	4	6	4	8	1	3	2	4	4	9	48	104	254	*100*
% of Total	*1.6*	*3.9*	*0.4*	*1.2*	*0.8*	*7.5*	*7.1*	*1.6*	*2.4*	*1.6*	*3.1*	*0.4*	*1.2*	*0.8*	*1.6*	*1.6*	*3.5*	*18.9*	*40.9*	*100*	

Table 2.4 Host markets characteristics: descriptive statistics

This table reports mean and median values of market characteristics for three host markets: European markets (excluding the UK), the UK and the US. Market liquidity is measured by the annual market turnover ratio calculated as the value of all trades of the DS Total Market index over the total market capitalization of the index for the year preceding cross-listing. Analyst coverage intensity is calculated as the number of 1-year EPS analyst estimates per company for each country-year proceeding cross-listing. Capital market size is the total market value of the DS Total Market index in GB pounds in the year proceeding cross-listing. Accounting standards index is from La Porta et al (1998). Legal protection is quantified by legal index calculated as the product of the anti-director rights index from Djankov et al (2008) and the rule-of-law index from Kaufmann et al (2005). GDP per capita is calculated as 3-year moving average of GDP per capita in current international dollars for 3 years proceeding cross-listing.

	Host market								
	Europe			UK			US		
Host market characteristics	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**
Capital market size, billion GBP	100	175.8	52.4	48	992.0	1,115.4	104	5,221.9	6,716.2
Market liquidity	75	560.7	463.4	45	845.5	674.1	104	1085.6	941.3
Analyst coverage	89	37.96	22.91	45	20.12	18.79	104	25.39	24.04
Accounting standards	94	65.1	64.0	48	78.0	78.0	104	71.0	71.0
Investor protection	101	5.03	4.62	48	8.75	8.75	104	4.77	4.77
GDP per capita, current USD	102	20,390	18,466	48	22,799	23,315	104	28,516	30,198

Table 2.5 Dependent and explanatory variables: descriptive statistics

The table reports descriptive statistics: number of observations, mean, median, and percentage of positive observations, of the dependent variable (Panel A) and also of the explanatory and control variables (panel B) for the total sample of 254 cross-listing announcement events and for subsamples by host market. Dependent variable is cumulative abnormal returns (CARs) estimated as a sum of market-adjusted abnormal returns during the event window. All explanatory and control variables are defined in Table 2.2. For mean CARs '***' indicates significant at 1%, '**' indicates significant at 5% and '*' indicates significant at 10%.

	All host markets							Europe				UK				US			
Variable	**N**	**Mean**	**Median**	**Min**	**Max**	**St Dev**	**>0,%**	**N**	**Mean**	**Median**	**%**	**N**	**Mean**	**Median**	**%**	**N**	**Mean**	**Median**	**%**
Panel A. Dependent variable																			
CARs (-10,+10) days	254	0.018***	0.008	-0.283	0.794	0.107	52.0	102	-0.002	-0.002	47.1	48	0.027**	0.015	58.3	104	0.033**	0.014	53.8
CARs (-5,+5) days	254	0.020***	0.009	-0.267	0.451	0.097	53.8	102	0.000	-0.003	45.4	48	0.033***	0.021	64.6	104	0.032***	0.016	56.9
CARs (-3,+3) days	254	0.015***	0.009	-0.245	0.416	0.081	55.5	102	-0.002	0.006	50.5	48	0.034**	0.017	60.4	104	0.022***	0.012	57.8
CARs (-1,+1) days	254	0.008**	0.004	-0.251	0.256	0.052	52.6	102	0.000	0.002	53.6	48	0.014**	0.008	58.3	104	0.012**	0.000	49.0
Panel B. Explanatory and control variables																			
Market correlation	243	0.63	0.67	-0.05	0.94	0.18		94	0.66	0.69		48	0.61	0.63		101	0.61	0.65	
Investor protection	254	5.7	6.2	-3.9	8.9	3.0		102	5.62	6.13		48	4.74	6.23		104	6.34	6.23	
Accounting standards	234	69.7	69.0	51.0	83.0	7.7		96	69.15	68.00		36	68.75	71.50		102	70.48	69.00	
Market liquidity	219	626.5	548.8	6.2	2099.5	486.0		90	665.4	548.4		34	352.9	284.2		95	687.7	565.1	
Analyst coverage	239	33.7	20.9	1.8	268.1	36.0		96	31.36	20.96		44	32.12	12.30		99	36.61	21.68	
Geographic distance, km	240	3,048	1,209	170	8,261	2,829		98	632	433		40	707	463		102	6286	6198	
GDP per capita, dollars	254	20,469	20,363	5,891	54,975	7,213		102	19,749	17,698		48	18,597	15,169		104	22,040	23,301	
Dot-com bubble	254	0.08	0.0	0.0	1.00	0.27		102	0.08	0.00		48	0.00	0.00		104	0.12	0.00	
Sales growth	211	0.68	0.27	-11.90	19.94	2.11		84	0.97	0.27		37	0.15	0.29		90	0.62	0.31	
Capital raised	254	0.22	0.00	0.00	1.00	0.41		102	0.12	0.00		48	0.25	0.00		104	0.30	0.00	
Company size, million GBP	254	5,484	1,702	3.75	85,366	10,630		102	3,893	1,515		48	3,079	589		104	8,154	2,448	
First foreign listing	254	0.53	1.00	0.00	1.00	0.50		102	0.46	0.00		48	0.69	1.00		104	0.52	1.00	
US listings: prior OTC	254	0.11	0.00	0.00	1.00	0.32		102	0.00	0.00		48	0.00	0.00		104	0.28	0.00	

Table 2.6 The wealth effects of cross-listing by host and home markets

Panel A of the table reports mean cumulative abnormal returns around the announcement of cross-listing for total sample of 254 cross-listing announcement events and for subsamples by host and home markets. Abnormal returns are market-adjusted returns with Datastream Total Market index returns in local currency used as a proxy for market returns. Cumulative abnormal returns are calculated as sum of abnormal returns over the 21-day (-10, 10) event window. Panel A also reports the number of observations for each subsample and probability of t-statistics (in parenthesis). Additionally Panel A reports the differences in mean CARs between host markets and its significance; probability of t-statistics for difference in means for paired subsamples is reported in parenthesis. Panel B of the table reports excess returns (alpha) for three-month (-2,0) event window around cross-listing for total sample of 497 cross-listing events, trimmed at 5%, and for subsamples by host and home markets. The excess returns (alpha) are estimated with 3-factor model: $R_i - R_f = \alpha_i + \beta_{1i}(R_m - R_f) + \beta_{2i}SMB + b_{3i}HML + \varepsilon_i$. Panel B also reports the number of observations for each subsample, t-statistics on the coefficient estimates (in parenthesis), and probability (Pr) of Wald test. '***' indicates significant at 1%, '**' indicates significant at 5% and '*' indicates significant at 10%.

Panel A. CARs around cross-listing announcement

Home market	Host market								Difference between host markets		
	All		Europe		UK		US		UK - Europe	US - Europe	US -UK
	mean	N	mean	N	mean	N	mean	N			
All home markets	0.018***	254	-0.002	102	0.027**	48	0.033**	104	0.029**	0.035**	0.006
	(0.01)		(0.78)		(0.04)		(0.01)		(0.05)	(0.02)	(0.75)
UK & Ireland	0.025*	69	0.014	18	0.022	15	0.033	36	0.008	0.019	0.011
	(0.06)		(0.54)		(0.20)		(0.15)		(0.77)	(0.54)	(0.68)
Continental Europe	0.012*	166	-0.004	79	0.041*	21	0.023*	66	0.045**	0.027*	-0.018
(ex CEE)	(0.07)		(0.61)		(0.06)		(0.07)		(0.05)	(0.07)	(0.46)
CEE	0.036	19	-0.030	5	0.009	12	0.359	2	0.039	0.390	0.351
	(0.48)		(0.67)		(0.77)		(0.56)		(0.60)	(0.53)	(0.57)

Panel B. Excess returns around cross-listing event

Home market	Host market								Pr [Wald test statistics]		
	All		Europe		UK		US		UK - Europe	US - Europe	US -UK
	est.	N	est.	N	est.	N	est.	N			
All home markets	0.012**	447	0.050	201	0.022	75	0.018**	171	0.81	0.06*	0.01***
	(2.39)		(0.72)		(1.33)		(2.20)				
UK & Ireland	0.035***	143	0.037*	41	0.053	26	0.021	78	0.40	0.44	0.42
	(3.25)		(1.82)		(1.42)		(1.48)				
Continental Europe	0.004	276	0.002	153	0.012	29	0.003	92	0.58	0.86	0.16
(ex CEE)	(0.66)		(0.22)		(0.73)		(0.81)				
CEE	0.036	28	0.167	7	0.000	20	0.071	3	0.25	0.75	0.58
	(0.68)		(0.62)		(0.0)		-				

Table 2.7 The wealth effects of cross-listing over time

Panel A of the table reports mean cumulative abnormal returns around the announcement of cross-listing for total sample of 254 cross-listing announcement events and for subsamples by different periods of time. Abnormal returns are market-adjusted returns with Datastream Total Market index returns in local currency used as a proxy for market returns. Cumulative abnormal returns are calculated as sum of abnormal returns over the 21-day (-10, 10) event window. Panel A also reports the number of observations for each subsample and t-statistics (in parenthesis). Additionally Panel A reports median, minimum and maxim value, and percentage of positive observations. Panel B of the table reports excess returns (alpha) for three-month (-2,0) event window around cross-listing for total sample of 497 cross-listing events, trimmed at 5%, and for subsamples by different periods of time. The excess returns (alpha) are estimated with 3-factor model: $R_i - R_f = \alpha_i + \beta_{1i}(R_m - R_f) + \beta_{2i}SMB + b_{3i}HML + \varepsilon_i$. Panel B also reports the number of observations for each subsample, *t*-statistics on the coefficient estimates (in parenthesis), and probability (Pr) of Wald test. '***' indicates significant at 1%, '**' indicates significant at 5% and '*' indicates significant at 10%.

Panel A. CARs around cross-listing announcement							***Panel B. Excess returns around cross-listing event***		
Subsample	**N**	**Mean**	**Median**	**Min**	**Max**	**>0,%**	**estimate**	**N**	**Pr [Wald test]**
All host markets	254	**0.018****	0.008	-0.28	0.79	52.0	**0.012****	447	
		(2.63)	(0.57)				(2.39)		
Host Europe	102	-0.002	-0.002	-0.28	0.21	47.1	0.050	201	
		(-0.28)	(0.8)				(0.72)		
before Euro	91	-0.004	-0.001	-0.28	0.21	47.3	0.005	179	
		(-0.45)	(0.72)				(0.64)		
Eurozone	11	0.011	-0.005	-0.10	0.12	45.5	0.032	22	
		(0.6)	(2.09)				(1.27)		0.29
Host UK	48	**0.027****	**0.015****	-0.21	0.32	58.3	0.022	75	
		(2.11)	(6.93)				(1.33)		
Main Market	39	0.014	**0.012****	-0.21	0.20	56.4	0.009	63	
		(1.15)	(4.12)				(0.53)		
AIM	9	**0.084***	**0.070*****	-0.07	0.32	66.7	**0.103***	10	
		(2.08)	(28.1)				(2.25)		0.09*
Host US	104	**0.033****	0.014	-0.20	0.79	53.8	**0.018****	171	
		(2.49)	(1.37)				(2.20)		
before SOX	83	**0.034****	**0.023****	-0.17	0.55	56.6	0.016	139	
		(2.67)	(4.22)				(1.64)		
after SOX	21	0.029	**-0.008****	-0.20	0.79	42.9	0.034	32	
		(0.69)	(5.15)				(1.54)		0.42

Table 2.8 The wealth effects of cross-listing by industry

Panel A of the table reports mean cumulative abnormal returns around the announcement of cross-listing for total sample of 254 cross-listing announcement events divided into six groups based on industry affiliation as defined in Table 2.2. Abnormal returns are market-adjusted returns with Datastream Total Market index returns in local currency used as a proxy for market returns. Cumulative abnormal returns are calculated as sum of abnormal returns over the 21-day (-10, 10) event window. Panel A also reports the number of observations for each group and t-statistics (in parenthesis). Panel B of the table reports excess returns (alpha) for three-month (-2,0) event window around cross-listing for total sample of 497 cross-listing events, trimmed at 5%, divided into six groups based on industry affiliation. The excess returns (alpha) are estimated with 3-factor model: $R_i - R_f = \alpha_i + \beta_{1i}(R_m - R_f) + \beta_{2i}SMB + b_{3i}HML + \varepsilon_i$. Panel B also reports the number of observations for each subsample and *t*-statistics on the coefficient estimates (in parenthesis). '***' indicates significant at 1%, '**' indicates significant at 5% and '*' indicates significant at 10%.

Panel A. CARs around cross-listing announcement

Industry	Host market							
	All		Europe		UK		US	
	mean	N	mean	N	mean	N	mean	N
Financials	-0.006	50	0.000	25	0.012	8	-0.025	17
	(-0.76)		(-0.04)		(0.66)		(-1.39)	
Healthcare	0.033	28	0.010	6	0.093	4	0.028	18
	(1.26)		(0.32)		(2.14)		(0.72)	
Manufacturers	**0.02****	102	-0.005	43	0.023	23	**0.06****	36
	(2.01)		(-0.36)		(1.33)		(2.16)	
Nat. resources	**0.04****	22	**0.04****	8	-0.026	5	**0.08****	9
	(2.39)		(3.27)		(-0.58)		(2.78)	
Services	0.012	22	0.014	7	0.055	7	**-0.03****	8
	(0.69)		(1.05)		(1.16)		(-2.41)	
Technology	0.012	30	-0.039	13	0.030	1	0.053	16
	(0.51)		(-1.16)		-		(1.55)	

Panel B. Excess returns around cross-listing event

Industry	Host market							
	All		Europe		UK		US	
	estimate	N	estimate	N	estimate	N	estimate	N
Financials	-0.004	85	-0.012	51	0.03	15	-0.012	19
	(-0.51)		(-1.25)		(0.91)		(-0.88)	
Healthcare	**0.055***	41	-0.110	9	-0.004	4	**0.087****	26
	(1.80)		(-1.23)		-		(2.64)	
Manufactors	0.004	179	0.009	85	-0.012	36	0.010	58
	(0.50)		(0.89)		(-0.69)		(0.67)	
Nat.resources	**0.046*****	46	**0.071*****	16	0.07	9	0.031	21
	(3.31)		(3.54)		(0.71)		(1.38)	
Services	0.027	44	0.008	14	0.106	8	-0.021	20
	(1.25)		(0.25)		(1.47)		(-0.70)	
Technology	-0.013	52	0.053	24	0.016	1	-0.037	27
	(-0.60)		(1.25)		-		(-1.54)	

Table 2.9 The wealth effects of cross-listing by listing characteristics

Panel A of the table reports mean cumulative abnormal returns around the announcement of cross-listing for total sample of 254 cross-listing announcement events divided into subsamples by listing characteristics defined in Table 2.2. Abnormal returns are market-adjusted returns with Datastream Total Market index returns in local currency used as a proxy for market returns. Cumulative abnormal returns are calculated as sum of abnormal returns over the 21-day (-10, 10) event window. Panel A also reports the number of observations for each subsample and probability (in parenthesis) of *t*-statistics. Panel B of the table reports excess returns (alpha) for three-month (-2,0) event window around cross-listing for total sample of 497 cross-listing events, trimmed at 5%, divided into subsamples by listing characteristics. The excess returns (alpha) are estimated with 3-factor model: $R_i - R_f = \alpha_i + \beta_{1i}(R_m - R_f) + \beta_{2i}SMB + + b_{3i}HML + \varepsilon_i$. Panel B also reports the number of observations for each subsample and *t*-statistics on the coefficient estimates (in parenthesis). '***' indicates significant at 1%, '**' indicates significant at 5% and '*' indicates significant at 10%.

Panel A. CARs around cross-listing announcement

	Host market							
	All		Europe		UK		US	
	mean	N	mean	N	mean	N	mean	N
By listing order								
First	**0.029*** **	134	0.003	47	0.026	33	**0.053** **	54
	(2.66)		(0.28)		(1.57)		(2.34)	
Consequent	0.005	120	-0.007	55	0.030	15	0.011	50
	(0.71)		(-0.61)		(1.48)		(0.94)	
By Capital raising								
Capital raising	**0.039***	55	0.018	12	0.048	12	0.044	31
	(1.90)		(0.58)		(1.40)		(1.36)	
Not capital raising	**0.012***	199	-0.005	90	0.020	36	**0.028** **	73
	(1.84)		(-0.62)		(1.56)		(2.17)	
US listings: with prior OTC vs without prior OTC								
no prior OTC							**0.044** **	75
							(2.59)	
prior OTC							0.025	29
							(0.17)	

Panel B. Excess returns around cross-listing event

	Host market							
	All		Europe		UK		US	
	mean	N	mean	N	mean	N	mean	N
By listing order								
First	**0.019** **	243	**0.023***	92	-0.003	45	**0.023***	106
	(2.23)		(1.88)		(-0.11)		(1.89)	
Consequent	0.004	204	-0.005	109	0.038	28	0.002	65
	(0.69)		(-0.55)		(1.67)		(0.20)	
By Capital raising								
Capital raising	0.028	65	**0.101***	13	0.080	14	**-0.019**	38
	(1.47)		(2.16)		(1.50)		(-0.98)	
Not capital raising	**0.010***	382	0.000	188	0.011	61	**0.031*** **	135
	(1.87)		(0.02)		(0.65)		(3.28)	
For US listings: with								
no prior OTC							**0.026*** **	137
							(2.69)	
prior OTC							0.034	32
							(1.54)	

Table 2.10 The wealth effects of cross-listing by company size

Panel A of the table reports mean cumulative abnormal returns around the announcement of cross-listing for total sample of 254 cross-listing announcement events divided into three groups based on company size measured as natural logarithm of market value of company's common stock prior to cross-listing. Abnormal returns are market-adjusted returns with Datastream Total Market index returns in local currency used as a proxy for market returns. Cumulative abnormal returns are calculated as sum of abnormal returns over the 21-day (-10, 10) event window. Panel A also reports the number of observations for each group and t-statistics (in parenthesis). Panel B of the table reports excess returns (alpha) for three-month (-2,0) event window around cross-listing for total sample of 497 cross-listing events, trimmed at 5%, divided into three groups based on company size. The excess returns (alpha) are estimated with 3-factor model: $R_i - R_f = \alpha_i + \beta_{1i}(R_m - R_f) + \beta_{2i}SMB + b_{3i}HML + \varepsilon_i$. Panel B also reports the number of observations for each subsample and *t*-statistics on the coefficient estimates (in parenthesis). Additionally Panels A and B report average company size for each group. '***' indicates significant at 1%, '**' indicates significant at 5% and '*' indicates significant at 10%.

Panel A. CARs around cross-listing announcement

Group by company size	Host market																					
	All			Europe						UK						US						
	average company size (mln GBP)			all		before Euro		Euro zone		all		Main Market		AIM		all		before SOX		after SOX	
		mean	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean	N
Small	170.7	**0.027****	84	0.014	35	0.010	32	0.061	3	0.030	23	-0.005	14	**0.084***	9	0.042	26	**0.081****	15	-0.012	11
		(2.35)		(0.98)		(0.64)		(1.61)		(1.35)		(-0.24)		(2.08)		(1.66)		(2.36)		(-0.36)	
Medium	1,670.6	0.023	85	-0.009	41	-0.010	38	-0.009	3	0.058	12	0.058	12	-	0	**0.070****	32	**0.050****	29	0.267	3
		(1.63)		(-0.88)		(-0.88)		(-0.04)		(0.28)		(0.28)				(2.12)		(2.01)		(1)	
Large	14,548.1	0.003	85	-0.013	26	-0.013	21	-0.012	5	**0.041****	13	**0.041****	13	**-**	0	0.001	46	0.003	39	-0.008	7
		(0.36)		(-0.81)		(-0.70)		(-0.41)		(2.22)		(2.22)				(0.12)		(0.24)		(-0.31)	

Panel B. Excess returns around cross-listing event

Group by company size	Host market																					
	All			Europe						UK						US						
	average company size (mln GBP)			all		before Euro		Euro zone		all		Main Market		AIM		all		before SOX		after SOX	
		est.	N	est.	N	est.	N	est.	N	est.	N	est.	N	est.	N	est.	N	est.	N	est.	N
Small	185.3	**0.043*****	118	0.030	38	0.033	34	-0.033	4	0.024	34	-0.002	23	0.075	11	**0.065****	46	**0.062****	34	0.038	12
		(2.90)		(1.12)		(1.21)		-		(0.96)		(-0.05)		(1.49)		(2.39)		(2.11)		(0.5)	
Medium	1,896.4	**0.020****	118	0.018	49	0.012	41	**0.084***	8	0.043	14	0.043	14	-	0	0.015	55	0.014	48	-0.017	7
		(2.08)		(1.25)		(0.69)		(2.32)		(1.2)		(1.2)				(0.95)		(0.83)		(-0.34)	
Large	14,303.6	-0.009	118	-0.018	33	-0.170	26	0.051	7	-0.019	17	-0.019	17	-	0	-0.002	68	0.002	53	-0.001	15
		(-1.13)		(-1.07)		(-0.86)		(1.37)		(-0.63)		(-0.63)				(-0.16)		(0.17)		(-0.03)	

Table 2.11 The determinants of the effect of cross-listing on shareholders' wealth: multivariate regression analysis

The table reports the estimation results of regressions of CARs for 21-day (-10, 10) event window around the announcement of cross-listing on a number of potential determinants of shareholders' wealth effects of cross-listing in the multivariate framework. CARs are calculated as sum of abnormal returns over 21-days event window. Abnormal returns are market-adjusted returns with Datastream Total Market index returns in local currency used as a proxy for market returns. The explanatory variables are defined in Table 2.2. Regression specification is as follows: $CAR_i = \Sigma_{n=EU,UK,US}\, \beta_n\, Host_n + \beta_j X_{i,j} + \beta_{j,n}\, Host_n\, X_{i,j} + \varepsilon_i$, where $Host_n$ is host market dummy variable and $X_{i,j}$ are explanatory variables. The following explanatory variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth, are host-market-adjusted, i.e. ε_j from the regression $Var_j = \Sigma_{n=EU,UK,US}\, \beta_n\, Host_n + \varepsilon_j$. Standard errors, reported in parentheses, are robust to autocorrelation and heteroskedasticity (Newey-West). '***' indicates significant at 1%, '**' indicates significant at 5% and '*' indicates significant at 10%.

			Model 3		Model 4		Model 5	
				Host				
Variable	**Model 1**	**Model 2**	**Variable**	**Europe**	**Variable**	**Host UK**	**Variable**	**Host US**
Host Europe	-0.027	-0.002	-0.007		0.00		-0.01	
	(-1.15)	(-0.28)	(-0.86)		(0.04)		(-1.11)	
Host UK	0.026	**0.032***	**0.038****		**0.10****		**0.03****	
	(0.64)	(1.97)	(2.3)		(2.14)		(1.99)	
Host US	0.011	**0.033****	0.018		**0.027***		**0.032****	
	(0.51)	(2.21)	(1.37)		(1.87)		(2.09)	
Market correlations	-0.041		**-0.104***	**0.121***	-0.045	-0.029	0.014	**-0.213*****
	(-0.77)		(-1.93)	(1.68)	(-0.96)	(-0.23)	(0.31)	(-2.7)
Accounting standards	0.001	0.00	0.001	-0.002	0.001	0.003	-0.002	**0.003***
	(1.25)	(0.38)	(0.41)	(-1.00)	(0.98)	(0.79)	(-1.57)	(1.68)
Investor protection	-0.006				-0.006	-0.029		
	(-1.13)				(-1.16)	(-1.53)		
Market liquidity	0.005							
	(0.56)							
Analayst coverage	0.018	0.012						
	(1.22)	(0.98)						
Geographic distance	**-0.027***	-0.017	**-0.086****	**0.081****	-0.015	**-0.111****	-0.016	-0.038
	(-1.73)	(-1.49)	(-2.37)	(2.13)	(-1.1)	(-2.59)	(-1.34)	(-0.23)
GDP per capita	-0.044	-0.047			-0.021	0.015		
	(-0.94)	(-1.61)			(-0.85)	(0.3)		
Dot-com bubble	0.053	0.047	0.074	-0.039	0.057		0.034	0.039
	(1.52)	(1.34)	(1.55)	(-0.59)	(1.57)		(0.68)	(0.56)
Sales growth	0.004	0.004	0.01	-0.009	0.006	-0.006	0.00	0.022
	(0.79)	(0.93)	(1.32)	(-0.96)	(1.01)	(-0.89)	(0.10)	(1.64)

Table 2.11 continued

			Model 3		Model 4		Model 5	
Variable	**Model 1**	**Model 2**	**Variable**	**Host Europe**	**Variable**	**Host UK**	**Variable**	**Host US**
Industry Financials	0.014							
	(0.54)							
Industry Healthcare	0.019							
	(0.44)							
Industry Manufacturing	0.027							
	(1.22)							
Industry Resources	**0.065****	**0.046****	**0.052****		**0.059*****		**0.046****	
	(2.04)	(2.41)	(2.54)		(2.95)		(1.98)	
Industry Technology	0.031							
	(0.78)							
Capital raised	-0.006		0.002	0.003	-0.02	**0.184***	0.026	-0.045
	(-0.21)		(0.08)	(0.07)	(-0.78)	(1.94)	(0.59)	(-0.95)
Company size	**-0.009***	**-0.008***	-0.009	0.005	**-0.008***	0.002	-0.005	-0.003
	(-1.69)	(-1.84)	(-1.49)	(0.65)	(-1.68)	(0.21)	(-1.22)	(-0.38)
First foreign listing	0.005							
	(0.37)							
US prior OTC	-0.03	-0.027					-0.024	
	(-1.33)	(-1.23)					(-1.21)	
R2	*0.1498*	*0.1186*	*0.1606*		*0.1817*		*0.2073*	
Adj-R2	*0.0309*	*0.0632*	*0.0777*		*0.0848*		*0.1239*	
N	*164*	*187*	*190*		*190*		*190*	

Table 2.12 Impact of Euro on the determinants of the effects of cross-listing on shareholders' wealth

The table reports the estimation results of regressions of cumulative CARs for 21-day (-10, 10) event window around the announcement of cross-listing on a number of potential determinants of shareholders' wealth effects of cross-listing in the multivariate framework. CARs are calculated as sum of abnormal returns over 21-days event window. Abnormal returns are market-adjusted returns with Datastream Total Market index returns in local currency used as a proxy for market returns. The explanatory variables are defined in Table 2.2. Regression specification is as follows: $CAR_i = \Sigma_{n=EU,UK,US}\ \beta_n Host_n + \beta_j X_{i,j} + +\beta_{1j} X_{i,j} D_{beforeeuro} + \beta_{2j} X_{i,j} D_{eurozone} + \varepsilon_i$, where $X_{i,j}$ are explanatory variables; $D_{beforeeuro}$ is dummy variable that equals one if cross-listing takes place in Europe before the introduction of Euro; D_{euro} is dummy variable that equals one if cross-listing takes place within the Euro zone after the introduction of Euro. The following explanatory variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth, are host-market-adjusted, i.e. ε_j from the regression $Var_j = \Sigma_{n=EU,UK,US}\ \beta_n\ Host_n + \varepsilon_j$. Standard errors, reported in parentheses, are robust to autocorrelation and heteroskedasticity (Newey-West). '***' indicates significant at 1%, '**' indicates significant at 5% and '*' indicates significant at 10%.

	Model 1			**Model 2**		
		Host Europe			**Host Europe**	
	Variable	**before Euro**	**Euro zone**	**Variable**	**before Euro**	**Euro zone**
Host Europe	-0.017			-0.012		
	(-0.77)			(-1.24)		
Host UK	0.001			**0.031***		
	(0.04)			(1.85)		
Host US	-0.014			0.018		
	(-0.67)			(1.61)		
Market Correlations	**-0.14****	0.168	0.18	**-0.099****	0.078	0.146
	(-2)	(1.57)	(1.15)	(-2.03)	(1.06)	(0.91)
Investor protection	0.002	-0.002	-0.007			
	(1.19)	(-1.26)	(-1.00)			
Analayst coverage	**0.026***	-0.03	**-0.068****			
	(1.81)	(-1.27)	(-2.00)			
Geographic distance	**-0.094*****	**0.086****	**0.096***	**-0.112*****	**0.106*****	**0.083***
	(-2.75)	(2.26)	(1.91)	(-3.08)	(2.72)	(1.75)
Dot-com bubble	0.076		-0.034	0.073		-0.03
	(1.62)		(-0.46)	(1.53)		(-0.45)
Sales growth	0.01	-0.007	-0.01	0.009	-0.008	-0.007
	(1.26)	(-0.76)	(-0.67)	(1.26)	(-0.89)	(-0.73)
Industry Financials	0.024					
	(0.95)					
Industry Healthcare	0.021					
	(0.53)					
Industry Manufacturing	0.034					
	(1.61)					
Industry Resources	**0.084*****			**0.056*****		
	(2.82)			(2.9)		

Table 2.12 continued

	Model 1			Model 2		
		Host Europe			Host Europe	
	Variable	before Euro	Euro zone	Variable	before Euro	Euro zone
Industry Technology	0.035					
	(0.95)					
Capital raised	0.006	-0.032	0.075			
	(0.17)	(-0.56)	(1.32)			
Company size	-0.009	0.00	0.007	-0.008	0.01	-0.003
	(-1.41)	(0.02)	(0.62)	(-1.38)	(1.09)	(-0.24)
First foreign listing	0.008	-0.042	0.011			
	(0.35)	(-1.41)	(0.20)			
R2		*0.2036*			*0.1642*	
Adj-R2		*0.0248*			*0.0843*	
N		*181*			*196*	

Table 2.13 Impact of SOX on the determinants of the effects of cross-listing on shareholders' wealth

The table reports the estimation results of regressions of cumulative abnormal returns for 21-day (-10, 10) event window around the announcement of cross-listing on a number of potential determinants of shareholders' wealth effects of cross-listing in the multivariate framework. CARs are calculated as sum of abnormal returns over 21-days event window. Abnormal returns are market-adjusted returns with Datastream Total Market index returns in local currency used as a proxy for market returns. The explanatory variables are defined in Table 2.2. Regression specification is as follows: $CAR_i=\Sigma_{n=EU,UK,US}\,\beta_n Host_n+\beta_j X_{i,j}+\beta_{1j} X_{i,j} D_{beforesox}+\beta_{2j} X_{i,j} D_{sox}+\varepsilon_i$, where $X_{i,j}$ are explanatory variables; $D_{beforeSOX}$ is dummy variable that equals one if cross-listing takes place in the US before the adoption of SOX; $D_{afterSOX}$ is dummy variable that equals one if cross-listing takes place in the US after the adoption of SOX. The following explanatory variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth, are host-market-adjusted, i.e. ε_j from the regression $Var_j = \Sigma_{n=EU,UK,US}\,\beta_n\, Host_n + \varepsilon_j$. Standard errors, reported in parentheses, are robust to autocorrelation and heteroskedasticity (Newey-West). '***' indicates significant at 1%, '**'indicates significant at 5% and '*' indicates significant at 10%.

	Model 1			**Model 2**			**Model 3**		
		Host US			**Host US**			**Host US**	
	Variable	**prior SOX**	**post SOX**	**Variable**	**prior SOX**	**post SOX**	**Variable**	**prior SOX**	**post SOX**
Host Europe	**-0.038***			-0.008			-0.004		
	(-1.78)			(-0.94)			(-0.48)		
Host UK	-0.018			0.027			**0.026***		
	(-0.55)			(1.62)			(1.66)		
Host US	0.027			**0.032****			**0.042****		
	(1.02)			(2.73)			(3.2)		
Market Correlations	0.04	-0.10	-0.248						
	(0.58)	(-0.82)	(-1.14)						
Accounting standards							-0.001	**0.004***	**-0.006****
							(-1.09)	(1.81)	(-2.16)
Market liquidity	-0.012	0.002	0.028						
	(-1.18)	(0.13)	(1.11)						
Analayst coverage	0.03	-0.019	-0.032				0.004	0.012	**-0.072****
	(1.65)	(-0.67)	(-1.06)				(0.46)	(0.64)	(-2.23)
Geographic distance	-0.011	-0.19	0.31	**-0.022***	-0.098	**0.492*****			
	(-0.59)	(-0.9)	(0.6)	(-1.84)	(-0.62)	(2.84)			

Table 2.13 continued

	Model 1			Model 2			Model 3		
		Host US			Host US			Host US	
	Variable	prior SOX	post SOX	Variable	prior SOX	post SOX	Variable	prior SOX	post SOX
Dot-com bubble	0.012	0.068		0.04	0.04		0.034	0.033	
	(0.22)	(0.88)		(0.85)	(0.61)		(0.67)	(0.48)	
Sales growth	0.001	0.03	0.004	0.001	**0.031***	-0.002	0.001	0.028	0.003
	(0.20)	(1.53)	(0.38)	(0.27)	(1.72)	(-0.33)	(0.28)	(1.47)	(0.34)
Industry Financials	0.014								
	(0.61)								
Industry Healthcare	0.008								
	(0.27)								
Industry Manufacturing	0.02								
	(0.94)								
Industry Resources	**0.063****			**0.044****			**0.042***		
	(2.06)			(2.12)			(1.83)		
Industry Technology	0.047								
	(1.09)								
Capital raised	0.031	-0.052	-0.013						
	(0.71)	(-1.09)	(-0.1)						
Company size	-0.003	**-0.019***	0.008	-0.003	**-0.020***	0.009	**0.019***	**-0.008***	-0.016
	(-0.42)	(-1.66)	(0.67)	(-0.56)	(-1.93)	(0.94)	(1.82)	(-1.72)	(-1.45)
First foreign listing	-0.004	0.012	-0.001						
	(-0.17)	(0.35)	(-0.02)						
prior US OTC		-0.005	**-0.09***		0.009	**-0.069****		0.006	**-0.065***
		(-0.18)	(-1.75)		(0.37)	(-2.05)		(0.25)	(-1.78)
R2		*0.3013*			*0.2271*			*0.2653*	
Adj-R2		*0.1174*			*0.1603*			*0.1828*	
N		*169*			*202*			*189*	

Appendix 2.1 The determinants of the effect of cross-listing on shareholders' wealth: coefficient estimates and variance inflation factors

The table reports the coefficient estimates and variance inflation factors (VIF) from regressions reported in Table 2.11. CARs are the sum of market-adjusted returns over 21-days event window. The explanatory variables are defined in Table 2.2. Regression specification: $CAR_i = \Sigma_{n=EU,UK,US}\, \beta_n\, Host_n + \beta_j X_{i,j} + \beta_{j,n}\, Host_n\, X_{i,j} + \varepsilon_i$, where $Host_n$ is host market dummy variable and X_i are explanatory variables. The following explanatory variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth, are host-market-adjusted, i.e. ε_j from the regression $Var_j = \Sigma_{n=EU,UK,US}\, \beta_n\, Host_n + \varepsilon_j$.

	Model 1		Model 2		Model 3				Model 4				Model 5			
					Variable		Host Europe		Variable		Host UK		Variable		Host US	
Variable	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF
Host Europe	-0.027	5.99	-0.002	1.10	-0.007	1.40			0.00	1.27			-0.010	1.31		
Host UK	0.026	2.69	0.032	1.10	0.038	1.08			0.100	9.11			0.030	1.08		
Host US	0.011	7.70	0.033	1.70	0.018	1.56			0.027	1.43			0.032	2.38		
Market correlations	-0.041	1.58			-0.104	1.85	0.121	1.81	-0.045	1.66	-0.029	2.21	0.014	2.16	-0.213	2.43
Accounting standards	0.001	2.21	0.000	1.38	0.001	2.14	-0.002	2.14	0.001	2.37	0.003	3.02	-0.002	2.08	0.003	2.83
Investor protection	-0.006	2.76							-0.006	3.01	-0.029	11.33				
Market liquidity	-0.005	1.40														
Analayst coverage	0.018	2.51	0.012	2.62												
Geographic distance	-0.027	1.22	-0.017	1.08	-0.086	7.26	0.081	7.32	-0.015	1.27	-0.111	1.57	-0.016	1.11	-0.038	2.29
GDP per capita	-0.044	3.35	-0.047	2.43					-0.021	1.93	0.015	2.59				
Dot-com bubble	0.053	1.30	0.047	1.24	0.074	2.06	-0.039	2.20	0.057	1.27			0.034	3.28	0.039	3.39
Sales growth	0.004	1.26	0.004	1.06	0.010	3.15	-0.009	3.34	0.006	1.38	-0.006	1.52	0.0005	1.44	0.022	1.41
Industry Financials	0.014	3.92														
Industry Healthcare	0.019	2.57														
Industry Manufacturing	0.027	5.22														
Industry Resources	0.065	1.89	0.046	1.10	0.052	1.14			0.059	1.21			0.046	1.13		
Industry Technology	0.031	2.40														
Capital raised	-0.006	1.62			0.002	1.95	0.003	2.25	-0.020	1.56	0.184	1.63	0.026	4.60	-0.045	4.56
Company size	-0.009	1.67	-0.008	1.21	-0.009	1.67	0.005	1.94	-0.008	1.59	0.002	2.28	-0.005	2.44	-0.003	2.38
First foreign listing	0.005	2.72														
US prior OTC	-0.030	1.81	-0.027	1.58									-0.024	1.75		
Adj-R2	*0.0309*		*0.0632*		*0.0777*				*0.0848*				*0.1239*			
N	*164*		*187*		*190*				*190*				*190*			

Appendix 2.2 Impact of Euro on the determinants of the effect of cross-listing on shareholders' wealth: coefficient estimates and variance inflation factors

The table reports the coefficient estimates and variance inflation factors (VIF) from regressions reported in Table 2.12. CARs are the sum of market-adjusted returns over 21-days event window. The explanatory variables are defined in Table 2.2. Regression specification: $CAR_i=\Sigma_{n=EU,UK,US}\beta_n Host_n+ \beta_j X_{i,j} +\beta_{1j} X_{i,j}D_{beforeeuro}+\beta_{2j} X_{i,j}D_{eurozone} + \varepsilon_i$, where $X_{i,j}$ are explanatory variables; $D_{beforeeuro}$ is dummy variable that equals one if cross-listing takes place in Europe before the introduction of Euro; D_{euro} is dummy variable that equals one if cross-listing takes place within Euro zone after the introduction of Euro. The following explanatory variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth, are host-market-adjusted, i.e. ε_j from the regression $Var_j = \Sigma_{n=EU,UK,US}\beta_n Host_n + \varepsilon_j$.

	Model 1						Model 2					
			Host Europe						Host Europe			
	Variable		before Euro		Eurozone		Variable		before Euro		Eurozone	
Variable	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF
Host Europe	-0.017	7.56					-0.01	1.27				
Host UK	0.001	2.94					0.031	1.04				
Host US	-0.014	7.36					0.018	1.21				
Market correlations	-0.14	2.57	0.168	2.14	0.18	3.18	-0.1	1.72	0.078	1.63	0.146	1.36
Legal protection	0.002	2.88	-0.002	2.47	-0.01	7.83						
Analayst coverage	0.026	2.59	-0.03	1.71	-0.068	10.97						
Geographic distance	-0.094	8.20	0.086	7.37	0.10	2.89	-0.11	5.55	0.106	4.83	0.08	1.90
Dot-com bubble	0.076	2.32			-0.034	2.94	0.073	2.05			-0.03	2.21
Sales growth	0.01	3.42	-0.007	3.53	-0.01	2.17	0.009	2.97	-0.008	3.04	-0.007	1.14
Industry Financials	0.024	4.18										
Industry Healthcare	0.021	2.56										
Industry Manufacturing	0.034	5.94										
Industry Resources	0.084	1.94					0.056	1.14				
Industry Technology	0.035	2.28										
Capital raised	0.006	2.28	-0.032	2.29	0.08	3.91						
Company size	-0.009	1.92	0.00	2.63	0.01	3.47	-0.01	1.57	0.010	1.48	-0.003	1.24
First foreign listing	0.008	4.17	-0.042	4.22	0.01	7.90						
Adj-R2			*0.0248*						*0.0843*			
N			*181*						*196*			

Appendix 2.3 Impact of SOX on the determinants of the effect of cross-listing on shareholders' wealth: coefficient estimates and variance inflation factors

The table reports the coefficient estimates and variance inflation factors (VIF) from regressions reported in Table 2.13. CARs are the sum of market-adjusted returns over 21-days event window. The explanatory variables are defined in Table 2.2. Regression specification: $CAR_i = \Sigma_{n=EU,UK,US}\, \beta_n Host_n + \beta_j X_{i,j} + \beta_{1j} X_{i,j} D_{beforesox} + \beta_{2j} X_{i,j} D_{sox} + \varepsilon_i$, where $X_{i,j}$ are explanatory variables; $D_{beforeSOX}$ is dummy variable that equals one if cross-listing takes place in the US before the adoption of SOX; $D_{afterSOX}$ is dummy variable that equals one if cross-listing takes place in the US after the adoption of SOX. The following explanatory variables: market correlation, accounting standards, investor protection, market liquidity, analyst coverage, geographic distance, GDP per capita, company size and sales growth, are host-market-adjusted, i.e. ε_j from the regression $Var_j = \Sigma_{n=EU,UK,US}\, \beta_n Host_n + \varepsilon_j$.

	Model 1						Model 2						Model 3					
	Variable		Host Europe				Variable		Host Europe				Variable		Host Europe			
			prior SOX		post SOX				prior SOX		post SOX				prior SOX		post SOX	
Variable	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF	est.	VIF
Host Europe	-0.038	6.74					-0.01	1.15					0.00	1.16				
Host UK	-0.018	2.84					0.03	1.02					0.03	1.04				
Host US	0.027	11.64					0.03	1.93					0.04	2.25				
Market correlations	0.04	3.03	-0.1	2.87	-0.248	10.28												
Accounting standards													0.00	2.3	-0.01	2	0.00	1.89
Market liquidity	0.012	3.07	-0.002	2.26	-0.028	3.84												
Analayst coverage	0.03	3.05	-0.019	2.20	-0.032	4.65							0.00	2.02	-0.07	2.01	0.01	1.74
Geographic distance	-0.011	1.43	-0.19	1.74	0.31	7.10	-0.02	1.02	-0.10	1.07	0.49	1.15						
Dot-com bubble	0.012	3.48	0.068	4.01			0.04	2.91	0.04	3.08			0.03	3.1			0.03	3.26
Sales growth	0.001	1.59	0.03	1.48	0.004	2.12	0.00	1.25	0.03	1.3	0.00	1.34	0.00	1.28	0.00	1.44	0.03	1.35
Industry Financials	0.014	4.33																
Industry Healthcare	0.008	2.92																
Industry Manufacturing	0.02	6.05																
Industry Resources	0.063	2.12					0.04	1.12					0.04	1.12				
Industry Technology	0.047	2.92																
Capital raised	0.031	4.70	-0.052	4.65	-0.013	1.80												
Company size	-0.003	3.11	-0.019	2.74	0.008	3.16	0.00	1.82	-0.02	1.98	0.01	1.5	0.02	1.57	-0.02	2.23	-0.01	2.07
First foreign listing	-0.004	5.70	0.012	5.09	-0.001	4.33												
US prior OTC			-0.005	2.26	-0.09	2.07			0.01	1.69	-0.07	1.26			-0.07	1.19	0.01	1.87
Adj-R2			*0.1174*						*0.1603*						*0.1828*			
N			*169*						*202*						*189*			

Chapter 3
Liquidity and Volatility of Stocks Listed and Traded in Multiple Stock Markets

3.1 Introduction

Companies choose to list on a foreign stock exchange with a view to improving stock visibility, prestige and liquidity (Bancel and Mittoo, 2001) with the ultimate goal of enhancing their stock valuation (Chouinard and D'Souza, 2003-2004). Potentially, the improvement in stock valuation stems from the fact that a cross-listing results in an enhanced information environment because of the need to meet the mandatory listing and disclosure requirements. Thus, when stocks are listed in multiple stock exchanges with different accounting and disclosure requirements investors enjoy additional information. Chemmanur and Fulghieri (2006) theoretically show that a foreign listing on an exchange with strict disclosure requirements reduces investors' monitoring costs and improves stock valuation. Therefore, an enhanced information environment reduces the adverse selection component of trading costs and enhances liquidity, resulting in a reduction in the cost of transactions, especially the bid-ask spread (Kyle (1985) and Glosten and Milgrom (1985) provide an excellent discussion on how information flow affects the size of the bid-ask spread). This, in turn, results in a lower cost of capital (Diamond and Verrechia, 1991; Baiman and Verrecchia, 1996) leading to an increase in the value of the firm.

Existing empirical evidence shows that cross-listing in the US by a foreign company, on average, results in abnormal positive returns around cross-listing (Miller, 1999; Foerster and Karolyi, 1999), increased company visibility (Baker et al, 2002), improved analyst coverage, in terms of quantity as well as accuracy (Lang et al, 2003a), enhanced stock liquidity (Smith and Sofianos, 1997; Foerster and Karolyi, 1993 and 1998), lower cost of capital (Errunza and Miller, 2000; Hail and Leuz, 2009) and improved relative valuation (Doidge et al, 2004 and 2009a). The findings of chapter 2 of this thesis also suggest that international cross-listing, on average, results in gains in shareholders' wealth for cross-

listing companies. The possible sources of the gains in shareholders wealth after cross-listing include an improvement in the quality of the stock's information environment and, accordingly, an improvement in the stock's liquidity and volatility. The change in stock liquidity and volatility after cross-listing is the focus of chapter 3.

The findings on the improvements in stock valuation can be interpreted as indirect evidence of the reduction in information asymmetry following a cross-listing. Two studies investigate directly the quality of the information environment of cross-listed stocks. First, Bailey et al (2006) examine the consequences of the increased disclosure of non-US firms listed in the US, and report a significant increase in stock return volatility and trading volume reaction to earnings announcements after cross-listing in the US, which they attribute to the changes in the company-level disclosure. Second, Fernandes and Ferreira (2008) investigate the change in the quality of the information environment around cross-listing and focus on the change in stock price informativeness, i.e. the level of private information incorporated in the stock price. They find that cross-listing is positively associated with firm-specific stock return variation, interpreted as the measure of stock price informativeness, particularly for stocks from developed markets.

The existing evidence on whether cross-listing improves the information environment is far from conclusive. Moreover, the quality of the information environment is not easily quantifiable or empirically testable and the results of empirical tests are sensitive to the choice of proxy. Leuz and Verrecchia (2000) suggest that stock liquidity and volatility proxy for the quality of the firm's information environment. More specifically, the improvement in stock liquidity and the reduction in stock return volatility after cross-listing can be interpreted as an outcome of the decreased level of information asymmetry between company managers and investors and between different groups of investors after cross-listing.

Existing empirical evidence on the change in stock liquidity and volatility after cross-listing is mixed. Some studies report that after cross-listing there is a significant decrease in the stock's trading costs (Foerster and Karolyi, 1998; Domowitz et al, 1998; Hamet, 2002) and an increase in the stock's trading volume (Smith and Sofianos, 1997; Foerster and Karolyi, 1993 and 1998; Hamet, 2002). Other studies report no impact from an

international cross-listing on the stock's trading costs (Noronha et al, 1996; Silva and Chavez, 2008) and no impact or deterioration of trading activity on the stock's home market (Berkman and Nguyen, 2010; Domowitz et al, 1998; Foerster and Karolyi, 1998). Empirical studies on the impact of cross-listing on volatility report either no significant relationship (Howe and Madura, 1990; Lau et al, 1994; Martell et al, 1999) or an increase in volatility after cross-listing, mainly associated with the increase in the stock's trading activity (Barclay et al, 1990; Chan et al, 1996; Werner and Kleidon, 1996; Menkveld, 2008). Overall, existing empirical evidence on the consequences of cross-listing in terms of stock liquidity and volatility is not conclusive and in some cases is outdated.

There are several potential reasons for corporate finance managers and investors to be concerned about stock liquidity and volatility. First, improved stock liquidity decreases trading costs for investors and, accordingly, reduces the required illiquidity premium resulting in higher stock valuation (Amihud and Mendelson, 1986; Brennan et al, 1998; Jacoby et al, 2000; Amihud, 2002). Second, lower volatility is associated with a reduction in the perceived riskiness of the stock (Bushee and Noe, 2000) and, consequently, with a lower cost of capital (Froot et al, 1992). Finally, a stock with lower volatility provides less costly and more effective stock-price-based management compensation (Baiman and Verrecchia, 1995 and 1996).

This study contributes to the literature by examining the impact of cross-listing on the stock's liquidity and volatility. More specifically, the main research question addressed is: Does cross-listing improve stock liquidity and volatility? Cross-listed stocks are expected to have higher liquidity and lower return volatility compared to domestic stocks because cross-listing improves the stock's information environment. Several measures are used to capture various dimensions of stock's liquidity and volatility, including trading costs and trading volume-based measures of stock liquidity and stock return variance and intraday stock price variation. The impact of cross-listing is evaluated in a multivariate framework after controlling for other factors that potentially affect stock liquidity and volatility. These include the change in company size, accounting practices, analyst coverage and trading activity following cross-listing.

The second important contribution is a direct comparison between the impact of a cross-listing and the impact of an admission to trade on a foreign exchange, referred to in this study as a cross-trading. Cross-listing is initiated by the company's decision to cross-list its shares on a foreign stock exchange and involves a company submitting a listing application and meeting listing and disclosure requirements of the host foreign stock exchange. Cross-listed stocks are listed in the stock exchange's official directory of listed foreign companies available on stock exchange's web-sites. Cross-trading in this study includes admissions to trade on foreign over-the-counter (OTC) markets and on foreign new markets and alternative trading platforms such as Open market of Deutsche Borse and VIRTX of Swiss stock exchange. OTC trading in the US takes place in the form of a Level I American Depository Receipt (ADR) and is initiated by the company; OTC trading in the UK and trading on alternative markets and trading platforms is initiated by market makers/dealers without the firm's involvement (a company could be not even aware that its stocks are cross-traded, for example, on the Open market of Deutsche Borse). The main difference between cross-listing and cross-trading is that, in contrast to cross-listing, cross-trading does not involve meeting mandatory listing or additional disclosure requirements. Cross-trading is similar to cross-listing in the way that it makes a stock accessible to foreign investors and, thus, facilitates inter-market competition. While cross-trading has become wide spread in recent decade, the empirical evidence on its implications is limited.[51] To address this gap, this study specifically investigates the extent to which cross-listing and cross-trading result in different outcomes for stock liquidity and volatility. Thus, the second research question addressed is: Does cross-listing have a more profound impact on the liquidity and volatility than cross-trading?

The sample includes 425 stocks from 17 European countries that were listed in various foreign markets during the period from 1990 to 2007. While prior literature reports that a US cross-listing is beneficial in terms of liquidity (Foerster and Karolyi, 1993 and 1998) and improvement in the information environment (Lang et al, 2003a; Fernandes and Ferreira, 2008), the evidence on the implications of foreign listing/trading on other host markets is limited. Since the US differs significantly from other markets in terms of the size

[51] Only a few studies examine the consequences of a foreign trading on stock liquidity (e.g. Hamet, 2002; Ellul, 2006) and stock return volatility (e.g. Bayar and Onder, 2005).

of the investor pool, the level of liquidity, and the legal and information environment, it is reasonable to expect that the findings for the US market are not necessarily applicable to other markets. Moreover, the inclusion of all foreign listing and trading accounts of the sample cross-listed stock allows an assessment of the impact of cross-listing and cross-trading on various host markets and an assessment of the impact of cross-listing on the stock's aggregate trading activity.

Using cross-sectional analysis, the liquidity and volatility of cross-listed stocks are compared against the liquidity and volatility of 3,702 domestic stocks from the same countries. Several studies find that the impact of a foreign listing in terms of liquidity (Halling et al, 2008) and corporate valuation (Gozzi et al, 2008) is concentrated around the cross-listing event and diminishes over time. This study contributes to the debate by providing evidence on the evolution of stock liquidity and volatility around cross-listing and cross-trading and their long-run sustainability. Finally, the change in stock liquidity and volatility is evaluated in a time-series framework against those of the cross-listed stocks over the pre-cross-listing period of time.

The primary empirical finding is that cross-listing and cross-trading on a foreign market improve the liquidity and reduce volatility of a stock. In the case of liquidity, this is also true in comparison to the pre-cross-listing/trading period of time. After controlling for the effects of factors that are known to affect stock liquidity and for the change in company characteristics after cross-listing/ cross-trading in the multivariate analysis, it is found that a presence on a foreign exchange, either through cross-listing or cross-trading, is associated with a significantly reduced bid-ask spread, increased trading volumes, and also with a reduction in stock return volatility. Home market stock turnover does not improve after cross-listing or after cross-trading. At the same time, total turnover, which in contrast to home market turnover accounts for trading volumes on foreign exchange(s), improves for cross-listed stocks but not for cross-traded stocks. The documented effects of cross-listing and cross-trading are found to be sustained over a long period of time following the cross-listing/ cross-trading event.

Although added mandatory disclosure requirements of cross-listing should cause a more profound effect on the liquidity and volatility, the results do not show any significant

difference in the impact of cross-listing and cross-trading. This finding, arguably, can be attributed to the fact that the improvement in the information environment after cross-listing is not substantially different from that after cross-trading. The major improvement in the information environment of cross-listed and cross-traded stocks arises, possibly, not from additional mandatory information disclosure but from the intensified competition among market makers and from the production of stock-specific information. Both enhanced competition and information production are the outcome of the increase in the number of market participants with an economic interest in the stock after cross-listing/ cross-trading.

Finally, the results are in line with the expectation that the implications of a foreign listing and trading vary depending on the level of development of the stock's home market, in line with Domowitz et al (1998), Bacidore et al (2005), Halling et al (2008), Fernandes and Ferreira (2008). More specifically, it is found that the results are driven by the experience of stocks from developed markets and do not hold for stocks from emerging markets.

The rest of the chapter is organized as follows: Section 3.2 provides an overview of the literature on the implications of cross-listing and cross-trading for stock liquidity and volatility. Section 3.3 develops testable hypotheses on the implications of cross-listing and/or cross-trading on the stock's liquidity and volatility and discusses other important factors that affect stock trading after cross-listing/ cross-trading. Section 3.4 and section 3.5 describe the methodology and the sample employed, while section 3.6 presents the empirical findings and, finally, section 3.7 concludes the chapter.

3.2 Literature review

Based on Bancel and Mittoo's (2001) survey, European managers make a decision to cross-list with the expectation of improving the company's visibility, prestige and image and also to increase the shareholder base and gain improved access to foreign capital markets. However, companies experience positive net benefits from cross-listing only if there is an increase in the stock's trading volume after the cross-listing. Along similar lines, Pagano et

al (2002) identify stock liquidity as one of the motives for cross-listing. Reduction in volatility is generally associated with a reduction in the perceived riskiness of the stock (Bushee and Noe, 2000). This perception of reduced riskiness can potentially lead to a lower cost of capital after cross-listing (Froot et al, 1992; Hail and Leuz, 2009). The following two sub-sections review existing empirical evidence on the impact of multimarket listing on both stock's liquidity and volatility.

3.2.1 Liquidity

Cross-listing/cross-trading of a stock on a foreign exchange results in a larger investor base. A larger investor base in turn should facilitate increased stock turnover and more intense competition in stock trading among market makers and investors leading to a reduction in transaction costs. Additionally, cross-listing imposes extra disclosure requirements and, accordingly, brings more information to the market, which, in turn, is expected to induce more active stock trading (Kyle, 1985).

Cross-listing and liquidity

A number of studies examine the consequences of international cross-listing on a stock's liquidity in general and on trading volumes and trading costs in particular. Noronha et al (1996) examine the change in liquidity of 126 US stocks following a listing in London and Tokyo and document a significant increase in trading activity on the home market driven by an increase in informed trading. However, despite the fact that a listing on a foreign exchange makes competition among market makers more intense, they do not find any decrease in spreads. Smith and Sofianos (1997) examine the change in trading activity of 128 non-US stocks listed on the NYSE and report that in total, on the NYSE and the home market combined, the volume of trading increase by 42% and the home market trading volume increase by 24%. It should be noted, however, that the increase in the home market trading activity is driven by the increase in the home market trading volume of stocks from developed countries. Domowitz et al (1998) show that for stocks from Mexico, a segmented emerging market, trading activity on the home market reduces after cross-listing in the US, and they attribute this finding to the migration of foreign investors. However, despite the

migration of order flows to the US, Domowitz et al (1998) find evidence that inter-market competition contributes to narrower spreads. Furthermore, Silva and Chavez (2008) do not find evidence that internationally cross-listed companies from emerging markets in Latin America have enhanced liquidity in terms of trading costs in the home market compared to domestic companies.

Several studies examine liquidity changes after cross-listing in the US by Canadian companies. Foerster and Karolyi (1993) find an increase of 62% in total trading volume after cross-listing and an increase in domestic trading volume of 26%. Mitto (1997) reports an increase in domestic trading volume for stocks listed on the Toronto stock exchange and a decrease for stocks listed on the Vancouver stock exchange. Foerster and Karolyi (1998) examine the consequences of the foreign listing of 52 Canadian firms in the US in terms of liquidity and report that the total trading volume (TSE and US markets combined) increases by 28% while trading volume on the TSE, the home market, decreases slightly, as some portion of trading activity migrates to the foreign market. Furthermore, trading costs measured by the bid-ask spread (posted as well as effective) decrease significantly following listing in the US, particularly for firms that have a significant portion (over 50%) of total trading activity taking place in the US. Foerster and Karolyi (1998) interpret the decrease in the trading costs as the result of intensified competition among market makers due to the additional presence of US market makers. A recent paper by Kryzanowski and Lazrak (2009) examines the liquidity of Canadian stocks that cross-list on various US exchanges and detects no variation in trading costs that might be driven by the choice of the any particular US exchange as the destination exchange.

A group of studies employ intraday data to investigate the impact of trading on a foreign exchange on trading activity in the home market. Werner and Kleidon (1996), Howe and Ragan (2002) and Menkveld (2008) all report that the trading of a cross-listed stock in the home market is concentrated in the overlapping trading hours. This is in line with the theoretical prediction of Admati and Pfleiderer (1988) that traders tend to cluster in time. Furthermore, Bacidore et al (2005) and Moulton and Wei (2009) provide evidence that liquidity of cross-listed stocks, in terms of spreads and depth, improves during the overlapping trading hours. However, Bacidore et al (2005) report that the improvement in

the home market liquidity is only observed for stocks from developed countries and not for those from emerging markets.

Halling et al (2008) provide empirical evidence on the home market liquidity of non-US stocks around cross-listing in the US. They show that trading activity in the home market is stimulated by a listing on a foreign exchange. More specifically the home market's stock turnover ratio peaks in the year of cross-listing and stays above its pre-cross-listed level in the consequent years. However, these findings hold only for stocks from developed countries and countries with strong anti-insider trading protection. Stocks from countries with weak anti-insider trading protection, however, experience a significant decrease in the home market liquidity after cross-listing.

Finally, Berkman and Nguyen (2010) report evidence that seems to contradict the prior literature. They show that cross-listing in the US is not associated with improvements in domestic liquidity, which is proxied by the quoted bid-ask spread, price impact, turnover and the probability of informed trading. Moreover, they report a weak improvement in stock liquidity on the home market for stocks from emerging markets and from countries with weak investor protection and poor accounting information quality.

Overall, existing empirical evidence suggests that after a cross-listing there is improvement in the home market liquidity for stocks from developed markets but for stocks from emerging markets there is either no impact or deterioration. These findings are consistent with the theoretical predictions of Chowdhry and Nanda (1991) that equity trading tends to be concentrated on the market with lower trading costs.[52] They are also in line with the predictions of Domowitz et al (1998) that domestic market quality of cross-listed stocks deteriorates if the home market is segmented in terms of information flow. None of the existing studies, however, examine the aggregate stock turnover after cross-listing that would account for trading in all markets where the stock is listed/ traded.

Cross-trading and liquidity

Empirical evidence on the impact of over-the-counter (OTC) and off-exchange trading on the home market liquidity of stocks is limited. Hamet (2002) examined the

[52] The level of economic and financial development is highly correlated with trading costs; for example, Halling et al (2008) use capital market development measure as a proxy for trading costs.

trading activity of 52 French stocks that are also traded on SEAQ-I, a trading platform on the London stock exchange that enables trading of foreign stocks that are not listed on the London stock exchange. The study reports that off-board trading in London has a positive impact on the trading volumes and reduces transaction costs on the Paris Bourse. Ellul (2006) studied the inter-market flow of information and price discovery dynamics of French, German and Italian stocks that are cross-traded on the LSE's SEAQ-I and found clear evidence of order-splitting activity of market makers between the home and the foreign markets. Large order execution, which is concentrated in London, results in a significant increase in trading volume and price impact in the home market; and trading volumes on the home and foreign markets are positively correlated.

3.2.2 Volatility

On the one hand, if cross-listing improves the stock's information environment due to increased information production then stock risk, i.e. uncertainty about future cash flows, should be reduced after cross-listing. On the other hand, higher trading volumes after cross-listing/ trading should be associated with higher volatility (Jones et al, 1994; Chan and Fong, 2000). Higher trading volumes after cross-listing/ trading are expected due to an increase in the numbers of investors after a foreign listing and also due to more information released to the market. More information results in higher trading, potentially due to different interpretations of public information by investors (Bamber et al, 1999). Therefore, theoretical predictions on the impact of cross-listing on stock risk are controversial and need validation by empirical evidence.

Cross-listing and volatility

The literature offers empirical evidence on the consequences of international cross-listing on stock return variance using both daily and intraday data. The studies that use daily data include evidence on the experience of US stocks cross-listed outside of the US and of non-US stocks cross-listed in the US. Barclay et al (1990) show that the increase in stock-return variance following a listing on a foreign exchange is driven by trading volumes: NYSE stocks after a secondary listing in Tokyo have an insignificant (less than 1%) portion

of total trading volume taking place in Tokyo and their stock-return variance remains unchanged after cross-listing despite the significant increase in trading hours. At the same time Japanese stocks listed on the NYSE have more active trading on the foreign exchange (around 8% of the total trading volume takes place on the NYSE) and experience a significant increase in the stock-return variance after cross-listing. Similar to Barclay et al (1990), Howe and Madura (1990) and Lau et al (1994) report no significant changes in stock risk and return variances after an international cross-listing by a US firm.

Several studies examine the implications on the stock volatility for non-US firms listing in the US. Jayaraman et al (1993) find a significant permanent increase in return volatility after cross-listing in the US, on average, by 56% for stocks from developed European and Asian countries, which they interpret as consistent with the theory that a foreign listing extends trading hours and creates new profitable opportunities for informed traders (Freedman, 1989 sited by Jayaraman et al, 1993), whereas the disclosure of more information via trading results in higher stock volatility (Black, 1986; French and Roll, 1986). For a small sample of Japanese stocks, Ko et al (1997) show that abnormal return volatility increases after cross-listing in the US. Contrary evidence is reported by Martell et al (1999): they find no evidence that stock return volatility changes after cross-listing in the US for a sample of stocks from emerging markets in Latin America and attribute this finding to the fact that a cross-listing in the US does not extend trading hours for Latin American stocks. Domowitz et al (1998) argue that the impact of a cross-listing is complex and depends on the level of transparency of the home market. Empirically, Domowitz et al (1998) and Coppejans and Domowitz (2000) show that for stocks from Mexico, a market with poor information linkages, a US listing results in increased volatility in the home market. This is because the migration of the trading activity to the foreign market results in a deterioration of the quality of the home market.

Another group of studies focuses on the intraday volatility patterns of cross-listed stocks. Chan et al (1996) show that foreign stocks cross-listed in the US experience higher volatility and higher trading volumes than similar US stocks, particularly in the early mornings. The authors argue that this can be explained by the market reaction to public information accumulated in the foreign markets overnight. Werner and Kleidon (1996), Forster and George (1995), and Menkveld (2008) report a significant increase in return

volatility of cross-listed stocks in the overlapping trading hours between the home and the host markets and show that this increase in volatility is related to the level of trading activity on the home market (Werner and Kleidon, 1996) as well as on the foreign market (Forster and George, 1995; Menkveld, 2008).

Overall, empirical evidence on the impact of cross-listing on stock return volatility is mixed. However, there is a common element in most of the empirical evidence: the change in volatility after cross-listing is positively related to the change in trading volumes after cross-listing.

Cross-trading and volatility

Empirical evidence on the impact of off-exchange trading on the home market return volatility is far from comprehensive. Ko et al (1997) report that, for a small sample of Japanese stocks, abnormal return volatility increases significantly after cross-listing on the NYSE as well as after listing on the US OTC market. However, the increase in volatility is less for OTC listings. Bayar and Onder (2005) examine the volatility of French stocks traded on the Deutsche Borse's electronic market XETRA and find that volatility increases after cross-trading on the XETRA for the majority of the stocks in the sample. This finding is puzzling given the significant level of integration of French and German markets and because of the additional finding that the home market liquidity deteriorates after cross-trading on XETRA. The findings of Bayar and Onder (2005) are neither consistent with the literature that link the increase in volatility to the increase in trading volume nor with the argument of Domowitz et al (1998) that the increase in volatility is possible if the home and the host markets are informationally segmented.

To summarize, the empirical evidence on the implications of cross-listing and cross-trading on stock liquidity and volatility is not conclusive and is based mainly on samples of US stocks traded outside of the US and of non-US stocks traded in the US. However, a large population of non-US stocks cross-listed and cross-traded on non-US exchanges is not covered. At the same time, as Domowitz et al (1998) show, the impact of a cross-listing depends on the information linkages between the host and home markets. Thus, inclusion in the sample of various home as well as host markets could shed more light on the economic consequences of a foreign listing/trading. Furthermore, the evidence on the implications of

an admission to trade on a foreign exchange is limited. Moreover, there is no evidence on the difference between the impacts of cross-listing and cross-trading on stock liquidity and volatility.

3.3 Hypotheses development

By making the decision to cross-list on a foreign exchange, a company commits to higher levels of disclosure and scrutiny by a greater number of market participants, which, in turn, should lower the information asymmetry between company insiders and outside investors. Consequently, the adverse selection component of trading costs should be lower. Stock liquidity, measured by bid-ask spread and trading volume, and stock return volatility are expected to improve if the firm's information environment improves (Leuz and Verrecchia, 2000). The improved information disclosure, however, is not the only outcome of a cross-listing. Intensified inter-market competition, increased stock-specific information production and enhanced stock visibility after the stock becomes available for trading on a foreign exchange also potentially have an impact on stock liquidity and volatility. The following sections 3.3.1 and 3.3.2 discuss specifically how international cross-listing and cross-trading should affect stock liquidity and volatility.

3.3.1 Liquidity

There are several potential sources of improvement in a stock's liquidity after a foreign listing. Firstly, in the case of cross-listing, enhanced disclosure as a result of compliance with listing requirements reduces information asymmetry (Brown and Hillegeist, 2007), and positively affects stock liquidity (Diamond and Verrecchia, 1991). Since stock liquidity can be defined as the ability to trade large quantities of the stock at low cost, the two major dimensions of liquidity are trading quantity and trading cost. Bid-ask spread, a proxy for the trading cost dimension of liquidity, represents the cost that a trader must incur in order to execute a trade. Thus, a lower bid-ask spread indicates higher stock liquidity.

Kyle (1985) and Glosten and Milgrom (1985) theoretically establish a positive association between a bid-ask spread and the level of information asymmetry. Extensive empirical evidence confirms that improved disclosure is associated with improved liquidity in terms of spreads, trading volumes, depth and adverse selection spread component (Welker, 1995; Healy et al, 1999; Leuz and Verrecchia, 2000; Heflin et al, 2000; and Krishnamurti et al, 2005).

The other sources of improved liquidity apply both for cross-listing and for cross-trading. Improvement in the information environment could also be driven by the increase, after international cross-listing and cross-trading, in the number of market participants that have economic incentives to generate stock-specific information in order to profit from informed trading. Kyle (1985) shows that information arrival increases trading volumes. Noronha et al (1996) empirically confirm the increase in informed trading after cross-listing. Furthermore, the presence of foreign traders and market makers for cross-listed and cross-traded stocks boosts inter-market competition. Stoll (1978 and 2001) and Amihud and Mendelson (1995) theoretically show that increased competition forces market makers to reduce the spreads. This proposition is supported empirically by Werner and Kleidon (1996). Finally, a more liquid trading environment after cross-listing could be expected as an outcome of increased stock visibility and investor recognition (Merton, 1987).

H1.1: Cross-listing or cross-trading on a foreign market improves the liquidity of a stock.

In case of cross-trading, the stock does not benefit from additional mandatory disclosure. Although the level of disclosure requirement does not change, the exposure of the stock to more traders enhances the level of information available in the market as more trading brings more information to the market (Glosten and Milgrom, 1985). Additionally, the sources of potential change in stock liquidity in the case of cross-trading include: increased competition among market makers, improved accessibility to foreign investors, and change in the composition of the investor base, but not improved disclosure. Consequently, cross-trading should have a less significant impact on stock liquidity.

H1.2: The improvement in liquidity from cross-listing is significantly higher than the improvement in liquidity from cross-trading.

3.3.2 Volatility

Limited stock-specific information is a source of risk and, accordingly, of higher volatility due to a higher level of uncertainty about the stock's future cash flows (Barry and Brown, 1986; Wang, 1993) and also due to a higher probability of a large one-time stock price response to new information (Lang and Lundholm, 1993). The other significant contributor to higher stock volatility in the presence of information asymmetry is noise trading (Campbell and Kyle, 1993; De Long et al, 1990; Wang, 1993), since more active noise trading reduces stock price informativeness, meaning it further increases the uncertainty about stock fundamentals to uninformed traders, and, consequently, increases the stock's fundamental risk. Therefore, lower levels of information asymmetry between corporate managers and shareholders and/or among different groups of investors and traders are generally associated with lower volatility. Accordingly, since cross-listing is associated with higher levels of information disclosure due to the presence of additional listing requirements, it should reduce stock risk (Barry and Brown, 1985 and 1986) and, specifically, stock return volatility (Wang, 1993; Leuz and Verrecchia, 2000).

H2.1: Stock presence on a foreign exchange (listed and/or traded) reduces stock return volatility.

Compared to cross-listing, the change in information asymmetry after cross-trading is less profound as it does not impose additional disclosure requirements. However, cross-trading does increase the production of stock-specific information as the result of the increase in the number of market participants that have an interest in the stock as a potential source of trading profit.

H2.2: Cross-listing is associated with greater reduction in stock return volatility compared with cross-trading.

Empirical evidence on the relationship between the level of information asymmetry and volatility, however, contradicts the theoretical prediction: Leuz and Verrecchia (2000) and Brown and Hillegeist (2007) find that increased disclosure is associated with higher stock return volatility. Furthermore, a survey of the literature on the implications of an international cross-listing and cross-trading (discussed in section 3.2.2) reveals that stock volatility generally increases after cross-listing and cross-trading, particularly when cross-

listing and cross-trading is associated with an increase in trading activity. I recognize the complexity of the relationship between the improved disclosure and stock return volatility and explicitly control for other important components of the change in volatility after a foreign listing. Particularly, the change in trading volume after cross-listing is one of the most important components as its expected impact on volatility is directly opposite to that of the impact from increased disclosure, as discussed in the forthcoming section 3.3.4 on the main control variables.

3.3.3 Developed vs. emerging home market

The literature reviewed in section 3.2 provides evidence that the impact of an international cross-listing on stock liquidity and volatility differs depending on the level of development of the stock's home market. Fernandes and Ferreira (2008) show that for stocks from developed countries stock price informativeness after cross-listing increases, while for stocks from emerging countries it decreases. Domowitz et al (1998) develop a theoretical model to show that a cross-listing by a stock from a market with poor information linkages, which is generally the case for an emerging market, results in a decrease in home market liquidity and an increase in stock volatility. This is an outcome of the migration of trading activity to the foreign market and consequent deterioration of the quality of the home market. Based on the theoretical argument of Domowitz et al (1998) and existing empirical evidence (Domowitz et al, 1998; Smith and Sofianos, 1997; Bacidore et al, 2005; Halling et al, 2008, Fernandes and Ferreira, 2008), I put forward an additional hypothesis on the impact of foreign listing/ trading for stocks from developed and emerging markets.

> H3: Compared to stocks from emerging markets, stocks from developed countries experience a significantly higher improvement in liquidity and a significantly larger reduction in return volatility after cross-listing and cross-trading.

3.3.4 Main control variables

After cross-listing there are several channels through which the information environment is affected and, accordingly, this affects stock liquidity and stock volatility. I account for the fact that the changes in stock liquidity and volatility after cross-listing are potentially driven by the changes in company size, accounting information disclosure practices, analyst following, and the level of trading activity, and evaluate whether a cross-listing and/or a cross-trading have an impact on the stock liquidity and volatility after controlling for changes in these factors.

Firstly, there is evidence that companies that cross-list are larger than those that do not (Pagano et al, 2002). In turn, larger companies have a better information environment as predicted by the differential information hypothesis (Freeman, 1987). However, based on the findings of chapter 2 the implications of cross-listing in terms of the impact on shareholders' wealth are more profound for smaller companies. Arguably, smaller companies overcome larger information barriers by means of cross-listing and, consequently, experience greater incremental reduction in the level of information asymmetry. Thus, the expectation is that larger companies have a lower level of information asymmetry and, accordingly, better liquidity and lower volatility; but, the improvement in stock liquidity and volatility after cross-listing is more significant for smaller companies.

Secondly, a cross-listed company is more likely to have adopted superior accounting practices (Lang et al, 2003b). Leuz and Verrecchia (2000) show that higher quality information disclosure as the outcome of adopting internationally recognized accounting standards and principles is associated with lower levels of information asymmetry, measured by bid-ask spreads and trading volume. Thus, the expectation is that an improvement in the quality of accounting information around a cross-listing enhances stock liquidity and reduced stock volatility.

Thirdly, cross-listing results in increased attention from financial analysts (Baker et al, 2002; Lang et al, 2003a). The quality of the information environment in turn is positively related to the level of analyst coverage of the company (Draper and Paudyal, 2008). Thus, the expectation is that an increase in analyst coverage after cross-listing improves stock liquidity and reduces stock volatility.

In the case of volatility, the evidence[53] supports the argument that higher volatility is associated with higher information flows, in line with Black (1986) and French and Roll (1986), and with higher trading volumes, in line with Karpoff (1987), Schwert (1989), Jones et al (1994) and Chan and Fong (2000). Therefore, it is important to control for the change in the level of trading activity after cross-listing. The expectation is that the increase in trading activity after foreign listing/ trading significantly increases stock return volatility.

3.4. Methodology

3.4.1 Cross-sectional analysis

In the cross-sectional analysis the liquidity and volatility of cross-listed and cross-traded stocks are compared against those of pure domestic stocks. However, in order to evaluate the impact of foreign presence, and cross-listing and cross-trading individually, on the stock liquidity and volatility, it is necessary to account for the fact that, potentially, companies that have their shares listed and traded abroad differ in their characteristics from companies that have their shares listed and traded only in the home market. Thus, a cross-listing decision is a matter of choice for a company and largely determined by company-specific factors. Pagano et al (2002) provide evidence that cross-listing companies tend to be larger, more export-oriented and faster growing compared to peer companies from their home countries. Similarly, in the case of a cross-trading, larger companies are more likely to choose to have their shares traded on a foreign exchange (e.g. US OTC) or to be chosen by market makers to have their shares traded on a foreign exchange (e.g. Open market of Deutsche Borse). Therefore, there is a potential endogeneity problem in the estimation of the relationship between cross-listing and/or cross-trading and stock liquidity and volatility. In other words, improved liquidity and volatility after cross-listing and/or cross-trading is potentially not an outcome of cross-listing and/or cross-trading as such, but rather the reflection of the fact that stocks with better liquidity and lower volatility are more likely to cross-list and cross-trade. Therefore, it is essential to control for the self-selection bias in the

[53] Barclay et al (1990), Jayaraman et al (1993), Chan et al (1996), Werner and Kleidon (1996), Forster and George (1995), Menkveld (2008) - discussed in the literature review in section 3.2.2.

regression analysis. I follow Doidge et al (2004) and use Heckman's (1979) two-stage estimation method to control for potential endogeneity.[54] The first stage of this estimation procedure evaluates the likelihood of a company cross-listing and/or cross-trading given company and home country characteristics, using the sample of cross-listed as well as domestic stocks:

$$Probability\ (FP_{i,t}) = f(\omega F_{i,t}) \qquad (3.1)$$

where $F_{i,t}$ is the foreign presence dummy variable that equals one if stock i is cross-listed and/or cross-traded in month t and equals zero otherwise; $F_{i,t}$ are the potential determinants of cross-listing and/or cross-trading status.

Similar to Doidge et al (2004, 2009a), I estimate a probit model that includes company size and a number of country characteristics, such as economic development, financial development, legal environment and accounting opacity, as potential determinants of a cross-listing and/or cross-trading status. Maximum likelihood coefficient estimates from the probit model are used to calculate the Inverse Mills Ratios, which are the ratios of the probability density function over the cumulative distribution function of a distribution, for each observation in the sample:

$$for\ FP_{i,t} = 1,\ \lambda_{i,t} = \varphi(\omega F_{i,t}) / \Phi(\omega F_{i,t})$$

$$for\ FP_{i,t} = 0,\ \lambda_{i,t} = -\varphi(\omega F_{i,t}) / [1 - \Phi(\omega F_{i,t})] \qquad (3.2)$$

where $F_{i,t}$ is the foreign presence dummy variable that equals one if stock i is cross-listed and/or cross-traded in month t and equals zero otherwise; $\lambda_{i,t}$ is the Inverse Mills Ratio; φ is the normal probability distribution function and Φ is the normal cumulative distribution function. The Inverse Mills Ratio is an estimate of the non-selection hazard that accounts for the probability of a stock with characteristics $F_{i,t}$ being listed/ traded on a foreign exchange.

The second stage of the estimation procedure evaluates the relationship between the measures of liquidity and volatility and the cross-listing and/or cross-trading status and other stock characteristics using a multivariate framework. Multivariate regression specifications additionally include the estimated Inverse Mills Ratios in order to account for the self-selection bias and obtain consistent parameter estimates (Leuz and Verrecchia, 2000; Doidge et al, 2004). Thus, the main model specification is as follows:

[54] This procedure has been used in a number of studies including Doidge et al (2004 and 2009a), Leuz and Verrecchia (2000), Bailey et al (2006), and Fernandes and Ferreira (2008).

$$Liquidity/Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t} \quad (3.3)$$

where $D_{i,t}$ is dummy variable that reflects foreign listed/traded status of the stock i in month t; $F_{i,t}$ are control variables; $\lambda_{i,t}$ is the Inverse Mills Ratio.[55]

In order to control for other important determinants of stock liquidity and volatility around the change in listing status, additional interaction variables of the main control variables with a dummy variable representing foreign listed/traded status are included in the model:

$$Liquidity/Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t} \quad (3.4)$$

where $D_{i,t}$ is dummy variable that reflects foreign listed/traded status of the stock i in month t; $V_{i,t}$ are stock characteristics, the main control variables; $F_{i,t}$ are other control variables; $\lambda_{i,t}$ is the Inverse Mills Ratio.

3.4.2 Evolution of stock liquidity and volatility

As discussed above, the endogeneity concern is that, potentially, more liquid and less risky stocks have a higher propensity to cross-list and/or cross-trade outside the home market. One way to test this proposition and, additionally, to evaluate the long-term sustainability of the changes in liquidity and volatility after the change in the listing status, is to track the evolution of stock liquidity and volatility of cross-listed stocks before and after cross-listing/trading.[56] In order to reveal the dynamics, the year of the initial foreign presence/ cross-listing/ cross-trading is assigned as the year 0, and the years around the year 0 are assigned accordingly as the years ≤-4, -3, …, 0, +1, …, +3, ≥+4 relative to the year 0. Initially, stock liquidity and volatility of cross-listed stocks individually in each of the years ≤-4, -3, …, 0, +1, …, +3, ≥+4 are compared against the stock liquidity and volatility in the year 0 and against the liquidity and volatility of domestic stocks. Then, the evolution of stock liquidity and volatility is evaluated using a multivariate regression analysis framework. In the cross-sectional regression (model specification (3.4), section 3.4.1) variables representing

[55] The estimation procedure that does not account for self-selection bias engages similar model specification without the Inverse Mills Ratio: $Liquidity/Volatility\ Measure_{i,t} = \alpha + \gamma D_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is the foreign presence dummy variable for stock i in month t and $F_{i,t}$ are control variables.

[56] Similar analysis was performed by Gozzi et al (2008) to track the evolution of Tobin's Q of cross-listed stocks around cross-listing event and also by Hail and Leuz (2009) to analyze the sustainability of the reduction in the cost of capital of cross-listed stocks around cross-listing.

foreign presence, cross-listing and cross-trading listing statuses are replaced with a series of dummy variables representing years around foreign presence/ cross-listing/ cross-trading from beyond year -4 to beyond year +4. Coefficient estimates on these year dummies relative to the year of cross-listing/ trading would thus indicate the evolution of stock liquidity and volatility before, during the year of and after cross-listing and cross-trading, controlling for other factors.

3.4.3 Time-series framework

The other way to control for the self-selection bias is to examine the changes in the liquidity and volatility of the cross-listed stocks before and after the cross-listing/trading. In this analysis, the liquidity and volatility of cross-listed/ traded stocks are compared against the stock liquidity and volatility of the same stocks over the period of time when the stocks were not listed or traded abroad, i.e. had domestic listing status. I use a 36 month period[57] before the first foreign listing/trading as the base period for calculation of the base or benchmark variables. I calculate the base, or benchmark, measures of stock liquidity and volatility for each stock as the averages of these measures over the period of time when the stock was not listed/ traded abroad. Then, for the purpose of univariate analysis, I calculate ratios of the liquidity/volatility measures as a ratio of the average liquidity/volatility measure over the period of time when stock is present abroad (cross-listed and/or cross-traded) to the base liquidity/volatility measure for each stock. Estimated liquidity and volatility ratios of more than one indicate an increase in a liquidity/volatility measure after the change in the listing/trading status. A ratio of less than one represents a decrease.

Additionally, liquidity and volatility ratios are analysed cross-sectionally using multivariate regression analysis. For the purpose of multivariate analysis, ratios of the liquidity/volatility measures are calculated for each stock-month by dividing the liquidity/ volatility measure by the base liquidity/volatility measure. The regression specifications include ratios of the explanatory and control variables, calculated similar to the liquidity and

[57] If a full 36 months of data is not available I only use the data if at least 12 full months of complete data are available.

volatility ratios, as ratios of a variable in month *t* to the base variable, i.e. the average value of the variable over the period of time when the stock had domestic listing status:

$$(Liquidity\ or\ Volatility\ Measure_{i,t} / Liquidity\ or\ Volatility\ Measure_{i,base}) =$$
$$= \alpha + \gamma D_{i,t} + \Sigma\theta(F_{i,t}/F_{i,base}) + \varepsilon_{i,t}, \quad (3.5)$$

where $Liquidity\ or\ Volatility\ Measure_{i,t}$ is liquidity or volatility measure of stock *i* in month *t;* $Liquidity\ or\ Volatility\ Measure_{i,base}$ is base liquidity or volatility measure of stock *i*, i.e. the average over the period of time when the stock was not listed/ traded abroad; $D_{i,t}$ is dummy variable that reflects foreign listed/traded status of the stock *i* in month *t;* $F_{i,t}$ are stock characteristics, the explanatory and control variables, of stock *i* in month *t;* $F_{i,base}$ are base stock characteristics of the stock *i*, i.e. the average over the period of time when the stock was not listed/ traded abroad. Such model specifications allow the examination of whether the change in stock liquidity and volatility is driven by the change the foreign listing/trading status or by the changes in stock characteristics after cross-listing.

3.4.4 Variables definition and measurement

Dependent variables

The dependent variables reflect stock price behaviour on the stock's home market. All liquidity and volatility measures, defined below, are calculated for each month using daily data. The following widely accepted measures of stock liquidity and volatility are calculated.

Liquidity

Proportional bid-ask spread is a commonly used liquidity measure (Copeland and Galai, 1983; Foerster and Karolyi, 1998; Hasbrouck and Seppi, 2001) that reflects the difference between the ask and bid home market prices relative to the midpoint, i.e. the average of the ask and bid prices. Monthly average bid-ask spread is the average of the daily bid-ask spreads: $Bid\text{-}Ask\ Spread_{i,T}=(1/N_{i,T})\sum(P_{ask\ i,t} - P_{bid\ i,t})/((P_{ask\ i,t} + P_{bid\ i,t})/2)$, where $Bid\text{-}Ask\ Spread_{i,T}$ is the average bid-ask spread of stock *i* in month *T;* $N_{i,T}$ is number of trading days for stock *i* in month *T;* $P_{ask\ i,t}$ is the ask price of stock *i* at day *t;* $P_{bid\ i,,t}$ is the bid price of stock *i* at day *t.*

Trading volume in the home market**,** another common trade-based proxy for stock liquidity (Foerster and Karolyi, 1998; Rubin, 2007; Chordia et al, 2007), is measured by the average daily number of shares traded on the home market in each month:

$VO_{i,T} = (1/N_{i,T}) \sum VO_{i,t}$, where $VO_{i,T}$ is average share trading volume of stock i in month T; $N_{i,T}$ is number of trading days for stock i in month T; $VO_{i,t}$ is number of shares traded on the home market of stock i at day t.

Turnover ratio, used by Leuz and Verrecchia (2000) and Leuz (2003) as a proxy for the level of information asymmetry, is the monthly average of the daily turnover ratios calculated as a ratio of the trading volume by value, i.e. the product of the number of shares traded and the stock price, to the stock's market capitalization[58]:

$TVtoMV_{i,T} = (1/N_{i,T}) \sum (VO_{i,t} P_{i,t} / MV_{i,t})$, where $TVtoMV_{i,T}$ is average turnover ratio of stock i in month T; $N_{i,T}$ is number of trading days for stock i in month T; $VO_{i,t}$ is number of shares traded on the home market of stock i at day t; $P_{i,t}$ is closing price of stock i at day t; $MV_{i,t}$ is market capitalization of stock i at day t.

When a stock is traded in more than one market, as in the case of cross-listed stocks, analysis of home market liquidity might not provide a complete picture if a significant portion of the stock trading takes place in foreign market(s). Accordingly, it is beneficial for an understanding of the stock's overall liquidity to additionally examine the changes after cross-listing/ trading in total trading volume and total turnover ratio. Total trading volume and total turnover ratio take into account trading volumes in all markets where the stock is listed and traded.

Total trading volume is the average of the total daily trading volume in each month. Daily trading volume is calculated as the sum of the number of shares traded at day t on all exchanges in the sample where the stock is being traded:

$VOTotal_{i,T} = (1/N_{i,T}) \sum\sum VO_{i,m,t}$, where $VOTotal_{i,T}$ is the average share trading volume of stock i in month T; $N_{i,T}$ is number of trading days for stock i in month T; $VO_{i,m,t}$ is number of shares traded on exchange m of stock i at day t. If trading on a foreign exchange takes place in the

[58] This turnover measure is numerically equal to the share turnover (Lo and Wang, 2009), calculated as the ratio of the share trading volume to the number of shares outstanding, which is widely used in the literature (Datar et al, 1998; Lo and Wang, 2000; Chordia et al, 2001; Chordia et al, 2007; Statman et al, 2006; Korajczyk and Sadka, 2008).

form of depository receipts (DR) then the number of shares traded on a foreign exchange is adjusted using the DR conversion ratio.

Total turnover ratio is the monthly average of the daily total turnover ratios calculated as a ratio of the total trading volume in GB pounds (GBP) to the stock's market capitalization in GBP. Total trading volume in GBP is the sum of the trading volumes in GBP on each exchange in the sample where the stock is traded, calculated as the product of the number of shares traded and the stock price converted to GBP: $TVTotaltoMV_{i,T}=(1/N_{i,T})\sum((\sum VO_{i,m,t}P^{GBP}_{i,m,t})/MV^{GBP}_{i,t})$, where $TVTotaltoMV_{i,T}$ is the average total turnover ratio of stock i in month T; $N_{i,T}$ is number of trading days for stock i in month T; $VO_{i,m,t}$ is number of shares traded of stock i on exchange m at day t; $P^{GBP}_{i,m,t}$ is closing price of stock i on exchange m at day t converted to GBP; $MV^{GBP}_{i,t}$ is home market capitalization of stock i at day t converted to GBP.

Volatility

Higher levels of information asymmetry between companies and shareholders and among investors are associated with higher variability in stock returns (Barry and Brown, 1985 and 1986; Wang, 1993; Lang and Lundholm, 1993). I use three measures of volatility to quantify stock risk.[59] First, following Lang and Lundholm (1993), and Leuz and Verrecchia (2000), I use ***stock return volatility*** as a proxy for information asymmetry defined as the monthly standard deviation of the stock's daily returns including dividend income.

The second measure of volatility is the firm-to-market ***volatility ratio***, used by Agrawal et al (2004) and Clayton et al (2005). It additionally accounts for market level volatility and is calculated as the ratio of monthly standard deviation of the stock's daily total returns to the monthly standard deviation of daily total returns of the home market index:

[59] The focus of this study is on the total stock risk. A number of studies link the quality of the information environment to stock's idiosyncratic risk (e.g. Ferreire and Laux, 2007; Fernandes and Ferreira, 2008). I acknowledge that stock idiosyncratic risk would be an appropriate measure; however, I do not use it due to data limitations. In order to obtain reliable estimates of the idiosyncratic risk using a market model a relatively long time series of daily stock returns are required (Draper and Paudyal, 1995). In this study I evaluate and compare stock risk over periods of time when the stock had different listing statuses and in many cases the length of such time periods is not sufficient to estimate the parameters of a market model.

$Volatility\ Ratio_{i,T} = \sigma_{i,T} / \sigma_{m(i),T}$, where $Volatility\ Ratio_{i,T}$ is the firm-to-market volatility ratio of stock *i*, or monthly market-adjusted volatility of stock *i*'s daily returns in month *T;* $\sigma_{i,T}$ is monthly standard deviation of stock *i*'s daily returns in month *T;* $\sigma_{m(i),T}$ is monthly standard deviation of stock *i*'s home market index daily returns in month *T*.

The third measure of stock volatility focuses on the intra-day volatility of the stock price. The ***high-low ratio*** (Parkinson, 1980; Martens and van Dijk, 2007; Alizadeh et al, 2002) is the average of the daily high-low ratios calculated as the natural logarithm of the ratio of the highest stock price achieved on the day to the lowest price achieved on the day: $High\text{-}low\ Ratio_{i,T} = (1/N_{i,T})\sum ln(P_{high\ i,t} / P_{low\ i,t})$, where $High\text{-}low\ Ratio_{i,T}$ is the average of daily high-low ratios of stock *i* in month *T;* $N_{i,T}$ is number of trading days for stock *i* in month *T;* $P_{high\ i,t}$ is the highest price achieved of stock *i* at day *t;* $P_{low\ i,t}$ is the lowest price achieved of stock *i* at day *t*.

Table 3.1 summarizes definition, measurement and data sources for the dependent variables.

Explanatory and control variables

Explanatory variable: cross-listing/trading status

Definition, measurement and data sources for the explanatory variables are presented in Table 3.2. The main explanatory variable is the *listing status* variable that reflects one of the following listing and/or trading statuses:

- domestic, i.e. not listed or trade outside of the home market
- cross-traded, i.e. traded abroad without stock exchange listing in addition to the home market listing
- cross-listed, i.e. listed on a foreign exchange in addition to the home market listing
- with a foreign presence, i.e. cross-listed and/or cross-traded inclusive
- cross-listed and cross-traded, i.e. cross-listed and cross-traded simultaneously

Listing/ trading status of a cross-listed company in the sample changes over time: from domestic to listed and/or traded on one or more foreign exchanges/ trading venues. The listing/ trading classification is based on the sample data.

Main control variables

As outlined in section 3.3.4, a number of firm-specific characteristics could be responsible for the change in the stock's information environment and, accordingly, in stock liquidity and volatility. *Company size* is measured by stock market capitalization. Daily stock market capitalization is used to calculate daily measures of stock liquidity and volatility, whereas stock market capitalization at the end of the month is used in the regression analysis that uses monthly data. *International accounting standards* (IAS) is the dummy variable that proxies for the adoption of IAS or US GAAP accounting practices. The IAS variable is time varying, i.e. it reflects any changes in the accounting standards used by a company over time. *Analyst coverage* is measured by the total number of EPS one-year estimates on the company in the I/B/E/S database, similar to Leuz and Verrecchia (2000). In order to overcome the problem of a high correlation between company size and analyst coverage and to assess the incremental role of analyst coverage in reducing the level of information asymmetry, I follow Draper and Paudyal (2008) and use *residual analyst coverage* variable in the regression analysis, which is the error term $\varepsilon_{i,t}$ from the regression of the analyst coverage on the company size: $ln(1+AC_i) = \alpha + \beta ln(MV_{i,t}) + \varepsilon_{i,t}$, where AC_i is analyst coverage measured by the total number of EPS estimates for stock i in the preceding year; $MV_{i,t}$ is company size measured by the stock market capitalization of stock i in month t. The last main control variable of the changes in stock volatility after cross-listing/trading is the level of trading activity, measured by the stock's total trading volume, defined in section 3.4.4 and Table 3.1.

Other control variables

Extensive literature (Roll, 1984; Atkins and Dyl, 1997; Glosten and Harris, 1988; Stoll, 1989; and Menyah and Paudyal, 2000; Gregoriou et al, 2005) documents that stock liquidity is determined, in addition to company size, by stock return volatility and, in case of the bid-ask spread, by the level of trading activity. To control for these two determinants, I include the stock turnover ratio and return volatility variables (defined in section 3.4.4) in the regressions of the bid-ask spread and return volatility variable in the regressions of the other liquidity measures. Further, stock liquidity and volatility are expected to be affected by the level of the stock's ownership concentration that restricts the availability of shares for

trading to common investors (Leuz and Verrecchia, 2000; Fernandes and Ferreira, 2008). Ownership concentration is measured as the percentage of shares held by insiders of the total common shares outstanding at the end of the preceding year. To control for various dimensions of company risk, I include in the regressions of volatility measures company-level fundamentals such as sales growth, leverage and intangibles. Sales growth is the percentage change in sales over the preceding three years. Leverage is the ratio of the total liabilities to total assets at the end of the preceding year. Intangibles is the ratio of the total value of intangible assets to the total assets at the end of the preceding year.

Liquidity and volatility of a stock are inevitably affected by the level of the equity market liquidity and volatility of the stock's primary market of trading, i.e. the home country. The level of market liquidity and volatility varies significantly across countries and is determined by the level of economic and financial development and the level of investor protection (Domowitz et al, 2001; Chiyachantana et al, 2004; Chiyachantana et al, 2006). Since the sample includes stocks from seventeen countries that vary significantly by the above characteristics, it is essential to control for the home country characteristics in the regression analysis of liquidity and volatility.

As a proxy for the level of economic development of the home country I use the natural logarithm of the 3-year-average *per capita GDP* in US dollars. *Market size* is the proxy for the level of financial development of the home country and is measured as the natural logarithm of total market capitalization of the Datastream Total Market index, converted from local currency to GB pounds. The level of the *market liquidity* of the home country complements market size as, despite their size, some small markets are very liquid. Market-level liquidity is measured by the market turnover ratio calculated as the average of the daily ratios of the aggregate trading volume by value to the aggregate market capitalization of the Datastream Total market index, calculated for each month. To control for the *legal environment* of the home country, I follow Durnev and Kim (2005) and use the legal index, defined as the anti-director rights index multiplied by the rule-of-law index, which assesses the law and order tradition of a country. Durnev and Kim (2005) argue that the Legal index reflects both de jure and de facto aspects of investor protection, which is important since some countries with high de jure protection do not have high de facto investor protection. The anti-director rights index is from Djankov et al (2007) and the rule-

of-law index is from Kaufmann et al (2005). Finally, in order to evaluate the change in the quality of the stock's information environment due to a change in the listing status, it is necessary to control for the quality of the information environment of the home country, which I proxy with the *accounting opacity* index from Kurtzman et al (2004) that quantifies inadequate accounting and governance practices on a country level.

3.5 The sample

The main sample consists of European stocks that are cross-listed on a foreign stock exchange(s). The sample stocks are matched with domestic stocks. Cross-listed stocks are those that have had their stock cross-listed on at least one foreign exchange in addition to listing on the exchange in the home market. Cross-listing data includes events up to December 2007 and comes from the stock exchanges' web-sites, Factiva news database and foreign listings dataset of Sarkissian and Schill (2004, 2009a). Data on depository receipts (DRs) are from the BNY, Citibank, Deutsche Bank, and JP Morgan DRs databases available on-line. The additional requirement for sample inclusion is the availability of a home market listing, i.e. direct foreign IPOs are excluded. The analysis is performed on the security level rather than the company level: all related listings for each cross-listed stock are identified by ISIN (data source: Datastream). Underlying ISINs and conversion ratios for depository receipts are from the mentioned above DRs databases. Only common equity and major securities are included in the sample.

The initial sample included 820 European cross-listed stocks with multiple foreign listing and trading accounts.[60] For each of these stocks I determine their foreign listing/ trading status, as defined in section 3.4.4, for each month from January 1990 to December 2007.[61] Stock price and other financial data are obtained from Datastream. After checking for the availability of daily data required in order to calculate stock liquidity and volatility measures I am left with the sample of 509 cross-listed/traded stocks from 20 European

[60] Those are 820 unique stocks. Each of these stocks contributes to the sample at least one foreign account. On average, a sample stock is listed and/or traded on more than one foreign exchange.
[61] The period of time before year 1990 is excluded from analysis due to poor data availability.

countries. The final sample for the regression analysis includes 425 stocks with a foreign presence from 17 European countries. The sample is reduced from 509 to 425 stocks due to unavailability of data on some of the explanatory and control variables. Columns (2) and (5) of Table 3.3 present the distribution of stocks with a foreign presence by home country. The most represented country is the United Kingdom, followed by France and Germany.

For the purpose of the cross-sectional analysis, the sample of cross-listed stocks is supplemented by a sample of European domestic stocks, i.e. stocks that have not been listed or traded on a foreign exchange. The list of listed and traded stocks for each European country in the sample is obtained from Datastream. For each stock in the list I identify related listing and trading accounts using the Datastream database. The list of domestic stocks is obtained by eliminating stocks with at least one foreign listing/ trading account from the Datastream's list of European stocks. Initially, I identified 4,844 European domestic stocks. After checking for the availability of daily data required to calculate stock liquidity and volatility measures, I am left with the sample of 3,702 domestic stocks from 20 European countries. Out of these 3,702 domestic stocks only 1,755 stocks have data available for all explanatory and control variables. Columns (3) and (6) of Table 3.3 present the distribution of domestic stocks by home country. The most represented country is Germany, followed by the United Kingdom[62] and France.

The total cross-sectional sample includes observations from January 1990 to December 2007 and consists of 4,211 stocks, including 509 stocks with a foreign presence. The sample used in regression analysis is reduced due to the unavailability of data for some of the explanatory and control variables; the smallest sample used to estimate some model specifications contains 2,180 stocks, including 425 stocks with a foreign presence. Columns (4) and (7) of Table 3.3 present the distribution of the sample by home country.

Finally, for the purpose of the time-series analysis, the sample of 509 cross-listed stocks from 20 European countries is checked for availability of daily data over the period of 36 months (at least 12 months) prior to the first foreign listing/trading, i.e. over the base

[62] The relatively small number of domestic stocks from the UK can be explained by the fact that majority of the UK stocks are listed or admitted to trade on other European exchanges. Out of the 1,928 UK stocks available in Datasream, only 546 stocks were identified as domestic, while 1,138 stocks were identified as stocks with a foreign presence. The majority of stocks with a foreign presence are admitted to trade on Berlin exchange, Frankfurt exchange and XETRA.

period when a stock had domestic listing status, for the purpose of calculating the base, or benchmark, measures of liquidity and volatility. Eventually, for the time-series analysis I am left with a sample of 491 cross-listed stocks.

To avoid drawing spurious inferences from extreme values, the observations of all liquidity and volatility measures over the whole sample period are trimmed 1% at each end. Similarly, the observations of company size, sales growth, leverage, and intangibles variables are also trimmed 1% at each end. The closely held shares variable, proxy for ownership concentration, is discarded if it is more than 100 percent.

3.6 Empirical results

The empirical results section first discusses the findings from the cross-sectional analysis of cross-listed stocks as well as domestic stocks. The aim is to evaluate the impact of the change in the listing status on the stock liquidity and volatility. The cross-sectional analysis is followed by a discussion of the evolution in the stock liquidity and volatility before and after cross-listing/trading. Then there will be an examination of the changes in stock volatility and liquidity performed using the time-series framework. The final sub-section discusses the implications of multi-market trading for stock from developed vs. emerging markets.

3.6.1 Cross-sectional analysis

In this section the liquidity and volatility of cross-listed stocks is evaluated against those of domestic stocks from the respective home countries. First, there is discussion of the descriptive summary statistics of the liquidity and volatility measures and also of firm characteristics. Then, the following section estimates the probability of cross-listing and/or cross-trading. The estimated probability of foreign presence is used in the following multivariate regression analysis in order to control for the potential self-selection bias. The final part of the cross-sectional analysis investigates in detail the evolution of stock liquidity

and volatility around cross-listing on a year-by-year basis relative to a foreign listing/ trading event.

Summary statistics

Stock liquidity and volatility measures

Panel A of Table 3.4 reports the mean and median of the liquidity and volatility measures and the number of stock-month observations (N observations) for the full sample and for sub-samples by listing/ trading status. Table 3.4 also reports the difference in variable means and medians between two groups of stocks: 1) stocks with a particular foreign listing/ trading status (with a foreign presence, and individually for cross-traded only, cross-listed only and cross-listed and traded simultaneously), and 2) domestic stocks. The significance of the difference in means is evaluated with the t-test, while the significance of the difference in medians is evaluated using non-parametric Wilcoxon rank sum test. Based on the t-test and the Wilcoxon test, I find that mean and median *liquidity* measures of stocks with a foreign presence are significantly different from those of domestic stocks. In line with expectations, compared to those of domestic stocks, stocks with a foreign presence and, particularly, stocks that are cross-listed and cross-traded at the same time, enjoy a significantly lower bid-ask spread and significantly higher home market trading volume, total trading volume, home market turnover ratio and total turnover ratio. However, in contrast to the expectation that a foreign exchange listing is associated with greater improvement in stock liquidity compared to an admission to trade, cross-traded stocks have higher liquidity than cross-listed stocks. Further, Panel A of Table 3.4 reports that, in line with expectations, mean and median *volatility* measures of the stocks with a foreign presence, including cross-listed and cross-traded stocks, are significantly lower than those of domestic stocks based on the t-test and the Wilcoxon test accordingly.

Firm characteristics

Panel B of Table 3.4 provides descriptive statistics of firm characteristics that are used as control variables in the multivariate analysis. Based on the t-test and the Wilcoxon test, companies with a foreign presence and particularly, stocks simultaneously listed and

traded abroad, are significantly larger than domestic companies. In fact, a company that has its stock listed and/or traded on a foreign exchange is, on average, 25 times larger in terms of market capitalization than an average domestic company in the sample. However, I find no evidence that companies with a presence on foreign exchange(s) adopt internationally recognized accounting standards more often than domestic companies. Only stocks that list and trade abroad at the same time have a higher mean IAS variable than domestic stocks. As expected, stocks with a foreign presence and, particularly, stocks simultaneously listed and traded abroad, have significantly higher analyst coverage than domestic stocks (on average, 13.8 analysts follow a stock with a foreign presence as opposed to only 2.9 analysts that follow a domestic stock) and have significantly lower ownership concentration, measured by the percentage of closely held shares, than domestic stocks (the difference in ownership concentration between a stock with a foreign presence and a domestic stock is around 20%). Furthermore, companies with a foreign presence exhibit significantly lower sales growth, are significantly more leveraged, and have a significantly higher ratio of intangible assets to total assets.

Appendix 3.1 reports a correlation matrix of the dependent, explanatory, and control variables that indicate that the level of correlations between independent variables is within an acceptable range and, thus, should not cause any bias in the estimation of the determinants of the stock liquidity and volatility.

Probability of a foreign presence

The first stage of Heckman's (1979) estimation procedure, which is used to correct potential self-selection bias in cross-listing and cross-trading status, includes modelling the probability of a change in the listing status. The probability of a foreign presence is estimated using the full sample of cross-listed/ traded and domestic stocks as a function of company and home country-specific characteristics. Table 3.5 reports the output from a probit regression of the foreign presence dummy variable on company size and a number of the home country characteristics, including per capita GDP, market size, legal index and accounting opacity index. The coefficients are estimated using maximum-likelihood procedures; standard errors are adjusted for clustering at the stock level. Pseudo R-squared

statistics indicate that the model has significant explanatory power. All variables have the predicted sign and are significant. I find that companies are more likely to cross-list and/or cross-trade outside of the home country if they are larger and fulfil one of the following country-level factors: higher per capita GDP, smaller capital markets, weaker investor protection and higher accounting opacity. Additional analysis (not reported) of the individual probability of cross-listing and cross-trading indicates that the determinants of cross-listing status and the determinants of cross-trading status are quantitatively similar. The estimates of the probability of foreign presence from the probit model are utilized to estimate the Inverse Mills Ratios that are used in the second stage of Heckman's (1979) correction procedure.

Multivariate analysis

This section discusses the estimation results from the second stage of Heckman's (1979) procedure that accounts for the self-selection bias. Alternatively, the output of the regressions of liquidity and volatility measures without the Inverse Mills Ratio, i.e. of the regressions that do not account for the self-selection bias, are reported in Appendix 3.2 for the liquidity measures and Appendix 3.3 for the volatility measures.

A multivariate framework is used to test the main hypothesis that a stock's availability for trading on a foreign exchange can improve the stock's liquidity and volatility. Also I control for other factors that are likely to affect the cross-section of stock-level liquidity and volatility. Furthermore, the multivariate analysis is used to test whether the impact of cross-listing differs from that of cross-trading. All explanatory and control variables are discussed in section 3.4.4 and summarized in Table 3.2. Panel data regressions reported in Table 3.6 and Table 3.7 for liquidity measures and in Table 3.8 and Table 3.9 for volatility measures are estimated using an OLS procedure with heteroskedasticity consistent (White, 1980) standard errors that are adjusted to account for the possible correlation within a cluster (Rogers or clustered standard errors).[63] Additionally, all model specifications include industry-fixed effects to account for potential cross-sectional dependence within an industry and year-fixed effects to account for potential dependence across time. Finally, I

[63] This estimation method is chosen based on the findings of Petersen (2009) that it produces unbiased standard errors when there is a possibility that residuals are correlated cross-sectionally.

control for country level differences by including country-level control variables: per capita GDP, capital market size, legal index and accounting opacity index.

As a robustness test, I use two alternative panel data methods to estimate the relationship between stock liquidity and volatility and the stock's foreign presence controlling for other firm-level and country-level determinants of stock liquidity and volatility: 1) firm fixed effects that control for all unobserved heterogeneity across stocks and 2) random effects. The estimation results are presented in Appendix 3.4 for liquidity measures and Appendix 3.5 for volatility measures.

Liquidity

Table 3.6 and Table 3.7 report results from the regressions of the liquidity measures, bid-ask spread, trading volume, total trading volume, turnover ratio and total turnover ratio, on the explanatory and control variables that potentially affect stock liquidity. The dependent variables are defined in Table 3.1. Regression specifications in Table 3.6 aim to evaluate the power of the stock's foreign presence in explaining stock liquidity and additionally include the Inverse Mills Ratio to account for the probability of a stock having a foreign presence.

Additionally, model specifications (2) of Table 3.6 include interactive variables of the foreign presence dummy variable with the main control variables: company size, international accounting standards, and residual analyst coverage. This enables the impact of the changes in these firm characteristics after cross-listing/ trading to be accounted for. The interaction variables measure the incremental contribution to the change in stock liquidity due to the change in the company size, company-level accounting practices and analyst coverage.

Regression specifications in Table 3.7 focus on the difference in the impact of cross-listing and cross-trading on stock liquidity and include, instead of a foreign presence variable, cross-listing and cross-trading variables. Additionally, model specifications (2) of Table 3.7 include interactive variables of the cross-listing and cross-trading dummy variables with the main control variables, company size, international accounting standards and analyst coverage.

Bid-ask spread

The hypothesis to test is that cross-listing and, to a lesser degree, cross-trading, result in a lower bid-ask spread of the stock. In model specifications that do not control for the change in the following variables: company size, analyst following and accounting standards (bid-ask spread models (1), Tables 3.6 and 3.7), the coefficient estimates of the foreign presence variable and the cross-listed variables are positive and significant at the 1% level. However, after introducing interactive variables to reflect changes in firm characteristics after the change in listing status, the foreign presence and cross-listed and cross-traded variables have coefficient estimates that are negative and statistically significant. The foreign presence variable also has negative and significant coefficient estimates in the firm fixed effects and random effects models (bid-ask spread models (1) and (2) in Appendix 3.4).

Theoretically, stocks of larger companies that use higher quality accounting standards provide lower trading costs to investors due to lower information costs. Empirically, I find that indeed, company size and international accounting standards are negative and statistically significant determinants of the bid-ask spread (bid-ask spread models, Tables 3.6 and 3.7). However, I find that the impact of cross-listing/trading on the bid-ask spread is asymmetric based on company size and accounting standards used. It is smaller companies that experience a more considerable incremental reduction in the bid-ask spread following cross-listing/trading, as suggested by the positive and highly significant coefficient estimates on the interaction variables of company size with listing status dummy variables (bid-ask spread models (2), Tables 3.6 and 3.7). Similarly, companies that use international accounting standards experience an increase in the bid-ask spread after becoming present on a foreign exchange, suggested by the IAS*Foreign presence variable coefficient of 0.01, which is significant at 1%. The bid-ask spread model (2) of Table 3.7 reveals that the latter result is driven by cross-traded stocks rather than by cross-listed stocks.

Greater analyst coverage results in lower information costs for investors and, accordingly, in lower bid-ask spreads. Empirically, the coefficient estimate on the residual analyst coverage is negative in all bid-ask spread model specifications. However, the negative impact of the change in intensity of analyst coverage after the change in listing

status holds only for cross-trading (bid-ask spread model (2), Table 3.7). Also, the findings are in line with the theoretical expectations that the bid-ask spread is lower for stocks that are more actively traded and higher for stocks that exhibit higher return volatility and a higher concentration in stock ownership (bid-ask spread models, Tables 3.6 and 3.7).

To summarize, the findings provide empirical support for the hypothesis H1.1 that cross-listed and cross-traded stocks have lower trading costs. This finding is in line with existing empirical evidence of Foerster and Karolyi (1998), Domowitz et al (1998) and Hamet (2002). I find that foreign presence overall, and cross-listing and cross-trading individually, significantly reduces the bid-ask spread, after controlling for stock-specific and country-level determinants of the bid-ask spread and after controlling for the asymmetric impact of company size and company accounting practices on the bid-ask spread following cross-listing/trading. However, the expectation that cross-listing has a more profound impact than cross-trading due to additional disclosure requirements (hypothesis H1.2) is not supported empirically. I find that the impact of cross-listing on the bid-ask spread is similar to that of cross-trading: based on the Wald test the difference in coefficient estimates is insignificant.

Trading volume

Table 3.6 and Table 3.7 report the output of the regressions of home market trading volume and total trading volume (the sum of trading volumes on all exchanges and trading venues) on the determinants of the stock trading activity. It is found that stocks with a foreign presence exhibit more active home and total trading activity, controlling for other stock-level and market-level factors (trading volume models (1) and (2), Table 3.6). The improvement in home market trading is driven equally by cross-listed and cross-traded stocks (trading volume models (1) and (2), Table 3.7). Furthermore, I investigate whether trading volume is affected by the change in the listing status itself or rather by the changes in firm characteristics that emerge after cross-listing/trading, namely: company size, accounting practices and analyst coverage, and estimate model specifications (2) (Tables 3.6 and 3.7).

As expected, larger companies have higher trading volumes in the home market and overall. It is, however, smaller companies that experience a more considerable increase in trading volume after cross-listing/ cross-trading, suggested by the negative and highly

significant coefficient estimates on the interaction variables of company size with listing status dummy variables (trading volume models (2), Tables 3.6 and 3.7). Similarly, companies that use international accounting standards experience a reduction in trading volume after becoming present on a foreign exchange, suggested by the negative and significant coefficient on IAS*Foreign presence variable. Residual analyst coverage is associated with both significantly higher home market trading volume and total trading volume. However, the liquidity impact is higher for stocks with a smaller increase in analyst coverage after cross-listing, as suggested by the negative and significant coefficient estimate on the Analysts*ForeignPresence and Analysts*Cross-traded variables. In addition, the trading volume models show that the home market trading volume and the total trading volume are higher for stocks that exhibit higher return volatility and are lower for stocks with a higher proportion of closely held shares (Tables 3.6 and 3.7). Based on the Wald test, the difference between the estimated coefficients of cross-listed and cross-traded variables (trading volume models (2), Table 3.7) is insignificant.

Overall, the findings support the hypothesis H1.1 that a stock's presence on a foreign market increases trading volume of the stock. This is in line with the empirical evidence of Smith and Sofianos (1997), Foerster and Karolyi (1993, 1998), Hamet (2002). However, empirical evidence does not support hypothesis H1.2, that is, cross-listing is associated with a greater increase in the stock's trading volume than cross-trading.

Turnover ratio

Stocks with a foreign presence do have higher home market and total turnover ratios, controlling for other stock-level and market-level factors (turnover ratio models (1), Table 3.6). However, based on the output of the regressions that include variables reflecting the impact of the change in company size, accounting practices and analyst coverage after cross-listing/trading (turnover ratio models (2), Table 3.6), it is the increase in company size and the increase in analyst coverage (in the case of the home market turnover) that drive the improvement in the turnover ratios rather the change in listing status per se. Cross-listing has a positive and significant impact on stock liquidity, measured by the total turnover ratio, after controlling for other factors (total turnover ratio models (1) and (2) Table 3.7). The

Wald test provides inconclusive evidence on the difference in the impact of cross-listing and cross-trading on the stock's turnover ratio.

To sum up, the findings on the change in stock liquidity after cross-listing/ trading partly support the hypothesis H1.1 that cross-listing and cross-trading improves the liquidity of a stock. More specifically, it is found that cross-listing, as well as cross-trading, significantly reduces the stock's transaction cost measured by the bid-ask spread and increases the stock's trading volumes. This is possibly due to facilitated inter-market competition among market makers rather than the increase in the level of information disclosure since the evidence suggests that the impact of cross-listing and cross-trading on the liquidity of a stock is similar.

Volatility

The next step is to examine whether cross-listing and cross-trading contribute to a change in stock return volatility, controlling for other factors that are likely to affect the cross-section of stock-level return volatility. I use three measures that reflect different aspects of stock volatility: stock return volatility, volatility ratio that accounts for market-level volatility and high-low ratio that captures intra-day stock price variation. The dependent variables are defined in Table 3.1. Then, Tables 3.8 and 3.9 report output for regressions of the volatility measures on the explanatory and control variables that are defined in Table 3.2. Regression specifications in Table 3.8 include the foreign presence variable and evaluate the impact of the stock's foreign presence on stock volatility. Table 3.9 reports output of regressions that focus on the difference in the impact of cross-listing and cross-trading on volatility and include, instead of a foreign presence variable, cross-listing and cross-trading variables. Additionally, model specifications (2) of Table 3.8 and Table 3.9 include interactive variables of the listing status variable with the explanatory variables, company size, international accounting standards, residual analyst coverage, and trading volume, in order to measure the incremental contribution to the change in stock volatility resulting from the change in these firm characteristics after the change in listing status.

Tables 3.8 and 3.9 report that the coefficient estimates on the foreign presence, cross-listed and cross-traded variables are negative and statistically significant or

insignificant in all model specifications, except for the high-low ratio models (1). After controlling for the changes in firm characteristics after cross-listing/ cross-trading (models (2), Tables 3.8 and 3.9), coefficient estimates become more negative and statistically significant. The exception is the coefficient estimate on the cross-traded variable in the volatility ratio model (2) (Table 3.9). The high-low ratio, which has positive and significant coefficient estimate in models (1), becomes negative and significant after controlling for the change in company size and in stock trading volume (models (2)), implying that intra-day volatility is also reduced by cross-listing and cross-trading.

As predicted, company size is a highly significant negative determinant of all measures of stock volatility. However, the impact of foreign presence on stock volatility is asymmetric based on company size, meaning smaller companies experience larger reductions in volatility following cross-listing/ cross-trading, as suggested by the positive coefficient estimates on the interaction variables of company size with foreign presence (models (2), Table 3.8). This holds for cross-listed but not for cross-listed stocks (models (2), Table 3.9). In contrast to expectations, the coefficient estimate on the international accounting standards variable is positive and significant in all model specifications (Tables 3.8 and 3.9). However, for cross-listed/ cross-traded stocks the adoption of international accounting standards is rewarded with lower return volatility. Furthermore, no consistent evidence is found that residual analyst coverage has an impact on return volatility. In line with extensive empirical evidence in the literature (Karpoff, 1987; Schwert, 1989; Jones et al, 1994; Chan and Fong, 2000), higher trading volume is found to be associated with higher volatility. The interactive variables of the trading volume and listing status variables capture the additional increase in volatility due to the increase in trading activity of cross-listed/ traded stocks (return volatility model (2), Tables 3.8 and 3.9). The results also reveal that stocks with higher growth rates, higher leverage, higher intangibles and more concentrated stock ownership have significantly higher volatility.

Overall, there is empirical evidence to support hypothesis H2.1 that cross-listing and cross-trading reduce volatility. In contrast, there is no evidence found to support hypothesis H2.2 that cross-listing results in greater reduction in return volatility compared to cross-trading due to additional mandatory information disclosure requirements. The impact of cross-listing is not different from that of cross-trading as the coefficient estimates are similar

in magnitude and statistical significance as suggested by the Wald test (Table 3.9). The fact that cross-trading reduces volatility as much as cross-listing implies that the improvement in the stock's information environment comes not from the imposed cross-listing disclosure requirements but mostly from the increased production of stock-specific information that occurs because after cross-listing/ trading, a larger number of investors have access to the stock.

3.6.2 Evolution of stock liquidity and volatility

Estimates reported in Tables 3.6 - 3.9 provided evidence on whether cross-listing/ trading has a significant impact on stock liquidity and volatility. The next empirical question is: what are the dynamics of stock liquidity and volatility around cross-listing and cross-trading? In order to reveal the dynamics, stock liquidity and volatility are examined around the initial year (year 0) of foreign presence/ cross-listing/ cross-trading.

Panels A.1, A.2, and A.3 of Figure 3.1 plot the results of univariate analysis of the evolution of stock liquidity and volatility around foreign presence, cross-listing, and cross-trading respectively. To construct the plotted relative measures of stock liquidity and volatility, mean liquidity and volatility measures are first calculated for companies with a foreign presence in year $\leq$-4, -3, …, 0, +1, …, +3, $\geq$+4 relative to the year 0 of foreign presence/ cross-listing/ cross-trading accordingly, then the calculated means are divided by the mean of the corresponding measure of stock liquidity/ volatility of the companies with domestic listing status.

Table 3.10 reports the regression estimation output of the evolution of stock liquidity and volatility controlling for other factors. Regression specifications are the same as model specifications (2) of Tables 3.6 – 3.9, except that variables representing listing status are replaced with a series of dummy variables representing years around foreign presence/ cross-listing/ cross-trading from beyond year -4 to beyond year +4. Only coefficient estimates on the dummy variables representing years around the year of the change in listing status are reported in Table 3.10. Panels B.1, B.2, and B.3 of Figure 3.1 plot coefficient estimates on

the dummy variables that represent the year relative to the change in listing status reported in Table 3.10.

Bid-ask spread

A relative bid-ask spread of 0.54 and below (Figure 3.1 Panel A.1) indicates that the bid-ask spread of companies with a foreign presence is almost half of that of domestic companies even before foreign listing/ admission to trade, as long as it is four or more years before cross-listing/ cross-trading. The plot reveals that there is a significant downward trend in the bid-ask spread following both cross-listing and cross-trading, suggesting that the reduction in the bid-ask spread after foreign listing/ trading endures over time. After controlling for other factors that affect the stock's bid-ask spread, the impact of foreign presence is profoundly negative (Panel A of Table 3.10; Panel B.1 of Figure 3.1). Specifically, coefficient estimates on the dummy variable representing years relative to foreign presence/ cross-listing/ cross-trading are positive for the years before the change in listing/ trading status and both negative and statistically significant in the year of foreign listing/ trading and thereafter. Coefficient estimates on the dummy variables for cross-listing and cross-trading are similar in magnitude and statistical significance; in other words the impact of cross-listing and that of cross-trading are comparable. Overall, there is evidence that listing/trading on foreign exchanges is associated with a significant decrease in the bid-ask spread that is sustainable over time.

Trading volume

Relative trading volume and relative total trading volume measures of 6.33 and above (Panel A.1 of Figure 3.1) suggest that mean trading volumes of stocks with a foreign presence is at least 6.33 times higher than those of domestic stocks even before the foreign listing and continue to increase for the duration of the foreign listing/trading. After controlling for other factors, foreign listing status is associated with a positive and statistically significant contribution to the stock's trading volumes (Panel A of Table 3.10; Panel B.1 of Figure 3.1). However, the positive impact of the change in listing status is observed only around cross-listing, whereas the initial year of cross-trading (year 0) is associated with smaller trading volumes.

Turnover ratio

The next proxy of stock liquidity, turnover ratio, accounts for the number of shares outstanding. Turnover ratio and total turnover ratios of cross-listed stocks three or more years before the year of the cross-listing/ trading event are no different from those of domestic stocks. In the year of cross-listing/trading, mean turnover ratios of cross-listing/ cross-trading stocks are above the level of those of domestic stocks, in other words, relative mean turnover ratio is more than one, and is steadily increasing following the cross-listing/trading event (Panel A.2 of Figure 3.1). After controlling for other factors, a foreign exchange listing is associated with a positive contribution to the stock's turnover ratio and, particularly, total turnover ratio, while admission to trade is associated with a negative contribution to the stock's turnover ratio (Panel A of Table 3.10; Panel B.2 of Figure 3.1). This finding empirically supports hypothesis H1.2 that cross-listing has a more profound positive impact on stock liquidity than cross-trading.

Volatility

Panel A.3 of Figure 3.1 shows that stock volatility, measured by stock return volatility, the volatility ratio, i.e. stock return volatility relative to the stock market volatility, and the high–low ratio, of cross-listed stocks is less than that of domestic stocks, as relative volatility measures are below one for any year relative to a cross-listing/ trading event. There is an increase in the mean stock return volatility and high-low ratio during (-1; +1) years around the cross-listing/ trading event, followed by a downward trend during and after the second year relative to the change in listing status. After controlling for other factors that potentially affect stock volatility in the regression analysis, foreign trading is associated with a negative and statistically significant contribution to the stock's return volatility and the high-low ratio, while a foreign exchange listing is associated with a negative but insignificant contribution to the stock volatility (Panel B of Table 3.10; Panel B.3 of Figure 3.1). Overall, the decrease in volatility as a result of the change in listing is persistent over time.

To sum up, the findings of the analysis of the evolution of stock liquidity and volatility confirm and further extend the results from the cross-sectional analysis (section 3.6.1). Supportive of the hypothesis H1.1, trading on a foreign exchange is found to be

associated with reduced transaction costs. Supportive of the hypothesis H1.2 that cross-listing has greater positive impact on stock liquidity than cross-trading, cross-listing is found to be associated with a significant increase in trading activity, whereas cross-trading is not. Furthermore, the findings support hypothesis H2.1 that the stock price of cross-listed/ traded stocks is less volatile and do not support hypothesis H2.2 that cross-listing is associated with greater reduction in volatility than cross-trading. More importantly, the improvements in stock liquidity and volatility due to listing and/or trading on a foreign exchange are found to be sustainable more than four years after the initial change in listing status.

3.6.3 Time-series analysis: Change in stock liquidity and volatility around cross-listing/trading

The results from the cross-sectional analysis (section 3.6.1) have revealed a significant relationship between stock foreign listing/trading status and stock liquidity and volatility. The next step is to examine the changes in stock liquidity and volatility measures specifically for cross-listed stocks after the changes in the listing/ trading status. The changes are related not only to the stock's listing status but also to firm characteristics. In contrast to the preceding cross-sectional analysis, the benchmark is liquidity and volatility of cross-listed stocks prior to the change in listing status and not those of domestic stocks.

Univariate analysis

Initially, liquidity and volatility measures for each stock are calculated for the periods of time when the stock had a different listing status. The liquidity and volatility ratios are calculated by dividing the average liquidity/volatility measure over the period of time when the stock is present abroad, cross-listed and/or cross-traded, to the base liquidity/volatility measure for each stock, i.e. the average for the period of time when the stock had just a domestic status. An estimated liquidity/volatility ratio of more than one indicates an increase in a liquidity/volatility measure after the change in the listing status from the domestic listing status. Stocks with the same listing status are pooled to estimate the mean and median effect of the foreign listed/ traded status relative to the domestic status. Panel A of Table 3.11 reports mean and median liquidity and volatility ratios for the sub-samples of stocks with various listing statuses: stocks with a foreign presence inclusive of

cross-listing and trading, and individually cross-traded (but not cross-listed) stocks, cross-listed (but not cross-traded) stocks, and stocks cross-listed and cross-traded simultaneously.

Liquidity

Panel A of Table 3.11 reports that the mean and median bid-ask spread ratios of cross-listed and cross-traded stocks are less than one and are statistically significant based on the t-test and the Wilcoxon test. This finding implies that a sample stock, on average, experiences a significant decrease in the bid-ask spread following a foreign listing/ admission to trade. The lowest bid-ask spread ratio, in other words, the most considerable decrease in bid-ask spread, is for stocks that are listed and traded on a foreign exchange(s) simultaneously. 71.7% stocks with a foreign presence and as many as 83.1% of stocks that are cross-listed and traded simultaneously have a bid-ask spread ratio less than one. The mean and median trading volume, total trading volume, turnover ratio and total turnover ratio ratios are significantly more than one, suggesting that a sample stock, on average, experiences significant increases in trading following a foreign listing/ trading. Around 70% of the stocks with a foreign presence have trading volume and turnover ratios of more than one, which indicates an increase in trading activity.

Volatility

Panel A of Table 3.11 reports that the mean and median volatility ratios of cross-listed and cross-traded stocks are more than one or are not statistically different from one based on the t-test and the Wilcoxon test. This indicates either an increase or no change in return volatility after the change in listing status. Less than half of the stocks in the sample (48.9% for return volatility ratio, 47.3% for market-adjusted volatility ratio and 42.4% for high-low ratio ratio) have volatility measure ratios of less than one, or in other words, less than half the stocks experience a decrease in volatility after cross-listing/ trading. Thus, based on a univariate analysis there is no evidence that foreign listing/ trading reduces stock volatility.

Firm characteristics

Summary statistics of the cross-section of cross-listed/traded and domestic stocks (Panel B of Table 3.4) show that the firm characteristics of stocks with a foreign presence

differ significantly from those of domestic stocks. One possibility is that stocks with particular characteristics self-select to list on a foreign exchange. The other possibility, however, is that firm characteristics of a given stock change over time and, particularly, after a foreign listing. For example, a foreign listing reduces capital constraints for a cross-listed firm (Lins et al 2005), which in turn would have a positive impact on the company size as a direct outcome of equity capital and debt raising activity. In order to evaluate the change in company characteristics around foreign listing/ trading, I calculate ratios of the main control variables by dividing a variable mean for the period of time when the stock had a particular foreign listing status, by the average value of the variable over the period of time when the stock had a domestic listing status. Panel B of Table 3.11 reports the mean and median firm characteristics ratios. A variable ratio of more than one indicates an increase in the firm-level variable after foreign listing/ trading. The international accounting standards difference is calculated as the mean distance between the international accounting standards variable over the period of time with a particular listing status to the base international accounting standards variable; a positive international accounting standards difference indicates an improvement in company accounting practices after cross-listing/ cross-trading.

There is compelling evidence that cross-listed companies experience a significant increase in company size after a foreign listing/ admission to trade as the mean and median company size ratios are significantly above one, based both on the t-test and the Wilcoxon test. The median company size of a stock with a foreign presence is on average 1.47 times larger than the median company size of the same stocks prior to foreign listing/ trading. The increase in size is particularly profound for stocks that are simultaneously listed and traded on foreign exchange(s): 88.8% of these stocks experience an increase in company size after becoming cross-listed and cross-traded. Company size in this analysis is quantified by the stock market capitalization, which is the product of the number of common shares outstanding and the stock price. Additionally, Appendix 3.6 presents analysis of the change in firm characteristics related to company size. It shows that cross-listed stocks experience a significant increase in both the number of shares outstanding, which is an indication of capital raising activity by cross-listed companies, and, to a lesser extent, in stock price, which is consistent with the literature supporting the existence of the cross-listing valuation premium (e.g. Miller, 1999; Doidge et al, 2004 and 2009a). Furthermore, Appendix 3.6

reports that a significant increase in total assets, which is an alternative proxy for company size, after cross-listing/trading is comparable to the increase in the market value. The increase in total assets is driven by the increase in the book value of equity capital and even more so by the increase in the value of long-term debt. This is consistent with the argument of Doidge et al (2004) that companies cross-list to take advantage of existing growth opportunities and also consistent with the argument of Lins et al (2005) that cross-listing improves access to capital by cross-listed companies.

Simultaneously cross-listed and cross-traded stocks exhibit significantly improved accounting practices: on average, the use of international accounting standards increases by 19% after foreign listing/ trading (Panel B Table 3.11). Contrary to expectations, the median analyst coverage ratio shows that presence on a foreign exchange is not associated with an increase in analyst coverage. In fact, for stocks admitted to trade on a foreign exchange there is a decrease in analyst coverage relative to the domestic listing status period. The only sub-group of stocks that experience a statistically significant increase in analyst coverage are stocks listed on a foreign exchange.

Based on the median ownership concentration ratio, stocks with a foreign presence and, particularly, simultaneously cross-listed and cross-traded stocks, have more dispersed ownership after foreign listing/ trading. Company sales growth, however, reduces after foreign listing/ trading: only around 35% of stocks have a sales growth ratio above one. There is no evidence that leverage changes significantly around a foreign listed/ trading. The ratio of intangible to total assets increases significantly: around 70% of stocks with a foreign presence have the Intangibles ratio above one.

Multivariate time-series analysis

The next step is to regress the liquidity and volatility measure ratios on the dummy variables representing a foreign listing and/or trading status and the ratios of the control variables in order to detect the primary determinants of the changes in stock liquidity and volatility around a foreign listing/ trading. Additionally, I control for market-level liquidity in regressions of stock-level liquidity measures. Table 3.12 reports the output of the

regressions of the liquidity and volatility measure ratios estimated using an OLS procedure with heteroskedasticity consistent (White, 1980) standard errors adjusted to account for possible correlation within a cluster.

Liquidity

A stock presence (listed or traded) on a foreign exchange is associated with a significant decrease in the bid-ask spread and a significant increase in trading activity in terms of volume and turnover ratio (model (1), Table 3.12). Coefficient estimates on cross-listed and cross-traded variables are of the same signs and similar magnitudes (model (2), Table 3.12). Additionally, model (3) controls for changes in firm characteristics and market-level liquidity. As expected, a significant portion of the improvement in liquidity around foreign listing / trading can be explained by the increase in company size and by the use of better accounting standards. Furthermore, a part of the bid-ask spread reduction can be explained by higher stock turnover after foreign listing/ trading, which, in turn, is positively associated with increased stock return volatility after cross-listing/ trading. After controlling for the change in firm characteristics and for market-level liquidity in model (3), coefficient estimates on the cross-listed and cross-traded variables in the bid-ask spread model remain negative, however, this is significant only for the cross-traded variable; coefficient estimates on the cross-listed and cross-traded variables in the trading volume and turnover models remain positive and significant in all model specifications.

Overall, the empirical results of the time-series analysis of the changes in stock liquidity after cross-listing/ trading support hypothesis H1.1 that cross-listing or an admission to trade on a foreign market improves the liquidity of a stock as a result of an enhanced information environment. However, the results do not support hypothesis H1.2 that due to greater enforced information disclosure, the impact of cross-listing on stock liquidity is more profound than the impact of cross-trading. On the contrary, it is found that, based on the Wald test statistics, the impact of cross-trading is as at least as significant as that of cross-listing, particularly in the case of the bid-ask spread.

Volatility

Based on the regression output of models (1) and (2) (Table 3.12), cross-listing and cross-trading statuses are not significant determinants of the changes in return volatility and market-adjusted return volatility and are significant positive determinants of intra-day volatility, measured by the high-low ratio. Based on model (3) that additionally controls for changes in firm characteristics, an increase in company size and improvement in accounting standards, in line with the theoretical expectations, significantly reduces stock volatility, while the enhanced trading after cross-listing/ trading significantly increases stock volatility. Coefficient estimates on the cross-listed and cross-traded variables in the volatility models are not statistically different from zero, with the only exception being the negative and significant coefficient estimate on the cross-traded variable in the return volatility ratio model, suggesting that cross-trading reduces stock return volatility.

Overall, the empirical results of the time-series analysis of the changes in stock volatility after cross-listing/ trading do not support hypotheses H2.1 and H2.2 which relate to the decrease in stock volatility after cross-listing and/or cross-trading due to the improvement in the stock's information environment.

3.6.4 Implications of cross-listing and cross-trading for stocks from developed vs. emerging home markets

In order to test hypothesis H3 that the impact of cross-listing and cross-trading differs depending on the stock's home market, I estimate cross-sectional regressions of liquidity and volatility measures on the explanatory and control variables separately for two sub-samples: 1) stocks from developed markets and 2) stocks from emerging markets. Tables 3.13 and 3.14 report the regression output of the liquidity and volatility measures respectively. The number of observations from stocks from developed markets is significantly larger than the number of observations from stocks from emerging markets. This means that the findings from the cross-sectional analysis for the full sample (discussed in section 3.6.1) may be driven by stocks from developed markets. Indeed, the findings on the determinants of the trading activity of developed market stocks (Table 3.13 and Table 3.14) are in line with the findings for the full sample (Table 3.7 and Table 3.9).

Table 3.13 reports that the impact of cross-listing and cross-trading on stock liquidity differs for stocks from emerging markets. While cross-listing and cross-trading by developed market stocks, on average, are associated with an improved stock liquidity in terms of bid-ask spread, cross-listing and cross-trading by stocks from emerging markets have no impact on the bid-ask spread. Negative and significant coefficient on the cross-listing variable for turnover ratio and positive and significant coefficient on the cross-listing variable for total turnover ratio can be interpreted as evidence for the migration of the stock's trading to foreign stock exchanges after cross-listing. This finding is in line with theoretical argument and empirical evidence of Domowitz et al (1998).

Table 3.14 reports that there is no conclusive evidence that cross-listing reduces volatility for stocks from emerging markets. On the other hand, cross-trading by stocks from emerging markets reduces the home market stock return volatility after controlling for the increase in volatility due to more active trading. In terms of the reduction in stock volatility, cross-trading seems to be more beneficial than cross-listing for stocks from emerging markets.

To summarize, the findings support the hypothesis H3 that stocks from developed markets experience more substantial improvement in liquidity and reduction in volatility than stocks from emerging markets. These findings are in line with the theoretical argument of Domowitz et al (1998)[64] and the empirical findings of Domowitz et al (1998), Bacidore et al (2005), Halling et al (2008), Fernandes and Ferreira (2008) on the impact of a foreign listing for emerging market stocks, which is the opposite to that of the impact of a foreign listing for developed market stocks.

[64] Domowitz et al (1998) show that a cross-listing by a stock from a market with poor information linkages, which is generally the case for an emerging market, results in a decrease in home market liquidity due to the migration of trading activity to the foreign market and increase in stock volatility due to deterioration of the quality of the home market.

3.7 Conclusion

A company's commitment to higher levels of information disclosure and scrutiny by market participants after a foreign listing should lower the information asymmetry between managers and investors and also between different groups of investors. The enhanced information environment of the stock after cross-listing, in turn, should positively affect stock liquidity and volatility. This study tests this proposition empirically by examining the changes in a stock's liquidity and return volatility after the stock becomes available for trading on a foreign stock exchange. The sample used in the study is a set of European cross-listed companies that have their shares listed and traded on various foreign exchanges. Since the presence on a foreign stock exchange enhances the stock's information environment via additional information disclosure by the company and also via production of stock-specific information by an increased number of investors, stocks that can be traded on foreign exchange(s) are expected to be more liquid and exhibit less return volatility. Furthermore, this study distinguishes between cross-listing and cross-trading, as they differ in the level of mandatory information disclosure, and tests the hypothesis that cross-listing improves stock liquidity and reduces volatility to a greater extent than cross-trading.

Three different methods are used to evaluate the relationship between the foreign listing status and stock liquidity and volatility. Firstly, the liquidity and volatility of cross-listed and cross-traded stocks are compared against that of domestic stocks, controlling for other determinants of stock liquidity and volatility in the cross-sectional analysis. Secondly, the evolution of stock liquidity and volatility measures is tracked in the years around the year of cross-listing and/or cross-trading using the sample of cross-listed and/or cross-traded stocks as well as domestic stocks. Thirdly, stock liquidity and volatility after cross-listing and cross-trading are evaluated against those of the same stocks for the period of time prior to cross-listing and cross-trading using time-series analysis. Additionally, the impact of foreign listing and trading is evaluated individually for stocks from developed markets and for stocks from emerging markets to test the hypothesis that the implications of cross-listing and cross-trading depend on the level of economic development of the stock's home market.

The empirical evidence show that, compared to purely domestic stocks, stocks that can be traded on an exchange(s) outside of the home country have lower transaction costs,

higher trading activity and a less volatile stock return. After controlling for the self-selection bias and other factors that potentially affect stock liquidity and return volatility, a presence on a foreign exchange is associated with a significant reduction in transaction costs measured by the bid-ask spread, increase in trading volumes and a significant reduction in return volatility. Higher turnover ratios of stocks with foreign presence are mainly explained by the increase in company size after cross-listing and cross-trading. Cross-listing, however, is associated with significant improvements in the total trading volume and total turnover ratio as an outcome of active trading on foreign exchange(s) after cross-listing.

The important finding is that the impact of cross-listing and cross-trading on stock liquidity and volatility is sustained over time. More specifically, the observed decrease in bid-ask spread, the increase in total trading volume, and the decrease in volatility are sustained for four or more years after cross-listing and cross-trading.

Evidence from time-series analysis that investigates the changes in the liquidity and volatility of cross-listed stocks suggests that cross-listing and cross-trading are associated with significant improvement in stock's liquidity. This is true even after controlling for the change in firm characteristics following the change in listing status.

The next major finding of this study is that the impact of cross-listing is not significantly different from that of cross-trading. There are two possible explanations for this. First, there is a possibility that the information environment of cross-listed stocks, although improved due to additional mandatory disclosure requirements, is not substantially better than the information environment of cross-traded stocks. The sample contains European stocks cross-listed on various exchanges, including European exchanges. The level of additional information disclosed from cross-listing within the European Union is not expected to be significant due to the presence of the mutual recognition principle with regards to stock exchange listings. According to this principle, EU-complied companies are not subject to any additional legal and disclosure requirements when cross-listing within the European Union. Due to the substantially different legal frameworks they offer, comparing the impact of cross-listing on different markets, particularly, the US and continental Europe, on the stock's information environment, is one of the directions for future research on cross-listing.

Second, the similar impact of cross-listing and cross-trading can be explained by the fact that along with added mandatory disclosure, there are other important factors that equally affect the information environment of cross-listed and cross-traded stocks. More specifically, these factors include improved stock accessibility to foreign investors, intensified competition among market makers, and increased production of stock-specific information by a larger number of market participants that have an economic interest in the stock after cross-listing and cross-trading. The finding that the difference between the implications of cross-listing and cross-trading is not significant triggers new questions for future research regarding the motivations and justification for cross-listing vs. cross-trading.

Finally, the impact of increased scrutiny and disclosure after a foreign listing differs significantly based on the level of economic development of the home country. The findings discussed above on the impact of cross-listing and cross-trading on stock's liquidity and volatility are driven by the observations contributed by stocks from developed markets. For stocks from emerging markets, cross-listing has no significant impact on the stock's liquidity and volatility. Cross-trading, however, is more beneficial for stocks from emerging markets than cross-listing in terms of reduction in the stock return volatility.

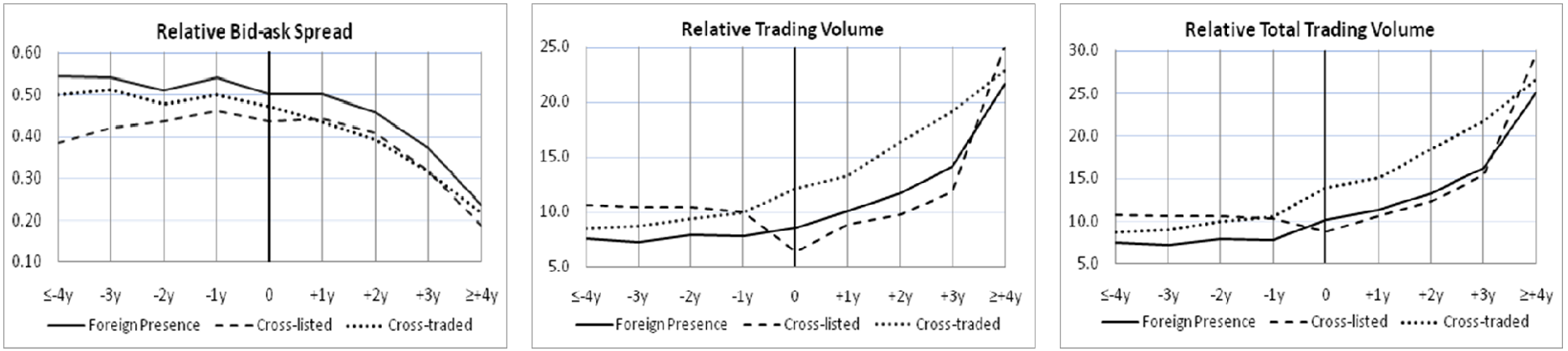
Implications of the findings:

The economic consequences of the findings of this study are relevant to corporate financial managers as well as equity investors and traders. It has been shown that foreign listing and trading result in a significant decrease in bid-ask spread, increase in home market and total trading activity and reduction in stock return volatility. This means that cross-listing and cross-trading should be viewed by corporate financial managers as a means to achieve a lower cost of capital. When considering a foreign listing or an admission to trade as a corporate strategy to improve stock liquidity and risk (and ultimately the value of the firm) managers should consider the evidence that there is no significant difference in the impact of cross-listing and cross-trading on transaction costs and return volatility. Nevertheless, evidence shows that cross-listing results in greater total trading activity as a result of more active trading on foreign host exchange(s). The additional benefit of cross-listing in terms of more active trading should, however, be evaluated against the extra costs

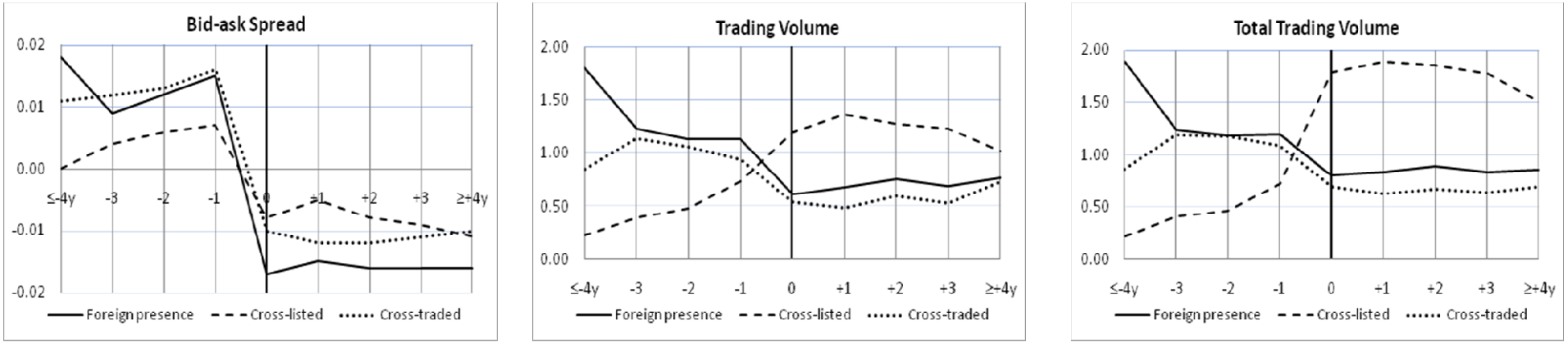
associated with a cross-listing as opposed to cross-trading. For equity investors and traders it is relevant to know that cross-listed and cross-traded stocks offer lower costs of trading, higher stock liquidity and lower return volatility and, accordingly, lower price uncertainty.

Figure 3.1 The evolution of stock liquidity and volatility around cross-listing and/or cross-trading

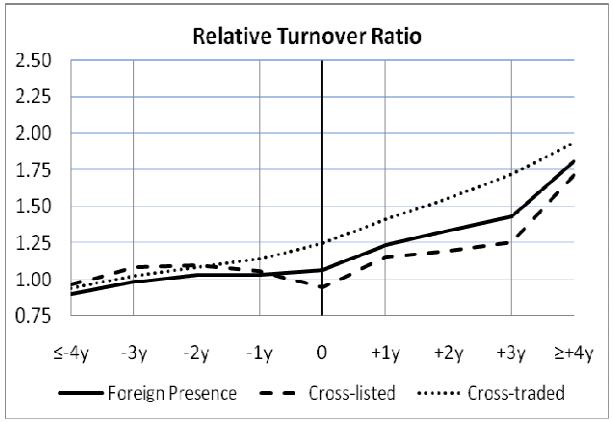
Panel A.1 The evolution of relative stock liquidity. Panel A plots the relative measures of stock liquidity in each year around the year of foreign presence, cross-listing and cross-trading (year 0). Foreign presence is inclusive of cross-listing and cross-trading. The relative measure of stock liquidity is defined as the mean measure of stock liquidity of the sub-sample of stocks with a particular listing status over the mean measure of stock liquidity of domestic stocks.

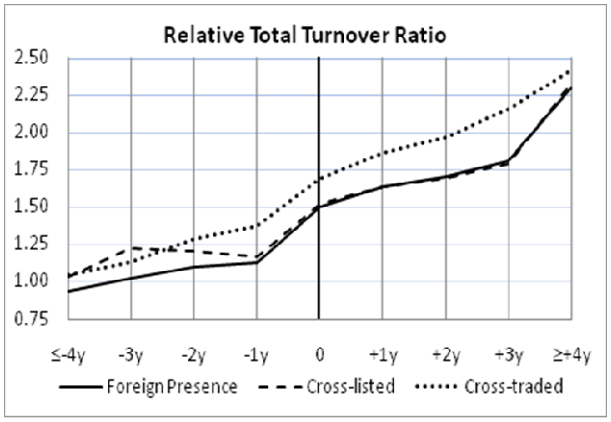


Panel B.1 The evolution of stock liquidity: regression analysis. Panel B plots the coefficient estimates of the year-specific dummy variables relative to the year of foreign presence, cross-listing and cross-trading (year 0) from regressions reported in Table 3.10. Foreign presence is inclusive of cross-listing and cross-trading.

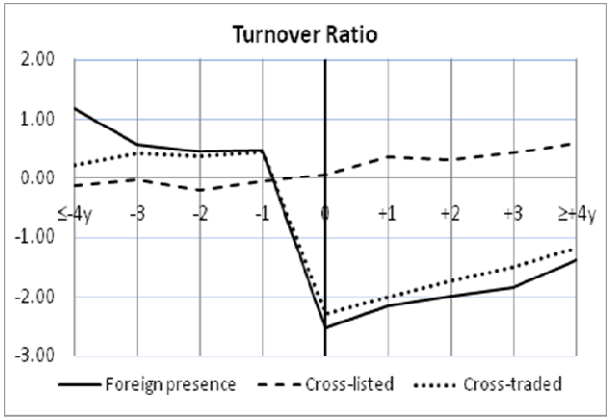


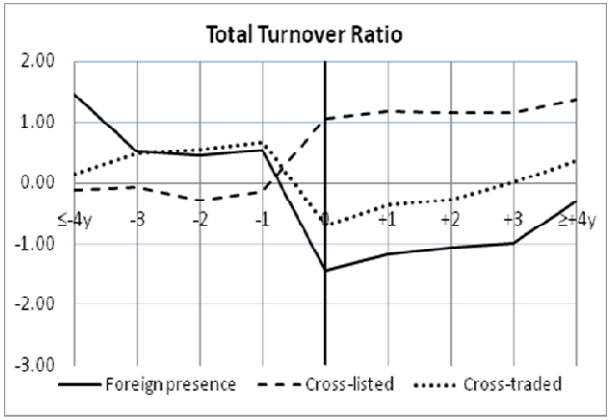
Panel A.2 The evolution of relative stock liquidity. Panel A plots the relative measures of stock liquidity in each year around the year of foreign presence, cross-listing and cross-trading (year 0). Foreign presence is inclusive of cross-listing and cross-trading. The relative measure of stock liquidity is defined as the mean measure of stock liquidity of the sub-sample of stocks with a particular listing status over the mean measure of stock liquidity of domestic stocks.



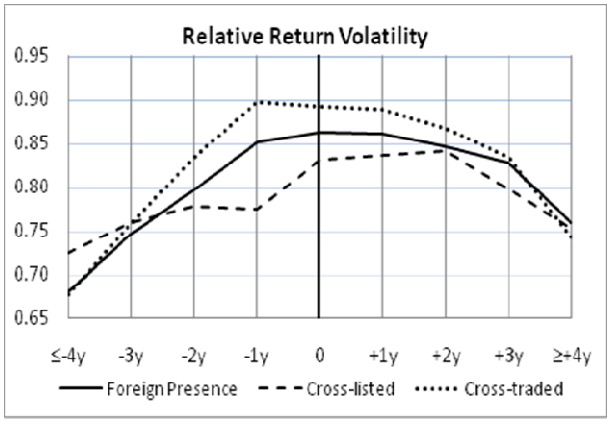


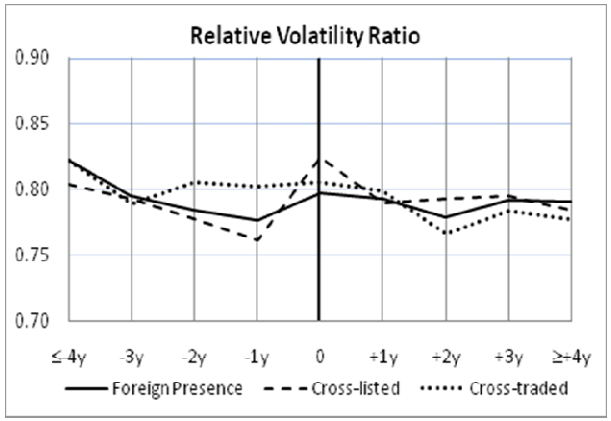
Panel B.2 The evolution of stock liquidity: regression analysis. Panel B plots the coefficient estimates of the year-specific dummy variables relative to the year of foreign presence, cross-listing and cross-trading (year 0) from regressions reported in Table 3.10. Foreign presence is inclusive of cross-listing and cross-trading.

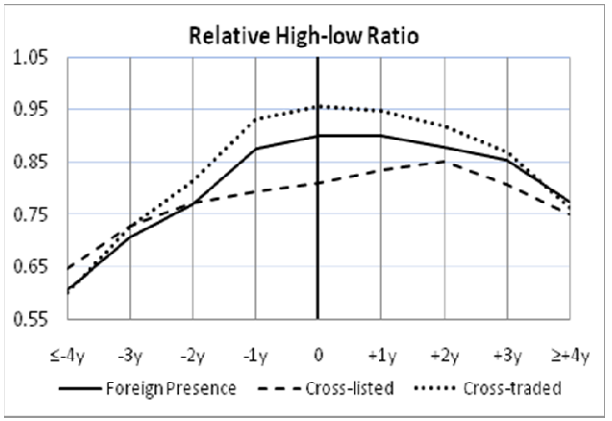




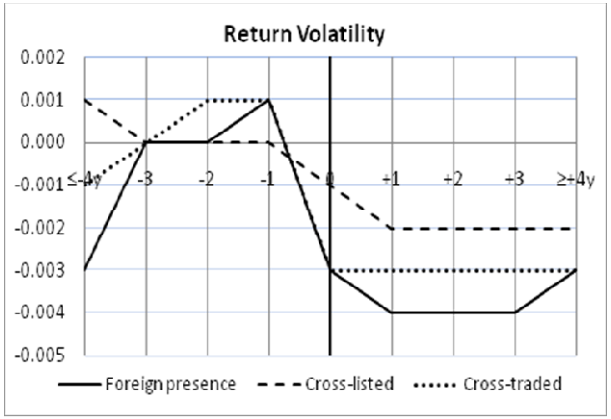
Panel A.3 The evolution of relative stock volatility. Panel A plots the relative measures of stock volatility in each year around the year of foreign presence, cross-listing and cross-trading (year 0). Foreign presence is inclusive of cross-listing and cross-trading. The relative measure of stock volatility is defined as the mean measure of stock volatility of the sub-sample of stocks with a particular listing status over the mean measure of stock volatility of domestic stocks.

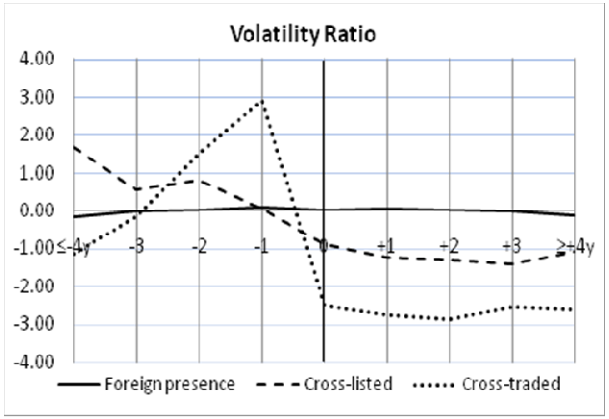






Panel B.2 The evolution of stock volatility: regression analysis. Panel B plots the coefficient estimates of the year-specific dummy variables relative to the year of foreign presence, cross-listing and cross-trading (year 0) from regressions reported in Table 3.10. Foreign presence is inclusive of cross-listing and cross-trading.





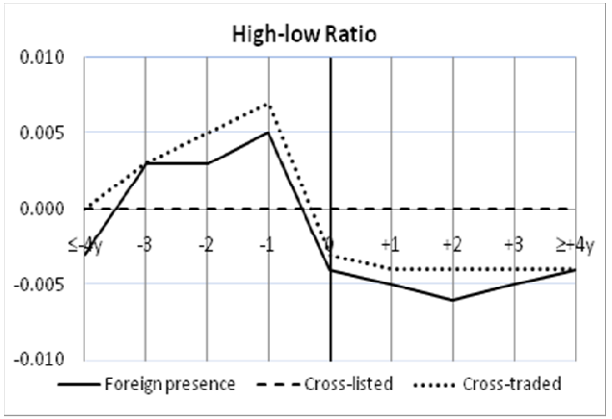


Table 3.1 Stock liquidity and volatility measures

The table presents the list of stock liquidity and volatility measures and provides definition and data sources for each of the variables.

Variable	Definition/ Measurement	Data source
Liquidity		
Proportional Bid-ask spread	Monthly average bid-ask spread is the average of the daily bid-ask spreads. Daily bid-ask spread is the ratio of the difference between ask and bid home market prices to the average of ask and bid prices	Datastream
Trading volume	the average daily number of shares traded on the home market for each month	Datastream
Turnover ratio	the average of the daily turnover ratios. Daily turnover ration is the product of the number of shares traded and the stock price divided by the stock's market capitalization	Datastream
Total trading volume	the average of the total daily trading volume for each month. Daily trading volume is the sum of the number of shares traded on all exchanges in the sample	Datastream
Total turnover ratio	the average of the daily total turnover ratios. Daily total turnover ratio is calculated as the total trading volume in GBP divided by the stock market capitalization in GBP. Total trading volume in GBP is the sum of the trading volumes in GBP on each exchange in the sample, calculated as the product of the number of shares traded and the stock price converted to GBP	Datastream
Volatility		
Return volatility	monthly standard deviation of the stock's daily total return (including dividend income)	Datastream
Volatility ratio	the ratio of monthly standard deviation of the stock's daily total return to monthly standard deviation of the home market index daily total return	Datastream
High-low ratio	the average of the daily high-low ratios. Daily high-low ratio is the natural logarithm of the ratio of the highest stock price to the lowest stock price achieved on the day	Datastream

Table 3.2 Explanatory and control variables

The table presents the list of the explanatory and control variables and the abbreviation used in the forthcoming tables, and provides definition and data sources for each of the variables.

Variable	Abbreviation	Definition/ Measurement	Data source
Stock-level variables			
Foreign presence	Foreign presence; FP	dummy variable =1 if stock is listed and/or traded on a foreign exchange, =0 otherwise	the sample
Inverse Mills Ratio	Inverse Mills Ratio	derived from probit model estimation of probability for a stock to have a foreign presence	estimated
Cross-listed	Cross-listed; CL	dummy variable =1 if stock is listed on a foreign exchange, =0 otherwise	the sample
Cross-traded	Cross-traded; CT	dummy variable =1 if stock is admitted to trading on a foreign exchange, =0 otherwise	the sample
Company size	Company size	stock market capitalization, daily and monthly at the end of the month	Datastream
International accounting standards	Int accounting standards; IAS	dummy variable =1 if company used IAS, IFRS or US GAAP at the end of the proceeding year, =0 otherwise	Datastream
Analysts coverage	Analysts coverage	the total number of EPS one-year estimates on the company	I/B/E/S, Datastream
Analysts coverage residual	Analysts; Analysts Residual	the error term from the regression of the analysts coverage on the company size	estimated
Ownership concentration	Own. concentration	closely held shares – the percentage of shares held by insiders of the total common shares outstanding at the end of the preceding year	Datastream
Sales growth	Sales growth	the percentage increase in sales over the preceding three years	Datastream
Leverage	Leverage	the ratio of the total liabilities to total assets at the end of the preceding year	Datastream
Intangibles to Total assets ratio	Intangibles	the ratio of total value of intangible assets to total assets at the end of the preceding year	Datastream
Market-level variables			
GDP per capita	GDP per capita	the natural logarithm of the 3-year average GDP per capita in USD	UN Statistics Division
Capital market size	Market size	the natural logarithm of total market capitalization of the DS Total Market index converted from local currency to GBP	Datastream
Market liqudity	Market turnover	the average daily ratio of the aggregate trading volume by value to the aggregate market capitalization of the DS Total market index calculated for each month	Datastream
Legal index	Legal index	the anti-director rights index multiplied by the rule-of-law index	Djankov et al (2007), Kaufmann et al (2005)
Accounting opacity	Accounting opacity	accounting opacity index	Kurtzman et al (2004)

Table 3.3 Sample description

The table reports the sample description by the home country. It displays the number of companies with a foreign presence, i.e. listed and/or traded on a foreign exchange(s), the number of domestic companies, i.e. listed and traded in the home country exclusively, and the total number of companies, which is the sum of the two previous categories, for each home country in the sample and for the total sample. Columns (2) – (4) report description of the sample that includes stocks with data available for all liquidity and volatility measures defined in Table 3.1. Columns (5) – (7) report description of the sample that includes stocks with data available for all liquidity and volatility measures defined in Table 3.1 as well as with data available for all explanatory and control variables defined in Table 3.2. Accordingly, the former sample is used in univariate analysis, while the latter sample is used in multivariate regression analysis that incorporates the explanatory and control variables. Stocks from Belgium, Luxemburg and Norway are excluded from multivariate regression analysis due to unavailability of data on the control variables.

	Sample with data available for liquidity and volatility measures			Sample with data available for all variables		
Home Country	Number of companies with foreign presence	Number of domestic companies	Total number of companies	Number of companies with foreign presence	Number of domestic companies	Total number of companies
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Austria	11	6	17	10	2	12
Belgium	13	80	93	0	0	0
Denmark	12	115	127	12	68	80
Finland	9	42	51	8	32	40
France	57	442	499	55	245	300
Germany	55	1559	1614	51	685	736
Hungary	11	13	24	11	2	13
Ireland	42	6	48	33	4	37
Italy	20	64	84	18	38	56
Luxemburg	7	9	16	0	0	0
Netherlands	22	26	48	20	22	42
Norway	12	77	89	0	0	0
Poland	9	199	208	9	50	59
Portugal	2	29	31	2	15	17
Russia	34	122	156	23	26	49
Spain	10	26	36	10	17	27
Sweden	17	110	127	15	27	42
Switzerland	22	74	96	20	63	83
Turkey	12	250	262	11	162	173
United Kingdom	132	453	585	117	297	414
Total	509	3702	4211	425	1755	2180

Table 3.4. Summary statistics

Panel A of the table reports the summary statistics of the stock liquidity and volatility measures by different listing status. Liquidity and volatility measures are defined in Table 3.1. Panel B of the table reports the summary statistics of firm characteristics by different listing status. Company-specific variables are defined in Table 3.2. All stocks are inclusive of domestic stocks and stocks with a foreign presence, i.e. listed and/or traded on a foreign exchange(s). Stocks with a foreign presence include traded only stocks, i.e. traded abroad without stock exchange listing in addition to the home market listing, cross-listed only stocks, i.e. listed on a foreign exchange in addition to the home market listing, and cross-listed and cross-traded stocks (CL and CT), i.e. cross-listed and cross-traded simultaneously. Number of observations (N) is the number of stock-months observations of available data. Mean-difference with domestic is the difference between the mean of the sub-sample with a particular listing status and the mean of domestic stocks. Median-difference with domestic is the difference between the median of the sub-sample with a particular listing status and the median of domestic stocks.

Variable	Listing/ trading status	N observations	Mean	Mean - difference with Domestic (1)	Median	Median - difference with Domestic (2)	Min	Max	St Dev
Panel A: Dependent Variables									
Liquidity									
Bid-ask spread	All	293,978	0.035		0.020		0.000	1.08	0.05
	Domestic	253,644	0.039		0.023		0.000	1.08	0.05
	Foreign Presence	40,334	0.013	-0.026***	0.005	-0.017***	0.000	0.40	0.02
	Traded only	21,602	0.015	-0.024***	0.006	-0.017***	0.000	0.40	0.03
	Cross-listed only	8,142	0.017	-0.022	0.009	-0.013***	0.000	0.32	0.03
	CL and CT	10,590	0.006	-0.033***	0.003	-0.020***	0.000	0.40	0.01
Trading volume	All	293,978	599.9		12.2		0.000	39,820	2,525
	Domestic	253,644	186.8		7.8		0.000	35,876	959
	Foreign Presence	40,334	3,198.0	3,011.2***	767.7	759.8***	0.000	39,820	5,733
	Traded only	21,602	3,003.8	2,817.1***	655.2	647.3***	0.000	39,820	5,847
	Cross-listed only	8,142	1,631.0	1,444.3**	374.0	366.1***	0.005	29,555	2,998
	CL and CT	10,590	4,798.8	4,612.0***	1,791.9	1,784.0***	0.178	39,441	6,633
Total trading	All	293,978	678.7		12.7		0.000	43,364	2,852
volume	Domestic	253,644	189.6		7.9		0.000	41,116	995
	Foreign Presence	40,334	3,754.5	3,564.8***	1,092.1	1,084.2***	0.011	43,364	6,490
	Traded only	21,602	3,393.7	3,204.1***	801.5	793.5***	0.150	43,364	6,578
	Cross-listed only	8,142	1,895.6	1,706.0**	517.9	510.0***	0.011	33,163	3,289
	CL and CT	10,590	5,919.5	5,729.9***	3,005.5	2,997.6***	0.361	42,605	7,498
Turnover ratio	All	293,978	2.40		1.01		0.000	57.29	4.21
	Domestic	253,644	2.23		0.86		0.000	57.29	4.34
	Foreign Presence	40,334	3.52	1.30***	2.83	1.98***	0.000	23.20	3.03
	Traded only	21,602	3.73	1.51***	3.06	2.20***	0.000	23.20	3.14
	Cross-listed only	8,142	2.25	0.02**	1.86	1.00***	0.001	17.67	2.00
	CL and CT	10,590	4.06	1.84***	3.58	2.73***	0.001	22.82	3.17
Total turnover	All	293,978	2.57		1.08		0.000	57.29	4.35
ratio	Domestic	253,644	2.25		0.87		0.000	57.29	4.36
	Foreign Presence	40,334	4.56	2.31***	3.68	2.82***	0.000	34.13	3.71
	Traded only	21,602	4.53	2.29***	3.65	2.78***	0.000	30.41	3.76
	Cross-listed only	8,142	3.15	0.91***	2.44	1.57***	0.006	28.09	2.97
	CL and CT	10,590	5.70	3.45***	4.90	4.03***	0.009	34.13	3.74

Table 3.4 continued

Variable	Listing/ trading status	N observations	Mean	Mean - difference with Domestic (1)	Median	Median - difference with Domestic (2)	Min	Max	St Dev
Panel A: Dependent Variables									
Volatility									
Return volatility	All	293,978	0.022		0.020		0.000	0.10	0.01
	Domestic	253,644	0.022		0.020		0.000	0.10	0.01
	Foreign Presence	40,334	0.018	-0.004***	0.017	-0.004***	0.000	0.06	0.01
	Traded only	21,602	0.018	-0.004***	0.017	-0.004***	0.000	0.06	0.01
	Cross-listed only	8,142	0.017	-0.005*	0.016	-0.004***	0.000	0.05	0.01
	CL and CT	10,590	0.017	-0.005***	0.016	-0.004***	0.001	0.05	0.01
Volatility ratio	All	293,978	2.410		2.022		0.000	20.01	1.59
	Domestic	253,644	2.482		2.087		0.000	20.01	1.66
	Foreign Presence	40,334	1.961	-0.52***	1.772	-0.314***	0.000	10.36	0.95
	Traded only	21,602	1.960	-0.521***	1.764	-0.323***	0.000	10.36	0.98
	Cross-listed only	8,142	2.041	-0.441**	1.850	-0.237***	0.020	9.94	1.01
	CL and CT	10,590	1.902	-0.58***	1.737	-0.350***	0.091	8.82	0.82
High- low ratio	All	293,978	0.033		0.027		0.000	0.19	0.02
	Domestic	253,644	0.034		0.028		0.000	0.19	0.02
	Foreign Presence	40,334	0.028	-0.006***	0.024	-0.004***	0.001	0.13	0.01
	Traded only	21,602	0.029	-0.005***	0.025	-0.003***	0.001	0.13	0.02
	Cross-listed only	8,142	0.026	-0.008***	0.022	-0.006***	0.001	0.12	0.01
	CL and CT	10,590	0.027	-0.007***	0.024	-0.004***	0.001	0.12	0.01

(1) statistical significance reported is based on t-test

(2) statistical significance reported is based on Wilcoxon rank sum test

'***' indicates significance at 1% , '**' indicates significance at 5% and '*' indicates significance at 10%

Table 3.4 continued

Variable	Listing/ trading status	N observations	Mean	Mean - difference with Domestic (1)	Median	Median - difference with Domestic (2)	Min	Max	St Dev
Panel B: Firm Characteristics									
Company	All	280,816	923		53		0	49,349	3,585
size	Domestic	241,366	210		38		0	49,310	885
	Foreign Presence	39,450	5,286	5,075***	2,060	2,023***	2	49,349	8,034
	Traded only	21,249	3,852	3,642***	1,546	1,509***	2	49,349	6,250
	Cross-listed only	8,105	3,448	3,237***	862	824***	2	48,681	6,195
	CL and CT	10,096	9,780	9,569***	5,970	5,932***	4	49,280	10,582
Int. accounting	All	248,387	0.35		0.0		0.00	1.00	0.48
standards	Domestic	209,693	0.35		0.0		0.00	1.00	0.48
	Foreign Presence	38,694	0.34	-0.01***	0.0	0***	0.00	1.00	0.47
	Traded only	20,944	0.35	0.01	0.0	0	0.00	1.00	0.48
	Cross-listed only	7,582	0.20	-0.15***	0.0	0***	0.00	1.00	0.40
	CL and CT	10,168	0.41	0.06***	0.0	0***	0.00	1.00	0.49
Analysts	All	273,594	4.5		1.0		0.0	54.0	7.1
coverage	Domestic	233,788	2.9		1.0		0.0	41.0	5.1
	Foreign Presence	39,806	13.8	10.9***	13.0	12.0***	0.0	54.0	9.8
	Traded only	21,439	12.1	9.2***	11.0	10.0***	0.0	48.0	8.8
	Cross-listed only	7,959	12.9	10.0***	11.0	10.0***	0.0	50.0	10.5
	CL and CT	10,408	17.9	15.0***	18.0	17.0***	0.0	54.0	10.0
Ownership	All	186,234	43.46		45.98		0.00	100.0	27.0
concentration	Domestic	151,429	47.15		50.57		0.00	100.0	26.2
	Foreign Presence	34,805	27.39	-19.76***	22.97	-27.60***	0.00	100.0	24.1
	Traded only	19,016	29.84	-17.31***	25.72	-24.85***	0.00	100.0	24.7
	Cross-listed only	6,827	26.29	-20.86***	23.23	-27.34***	0.00	97.9	22.9
	CL and CT	8,962	23.04	-24.11***	16.39	-34.18***	0.00	100.0	23.0
Sales	All	240,962	0.48		0.16		-0.95	22.7	1.50
growth	Domestic	203,788	0.51		0.16		-0.95	22.7	1.60
	Foreign Presence	37,174	0.31	-0.20***	0.15	-0.01***	-0.78	7.9	0.70
	Traded only	20,227	0.31	-0.20***	0.15	-0.01***	-0.76	7.9	0.68
	Cross-listed only	7,207	0.33	-0.18***	0.17	0.01	-0.78	7.7	0.78
	CL and CT	9,740	0.29	-0.22***	0.14	-0.03***	-0.76	7.3	0.69
Leverage	All	262,944	0.57		0.58		0.01	1.38	0.24
	Domestic	224,652	0.56		0.57		0.01	1.38	0.25
	Foreign Presence	38,292	0.62	0.06***	0.62	0.05***	0.05	1.21	0.22
	Traded only	20,628	0.60	0.04***	0.60	0.04***	0.05	1.21	0.22
	Cross-listed only	7,556	0.62	0.06***	0.63	0.06***	0.05	1.19	0.22
	CL and CT	10,108	0.65	0.09***	0.64	0.07***	0.05	1.00	0.22
Intangibles	All	258,522	0.09		0.02		0.00	0.67	0.13
	Domestic	221,028	0.09		0.02		0.00	0.66	0.13
	Foreign Presence	37,494	0.12	0.03***	0.06	0.04***	0.00	0.67	0.14
	Traded only	20,290	0.12	0.03***	0.07	0.05***	0.00	0.65	0.14
	Cross-listed only	7,339	0.10	0.02***	0.03	0.01*	0.00	0.66	0.14
	CL and CT	9,865	0.13	0.04***	0.06	0.04***	0.00	0.67	0.15

(1) statistical significance reported is based on t-test

(2) statistical significance reported is based on Wilcoxon rank sum test

'***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%

Table 3.5 Probability of foreign presence

The table reports the output from binary probit model regression of the dependent variable, foreign presence, on the company size and market-level variables: *Probability* ($FP_{i,t}$) = $f(\omega F_{i,t})$, where $F_{i,t}$ is the foreign presence dummy variable that equals one if stock i is cross-listed and/or cross-traded in month t and equals zero otherwise; $F_{i,t}$ are the potential determinants of cross-listing and/or cross-trading status. The explanatory variables are defined in Table 3.2. The number (N) of observations is the number of stock-months observations of available data. The coefficients are estimated using maximum-likelihood procedures, standard errors are adjusted for clustering on the stock level.

	Foreign presence		
Varible	Estimate	z-stat	Pr > |z|
Intercept	-9.60	-9.77	<.0001
Company size	0.59	31.06	<.0001
GDP per capita	0.86	7.56	<.0001
Market size	-0.28	-8.15	<.0001
Legal index	-0.21	-6.75	<.0001
Accounting opacity	1.88	5.86	<.0001
Pseudo R-Sq	0.513		
N observations	266,942		
N stocks	3,967		

Table 3.6 Stock liquidity and a foreign presence

The table reports the estimates from the OLS regressions of the dependant variables: bid-ask spread, trading volume, total trading volume, turnover ratio and total turnover ratio, defined in Table 3.1. Model (1) specification: $Liquidity\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, and Model (2) specification: $Liquidity\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is foreign presence dummy variable; V_i are main control variables; $F_{i,t}$ are other control variables; $\lambda_{i,t}$ is the Inverse Mills Ratio. The explanatory and control variables are defined in Table 3.2. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Bid-ask spread		Trading volume		Total trading volume		Turnover ratio		Total turnover ratio	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Foreign presence	**0.01*** **	**-0.02*** **	**0.72*** **	**2.02*** **	**1.11*** **	**1.85*** **	**0.67*** **	**-1.56*** **	**1.77*** **	**-1.01***
	(4.20)	(-3.19)	(7.06)	(5.18)	(11.60)	(5.63)	(5.03)	(-3.83)	(9.68)	(-1.72)
Company size*FP		0.004***		-0.15***		-0.09*		0.36***		0.40***
		(5.88)		(-2.70)		(-1.84)		(5.73)		(5.31)
IAS*FP		0.01***		-0.88***		-0.27**		-0.36**		0.62***
		(6.58)		(-6.91)		(-2.18)		(-1.98)		(3.01)
Analysts*FP		-0.002**		-0.28***		-0.36***		0.45***		0.30
		(-2.30)		(-2.78)		(-3.84)		(3.79)		(1.54)
Company size	-0.01***	-0.01***	1.21***	1.47***	1.13***	1.27***	0.90***	0.28*	0.71***	-0.00
	(-28.95)	(-27.40)	(13.58)	(12.13)	(13.16)	(11.74)	(6.73)	(1.66)	(4.75)	(-0.00)
Stock turnover ratio	-0.001***	-0.001***								
	(-14.87)	(-15.31)								
Return volatility	0.41***	0.40***	45.02***	43.35***	43.58***	42.94***	76.12***	76.32***	78.68***	80.44***
	(15.31)	(14.89)	(22.50)	(22.05)	(21.96)	(21.91)	(24.77)	(25.16)	(24.57)	(25.58)
Int accounting stnds	-0.01***	-0.01***	-0.04	0.13*	0.06	0.09	-0.37***	-0.24**	-0.21**	-0.30***
	(-7.65)	(-9.08)	(-0.63)	(1.86)	(0.90)	(1.38)	(-3.92)	(-2.48)	(-2.04)	(-3.02)
Own. concentration	0.0001***	0.0001***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***
	(3.88)	(4.14)	(-22.49)	(-22.49)	(-22.54)	(-22.52)	(-16.71)	(-16.74)	(-17.07)	(-17.19)
Analysts following	-0.001**	-0.00	0.53***	0.56***	0.52***	0.57***	0.28***	0.21***	0.23***	0.19***
	(-1.98)	(-1.22)	(11.62)	(11.61)	(11.52)	(11.84)	(6.39)	(4.58)	(4.01)	(3.88)
Market turnover	0.003**	0.00	0.07***	0.08***	0.06***	0.06***	0.21***	0.20***	0.20***	0.18***
	(2.31)	(1.50)	(6.02)	(7.06)	(5.08)	(5.55)	(12.65)	(12.56)	(11.77)	(11.01)
GDP per capita	0.00	0.004**	-1.33***	-1.05***	-1.62***	-1.48***	-2.81***	-3.49***	-3.45***	-4.23***
	(0.45)	(2.06)	(-8.13)	(-5.68)	(-10.40)	(-8.81)	(-7.82)	(-8.76)	(-9.29)	(-10.55)
Market size	0.01***	0.005***	-0.07	-0.18***	-0.00	-0.05	-0.45***	-0.23**	-0.28***	-0.01
	(8.68)	(8.10)	(-1.28)	(-2.85)	(-0.01)	(-0.85)	(-5.24)	(-2.51)	(-3.14)	(-0.16)
Legal index	-0.002***	-0.003***	-0.69***	-0.76***	-0.64***	-0.67***	-0.66***	-0.50***	-0.56***	-0.37***
	(-3.33)	(-5.11)	(-13.18)	(-12.81)	(-12.86)	(-12.21)	(-9.19)	(-6.44)	(-7.95)	(-4.93)
Accounting opacity	-0.02**	-0.01	5.29***	5.96***	4.44***	4.81***	2.81***	1.14	1.45**	-0.41
	(-2.05)	(-0.75)	(10.90)	(11.15)	(9.36)	(9.49)	(4.61)	(1.61)	(2.20)	(-0.56)
Inverse Mills Ratio	0.004***	0.002**	1.19***	1.68***	0.99***	1.24***	1.75***	0.60*	1.34***	0.00
	(4.13)	(2.40)	(6.22)	(6.82)	(5.34)	(5.65)	(6.16)	(1.73)	(4.33)	(0.01)
Intercept	0.03	0.01	7.82***	4.04*	10.80***	8.80***	24.73***	34.37***	31.00***	41.84***
	(1.58)	(0.31)	(4.42)	(1.84)	(6.31)	(4.47)	(6.66)	(7.92)	(7.90)	(9.51)
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	*0.3440*	*0.3513*	*0.6721*	*0.6760*	*0.6884*	*0.6898*	*0.3587*	*0.3625*	*0.3688*	*0.3727*
N observations	*167,542*	*167,542*	*166,191*	*166,191*	*166,194*	*166,194*	*167,542*	*167,542*	*167,542*	*167,542*
N stocks	*2,347*	*2,347*	*2,345*	*2,345*	*2,345*	*2,345*	*2,347*	*2,347*	*2,347*	*2,347*

Table 3.7 Stock liquidity and cross-listing and cross-trading status

The table reports the estimates from the OLS regressions of the dependant variables: bid-ask spread, trading volume, total trading volume, turnover ratio and total turnover ratio, defined in Table 3.1. Model (1) specification: $Liquidity\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, and Model (2) specification: $Liquidity\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is dummy variable representing cross-listing or cross-trading status accordingly; V_i are main control variables; $F_{i,t}$ are other control variables; $\lambda_{i,t}$ is the Inverse Mills Ratio. The explanatory and control variables are defined in Table 3.2. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Bid-ask spread		Trading volume		Total trading volume		Turnover ratio		Total turnover ratio	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Cross-listed	**0.01*** **	**-0.01***	**0.21***	**2.17*** **	**0.64*** **	**2.54*** **	**0.20**	**0.55**	**1.21*** **	**1.09** **
	(4.35)	(-1.76)	(1.69)	(3.58)	(5.75)	(5.77)	(1.24)	(1.15)	(6.70)	(2.16)
Company size*CL		0.002***		-0.24***		-0.25***		-0.04		-0.02
		(2.79)		(-3.26)		(-4.55)		(-0.62)		(-0.34)
IAS*CL		-0.004**		-0.48**		0.03		-0.48*		0.52*
		(-1.97)		(-2.52)		(0.13)		(-1.67)		(1.80)
Analysts*CL		0.00		-0.08		-0.18		0.30**		0.34
		(1.00)		(-0.56)		(-1.20)		(2.06)		(1.61)
Cross-traded	**0.01*** **	**-0.01** **	**0.59*** **	**1.82*** **	**0.91*** **	**1.65*** **	**0.91*** **	**-1.51*** **	**1.90*** **	**-0.37**
	(7.07)	(-2.16)	(5.70)	(5.03)	(9.31)	(4.67)	(6.12)	(-3.37)	(9.32)	(-0.48)
Company size*CT		0.003***		-0.13***		-0.09*		0.38***		0.32***
		(3.82)		(-2.75)		(-1.82)		(6.07)		(3.63)
IAS*CT		0.01***		-0.71***		-0.24		-0.45**		0.22
		(6.48)		(-4.88)		(-1.61)		(-2.20)		(0.82)
Analysts*CT		-0.003**		-0.30**		-0.36***		0.43***		0.19
		(-2.40)		(-2.57)		(-3.58)		(3.25)		(0.78)
Company size	-0.01***	-0.01***	1.21***	1.58***	1.04***	1.35***	0.76***	0.27	0.34**	-0.08
	(-29.09)	(-28.06)	(12.47)	(12.61)	(11.17)	(12.08)	(5.35)	(1.61)	(2.18)	(-0.48)
Stock turnover ratio	-0.001***	-0.001***								
	(-15.14)	(-15.40)								
Return volatility	0.41***	0.41***	45.16***	43.25***	43.72***	42.76***	76.12***	75.89***	78.67***	79.91***
	(15.19)	(15.22)	(22.52)	(21.92)	(21.97)	(21.75)	(24.78)	(25.02)	(24.73)	(25.45)
IAS	-0.01***	-0.01***	-0.04	0.11	0.06	0.07	-0.38***	-0.19**	-0.21**	-0.27***
	(-7.81)	(-8.95)	(-0.64)	(1.55)	(0.90)	(1.07)	(-3.98)	(-2.05)	(-2.16)	(-2.73)
Own. concentration	0.0001***	0.0001***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***
	(3.96)	(4.13)	(-22.64)	(-22.63)	(-22.64)	(-22.67)	(-16.69)	(-16.73)	(-17.06)	(-17.18)
Analysts residual	-0.001**	-0.00	0.53***	0.56***	0.52***	0.57***	0.28***	0.20***	0.22***	0.19***
	(-2.20)	(-1.31)	(11.75)	(11.60)	(11.59)	(11.87)	(6.29)	(4.39)	(3.97)	(3.77)
Market turnover	0.003**	0.00	0.07***	0.08***	0.06***	0.06***	0.20***	0.20***	0.20***	0.19***
	(2.32)	(1.32)	(5.81)	(6.89)	(4.86)	(5.52)	(12.46)	(12.59)	(11.54)	(11.18)
GDP per capita	0.00	0.00	-1.32***	-0.92***	-1.74***	-1.41***	-2.99***	-3.57***	-3.97***	-4.45***
	(0.55)	(1.16)	(-7.48)	(-4.78)	(-10.59)	(-7.98)	(-8.03)	(-8.96)	(-10.59)	(-11.10)
Market size	0.01***	0.005***	-0.08	-0.22***	0.04	-0.08	-0.39***	-0.21**	-0.11	0.05
	(8.78)	(8.40)	(-1.27)	(-3.44)	(0.66)	(-1.27)	(-4.35)	(-2.28)	(-1.23)	(0.50)
Legal index	-0.01**	-0.01*	5.28***	6.21***	4.17***	5.01***	2.33***	0.94	0.28	-0.82
	(-2.14)	(-1.94)	(10.44)	(11.32)	(8.47)	(9.60)	(3.73)	(1.35)	(0.42)	(-1.16)
Accounting opacity	-0.002***	-0.002***	-0.70***	-0.80***	-0.61***	-0.69***	-0.63***	-0.50***	-0.44***	-0.33***
	(-3.75)	(-4.57)	(-12.60)	(-13.20)	(-11.93)	(-12.40)	(-8.27)	(-6.28)	(-6.30)	(-4.35)

Table 3.7 continued

	Bid-ask spread		Trading volume		Total trading volume		Turnover ratio		Total turnover ratio	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Inverse Mills Ratio	0.004***	0.004***	1.15***	1.89***	0.78***	1.39***	1.50***	0.58*	0.64**	-0.17
	(4.75)	(4.74)	(5.64)	(7.32)	(3.96)	(6.05)	(5.01)	(1.67)	(2.00)	(-0.47)
Intercept	0.03*	0.03	8.00***	2.37	12.56***	7.74***	27.22***	35.33***	37.69***	44.31***
	(1.73)	(1.60)	(4.20)	(1.04)	(6.92)	(3.78)	(7.05)	(8.19)	(9.46)	(10.16)
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	*0.3462*	*0.3525*	*0.6707*	*0.6730*	*0.6869*	*0.6900*	*0.3604*	*0.3650*	*0.3747*	*0.3773*
N observations	*167,542*	*167,542*	*166,191*	*166,191*	*166,194*	*166,194*	*167,542*	*167,542*	*167,542*	*167,542*
N stocks	*2,347*	2,347	2,345	2,345	2,345	2,345	2,347	2,347	2,347	2,347
Coefficient Estimates Difference:										
Cross-listed - Cross-traded	-0.006	0.004	-0.378	0.353	-0.276	0.892	-0.714	2.057	-0.694	1.456
Wald test (Pr > F stats)	***0.002***	***0.724***	***0.017***	***0.589***	***0.071***	***0.129***	***0.000***	***0.001***	***0.011***	***0.156***

Table 3.8 Stock volatility and a foreign presence

The table reports the estimates from the OLS regressions of the dependant variables: return volatility, volatility ratio, and high-low ratio, defined in Table 3.1. Model (1) specification: $Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, and Model (2) specification: $Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is foreign presence dummy variable; V_i are main control variables; $F_{i,t}$ are other control variables; $\lambda_{i,t}$ is the Inverse Mills Ratio. The explanatory and control variables are defined in Table 3.2. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Return volatility		Volatility ratio		High-low ratio	
	(1)	(2)	(1)	(2)	(1)	(2)
Foreign presence	**0.00**	**-0.005*** **	**-0.03**	**-0.05**	**0.004*** **	**-0.01*** **
	(1.30)	(-5.14)	(-0.84)	(-0.43)	(6.14)	(-3.22)
Company size*FP		0.001***		0.02		0.00***
		(4.10)		(0.97)		(4.39)
IAS *FP		-0.003***		-0.35***		-0.01***
		(-7.42)		(-7.72)		(-7.16)
Analysts *FP		-0.00		-0.02		-0.00
		(-0.64)		(-0.52)		(-0.64)
Total trading volume*FP		0.0003***		0.00		0.00
		(2.61)		(0.31)		(1.37)
Company size	-0.002***	-0.002***	-0.25***	-0.25***	-0.004***	-0.005***
	(-26.63)	(-26.65)	(-27.45)	(-25.85)	(-28.57)	(-28.86)
Total trading volume	0.001***	0.001***	0.15***	0.14***	0.002***	0.002***
	(19.92)	(18.22)	(20.62)	(19.53)	(22.39)	(21.02)
Sales growth	0.001***	0.001***	0.02***	0.02***	0.001***	0.001***
	(8.69)	(8.91)	(3.45)	(3.39)	(7.64)	(7.84)
Leverage	0.002***	0.002***	0.27***	0.26***	0.004***	0.003***
	(3.89)	(3.58)	(4.65)	(4.56)	(4.29)	(4.03)
Intangibles	0.01***	0.01***	0.53***	0.52***	0.01***	0.01***
	(7.38)	(7.50)	(5.18)	(5.06)	(6.28)	(6.40)
Int accounting standards	0.002***	0.003***	0.25***	0.33***	0.003***	0.004***
	(8.96)	(10.95)	(8.67)	(10.50)	(6.76)	(9.32)
Ownership concentration	0.00001***	0.00001***	0.00***	0.00***	0.0001***	0.0001***
	(10.35)	(10.98)	(7.49)	(7.68)	(9.94)	(10.55)
Analysts following	0.00	0.00	-0.10***	-0.09***	0.001***	0.001***
	(0.92)	(1.11)	(-6.00)	(-5.66)	(3.02)	(3.08)
GDP per capita	0.03***	0.03***	3.23***	3.12***	0.05***	0.05***
	(7.46)	(7.84)	(6.61)	(6.37)	(5.92)	(6.35)
Market size	-0.004***	-0.005***	-0.24***	-0.23***	-0.01***	-0.01***
	(-8.10)	(-8.69)	(-3.88)	(-3.75)	(-6.98)	(-7.63)
Legal index	-0.01***	-0.01***	-0.42***	-0.40***	-0.01***	-0.01***
	(-6.94)	(-7.36)	(-3.63)	(-3.43)	(-6.03)	(-6.53)
Accounting opacity	0.10***	0.10***	7.68***	7.30***	0.16***	0.17***
	(7.27)	(7.67)	(4.81)	(4.59)	(6.06)	(6.49)

Table 3.8 continued

	Return volatility		Volatility ratio		High-low ratio	
	(1)	(2)	(1)	(2)	(1)	(2)
Inverse Mills Ratio	0.06***	0.06***	4.30***	4.10***	0.09***	0.10***
	(8.07)	(8.45)	(5.21)	(4.98)	(6.75)	(7.17)
Intercept	-0.36***	-0.37***	-35.38***	-33.93***	-0.55***	-0.57***
	(-7.17)	(-7.50)	(-6.10)	(-5.85)	(-5.69)	(-6.06)
Industry indicators	yes	yes	yes	yes	yes	yes
Year indicators	yes	yes	yes	yes	yes	yes
R-sq	*0.2797*	*0.2856*	*0.2523*	*0.2545*	*0.3154*	*0.3222*
N observations	*149,640*	*149,640*	*149,640*	*149,640*	*149,640*	*149,640*
N stocks	*2,180*	*2,180*	*2,180*	*2,180*	*2,180*	*2,180*

Table 3.9 Stock volatility and cross-listing and cross-trading status

The table reports the estimates from the OLS regressions of the dependant variables, return volatility, volatility ratio, and high-low ratio, defined in Table 3.1. Model (1) specification: $Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, and Model (2) specification: $Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is dummy variable representing cross-listing or cross-trading status accordingly; V_i are main control variables; $F_{i,t}$ are other control variables; $\lambda_{i,t}$ is the Inverse Mills Ratio. The explanatory and control variables are defined in Table 3.2. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Return volatility		Volatility ratio		High-low ratio	
	(1)	(2)	(1)	(2)	(1)	(2)
Cross-listed	**0.00**	**-0.003****	**-0.02**	**-0.26**	**0.001****	**-0.00**
	(0.96)	(-2.11)	(-0.42)	(-1.48)	(2.15)	(-0.87)
Company size*CL		0.00		0.02		0.00
		(0.72)		(0.89)		(1.30)
IAS *CL		-0.001**		-0.19***		-0.003***
		(-2.23)		(-2.86)		(-2.63)
Analysts *CL		-0.00**		-0.14**		-0.00
		(-2.08)		(-2.53)		(-1.09)
Total trading volume*CL		0.0004*		0.03		0.00
		(1.66)		(1.15)		(0.04)
Cross-traded	**0.001****	**-0.003*****	**-0.03**	**0.12**	**0.004*****	**-0.004***
	(2.44)	(-2.94)	(-0.85)	(0.92)	(6.91)	(-1.73)
Company size*CT		0.001***		0.00		0.001***
		(2.87)		(0.10)		(3.23)
IAS*CT		-0.002***		-0.26***		-0.005***
		(-6.05)		(-5.24)		(-6.38)
Analysts*CT		0.00		0.03		0.00
		(0.90)		(0.60)		(0.14)
Total trading volume*CT		0.00		-0.01		0.00
		(1.48)		(-0.81)		(0.79)
Company size	-0.002***	-0.002***	-0.25***	-0.25***	-0.004***	-0.004***
	(-26.91)	(-26.78)	(-27.10)	(-25.95)	(-28.83)	(-28.94)
Total trading volume	0.00***	0.00***	0.15***	0.15***	0.00***	0.00***
	(19.75)	(18.54)	(20.63)	(19.88)	(22.28)	(21.41)
Sales growth	0.001***	0.001***	0.02***	0.02***	0.001***	0.001***
	(8.76)	(8.87)	(3.44)	(3.40)	(7.69)	(7.79)
Leverage	0.002***	0.002***	0.27***	0.27***	0.004***	0.003***
	(3.88)	(3.68)	(4.64)	(4.67)	(4.32)	(4.16)
Intangibles	0.01***	0.01***	0.53***	0.51***	0.01***	0.01***
	(7.40)	(7.31)	(5.18)	(4.97)	(6.36)	(6.28)
Int accounting standards	0.002***	0.003***	0.25***	0.31***	0.003***	0.004***
	(8.93)	(10.90)	(8.66)	(10.25)	(6.71)	(9.34)
Ownership concentration	0.00001***	0.00001***	0.004***	0.004***	0.0001***	0.0001***
	(10.41)	(11.02)	(7.49)	(7.72)	(10.01)	(10.53)
Analysts following	0.00	0.00	-0.10***	-0.09***	0.001***	0.001***
	(0.83)	(1.03)	(-6.00)	(-5.54)	(2.95)	(2.96)

Table 3.9 continued

	Return volatility		Volatility ratio		High-low ratio	
	(1)	(2)	(1)	(2)	(1)	(2)
GDP per capita	0.03***	0.03***	3.23***	3.13***	0.05***	0.05***
	(7.49)	(7.80)	(6.55)	(6.37)	(6.14)	(6.50)
Market size	-0.004***	-0.005***	-0.24***	-0.23***	-0.01***	-0.01***
	(-8.11)	(-8.59)	(-3.84)	(-3.71)	(-7.22)	(-7.77)
Legal index	-0.01***	-0.01***	-0.42***	-0.40***	-0.01***	-0.01***
	(-7.00)	(-7.34)	(-3.59)	(-3.43)	(-6.28)	(-6.71)
Accounting opacity	0.10***	0.10***	7.67***	7.36***	0.17***	0.17***
	(7.31)	(7.65)	(4.77)	(4.61)	(6.27)	(6.63)
Inverse Mills Ratio	0.06***	0.06***	4.29***	4.13***	0.10***	0.10***
	(8.12)	(8.44)	(5.17)	(5.00)	(6.98)	(7.34)
Intercept	-0.37***	-0.37***	-35.35***	-34.14***	-0.57***	-0.58***
	(-7.20)	(-7.47)	(-6.04)	(-5.86)	(-5.90)	(-6.20)
Industry fixed effects	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
R-sq	*0.2800*	*0.2855*	*0.2523*	*0.2547*	*0.3166*	*0.3227*
N observations	*149,640*	*149,640*	*149,640*	*149,640*	*149,640*	*149,640*
N stocks	*2,180*	*2,180*	*2,180*	*2,180*	*2,180*	*2,180*
Coefficient Estimates Difference:						
Cross-listed - Cross-traded	*0.000*	*0.000*	*0.014*	*-0.379*	*-0.003*	*0.001*
Wald test (Pr > F stats)	***0.383***	***0.996***	***0.798***	***0.118***	***0.004***	***0.803***

Table 3.10 Cross-listing and/or cross-trading and the evolution of stock liquidity and volatility

Panel A of Table 3.10 reports the estimates from the OLS regressions of the dependant variables: bid-ask spread, trading volume, total trading volume, turnover ratio and total turnover ratio, defined in Table 3.1. In the regressions, foreign presence, cross-listing, cross-trading variables are replaced by a series of the year-specific dummy variables relative to the year of foreign presence, cross-listing, cross-trading accordingly (year 0). Model specification: $Liquidity\ Measure_{i,t} = \alpha + \Sigma\gamma Y_n + \Sigma\beta D_{i,t}V_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, where Y_n is variable representing a year relative to the year of foreign presence, cross-listing, cross-trading accordingly (from year -4 and earlier to year +4 and later); $D_{i,t}$ is dummy variable representing foreign presence, cross-listing, cross-trading accordingly, V_i are main stock-specific control variables; $F_{i,t}$ are other control variables. The explanatory and control variables are defined in Table 3.2. Only the coefficient estimates on the year-specific dummies around foreign presence, cross-listing, cross-trading are reported in the Table but the regressions include the full set of control variables as in model (2) of Table 3.6 for foreign presence and model (2) of Table 3.7 for cross-listing and cross-trading. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

		Years relative to foreign presence/ cross-listing/ cross-trading								
		≤-4y	-3	-2	-1	0	+1	+2	+3	≥+4y
	Panel A: Liquidity									
Bid-ask spread										
	Foreign presence	0.018	0.009***	0.012***	0.015***	-0.017***	-0.015***	-0.016***	-0.016***	-0.016***
		(1.42)	(4.65)	(6.51)	(8.59)	(-3.21)	(-2.93)	(-3)	(-3.03)	(-2.73)
	Cross-listed	0	0.004*	0.006**	0.007***	-0.008	-0.005	-0.008	-0.009	-0.011*
		(0.12)	(1.83)	(2.55)	(2.94)	(-1.64)	(-0.85)	(-1.44)	(-1.58)	(-1.91)
	Cross-traded	0.011***	0.012***	0.013***	0.016***	-0.01	-0.012*	-0.012*	-0.011*	-0.01
		(3.63)	(6.14)	(8.18)	(9.8)	(-1.54)	(-1.88)	(-1.86)	(-1.79)	(-1.45)
Trading volume										
	Foreign presence	1.801***	1.237***	1.137***	1.134***	0.613*	0.685**	0.754**	0.693**	0.765**
		(3.83)	(7.74)	(8.22)	(9.03)	(1.94)	(2.21)	(2.36)	(2.11)	(2.17)
	Cross-listed	0.229	0.392**	0.487***	0.739***	1.194**	1.365***	1.281**	1.233**	1.028*
		(0.87)	(1.97)	(2.89)	(5.18)	(2.26)	(2.6)	(2.3)	(2.2)	(1.66)
	Cross-traded	0.847***	1.134***	1.056***	0.938***	0.537	0.486	0.596*	0.529	0.73**
		(3.27)	(7.38)	(7.81)	(7.43)	(1.63)	(1.47)	(1.79)	(1.54)	(2.02)
Total trading volume										
	Foreign presence	1.89***	1.244***	1.185***	1.194***	0.808***	0.838***	0.888***	0.841***	0.863***
		(4.43)	(7.75)	(8.65)	(9.53)	(2.82)	(3.01)	(3.13)	(2.89)	(2.8)
	Cross-listed	0.217	0.407**	0.47***	0.725***	1.792***	1.894***	1.852***	1.776***	1.508***
		(0.85)	(2.27)	(2.86)	(4.91)	(4.48)	(4.9)	(4.56)	(4.46)	(3.57)
	Cross-traded	0.862***	1.194***	1.173***	1.089***	0.699**	0.627*	0.672**	0.638*	0.694*
		(3.43)	(8.15)	(9.15)	(9.07)	(2.1)	(1.89)	(2.01)	(1.84)	(1.89)
Turnover ratio										
	Foreign presence	1.186	0.559***	0.453***	0.473***	-2.517***	-2.169***	-1.98***	-1.845***	-1.389***
		(1.11)	(3.74)	(3.16)	(3.74)	(-7)	(-6.08)	(-5.52)	(-4.98)	(-3.55)
	Cross-listed	-0.133	-0.024	-0.199	-0.046	0.054	0.345	0.317	0.415	0.596
		(-0.42)	(-0.09)	(-0.99)	(-0.24)	(0.11)	(0.75)	(0.67)	(0.86)	(1.18)
	Cross-traded	0.218	0.421***	0.365**	0.426***	-2.295***	-1.999***	-1.733***	-1.49***	-1.19**
		(0.72)	(2.82)	(2.56)	(3.2)	(-5.44)	(-4.66)	(-4.09)	(-3.43)	(-2.55)
Total turnover ratio										
	Foreign presence	1.468	0.514***	0.456***	0.553***	-1.435**	-1.166**	-1.046*	-0.978*	-0.293
		(1.07)	(3.19)	(2.99)	(3.85)	(-2.57)	(-2.03)	(-1.87)	(-1.73)	(-0.45)
	Cross-listed	-0.122	-0.068	-0.273	-0.128	1.07*	1.173**	1.167**	1.152**	1.358**
		(-0.31)	(-0.27)	(-1.21)	(-0.58)	(1.91)	(2.24)	(2.3)	(2.29)	(2.52)
	Cross-traded	0.144	0.48***	0.546***	0.684***	-0.689	-0.354	-0.267	0.023	0.363
		(0.38)	(3.02)	(3.38)	(4.67)	(-0.95)	(-0.47)	(-0.36)	(0.03)	(0.42)

Table 3.10 continued

Panel B of Table 3.10 reports the estimates from the OLS regressions of the dependant variables: return volatility, volatility ratio, and high-low ratio, defined in Table 3.1. In the regressions, foreign presence, cross-listing, cross-trading variables are replaced by a series of the year-specific dummy variables relative to the year of foreign presence/ cross-listing/ cross-trading accordingly (year 0). Model specification: $Volatility\ Measure_{i,t} = \alpha + \Sigma\gamma Y_n + \Sigma\beta D_{i,t}V_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, where Y_n is variable representing a year relative to the year of foreign presence, cross-listing, cross-trading accordingly (from year -4 and earlier to year +4 and later); $D_{i,t}$ is dummy variable representing foreign presence, cross-listing, cross-trading accordingly, V_i are main stock-specific control variables; $F_{i,t}$ are other control variables. The explanatory and control variables are defined in Table 3.2. Only the coefficient estimates on the year-specific dummies around foreign presence, cross-listing, cross-trading are reported in the Table, but regressions include the full set of control variables as in model (2) of Table 3.8 for foreign presence and model (2) of Table 3.9 for cross-listing and cross-trading. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

		Years relative to foreign presence/ cross-listing/ cross-trading								
		≤-4y	-3	-2	-1	0	+1	+2	+3	≥+4y
Panel B: Volatility										
Return volatility										
	Foreign presence	-0.003**	0	0	0.001	-0.003***	-0.004***	-0.004***	-0.004***	-0.003***
		(-2.02)	(0.83)	(0.36)	(1.56)	(-3.77)	(-4.25)	(-4.72)	(-4.07)	(-3.73)
	Cross-listed	0.001*	0	0	0	-0.001	-0.002	-0.002	-0.002	-0.002
		(1.68)	(0.54)	(0.82)	(0.07)	(-0.87)	(-1.21)	(-1.3)	(-1.4)	(-1.07)
	Cross-traded	-0.001	0	0.001	0.001***	-0.003**	-0.003***	-0.003***	-0.003**	-0.003***
		(-1.12)	(-0.14)	(1.51)	(2.9)	(-2.49)	(-2.74)	(-2.88)	(-2.53)	(-2.59)
Volatility ratio										
	Foreign presence	-0.174	-0.01	0.028	0.091	0.017	0.049	0.019	-0.02	-0.141
		(-1.03)	(-0.14)	(0.46)	(1.6)	(0.15)	(0.44)	(0.16)	(-0.18)	(-1.23)
	Cross-listed	1.680	0.540	0.820	0.070	-0.870	-1.210	-1.300	-1.400	-1.070
		(0.01)	(-0.61)	(0.03)	(-0.93)	(-0.69)	(-0.99)	(-0.78)	(-0.84)	(-1.21)
	Cross-traded	-1.120	-0.140	1.510	2.900	-2.490	-2.740	-2.880	-2.530	-2.590
		(-0.08)	(0.13)	(1.86)	(3.54)	(0.95)	(1.15)	(1.09)	(0.47)	(-0.46)
High- low ratio										
	Foreign presence	-0.003	0.003***	0.003***	0.005***	-0.004**	-0.005***	-0.006***	-0.005**	-0.004**
		(-0.94)	(2.6)	(3.06)	(5.47)	(-1.99)	(-2.62)	(-3.09)	(-2.48)	(-2.21)
	Cross-listed	0.001	0	0.002	0.002	0	0	-0.001	0	0
		(0.55)	(-0.03)	(1.14)	(1.53)	(-0.06)	(-0.09)	(-0.2)	(0.01)	(0.03)
	Cross-traded	0	0.003**	0.005***	0.007***	-0.003	-0.004*	-0.004*	-0.004*	-0.004*
		(-0.26)	(2.36)	(4.57)	(6.88)	(-1.28)	(-1.76)	(-1.95)	(-1.77)	(-1.82)

Table 3.11 The changes in stock liquidity, volatility and firm characteristics around cross-listing and cross-trading: Univariate analysis

Panel A of the table reports the number of observations and the mean and the median ratios of the stock liquidity and volatility measures by different listing status. The ratios are calculated as the average liquidity/volatility measure for the period of time when stock is cross-listed and/or cross-traded, over the base liquidity/volatility measure, which is the average liquidity/volatility measure for the period of time during 36 months (at least 24 months) before the cross-listing/ cross-trading. Liquidity and volatility measures are defined in Table 3.1. Stocks with a foreign presence are those that are listed and/or traded on a foreign exchange(s). Stocks with a foreign presence include traded only stocks, i.e. traded abroad without stock exchange listing in addition to the home market listing, cross-listed only stocks, i.e. listed on a foreign exchange in addition to the home market listing, and cross-listed and cross-traded stocks (CL and CT), i.e. cross-listed and cross-traded simultaneously. Additionally, Panel A reports t-statistics and p-value of the test of the difference of the means of the ratios from one and chi-sq statistics and p-value of the Wilcoxon rank sum test of the difference of the medians of the ratios from one (the ratio of one would indicate no change in the liquidity/ volatility measure after cross-listing/ trading). Last two columns report the percentage of observations of the ratios that are less than one and greater than one. N is the number of stocks with available data.

				Mean difference from 1			Median difference from 1 (1)		N < 1,	N > 1,
Variable	Listing/ trading status	N	Mean	t-stats	Pr (t)	Median	Chi-Sq	Pr(Chi-Sq)	% of Total	% of Total
Panel A: Dependent Variables										
Liquidity										
Bid-ask spread	Foreign Presence	491	0.90	2.70	0.01	0.72	130.7	<.0001	71.7%	
Ratio	Traded only	298	0.91	1.74	0.08	0.72	114.0	<.0001	71.8%	
	Cross-listed only	104	1.04	0.51	0.61	0.91	25.0	<.0001	61.5%	
	CL and CT	89	0.70	3.81	0.00	0.48	200.9	<.0001	83.1%	
Trading volume	Foreign Presence	491	8.62	1.71	0.09	1.69	153.8	<.0001		73.5%
Ratio	Traded only	298	2.58	5.49	<.0001	1.48	97.7	<.0001		70.1%
	Cross-listed only	104	5.13	2.14	0.04	1.43	69.5	<.0001		69.2%
	CL and CT	89	32.93	1.31	0.19	2.93	290.2	<.0001		89.9%
Total trading	Foreign Presence	491	9.52	1.89	0.06	1.91	261.1	<.0001		80.7%
volume Ratio	Traded only	298	2.90	6.09	<.0001	1.73	210.2	<.0001		79.5%
	Cross-listed only	104	6.61	2.46	0.02	1.60	91.9	<.0001		72.1%
	CL and CT	89	35.07	1.39	0.17	3.28	360.2	<.0001		94.4%
Turnover ratio	Foreign Presence	491	2.54	3.58	0.00	1.39	100.8	<.0001		69.00%
Ratio	Traded only	298	1.74	4.05	<.0001	1.31	57.4	<.0001		65.4%
	Cross-listed only	104	2.26	2.56	0.01	1.22	50.2	<.0001		66.3%
	CL and CT	89	5.53	2.42	0.02	2.15	214.7	<.0001		84.3%
Total turnover	Foreign Presence	491	3.27	5.45	<.0001	1.66	217.9	<.0001		78.0%
ratio Ratio	Traded only	298	2.45	5.36	<.0001	1.54	173.7	<.0001		76.8%
	Cross-listed only	104	2.80	3.13	0.00	1.37	84.1	<.0001		71.2%
	CL and CT	89	6.59	2.83	0.01	2.30	290.9	<.0001		89.9%
Volatility										
Return volatility	Foreign Presence	491	1.09	3.06	0.00	1.01	0.3	0.55	48.9%	
Ratio	Traded only	298	1.02	0.89	0.38	0.98	2.7	0.10	53.4%	
	Cross-listed only	104	1.21	1.92	0.06	1.08	4.3	0.04	45.2%	
	CL and CT	89	1.22	2.40	0.02	1.07	25.5	<.0001	38.2%	
Volatility ratio	Foreign Presence	491	1.15	3.33	0.00	1.02	2.1	0.15	47.3%	
Ratio	Traded only	298	1.08	4.00	<.0001	1.01	0.7	0.41	48.3%	
	Cross-listed only	104	1.20	1.32	0.19	1.01	0.2	0.68	49.0%	
	CL and CT	89	1.33	2.03	0.05	1.04	13.0	0.00	41.6%	
High- low ratio	Foreign Presence	491	1.20	6.26	<.0001	1.07	16.2	<.0001	42.4%	
Ratio	Traded only	298	1.15	3.58	0.00	1.02	1.7	0.19	47.3%	
	Cross-listed only	104	1.17	3.80	0.00	1.13	17.4	<.0001	40.4%	
	CL and CT	89	1.40	4.46	<.0001	1.25	87.8	<.0001	28.1%	

Table 3.11 continued

Panel B of the table reports the number of observations and the mean and the median ratios of the firm characteristics by different listing/ trading status. The ratios are calculated as the firm characteristic for the period of time when stock is cross-listed and/or cross-traded, over the base firm characteristic, which is the firm characteristic for the period of time during 36 months (at least 24 months) before the cross-listing/ cross-trading. Firm characteristics are defined in Table 3.2. Stocks with a foreign presence are those that are listed and/or traded on a foreign exchange(s). Stocks with a foreign presence include traded only stocks, i.e. traded abroad without stock exchange listing in addition to the home market listing, cross-listed only stocks, i.e. listed on a foreign exchange in addition to the home market listing, and cross-listed and cross-traded stocks (CL and CT), i.e. cross-listed and cross-traded simultaneously. Additionally, Panel B reports t-statistics and p-value of the test of the difference of the means of the ratios from one and chi-sq statistics and p-value of the Wilcoxon rank sum test of the difference of the medians of the ratios from one (the ratio of one would indicate no change in the firm characteristic after cross-listing/ trading). Last column reports the percentage of observations of the ratios that are greater than one. N is the number of stocks with available data.

				Mean difference from 1			Median difference from 1 (1)		N > 1, % of
Variable	Listing/ trading status	N	Mean	t-stats	Pr (t)	Median	Chi-Sq	Pr(Chi-Sq)	Total
Panel B: Firm Characteristics									
Company	Foreign Presence	487	2.83	3.61	0.00	1.47	139.6	<.0001	72.5%
size Ratio	Traded only	295	2.01	5.39	<.0001	1.42	91.0	<.0001	69.5%
	Cross-listed only	103	1.85	4.81	<.0001	1.34	53.9	<.0001	67.0%
	CL and CT	89	6.66	2.13	0.04	2.29	273.5	<.0001	88.8%
IAS Difference	Foreign Presence	447	0.11	7.78	<.0001	0.00	95.4	<.0001	46.3%
	Traded only	270	0.12	7.45	<.0001	0.05	120.1	<.0001	51.9%
	Cross-listed only	94	0.00	0.12	0.90	0.00	0.5	0.49	18.1%
	CL and CT	83	0.22	4.71	<.0001	0.19	126.3	<.0001	60.2%
Analysts	Foreign Presence	435	1.53	5.35	<.0001	0.98	1.4	0.24	47.1%
coverage	Traded only	257	1.44	3.38	0.00	0.90	15.9	<.0001	40.9%
Ratio	Cross-listed only	92	1.64	3.23	0.00	1.06	14.0	0.00	58.7%
	CL and CT	86	1.68	2.91	0.00	1.03	2.7	0.10	53.5%
Ownership	Foreign Presence	403	9.31	1.62	0.11	0.96	8.5	0.00	43.4%
concentration	Traded only	247	2.62	2.73	0.01	0.99	1.4	0.24	46.6%
Ratio	Cross-listed only	83	13.95	1.12	0.26	0.95	12.6	0.00	41.0%
	CL and CT	73	26.69	1.03	0.31	0.80	31.1	<.0001	35.6%
Sales	Foreign Presence	409	1.15	0.53	0.59	0.64	48.8	<.0001	35.2%
growth Ratio	Traded only	247	1.05	0.11	0.91	0.63	48.3	<.0001	34.0%
	Cross-listed only	87	0.99	0.06	0.95	0.79	18.9	<.0001	39.1%
	CL and CT	75	1.68	0.99	0.33	0.58	36.3	<.0001	34.7%
Leverage	Foreign Presence	450	1.04	2.19	0.03	0.99	2.8	0.09	46.4%
Ratio	Traded only	272	1.05	1.98	0.05	1.00	0.3	0.60	48.5%
	Cross-listed only	95	1.02	0.55	0.58	0.99	1.2	0.28	47.4%
	CL and CT	83	1.04	0.88	0.38	0.99	22.0	<.0001	38.6%
Intangibles	Foreign Presence	357	8.50	2.94	0.00	1.35	60.2	<.0001	67.0%
Ratio	Traded only	224	11.21	2.53	0.01	1.35	81.3	<.0001	71.0%
	Cross-listed only	75	2.49	2.77	0.01	1.05	0.6	0.46	52.0%
	CL and CT	58	5.82	3.24	0.00	1.88	57.2	<.0001	70.7%

(1) based on Wilcoxon rank sum test

Table 3.12 The change in stock liquidity and volatility around cross-listing and cross-trading: Regression analysis

The table reports the estimates from the OLS regressions of the dependant variables, the ratios of the bid-ask spread, trading volume, total trading volume, turnover ratio, total turnover ratio, return volatility, volatility ratio, and high-low ratio variables, defined in Table 3.1, to the appropriate base measure, i.e. the average measure for the period of time when the stock had domestic listing status. Model specification: $(Liquidity\ or\ Volatility\ Measure_{i,t} / Liquidity\ or\ Volatility\ Measure_{i,base}) = \alpha + \gamma D_{i,t} + \Sigma\theta(F_{i,t}/F_{i,base}) + \varepsilon_{i,t}$, where $Liquidity\ or\ Volatility\ Measure_{i,base}$ is average liquidity or volatility measure over the period of time when the stock was not listed/ traded abroad; $D_{i,t}$ is dummy variable representing cross-listing or cross-trading accordingly; $F_{i,t}$ are control variables; $F_{i,base}$ is average control variable over the period of time when the stock was not listed/ traded abroad. The control variables (except for the market turnover variable) are calculated as the ratio of the control variables, defined in Table 3.2, to the appropriate base measure, i.e. the average measure for the period of time when the stock had domestic listing status. Market turnover variable is defined in Table 3.2. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Liquidity					Volatility		
	Bid-ask spread Ratio	Trading volume Ratio	Total trading volume Ratio	Turnover ratio Ratio	Total turnover ratio Ratio	Return volatility Ratio	Volatility ratio Ratio	High-low ratio Ratio
Model (1)								
Foreign Presence	**-0.46*** **	**0.81*** **	**0.95*** **	**0.47*** **	**0.76*** **	**-0.03**	**0.02**	**0.14*** **
	(-10.36)	(10.97)	(13.05)	(8.62)	(12.05)	(-1.20)	(0.91)	(4.46)
Intercept	-0.13***	-0.30***	-0.29***	-0.23***	-0.21***	0.07***	0.05***	-0.18***
	(-13.64)	(-13.82)	(-12.76)	(-13.09)	(-9.83)	(6.76)	(5.39)	(-11.33)
Adj. R-sq	*0.063*	*0.086*	*0.125*	*0.047*	*0.095*	*0.0004*	*0.0002*	*0.009*
Model (2)								
Cross-listed	**-0.26*** **	**0.73*** **	**0.79*** **	**0.42*** **	**0.49*** **	**0.01**	**-0.016**	**0.13** **
	(-2.91)	(5.74)	(6.36)	(4.75)	(5.38)	(0.34)	(-0.53)	(2.55)
Cross-traded	**-0.53*** **	**0.82*** **	**0.95*** **	**0.50*** **	**0.79*** **	**-0.02**	**0.03**	**0.14*** **
	(-11.13)	(10.37)	(12.95)	(8.27)	(11.58)	(-0.96)	(1.13)	(3.95)
Intercept	-0.08***	-0.39***	-0.37***	-0.30***	-0.26***	0.06***	0.05***	-0.19***
	(-3.65)	(-10.87)	(-10.96)	(-11.04)	(-8.85)	(5.07)	(4.27)	(-10.51)
Adj. R-sq	*0.112*	*0.152*	*0.204*	*0.088*	*0.145*	*0.0004*	*0.0007*	*0.016*
Model (3)								
Cross-listed	**-0.02**	**0.49*** **	**0.59*** **	**0.31*** **	**0.45*** **	**0.0**	**-0.016**	**0.02**
	(-0.44)	(2.98)	(3.65)	(2.84)	(4.28)	(-0.01)	(-0.48)	(0.38)
Cross-traded	**-0.15*** **	**0.49*** **	**0.66*** **	**0.32*** **	**0.61*** **	**-0.10*** **	**0.002**	**-0.01**
	(-4.96)	(5.45)	(7.87)	(5.11)	(9.16)	(-4.52)	(0.08)	(-0.15)
Company size Ratio	-0.37***	0.27***	0.32***	0.11**	0.13**	-0.09***	-0.07***	-0.11***
	(-13.58)	(3.19)	(4.00)	(2.08)	(2.38)	(-3.93)	(-3.28)	(-2.72)
IAS Difference	-0.42***	0.17	0.31***	0.11	0.35***	-0.14***	-0.06	-0.09**
	(-6.84)	(1.6)	(3.29)	(1.43)	(4.23)	(-4.22)	(-1.63)	(-2.26)
Analysts coverage	0.0	0.0	0.0	0.0001***	0.0	0.0001**	0.0	0.0002**
Ratio	(0.8)	(1.63)	(0.62)	(3.24)	(1.32)	(2.28)	(-1.17)	(2.47)
Own. Concentration	0.0	-0.001***	-0.001***	0.0	0.0	0.0	0.0	0.0
Ratio	(-0.07)	(-5.18)	(-5.42)	(-0.23)	(-1.08)	(-1.34)	(-0.65)	(-1.3)
Turnover ratio	-0.27***					0.14***	0.10***	0.26***
Ratio	(-8.73)					(7.2)	(5.24)	(7.72)
Return volatility	0.63***	0.35***	0.40***	0.31***	0.41***			
Ratio	(23.15)	(3.66)	(7.78)	(3.81)	(5.85)			

Table 3.12 continued

	Liquidity					Volatility		
	Bid-ask spread Ratio	Trading volume Ratio	Total trading volume Ratio	Turnover ratio Ratio	Total turnover ratio Ratio	Return volatility Ratio	Volatility ratio Ratio	High-low ratio Ratio
Sales Growth Ratio						0.0	0.0	0.0
						(0.51)	(-0.53)	(-0.31)
Leverage Ratio						0.05	0.07	0.08
						(0.83)	(1.28)	(1.25)
Intangibles Ratio						0.0	0.0	0.0
						(1.16)	(0.44)	(1.07)
Market turnover	0.0	0.15***	0.05***	0.14***	0.03**			
	(-0.13)	(8.52)	(3.66)	(9.54)	(2.41)			
Intercept	-0.86***	-1.07***	-0.81***	-0.95***	-0.73***	0.0	-0.03	-0.19***
	(-18.06)	(-9.72)	(-11.06)	(-10.21)	(-9.03)	(0.0)	(-0.51)	(-2.69)
Adj. R-sq	*0.549*	*0.282*	*0.315*	*0.234*	*0.245*	*0.087*	*0.046*	*0.175*
N observations	31,404	31,575	31,575	31,575	31,575	22,621	22,621	22,621
N stocks	309	309	309	309	309	238	238	238
Coefficient Estimates Difference:								
CL - CT	***0.124***	***-0.004***	***-0.067***	***-0.007***	***-0.160***	***0.102***	***-0.017***	***0.025***
Wald test (Pr > F)	*<.0001*	*0.7829*	*<.0001*	*0.5293*	*<.0001*	*<.0001*	*0.0385*	*0.009*

Table 3.13 Stock liquidity: Developed vs. emerging home market

The table reports the estimates from the OLS regressions of the dependant variables: bid-ask spread, trading volume, total trading volume, turnover ratio and total turnover ratio, defined in Table 3.1. Model specification: $Liquidity\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is dummy variable representing cross-listing or cross-trading status accordingly; V_i are main control variables; $F_{i,t}$ are other control variables; $\lambda_{i,t}$ is the Inverse Mills Ratio. The explanatory and control variables are defined in Table 3.2. The model is estimated for each liquidity measure for two sub-samples: 1) stocks from developed markets and 2) stocks from emerging markets. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Bid-ask spread		Trading volume		Total trading		Turnover ratio		Total turnover ratio	
	Developed	Emerging	Developed	Emerging	Developed	Emerging	Developed	Emerging	Developed	Emerging
Cross-listed	**-0.02****	**-0.09**	**2.26*****	**3.34****	**2.67*****	**0.94**	**0.57**	**-13.23*****	**0.83***	**17.42*****
	(-2.42)	(-1.38)	(3.62)	(2.56)	(6.13)	(0.58)	(1.41)	(-3.31)	(1.72)	(3.37)
Company size*CL	0.003***	0.01	-0.26***	-0.43***	-0.28***	0.05	-0.06	1.67***	-0.01	-1.37**
	(3.43)	(0.93)	(-3.38)	(-2.79)	(-5.09)	(0.22)	(-1.13)	(3.24)	(-0.22)	(-2.10)
IAS*CL	-0.00	0.00	-0.49**	0.00	-0.03	0.00	-0.64***	0.00	-0.01	0.00
	(-1.31)	(.)	(-2.48)	(.)	(-0.17)	(.)	(-2.61)	(.)	(-0.04)	(.)
Analysts*CL	0.00	0.01	-0.09	-0.54	-0.16	0.21	0.29**	1.31	0.36*	-2.41
	(0.52)	(0.48)	(-0.61)	(-0.87)	(-1.15)	(0.27)	(2.13)	(0.86)	(1.70)	(-0.83)
Cross-traded	**-0.03*****	**-0.03**	**2.12*****	**2.33****	**2.10*****	**1.92***	**-0.53**	**0.56**	**0.84**	**1.20**
	(-3.32)	(-0.90)	(5.63)	(2.52)	(6.05)	(1.94)	(-1.26)	(0.28)	(1.03)	(0.58)
Company size*CT	0.004***	0.00	-0.17***	-0.18	-0.15***	-0.08	0.25***	0.00	0.16*	0.03
	(4.68)	(1.03)	(-3.51)	(-1.22)	(-3.21)	(-0.54)	(4.47)	(0.00)	(1.81)	(0.10)
IAS*CT	0.01***	-0.02*	-0.42***	-0.37	0.11	-0.29	-0.15	1.26	0.67***	1.17
	(5.47)	(-1.84)	(-3.05)	(-0.84)	(0.90)	(-0.63)	(-0.82)	(1.00)	(2.95)	(0.79)
Analysts*CT	-0.00**	-0.00	-0.36***	-0.02	-0.43***	-0.09	0.26**	1.01**	-0.03	0.91*
	(-2.35)	(-0.13)	(-2.76)	(-0.07)	(-4.05)	(-0.33)	(2.08)	(1.97)	(-0.13)	(1.66)
Company size	-0.01***	-0.005***	1.63***	1.72***	1.42***	1.51***	0.13	2.21	-0.15	1.80
	(-28.80)	(-3.31)	(12.48)	(3.81)	(12.65)	(3.22)	(0.86)	(1.58)	(-0.94)	(1.24)
Stock turnover ratio	-0.001***	-0.0003***								
	(-10.29)	(-3.95)								
Return volatility	0.45***	0.17***	41.67***	46.62***	40.96***	47.34***	56.83***	242.94***	60.62***	249.15***
	(16.24)	(2.88)	(20.25)	(12.28)	(20.10)	(12.50)	(25.34)	(13.26)	(25.63)	(13.64)
IAS	-0.01***	-0.00	0.11	0.43**	0.09	0.40**	0.02	-0.41	-0.05	-0.44
	(-10.24)	(-1.35)	(1.60)	(2.37)	(1.22)	(2.20)	(0.27)	(-0.81)	(-0.80)	(-0.85)
Own. concentration	0.0001***	0.00	-0.03***	-0.02***	-0.03***	-0.02***	-0.03***	-0.08***	-0.03***	-0.08***
	(5.21)	(1.15)	(-21.33)	(-4.20)	(-21.55)	(-4.06)	(-24.74)	(-4.66)	(-22.44)	(-4.68)
Analysts residual	0.00	-0.00	0.57***	0.12	0.58***	0.14	0.20***	-0.56	0.18***	-0.47
	(0.52)	(-0.34)	(11.57)	(0.85)	(11.76)	(0.94)	(5.69)	(-1.40)	(4.44)	(-1.16)
Market turnover	0.001***	-0.00	0.12***	0.03**	0.10***	0.02**	0.12***	0.21***	0.11***	0.22***
	(4.84)	(-0.03)	(8.70)	(2.48)	(7.55)	(2.24)	(10.17)	(4.52)	(8.27)	(4.65)
GDP per capita	-0.01**	-0.00	-5.49***	-2.70***	-6.31***	-3.19***	0.18	-2.38	-1.07**	-3.31
	(-2.01)	(-0.33)	(-9.04)	(-3.30)	(-10.48)	(-3.76)	(0.41)	(-0.97)	(-2.30)	(-1.29)
Market size	0.00***	0.00	-0.43***	-1.42***	-0.30***	-1.38***	0.10	-1.76**	0.28***	-1.61**
	(5.99)	(0.28)	(-5.93)	(-4.97)	(-4.51)	(-4.82)	(1.25)	(-2.32)	(3.35)	(-2.12)
Legal index	-0.004***	0.03***	-0.99***	-0.88***	-0.91***	-0.70**	-0.12*	-1.60**	-0.03	-1.28
	(-7.50)	(4.01)	(-14.73)	(-3.36)	(-14.50)	(-2.58)	(-1.88)	(-2.17)	(-0.47)	(-1.64)
Accounting opacity	-0.04***	1.14***	5.27***	-19.68***	4.06***	-17.83**	2.09***	5.94	0.39	5.38
	(-5.98)	(3.19)	(8.99)	(-2.63)	(7.41)	(-2.41)	(3.43)	(0.38)	(0.63)	(0.33)

Table 3.13 continued

	Bid-ask spread		Trading volume		volume		Turnover ratio		Total turnover ratio	
	Developed	Emerging	Developed	Emerging	Developed	Emerging	Developed	Emerging	Developed	Emerging
Inverse Mills Ratio	0.005***	0.01	1.96***	2.85***	1.50***	2.47**	-0.03	7.68***	-0.64**	6.86**
	(7.84)	(0.81)	(7.29)	(3.05)	(6.48)	(2.55)	(-0.09)	(2.65)	(-1.98)	(2.29)
Intercept	0.18***	-0.45*	48.89***	40.77***	57.49***	45.10***	-3.48	20.45	9.49*	30.73
	(3.25)	(-1.72)	(7.79)	(4.46)	(9.25)	(4.79)	(-0.73)	(0.72)	(1.93)	(1.06)
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	*0.3929*	*0.3385*	*0.6993*	*0.4148*	*0.7154*	*0.4274*	*0.3753*	*0.3850*	*0.4138*	*0.3745*
N observations	*152,755*	*14,787*	*151,405*	*14,786*	*151,408*	*14,786*	*152,755*	*14,787*	*152,755*	*14,787*
N stocks	*2,020*	*327*	*2,018*	*326*	*2,018*	*326*	*2,019*	*326*	*2,020*	*327*

Table 3.14 Stock volatility: Developed vs. emerging home market

The table reports the estimates from the OLS regressions of the dependant variables: return volatility, volatility ratio, and high-low ratio, defined in Table 3.1. Model specification: $Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \gamma\lambda_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is dummy variable representing cross-listing or cross-trading status accordingly; V_i are main control variables; $F_{i,t}$ are other control variables; $\lambda_{i,t}$ is the Inverse Mills Ratio. The explanatory and control variables are defined in Table 3.2. The model is estimated for each liquidity measure for two sub-samples: 1) stocks from developed markets and 2) stocks from emerging markets. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Return volatility		Volatility ratio		High-low ratio	
	Developed	Emerging	Developed	Emerging	Developed	Emerging
Cross-listed	**-0.003****	**0.02**	**-0.17**	**1.02****	**-0.00**	**-0.03***
	(-2.12)	(1.61)	(-0.89)	(2.02)	(-1.09)	(-1.75)
Company size*CL	0.00	-0.00***	0.02	-0.04	0.00	0.00
	(0.71)	(-4.26)	(0.75)	(-1.46)	(1.19)	(0.73)
IAS *CL	-0.001**	0.00	-0.17**	0.00	-0.00***	0.00
	(-2.05)	(.)	(-2.43)	(.)	(-2.70)	(.)
Analysts *CL	-0.001**	-0.01**	-0.13**	-0.02	-0.00*	-0.01***
	(-2.52)	(-2.47)	(-2.24)	(-0.10)	(-1.91)	(-2.84)
Total trading volume*CL	0.00*	0.00	0.02	-0.07	0.00	0.00
	(1.72)	(1.19)	(0.81)	(-1.47)	(0.52)	(1.08)
Cross-traded	**-0.002***	**-0.01*****	**0.12**	**-0.40*****	**-0.00**	**-0.01****
	(-1.66)	(-3.53)	(0.79)	(-2.73)	(-0.62)	(-2.34)
Company size*CT	0.0004**	0.0005**	0.01	0.03	0.00**	-0.00
	(1.98)	(2.00)	(0.50)	(1.13)	(2.56)	(-0.00)
IAS*CT	-0.002***	0.00	-0.26***	-0.02	-0.004***	-0.01
	(-5.52)	(0.13)	(-4.80)	(-0.25)	(-5.90)	(-1.61)
Analysts*CT	0.00	0.00	-0.00	0.09**	0.00	-0.00
	(0.52)	(0.87)	(-0.07)	(2.31)	(0.07)	(-0.47)
Total trading volume*CT	0.00	0.0003**	-0.02	0.04***	0.00	0.002***
	(1.17)	(2.01)	(-0.98)	(2.82)	(0.24)	(3.64)
Company size	-0.002***	-0.001***	-0.27***	-0.09***	-0.005***	-0.004***
	(-25.68)	(-8.93)	(-26.23)	(-7.58)	(-26.95)	(-12.59)
Total trading volume	0.001***	0.001***	0.15***	0.05***	0.002***	0.002***
	(17.27)	(7.25)	(19.03)	(6.03)	(20.08)	(6.83)
Sales growth	0.001***	0.00	0.03***	-0.01	0.001***	-0.00
	(9.07)	(0.21)	(3.36)	(-1.48)	(8.02)	(-0.84)
Leverage	0.002***	0.002**	0.27***	0.13**	0.003***	0.003**
	(3.24)	(2.36)	(4.33)	(2.58)	(3.82)	(2.18)
Intangibles	0.01***	0.01***	0.48***	0.57***	0.01***	0.00
	(7.10)	(3.36)	(4.72)	(3.34)	(6.26)	(0.54)
Int accounting standards	0.003***	0.00	0.35***	-0.07**	0.005***	0.00
	(10.16)	(1.21)	(10.34)	(-1.99)	(9.20)	(1.07)
Ownership concentration	0.00001***	0.00001**	0.004***	0	0.0001***	0.00001***
	(10.08)	(2.08)	(7.43)	(1.40)	(9.86)	(2.63)
Analysts following	0.0002*	-0.001***	-0.11***	-0.11***	0.001***	-0.002***
	(1.67)	(-2.63)	(-6.19)	(-5.05)	(3.75)	(-3.17)

Table 3.14 continued

	Return volatility		Volatility ratio		High-low ratio	
	Developed	Emerging	Developed	Emerging	Developed	Emerging
GDP per capita	0.05***	0.14**	2.84***	-7.71*	0.08***	0.39**
	(10.90)	(2.45)	(4.19)	(-1.70)	(8.95)	(2.29)
Market size	-0.01***	-0.01*	-0.24***	1.17**	-0.01***	-0.05**
	(-10.03)	(-1.95)	(-3.66)	(2.17)	(-8.78)	(-2.25)
Legal index	-0.01***	-0.03**	-0.44***	2.14*	-0.01***	-0.10**
	(-9.05)	(-2.50)	(-3.55)	(1.93)	(-7.91)	(-2.30)
Accounting opacity	0.14***	0.21*	8.00***	-25.29**	0.22***	0.89**
	(10.12)	(1.75)	(4.56)	(-2.48)	(8.53)	(2.33)
Inverse Mills Ratio	0.08***	0.21**	4.46***	-14.59**	0.12***	0.62**
	(10.71)	(2.31)	(4.95)	(-2.03)	(9.06)	(2.30)
Intercept	-0.56***	-1.49**	-31.88***	93.78*	-0.92***	-4.37**
	(-10.60)	(-2.34)	(-4.12)	(1.83)	(-8.70)	(-2.28)
Industry fixed effects	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
R-sq	*0.3006*	*0.1856*	*0.2527*	*0.2083*	*0.3206*	*0.2717*
N observations	*138,102*	*11,538*	*138,102*	*11,538*	*138,102*	*11,538*
N stocks	*1,886*	*294*	*1,886*	*293*	*1,886*	*294*

Appendix 3.1 Correlation matrix

The table reports the correlation matrix of the dependent variable, defined in Table 3.1, and the explanatory and control variables, defined in Table 3.2. The sample includes monthly observations contributed by 2,180 stocks including 425 stocks with a foreign presence.

	Trading volume	Total trading volume	Turnover ratio	Total turnover ratio	Return volatility	Volatility ratio	High-low ratio	Foreign presence	Cross-listed	Cross-traded	Company size	Int. accounting stnds	Analysts coverage	Own. concentration	Sales growth	Leverage	Intangibles	Market turnover	GDP per capita	Market size	Legal index	Accounting opacity
Bid-ask spread	-0.29	-0.30	-0.17	-0.18	0.17	0.11	0.33	-0.22	-0.15	-0.21	-0.50	-0.14	0.01	0.14	0.00	-0.06	-0.05	0.03	0.07	0.11	-0.10	-0.03
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0.74)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Trading volume	1.00	0.99	0.53	0.55	-0.02	-0.03	0.07	0.53	0.35	0.49	0.58	-0.07	0.21	-0.49	0.02	0.08	0.10	0.26	-0.20	0.01	-0.39	0.31
		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Total trading		1.00	0.51	0.56	-0.03	-0.03	0.07	0.56	0.38	0.52	0.61	-0.05	0.21	-0.49	0.02	0.09	0.11	0.24	-0.19	0.01	-0.37	0.29
volume			(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Turnover ratio			1.00	0.95	0.14	0.04	0.22	0.20	0.11	0.22	0.12	-0.06	0.07	-0.23	0.03	0.02	0.04	0.26	-0.34	-0.15	-0.28	0.25
				(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Total turnover				1.00	0.14	0.04	0.21	0.29	0.19	0.30	0.18	-0.03	0.08	-0.25	0.03	0.04	0.05	0.23	-0.32	-0.14	-0.26	0.23
ratio					(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Return volatility					1.00	0.58	0.73	-0.11	-0.07	-0.09	-0.24	0.14	0.12	0.11	0.13	-0.03	0.13	-0.13	-0.09	-0.03	0.16	-0.18
						(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Volatility ratio						1.00	0.36	-0.09	-0.06	-0.09	-0.18	0.17	0.02	0.02	0.00	-0.01	0.13	-0.21	0.17	0.11	0.14	-0.19
							(0)	(0)	(0)	(0.0)	(0)	(0)	(0)	(0)	(0.49)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
High-low ratio							1.00	-0.04	-0.04	-0.03	-0.25	0.12	0.13	0.08	0.13	-0.03	0.12	-0.08	-0.16	-0.07	0.07	-0.09
								(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Foreign presence								1.00	0.63	0.88	0.61	0.00	0.17	-0.31	-0.04	0.12	0.12	0.10	0.05	-0.05	-0.12	0.19
									(0)	(0)	(0)	(0.24)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Cross-listed									1.00	0.35	0.43	-0.02	0.13	-0.23	-0.02	0.10	0.07	0.03	0.05	-0.04	-0.10	0.11
										(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Cross-traded										1.00	0.57	0.03	0.14	-0.26	-0.03	0.10	0.12	0.11	0.06	-0.03	-0.08	0.17
											(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Company											1.00	0.06	0.00	-0.28	0.00	0.17	0.08	0.05	0.06	0.06	-0.04	0.09
size												(0)	(0.66)	(0)	(0.76)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Int. accounting												1.00	-0.02	0.06	0.03	-0.08	0.21	-0.27	0.21	0.07	0.34	-0.33
standards													(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Analysts													1.00	-0.29	-0.03	0.00	0.12	0.00	0.01	0.05	-0.05	-0.09
coverage														(0)	(0)	(0.84)	(0)	(0.47)	(0)	(0)	(0)	(0)
Ownership														1.00	0.06	-0.05	-0.10	-0.09	-0.14	-0.17	0.25	-0.01
concentration															(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Sales															1.00	-0.09	0.07	0.00	-0.09	-0.01	0.01	-0.02
growth																(0)	(0)	(0.14)	(0)	(0)	(0)	(0)
Leverage																1.00	-0.02	0.02	0.08	0.01	0.05	0.03
																	(0)	(0)	(0)	(0.02)	(0)	(0)
Intangibles																	1.00	-0.04	0.20	0.16	0.06	-0.13
																		(0)	(0)	(0)	(0)	(0)
Market turnover																		1.00	-0.08	0.08	-0.50	0.44
																			(0)	(0)	(0)	(0)
GDP per capita																			1.00	0.57	0.18	-0.37
																				(0)	(0)	(0)
Market size																				1.00	-0.17	-0.30
																					(0)	(0)
Legal index																					1.00	-0.44
																						(0)

Appendix 3.2 Stock liquidity and a foreign presence (without the Inverse Mills Ratio)

The table reports the estimates from the OLS regressions of the dependant variables: bid-ask spread, trading volume, total trading volume, turnover ratio and total turnover ratio, defined in Table 3.1. Model (1) specification: $Liquidity\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, and Model (2) specification: $Liquidity\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is foreign presence dummy variable; V_i are main control variables; $F_{i,t}$ are other control variables. Foreign presence dummy variable equals one if the stock is listed and/or traded on a foreign exchange and equals zero otherwise. Control variables are defined in Table 3.2. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Bid-ask spread		Trading volume		Total trading volume		Turnover ratio		Total turnover ratio	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Foreign presence	**0.02*** **	**-0.02*** **	**0.88*** **	**0.81** **	**1.25*** **	**0.95*** **	**0.91*** **	**-1.99*** **	**1.95*** **	**-1.01***
	(12.97)	(-2.89)	(8.86)	(2.49)	(13.28)	(3.29)	(7.15)	(-5.7)	(11.91)	(-1.75)
Company size*FP		0.004***		0.07*		0.08*		0.44***		0.40***
		(6.06)		(1.66)		(1.89)		(8.82)		(5.94)
IAS*FP		0.01***		-0.91***		-0.29**		-0.37**		0.62***
		(7.76)		(-6.9)		(-2.42)		(-2)		(3.01)
Analysts*FP		-0.002**		-0.34***		-0.41***		0.42***		0.30
		(-2.12)		(-3.3)		(-4.3)		(3.61)		(1.56)
Company size	-0.01***	-0.01***	0.66***	0.64***	0.67***	0.65***	0.08***	-0.02	0.08***	-0.002
	(-28.84)	(-27.23)	(34.27)	(30.6)	(35.79)	(31.12)	(3.36)	(-0.54)	(3.12)	(-0.07)
Stock turnover	-0.001***	-0.001***								
	(-15.16)	(-15.63)								
Return volatility	0.39***	0.39***	47.18***	45.38***	45.37***	44.44***	79.23***	77.03***	81.06***	80.44***
	(14.5)	(14.48)	(23.22)	(22.92)	(22.56)	(22.57)	(25.69)	(25.65)	(25.42)	(25.79)
Int accounting standards	-0.01***	-0.01***	-0.05	0.14**	0.06	0.11	-0.38***	-0.23**	-0.21**	-0.30***
	(-7.93)	(-9.64)	(-0.7)	(2.04)	(0.82)	(1.52)	(-3.98)	(-2.43)	(-2.11)	(-3.02)
Ownership concentration	0.0001***	0.0001***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***
	(3.69)	(4.06)	(-22.68)	(-22.56)	(-22.73)	(-22.6)	(-17)	(-16.79)	(-17.42)	(-17.2)
Analysts residual	-0.001**	-0.001	0.54***	0.59***	0.53***	0.60***	0.31***	0.22***	0.25***	0.19***
	(-2.18)	(-1.38)	(11.91)	(12.18)	(11.81)	(12.26)	(6.85)	(4.81)	(4.3)	(3.89)
Market turnover	0.0004***	0.0002**	0.07***	0.07***	0.06***	0.06***	0.20***	0.20***	0.20***	0.18***
	(3.37)	(2.02)	(5.67)	(6.13)	(4.78)	(4.81)	(12.26)	(12.23)	(11.48)	(10.95)
GDP per capita	0.01***	0.01***	-2.11***	-2.11***	-2.27***	-2.27***	-3.96***	-3.87***	-4.33***	-4.24***
	(3.17)	(3.51)	(-17.4)	(-17.68)	(-18.9)	(-19.09)	(-12.16)	(-12.13)	(-13.31)	(-13.14)
Market size	0.005***	0.004***	0.19***	0.18***	0.22***	0.21***	-0.06	-0.11**	0.01	-0.01
	(7.79)	(7.5)	(4.55)	(4.26)	(5.19)	(5.15)	(-1.21)	(-2.14)	(0.26)	(-0.27)
Legal index	-0.003***	-0.003***	-0.50***	-0.50***	-0.48***	-0.48***	-0.37***	-0.41***	-0.34***	-0.37***
	(-5.76)	(-6.34)	(-11.87)	(-12.24)	(-11.75)	(-11.96)	(-7.74)	(-8.66)	(-7.03)	(-7.75)
Accounting opacity	0.005	0.01	3.60***	3.59***	3.04***	3.06***	0.32	0.30	-0.45	-0.42
	(0.89)	(1.14)	(8.95)	(9.08)	(7.71)	(7.88)	(0.69)	(0.65)	(-0.97)	(-0.91)
Intercept	-0.03*	-0.03	17.52***	17.87***	18.84***	19.0***	38.99***	39.27***	41.91***	41.87***
	(-1.72)	(-1.62)	(17.15)	(17.60)	(18.53)	(18.77)	(12.14)	(12.35)	(12.99)	(13.05)
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Adj. R-sq	*0.342*	*0.351*	*0.669*	*0.673*	*0.687*	*0.688*	*0.355*	*0.362*	*0.367*	*0.373*
N observations	*167,542*	*167,542*	*166,191*	*166,191*	*166,194*	*166,194*	*167,542*	*167,542*	*167,542*	*167,542*
N stocks	*2,347*	*2,347*	*2,345*	*2,345*	*2,345*	*2,345*	*2,347*	*2,347*	*2,347*	*2,347*

Appendix 3.3 Stock volatility and a foreign presence (without the Inverse Mills Ratio)

The table reports the estimates from the OLS regressions of the dependant variables, return volatility, volatility ratio, and high-low ratio, defined in Table 3.1. Model (1) specification:
$Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, and Model (2) specification:
$Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is foreign presence dummy variable, V_i are main control variables; $F_{i,t}$ are other control variables. Foreign presence dummy variable equals one if the stock is listed and/or traded on a foreign exchange and equals zero otherwise. Control variables are defined in Table 3.2. Reported in parentheses *t*-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at stock level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Return volatility		Volatility ratio		High-low ratio	
	(1)	(2)	(1)	(2)	(1)	(2)
Foreign presence	**0.0**	**-0.004*** **	**-0.03**	**0.02**	**0.004*** **	**-0.01** **
	(1.18)	(-4.33)	(-0.8)	(0.18)	(5.99)	(-2.44)
Company size*FP		0.0004***		0.004		0.001***
		(2.99)		(0.23)		(3.4)
IAS*FP		-0.003***		-0.36***		-0.01***
		(-8.1)		(-8.23)		(-7.73)
Analysts*FP		0.0		-0.03		-0.001
		(-1.06)		(-0.72)		(-1.03)
Total trading volume*FP		0.0004***		0.01		0.0005**
		(3.29)		(0.68)		(1.97)
Company size	-0.002***	-0.002***	-0.25***	-0.25***	-0.004***	-0.01***
	(-26.67)	(-26.37)	(-27.47)	(-25.74)	(-28.68)	(-28.7)
Total trading volume	0.001***	0.001***	0.15***	0.15***	0.002***	0.002***
	(20.18)	(18.46)	(20.75)	(19.64)	(22.71)	(21.28)
Sales growth	0.0005***	0***	0.03***	0.03***	0.001***	0.001***
	(8.82)	(9.01)	(3.63)	(3.53)	(7.76)	(7.93)
Leverage	0.002***	0.002***	0.27***	0.26***	0.004***	0.003***
	(3.97)	(3.66)	(4.71)	(4.62)	(4.34)	(4.07)
Intangibles	0.006***	0.01***	0.52***	0.5***	0.01***	0.01***
	(7.12)	(7.2)	(5.07)	(4.93)	(6.1)	(6.18)
Int accounting standards	0.002***	0.003***	0.28***	0.36***	0.004***	0.01***
	(10.69)	(12.59)	(9.79)	(11.51)	(8.26)	(10.84)
Ownership concentration	0.00005***	0.00005***	0.004***	0.004***	0.0001***	0.0001***
	(10.76)	(11.39)	(7.8)	(7.98)	(10.33)	(10.93)
Analysts residual	0.0	0.0	-0.1***	-0.09***	0.001***	0***
	(1.03)	(1.36)	(-5.97)	(-5.55)	(3.1)	(3.3)
GDP per capita	-0.003***	-0.003***	0.66***	0.66***	-0.01***	-0.01***
	(-8.28)	(-8.47)	(14.77)	(14.98)	(-8.74)	(-8.87)
Market size	0.0	0.0	0.08***	0.08***	-0.0005**	0***
	(-0.32)	(-1.26)	(5.38)	(4.99)	(-2)	(-2.95)
Legal index	0.001***	0.001***	0.18***	0.17***	0.001***	0***
	(10.44)	(9.76)	(11.89)	(11.55)	(6.42)	(5.71)
Accounting opacity	-0.01***	-0.01***	-0.77***	-0.76***	-0.02***	-0.02***
	(-10)	(-10.22)	(-5.42)	(-5.41)	(-9.37)	(-9.47)
Intercept	0.05***	0.05***	-4.88***	-4.81***	0.11***	0.11***
	(16.61)	(18.04)	(-13.53)	(-13.57)	(14.43)	(15.24)
Industry indicators	yes	yes	yes	yes	yes	yes
Year indicators	yes	yes	yes	yes	yes	yes
Adj. R-sq	*0.275*	*0.280*	*0.250*	*0.253*	*0.311*	*0.318*
N observations	*149,788*	*149,788*	*149,788*	*149,788*	*149,788*	*149,788*
N stocks	*2,180*	*2,180*	*2,180*	*2,180*	*2,180*	*2,180*

Appendix 3.4 Stock liquidity and a foreign presence: Firm fixed effects and random effects models

The table reports the estimates from the fixed-firm effects and random effects regressions of the dependant variables: bid-ask spread, trading volume, total trading volume, turnover ratio and total turnover ratio, defined in Table 3.1. Model specification: $Liquidity\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is foreign presence dummy variable; V_i are main control variables; $F_{i,t}$ are other control variables. Foreign presence dummy variable equals one if the stock is listed and/or traded on a foreign exchange and equals zero otherwise. The explanatory and control variables are defined in Table 3.2. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses is *t*-value. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Bid-ask spread		Trading volume		Total trading volume		Turnover ratio		Total turnover ratio	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
	Fixed Effects	Random Effects	Fixed Effects	Random Effects	Fixed Effects	Random Effects	Fixed Effects	Random Effects	Fixed Effects	Random Effects
Foreign presence	**-0.02*** **	**-0.02*** **	**-0.06**	**-0.07**	**-0.12*** **	**-0.12*** **	**-1.31*** **	**-1.48*** **	**-1.11*** **	**-1.25*** **
	(-19.21)	(-18.13)	(-1.40)	(-1.59)	(-2.92)	(-2.88)	(-11.96)	(-13.68)	(-9.54)	(-10.90)
Company size*FP	0.004***	0.004***	0.05***	0.05***	0.07***	0.07***	0.27***	0.30***	0.30***	0.32***
	(22.25)	(22.25)	(8.34)	(8.52)	(12.15)	(12.13)	(18.68)	(20.49)	(19.05)	(20.78)
IAS*FP	0.003***	0.004***	0.02	-0.00	0.16***	0.15***	0.66***	0.66***	1.00***	1.00***
	(7.83)	(8.86)	(1.05)	(-0.23)	(11.10)	(9.87)	(17.27)	(17.20)	(24.73)	(24.61)
Analysts*FP	-0.001***	-0.002***	0.11***	0.15***	0.06***	0.10***	0.29***	0.37***	0.25***	0.34***
	(-2.67)	(-5.52)	(10.62)	(14.19)	(5.41)	(9.22)	(10.47)	(13.66)	(8.55)	(11.89)
Return volatility	0.38***	0.41***	25.64***	23.45***	25.68***	23.25***	59.24***	54.46***	63.67***	58.21***
	(48.87)	(54.72)	(95.03)	(88.02)	(96.24)	(88.10)	(85.80)	(80.53)	(86.86)	(81.09)
Stock turnover ratio	-0.001***	-0.001***								
	(-29.05)	(-32.83)								
Company size	-0.02***	-0.02***	0.22***	0.26***	0.23***	0.28***	0.08***	0.10***	0.10***	0.14***
	(-146.53)	(-157.68)	(55.33)	(69.53)	(59.63)	(74.44)	(7.86)	(11.15)	(9.58)	(13.69)
Int acc. standards	-0.002***	-0.002***	0.11***	0.11***	0.09***	0.09***	0.11***	0.19***	0.04*	0.18***
	(-7.85)	(-9.44)	(12.23)	(13.62)	(9.36)	(11.74)	(4.51)	(9.49)	(1.76)	(8.18)
Analysts following	0.001***	0.001***	0.03***	0.02***	0.05***	0.04***	-0.09***	-0.20***	-0.05***	-0.17***
	(5.74)	(6.34)	(6.26)	(4.59)	(10.70)	(8.38)	(-6.97)	(-15.76)	(-3.81)	(-12.50)
Own. concentration	0.0001***	0.0001***	-0.01***	-0.01***	-0.01***	-0.01***	-0.02***	-0.02***	-0.02***	-0.02***
	(12.14)	(12.74)	(-76.61)	(-78.34)	(-77.37)	(-79.01)	(-42.34)	(-43.20)	(-42.96)	(-43.88)
Market turnover	0.0001**	0.00	0.05***	0.05***	0.03***	0.03***	0.12***	0.12***	0.11***	0.11***
	(2.03)	(0.23)	(36.93)	(37.37)	(24.60)	(24.00)	(35.27)	(35.80)	(29.13)	(29.58)
GDP per capita	-0.01***	-0.01***	-0.18*	1.04***	-0.16*	1.25***	1.78***	1.73***	1.52***	2.02***
	(-3.45)	(-6.63)	(-1.92)	(36.42)	(-1.76)	(43.96)	(7.60)	(24.91)	(6.10)	(27.60)
Market size	0.01***	0.01***	-0.22***	-0.18***	-0.24***	-0.22***	-0.03	-0.30***	-0.20***	-0.40***
	(24.56)	(25.93)	(-15.34)	(-21.93)	(-16.56)	(-27.75)	(-0.82)	(-15.06)	(-4.97)	(-19.12)
Accounting opacity		0.05***		6.42***	0.42	6.28***		7.73***		7.50***
		(5.90)		(18.72)	(0.00)	(18.31)		(14.02)		(13.35)
Legal index		-0.00**		-0.57***		-0.58***		-0.61***		-0.63***
		(-2.06)		(-18.56)		(-18.99)		(-12.38)		(-12.60)
Intercept	0.07***	0.07***	5.70***	-7.69***	5.58	-9.06***	-16.38***	-13.87***	-12.16***	-15.37***
	(2.72)	(9.06)	(6.65)	(-27.97)	(0.00)	(-33.18)	(-7.44)	(-22.34)	(-5.21)	(-23.58)
Year fixed effects	yes	no	yes	no	yes	no	yes	no	yes	no
R-sq	*0.6622*	*0.2884*	*0.9246*	*0.4594*	*0.9286*	*0.4573*	*0.6882*	*0.1186*	*0.6827*	*0.1305*
N stocks	*2,347*	*2,347*	*2,345*	*2,345*	*2,345*	*2,345*	*2,347*	*2,347*	*2,347*	*2,347*
N observations	*167,542*	*167,542*	*166,191*	*166,191*	*166,194*	*166,194*	*167,542*	*167,542*	*167,542*	*167,542*

Appendix 3.5 Stock volatility and a foreign presence: Firm fixed effects and random effects models

The table reports the estimates from the fixed-firm effects and random effects regressions of the dependant variables: return volatility, volatility ratio, and high-low ratio, defined in Table 3.1. Model specification: $Volatility\ Measure_{i,t} = \alpha + \beta D_{i,t} + \Sigma\beta_1 D_{i,t} V_{i,t} + \Sigma\theta F_{i,t} + \varepsilon_{i,t}$, where $D_{i,t}$ is foreign presence dummy variable, V_i are main control variables; $F_{i,t}$ are other control variables. Foreign presence dummy variable equals one if the stock is listed and/or traded on a foreign exchange and equals zero otherwise. The explanatory and control variables are defined in Table 3.2. Number (N) of observations is the number of stock-months observations of available data. Reported in parentheses is *t*-value. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

	Return volatility		Volatility ratio		High-low ratio	
	(1)	(2)	(1)	(2)	(1)	(2)
	Fixed Effects	Random Effects	Fixed Effects	Random Effects	Fixed Effects	Random Effects
Foreign presence	**0.003*** **	**0.001*** **	**0.39*** **	**0.10***	**0.00**	**0.00**
	(6.21)	(3.18)	(6.22)	(1.70)	(0.31)	(0.15)
Company size*FP	-0.0004***	-0.0003***	-0.01	0.01	-0.0004***	-0.0005***
	(-5.91)	(-5.03)	(-1.08)	(1.46)	(-3.77)	(-4.33)
IAS*FP	-0.001***	-0.001***	-0.20***	-0.24***	-0.003***	-0.003***
	(-9.04)	(-10.14)	(-9.84)	(-11.68)	(-12.72)	(-13.48)
Analysts*FP	-0.001***	-0.001***	0.02	0.15***	-0.001***	-0.003***
	(-6.14)	(-13.59)	(1.43)	(9.74)	(-7.58)	(-15.52)
Total trading volume*FP	-0.00	0.00***	-0.08***	-0.08***	0.001***	0.001***
	(-0.77)	(4.72)	(-10.52)	(-11.70)	(7.63)	(12.90)
Company size	-0.001***	-0.002***	-0.08***	-0.14***	-0.005***	-0.01***
	(-34.89)	(-61.84)	(-13.29)	(-28.81)	(-66.35)	(-90.80)
Total trading volume	0.002***	0.002***	0.28***	0.27***	0.003***	0.003***
	(88.01)	(78.59)	(80.60)	(83.66)	(75.47)	(70.79)
Sales growth	0.0002***	0.001***	-0.02***	-0.04***	0.001***	0.001***
	(12.12)	(27.46)	(-5.96)	(-13.77)	(18.00)	(31.41)
Leverage	0.002***	0.002***	0.68***	0.44***	0.003***	0.003***
	(11.89)	(10.60)	(23.44)	(16.28)	(9.16)	(8.87)
Intangibles	0.002***	0.004***	0.09*	0.12***	0.01***	0.01***
	(6.75)	(13.48)	(1.93)	(2.75)	(10.00)	(18.22)
Ownership concentration	0.00001***	0.00001***	0.003***	0.003***	0.0001***	0.0001***
	(18.33)	(21.37)	(10.35)	(11.01)	(19.45)	(22.66)
Int accounting standards	0.002***	0.0002**	0.02	0.02	0.003***	0.001***
	(18.09)	(2.18)	(1.34)	(1.50)	(23.31)	(10.76)
Analysts following	0.0001**	0.001***	-0.13***	-0.21***	0.001***	0.001***
	(2.40)	(15.40)	(-17.91)	(-30.36)	(9.78)	(17.30)
GDP per capita	0.02***	-0.01***	0.14	1.24***	0.02***	-0.02***
	(21.46)	(-38.33)	(1.09)	(39.51)	(11.38)	(-37.76)
Market size	-0.001***	0.003***	-0.44***	-0.30***	0.001***	0.01***
	(-3.78)	(41.74)	(-21.18)	(-32.07)	(5.84)	(49.17)
Accounting opacity		-0.02***		-3.42***		-0.01***
		(-14.97)		(-24.36)		(-3.56)
Legal index		0.00***		0.15***		0.004***
		(23.93)		(11.56)		(15.92)
Intercept	-0.16***	0.08***	4.99***	-6.03***	-0.14***	0.13***
	(-19.24)	(38.45)	(4.18)	(-22.45)	(-10.23)	(33.77)
Year indicators	yes	no	yes	no	yes	no
R-sq	*0.4696*	*0.1594*	*0.4080*	*0.0717*	*0.5268*	*0.1907*
N observations	*149,788*	*149,788*	*149,788*	*149,788*	*149,788*	*149,788*
N stocks	*2,180*	*2,180*	*2,180*	*2,180*	*2,180*	*2,180*

Appendix 3.6 Change in firm characteristics related to company size around cross-listing/ trading

The appendix reports the number of observations and the mean and the median ratios of firm characteristics related to company size by different listing/ trading status. The ratios are calculated as the firm characteristic for the period of time when stock is cross-listed and/or cross-traded, over the base firm characteristic, which is the firm characteristic for the period of time during 36 months (at least 24 months) before the cross-listing/ cross-trading. Company size is the stock market capitalization. Number (N) of shares outstanding is the total number of ordinary shares that represent the capital of the company. Stock price is the official closing price of the stock. Total assets are the annual Worldscope data on the value of the firm's total assets. Book value represents the book value of the equity capital of the company at the company's fiscal year end. Long-term debt represents all interest bearing financial obligations, excluding amounts due within one year. Market capitalization, price, total assets, book value and long-term debt data are obtained from Datastream. Stocks with a foreign presence are those that are listed and/or traded on a foreign exchange(s). Stocks with a foreign presence include traded only stocks, i.e. traded abroad without stock exchange listing in addition to the home market listing, cross-listed only stocks, i.e. listed on a foreign exchange in addition to the home market listing, and cross-listed and cross-traded stocks (CL and CT), i.e. cross-listed and cross-traded simultaneously. Last column reports the percentage of observations of the ratios that are greater than one. N is the number of stocks with available data.

Variable	Listing/ trading status	N	Mean	Median	N > 1, % of Total
Company size Ratio	Foreign Presence	487	2.83	1.47	72.5%
	Traded only	295	2.01	1.42	69.5%
	Cross-listed only	103	1.85	1.34	67.0%
	CL and CT	89	6.66	2.29	88.8%
N of shares	Foreign Presence	469	4.77	1.22	
outstanding Ratio	Traded only	282	2.63	1.18	75.9%
	Cross-listed only	102	2.20	1.05	61.8%
	CL and CT	85	14.98	1.90	88.2%
Stock price Ratio	Foreign Presence	473	2.01	1.26	
	Traded only	283	1.47	1.20	60.1%
	Cross-listed only	102	1.49	1.21	58.8%
	CL and CT	88	4.35	1.59	75.0%
Total assets Ratio	Foreign Presence	444	2.35	1.40	
	Traded only	267	1.84	1.35	75.7%
	Cross-listed only	96	1.61	1.15	60.4%
	CL and CT	81	4.89	2.20	87.7%
Book value Ratio	Foreign Presence	363	1.62	1.22	
	Traded only	223	1.61	1.19	68.6%
	Cross-listed only	77	1.32	1.09	59.7%
	CL and CT	63	2.05	1.62	84.1%
Long-term debt	Foreign Presence	415	7.01	1.58	
Ratio	Traded only	248	5.13	1.57	72.6%
	Cross-listed only	89	4.99	1.23	61.8%
	CL and CT	78	15.30	2.57	83.3%

Chapter 4
The determinants of the foreign trading volume of cross-listed stocks

4.1 Introduction

Globalization has opened up new possibilities for companies to have their shares listed and traded on foreign markets. In addition, recent technological advances, particularly the emergence of electronic trading systems, have resulted in significantly intensified competition within the stock exchange industry. In response, stock exchanges have gone through dramatic changes over the last decades.[65] In the new business environment, a stock exchange's competiveness is a function of the exchange's ability to 'attract order flow and so provide liquidity to investors' (Aggarwal, 2002).[66]

This chapter contributes to the literature by addressing the following research question: What determines the distribution of trading of cross-listed stocks? The implications of the location of trading of cross-listed stocks are investigated both from the point of view of stock exchanges and also from the point of view of companies. From a stock exchange perspective, it compares the ability of stock exchanges to attract trading of foreign stocks. This contributes to the literature that has examined how stock exchanges can attract stocks for listing (Pagano et al, 2001; Fernandes and Giannetti, 2009). From a corporate perspective, this study examines stock-level determinants of the distribution of foreign trading volume. Because the study analyzes the case of stocks from multiple countries traded in various foreign stock exchanges, it adds to the literature that has examined the determinants of foreign trading volume distribution of non-US

[65] The changes in the stock exchange industry have included the demutualization of stock exchanges and stock exchanges becoming for-profit entities. This has been accompanied by stock exchange consolidations, the development of new market segments and alternative markets and the introduction of new trading systems and platforms.

Some evidence from the financial press on the intensified competition and the changes in stock exchange industry include: "In New York: Big Board faces growing threats from its rivals", The Asian Wall Street Journal (January, 20, 2000); "Stock market shakeout: A wave of stock market mergers heralds a new era of competition", National Post (July, 20, 2000); "Exchanges face up to competition", Financial News (February, 22, 2004).

[66] Anecdotal evidence on the importance of trading volumes for the stock exchanges survival includes: "Lack of volume brings end to financial chapter", The Boston Globe, (October, 3, 2007).

stocks that cross-list in the US (Pulatkonak and Sofianos, 1999; Baruch et al, 2007; Halling et al, 2008). As a further contribution, this study examines the role of stock exchange characteristics as the determinants of the trading volume distribution of cross-listed stocks. In addition, this study considers the role of firm specific factors in the ability of a stock exchange to attract trading volumes of foreign stocks. This is important because some provisions of stock exchanges may be suitable for some firms but not for others.[67] Detailed discussion of the above contributions of this chapter follows.

The ability of a stock exchange to attract trading volumes is determined by the quality of the trading environment. Previous research shows that the quality of the equity listing and trading environment is positively associated with the demutualized status of the exchange (Hughes and Zargar, 2006; Krishnamurti et al, 2003), the implementation of electronic trading (Jain, 2005), and the introduction and enforcement of insider trading regulation (Fischer, 1992; Bhattacharya and Daouk, 2002; Beny, 2005). In the integrated financial markets, however, the competitive position of a stock exchange can be further strengthened by focusing on attracting business from abroad and several studies have examined the ability of a stock exchange to attract foreign listings (Pagano et al, 2001; Fernandes and Giannetti, 2009). There is no evidence, however, on the determinants of the ability of a stock exchange to attract trading volumes of foreign stocks. This study contributes to the market microstructure literature by evaluating the ability of stock exchanges to attract foreign equity trading and by assessing the stock exchange characteristics that affect the location of trading of foreign stocks.

Knowledge of the determinants of foreign trading volume is also important for cross-listed companies. Companies choose to cross-list their shares on a foreign exchange in order to gain access to global capital, internationalize and expand their investor base, and improve stock visibility to foreign investors. Chapter 2 and chapter 3 of this thesis document that an international cross-listing is beneficial in terms of the increase in shareholders' wealth and in terms of improvement in stock liquidity and volatility. However, in order to achieve the benefits of cross-listing, it is crucial for cross-listed companies to develop and maintain active stock trading following the cross-listing. Active trading on a foreign exchange after cross-listing is associated with lower trading costs measured by the bid-ask spread (Foerster and Karolyi,

[67] For example the effect of cost of listing, annual fees, and disclosure requirements could depend on firm size.

1998), improved valuation[68] of cross-listed stocks (King and Segal, 2004), and a higher foreign market share of the stock price discovery (Eun and Sabherwahl, 2003). Additionally, data from the industry show that insufficient foreign trading volume of cross-listed stocks is a primary reason for de-listings from foreign exchanges.[69] In addition to the evidence on the stock exchange characteristics that determine foreign trading volumes, this study provides empirical evidence on the stock-specific factors that affect the distribution of trading volume across various foreign host markets.

Theoretical models on multi-market trading highlight the importance of market quality in explaining the location of trading since trading tends to agglomerate on a single market with the most favourable trading environment.[70] However, determining the factors that lead to a more favourable trading environment is an open empirical question. Existing empirical studies provide evidence of the increase in liquidity following a cross-listing (Smith and Sofianos, 1997; Foerster and Karolyi, 1993 and 1998; Karolyi, 1998; Jayakumar, 2002; chapter 3 of this thesis). At the same time, there is evidence of great variability in the foreign market fraction of trading (Pulatkonak and Sofianos, 1999; Baruch et al, 2007; Halling et al, 2008).

Existing empirical evidence on the distribution of trading volume of cross-listed stocks is limited to the evidence from foreign stocks that are listed in the US. Focusing on the US as a single host market has several major limitations. First, such analysis accounts only for the home market's share and the US market's share of trading and ignores trading on other exchanges. However, companies, particularly European companies, have a long tradition of listing on multiple exchanges.[71] Second, empirical findings on the distribution of equity trading from the US market might not be applicable to other host markets due to some distinctive US market characteristics, particularly the time zone difference, which is an important factor in explaining the distribution of equity trading volume (Pulatkonak and Sofianos, 1999). However, in the case

[68] Improved stock liquidity after cross-listing and, accordingly, lower trading costs and reduced illiquidity premium for investors are expected to lower the cost of capital of cross-listed companies (Amihud and Mendelson, 1986; Brennan and Subrahmanyam, 1996; Brennan et al, 1998; Jacoby et al, 2000; and Amihud, 2002).

[69] Survey of 119 de-listing announcement statements by European companies obtained from Factiva news database reveals that the low trading volume on a foreign exchange is by far the main reason for de-listing (named in 53 out of 119 statements).

[70] Theoretical models on multi-market trading have been developed by Kyle (1985), Admati and Pfleiderer (1988), Pagano (1989) and Chowdhry and Nanda's (1991).

[71] For example, Volkswagen AG simultaneously listed its shares on 13 stock exchanges, Bayer AG listed on 10 exchanges, Deutsche Bank AG listed on 10 exchanges, Daimler Chrysler AG listed on 7 exchanges (Abee and Zimmermann, 2006).

of equity trading within Europe, the time zone difference is negligible. Thus, the distribution of trading volume must be driven by other factors that need to be investigated empirically. Finally, analysis of the US as the single foreign host market does not allow the comparison of various host markets and does not provide any evidence on relative host market characteristics that determine the distribution of equity trading. In contrast to the existing research, this study evaluates trading volume distribution of European cross-listed stocks among multiple foreign stock exchanges and trading venues.

While the US exchanges attract foreign companies due to a large investor base and a high level of liquidity, other major non-US stock exchanges are also important as listing and trading locations of foreign stocks. According to the World Federation of Exchanges' statistics, in 2007 listed foreign companies constituted 18% of the total number of listed companies on the NYSE, 10% on NASDAQ, 22% on LSE, 12% on Deutsche Borse, 19% on Euronext and 25% on SWX. In addition to the significant number of foreign companies listed, foreign equity trading contributes significantly to the exchanges' turnover: in 2007 the fraction of foreign equity trading in the total equity trading was 9% on the NYSE, 10% on NASDAQ, 41% on LSE, 8% on Deutsche Borse, 1% on Euronext, and 9% on SWX. The fraction of foreign equity trading differs among the exchanges and this can potentially be explained by variation in the stock exchange characteristics, such as market size, aggregate market liquidity, organizational structure, and market design.

The first part of the analysis of the distribution of foreign equity trading takes place at the stock exchange level and evaluates the characteristics of the host stock exchange that affect trading volume of foreign stocks. Exchange characteristics are considered to be the gravitation forces or the 'pull' factors of trading volume. The exchange's ability to attract foreign equity trading is quantified by the average foreign trading volume share, which is the average (across the stocks traded on the exchange) fraction of the trading volume on a particular foreign exchange out of the total trading volume. Arguably, due to the increasing significance of trading commissions in stock exchange profitability, a trading-volume-based measure of a stock exchange's ability to attract foreign business is a better measure than the 'number of foreign stocks listed' measure used in previous research (Pagano et al, 2001; Fernandes and Giannetti, 2009). Indeed, Aggarwal (2002) states that the main source of a stock exchange's revenues

comes from trading commissions.[72] Trading commissions in turn, are a function of trading volume. Thus, for a stock exchange's survival, it is crucial to succeed in attracting equity trading volumes, including trading volumes of foreign equity.

Furthermore, this study contributes to the literature by providing empirical evidence on the relative attractiveness of regulated markets vs. non-regulated markets (off-exchange venues, such as OTC markets and trading platforms) that differ mainly in terms of additional disclosure and listing requirements. Off-exchange equity trading activity is largely ignored by academic research. Nevertheless, industry statistics show that as much as one third of cash equity trading of European blue chip stocks takes place over-the-counter.[73] Also, Voth (2004) argues that OTC trading in equities is the main source of competition for exchanges.

In the second part of the empirical investigation, analysis of the distribution of foreign equity trading takes place at the stock level. This allows the evaluation of the stock-specific factors that affect the distribution of trading volume across various markets. As discussed above, existing research on the distribution of foreign trading of cross-listed stocks provides evidence from foreign stocks cross-listed in the US. Baruch et al (2007) show that the US share of trading of cross-listed stocks is positively determined by the level of correlation of stock returns with returns of other assets traded on the host market. Halling et al (2008) report that the US share of equity trading depends on a number of company characteristics such as size, volatility and industry and on the level of development of the stock's home market and the extent of investor protection. Using a pooled sample of observations from various host exchanges, this study evaluates stock-level determinants of foreign trading volume distribution. Stock-level determinants include listing characteristics, company characteristics and home country characteristics. Several listing characteristics, including currency of listing, form of listing (depository receipts vs. ordinary listing), and the order of foreign listing (first vs. consequent), have not been evaluated in the prior literature. These variables have become

[72] This is because other sources of revenue have lost their significance: listing fees have been reduced as a result of intensified competition among exchanges, membership fees have been cancelled as a result of the demutualization processes, revenues from sales of market data have diminished as a result of technological advances which dramatically reduced the costs of obtaining such data.

Statistics on the sources of revenue of stock exchanges support the argument on the importance of trading commissions: according to the World Federation of Exchanges' 'Cost & Revenue Survey 2006' listing fees is only a small fraction - on average less than 10% of total revenues of a stock exchange while trading commissions is the major revenue source - on average 50% of the total revenues.

[73] "Exchanging Over the Counter". The Banker (2004), p.49.

available for investigation due to the novelty of the sample used in this study, which consists of stocks that are cross-listed on various exchanges.

Finally, this study examines whether the stock-level determinants of foreign trading volume share differ by host exchange. Pagano et al (2002) show that the US exchanges are more successful in attracting listings of high-growth companies, technology companies and companies with a large share of foreign sales, whereas European exchanges mostly attract listings of companies with a strong record of past profitability.[74] The role of stock-specific factors in explaining the distribution of foreign trading by the host stock exchange is investigated by estimating the determinants of foreign trading distribution individually for major exchanges.

The sample consists of the 795 cross-listed stocks from 25 European countries, including 7 emerging markets. In contrast to the existing empirical studies on the determinants of the US fraction of trading, this study includes in the sample all foreign listing and trading accounts of cross-listed stocks (subject to data availability). In total that gives 2,853 foreign trading accounts on more than 30 foreign stock exchanges (including OTC and trading platforms) over the period from January 1990 to December 2007.

The empirical findings reveal the superior ability of the US stock exchanges to attract foreign equity trading of European stocks. Furthermore, this study shows that such stock exchange characteristics as demutualized status, greater aggregate market liquidity and enforced insider trading laws are positive determinants, while higher trading costs and higher levels of accounting opacity are negative determinants of an exchange's average foreign trading volume share. There is clear evidence, both from exchange level and stock level analysis, that OTC's and trading platforms' accounts generate significantly less active trading activity than stock exchanges' accounts. In addition, the level of investor protection is an important factor in foreign equity trading: markets that provide better investor protection are more successful in attracting trading of foreign stocks.

The results also highlight the importance of stock-specific factors, including listing and company characteristics, in explaining the fraction of trading volume on a foreign exchange.

[74] In addition, there is industry evidence to suggest that exchanges specialize in stocks with particular characteristics. For example, companies traded on the NASDAQ stock exchange differ from those traded on NYSE, most prominently by company size and industry affiliation.

Thus, the fraction of trading on a foreign exchange is higher if it takes place in the same currency as trading on the stock's home market and increases with the duration of listing. Foreign trading volume share is larger for smaller and riskier companies and for stocks that exhibit lower stock correlation returns with market index returns in the host market. Lastly, analysis of the determinants by stock exchange reveals that export-oriented foreign companies have better liquidity in the US. Stocks from emerging markets and from English-speaking countries have most active foreign trading in London, while larger companies from counties with stronger investor protection and a better information environment have a higher foreign trading volume share on VIRTX.

The reminder of the chapter is organized as follows: Section 4.2 provides an overview of the theoretical and empirical literature on multimarket trading. Section 4.3 develops testable hypotheses on the potential determinants of the foreign trading volume distribution. Section 4.4 and section 4.5 describe the methodology and the sample respectively. Section 4.6 presents the empirical findings. Finally, section 4.7 concludes the chapter.

4.2 Literature review

4.2.1 Theoretical background on multimarket trading

The central prediction of theoretical models of multimarket equity trading by Kyle (1985), Admati and Pfleiderer (1988), Pagano (1989) and Chowdhry and Nanda (1991) is that all trades of any asset will gravitate to a single market that offers the most favourable trading conditions.[75] The rationale is that all traders will concentrate on a single market in order to attain the highest possible level of liquidity.

Pagano's (1989) model assumes the presence of more than one market with different characteristics where traders can choose to trade. Accordingly, the depth and liquidity of a market are endogenous and depend on the traders' choice of trading location. Initially, traders are assumed to hold different endowments of the stock. Asset price is modelled as a function of

[75] O'Hara (1995) provides a comprehensive overview of the earlier theoretical literature on liquidity and multimarket trading in Chapter 8.

the demand, which arises as traders need to rebalance portfolios after receiving a random endowment shock. Traders maximize their mean-variance utility function and are aware that the demand affects the market price and, thus, have to base their trading decisions on the expectations of other traders' actions. In a one-market world, an increase in the number of traders in the market has two opposite effects on the expected utility of an investor. On the one hand, it decreases the variance of the stock price and, consequently, lowers the expected utility. On the other hand, it positively affects the asset price and, thus, leads to a higher utility from trading on this market. In cases where a trader can choose between markets, Pagano (1989) defines a two-market conjectural equilibrium with the condition that each trader's expectations about the number of traders on each market and about the endowment variances of traders are accurate, and shows that all traders will concentrate on a single market. In other words, no two-market conjectural equilibrium exists unless the two markets are identical in terms of the number of traders and trading costs, which is possible but highly unlikely. Additionally, the co-existence of two markets is possible when the difference in the trading costs is compensated for by the difference in the market volatility ('speculative value') or by the difference in the number of traders ('liquidity value').

The limitation of Pagano's model is that it ignores information asymmetry issues as it assumes that all risk-averse traders, trading a risky asset in more than one market, have the same information regarding the asset's future value. However, strategic behaviour of informed traders can significantly distort the equilibrium described by Pagano's model. In fact, Kyle (1985) shows that the level of trading by informed traders is determined by market liquidity, which, in turn, depends on trading activity of noise traders. On similar lines, Admati and Pfleiderer (1988) show that the behaviour of informed traders can affect market liquidity. Informed traders intensify the concentration of trading at particular times of the day by liquidity traders, who in turn, cluster their trading in order to avoid the effects of informed trading.

Building upon the framework of Kyle (1985) and Admati and Pfleiderer (1988), which incorporates the presence of information asymmetries in a simultaneous multimarket trading environment, Chowdhry and Nanda (1991) consider informed traders as well as large and small liquidity traders. In contrast to the outcome of Pagano's (1989) model, the co-existence of more than one market that simultaneously trades the same assets is always possible due to the presence of small liquidity traders. Informed and large liquidity traders have the option of

trading in multiple markets. Informed traders would trade in multiple markets in order to maximize profit from private information, and large liquidity traders would trade in order to minimize costs measured by the price impact of a trade. Small liquidity traders trade only on a single market. The price in each market is determined by the order flow, traders' behaviour, trading rules and the mechanisms of this particular market, and, thus, can differ across markets. The more segmented the markets are in terms of information flow, the higher informed traders' expected profits are, due to the presence of small liquidity traders concentrated on a single market. Chowdhry and Nanda (1991) give small liquidity traders discretion to choose the single market where they trade and show that they, predictably, choose the market with the lowest transaction costs and, in equilibrium, will concentrate in the market that has the highest volume of trading by large liquidity traders. In sequence, the market with the concentration of small liquidity traders will attract more trading by informed traders as well as by large liquidity traders. The key implication of Chowdhryand Nanda's (1991) model is that in equity trading there always emerges a dominant market with the most favourable trading conditions that attracts the majority of the trades of the security.

A more recent paper by Domowitz et al (1998) develops a theoretical model of multi-market trading after international cross-listing that focuses on the importance of informational linkages between markets. Building upon the framework of Glosten and Milgrom (1985), Domowitz et al (1998) allow both domestic and foreign investors to trade in the local market as well as in the foreign market where the stock is cross-listed. Trading costs of local and foreign markets are different due to the difference in the costs of gathering information about stock fundamentals. The consequences of the foreign listing in the model depend on the level of informational segmentation between the foreign and domestic markets. Domowitz et al (1998) show that in the case of perfect quotation transparency, cross-listing is followed by improvement in market liquidity, both in terms of trading volume and depth, and by a reduction in stock price volatility. This is due to intensified competition for order flow from both markets, improved informativeness of the stock price and the increased number of analysts following the stock. The model predicts an increase in total trading volume following cross-listing, however, the distribution of trading volume between the foreign and domestic markets is subject to the costs of trading in the foreign market. In the opposite case of complete fragmentation, i.e. no information linkages between the markets, cross-listing is followed by migration of investors to the foreign market and the reduction of trading volume in the domestic market. Furthermore, the

reduction in trading activity leads to higher spreads and higher stock price volatility in the domestic market after cross-listing. To sum up, the key prediction of Domowitz et al's (1998) model is that the consequences of multi-market trading vary significantly depending on the level of informational transparency between foreign and local markets.

The two most recent theoretical models of the multimarket trading by Baruch et al (2007) and Baruch and Saar (2009) emphasize the importance of the level of correlation between stock returns and returns of other securities listed on this market, i.e. the commonality in return patterns, in explaining the market share of equity trading. Both models employ Kyle's (1985) theoretical framework with two markets and three assets: one traded on the first market only, one traded on the second market and one cross-listed, i.e. traded on both markets. Competitive risk-neutral market makers make the market for assets listed on their exchange and can observe the order flow of assets only in their own market. Two groups of investors: informed traders and discretionary liquidity traders, can choose the market to trade or can trade on both markets. Market makers obtain information about the asset not only from the asset's own order flow, but also from the order flow of other assets traded on the market, which is feasible due to the correlation of the assets returns traded on the same market. In equilibrium, the relevance of the order flow of an asset for pricing of another asset in the market is a function of the level of correlation between these assets, which also negatively affects the sensitivity of the asset price to its own order flow. Baruch and Saar (2009) further extend the model to demonstrate how the location of listing affects stock liquidity and show that a stock is more liquid when it is listed on a market where other assets, that exhibit higher level of correlation with the stock return, are traded. On the other hand, Baruch et al (2007) extend the model to analyze the distribution of trading of cross-listed stocks. They show that the level of correlation of returns of cross-listed stock with other assets traded on the market, determines how informative the other assets' order flow for pricing the cross-listed stock is seen to be. Accordingly, both informed and liquidity traders submit a larger proportion of their orders in the market that is more informative. In other words, the market on which the cross-listed stock has higher correlation with the other assets hosts a higher fraction of the trading volume of cross-listed stock.

To summarize, the theoretical models discussed in this section predict the equilibrium distribution of trading volumes for stocks that are traded on more than one market. According to

Pagano (1989), conditions for the co-existence of two markets are unrealistic. Thus, the likely scenario is that only one market with the most favourable transaction costs will survive. Similarly, Chowdhry and Nanda (1991) predict a 'winner takes most' equilibrium, meaning that traders concentrate on the most liquid market. Domowitz et al (1998) show that such an equilibrium is complicated by the degree of information segmentation between two markets. Finally, Baruch et al (2007) and Baruch and Saar (2009) highlight the importance of correlation of stock's returns with that of the other assets traded on the market in explaining the distribution of order flow.

4.2.2 Empirical research on multimarket trading

Cross-listed stocks are traded on more than one market. These markets generally differ significantly in their characteristics and, thus, provide a natural setting for empirical testing of theoretical models of multimarket trading. Empirical literature on the distribution of trading volumes of cross-listed stocks indicates a great variability in the foreign market share of global trading and the explanatory power of its determinants.

The NYSE working paper by Pulatkonak and Sofianos (1999) was the first study to address the question of what factors determine the location of trading of a cross-listed stock. This study examines 1996's global trading data on 254 NYSE-listed non-US stocks and reports that, on average, 34% of total trading volumes of these stocks are contributed by trading on the NYSE. However, they also report a great variability in the foreign trading share across different companies: from 1% for Japanese cross-listed stocks to 95% for Latin American cross-listed stocks. Further, they examine the determinants of the distribution of trading activity including time-zone distance, whether the firm comes from developed or emerging economy, home-market commission rates and several other issue-specific factors. They report that altogether these factors explain 64 percent of the variation, but it is the time zone factor that is the most dominant: companies with home markets that trade around the same time-zone as the US are likely to be more active on the US markets.

Baruch et al (2007) analyse weekly stock returns and volume data on 251 non-US stocks cross-listed in the US and find strong empirical support for the hypothesis that trading volume of internationally cross-listed stocks is higher on exchanges on which cross-listed asset

returns have a greater correlation with returns of other assets traded on that market. They report that the US information factor, a proxy for the informativeness of the US market in explaining returns of the cross-listed stock, is the main determinant of the distribution of trading volumes between home and US markets.

Halling et al (2008) report that foreign trading volumes peak right after the cross-listing date and then decrease dramatically in the subsequent six months. However, they point out considerable cross-sectional variation in the persistence and magnitude of foreign trading. Halling et al (2008) use a sample of 437 non-US companies that are listed in the US and find that the portion of the US trade is higher for smaller, export and high-tech oriented companies and for companies from home markets with higher trading costs and weaker insider trading protection.

To conclude, empirical evidence on the distribution of trading volumes of cross-listed stocks is relatively new and still limited. Moreover, the literature offers empirical evidence on the determinants of foreign trading volume distribution only for non-US stocks that cross-list in the US. Finally, the role of stock exchange characteristics as the determinants of trading volume distribution of cross-listed stocks is totally ignored by the prior literature.

4.3 Testable hypotheses

This study examines the factors that determine the distribution of foreign trading volume of European cross-listed stocks among various exchanges. Arguably, there are two main forces that affect the location of the trading of foreign equity. On the one hand, there is a set of characteristics of a host exchange/market where trading of the stock takes place. On the other hand, there is a set of factors inherent to the traded stock and to the country of its origin. Host market characteristics determine how favorable a foreign trading environment is and, consequently, determine the ability of the host exchange to attract or 'pull' foreign equity trading. In turn, stock-specific factors drive trading volumes towards the foreign market depending on the suitability of a particular host market for the stock. Therefore, the two major groups of determinants are: 1) host market characteristics (the pull factors) and 2) stock-level factors. The pull factors include host exchange characteristics and host country characteristics as

well as characteristics of the host country relative to those of the home country. The stock-level factors include: listing characteristics, company characteristics and home market characteristics. Thus, two general testable hypotheses are as follows:

H1: Host market characteristics determine the ability of the host exchange to attract foreign equity trading.

H2: The distribution of foreign equity trading volume of a stock is significantly affected by firm specific factors.

The forthcoming sections 4.3.1 and 4.3.2 develop specific testable hypotheses on the pull factors and stock-level factors of foreign trading volume distribution. The list of potential determinants of foreign trading volume, including host market characteristics and stock-level factors, and the predicted direction of the effect of the determinants on the foreign trading volume share are presented in Table 4.1.

4.3.1 Host market characteristics: the pull factors of foreign trading

Host market characteristics that potentially affect a stock exchange's ability to attract foreign equity trading, include host stock exchange characteristics such as: the level of disclosure, organizational structure, market design, foreign equity expertise and industry specialization, market size, market liquidity, and trading costs. Other factors include host country characteristics, absolute and relative to those of the home country, such as the quality of legal and information environments.

Level of disclosure: stock exchange vs. trading platform. Cross-listed stocks can be traded on both regulated markets, which are stock exchanges where the stock is listed subject to compliance with listing requirements, and on non-regulated markets, i.e. trading venues where the stock is traded without meeting any disclosure or listings requirements. Specifically, non-regulated markets in the sample include US OTC market and VIRTX and XETRA trading platforms. Since the higher level of disclosure of regulated markets reduces traders' information costs regulated markets are expected to outperform non-regulated markets in terms of attracting trading volumes of foreign stocks.

H1.1: Regulated markets outperform non-regulated markets in terms of attracting trading volumes of foreign stocks.

Exchange characteristic: Demutualization of a stock exchange. One of the main developments in the stock exchange industry since the early 1990s has been the trend to demutualize exchanges from not-for-profit member-owned organizations into publicly owned corporations, mainly as a response to technological advances and the increase in global competition (Aggarwal, 2002). Demutualized exchanges are arguably superior to mutualised exchanges due to a more flexible governance structure, greater investor participation and greater access to global markets and capital (Hughes and Zargar, 2006). Empirical evidence suggests that demutualized stock exchanges provide a better quality market (Krishnamurti et al, 2003) and demonstrate a higher level of technical efficiency (Serifsoy, 2008).

H1.2: Demutualized exchanges have superior ability to attract foreign equity trading compared to that of mutualised exchanges.

Exchange characteristic: Market design: Electronic market vs. Floor trading. The other prominent innovation in the stock exchange industry in the last 20 years has been the dramatic change in market design due to technological advances, specifically, the introduction of automated or electronic trading as an addition to and later a replacement for, traditional floor trading. An electronic market has lower transaction costs due to low development and operating costs and lower implicit costs of trading (Domowitz, 2002). Empirically Jain (2005) shows that, based on the evidence from exchanges from 120 countries, electronic trading enhances liquidity and informativeness of stock markets. In turn, lower transaction costs and higher market efficiency are expected to enhance the ability of the exchange to attract foreign equity trading.

H1.3: Exchanges that have introduced electronic trading platforms have better ability to attract foreign equity trading compared to the period of time before the implementation of electronic trading and also compared to other exchanges that utilize floor trading.

Exchange characteristic: Foreign stock concentration. A stock exchange that has a significant share of foreign companies in its total number of listed companies might have a competitive advantage in attracting trading of foreign stocks, possibly due to market expertise in foreign equity. Pagano et al (2001) show that companies are more likely to cross-list on a foreign exchange that already has a significant number of cross-listed companies. Additionally, Serifsoy (2008) argues that the exchange's share of new foreign listings out of the total number

of new foreign listings worldwide is a measure of the general attractiveness of the capital market.

H1.4: Exchanges with higher share of foreign companies listed have superior ability to attract foreign equity trading.

Exchange characteristic: Industry specialization. Pagano et al (2002) and Sarkissian and Schill (2004) argue that a company's industry is one of the most important factors affecting a cross-listing decision. Companies are more likely to cross-list on a foreign exchange with a higher fraction of cross-listed companies in the same industry (Pagano et al, 2001). Furthermore, Baruch and Saar (2009) argue that 'stock is more liquid when it is listed on a market where 'similar' securities (i.e., securities with which its value innovations are more correlated) are traded' (p. 2240). One of the possible sources of the commonality in returns is the company's industry affiliation.

H1.5: Exchanges with a higher fraction of foreign stocks traded from the same industry attract more active foreign equity trading.

Trade friction: Common language. Sarkissian and Schill (2004) argue that a common language between countries is a proxy for cultural proximity as it often results from shared historical background and cultural proximity and is thus an important determinant of a cross-listing decision. Along similar lines, Grinblatt and Keloharju (2001) find that investors are more likely to trade stocks of companies that communicate in the investor's native language. This can be explained by the fact that the language differential, meaning information barriers between home and foreign markets, gives home market traders an informational advantage over foreign market traders under the assumption that most price-sensitive information is generated in the company's home market.

H1.6: Host market attracts trading of cross-listed stocks more easily when the host and home markets share a common language.

Trade friction: Geographic distance. Geographic distance can be interpreted as a measure of stock's unfamiliarity to foreign traders.[76] Grinblatt and Keloharju (2001) show that

[76] 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.

investors' equity trading activity is negatively related to the distance between the investor and the company's headquarters. Portes and Rey (2005) report that the distance between capital cities is the main negative determinant of cross-border equity flows. In addition, Sarkissian and Schill (2004) provide evidence that corporate cross-listing decisions exhibit a 'proximity bias' meaning that companies tend to cross-list in geographically-approximate markets. Lastly, Halling et al (2008) report that the US share of trading is larger for companies based in countries that are geographically close to the US.

H1.7: Stock's foreign trading volume share is inversely related to the geographic distance between host and home countries.

Trade friction: Market size. According to Fernandes and Giannetti (2009), market capitalization of the host exchange is a positive determinant of the probability of a foreign company listing on the exchange. The equity market size can be interpreted as a proxy for the size of the investor base and the level of equity market development. More developed markets with larger investor bases facilitate market liquidity and, accordingly, are expected to induce equity trading of foreign stocks.

H1.8: Larger markets have superior ability to attract foreign equity trading.

Trade friction: Aggregate market liquidity. Fernandes and Giannetti (2009) report that the probability of listing on a foreign exchange is positively related to the level of liquidity of the foreign exchange and negatively related to the level of liquidity of the home exchange. Serifsoy (2008) suggests that market liquidity measures the market depth and, thus, is a proxy for an exchange's importance and market power.

H1.9: Exchanges that offer a higher level of aggregate market liquidity have a stronger competitive position in attracting foreign equity trading.

Trade friction: Trading costs. When a stock is traded on several exchanges with different levels of trading costs it is reasonable to expect that order flow will migrate to the exchange that offers the lowest costs of execution. Empirically, Pulatkonak and Sofianos (1999) report that higher home market commissions lead to a higher US share of trading. Halling et al (2008) report a strong negative relationship between the level of the home market's financial development, an indirect proxy for transaction costs in the home market, and the US share of trading of cross-listed stocks.

H1.10: Exchanges that offer lower costs of trading have superior ability to attract foreign equity trading.

Host country characteristic: Legal environment. The quality of the legal environment relevant to equity trading is determined by the level of investor protection and enforcement of insider trading legislation in the country. Weak legal investor protection in the country empowers corporate managers to seize private benefits of control and, accordingly, increases the costs of owning and trading stocks for investors and, particularly, for foreign investors who do not understand how the local system works (Shleifer and Vishny, 1997). In a case when a stock is traded on more than one market with different levels of investor protection, the rational expectation is that investors would choose to trade on a market where they are better legally protected.

H1.11: Host markets that offer better legal protection to investors have superior ability to attract foreign equity trading.

The other important consideration for traders is legislation regarding insider trading. The principal aim of insider trading regulation is to prevent insiders with an information advantage from trading at the expense of other traders (Durnev and Nain, 2007). Numerous studies on the benefits of prohibiting insiders from trading argue that regulation reduces the amount of trading based on private information (Durnev and Nain, 2007), decreases adverse selection costs for market participants (Fischer, 1992), improves investor confidence by providing incentives for corporate managers to disclose information (Maug, 2002) and enhances stock price informativeness and market liquidity (Fernandes and Ferreira, 2009; Beny, 2005). Furthermore, Bhattacharya and Daouk (2002, 2009) suggest that the introduction of the regulation itself is not sufficient. It is the enforcement of insider trading laws rather than the existence of such laws that actually results in positive consequences for capital markets. Empirically, Halling et al (2008) show that the difference in the level of enforcement of insider trading legislation between the US and the home market is a significant positive determinant of the US fraction of foreign trading.

H1.12: Host markets that enforce insider trading laws have superior ability to attract foreign equity trading.

Host country characteristic: Information environment. In order to minimize the costs of obtaining reliable information about the stock, investors would choose to trade on a market with a better information environment.

H1.13: Host markets with lower levels of accounting opacity have superior ability to attract foreign equity trading.

4.3.2 Stock-level factors that affect foreign trading volume

Stock-level factors that potentially affect the distribution of equity trading volumes include three main groups of variables: 1) listing characteristics, 2) company characteristics, and 3) home market characteristics.

Listing characteristics

Although some of the listing characteristics that potentially affect the fraction of trading on a foreign exchange have been considered in previous studies (Pulatkonak and Sofianos, 1999; Sabherwal, 2007), the majority of listing characteristics examined in this study are unique and became available for examination due to the novelty of the sample which consists of European stocks traded on various exchanges.

Level of Disclosure: Listed versus traded. In addition to a stock exchange trading, a stock can be traded on over-the-counter (OTC) markets. Furthermore, 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, including the Frankfurt and XETRA exchanges, and VIRTX, the trading platform of the Swiss stock exchange. Often companies are not aware that their stocks are traded on such markets. A stock exchange listing, in contrast to an OTC and alternative markets trading, imposes additional disclosure requirements and, accordingly, results in enhanced stock visibility and lower information costs for investors. Moreover, by meeting stricter listing requirements, companies signal to the market their quality (Chemmanur and Fulghieri, 2006; Fuerst, 1998). In this study, if a stock is traded on the exchange where it is listed, it is referred to as listed account. If a stock is traded on an OTC market or alternative markets where it is admitted to trade rather than listed, it is referred as a traded account.

H2.1: Listed accounts have a higher share of foreign trading volume compared to traded accounts.

Stock visibility: Listing order. Arguably, the incremental increase in the investor base is largest for the first foreign listing. Empirically, Sarkissian and Schill (2009a) find that a first foreign listing has a more profound impact on corporate valuation than subsequent foreign listings.

H2.2: The first foreign exchange listing generates a higher share of foreign trading volume compared to consequent foreign listings.

Stock visibility: Duration of listing/ trading. According to Chordia et al (2007), the duration of listing is a proxy for stock's visibility to investors and, thus, is expected to have a positive relationship with the stock's trading volume on this exchange. Previous research provides contradictory evidence: Pulatkonak and Sofianos (1999) report a positive but insignificant impact of the duration of listing on the US share of trading volume, whereas Halling et al 2008 find that foreign trading volume decreases with the time elapsed since cross-listing, meaning trading of cross-listed stocks eventually migrates back to the home market.

H2.3: The duration of listing/trading on a foreign exchange positively affects the stock's trading volume on this exchange.

Stock visibility: Price level. Pulatkonak and Sofianos (1999) argue that stocks with a higher US dollar price have a larger US share of trading volume because the minimum tick size in New York is generally higher than the minimum tick size on the home market, which makes it difficult for the US market to compete with the home market in attracting order flow. Chordia et al (2007) report that stocks with higher price level experience higher turnover and interpret this result as consistent with the findings of Brennan and Hughes (1991), who show that trading costs are inversely related to price per share.

H2.3: Stock price level is a positive determinant of the stock's share of foreign trading volume.

Trade frictions: Currency of listing. When equity trading in the home and host markets takes place in the same currency, splitting orders between markets is easier for investors as they bypass currency exchange risk and avoid the extra costs involved in converting local currency into a foreign currency.

H2.4: Foreign trading of stock is more active when it takes place in the same currency as the home market trading.

Trade frictions: Depository receipts vs. ordinary listings. Foreign listing can take place in the form of ordinary shares as well as in the form of depository receipts (DRs). Often the DR conversion ratio, i.e. the number of underlying shares represented by a single depository receipt is different from one, making the price of a DR differ from the price of the underlying stock. For US investors ADRs (American DRs) trading could be preferable to trading ordinary shares in the issuer's home market because ADRs trade, clear and settle according to international conventions and offer quotes and dividends in US dollars. On the other hand, trading ADRs could be more expensive than trading ordinary shares as, generally, the Depository[77] charges a per share fee for every share purchased or sold and for dividends accrued. Arguably, the higher costs of trading outweigh the convenience of trading depository receipts.

H2.5: Depository receipts generate a smaller fraction of foreign trading compared to the foreign trading volume share of ordinary stocks.

Company characteristics

Company's visibility: Company size. Larger companies have greater visibility to investors because they release more public information, experience more intensive media attention, have larger advertising budgets and a greater analyst following (Bhushan, 1989; Aggarwal et al, 2005), and, accordingly, have more active trading of their stocks. Even though Kang and Stulz (1997) and Aggarwal et al (2005) report that larger companies have a greater fraction of equity owned by foreign institutional investors, it is not clear whether trading activity in stocks of larger companies would be driven abroad after cross-listing to a higher degree than trading activity in stocks of smaller companies. Empirically, Halling et al (2008) and Baruch et al (2007) show that larger companies have a lower share of the US trading volume. A possible explanation for this is that the trading of stocks of larger companies is anchored in the home market to a higher degree due to the presence of a more established investor base and a strong analyst following.

H2.6: Stocks of smaller companies have a higher share of foreign trading.

[77] Depository is a bank that issues DRs and acts as a registrar, transfer and corporate action agent.

Company's visibility: Growth opportunities. Another commonly used proxy for stock visibility is the company's growth opportunities (Chordia et al, 2007) and this is expected to be a positive determinant of the stock's trading activity. In addition, a company's growth could signal that the company needs to raise capital. In this case, listing on a foreign exchange might be motivated by the 'capital raising for investment' hypothesis (Pagano et al, 2002). Raising capital on a foreign exchange increases the probability of having a larger investor base and more active equity trading on the foreign exchange.

H2.7: Higher-growth stocks have a higher share of foreign trading.

Company's visibility: Foreign sales. Export-oriented companies are more visible to foreign investors due to their presence on the product market of the foreign country. Halling et al (2008) and Baruch et al (2007) argue that the fraction of foreign sales in the company's total sales should be positively related to the ratio of foreign to domestic trading volume.

H2.8: Stocks of companies with a higher fraction of foreign sales have a higher share of foreign trading.

Stock ownership structure: Foreign institutional investors. Baruch et al (2007) and Halling et al (2008) report that the fraction of the firm's shares owned by US institutional investors is a significant positive determinant of the US share of equity trading. Halling et al (2008) argue that institutional investors are likely to supply liquidity and encourage trading activity by other market participants in the market where they operate.

H2.9: Stocks with higher foreign institutional ownership have a higher share of foreign trading.

Stock ownership structure: Ownership concentration. The presence of controlling shareholders limits the ability of portfolio investors to hold the stock (Dahlquist et al, 2003). Thus, concentrated stock ownership is inversely related to stock liquidity (Heflin and Shaw, 2000; Rubin, 2007). Additionally, high ownership concentration could signal poor governance and poor minority investor protection (La Porta et al, 2000).

H2.10: Stocks with higher ownership concentration have a smaller share of foreign trading.

Stock risk. Riskier stocks, i.e. stocks with higher stock price volatility, have a higher level of uncertainty about fundamental values. In turn, higher levels of prediction error and

rebalancing needs of investors would generate higher trading activity in the stock (Chordia et al, 2007). Halling et al (2008) find that stock return volatility, interpreted as a measure of stock sensitivity to new information, is positively correlated with the US share of trading volume.

H2.11: Riskier stocks have a higher share of foreign trading.

Transparency level: accounting standards used. Higher levels of transparency at company level boost investor confidence due to the increased certainty about fundamental corporate values. Transparency at company level can be measured by the quality of the accounting standards used by the company. Adopting enhanced accounting disclosure standards, such as international accounting standards (IAS) or US GAAP, could be a way to overcome the home country's institutional deficiencies, particularly for companies from developing countries (Aggarwal et al, 2005).

H2.12: Stocks of companies that have adopted internationally recognised accounting standards have a higher share of foreign trading.

Stock return correlation with foreign market index returns. Due to the potential portfolio diversification benefits, foreign investors should find stocks that exhibit low correlation of returns with the foreign market index returns appealing. Empirically, Halling et al (2008) report a negative and significant relationship between the correlation of cross-listed stock returns with the US market returns and the US share of equity trading.

H2.13: Stocks that exhibit lower levels of correlation of returns with the foreign market returns have a higher share of foreign trading.

Foreign information factor. Baruch et al (2007) argue that the trading volume of internationally cross-listed stocks is higher on exchanges in which the cross-listed stock returns have a higher level of correlation with returns of other assets traded on that market. They show that the most important determinant of the distribution of trading volumes of stocks cross-listed in the US, is the US information factor, a measure of the incremental contribution of the US market in explaining stock's return.[78]

H2.14: Stocks with a higher foreign information factor have a higher share of trading on the relevant foreign market.

[78] Calculation of the foreign information factor (Baruch et al, 2007) is explained in Appendix 4.1.

Home country characteristics

Home countries in the sample exhibit significant differences in their level of economic development, the maturity of their legal systems, their accounting practices, the level of transaction costs, and their cultural and geographic proximity. These differences can potentially explain the variation in the foreign trading volume share of cross-listed stocks.

Economic development. The sample includes a number of European countries with developed capital markets as well as countries with emerging capital markets such as Central and Eastern European countries. Baruch et al (2007) argue that due to the presence of regulatory constraints and higher overall trading costs in emerging countries, stocks from emerging countries should have higher foreign trading turnover. Empirically, Baruch et al (2007) and Halling et al (2008) show that stocks from emerging markets exhibit a higher fraction of foreign trading.

H2.15: Stocks from emerging markets have a higher share of foreign trading.

Legal environment. As discussed in section 4.3.1, markets with enhanced investor protection and enforced insider trading regulation have a competitive advantage in attracting foreign equity trading. Thus, enhanced legal investor protection in the home country should help to retain trading of cross-listed stocks on the home market.

H2.16: Stocks from home markets with stronger legal protection of investors have a lower share of foreign trading.

H2.17: Stocks from home markets with enforced insider trading regulation have a lower share of foreign trading.

Information environment. Corporate transparency is greatly affected by the quality of accounting standards practised in the company's country of origin. The accounting opacity of the home country is an additional risk factor for foreign investors as it increases valuation uncertainty due to the poor quality and unreliability of accounting information. Thus, it should be negatively related to the attractiveness of the stock to foreign investors (Aggarwal et al, 2005).

H2.18: Stocks from home markets with higher levels of accounting opacity have a lower share of foreign trading.

Trade friction: Trading costs. As discussed in section 4.3.1, markets that offer lower costs of trading to investors have a competitive advantage in attracting foreign equity trading. Thus, higher trading costs in the home market push the trading of cross-listed stocks away from the home market towards markets with lower costs of trading.

H2.19: Stocks from home markets with higher costs of trading have a higher share of foreign trading.

4.3.3 Stock-level factors of foreign trading volume by host stock exchange

Finally, I argue that a stock with particular characteristics would have a different level of trading activity depending on the location of trading. In contrast to existing research on the distribution of trading volume of foreign stocks listed on US exchanges, this study investigates the determinants of the distribution of foreign trading among various host exchanges. Furthermore, the sample structure allows the empirical examination of whether exchanges specialize in different types of stocks, e.g. in terms of size and risk. Based on evidence from industry, I expect that the explanatory power of stock-level factors on the distribution of trading volume varies across host exchanges.

H3: Sensitivity of stock-level factors of foreign trading volume varies by host exchange.

4.4 Methodology

4.4.1 Dependent variables

Analysis is performed initially at the stock exchange level in order to evaluate the exchange-level factors that affect the exchange's ability to attract foreign equity trading and then on the stock-level in order to evaluate the stock-level factors that affect the distribution of the stock's trading volume.

Stock–level dependent variable

Foreign trading volume distribution on the stock-level is measured by the foreign share of equity trading volume, calculated monthly for each stock as the ratio of the number of shares

traded on the exchange to the total number of the shares traded in the same month on all exchanges/ trading venues in the sample[79]:

$$FTVS_{i,n} = NST_{i,n}/(\Sigma^{N}_{n=1}NST_{i,n}) \quad (4.1)$$

where $FTVS_{i,n}$ is the stock *i*'s foreign equity trading volume share on the exchange *n* in month *t;* $NST_{i,n}$ is the number of shares of stock *i* traded on the exchange *n* in month *t.*

The main innovation of this way of calculating foreign trading volume share is that it takes into account trading activity on all the venues where a stock is being traded (subject to data availability). In contrast, the calculation of the US fraction of trading in previous studies (Baruch et al, 2007; Halling et al, 2008) ignores trading on markets other than the stock's home market and the US market. Furthermore, using the number of shares traded for the calculation of foreign trading volume share rather than the dollar value of equity trading, as in Halling et al (2008), eliminates potential bias in the findings due to the currency exchange rate fluctuations.

In order to account for the fact that the foreign trading volume share is bounded between zero and one, the regression analysis uses the logistic transformation of the foreign trading volume share: $logtrFTVS_{i,n} = ln(FTVS_{i,n} / (1- FTVS_{i,n}))$ (4.2)

where $FTVS_{i,n}$ is the stock *i*'s foreign equity trading volume share on the exchange *n* in month *t.*

Exchange–level dependent variable

The ability of a stock exchange to attract foreign equity trading is measured by the exchange's monthly average foreign trading volume share. The exchange's average foreign trading volume share is calculated as the average of the trading volume shares of all foreign stocks traded on the exchange in each month. A stocks' trading volume share on a particular foreign exchange ($TVS_{i,n}$) is calculated as explained above (formula (4.1)).

$$AFTVS_{n} = (\Sigma^{N}_{n=1} FTVS_{i,n})/N \quad (4.3)$$

[79] For example, the Bank of Ireland stock (ISIN: IE0030606259) in 2007 had total trading volume of 18,714 million GBP, including 7,896 million GBP on the home exchange Dublin, and the rest 10,819 million GBP on foreign exchanges, referred to as the foreign trading volume in this study. Foreign trading volumes were contributed by trading on the London stock exchange (10,368 million GBP), on NYSE (446 million GBP), on the Frankfurt stock exchange (3 million GBP) and on the US OTC market (2 million GBP). Thus, the Bank of Ireland stock's foreign trading volume share on the London stock exchange in this example is 55% (=10,368/18,714), on NYSE 2%, on Frankfurt and US OTC market less that 1%.

where $FTVS_{i,n}$ is the stock i's foreign equity trading volume share on the exchange n in month t; $NST_{i,n}$ is the number of shares of stock i traded on the exchange n in month t; $AFTVS_n$ is the average foreign equity trading volume share of the exchange n in month t.

An exchange's average foreign equity trading volume share is an innovative measure of a stock exchange's competitiveness in attracting foreign business as it is a trading volume-based measure in contrast to 'the fraction of foreign stocks listed in the total number of stock listed' measure of a stock exchange's attractiveness for foreign stocks used in previous studies (Pagano et al, 2001; Fernandes and Giannetti, 2009).

In order to account for the fact that the foreign trading volume share is bounded between zero and one, the regression analysis uses the logistic transformation of the average foreign trading volume share: $logtrAFTVS_n = ln(AFTVS_n / (1 - AFTVS_n))$ (4.4)
where $AFTVS_n$ is the average foreign equity trading volume share of the exchange n in month t.

4.4.2 Multivariate regression analysis

The potential determinants of the foreign trading volumes share are evaluated using multivariate regression analysis. Based on the findings of Petersen (2009) and following Baruch et al (2007) the regressions are estimated using OLS procedure with heteroskedasticity consistent (White, 1980) standard errors adjusted to account for the possible correlation within a cluster, also called Rogers or clustered standard errors.[80] In the exchange-level analysis, standard errors are adjusted for cluster by exchange, while in the stock-level analysis the cluster variable is the company's foreign account on a particular exchange. As a robustness test, in some model specifications I additionally control for year-fixed effects by introducing year-specific dummy variables.

Exchange-level multivariate analysis: the pull factors

The first proposition is that host market-specific factors, or the pull factors of the foreign trading volume, can explain an exchange's level of equity trading of foreign cross-listed

[80] Petersen (2009) compares a number of approaches for estimating standard errors in panel data sets where the residuals may be correlated cross-sectionally and across time, and concludes that in the presence of a firm fixed effects (which is the case in this study) only clustered standard errors are unbiased.

stocks. To test this proposition, the monthly average foreign share of equity trading volume, the measure of a stock exchange's ability to attract foreign equity trading, is regressed on a set of exchange-specific and host country-specific variables. In addition, the regression includes a mean size of foreign companies traded on the exchange as a control variable.

$$logtrAFTVS_n = \alpha_0 + \Sigma\, \theta_k\, Z_{k,n} + C_n + \varepsilon_n \quad (4.5)$$

where $logtrAFTVS_n$ is log-transformation of the average foreign equity trading volume share on the host exchange n in month t; $Z_{k,n}$ is characteristic k of host market n in month t; C_n is average size of companies traded on host exchange n in month t (control variable). Estimated coefficients θ_k and their significance indicate the importance of the stock exchange-level factors and host country characteristics in explaining the level of the foreign equity trading.

Stock-level multivariate analysis

The second proposition is that stock-level factors, along with the pull factors, significantly affect the distribution of foreign equity trading volume of cross-listed stocks. The significance of the stock-level factors and the joint significance of the pull and the stock-level factors in explaining the foreign share of equity trading volume of European cross-listed stocks are evaluated at stock level using the following regressions:

$$logtrFTVS_{i,n} = \alpha_0 + \Sigma\, \gamma_j\, X_j + \varepsilon_{i,n} \quad (4.6)$$

$$logtrFTVS_{i,n} = \alpha_0 + \Sigma\, \gamma_j\, X_j + \Sigma\, \theta_k\, Z_{k,n} + \varepsilon_{i,n} \quad (4.7)$$

where $logtrFTVS_{i,n}$ is log-transformation of the stock *i's* fraction of trading volume on the exchange n in month *t;* X_j is vector of stock-level factors; $Z_{k,n}$ is characteristic k of the host market n or characteristic k of the host market n relative to characteristic k of the stock's home market. Where possible, the difference in characteristics between the host and the home markets is used in the regression instead of the host and home market-specific factors individually.

Multivariate analysis: Stock-specific factors by stock exchange

The third proposition is that the determinants vary depending on the trading venue. To test this proposition the loadings of the explanatory variables are estimated individually for all major exchanges in the sample by introducing interaction variables of a stock exchange dummy variable with the explanatory variables. The dependent variable is the foreign share of equity trading volume on the stock level. The regression is as follows:

$$logtrFTVS_{i,n} = \alpha_0 + \Sigma_{n,j}\, \omega_{n,j}\, (D\_SE_n\, X_j) + \varepsilon_{i,n} \quad (4.8)$$

where $logtrFTVS_{i,n}$ is log-transformation the stock *i's* share of trading volume on the exchange *n* in month *t*; D_SE_n is dummy variable that equals one if trading takes place on exchange *n* and zero otherwise; X_j is vector of stock-level factors. Estimated coefficients $\omega_{n,j}$ indicate the loadings of each of the stock-level factors specifically for exchange *n*.

4.4.3 Economic significance

Since the regression analysis uses the logistic transformation of the dependent variable, the interpretation of the estimated coefficients is not straight forward. To overcome this issue, the relative importance of variables is approximated by the economic significance of coefficient estimates calculated following the methodology of Welch (2004) and Bris et al (2007). The economic significance indicates the percentage standard deviations of the dependent variable explained with a one standard deviation change in the explanatory variable. It is calculated as a ratio of the product of the coefficient estimate and the standard deviation of the variable in the sample, termed the unit-normalized coefficient, to the standard deviation of the dependent variable (Bris et al, 2007). Importantly, the economic significance is comparable across explanatory variables.

4.4.4 Multicollinearity concern

The explanatory variables used in the analysis, particularly country characteristics, may exhibit high correlations and, thus, may trigger concerns about multicollinearity. Multicollinearity could inflate the estimates of a parameters variance (Greene, 2008). This in turn inflates the standard errors of the parameter estimates, reducing the significance of the coefficient estimates.

To detect whether multicollinearity is an issue, first, I look at the correlation matrix of the explanatory variables. Second, I estimate variance inflation factors (VIF) for each coefficient estimate.[81] Third, if there is evidence of multicollinearity, I additionally estimate regression specifications that omit the variable with the highest VIF and evaluate whether there

[81] VIF quantifies the severity of the multicollinearity in OLS regression analysis and provides an index that measures how much the variance of the parameter estimates is inflated due to multicollinearity (Wooldridge, 2009).

are any significant changes in coefficient estimates of other variables that are potentially correlated with the omitted variable.

4.4.5 Explanatory variable definitions

Explanatory variables, i.e. potential determinants of foreign trading volume distribution, include two main groups: host market characteristics and stock-level factors. Each of these groups is expected to affect the distribution of trading volumes of cross-listed stocks. Host market characteristics, or the pull factors of foreign trading volume, include host stock exchange characteristics, host country characteristics and host country characteristics relative to home country characteristics. Stock-level factors include company characteristics, listing characteristics, and home country characteristics.

Total trading costs are calculated as a sum of price impact costs, implicit costs and explicit costs, i.e. commissions, from Chiyachantana et al (2004). As a proxy for the level of investor protection, I use the anti-self-dealing index from Djankov et al (2008) that enumerates the legal protection of minority shareholders against expropriation by corporate insiders. The quality of the country's information environment is measured by the quality of accounting information prevailing in the country using the accounting opacity index from Kurtzman et al (2004).[82] The company's growth opportunities are measured by the price-to-book ratio (as in Chordia et al, 2007). Foreign institutional ownership is measured by the fraction of total shares in issue held by institutions domiciled in a country other than that of the stock.

Table 4.2 presents detailed definitions and data sources of all the explanatory variables. Additionally, Appendix 4.1 explains the calculation of the foreign information factor (Baruch et al, 2007).

[82] The most commonly used proxy in the literature for the quality of accounting information on a country level is the accounting standards index from La Porta et al (1998). However, this index captures the differences in the quality of accounting information between various countries based on data from 1990 and, thus, is obsolete today. To add to this, there have also been changes in accounting practices in recent decades, such as the global trend towards the implementation of international accounting standards. In contrast, this study employs a more recent accounting opacity index from Kurtzman et al (2004) that quantifies inadequate accounting and governance practices in 48 countries including emerging markets.

4.5 The sample

The sample consists of European companies that have had their stock cross-listed on at least one foreign stock exchange. The sample here is the same as the sample used in chapter 3.[83]

The final sample consists of 795 companies from 25 different countries with 2,853 foreign accounts, which is about 3.6 accounts per stock. Foreign accounts in the sample include stock exchange listings and also OTC and admitted to trade accounts. In total there are 39 foreign exchanges in the sample. However, out of 39 exchanges only eleven exchanges attract more than 90% of the foreign trading volume of European cross-listed stocks in the sample. Those stock exchanges are: the NYSE, NASDAQ, US OTC, the London stock exchange, Paris, Amsterdam, Milan, Frankfurt, XETRA, the Swiss stock exchange and VIRTX.[84] In this study Datastream is the main data source for company data such as stock price, number of shares traded total return index, market capitalization, price-to-book ratio, fraction of foreign sales and ownership structure.

The final sample includes observations from January 1990 to December 2007. The period of time prior to 1990 is excluded from analysis due to poor data availability. Market level data on equity turnover is available from January 1995 from Datastream (DS Total Market indices).

[83] From chapter 3 the Sample section: "Cross-listing data includes events up to December 2007 and comes from the stock exchanges' web-sites, Factiva news database and foreign listings dataset of Sarkissian and Shill (2004, 2009). Data on depository receipts is from the BNY, Citibank, Deutsche Bank and JP Morgan DRs databases available on-line. The additional requirement for sample inclusion is the availability of home market listing, i.e. direct foreign IPOs are excluded. The analysis is performed on the security level rather that the company level: all related listings for each cross-listed stock are identified by ISIN (data source: Datastream). Underlying ISINs and depository receipts conversion ratios for depository receipts are from the above mentioned Depository receipts (DRs) databases. Only common equity and major securities are included in the sample".

[84] Each of these eleven exchanges attracts at least 2% of the total equity trading volume of the sample stocks with the exception of the Deutsche Borse's XETRA and the Swiss stock exchange's VIRTX trading platforms that are included in the analysis of the major host exchanges for two reasons. First, they are integral parts of the larger exchanges: the Deutsche Borse and the Swiss stock exchange respectively. Second, the number of the accounts in the sample on these the exchanges are highly significant. Thus, in 2007, 18.7% of all the account-month observations are contributed by XETRA and 5.8% by VIRTX.

4.6 Sample summary statistics

4.6.1 Foreign equity trading distribution

Foreign equity trading distribution is examined on both the exchange-level and the stock-level.

Foreign equity trading: Exchange-level analysis

The first part of the empirical investigation takes place at stock exchange level. The variable under investigation is a stock exchange's monthly average trading volume share, defined in section 4.4.1. Panel A of Table 4.3 reports the average foreign trading volume share (AFTVS) for the total sample that consists of the pooled sample of 28 foreign exchanges. Panel A of Table 4.3 also reports AFTVS individually for eleven major stock exchanges. The AFTVS is calculated using a monthly panel trading data of 812 European cross-listed stocks from January 1990 to December 2007. Figure 1 graphically presents the AFTVS and the number of account-month observations by year, both for the total sample and individually for the eleven exchanges (based on data reported in Table 4.4). The sample period prior to 1995 is characterised by a small number of available observations and, thus, should be treated with caution.

The AFTVS for the total sample is 11.9%. The LSE and NASDAQ have the highest AFTVSs (36.6% and 29.2% respectively), while VIRTX and XETRA have the lowest AFTVSs (0.2% and 2.0% respectively) (Panel A of Table 4.3). London's AFTVS (mean 36.6%), the highest among the eleven exchanges, reached its maximum of 38.2 % in 1999 (discarding observations prior to 1995) and its minimum of 10.5% in 2005 (Table 4.4).

NASDAQ's AFTVS (mean 29.2%), the second highest in the sample, has been relatively stable across the years with a maximum of 36.7% in 2007 (discarding year 1990 because of the small number of observations) and a minimum of 18.7% in 1994. In the most recent years of the sample from 2003 to 2007, NASDAQ's AFTVS is within the 31-37% range, which is above its historical average. The NYSE's AFTVS is above the sample's average: 15.5% with a minimum of 10.4% in 2003. The US OTC's AFTVS is 9.7% and it has shown a clear downward trend over the years: it was at its peak of 30.2% in 1990, has been declining ever since and reached its minimum of 3.6% in 2007.

Amsterdam's AFTVS is 34.9% with a maximum of 24.6% in 1997 (discarding observations prior to 1995) and a minimum of 8.3% in 2000. In the last two years of the sample 2006-2007, Amsterdam's AFTVS was around 17%, the highest since 1998. The Paris stock exchange is also part of Euronext, and has also seen an improvement in the AFTVS in 2005-2007: it has been steadily improving and reached a maximum of 10.3% in 2007 (with the historical mean of 2.9%). Milan's AFTVS is 6.9% with significant fluctuations over time from 16.1% in 2005 to 1.9% in 2007.

The exchanges of Deutsche Borse, Frankfurt and XETRA, both have AFTVSs of around 2%, significantly below the sample average and this has been steadily low across the years. Similarly, the Swiss stock exchange and VIRTX have low AFTVSs of 2.9% and 0.2% respectively. The VIRTX's share has been low since 2001, when the exchange was introduced. On the other hand, the Swiss stock exchange seems to have lost the ability to attract trading volumes of foreign European stocks over time: it had its maximum foreign trading volume share of 8.8% in 1996 and ever since its share has been declining and went as low as 0.1% in 2007.

In addition to the AFTVS and the number of account-month observations, Table 4.4 reports the foreign trading volume (FTV) in GB pounds (GBP) by year for the total sample and individually for eleven major exchanges.[85] In 2007 the total FTV of the sample European stocks was 1,044.6 billion GBP. Overall, there is an upward trend in the total FTV over the years. On average, about 69% of the FTV of the European stocks takes place in the US and 25% on the major European exchanges, including 18% in the UK and about 7% in continental Europe. The NYSE is an absolute leader in attracting foreign trading of European cross-listed stocks in absolute terms: it attracts on average about 43.8% of the total foreign trading volume of the European stocks, followed by the LSE (19.4%), US OTC market (18.6%) and NASDAQ (6.5%). The rest of the exchanges attract on average 2% or less of the FETV.

The distribution of foreign trading volume in monetary units (GBP) differs significantly from the distribution of the number of foreign accounts (Table 4.4). Thus, on average, the US exchanges attract seven times more of the FTV compared to the major European exchanges excluding London. At the same time, the US exchanges host only 35% of the foreign accounts in the sample, while continental European exchanges host 40% of the foreign accounts. Deutsche Borse's exchanges Frankfurt and XETRA stand out from the other exchanges by the

[85] Trading volumes on various exchanges are converted to GB pounds for comparability.

number of the accounts they host, particularly, in the most recent period. In 2007 Frankfurt contributed 26.8% of all accounts and XETRA contributed 18.7%. The absolute majority of those accounts is an admission to trade rather than a stock exchange listing. Despite the significant number of trading accounts, Deutsche Borse and, similarly, the Swiss stock exchange' VIRTX struggle to attract and maintain active trading of foreign stocks.

Overall, analysis of the distribution of the foreign trading of the sample European stocks reveals that the US exchanges are the most successful in attracting trading volumes of European stocks: the NYSE attracts the highest foreign trading volume in monetary terms whereas NASDAQ has the highest AFTVS in the sample in 2007. The London stock exchange follows the NYSE and NASDAQ in ability to attract trading volume of foreign European stocks: it has both a significant FTV and AFTVS that are above the sample's average. US OTC historically hosted a significant portion of the trading volume of European stocks. However, between 2003 and 2007 it lost the ability to maintain active foreign equity trading. Both the Euronext stock exchanges in the sample, Amsterdam and Paris, have shown improvements in recent years in absolute FTV as well as in AFTVS. The Milan stock exchange generates insignificant FTV compared to the other stock exchanges in the sample. The Frankfurt stock exchange, XETRA and VIRTX despite having a large number of foreign stocks traded, have not shown the ability to attract the active trading of foreign stocks. The Swiss stock exchange had significant business from foreign stocks in the 1990s. However, since then, it has been losing its share in foreign equity trading of European stocks.

Foreign equity trading volume share: Stock-level analysis

The second part of the empirical investigation takes place at stock level. The variable under investigation is stock's foreign trading volume share (FTVS), defined in section 4.4.1. Panel A of Table 4.5.1 reports the FTVS for the 1990-2007 sample of 519 stocks with 1,714 foreign accounts. For the 2003-2007 sample the table reports the FTVS of 446 stocks with 1,477 foreign accounts and it separately reports the 2003-2007 sub-samples of listed and traded accounts.[86] The AFTVS for the 2003-2007 samples is around 3.0%, which is less than the

[86] The number of stocks in the sample in this section is significantly smaller than the number of stocks used in the analysis of foreign equity trading on the exchange level, 519 (446) stocks vs. 812 stocks, because the sample in this section includes only stocks with data available for all main stock-level explanatory variables.

FTVS for the 1990-2007 sample of 4.2%.[87] The difference in the mean FTVS between listed and traded accounts is striking: 8.0% for listed vs. 1.0% for traded accounts. Additionally, for the 2003-2007 sample Table 4.5.2 reports FTVS individually by host stock exchange for eleven major stock exchanges. NASDAQ has the highest FTVS in the sample (32.1%), followed by Milan (8.4%), the NYSE (8.4%), Amsterdam (7.8%) and London (6.7%). The Swiss stock exchange and VIRTX have the lowest FTVSs of around 0.1%, while Frankfurt and XETRA's FTVSs are only slightly higher (around 0.5%).

4.6.2 The determinants of the foreign equity trading distribution

As discussed in section 4.3, there are two major groups of factors that potentially affect the distribution of foreign trading of cross-listed stocks: 1) host market characteristics or the pull factors and 2) stock-level factors.

Pull factors of foreign equity trading

Pull factors: Exchange-level analysis

Panel B of Table 4.3 reports summary statistics of the pull factors for the total sample and individually for eleven major stock exchanges, calculated using a monthly panel trading data of 812 European cross-listed stocks from January 1990 to December 2007. Around 11% of the observations are traded accounts, i.e. traded on the US and London OTC markets and VIRTX and XETRA trading platforms. Almost half of all observations in the sample take place on a demutualised exchange. Indeed, by the end of the sample period all major host exchanges in the sample had been demutualized. The lowest mean demutualization indicator is for the NYSE, which was only demutualized in 2006. On average, 80% of the observations take place on an electronic market as opposed to the traditional floor trading. The lowest electronic market indicator is for the NYSE which in 2000 was among the last exchanges in the world to introduce automated trading. After 2002, all exchanges in the sample, both of host and home markets, had adopted electronic trading making the electronic market indicator an irrelevant variable.

[87] The foreign trading volume shares for the total sample and by stock exchange reported in Tables 4.5.1 and 4.5.2 differ from the ones reported in Tables 4.3 and 4.2 for two reasons: 1) the samples vary since the main sample in current section includes only stocks that have data available for all main explanatory variables and excludes observations prior 2003, and 2) the weighting methods for the mean calculation are different.

The Amsterdam and Swiss stock exchanges have the highest concentration of foreign stocks listed (42% and 35% respectively), whereas the Italian stock exchange has the lowest (2%). The US market stands out through its market size in terms of market capitalization of listed stocks (5,157.4 billion GBP), which is almost four times larger than the average market size in the sample (1,299.0 billion GBP) whereas Amsterdam has the smallest market size in the sample (261.7 billion GBP). The US market has the highest aggregate market liquidity of 100.04 on average (measured by the ratio of the aggregate monthly trading volume to the total market capitalization), followed by the Frankfurt stock exchange with a 93.06 turnover ratio. XETRA has the lowest level of liquidity in the sample with a turnover ratio of 36.96. Total trading costs vary from 0.47 on the Amsterdam stock exchange to 0.94 on the Swiss market with the sample average being 0.62. The level of investor protection in the host country is highest in the UK (investor protection index is 0.95) and the lowest in the Netherlands (investor protection index is 0.20). About 80% of the observations take place in a country where insider trading laws have been enforced. The lowest enforcement of insider trading laws variable is for the Frankfurt stock exchange (0.72). Italy has the highest level of accounting opacity (0.63), followed by the Netherlands (0.38), whereas Germany and the USA have the lowest level of accounting opacity (0.17 and 0.20 respectively). The average size of a foreign company in terms of market capitalization is smallest for NASDAQ (3.11 million GBP) and largest for VIRTX (18.56 million GBP).

Pull factors: Stock-level analysis

Panel B of Table 4.5.1 reports summary statistics of the pull factors calculated at stock level, specifically, host market characteristics relative to home market characteristics and host exchange characteristics such as an exchange's industry specialization and foreign stock concentration. Additionally, Panel B of Table 4.5.2 reports summary statistics of the pull factors on stock-level individually for eleven major exchanges. A host market is on average 9.91 times larger than a home market. The largest difference in market size is 41.39 for NASDAQ accounts, followed by 28.43 for the NYSE and 26.55 for US OTC. Among non-US exchanges, London has the largest difference in market size at 9.66. For Amsterdam, Milan and VIRTX the difference in market size between the host and home markets is less than one, suggesting that foreign stocks traded on these markets come from home markets that, on average, are larger than the host market.

Aggregate market liquidity of the host market is on average 5.2 times higher than the market liquidity of the home market. For Swiss and Italian stock exchanges the difference in market liquidity between the host and home markets is highest (19 times), whereas for Frankfurt and XETRA it is lowest (0.03), in other words, Frankfurt and XETRA trade foreign stocks that come from home markets more liquid than the host market. A negative average difference in trading costs between the host and home markets implies that, on average, costs of trading on the host market are lower than costs of trading on the home market. London offers the best improvement in total trading costs (the difference is -0.13), while the Swiss stock exchange and VIRTX on average have higher trading costs relative to the home market (the positive difference is 0.39 and 0.41 respectively).

The sample's average difference in the level of investor protection between the host and home countries is negative but small in magnitude, i.e. the home market on average has slightly better investor protection than the host market. London has the highest positive difference, i.e. improvement, in the level of investor protection at 0.52. The sample average difference in the enforcement of insider trading laws of 0.09 implies that host countries in the sample have insider trading laws enforced more often than the home countries. The difference in insider trading law enforcement is highest for London (0.24) and NASDAQ (0.22), while foreign listing in Netherlands, Italy, France and Switzerland does not provide any improvement in terms of insider trading regulation.

The level of accounting opacity in a home country is on average, higher than the level of accounting opacity in the host country. The highest negative difference between accounting opacity of the home and host countries is for Frankfurt and XETRA accounts (a difference of -0.19), while Italy has a significantly higher level of accounting opacity than the level of accounting opacity in the home country of foreign stocks traded in Milan (a difference of 0.31).

Around 22% of all observations in the sample are for accounts that are traded abroad in the same language environment as the home country. The highest common language indicator is for the Swiss stock exchange and NASDAQ's accounts (0.52 and 0.51 respectively), while Amsterdam, Milan, and Paris do not host trading of stocks from countries with a common language. The average geographic distance between home and host markets is around 2,000 km, driven by the distance of European home markets from the US (average geographic distance to a US exchange is above 6,000km). Within Europe, the average geographic distance between

home and host markets varies insignificantly within a 534–672 km range with the exception of Milan accounts that have average distance of 1,183 km.

Host stock exchange industry specialization is on average 13% with variation from 28% for NASDAQ to 10% for Frankfurt. On average, 18% of the companies listed on a host stock exchange in the sample are foreign companies (foreign stock concentration variable). The Amsterdam stock exchange has the highest fraction of foreign listed companies (43%), whereas Italian stock exchange has the lowest (2%).

Pull factors: Correlation analysis

Table 4.6.1 reports the correlation matrix of the AFTVS and the pull factors at stock exchange level. As predicted, the trading platform indicator is negatively correlated to the AFTVS. In contrast to expectations, the AFTVS is negatively correlated to demutualized status, electronic trading, and foreign stock concentration variables. For the rest of the variables, the signs of the correlation coefficients with the AFTVS variable are in line with theoretical expectations. Thus, exchanges that have a greater investor base, measured by the total market capitalization, and offer greater level of aggregate market liquidity have a higher AFTVS. Stock exchanges located in countries with better investor protection and actively enforced insider trading laws have more active trading of foreign stocks. Total trading costs and the level of accounting opacity in the host country are negatively correlated with the AFTVS. A control variable, average size of traded companies, is negatively correlated with the AFTVS variable.

Pull factors: correlation analysis at stock level

Table 4.6.2 reports the correlation matrix of the FTVS and the pull factors calculated at stock level. In line with expectations, the differences in market size, in aggregate market liquidity, in the level of investor protection and in the enforcement of insider trading laws and the existence of a common language between the host and home countries are all positive predictors of the FTVS, while the difference in the costs of trading between the host and home countries is a negative predictor of the FTVS. However, contrary to expectations, the difference in accounting opacity is positively correlated to the FTVS but the magnitude of the correlation is low (0.04). Also in contrast to expectations, the geographic distance variable is positively correlated to the FTVS. However, further analysis reveals that the geographic distance to the US exchanges variable is a positive and significant predictor of the FTVS, while the geographic

distance to non-US exchanges variable is a negative and significant predictor of the FTVS. A significant correlation coefficient between the FTVS and stock exchange industry specialization of 0.11 suggests that foreign stocks have a higher fraction of trading on a foreign exchange that has higher share of foreign stocks traded from the same industry. Foreign stock concentration, contrary to expectations, is negatively correlated to the FTVS.

Stock-level factors of foreign equity trading

Panel B of Table 4.5.1 reports summary statistics of stock-level factors of foreign trading volume for the 1990-2007 and the 2003-2007 samples. The reason for using the 2003-2007 sample rather than the full sample is that data for two important explanatory variables related to stock ownership structure, foreign institutional ownership and ownership concentration, are available from Datastream database only from 2003. Both samples in Table 4.5.1 include only observations that have data available for all major explanatory variables. Panel B of Table 4.5.2 reports summary statistics of the stock-level factors individually for eleven major exchanges.

Listing characteristics

Average trading indicator has increased from 0.63 for the 1990-2007 sample to 0.71 for the 1990-2007 sample reflecting the introduction of new trading platforms that in later years, hosted foreign trading of European cross-listed stocks. Frankfurt, XETRA and London hosted both listed and traded accounts. London is the most common choice for a first foreign listing by European companies in the sample: 12% of accounts are a first foreign listing compared to a 2% sample average, followed by NASDAQ (9%). The average age of an account in the sample is 6.24 years.[88] The oldest are the Swiss stock exchange's accounts (12.72 years), followed by the NYSE's accounts (10.61 years), while Milan's accounts are the youngest (4.35 years). The same currency indicators for the US exchanges and for the Swiss stock exchange equal zero. On the other hand, trading on VIRTX takes place in the currency of the stock's home listing. As a result of the adoption of the single European currency, the Euro, the same currency indicator for continental European stock exchanges is relatively high (from 0.55 to 0.98). In the sample, 27%

[88] Average duration of London listing/trading in the sample is relatively short (4.64 years). This can be explained by the changes in trading systems which resulted in the disruption of continuous listing, rather than a true reflection of the actual duration of listing.

of the accounts are in the form of depository receipts. Depository receipts are predominantly traded in the US. The NYSE, NASDAQ and US OTC have respectively 95%, 89% and 75% of all accounts in the form of ADRs. Frankfurt, XETRA and to a lesser extent London, accept depository receipts for trading as a supplement to trading ordinary shares. The average price level of European cross-listed stocks is 19.9 GBP with the lowest at 10.6 GBP for NASDAQ-traded and the highest at 33.2 GBP for Swiss stock exchange-traded stocks.

Company characteristics

The average market value of European cross-listed stock is 15.3 billion GBP for the 2003-2007 sample. The smallest in terms of market capitalization (3.8 billion GBP) and the riskiest foreign stocks in the sample are traded on NASDAQ. The Milan stock exchange has the highest average market value of traded stocks (30.9 billion GBP). The Swiss stock exchange, including VIRTX trading platform, attracts large low-risk foreign stocks. The NYSE and NASDAQ trade stocks that have the highest relative market valuation measured by a price-to-book ratio, of 4.83 and 3.21 respectively, both above the sample's average of 3.07. Milan hosts trading of stocks with price-to-book ratio of 2.0, the lowest in the sample. Noticeably, average price-to-book ratio for the 1990-2007 sample is higher than the price-to-book ratio for the 2003-2007 sample (3.64 vs. 3.07), reflecting higher market valuations in the late 1990s, particularly in the US. On average, the fraction of foreign sales in the company's total sales is 57% reflecting the strong export orientation of cross-listed companies. NASDAQ-traded European companies have the highest foreign sales share in the sample of 68%. Surprisingly, foreign institutional ownership of European stocks that are traded abroad is only 8% with a slight variation among exchanges: from 3% for Amsterdam- and Milan- traded stocks to 9% for London- and NASDAQ- traded stocks. Ownership concentration is 26% for the sample average, varying from 11% for Milan-traded stocks to 30% for Frankfurt-traded stocks.

The use of international accounting standards have increased significantly over time: from a 0.52 average for the 1990-2007 sample to a 0.73 average for the 2003-2007 sample. The Swiss stock exchange and VIRTX only trade stocks of companies that comply with international accounting standards requirements. The lowest average international accounting standards variable of 0.68 is for NASDAQ accounts. Average stock return correlation with foreign market returns and foreign information factor variables have increased over time, reflecting the increasing integration of the financial markets. The sample's average stock return

correlation with foreign market return is 0.48 with a small variation from 0.35 for NASDAQ-traded stocks to 0.65 to Milan-traded stocks. The sample's average foreign information factor is 2.62 with the smallest being for VIRTX-traded stocks (1.47) and the largest for Amsterdam-traded stocks (3.64).

Home market characteristics

2% of observations in the sample are contributed by stocks that originate in the emerging markets of Central and Eastern Europe. The Amsterdam, Milan, NASDAQ, Paris, Swiss stock exchanges and VIRTX trading platform do not host the trading of stocks from emerging markets. The highest average emerging market indicator in the sample is for Frankfurt's and XETRA's observations (0.04 and 0.032 respectively). The average investor protection index of the home market is 0.48 varying from 0.33 for Milan- traded accounts to 0.59 for NASDAQ-traded accounts. For 91% of observations, insider trading laws are enforced in the home country. The average trading costs in home countries are 0.62 with the highest being 0.69 for London's accounts and the lowest being 0.53 for VIRTX's accounts. The sample's average accounting opacity index of the home country is 0.34. Stocks from countries with the lowest level of accounting opacity are traded on the Swiss stock exchange (0.24), while stocks from countries with the highest level of accounting opacity are traded on the Frankfurt and XETRA exchanges (0.36).

Listed vs. traded accounts

Additionally, for the 2003-2007 sample Table 4.5.1 reports summary statistics separately for listed and traded accounts. Listed companies are larger than those admitted to trade (18.2 billion GBP vs. 14.0 billion GBP), are listed on a foreign exchange for a longer period of time (8.26 years vs. 5.42 years), are more likely to list in foreign country that shares a language with the home country (common language indicator 0.34 vs. 0.17), and are more likely to list in a country that is further away from the home country (geographic distance 2,283 km vs. 1,974 km).

Stock-level factors: Correlation analysis

Table 4.7 reports a correlation matrix of the FTVS and the stock-level variables for the 2003-2007 sample. All explanatory variables, with the exception of the international accounting

standards variable, are significantly correlated with the FTVS variable. Larger companies and companies with higher growth opportunities have a smaller FTVS. The FTVS is higher for companies that are more export-oriented, have higher foreign institutional ownership, are riskier (in terms of stock return variance), and have returns that are less correlated with foreign market returns. The foreign information factor, contrary to expectations, is negatively correlated to the FTVS. However, splitting the foreign information factor into two variables the US information factor and the foreign (non-US) information factor, reveals that these two variables have opposite effects on the FTVS: the US information factor is positively and significantly correlated to the FTVS while the foreign (non-US) information factor is negatively and significantly correlated to the FTVS.

FTVS is higher for companies that are listed (as opposed to admitted to trade), if the listing is the company's first foreign listing, if there is a longer duration of listing, and if the listing takes place in the form of a depository receipt. Stock price level and the same currency indicator have a rather low negative correlation with the FTVS.

The signs (positive or negative) on the correlation coefficients of all the home country-level variables are in line with expectations. Companies have a higher FTVS if they come from an emerging market, from a country with weaker investor protection and insider trading regulations, with less accounting opacity, and with higher trading cost.

4.7 Empirical results

4.7.1 Pull factors of foreign equity trading: Multivariate regression analysis

The first testable proposition is that host market characteristics determine the ability of the host exchange to attract foreign equity trading. The ability of the exchange to attract foreign equity trading is measured by the exchange's AFTVS defined in section 4.4.1. Equation (4.5) from section 4.4.2 is used in the regression analysis. Section 4.3.1 identifies the following host exchange-specific factors as potential determinants of the foreign equity trading distribution: the level of disclosure, demutualization status, market design, and foreign equity expertise, trading

frictions including capital market size, aggregate market liquidity and trading costs, and the quality of the legal and information environment.

Table 4.8 reports the output of the regressions of the logistic transformation of the stock exchange's monthly average foreign share of trading volume (AFTVS) on the host stock exchange characteristics, the pull factors. Model (1) includes stock exchange-specific factors, whereas models (2)–(5) additionally include host country characteristics, such as the level of investor protection, enforcement of insider trading laws and accounting opacity index. Data for foreign stock concentration are available only for stock exchanges but not for trading platforms and OTC markets. To avoid the loss of observations, the foreign stock concentration variable is included only in model (5). As a robustness test, model (3) is estimated with year fixed effects. Model (4) is estimated with exchange-fixed effects and includes OTC, VIRTX and XETRA indicators but excludes the demutualization indicator that is not available for OTC observations. For model (2) of Table 4.8, the primary model specification in the multivariate regression analysis of the pull factors of the foreign trading volume share, Table 4.8 additionally reports the economic significance of the coefficient estimates.

In line with the theoretical predictions, trading platforms have, on average, a lower AFTVS compared to the stock exchange in the sample as coefficient estimates on the trading platform dummy variable are negative in all model specifications. Model (4) includes, instead of the trading platform indicator, OTC, VIRTX and XETRA indicators. Coefficient estimates on the OTC and VIRTX indicators are negative and significant at the 1% level, while coefficient estimate of the XETRA indicator is insignificant. In line with the theoretical argument that demutualized exchanges are more efficient, the demutualization dummy variable has positive and significant coefficient estimate in models (1) and (2). However, after controlling for time effects in model (3), the demutualization variable is not statistically significantly different from zero. In contrast to expectations that automated trading provides a competitive advantage to a stock exchange in attracting trading volumes, the electronic market indicator has a negative and statistically significant coefficient estimates in model specifications (1) to (4).[89] A possible explanation for the negative sign of the electronic market indicator is that electronic markets in the sample are overrepresented by trading platforms which have a significantly smaller average

[89] In contrast to literature that supports the higher efficiency and lower costs of electronic vs. floor trading argument (Domowitz, 2002; Jain, 2005), Venkataraman (2001) reports higher trading costs on the electronic market (Paris) vs. floor trading (NYSE) and suggests that 'there is a benefit to human intermediation in the trading process' (p.1448).

share of foreign equity trading. It is possible that the electronic market indicator actually reflects the lesser ability of trading platforms to attract foreign equity trading

Market size is a positive and significant determinant of the AFTVS in model (1). However, after controlling for host country characteristics, such as the level of investor protection, enforcement of insider trading laws and accounting opacity index, it becomes insignificant. In line with the theoretical predictions, markets with a greater level of aggregate liquidity are more successful in attracting active trading of foreign stocks, as the coefficient estimates on the market liquidity variable are positive and highly significant in all model specifications. Higher transaction costs are expected to be a significant competitive disadvantage in attracting trading to the exchange. Indeed, the regression analysis reveals that total trading costs in the host market is a negative and statistically significant determinant of an exchange's average fraction of foreign equity trading.

The quality of the legal environment in the host country is expected to have a positive impact on the stock exchange's ability to attract foreign equity trading. Analysis reveals that enforcement of insider trading laws in the host country is positive and significant determinant of the AFTVS. The level of investor protection is a positive, although statistically insignificant, factor. As expected, accounting opacity in the host country has a negative impact on the stock exchange's ability to actively trade foreign stocks: coefficient estimate on the accounting opacity index is negative and significant. A control variable, average company size, is a highly significant (at 1% significance level) and negative determinant of the AFTVS.

Model (5) additionally includes a foreign stock concentration variable that is found to be an insignificant determinant. Since a foreign stock concentration variable is available for stock exchanges but not for trading platforms, Model (5) includes stock exchange observations only and has the highest explanatory power (adjusted R-squared is 77.9%), suggesting that determinants of the AFTVS differ for stock exchanges and trading platforms. The forthcoming section 4.7.2 examines the difference in the determinants of foreign trading volume share between listed and traded foreign accounts.

Multicollinearity issue

There is legitimate concern that the stock exchange level explanatory variables are correlated. A correlation matrix of the pull factors (Table 4.3) shows that the market size

variable is highly correlated with other variables, particularly market liquidity, the level of investor protection and the enforcement of insider trading laws indicator and the level of accounting opacity. However, the correlation coefficients are within an acceptable range (0.42-0.56). Additionally, I estimate variance inflation factors (VIFs) for coefficient estimates for all model specifications reported in Table 4.8. Estimated coefficients and variance inflation factors of the pull factors of foreign equity trading are reported in Appendix 4.2. The estimated VIFs are within the range of 1.08 to 4.18 indicating that multicollinearity should not affect the findings in any significant way.[90]

Pull factors: Economic significance

Table 4.8 additionally reports the economic significance of the coefficient estimates for model (2). Average company size is the most significant determinant of the average fraction of foreign equity trading (with the economic significance of 42%). This result highlights the importance of company-specific factors for trading volume distribution and motivates stock-level analysis that incorporates various stock- specific factors (discussed in forthcoming section 4.7.2). The other significant determinants of the AFTVS are: electronic market trading (negative impact with the economic significance of 35%), total trading costs (negative impact with the economic significance of 29%), trading on a demutualized exchange (positive impact with the economic significance of 25%), and enforcement of insider trading laws in the host country (positive impact with the economic significance of 24%). In other words, a one-standard deviation increase in the electronic market indicator, total trading costs, demutualization indicator, and insider trading enforcement indicator variables would adjust the AFTVS by 0.35, 0.29, 0.25 and 0.24 standard deviations respectively. Further, the aggregate market liquidity's economic significance is 21% with positive sign, the accounting opacity index's economic significance is 21% with negative sign, and the trading platform indicators' economic significance is 14% with a negative sign.

To summarize, the analysis has shown that stock exchange characteristics, or the pull factors of foreign trading volume, are significant determinants of a stock exchange' average foreign trading volume share, which is the measure of a stock exchange's ability to attract trading volumes of foreign stocks. The following stock exchange characteristics affect a stock exchange's ability to compete for foreign equity trading: costs of trading, the level of

[90] Multicollinearity is likely to be an issue if a VIF is above 10 (Wooldridge, 2009; Sabherwal, 2007).

accounting opacity, demutualization, market-level liquidity, and the enforcement of insider trading laws.

4.7.2 Stock-level determinants of the foreign trading volume share: Multivariate regression analysis

The next step is the investigation of the determinants of the foreign share of trading volume at the stock level in the multivariate framework. The dependent variable in the regressions is the logistic transformation of the monthly foreign trading volume share (FTVS) for each foreign trading account, as defined in section 4.4.1. Equations (4.6) and (4.7), section 4.4.2, are used in the regression analysis of foreign trading volume share at the stock-level. The output is reported in Table 4.9. Models (1.1) and (2.2) in Table 4.9 include only stock-specific characteristics such as listing characteristics, company characteristics and home market characteristics (equation (4.6)). Model specifications (3) - (5) in addition include the pull factors of the foreign trading volume share calculated at the stock level (equation (4.7)). The pull factors at the stock level include: the differences between host and home market characteristics and host exchange characteristics such as host exchange's industry specialization and foreign equity expertise.[91] Models (1) and (3) do not include stock ownership composition variable or foreign institutional ownership and ownership concentration variables, which were available only from January 2003, and, thus, employ the broadest sample of observations from January 1990 to December 2007. Models (2), (4) and (5) contain a full set of the explanatory variables, including stock ownership composition variables, and, accordingly, employ the sample of observations from January 2003 to December 2007. Model (5) includes an additional exchange-specific factor: foreign stock concentration variable, which is available only for stock exchange observations and not for trading platforms and OTC markets. Accordingly, model (5) is estimated using the sub-sample that includes only stock exchange accounts.

Stock-level factors: Listing characteristics

Table 4.9 reports that the most significant group of stock-level factors are the listing characteristics that are all found to be statistically significant determinants of the FTVS. One of

[91] None of the model specifications in Table 4.9 include the difference in the demutualization status and in electronic trading because all stock exchanges in the sample starting from year 2003 have been demutualized and have adopted automated trading, making these two variables irrelevant for the 2003-2007 sample.

the most significant determinants is whether the stock is listed or traded on a foreign exchange. There is evidence that traded status, as opposed to listed status, substantially reduces the fraction of trading on the foreign exchange: the coefficient estimates on the traded indicator in all model specifications are negative and significant at the 1% level. Thus, a corporate decision to list on a foreign exchange, as opposed to having a stock admitted to trade, although it entails additional listing requirements, guarantees more active foreign trading of stock.

Coefficient estimates on the first foreign listing indicator, the duration of the listing and the same currency indicator variables are also positive and significant mostly at 1% in all model specifications. Accordingly, the findings suggest that FTVS is significantly higher when a company is listed abroad for the first time, traded on a foreign exchange in the same currency as the home listing, and increases with the duration of listing.

The US listings take place primarily in the form of depository receipts, whereas other exchanges, such as Frankfurt, XETRA and the London stock exchanges, trade ADRs in addition to trading ordinary shares. After controlling for the US-specific effect[92] in models (1.2), (2.2), (3.2) and (4.2), ADR indicator, as predicted, is a negative and significant determinant of the FTVS. In line with the expectation that higher priced stocks are more visible to foreign investors, the coefficient estimate on the price level variable is positive and significant in model specifications that do not control for the US as host market.

Stock-level factors: Company characteristics

Company size is found to be a negative and significant at 1%, determinant of the FTVS in all model specifications, suggesting that smaller companies have a significantly larger FTVSs. Regression analysis reveals that only for the 1990-2007 sample does a company's growth significantly affect the FTVS, whereas the coefficient estimate on the price-to-book variable is statistically insignificant in all model specifications that employ the 2003-2007 sample. The significance of the price-to-book ratio in earlier years could be driven by the observations from the late 1990s, the period of the dot-com bubble, when growth opportunities, including those of foreign companies, were valued more highly than ever. Furthermore, there is evidence that stock risk is a positive and significant at least at a 5% level determinant of the foreign trading volume share in all model specifications. Company export orientation, measured

[92] The US-specific effect is controlled for by including a dummy variable representing the US as the host market.

by the fractions of foreign sales in total sales, is a positive determinant of the FTVS that is statistically significant in the model specifications that employ the 1990-2007 sample.

A higher fraction of foreign institutional ownership is expected to assure a FTVS, unless foreign institutional investors prefer to trade on the stock's home market. After controlling for home market characteristics (model (2)) and for the differences in host and home market characteristics (models (4)–(5)) that potentially affect the attractiveness of the home market relative to the host market as a location of the stock trading, foreign institutional ownership is a positive and statistically significant determinant of the FTVS. Ownership concentration, on other hand, have a negative impact on the FTVS, as predicted, however, the statistical significance of this variable is rather low.

Adopting IAS or US GAAP makes a company more transparent, comparable to other foreign companies, and, supposedly, more attractive to foreign traders (Aggarwal et al, 2005). However, I find no empirical support for this proposition: coefficient estimates on the International accounting standards dummy variable is insignificant in models (2), (4)–(5). Moreover, in models (1) and (3) that employ the 1990-2007 sample the IAS variable has negative and significant coefficient estimates, implying that stocks of companies that adopt international accounting standards are less actively traded in foreign markets.

Due to potential portfolio diversification benefits, stocks that exhibit a low return correlation with foreign market returns are expected to appeal to foreign investors. Indeed, empirical evidence strongly supports this proposition: coefficient estimates on the return correlation with foreign market return variable are negative and significant mainly at 1% in all models in Table 4.9.

According to Baruch at al. (2007), the foreign information factor that quantifies marginal contribution of foreign market returns in explaining the stock return pattern, is expected to be one of the main positive determinants of foreign trading volume share. Correlation analysis (section 4.6.2) show that the US information factor and the foreign (non-US) information factor have opposite effects on the FTVS. Thus, these two variables are included in the regressions individually, in place of the foreign information factor.[93] In line with the findings of Baruch et al (2007), regression analysis reveals that the US information

[93] In the model specification that incorporates the collective foreign information factor variable (not reported), the coefficient estimate on the foreign information factor is not statistically different from zero.

factor is a positive and highly significant determinant of foreign trading volume share. At the same time, the coefficient estimate on the foreign non-US information factor is negative and significant, which is directly opposite to the theoretical argument of Baruch et al (2007).

Stock-level factors: Country characteristics

Emerging markets are characterised by higher investment barriers for foreign investors. Thus, it is expected that a foreign listing by a company from an emerging market would generate more active foreign trading compared to a foreign listing by a company from a developed market. Empirical findings support this proposition as the coefficient estimate on the emerging market indicator has a positive sign in all model specifications and is statistically significant in models (1) and (2). The emerging market indicator becomes insignificant in the model specifications (3) and (4) that control for the difference in the host and home market characteristics.

In line with the predictions, FTVS is higher when a stock is traded in a foreign country that shares a language with the company's home country as the coefficient estimates on the common language indicator are positive and significant at the 1% level.

Geographic distance is a proxy for foreign investors' unfamiliarity and, accordingly, is expected to have a negative impact on the FTVS. In contrast to this prediction, the coefficient estimate on the geographic distance variable is positive and highly significant. Furthermore, summary statistics by stock exchange (Table 4.5.2) show that geographic distance from the US exchanges is very distinct from geographic distances from other host exchanges. Thus, it is possible that the geographic distance variable in the regressions captures the US-specific variation in the FTVS. To disentangle the US premium, models (1.2), (1.2), (2.2), (3.2) and (4.2) include, instead of the geographic distance variable, a dummy variable representing the US as the host market and also a residual geographic distance variable. The residual geographic distance variable is the residual from the OLS regression of the geographic distance variable on the US host market dummy variable. The coefficient estimate on the residual geographic distance variable, as expected, has a negative sign. In contrast, the coefficient estimate on the US host market indicator is positive and significant at the 1% level. This can be interpreted as the 'US trading premium'.

Weaker investor protection and poor enforcement of insider trading laws in the home country are expected to drive the equity trading away from the home country to foreign markets where the stock is listed/ traded. Empirical evidence supports this proposition: the coefficient estimates on the investor protection and the enforcement of insider trading laws in the home country dummy variables are negative and significant at 1% in models (1) and (2). Furthermore, the variables that represent the differences in legal environment between the host and the home countries, the difference in investor protection and the difference in enforcement of insider trading laws also have positive and significant coefficient estimates. These findings are consistent with the theoretical argument that investors prefer to trade in countries that provide higher standards of investor protection and better enforcement of insider trading laws.

Accounting opacity in the home country affects the perception of the quality of the company's accounting information and, thus, should negatively affect the stock's trading on a foreign exchange. Indeed, the coefficient estimates on the accounting opacity in the home country variable are negative and significant in models (1.1) and (2.1). Furthermore, the coefficient estimate on the difference in accounting opacity index between the host and the home countries (models (3) – (5)) is positive and significant, at least at the 5% level. This finding can be interpreted as evidence that foreign investors trade more actively those foreign stocks that come from countries with a level of accounting opacity lower than that in the foreign country.

Pull factors at stock level

Higher trading costs in the home country are a significant disadvantage in competing with foreign exchanges for equity trading volumes. Empirical findings show that the level of total trading costs in the home country (models (1.2) and (2.2)) is positive and significant at 1% determinant of the FTVS. However, there is no clear evidence that the difference in costs of trading between host and home markets is a negative determinant of the foreign trading volume share.

The difference in the market size variable is positive and significant at least at 1% in models (3.1), (4.1) and (5) but is insignificant in models (3.2) and (4.2). In contrast to expectations, the coefficient estimate on the difference in the aggregate market liquidity between host and home markets is negative and statistically significant in all model

specifications, meaning the smaller the difference in market liquidity between the host and home markets, the higher the foreign fraction of equity trading. This result is difficult to interpret as the theoretical models of Kyle (1985), Admati and Pfleiderer (1988), Pagano (1989) and Chowdhry and Nanda (1991) predict concentration of trading in the most liquid market.

Stock exchange industry specialization has insignificant coefficient estimates in all model specifications. The foreign stock concentration variable (model (5)), also has an insignificant coefficient estimate. In other words, there is no evidence found that a stock exchange with a higher share of listed stock from the same industry or a higher share of listed foreign stocks has an advantage in attracting trading of foreign stocks.

Multicollinearity issue

The correlation matrix of the stock-level factors (Table 4.7) reports that the level of correlations between the stock-level factors is within an acceptable range (<0.50). Correlations are higher for the market-level factors, particularly, the difference in market size, the difference in the level of investor protection, enforcement of insider trading laws, trading costs, and geographic distance variables (Table 4.6.2) (the highest correlation coefficient is 0.67). Estimated variance inflation factors (VIF) on the coefficient estimates of the determinants of the foreign trading volume share are less than 10 (Appendix 4.3), suggesting that multicollinearity should not cause a bias in the estimation results.[90] As a robustness test, models (3.3) and (4.3) exclude the variable with the highest variance inflation factor, the difference in market size variable. The output of the models with the omitted variable shows that coefficient estimates on the other explanatory variables are not affected. Overall, there is sufficient evidence that multicollinearity does not influence the estimation results in this analysis.

Economic significance of the determinants of foreign trading volume share

Table 4.10 reports the output of the regressions that include all significant determinants of foreign trading volume share from the multivariate analysis at stock level (Table 4.9). Additionally, Table 4.10 reports the economic significance of the coefficient estimates. Listing characteristics are the most significant determinants of foreign trading volume share that jointly explain the 0.70 standard deviations variation of foreign trading volume share. The traded indicator variable is individually the most significant factor with economic significance of 24.5%. Thus, change in status from traded to listed would increase the foreign trading volume

share by approximately 2.65% (0.242 times 0.11 standard deviation of the independent variables), keeping all other variables constant. An increase of 2.65% in the foreign trading volume share is highly significant taking into account that the sample's average AFTVS is only about 3%. The other significant listing-specific factors are the duration of listing/trading and the same currency indicator variables with the economic significance of 19.7% and 14.2% respectively.

Company size is the most significant company characteristics with an economic significance of 16.9% (negative contribution).

The difference in the level of investor protection and in the enforcement of insider trading laws between the host and home countries, jointly explain the 12.5% variation (positive contribution) in foreign trading volume share. The difference in aggregate market liquidity has economic significance of 15.3% (negative contribution), whereas the difference in the accounting opacity index has economic significance of 14.9% (positive contribution). Geographic distance between the host and home countries has an economic significance of 20.6% with a positive sign. Furthermore, output of Model (2) that includes the US host market indicator and the residual geographic distance variable reveals that the US host market indicator is the most significant determinant of foreign trading volume share with economic significance of 55.0%, while geographic distance is a negative factor with economic significance of 5.0%. The inclusion of the US host market indicator reverses the economic significance of the DR indictor from positive 4.8% to negative 6.2%, reduces the economic significance of the US information factor from 10.7% to 4.2% and of the common language indicator from 15.6% to 8.3%, and increases the economic significant of the difference in the enforcement of insider trading laws from 1.9% to 9.3%.

Overall, the stock-level analysis has shown that stock-specific factors of foreign trading volume are significant determinants of foreign trading volume distribution. Significant stock-specific determinants of foreign trading volume distribution include: 1) listing characteristics such as listed vs. traded status, the duration and the currency of listing/trading, 2) company characteristics, particularly, company size and stock risk, and 3) home market characteristics, such as geographic proximity to the host market and the quality of both the legal and the information environment. The next section investigates whether the determinants are different for stocks that are listed as oppose to stocks that are admitted to trade.

The determinants of the foreign trading volume share: Listed vs. traded

The nature of a foreign trading varies significantly depending on whether the stock is listed on a foreign exchange or is admitted to trade. Thus, the determinants of foreign trading volume share for listed and traded accounts are potentially different. To empirically investigate this proposition, the following regression is estimated:

$$logtrFTVS_{i,n} = \alpha_0 + \beta_{1i} X_j + \beta_{2i} Z_{k,n} + \Sigma\gamma_{j,Traded}(D_{Traded} X_j) + \Sigma\theta_{k,Traded}(D_{Traded} Z_{k,n}) + \varepsilon_{i,} \quad (4.9)$$

where $logtrFTVS_{i,n}$ is log-transformation the stock *i's* share of trading volume on the exchange *n* in month *t*; D_{Traded} is dummy variable that equals one if the stock is traded without meeting listing requirements on a stock exchange *n* in month *t* and equals zero otherwise; X_j is vector of stock-level factors; $Z_{k,n}$ is characteristic *k* of the host market *n* relative to characteristic *k* of the stock's home market.

Table 4.11 reports the results of this regression. Coefficient estimates on all the determinants have the same signs, meaning the direction of impact, for both listed and traded accounts. The only exception is the difference in the enforcement of the insider trading laws variable, which is positive and significant for listed accounts and negative but insignificant for traded accounts. The level of statistical significance of the determinants for listed and traded accounts varies for some variables. Thus, the foreign non-US information factor, the common language, the difference in the level of investor protection and the difference in market size variables are significant determinants for traded accounts. The difference in market liquidity is a significant factor for listed accounts.

4.7.3 Stock-level factors by stock exchange: Multivariate regression analysis

The last stage of the empirical investigation is analysis of stock-level determinants of the FTVS by stock exchange. Table 4.12 reports the output of the regression of the FTVS on the stock-level factors for the sample of 1,477 foreign accounts. The independent variables are the interaction variables of the explanatory variables with the dummy variables that represent eleven major foreign exchanges, namely: the NYSE, NASDAQ, US OTC, London SE, Swiss SE, Frankfurt, Paris, Amsterdam, Milan, VIRTX, and XETRA (equation (4.8), section 4.4.2). The explanatory variables are defined in Table 4.2.

The regression output reveals that smaller companies have a notably higher foreign trading volume share when they are listed/traded in Milan, Amsterdam and US OTC market, whereas larger companies have a significantly higher FTVS when they are traded on VIRTX and XETRA. Price-to-book ratio is a positive and significant determinant of the shares of foreign equity trading for Milan and Amsterdam accounts, and is a negative and significant determinant for NASDAQ, London, Frankfurt and XETRA accounts. In other words, on the latter four exchanges value stocks have more active foreign equity trading compared to growth stocks. In line with the expectations and the findings of the previous section on the stock-level factors of foreign equity trading, stock risk is a positive determinant of the foreign trading volume share for the majority of the stock exchanges. Riskier stocks have particularly high FTVS on the Swiss stock exchange, Frankfurt stock exchange, XETRA, NYSE, and NASDAQ. The export orientation of a company is a positive predictor of the FTVS only when a stock is listed/traded on the US exchanges, namely, NYSE, NASDAQ, and US OTC.

Higher foreign institutional ownership assures a higher FTVS only for NYSE listings. Although higher ownership concentration is expected to lessen stock trading on a foreign exchange, empirical results show that a stock's ownership concentration is a negative determinant of foreign trading volume share only for NYSE listings, while it is a positive determinant for Milan trading accounts. As expected, companies that have adopted international accounting standards have higher foreign trading volume share, particularly when their stocks are traded on VIRTX, the Italian stock exchange, NASDAQ, the NYSE and the Paris stock exchange. However, the adoption of internationally recognized accounting standards is a negative determinant of the XETRA's foreign trading share. Stocks that exhibit lower return correlations with foreign host market are more actively traded on NASDAQ, NYSE, and Frankfurt stock exchanges but significantly less actively traded on VIRTX. The foreign information factor is not a significant determinant of foreign trading volume share except for London and US OTC accounts (significant only at 10% confidence level).

The interaction variable of the 'Traded indicator' variable is calculated only for exchanges that host listed and also traded accounts. As predicted, traded accounts of the Frankfurt and XETRA exchanges have significantly smaller FTVS than listed accounts. In contrast to the expectation that a company's first foreign listing is expected to generate more active foreign trading compared to consequent foreign listings, it is found that the first foreign

listing indicator is a negative determinant of the FTVS for Paris, NYSE, and Amsterdam listings. The duration of listing is a significant and a positive determinant of foreign trading volume share for XETRA, Frankfurt, NYSE, and OTC accounts and a significant and negative determinant for VIRTX and Paris accounts. Coefficient estimates on the same currency indicator have positive signs for London, XETRA, and Frankfurt accounts but a negative sign for Milan accounts. Trading in the form of depository receipts vs. ordinary shares generates significantly less active trading only on European exchanges (London, XETRA, and Frankfurt), whereas the difference in foreign trading volume share generated by listings in the form of ADRs and ordinary listings is insignificant for NYSE and NASDAQ listings and positive and significant for US OTC market listings. Stocks with a higher price level have higher FTVS when listed/traded on US OTC market, NYSE and Frankfurt, but a smaller FTVS when listed in Paris.

Amsterdam, Milan, NASDAQ, the Swiss stock exchange, VIRTX and XETRA do not host stocks from emerging markets in the sample. Stocks from emerging markets that are traded in London, Frankfurt and Paris have more active foreign trading compared to stocks from developed markets. However, stocks from emerging markets have a smaller FTVS compared to stocks from developed markets on the US OTC market. A common language between the home and host countries reduces information barriers for foreign investors and, thus, stimulates more active foreign equity trading, particularly on London, Frankfurt, and Swiss stock exchanges. Geographic distance between the home and host countries is a measure of the unfamiliarity of foreign investors with a stock: the greater the distance, the smaller the foreign trading volume share is for VIRTX, Paris, XETRA, and London accounts. The level of investor protection in the home country is a positive determinant for Milan, Amsterdam and Swiss stock listings and a negative determinant for London, Paris and VIRTX listings. Coefficient estimates on the enforcement of insider trading laws variable are around zero for all exchanges. Stocks from home markets with higher trading costs have higher FTVS in London and Amsterdam, but, unexpectedly, smaller FTVS on the Italian and Swiss stock exchanges. Lastly, the accounting opacity of the home country negatively affects FTVS on Italian stock exchange, VIRTX, Paris and New York stock exchanges, but positively on the London stock exchange.

To summarize, analysis of stock-specific factors by stock exchange provides a useful insight for companies that are seeking to improve the liquidity of their stock. More specifically,

it provides evidence regarding which foreign market is more likely to provide active trading for a stock with particular characteristics, including company characteristics and the company's home market characteristics. The US exchanges have more active trading in stocks of more export-oriented companies, the London stock exchange has active trading of stocks from emerging markets, from English-speaking countries and from countries with poor investor protection. VIRTX, in contrast, is most successful in generating equity trading of large foreign companies that comply with international accounting standards and come from countries with better investor protection and a better information environment.

4.8 Conclusion

This study examines the distribution of foreign trading volume of European cross-listed stocks and the factors that affect this distribution. The distribution of foreign equity trading is measured by foreign trading volume share, which is the ratio of the number of shares traded on a particular exchange to the total number of shares traded on all exchanges in the sample (home exchange as well as foreign exchanges) for each stock. Arguably, there are two main groups of determinants for foreign trading volume share: the pull factors of the foreign trading volume, or exchange-specific factors, and the stock-specific factors. Empirical analysis reveals that both of these groups are significant determinants of foreign trading volume share.

Analysis of the location of cross-border equity trading of European cross-listed stocks shows that in terms of total trading volume (the NYSE) as well as in terms of the average foreign trading volume share (NASDAQ), the US exchanges are important markets where significant trading of European cross-listed stocks takes place. The London stock exchange follows the US exchanges for both total foreign equity trading volume and the average trading volume share of foreign stocks. There is evidence of the diminishing importance of US OTC as the market place for foreign equity trading. Also, there is evidence of the limited ability of other off-exchange trading venues, such as trading platforms XETRA and VIRTX, to attract active trading in foreign stocks despite a large number of foreign stocks being admitted to trade.

The findings on the exchange-specific factors that facilitate a more favourable trading environment for foreign equity trading are relevant for stock exchanges that compete for trading

of foreign stocks. I find evidence that higher trading costs and a higher level of accounting opacity in the host country have a significant negative impact on the stock exchange's ability to attract active foreign equity trading. Furthermore, there is evidence that demutualized stock exchanges, stock exchanges with higher levels of liquidity and stock exchanges in countries with enforced insider trading laws have a superior ability to attract equity trading of foreign stocks.

The second part of the investigation focuses on stock-specific factors as the determinants of foreign trading volume share. Stock-level analysis provides strong evidence that stocks admitted to trade on a foreign exchange have a significantly lower share of foreign trading compared to stocks listed on a foreign exchange. This is in line with the findings on the exchange-level analysis and in line with the theoretical model of Chemmanur and Fulghieri (2006) predicting that a foreign listing is beneficial due to the increase in investor awareness of the stock and the reduction in investors' monitoring costs. In other words, a stock exchange listing (as opposed to an admission to trade) on a foreign exchange, despite higher fees and disclosure requirements, should be regarded as a preferable option for companies that are looking to improve stock liquidity. Furthermore, the findings suggest that the share of foreign trading increases over time. While this result is intuitively compelling since duration of listing/ trading is the measure of stock visibility on the exchange, it contradicts the findings of Halling et al (2008) that trading volumes of large foreign stocks migrate back to the home market after the first year of cross-listing.

The findings suggest that company characteristics are important determinants of foreign trading volume share. Specifically, foreign trading volume share is larger for smaller and riskier companies, for companies with higher foreign institutional ownership and with lower stock return correlation with host market returns. However, the foreign information factor that Baruch et al (2007) name as the most significant determinant of trading volume distribution, is a positive determinant for the US observations but a negative determinant for non-US observations.

Listing/trading on the US exchanges results in more active foreign trading activity compared to other host markets. I interpret this as the US trading premium of foreign trading volume share, similar to the US cross-listing valuation premium of Doidge et al (2004) and Doidge et al (2009a), which they justify by the fact that the US offers a deep and liquid capital

market and a better-quality informational and legal environment. Furthermore, the US trading premium is robust in controlling for the differences in the level of liquidity, the quality of the information and the legal environments between the host and home markets.

After disentangling the US-specific variation and the geographic distance between the host and home markets, the measure of investors' unfamiliarity with the stock is a negative and significant determinant of the foreign trading volume share. The finding is in line with the argument of Sarkissian and Schill (2004, 2009a) regarding the importance of investor familiarity for cross-listing decisions and is in line with the 'home bias' argument (Brennan and Cao, 1997; Coval and Moskowitz, 1999; Huberman, 2001; Grinblatt, and Keloharju, 2001).

Finally, the findings highlight the importance of the quality of the legal and information environments for the distribution of foreign equity trading. I find that a market that provides better investor protection and has enforced insider trading laws has a strong advantage over other markets in attracting trading volumes of European cross-listed stocks. Furthermore, the higher the quality of the information environment of the home market and, particularly, of the home market relatively to the host market, the higher the fraction of trading on the foreign exchange.

The findings of this study have two important practical applications. First, for stock exchange executives, it answers the question of which stock exchange characteristics determine a more favourable trading environment for foreign cross-listed stocks, i.e. what makes stock exchanges more competitive in attracting foreign equity trading. Second, for corporate managers seeking to improve their company's stock liquidity, it answers the question of on which foreign stock exchange the company stock has the most potential to maximize its liquidity in terms of trading volume, given specific company characteristics.

Figure 4.1 Average stock exchange's share of foreign equity trading of European cross-listed stocks and Number of observations

The figures plot the annual average foreign equity trading share and the total annual number of stock-month observations for the total sample and individually for eleven major exchanges. The average annual foreign trading share is the mean of the stock-level foreign trading shares of all the stocks in the sample that are traded on the stock exchange, calculated monthly as the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample.

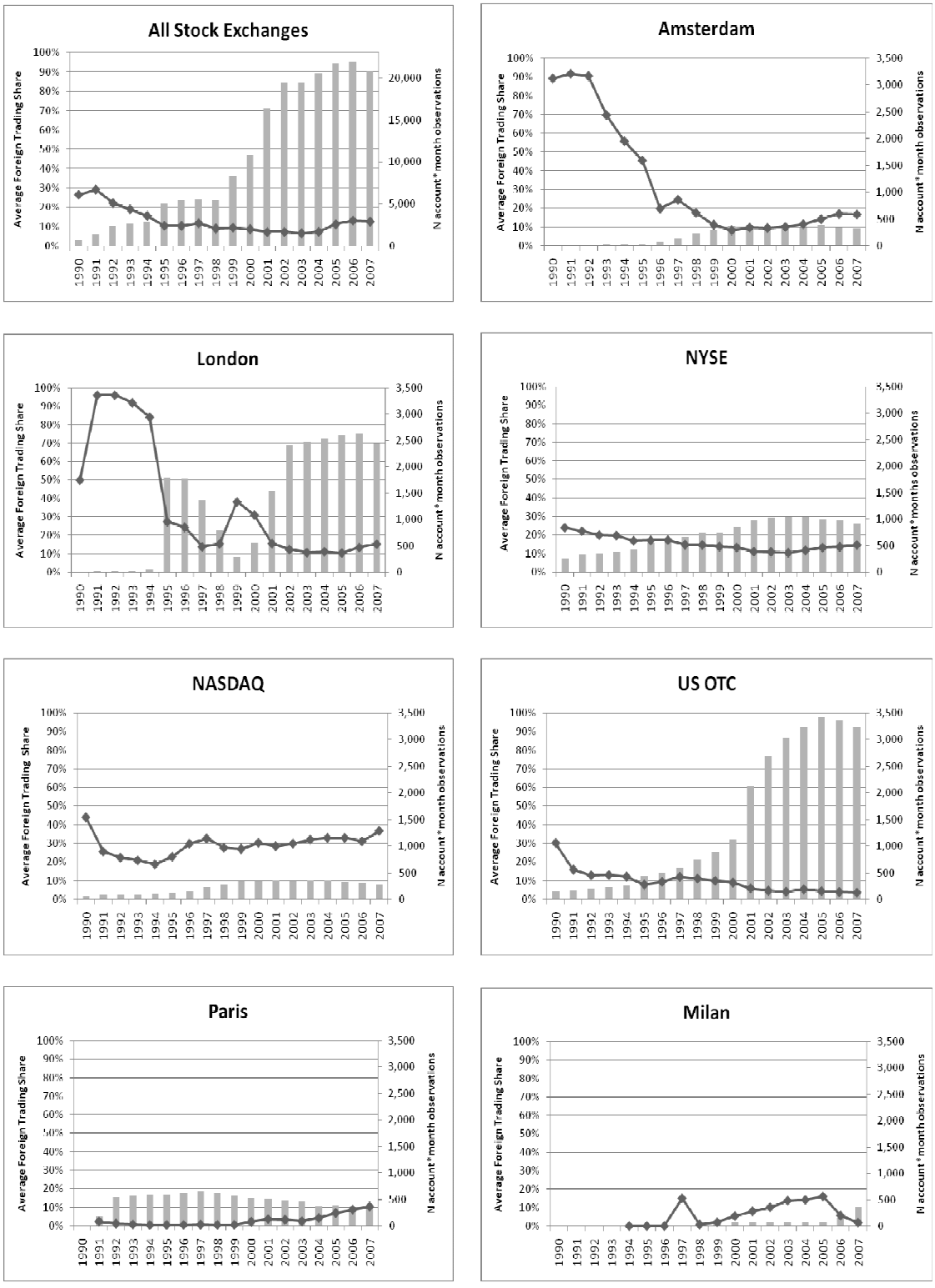


Figure 1 continued

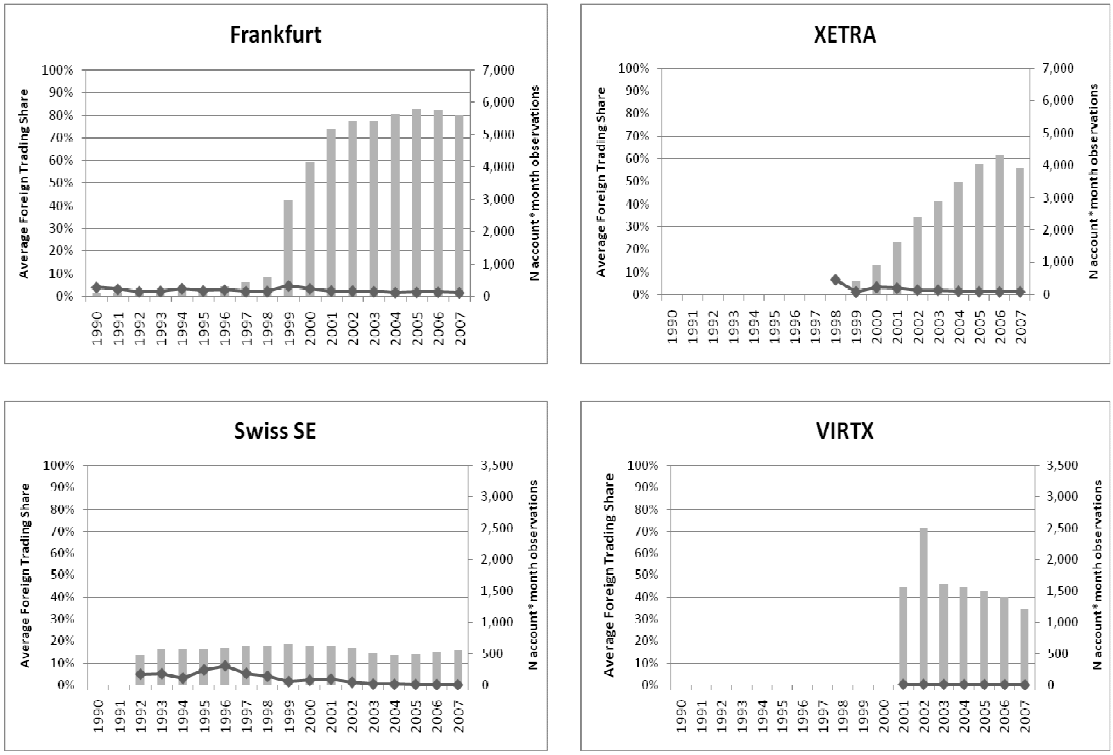


Table 4.1 Potential determinants of the foreign trading volume share

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

Determinant	Empirical measure	Effect on the foreign trading volume share
Host market characteristics - Pull factors		
Level of disclosure	Trading platform indicator	-
Exchange-specific factors	Organizational structure - Demutualization indicator	+
	Market design - Electronic market indicator	+
	Foreign stock concentration	+
	Exchange's Industry specialization	+
Trade frictions	Common language	+
	Geographic distance	-
	Market size	+
	Aggregate market liquidity	+
	Trading costs	-
Legal environment	Investor protection	+
	Insider trading laws enforced	+
Information environment	Accounting opacity	-
Stock-level factors		
Listing characteristics		
Level of disclosure	Traded (vs. exchange-listed)	-
Stock visibility	First foreign listing	+
	Time listed	+
	Price level	+
Trade frictions	The same currency of listing	+
	DR (vs. ordinary listing)	-
Company characteristics		
Company visibility	Company size	-
	Company growth opportunities	+
	Company foreign sales	+
Ownership structure	Company's foreign institutional ownership	+
	Ownership concentration	-
Stock risk	Stock return variance	+
Level of transparency	International accounting standards used	+
Returns co-movement	Stock retrun correrlation with foreign market	-
with foreign market	Foreign information factor	+
Home market characteristics		
Economic development	Level of development	+
Legal environment	Investor protection	-
	Insider trading laws enforced	-
Information environment	Accounting opacity	-
Trade frictions	Trading costs	+

Table 4.2 Explanatory variables

The table presents the list of explanatory variables, indicates whether the variable is used in the exchange-level and/or the stock level analysis, and provides a definition and data sources for each of the variables.

Explanatory variable	Used in exchange level analysis	Used in stock level analysis	Definition	Data source
Host market characteristics - Pull factors				
Trading platform indicator	V		dummy varible =1 if trading takes place on VIRTX, XETRA trading platforms or on the US OTC market; =0 otherwise	dataset
Demutualization indicator (host market)	V		dummy variable =1 if trading takes place on demutualized exchang; =0	Aggarwal (2002), stock exchange web-sites
Electronic market indicator (host market)	V		dummy varible =1 after the introduction of an electronic market on a particular exchange	Jain (2005)
Foreign stock concentration (host market)	V	V	percentage of the number of foreign companies listed in the total number of companies listed on the exchange in the preceding month; it is avalable for stock exchanges only	WFE statistics
Exchange's Industry specialization (host market)		V	percentage of foreign companies from the same industry traded on the exchange in the total number of companies traded on the exchange in the sample in the preceding month	dataset
Common language		V	dummy variable =1 if the host and the home countries share a common official language; =0 otherwise	Sarkissian and Shill (2004)
Geographic distance		V	the natural logarithm of the geographic distance in kilometres between capitals of the host and home countries	Sarkissian and Shill (2004)
Market size (host market)	V		the natural logarithm of total market capitalization of DS Total Market index, converted from local currency to GBP	Datastream
Market size (host market relative to home market)		V	the log-difference between the host total market capitalization and the home total market capitalization	
Aggregate market liquidity (host market)	V		market turnover ratio calculated as the ratio of the total value of the DS Total Market index constituent shares traded to the DS Total Market index capitalization	Datastream
Aggregate market liquidity (host market relative to home market)		V	the log-difference between the market turnover ratio of the host and of the home markets	
Trading costs (host market)	V		total trading costs are the sum of price impact costs, implicit costs and explicit costs	Chiyachantana et al (2004), Table V
Trading costs (host market relative to home market)		V	the difference in total trading costs of the host market and of the home markets	
Investor protection (host market)	V		anti-self-dealing index	Djankov et al (2008)
Investor protection (host market relative to home market)		V	the difference in anti-self-dealing index of the host market and of the home markets	

Table 4.2 continued

Explanatory variable	Used in exchange level analysis	Used in stock level analysis	Definition	Data source
Insider trading laws enforced (host market)	V		dummy variable =0 before enforcement of insider trading laws and =1 in the year of enforcement of insider trading regulation and thereafter	Bhattacharya and Daouk (2002)
Insider trading laws enforced (host market relative to home market)		V	non-negative difference between the insider trading laws enforcement variable of the host and of home countries (1)	
Accounting opacity (host market)	V		accounting opacity index	Kurtzman et al (2004)
Accounting opacity (host market relative to home market)		V	the difference in the accounting opacity index of the host country and of the home country	
Stock-level factors				
Listing characteristics				
Traded (vs. exchange-listed)		V	traded indicator=1 if the stock is traded on the US OTC, London OTC, open market of Deutsche Bourse, or VIRTX; =0 otherwise	dataset
First foreign listing		V	dummy variable = 1 if the foreign account is the fist and the only foreign listing of the stock; =0 otherwise	dataset
Time listed/ traded		V	the number of years a stock has been listed or traded on a particular exchange	dataset
Price level		V	the natural logarithm of the stock price on a particular exchange denominated in GBP	Datastream
The same currency of listing		V	dummy variable =1 if foreign trading takes place in the same currency as home trading; =0 otherwise	Datastream
DR (vs. ordinary listing)		V	dummy variable =1 if the listing is in the form of a depository receipt; =0 otherwise	dataset
Company characteristics				
Company size		V	market value of the company's share at the end of the preceding year	Datastream
Company growth opportunities		V	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	Datastream
Company foreign sales		V	the fraction of foreign sales in company's total net sales in the preceding year	Datastream
Foreign investors - company's foreign institutional ownership		V	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		V	calculated as one minus the percentage of total shares available to ordinary investors at the end of the preceding year	Datastream
Stock return variance		V	standard deviation of stock weekly returns over the preceding 12 months, calculated for each month	Datastream

Table 4.2 continued

Explanatory variable	Used in exchange level analysis	Used in stock level analysis	Definition	Data source
International accounting standards used		V	dummy variable =1 if the company used international accounting standards or US GAAP in the end of the preceding year; =0 otherwise	Datastream
Stock retrun correrlation with foreign market		V	correlation coefficient of weekly stock returns and foreign index returns over preceding 36 (at least 24) months, computed for each month	Datastream
Foreign information factor		V	Foreign information factor calculated using methodology of Baruch et al (2007), explained in Appendix 4.1	Datastream
Home market characteristics				
Level of development (home market)		V	emerging market indicator =1 if the stock is from emerging market; =0 otherwise	MSCI list
Investor protection (home market)		V	anti-self-dealing index	Djankov et al (2008)
Insider trading laws enforced (home market)		V	dummy variable =0 before enforcement of insider trading laws and =1 in the year of enforcement of insider trading regulation and thereafter	Bhattacharya and Daouk (2002)
Accounting opacity (home market)		V	accounting opacity index	Kurtzman et al (2004)
Trading costs (home market)		V	total trading costs are the sum of price impact costs, implicit costs and explicit costs	Chiyachantana et al (2004), Table V

(1) Host market characteristic relative to home market characteristic: $X_{relative} = \max[(X_{host} - X_{home}),0]$

Table 4.3 Average foreign trading volume share and Pull factors: Summary statistics

The table reports summary statistics of the exchange-level average foreign trading volume share and the host exchange-specific factors, or the pull factors of the foreign equity trading, for the total sample and individually for eleven major exchanges. The sample of 812 European cross-listed stocks is used to calculate the exchange-level average foreign trading volume shares, which are the means of the foreign trading volume shares of the stocks traded on the exchange in each month. Detailed summary statistics of the average foreign trading volume shares and the number of account-month observations by year and by stock exchange is presented in Table 4.4. The pull factors are defined in Table 4.2.

	Total sample	Amsterdam	Frankfurt	London	Milan	NYSE	Nasdaq	OTC	Paris	Swiss SE	VIRTX	XETRA
Panel A. Average foreign trading volume share												
Average foreign trading share	0.119	0.349	0.025	0.366	0.069	0.155	0.292	0.097	0.029	0.029	0.002	0.02
Annual foreign trading volume, bln GBP		10.8	4.1	144.5	12.8	133.4	23.8	324.4	9.4	8.6	0.7	4.4
Foreign trading volume, % of total		2.0%	1.2%	19.4%	1.6%	43.8%	6.5%	18.6%	1.6%	2.1%	0.2%	1.0%
N observations, % of total		1.8%	19.2%	11.4%	0.6%	11.2%	3.4%	12.5%	8.9%	8.7%	8.2%	12.4%
Panel B. Pull factors of the foreign equity trading												
Trading platform indicator	0.11	0	0	0	0	0	0	1	0	0	1	1
Demutualization indicator	0.52	0.62	0.44	0.45	0.70	0.11	0.44		0.48	0.38	0.91	0.86
Electronic market indicator	0.84	0.79	0.94	0.63	0.89	0.44	1.00	0.44	1.00	0.76	1.00	1.00
Foreign stock concentration	0.23	0.42	0.20	0.12	0.02	0.19	0.10		0.15	0.35		
Market size, billion GBP	1299	262	463	1113	285	5157	5157	5157	560	337	461	643
Market liquidity	66.1	84.5	93.1	75.5	79.0	100.0	100.0	100.0	60.0	57.7	66.6	37.0
Trading costs	0.62	0.47	0.57	0.56	0.45	0.64	0.64	0.64	0.50	0.94	0.94	0.57
Investor protection	0.46	0.20	0.28	0.95	0.42	0.65	0.65	0.65	0.38	0.27	0.27	0.28
IT laws enforcement	0.80	0.79	0.72	1.00	0.76	1.00	1.00	1.00	1.00	0.82	1.00	1.00
Accounting opacity	0.30	0.38	0.17	0.33	0.63	0.20	0.20	0.20	0.33	0.25	0.25	0.17
Average company size, million GBP	11.39	13.45	8.99	6.16	15.49	15.54	3.11	5.09	15.97	13.14	18.56	16.07

Table 4.4. Foreign equity trading volume, Number of observations and Average foreign trading volume share

The table reports the annual distribution of the foreign equity trading volume, the number of observations and the average foreign trading share (ATVS) for the total sample and individually for eleven major exchanges. The sample of 812 European cross-listed stocks with 2,965 foreign accounts is used to calculate the exchange-level foreign equity trading volume, the number of observations and the average foreign trading shares. Annual foreign equity trading volume is the sum of foreign trading volume of the sample cross-listed stocks traded on a particular exchange; foreign trading volume for each stock is calculated as the product of the number of the shares traded on the foreign exchange and the stock price (on a daily basis) converted to GBP. The number of observations is the total number of account-month observations for each year. The average foreign trading share is the mean of the foreign trading volume shares of the stocks traded on the exchange, calculated monthly as the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total sample																		
Foreign trading, bln GBP	31	57	55	101	78	766	961	871	634	357	635	669	1,875	3,082	2,546	629	809	1,045
N observations	771	1,391	2,424	2,714	2,913	5,104	5,462	5,591	5,470	8,395	10,837	16,333	19,485	19,484	20,590	21,703	21,876	20,877
ATVS	0.26	0.29	0.22	0.19	0.16	0.10	0.10	0.12	0.09	0.09	0.09	0.07	0.07	0.07	0.07	0.11	0.13	0.13
Amsterdam																		
Foreign trading, bln GBP	0	1	1	1	1	2	4	6	14	18	25	25	15	14	14	18	24	55
N observations	10	12	12	18	24	25	66	140	235	310	368	319	318	336	339	379	348	326
ATVS	0.89	0.92	0.91	0.70	0.56	0.46	0.20	0.25	0.18	0.11	0.08	0.10	0.10	0.10	0.12	0.14	0.17	0.17
London																		
Foreign trading, bln GBP	1	0	0	1	1	567	815	702	437	21	20	21	35	43	53	76	162	224
N observations	14	25	34	38	48	1,789	1,770	1,385	799	296	554	1,538	2,406	2,465	2,538	2,595	2,625	2,437
ATVS	0.50	0.96	0.96	0.92	0.84	0.27	0.24	0.14	0.15	0.38	0.31	0.16	0.12	0.11	0.11	0.10	0.13	0.15
NYSE																		
Foreign trading, bln GBP	18	25	34	63	48	62	86	96	120	212	340	252	201	178	210	224	281	431
N observations	256	334	363	394	433	554	624	666	735	750	854	982	1,033	1,045	1,042	1,004	972	910
ATVS	0.24	0.22	0.20	0.20	0.17	0.17	0.17	0.15	0.15	0.14	0.13	0.11	0.11	0.10	0.12	0.13	0.14	0.15
Nasdaq																		
Foreign trading, bln GBP	6	4	4	11	10	15	16	28	30	40	91	52	25	25	34	31	37	58
N observations	72	84	94	99	108	118	153	238	281	339	350	362	350	355	360	337	306	289
ATVS	0.44	0.26	0.22	0.21	0.19	0.23	0.30	0.33	0.28	0.27	0.30	0.29	0.30	0.32	0.33	0.33	0.31	0.37

Table 4.4 continued

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
OTC																		
Foreign trading, bln GBP	2	2	2	4	6	8	11	12	12	13	15	232	1,487	2,711	2,134	178	184	119
N observations	156	171	192	229	258	440	500	606	753	891	1,133	2,122	2,674	3,028	3,229	3,415	3,347	3,236
ATVS	0.30	0.16	0.13	0.13	0.12	0.08	0.09	0.12	0.11	0.10	0.09	0.06	0.05	0.04	0.05	0.04	0.04	0.04
Paris																		
Foreign trading, bln GBP		0	1	1	1	1	1	1	2	3	68	16	28	6	7	8	16	48
N observations		189	558	567	587	590	630	667	613	574	534	522	493	457	385	394	348	342
ATVS		0.02	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.04	0.03	0.02	0.04	0.07	0.09	0.10
Milan																		
Foreign trading, bln GBP			0		0	0	0	12	0	2	14	24	37	65	46	37	25	19
N observations			9	12	21	24	24	24	31	49	70	72	72	72	72	69	151	371
ATVS			0.00		0.00	0.00	0.00	0.15	0.01	0.02	0.05	0.08	0.10	0.14	0.14	0.16	0.06	0.02
Frankfurt																		
Foreign trading, bln GBP	1	0	0	1	1	1	2	3	6	17	19	7	5	3	4	5	6	5
N observations	119	135	145	201	248	253	320	440	583	2,983	4,171	5,164	5,415	5,428	5,656	5,787	5,745	5,588
ATVS	0.04	0.03	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.05	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01
XETRA																		
Foreign trading, bln GBP									0	1	8	10	12	10	12	13	14	16
N observations									3	435	908	1,602	2,398	2,862	3,457	4,042	4,318	3,913
ATVS									0.07	0.01	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01
Swiss stock exchange																		
Foreign trading, bln GBP			2	4	3	108	24	8	9	9	8	4	3	2	2	1	1	1
N observations			475	576	576	579	610	619	625	667	632	619	588	517	482	491	531	558
ATVS			0.05	0.05	0.03	0.07	0.09	0.05	0.04	0.02	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.00
VIRTX																		
Foreign trading, bln GBP												4	4	2	2	2	1	1
N observations												1,555	2,496	1,607	1,551	1,491	1,407	1,204
ATVS												0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 4.5 Stock-level variables: Summary statistics

Table 4.5.1 reports summary statistics of the stock-level foreign trading volume share and the stock-level determinants of the foreign trading volume share for the pooled 1990-2007 sample, the pooled 2003-2007 sample and the 2003-2007 sub-samples of listed and traded foreign accounts.

Table 4.5.2 reports summary statistics of the stock-level foreign trading volume share and the stock-level determinants of the foreign trading volume share individually for eleven major exchanges for the 2003-2007 samples.

Stock-level foreign trading volume share is the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample calculated monthly. The determinants are defined in Table 4.2.

(continued on the next page)

Table 4.5.1 Stock-level variables: Summary statistics

	Sample 1990-2007		Sample 2003-2007					
	Mean	**N**	**Mean**	**N**	**Min**	**Max**	**Listed**	**Traded**
Panel A. Foreign trading volume share								
Foreign trading volume share	0.042	81,917	0.030	51,846	0	1	0.080	0.010
Panel B. Stock-level factors								
Listing characteristics								
Traded indicator	0.63	81,917	0.71	51,846	0	1	0	1
First listing	0.05	81,917	0.02	51,846	0	1	0.07	0
Time listed	5.74	81,917	6.24	51,846	0.17	22	8.26	5.42
Price level	20.0	81,917	19.9	51,846	0.01	5841	18.15	20.66
Same currency	0.4	81,917	0.4	51,846	0	1	0.43	0.39
DR indicator	0.29	81,917	0.27	51,846	0	1	0.29	0.26
Company characteristics								
Company size, GBP mln	14,969	81,917	15,254	51,846	1.55	127,867	18,221	14,039
Price-to-book ratio	3.64	81,917	3.07	51,846	0.02	194.68	3.06	3.07
Foreign sales fraction	0.57	81,917	0.57	51,846	0	1	0.59	0.56
Foreign investors	0.08	51,846	0.08	51,846	0	0.94	0.07	0.08
Ownership concentration	0.26	52,504	0.26	51,846	0	0.96	0.23	0.27
Stock risk	0.04	81,917	0.04	51,846	0	0.45	0.04	0.04
Int. accounting standards	0.52	81,917	0.73	51,846	0	1	0.71	0.74
Return correlation	0.44	81,917	0.48	51,846	-0.15	0.94	0.49	0.48
Foreign information factor	2.33	81,917	2.62	51,846	0	27.67	2.75	2.56
Home market characteristics								
Emerging market indicator	0.02	81,917	0.02	51,846	0	1	0	0.03
Investor protection	0.49	81,917	0.48	51,846	0.18	0.95	0.48	0.49
IT laws enforced	0.89	81,917	0.91	51,846	0	1	0.86	0.93
Accounting opacity	0.34	81,917	0.34	51,846	0.17	0.63	0.33	0.34
Trading costs	0.61	81,917	0.62	51,846	0.45	2	0.63	0.61
Panel C. Pull factors - Host market characteristics relative to home market characteristics								
Market size difference	11.0	80,900	9.9	50,955	0.0	348.9	13.2	8.5
Market liquidity difference	4.2	80,254	5.2	50,955	0	109.8	7.86	4.15
Trading costs difference	-0.02	81,825	-0.02	51,777	-1.28	0.49	-0.04	-0.02
Investor protection difference	-0	81,917	-0.02	51,846	-0.75	0.77	0.04	-0.04
IT law enforced difference	0.1	81,825	0.09	51,777	0	1	0.14	0.07
Accounting opacity difference	-0.11	78,924	-0.11	78,924	-0.46	0.46	-0.08	-0.14
Common language	0.23	81,917	0.22	51,846	0	1	0.34	0.17
Geographic distance, km	2197	81917	2064	51846	174	8261	2283	1974
Pull factors - Host exchange								
Industry specialization	0.14	67,956	0.13	42,364	0.02	1	0.17	0.12
Foreign stocks concentration	0.19	42,397	0.18	30,658	0.01	0.86	0.2	0.17
N account-months observations	81,917		51,846				15,056	36,790
N foreign accounts	1,714		1,477				372	1,117
N stocks (ISINs)	519		446				211	410

Table 4.5.2 Stock-level variables by stock exchange: Summary statistics

	Sample 2003-2007										
	Amsterdam	Frankfurt	London	Milan	NYSE	Nasdaq	OTC	Paris	SwissSE	VIRTX	XETRA
Panel A. Foreign trading volume share											
Foreign trading volume share	0.078	0.004	0.067	0.084	0.083	0.321	0.023	0.013	0.001	0.001	0.005
Panel B. Stock-level factors											
Listing characteristics											
Traded indicator	0	0.88	0.65	1	0	0	1	0	0	1	0.82
First listing	0.02	0	0.12	0	0	0.09	0	0	0	0	0
Time listed	5.92	6.24	4.64	4.35	10.61	10.19	6.26	9.66	12.72	5.86	4.38
Price level	20.7	22.4	19.5	25.0	18.8	10.6	15.5	22.9	33.2	30.7	18.8
Same currency	0.80	0.55	0.27	0.98	0	0	0	0.67	0	1	0.57
DR indicator	0	0.11	0.03	0	0.95	0.89	0.75	0	0	0	0.10
Company characteristics											
Company size, GBP mln	25,346	12,831	14,275	30,891	23,385	3,851	9,589	23,886	23,435	26,850	18,836
Price-to-book ratio	2.72	3.26	2.78	2.00	4.83	3.21	2.70	2.18	2.66	2.87	3.07
Foreign sales fraction	0.59	0.57	0.56	0.57	0.57	0.68	0.54	0.56	0.65	0.59	0.57
Foreign investors	0.03	0.08	0.09	0.03	0.08	0.09	0.08	0.08	0.05	0.05	0.07
Ownership concentration	0.19	0.30	0.25	0.11	0.25	0.28	0.29	0.24	0.19	0.17	0.24
Stock risk	0.04	0.04	0.04	0.04	0.04	0.06	0.04	0.04	0.03	0.03	0.04
Int. accounting standards	0.78	0.70	0.72	0.90	0.70	0.68	0.70	0.74	1	1	0.75
Return correlation	0.59	0.48	0.49	0.65	0.46	0.35	0.40	0.60	0.52	0.52	0.53
Foreign information factor	3.64	2.89	1.93	1.84	2.65	3.02	1.98	2.69	1.94	1.47	3.23
Home market characteristics											
Emerging market indicator	0	0.04	0.01	0	0.01	0	0.01	0	0	0	0.03
Investor protection	0.42	0.50	0.43	0.33	0.55	0.59	0.54	0.45	0.34	0.40	0.46
IT laws enforced	1	0.91	0.76	1	0.92	0.78	0.92	1	1	1	0.98
Accounting opacity	0	0.36	0.33	0	0.34	0.33	0.32	0	0	0	0.36
Trading costs	1	1	1	1	1	1	1	1	1	1	1
Panel C. Pull factors											
Host market characteristics relative to home market characteristics											
Market size difference	0.6	2.9	9.7	0.8	28.4	41.4	26.6	1.8	1.1	0.9	2.2
Market liquidity difference	15.4	0.03	11.9	19.0	8.6	5.3	9.0	11.1	19.4	11.6	0.03
Trading costs difference	-0.08	-0.06	-0.13	-0.10	0.00	-0.03	0.03	-0.07	0.39	0.41	-0.03
Investor protection difference	-0.22	-0.21	0.52	0.09	0.11	0.06	0.11	-0.07	-0.08	-0.13	-0.18
IT law enforced difference	0	0.09	0.24	0	0.09	0.22	0.09	0	0	0	0.02
Accounting opacity difference	0.08	-0.19	0	0.31	-0.14	-0.13	-0.12	0.02	0.01	-0.04	-0.19
Common language	0	0.13	0.24	0	0.39	0.51	0.36	0	0.52	0.30	0.11
Geographic distance, km	554	672	638	1183	6261	6030	6258	534	643	582	646
Host exchange characteristics											
Industry specialization	0.13	0.10	0.13	0.26	0.12	0.28	0.12	0.27	0.15	0.12	0.11
Foreign stocks concentration	0.43	0.18	0.12	0.02	0.20	0.10		0.14	0.27		
N account-months observations	1,123	16,187	6,655	483	3,518	1,103	8,512	1,399	612	1,220	8,799
N foreign accounts	31	364	193	26	68	24	213	43	41	100	281
N stocks (ISINs)	31	320	186	26	68	24	187	43	41	100	248

Table 4.6.1 Pull factors (exchange-level): Correlation matrix

The table reports the correlation matrix of the exchange-level average foreign trading volume share and the host exchange-specific factors, or the pull factors of the foreign equity trading. The sample of 812 stocks European cross-listed stocks is used to calculate the exchange-level average foreign trading volume shares, which are the means of the foreign trading volume shares of the stocks traded on the exchange in each month. The pull factors are defined in Table 4.2.

	Average trading volume share	Trading platform indicator	Demutualization indicator	Electronic market indicator	Foreign companies concentration	Market size	Market liquidity	Trading costs	Investor protection	IT laws enforced	Accounting opacity
Trading platform indicator	-0.05	1									
	(0)										
Demutualization indicator	-0.08	0.2	1								
	(0)	(0)									
Electronic market indicator	-0.31	-0.14	0.43	1							
	(0)	(0)	(0)								
Foreign companies	-0.56	-	-0.1	0.04	1						
concentration	(0)	-	(0)	(0.16)							
Market size	0.33	0.34	0.04	-0.12	-0.35	1					
	(0)	(0)	(0.04)	(0)	(0)						
Market liquidity	0.39	0	-0.03	-0	-0.62	0.45	1				
	(0)	(0.88)	(0.16)	(0.98)	(0)	(0)					
Trading costs	-0.26	0.14	0.09	0.02	0.11	-0.11	0.05	1			
	(0)	(0)	(0)	(0.26)	(0)	(0)	(0.01)				
Investor protection	0.47	0.03	-0.2	-0.27	-0.35	0.42	0.27	-0.03	1		
	(0)	(0.13)	(0)	(0)	(0)	(0)	(0)	(0.09)			
IT laws enforced	0.23	0.19	0.29	0.1	0.02	0.56	0.11	-0.25	0.14	1	
	(0)	(0)	(0)	(0)	(0.49)	(0)	(0)	(0)	(0)		
Accounting opacity	-0.06	-0.32	0.13	0.19	-0.31	-0.43	0.17	-0.27	-0.07	-0.21	1
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	
Average company size	-0.2	0.03	0.35	0.3	0.18	-0.03	-0.01	-0.03	-0.31	0.2	0.13
	(0)	(0.12)	(0)	(0)	(0)	(0.13)	(0.52)	(0.09)	(0)	(0)	(0)

Table 4.6.2 Pull factors (stock-level): Correlation matrix

The table reports the correlation matrix of the pull factors used in the stock-level analysis with the stock-level foreign trading volume share and other explanatory variables for the 2003-2007 sample. Stock-level foreign trading volume share is the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample calculated monthly. The explanatory variables are defined in Table 4.2.

	Trading volume share	Company size	Price-to-book ratio	Foreign sales	Foreign investors	Ownership concentration	Stock risk	Int. accounting standards	Return correlation	US information factor	Foreign (non-US) information factor	Traded indicator	First listing	Time listed	Price level	Same currency
Common	0.32	-0.15	0.04	-0.02	0.07	0.03	0.03	-0.03	-0.24	0.13	-0.08	-0.18	0.23	0.19	0.01	-0.19
language	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.06)	(0.0)
Geographic	0.47	-0.05	0.02	-0.01	0.01	0.04	0.02	-0.04	-0.22	0.64	-0.41	-0.08	-0.05	0.22	-0.01	-0.48
distance US	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Geographic	-0.48	0.05	-0.02	-0.01	-0.01	-0.02	-0.04	0.04	0.20	-0.64	0.40	0.10	0.04	-0.23	-0.02	0.46
distance non-US	(0.0)	(0.0)	(0.0)	(0.11)	(0.01)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Market size dif	0.45	-0.24	-0.01	0.01	0.06	0.02	0.07	0.01	-0.31	0.39	-0.28	-0.05	0.13	0.13	-0.09	-0.25
	(0.0)	(0.0)	(0.05)	(0.03)	(0.0)	(0.0)	(0.0)	(0.20)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Market liquidity dif	0.31	0.01	-0.04	-0.03	-0.01	-0.06	0.04	0.09	-0.06	0.31	-0.32	-0.30	0.11	0.14	0.12	-0.27
	(0.0)	(0.03)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Trading costs dif	-0.15	0.24	-0.01	0.06	-0.12	0.00	-0.09	-0.07	0.23	0.09	-0.09	0.04	-0.19	0.06	0.08	0.11
	(0.0)	(0.0)	(0.02)	(0.0)	(0.0)	(0.46)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Investor	0.18	-0.02	-0.10	0.00	-0.09	-0.10	0.03	0.15	0.10	0.13	-0.13	-0.10	0.05	-0.01	0.24	0.00
protection dif	(0.0)	(0.0)	(0.0)	(0.55)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.01)	(0.0)	(0.47)
IT law enforced	0.28	-0.29	0.02	0.00	0.15	0.06	0.10	-0.04	-0.35	-0.04	-0.10	-0.11	0.32	0.06	-0.19	0.11
dif	(0.0)	(0.0)	(0.0)	(0.36)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Accounting	0.04	0.10	-0.02	0.15	-0.04	-0.21	0.05	0.13	0.13	0.01	0.01	-0.18	0.07	-0.03	0.21	-0.16
opacity dif	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.09)	(0.01)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Industry	0.11	0.01	-0.10	-0.15	-0.01	-0.06	0.00	0.01	0.11	0.03	-0.07	-0.29	0.11	0.06	0.01	0.09
specialization	(0.0)	(0.06)	(0.0)	(0.0)	(0.01)	(0.0)	(0.37)	(0.01)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.22)	(0.0)
Foreign stock	-0.05	0.05	-0.02	-0.01	-0.05	0.00	0.04	-0.14	0.09	-0.02	0.10	-0.22	-0.08	0.05	0.01	0.16
concentration	(0.0)	(0.0)	(0.0)	(0.27)	(0.0)	(0.59)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.14)	(0.0)

Table 4.6.2 continued

	DR indicator	Emerging market Home	Investor protection Home	IT laws enforced Home	Accounting opacity Home	Trading costs Home	Common language	Geographic distance US	Geographic distance non-US	Market size dif	Market liquidity dif	Trading costs dif	Investor protection dif	I I laws enrorced dif	Accounting opacity dif	Industry specialization
Common	0.13	-0.08	0.30	-0.34	-0.14	0.40	1.00									
language	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)										
Geographic	0.72	-0.05	0.13	-0.01	-0.08	0.00	0.23	1.00								
distance US	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.40)	(0.0)									
Geographic	-0.71	0.07	-0.13	0.00	0.13	0.03	-0.25	-0.99	1.00							
distance non-US	(0.0)	(0.0)	(0.0)	(0.49)	(0.0)	(0.0)	(0.0)	(0.0)								
Market size dif	0.48	0.11	-0.16	-0.51	0.07	0.45	0.17	0.63	-0.57	1.00						
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)							
Market liquidity dif	0.28	-0.02	-0.16	-0.09	-0.35	0.08	0.17	0.50	-0.50	0.42	1.00					
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)						
Trading costs dif	0.06	-0.26	0.03	0.50	0.04	-0.92	-0.28	0.12	-0.15	-0.36	0.04	1.00				
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)					
Investor	0.10	0.07	-0.75	-0.01	-0.09	0.09	-0.10	0.19	-0.19	0.48	0.58	-0.08	1.00			
protection dif	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)				
IT law enforced	0.05	-0.05	0.15	-1.00	0.12	0.54	0.34	0.01	0.00	0.51	0.09	-0.50	0.01	1.00		
dif	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)			
Accounting	-0.07	-0.20	-0.09	0.06	-0.83	0.08	0.10	-0.01	-0.02	-0.06	0.60	-0.06	0.29	-0.06	1.00	
opacity dif	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)		
Industry	-0.05	-0.07	-0.08	0.01	-0.03	-0.05	0.04	0.01	0.00	-0.08	0.24	0.06	0.11	-0.01	0.25	1.00
specialization	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.30)	(0.36)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	
Foreign stock	-0.02	0.01	-0.04	0.13	-0.02	-0.13	0.01	-0.02	-0.02	-0.31	-0.08	0.12	-0.23	-0.13	-0.11	-0.12
concentration	(0.0)	(0.03)	(0.0)	(0.0)	(0.0)	(0.0)	(0.02)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)

Table 4.7 Stock-level factors: Correlation matrix

The table reports the correlation matrix of the stock-level foreign trading volume share and the stock-level factors of the foreign trading volume share for the 2003-2007 sample. Stock-level foreign trading volume share is the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample calculated monthly. The explanatory variables are defined in Table 4.2.

	Trading volume share	Company size	Price-to-book ratio	Foreign sales	Foreign investors	Ownership concentration	Stock risk	Int accounting standards	Return correlation	US information factor	Foreign (non-US) information	Traded indicator	First listing indicator	Time listed	Price level	Same currency	DR indicator	Emerging market	Investor protection	IT law enforced	Accounting opacity
Company size	-0.27	1.00																			
	(0.00)																				
Price-to-book ratio	-0.01	0.04	1.00																		
	(0.06)	(0.00)																			
Foreign sales	0.04	-0.03	-0.03	1.00																	
	(0.00)	(0.00)	(0.00)																		
Foreign investors	0.09	-0.18	0.01	0.03	1.00																
	(0.00)	(0.00)	(0.00)	(0.00)																	
Ownership concentration	0.03	-0.26	0.03	-0.10	0.44	1.00															
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)																
Stock risk	0.12	-0.37	-0.01	0.13	0.10	0.03	1.00														
	(0.00)	(0.00)	(0.019)	(0.00)	(0.00)	(0.00)															
Int accounting standards	0.01	0.10	0.01	0.02	-0.03	-0.15	-0.29	1.00													
	(0.17)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)														
Return correlation	-0.27	0.50	-0.10	0.03	-0.18	-0.24	-0.08	-0.03	1.00												
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)													
US Information factor	0.34	-0.01	0.01	0.00	-0.02	0.00	0.00	0.03	-0.05	1.00											
	(0.00)	(0.002)	(0.003)	(0.33)	(0.00)	(0.98)	(0.32)	(0.00)	(0.00)												
Foreign (non-US) information factor	-0.24	0.14	0.03	0.10	-0.06	-0.11	-0.01	0.06	0.24	-0.26	1.00										
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.001)	(0.00)	(0.00)	(0.00)											
Traded indicator	-0.37	-0.05	0.00	-0.05	0.01	0.09	-0.05	0.03	-0.04	-0.11	0.03	1.00									
	(0.00)	(0.00)	(0.85)	(0.00)	(0.097)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)										

Table 4.7 continued

	Trading volume share	Company size	Price-to-book ratio	Foreign sales	Foreign investors	Ownership concentration	Stock risk	IAS	Return correlation	US information factor	Foreign (non-US) information factor	Traded indicator	First listing indicator	Time listed	Price level	Same currency	DR indicator	Emerging market	Investor protection	IT law enforced	Accounting opacity
First listing indicator	0.23	-0.29	0.00	-0.04	0.09	0.09	0.05	-0.09	-0.23	-0.04	-0.06	-0.22	1.00								
	(0.00)	(0.00)	(0.47)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)									
Time listed	0.34	0.11	0.04	0.06	-0.04	-0.08	-0.12	0.12	-0.02	0.19	-0.09	-0.33	0.04	1.00							
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.001)	(0.00)	(0.00)	(0.00)	(0.00)								
Price level	-0.04	0.44	0.00	0.08	-0.15	-0.16	-0.28	0.23	0.27	0.00	0.02	-0.02	-0.21	0.08	1.00						
	(0.00)	(0.00)	(0.44)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.44)	(0.00)	(0.00)	(0.00)	(0.00)							
Same currency	-0.09	0.05	-0.06	0.01	-0.08	-0.05	-0.01	0.01	0.22	-0.31	0.19	-0.04	-0.01	-0.05	0.11	1.00					
	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(0.038)	(0.002)	(0.00)	(0.00)	(0.00)	(0.00)	(0.07)	(0.00)	(0.00)						
DR indicator	0.30	0.00	0.03	0.06	0.03	0.00	0.04	-0.03	-0.17	0.47	-0.25	-0.04	-0.06	0.17	0.03	-0.34	1.00				
	(0.00)	(0.26)	(0.00)	(0.00)	(0.00)	(0.86)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)					
Emerging market	0.06	-0.17	-0.03	-0.15	0.17	0.11	-0.01	0.08	-0.18	-0.04	-0.02	0.08	-0.02	-0.02	-0.02	-0.12	-0.03	1.00			
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
Investor protection	-0.02	-0.02	0.13	-0.02	0.15	0.13	0.00	-0.23	-0.23	0.08	-0.07	0.01	0.13	0.04	-0.34	-0.34	0.11	-0.15	1.00		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.94)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
IT law enforced	-0.27	0.29	-0.02	0.00	-0.15	-0.07	-0.10	0.04	0.35	0.04	0.10	0.11	-0.32	-0.06	0.19	-0.11	-0.05	0.05	-0.15	1.00	
	(0.00)	(0.00)	(0.00)	(0.32)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Accounting opacity	-0.02	-0.07	-0.01	-0.21	0.04	0.20	-0.06	-0.13	-0.09	-0.07	-0.05	0.04	0.05	0.01	-0.25	0.25	-0.04	0.21	0.03	-0.12	1.00
	(0.00)	(0.00)	(0.15)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.002)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
Trading costs	0.23	-0.24	0.02	-0.06	0.12	-0.01	0.07	0.11	-0.31	-0.01	0.01	-0.04	0.21	0.00	-0.05	-0.19	0.03	0.27	-0.02	-0.54	-0.10
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.001)	(0.00)	(0.00)	(0.00)	(0.15)	(0.04)	(0.00)	(0.00)	(0.30)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 4.8 Pull factors of the foreign equity trading

The table reports the estimates from the OLS regressions of the dependant variable, the logistic transformation of stock exchange's monthly average foreign share of trading volume. The exchange-level average foreign trading share is the mean of the foreign trading volume shares of the stocks traded on the exchange, calculated monthly as the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample. Regression specification is as follows: $logtrAFTVS_n = \alpha_0 + \Sigma\, \theta_k\, Z_{k,n} + C_n + \varepsilon_n$, where $Z_{k,n}$ is characteristic k of host market n in month t, and C_n is average size of companies traded on host exchange n in month t (control variable). The explanatory variables are defined in Table 4.2. Additionally, regressions include a control variable, average company size measured by the natural logarithm of the mean stock market value of stocks traded on the exchange converted to GBP. Output for model (2) additionally includes economic significance (econ. sign.) of the variables calculated as the product of the coefficient estimate and the variable's standard deviation divided by the standard deviation of the dependent variable. Reported in parenthesis t-value is heteroskedasticity consistent (White, 1980) and adjusted for clustering at the stock exchange level. '***' indicates significance at 1%, '**' indicates significance at 5% and '*' indicates significance at 10%.

		Model (2)		Model (3)	Model (4)	Model (5)
	Model (1)		Econ. sign.			
Intercept	3.51	6.83*		12.27***	3.23	8.31**
	(1.73)	(1.84)		(3.35)	(0.8)	(2.36)
Trading platform	-1.13*	-1.20*	-0.14	-1.08		
	(-1.87)	(-1.79)		(-1.69)		
Demutualization	1.17**	1.13*	0.25	-0.20		-0.31
	(2.39)	(1.9)		(-0.47)		(-0.52)
Electronic market	-1.89***	-2.36**	-0.35	-2.76***	-1.58**	-0.37
	(-3.34)	(-2.89)		(-4.32)	(-2.8)	(-0.93)
Foreign stocks concentration						0.14
						(0.08)
Market size	0.42***	0.10		-0.09	0.09	-0.12
	(3.92)	(0.69)		(-0.85)	(0.47)	(-0.79)
Market liquidity	0.29*	0.46***	0.21	0.52***	0.50**	0.62***
	(2.09)	(3.11)		(3.66)	(2.2)	(5.18)
Trading costs	-4.14***	-4.35**	-0.29	-5.00***	-2.39	-6.87***
	(-3.36)	(-2.6)		(-3.21)	(-1.2)	(-4.58)
Investor protection		0.31		0.01	0.88	1.42
		(0.2)		(0.01)	(0.52)	(0.97)
IT laws enforced		1.44**	0.24	1.65***	1.55**	0.53
		(2.77)		(3.51)	(2.34)	(0.94)
Accounting opacity		-3.57*	-0.21	-3.62**	-1.84	-3.49**
		(-1.97)		(-2.33)	(-1)	(-2.34)
Average company size	-1.02***	-0.98***	-0.42	-1.32***	-0.83***	-0.76***
	(-8.66)	(-4.7)		(-5.81)	(-4.05)	(-4.5)
OTC indicator					-1.90***	
					(-4.99)	
VIRTX indicator					-2.26***	
					(-4.26)	
XETRA indicator					0.35	
					(0.79)	
Year-fixed effects	No	No		Yes	No	No
Exchange-fixed effects	No	No		No	Yes	No
Number of exchanges	16	13		13	15	11
Number of observations	2,574	2,237		2,237	2,572	958
Adj. R-sq	0.538	0.616		0.666	0.564	0.779

Table 4.9 Determinants of the foreign share trading volume: Stock-level analysis

The table reports the estimates from the OLS regressions of the dependant variable, the logistic transformation of the foreign share of trading volume. The stock-level foreign trading share is the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample calculated monthly. Regression specifications are as follows: $logtrFTVS_{i,n} = \alpha_0 + \Sigma\, \gamma_j\, X_j + \varepsilon_{i,n}$ for Models (1)-(2) and $logtrFTVS_{i,n} = \alpha_0 + \Sigma\, \gamma_j\, X_j + \Sigma\, \theta_k\, Z_{k,n} + \varepsilon_{i,n}$ for Models (3)-(5), where X_j is vector of stock-level factors, and $Z_{k,n}$ is characteristic k of the host market n relative to characteristic k of the stock's home market. Host US is a dummy variable that equals one if the US is the host market and zero otherwise. Geographic distance residual variable is the residual from the OLS regression of the geographic distance variable on the US host market dummy variable. Other explanatory variables are defined in Table 4.2. All model specification control for year and industry fixed effects and model (5) additionally controls for exchange fixed effects, i.e. regressions includes dummy variables that represent year, industry or host stock exchange accordingly. Reported in parenthesis t-value 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%.

	Model (1.1)	Model (1.2)	Model (2.1)	Model (2.2)	Model (3.1)	Model (3.2)	Model (3.3)	Model (4.1)	Model (4.2)	Model (4.3)	Model (5)
Listing characteristics											
Traded indicator	-1.74***	-1.63***	-1.82***	-1.68***	-1.79***	-1.66***	-1.76***	-1.97***	-1.89***	-1.98***	-2.25***
	(-10.25)	(-9.76)	(-9.70)	(-9.26)	(-9.84)	(-9.39)	(-9.64)	(-9.50)	(-9.75)	(-9.51)	(-8.01)
First listing indicator	0.80**	0.87***	2.20***	2.28***	0.86**	1.02***	0.86**	2.23***	2.47***	2.23***	0.99**
	(2.38)	(2.59)	(4.99)	(5.18)	(2.43)	(2.88)	(2.46)	(4.74)	(5.06)	(4.75)	(2.01)
Time listed/ traded	0.12***	0.11***	0.15***	0.14***	0.13***	0.13***	0.14***	0.16***	0.16***	0.16***	0.13***
	(7.82)	(6.83)	(8.4)	(7.96)	(7.33)	(7.33)	(8.39)	(7.78)	(7.94)	(8.23)	(4.57)
Same currency	0.41**	0.70***	0.88***	1.15***	0.70***	1.14***	0.74***	1.14***	1.49***	1.12***	1.12***
	(2.21)	(3.83)	(4.60)	(6.13)	(3.52)	(5.76)	(3.80)	(5.54)	(7.46)	(5.46)	(4.25)
ADR indicator	0.24	-0.45*	0.14	-0.53**	0.14	-0.73**	0.24	0.01	-0.88***	0.05	-0.38
	(1.00)	(-1.69)	(0.61)	(-2.14)	(0.54)	(-2.43)	(0.95)	(0.04)	(-3.13)	(0.20)	(-1.34)
Price Level	0.17**	0.11	0.17**	0.08	0.18**	0.05	0.17**	0.23***	0.05	0.23***	0.14
	(2.11)	(1.46)	(2.17)	(1.03)	(2.35)	(0.69)	(2.20)	(2.59)	(0.54)	(2.60)	(1.32)
Company characteristics											
Company size	-0.30***	-0.28***	-0.32***	-0.27***	-0.29***	-0.24***	-0.30***	-0.33***	-0.25***	-0.35***	-0.39***
	(-6.36)	(-5.87)	(-6.11)	(-5.24)	(-5.40)	(-4.52)	(-5.67)	(-5.74)	(-4.25)	(-6.10)	(-5.39)
Price-to-book ratio	0.01*	0.01**	-0.004	-0.003	0.02**	0.02**	0.02**	0.02	0.02	0.02	0.02
	(1.87)	(1.97)	(-0.74)	(-0.56)	(2.13)	(2.24)	(2.10)	(0.84)	(0.72)	(0.83)	(0.58)
Stock risk	6.47***	5.55***	6.50***	5.30**	7.38***	6.48***	7.57***	6.44***	5.40**	6.31***	7.33**
	(3.13)	(2.67)	(3.08)	(2.53)	(3.32)	(2.93)	(3.39)	(2.71)	(2.30)	(2.66)	(2.43)
Foreign sales	0.46**	0.47**	0.33	0.41*	0.22	0.20	0.32	0.06	0.03	0.10	0.06
	(1.99)	(2.05)	(1.38)	(1.71)	(0.86)	(0.80)	(1.27)	(0.22)	(0.10)	(0.37)	(0.19)
Foreign investors			1.38***	1.12**				1.33**	1.00**	1.43***	1.39**
			(2.94)	(2.35)				(2.54)	(1.98)	(2.75)	(2.25)
Ownership			-0.50*	-0.30				-0.50	-0.25	-0.59*	-0.55
concentration			(-1.72)	(-1.07)				(-1.48)	(-0.78)	(-1.74)	(-1.38)
Int. accounting	-0.63***	-0.55***	-0.06	0.04	-0.45***	-0.38***	-0.48***	0.04	0.13	0.02	0.20
standards	(-5.02)	(-4.37)	(-0.60)	(0.35)	(-3.61)	(-3.13)	(-3.78)	(0.35)	(1.16)	(0.17)	(1.24)
Return correlation	-1.79***	-1.57***	-1.36***	-1.20***	-1.95***	-1.96***	-2.04***	-1.08**	-1.23***	-1.11**	-1.59***
	(-5.38)	(-4.84)	(-3.50)	(-3.23)	(-5.61)	(-5.92)	(-5.85)	(-2.45)	(-2.98)	(-2.51)	(-2.88)
US information factor	0.31***	0.20***	0.25***	0.13***	0.29***	0.16***	0.30***	0.24***	0.09**	0.25***	0.29***
	(7.70)	(5.02)	(5.69)	(2.94)	(7.14)	(4.24)	(7.27)	(5.33)	(2.01)	(5.42)	(4.11)
Foreign (non-US)	-0.08***	-0.05**	-0.05**	-0.02	-0.07***	-0.04	-0.06**	-0.07***	-0.04*	-0.06***	-0.09***
information factor	(-3.60)	(-2.31)	(-2.32)	(-0.87)	(-2.78)	(-1.62)	(-2.40)	(-2.90)	(-1.68)	(-2.62)	(-3.46)

Table 4.9 continued

	Model (1.1)	Model (1.2)	Model (2.1)	Model (2.2)	Model (3.1)	Model (3.2)	Model (3.3)	Model (4.1)	Model (4.2)	Model (4.4)	Model (5)
Market characteristics											
Home emerging market	1.28***	1.29**	1.60***	1.62***	0.61	0.61	1.33	1.30	1.43	1.81	2.41**
	(2.60)	(2.40)	(3.10)	(2.87)	(0.55)	(0.48)	(1.11)	(1.00)	(0.97)	(1.37)	(2.03)
Common language	1.04***	0.59***	1.09***	0.59***	1.14***	0.72***	1.11***	1.31***	0.81***	1.27***	1.74***
	(5.20)	(2.89)	(5.65)	(2.94)	(5.68)	(3.44)	(5.62)	(6.44)	(3.81)	(6.41)	(5.83)
Geographic distance	0.68***		0.91***		0.52***		0.78***	1.00***		1.15***	1.00***
	(6.75)		(9.24)		(3.41)		(6.30)	(6.19)		(8.88)	(4.83)
Host US		3.18***		3.79***		3.83***			5.37***		
		(9.39)		(11.57)		(8.28)			(11.22)		
Geographic distance residual		-0.20		-0.22		-0.39**			-0.14		
		(-1.25)		(-1.36)		(-2.17)			(-0.76)		
Investor protection Home	-1.61***	-1.30***	-1.12***	-0.90***							
	(-5.70)	(-4.66)	(-3.75)	(-3.12)							
Investor protection dif					1.05***	1.37***	1.76***	0.66*	1.23***	1.06***	-0.62
					(3.13)	(4.20)	(6.59)	(1.72)	(3.28)	(3.39)	(-1.24)
IT laws enforced Home	-1.20***	-1.09***	-0.90**	-0.77**							
	(-4.30)	(-4.03)	(-2.50)	(-2.17)							
IT laws enforced dif					0.20	0.70**	0.81***	0.40	1.20***	0.88**	-0.07
					(0.63)	(2.25)	(2.75)	(0.92)	(2.71)	(2.03)	(-0.13)
Accounting opacity Home	-1.57**	-0.60	-1.73**	-0.42							
	(-2.11)	(-0.83)	(-2.36)	(-0.58)							
Accounting opacity dif					2.56***	3.03***	1.88**	3.24***	4.31***	3.00***	3.21**
					(3.09)	(3.80)	(2.19)	(3.05)	(4.42)	(2.82)	(2.46)
Trading costs Home	0.23	1.47***	0.26	1.75***							
	(0.48)	(2.75)	(0.51)	(3.11)							
Trading costs dif					1.05**	-0.28	0.34	0.35	-0.87*	0.14	-0.48
					(2.20)	(-0.60)	(0.83)	(0.67)	(-1.71)	(0.28)	(-0.72)
Market size dif					0.41***	0.16		0.22*	-0.09		0.32*
					(3.10)	(1.24)		(1.65)	(-0.62)		(1.75)
Market liquidity dif					-0.14***	-0.22***	-0.13**	-0.22***	-0.35***	-0.22***	-0.18**
					(-2.61)	(-4.27)	(-2.34)	(-3.00)	(-5.35)	(-3.10)	(-2.02)
Industry specialization					0.78	0.85	0.31	-0.09	0.17	-0.33	-0.49
					(0.73)	(0.8)	(0.3)	(-0.09)	(0.19)	(-0.36)	(-0.46)
Foreign stock concentration											-2.81
											(-1.20)
Intercept	-6.82***	-4.28***	-9.84***	-6.29***	-8.54***	-5.83***	-10.01***	-12.40***	-6.84***	-13.19***	-10.75***
	(-7.08)	(-5.97)	(-9.19)	(-7.21)	(-7.22)	(-9.27)	(-9.04)	(-9.72)	(-9.47)	(-10.94)	(-7.20)
Adj. R-sq	0.423	0.441	0.476	0.504	0.462	0.489	0.457	0.497	0.540	0.496	0.619
N observations	81,917	81,917	51,846	51,846	63,602	63,602	63,602	40,889	40,889	40,889	24,061
N foreign accounts	1,714	1,714	1,476	1,476	1,329	1,329	1,329	1,145	1,145	1,145	593

Table 4.10 Economic significance of the determinants of the foreign trading volume share

The table reports standard deviations (st dev) of the variables and the estimates from the OLS regressions of the dependant variable, the logistic transformation of the foreign trading volume share. The stock-level foreign trading share is the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample calculated monthly. Host US indicator is a dummy variable that equals one if the US is the host market and zero otherwise. Geographic distance residual variable is the residual from the OLS regression of the geographic distance variable on the US host market dummy variable. Other explanatory variables are defined in Table 4.2. Output additionally includes the economic significance (econ. sign.) of the variables calculated as the product of the coefficient estimate and the variable's standard deviation 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%.

		Model (1)			Model (2)		
	st dev	estimate	t-stats	econ. sign.	estimate	t-stats	econ. sign.
Foreign trading volume share	3.53						
Listing characteristics							
Traded indicator	0.45	-1.94***	-10.56	-0.245	-1.89***	-10.88	-0.239
First listing indicator	0.16	1.52***	3.59	0.070	1.86***	4.31	0.086
Years listed (traded)	3.83	0.18***	10.54	0.197	0.18***	10.48	0.194
Same currency indicator	0.49	1.02***	6.01	0.142	1.31***	7.98	0.181
ADR indicator	0.44	0.38*	1.73	0.048	-0.49**	-2.05	-0.062
Company characteristics							
Company size	1.93	-0.31***	-6.19	-0.169	-0.28***	-5.77	-0.154
Stock risk	0.03	7.00***	3.89	0.055	6.29***	3.55	0.050
Foreign investors	0.12	1.23***	2.99	0.043	0.90**	2.31	0.031
Return correlation	0.19	-1.54***	-3.8	-0.083	-1.54***	-4.04	-0.083
US information factor	1.50	0.25***	5.7	0.107	0.10**	2.42	0.042
Foreign (non-US) information factor	2.84	-0.06***	-2.87	-0.051	-0.03	-1.32	-0.022
Market characteristics							
Common language	0.41	1.33***	6.83	0.156	0.71***	3.49	0.083
Geographic distance	1.16	0.63***	4.71	0.206			
Host US indicator	0.44				4.43***	10.96	0.550
Geographic distance residual	0.47				-0.37**	-2.35	-0.050
Market size difference	1.52	0.27**	2.47	0.118	-0.06	-0.53	-0.025
Market liquidity difference	2.50	-0.22***	-3.62	-0.153	-0.32***	-5.69	-0.227
Trading costs difference	0.21	0.18	0.4	0.010	-1.33***	-3.17	-0.079
Investor protection difference	0.37	1.00***	3.19	0.106	1.47***	4.73	0.155
IT laws enforced difference	0.29	0.23	0.66	0.019	1.12***	3.27	0.093
Accounting opacity difference	0.13	3.93***	4.56	0.149	4.09***	5.07	0.155
Intercept		-9.55***	-9.48		-6.15***	-11.23	
Adj. R-sq		0.487			0.526		
N observations		56,682			56,682		
N foreign accounts		1,578			1,578		

Table 4.11 Determinants of the foreign trading volume share: Listed vs. traded

The table reports the estimates from the OLS regression of the dependant variable, the logistic transformation of the foreign trading volume share on the interaction variables of the explanatory variables and the dummy variable representing listed or traded status of the foreign account. The stock-level foreign trading share is the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample calculated monthly. Regression specification is as follows: $logtrFTVS_{i,n} = \alpha_0 + \beta_{1i} X_j + \beta_{2i} Z_{k,n} + \Sigma\gamma_{j,Traded}(D_{Traded} X_j) + \Sigma\theta_{k,Traded}(D_{Traded} Z_{k,n}) + \varepsilon_i$, where D_{Traded} is dummy variable that equals one if the stock is traded without meeting listing requirements on a stock exchange n in month t and equals zero otherwise, X_j is vector of stock-level factors, and $Z_{k,n}$ is characteristic k of the host market n relative to characteristic k of the stock's home market. The explanatory variables are defined in Table 4.2. 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		Var*D_Traded	
	estimate	t-stats	estimate	t-stats
Listing characteristics				
First listing indicator	0.04	0.09		
Time listed/ traded	0.12***	4.15	0.25***	11.06
Same currency	0.83**	2.32	1.20***	6.23
DR indicator	0.81	0.98	0.18	0.81
Company characteristics				
Company size	-0.46***	-4.71	-0.28***	-5.43
Stock Risk	6.65	1.58	6.78***	3.34
Foreign investors	1.74**	2.01	0.95**	2.04
Return correlation	-2.17***	-2.9	-1.00**	-2.2
US information factor	0.19***	3.58	0.27***	3.72
Foreign (non-US) information factor	-0.06	-1.2	-0.06**	-2.44
Market characteristics				
Common language	0.56	1.29	1.35***	6.38
Geographic distance	1.13***	5.39	0.44***	3.02
Investor protection difference	0.37	0.53	0.78**	2.25
IT laws enforced difference	2.33**	2.46	-0.40	-1.13
Accounting opacity difference	5.20***	2.71	3.73***	4.04
Trading costs difference	-0.51	-0.67	0.26	0.51
Market size difference	0.15	0.61	0.28**	2.22
Market liquidity difference	-0.32***	-2.76	-0.10	-1.58
Intercept	-10.74***	-10.65		
Adj. R-sq	0.512			
N observations	56,682			
N foreign accounts	1,578			

Table 4.12 Determinants of the foreign trading volume share by stock exchange

The table reports the estimates from the OLS regression of the dependant variable, the logistic transformation of the foreign trading volume share, on the interaction variables of the explanatory variables and the dummy variable representing one of the eleven major host stock exchanges: $logtrFTVS_{i,n} = \alpha_0 + \Sigma_{n,j}\, \omega_{n,j}\, (D\_SE_n\, X_j) + \varepsilon_{i,n}$, where D_SE_n is dummy variable that equals one if trading takes place on exchange n and zero otherwise; X_j is vector of stock-level factors. The stock-level foreign trading share is the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample calculated monthly. The explanatory variables are defined in Table 4.2. Reported in parenthesis t-value 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%.

	Amsterdam X_i*D_Ams	Frankfurt X_i*D_Fra	London X_i*D_Lon	Milan X_i*D_Mil	NYSE X_i*D_NY	Nasdaq X_i*D_Nas	OTC X_i*D_OTC	Paris X_i*D_Par	Swiss SE X_i*D_Swi	VIRTX X_i*D_Vir	XETRA X_i*D_Xet
Listing characersitics											
Traded indicator		-1.06***	-0.29								-0.79**
		(-3.54)	(-0.68)								(-2.08)
First listing	-1.24*	0.0	-0.62		-2.73***	0.65		-3.89***			
	(-1.94)	(0.0)	(-1.09)		(-3.45)	(0.73)		(-3.52)			
Time listed/ traded	-0.16	0.13***	0.13	0.09	0.06**	-0.1	0.05*	-0.17**	0.01	-1.17***	0.49***
	(-1.64)	(4.59)	(1.49)	(0.63)	(2.30)	(-1.61)	(1.70)	(-2.05)	(0.23)	(-10.39)	(9.15)
Same currency	0.44	0.80**	1.91**	-15.43**				0.37			1.55***
	(0.37)	(2.53)	(2.30)	(-2.21)				(0.45)			(2.98)
DR indicator		-2.25***	-3.63***		0.01	-1.48	1.98***				-3.01***
		(-8.34)	(-2.63)		(0.02)	(-1.41)	(5.01)				(-8.98)
Price level	0.37	0.25**	0.15	-0.25	0.26*	-0.34	0.44***	-0.90***	0.09	-0.03	-0.11
	(1.29)	(2.37)	(1.05)	(-0.56)	(1.81)	(-0.94)	(2.63)	(-3.14)	(0.42)	(-0.14)	(-0.68)
Company characersitics											
Company size	-1.28***	-0.1	-0.22	-2.12**	0.11	0.11	-0.25**	0.17	-0.07	0.45***	0.22**
	(-4.18)	(-1.39)	(-1.41)	(-2.10)	(0.69)	(0.37)	(-2.48)	(0.67)	(-0.43)	(3.98)	(2.03)
Price-to-book ratio	0.17**	-0.01***	-0.1**	1.04**	0.0	-0.16*	0.01	0.3	-0.06	0.0	-0.02**
	(2.41)	(-3.91)	(-2.50)	(2.03)	(0.33)	(-1.76)	(0.27)	(1.43)	(-0.5)	(0.53)	(-2.37)
Stock risk	-5.33	16.56***	-1.63	17.93	14.92**	9.89**	2.66	-4.13	42.76***	-7.62	14.97***
	(-0.61)	(7.67)	(-0.43)	(1.49)	(2.46)	(2.10)	(0.61)	(-0.65)	(2.72)	(-0.56)	(3.39)
Foreign sales	0.0	0.0	0.0	-0.02	0.02***	0.02**	0.01**	0.01	-0.01	0.0	0.0
	(0.26)	(-0.21)	(0.05)	(-1.37)	(3.91)	(2.33)	(2.17)	(0.82)	(-1.06)	(0.33)	(0.86)
Foreign investors	-0.02	0.0	0.01	0.0	0.03***	0.01	0.01	0.01	-0.02	0.0	0.0
	(-0.80)	(0.52)	(1.01)	(0.03)	(3.01)	(0.18)	(1.09)	(1.23)	(-1.58)	(0.39)	(-0.23)
Ownership concentration	2.58	-0.26	0.98	5.60*	-1.25**	-2.38	-0.94	-0.83	1.5	-0.45	-0.16
	(1.57)	(-0.80)	(1.59)	(1.81)	(-2.13)	(-1.43)	(-1.56)	(-1.03)	(1.55)	(-0.76)	(-0.28)
International accounting	0.21	0.15	0.28	2.85***	0.42***	1.26***	-0.17	0.73**	232.09	10.49**	-0.51**
standards	(0.40)	(1.20)	(1.23)	(4.06)	(2.81)	(2.93)	(-0.8)	(2.08)	(1.15)	(2.53)	(-2.57)
Return correlation	0.51	-1.78***	-1.02	2.98	-2.57***	-3.91*	0.04	-0.83	0.37	1.37*	-1.22
	(0.29)	(-3.98)	(-1.16)	(1.62)	(-3.2)	(-1.91)	(0.05)	(-0.63)	(0.23)	(1.68)	(-1.62)
Foreign information factor	0.0	-0.03	0.10*	-0.02	0.0	0.06	0.09*	0.02	0.07	0.04	0.01
	(-0.08)	(-1.31)	(1.90)	(-0.22)	(-0.15)	(1.07)	(1.68)	(0.40)	(1.54)	(0.87)	(0.18)

Table 4.12 continued

	Amsterdam X_i*D_Ams	Frankfurt X_i*D_Fra	London X_i*D_Lon	Milan X_i*D_Mil	NYSE X_i*D_NY	Nasdaq X_i*D_Nas	OTC X_i*D_OTC	Paris X_i*D_Par	Swiss SE X_i*D_Swi	VIRTX X_i*D_Vir	XETRA X_i*D_Xet
Home market characteristics											
Home emerging market		3.54***	6.16***		-1.12		-2.55***	2.42**			
		(6.21)	(3.00)		(-1.54)		(-2.78)	(2.41)			
Common language		1.81***	8.70***		1.05	0.27	0.77		6.78*	-0.04	1.11
		(4.53)	(3.01)		(0.72)	(0.07)	(0.47)		(1.86)	(-0.05)	(1.51)
Geographic distance	0.2	0.09	-0.40*	0.84	0.47	0.36	0.25	-1.08**	5.29	-1.01*	-0.56**
	(0.23)	(0.63)	(-1.9)	(0.31)	(1.52)	(0.78)	(1.27)	(-2.29)	(1.49)	(-1.71)	(-2.34)
Investor protection Home	8.85***	-0.56	-8.72*	12.28**	-2.82	-0.57	-2.02	-4.21**	2.99***	-3.22***	-1.14
	(5.14)	(-0.96)	(-1.70)	(2.41)	(-1.21)	(-0.11)	(-0.78)	(-2.52)	(3.10)	(-5.18)	(-1.46)
IT laws enforced Home	0.0	0.0**	0.0	0.03**	0.0	0.0	0.0	0.0**	-0.12	0.0	0.0
	(-0.13)	(2.02)	(-0.29)	(2.21)	(-0.19)	(1.00)	(-1.12)	(2.46)	(-1.16)	(-1.07)	(0.53)
Trading costs Home	12.2*	-0.79	5.3***	-42.8***	-0.53	0.98	-0.44	2.69	-42.79**	0.84	0.33
	(2.46)	(-1.3)	(2.66)	(-3.46)	(-0.50)	(0.32)	(-0.46)	(1.09)	(-2.00)	(0.35)	(0.23)
Accounting opacity Home	-4.07	-1.06	4.15**	-15.11***	-1.47*	10.81	-0.53	-3.35**	0.0	-7.22*	-2.80
	(-1.03)	(-1.18)	(2.08)	(-3.08)	(-1.71)	(1.64)	(-0.33)	(-2.39)	(0.0)	(-1.85)	(-1.58)
Intercept	-8.01***										
	(-20.49)										
Adj. R-sq		0.674									
N observations		51,846									
N foreign accounts		1,477									

Appendix 4.1 Foreign information factor calculation

Follow the methodology of Baruch et al (2007), the foreign information factor is calculate 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.

Foreign information factor is calculated monthly and each stock in the sample using weekly stock return and home and host index return data for the preceding 48 (at least 36) months. Home market returns are calculated using total return data, i.e. inclusive of price change as well as dividend income, converted into the currency of the foreign market.

Firstly, the following two time-series regressions are estimate for each stock:

$$R_{it} = \alpha_i + \sum_{k=-1}^{+1} \beta_{i,Home,t+k} R_{Home,t+k} + \varepsilon_{it}$$

(1 - restricted model)

$$R_{it} = \alpha_i + \sum_{k=-1}^{+1} \beta_{i,Home,t+k} R_{Home,t+k} + \sum_{k=-1}^{+1} \beta_{i,Foreign,t+k} R_{Foreign,t+k} + \varepsilon_{it}$$

(2 - unrestricted model)

where R_{it} is the return, calculated in the currency of the foreign market, of stock i in period t, $R_{Home,t+k}$ is the return, calculated in the currency of the foreign market, on the home market index in period t+k, and $R_{Foreign,t+k}$ is the foreign market index return in period t+k. As in Baruch et al (2007), the lead and lag terms in the regressions are used to account for non-synchronous trading across markets in different time zones.

The next step is to calculate the measure that captures the incremental contribution of the foreign market movement in explaining variation of the stock return in addition to the information about the stock return contained in movements in the home market index prices. Such measure is computed as F-statistics for each stock using R^2 from the unrestricted, the second, model (R^2_{UR}), and R2 from the restricted, the first, model (R^2_R):

$$F = \frac{(R^2_{UR} - R^2_R)/3}{(1 - R^2_{UR})/(n-6)}$$

where n is the number of observations for the stock, 3 in denominator is for the three regressors in the restricted model and 6 in the denominator is for the six regressors in the unrestricted model.

Appendix 4.2 Pull factors of the foreign equity trading: coefficient estimates and variance inflation factors

The table reports the coefficient estimates and variance inflation factors (VIF) from OLS regressions reported in Table 4.8. The dependant variable is the logistic transformation of stock exchange's monthly average foreign share of trading volume. The exchange-level average foreign trading share is the mean of the foreign trading volume shares of the stocks traded on the exchange, calculated monthly as the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample. The explanatory variables are defined in Table 4.2. Additionally, regressions include a control variable, average company size measured by the natural logarithm of the mean stock market value of stocks traded on the exchange converted to GBP.

	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF
Intercept	3.51	0	6.83	0	12.27	0	3.23	0	8.31	0
Trading platform	-1.13	1.37	-1.20	1.43	-1.08	1.45				
Demutualization	1.17	1.37	1.13	1.57	-0.20	4.18			-0.31	1.31
Electronic market	-1.89	1.24	-2.36	1.32	-2.76	1.64	-1.58	1.38	-0.37	1.09
Foreign stocks concentration									0.14	2.38
Market size	0.42	1.21	0.10	3.03	-0.09	3.59	0.09	3.81	-0.12	3.91
Market liquidity	0.29	1.41	0.46	1.53	0.52	1.59	0.50	1.84	0.62	2.17
Trading costs	-4.14	1.09	-4.35	1.58	-5.00	1.75	-2.39	1.85	-6.87	2.87
Investor protection			0.31	2.07	0.01	2.12	0.88	2.21	1.42	3.78
			1.44	1.76	1.65	1.98	1.55	1.93	0.53	2.34
Accounting opacity			-3.57	2.03	-3.62	2.12	-1.84	2.11	-3.49	3.36
Average company size	-1.02	1.19	-0.98	1.73	-1.32	2.61	-0.83	1.92	-0.76	1.56
OTC indicator							-1.90	1.43		
VIRTX indicator							-2.26	1.25		
XETRA indicator							0.35	1.64		
Year-fixed effects	No		No		Yes		No		No	
Exchange-fixed effects	No		No		No		Yes		No	
Number of exchanges	16		13		13		15		11	
Number of observations	2,574		2,237		2,237		2,572		958	
Adj. R-sq	0.538		0.616		0.666		0.564		0.779	

Appendix 4.3 Determinants of the foreign share trading volume (stock-level analysis): coefficient estimates and variance inflation factors

The table reports the coefficient estimates and variance inflation factors (VIF) from OLS regressions reported in Table 4.9. The dependant variable is the logistic transformation of the foreign share of trading volume. The stock-level foreign trading share is the ratio of the number of shares traded on the exchange to the total number of the shares traded in the same month on all exchanges in the sample calculated monthly. Host US is a dummy variable that equals one if the US is the host market and zero otherwise. Geographic distance residual variable is the residual from the OLS regression of the geographic distance variable on the US host market dummy variable. Other explanatory variables are defined in Table 4.2.

	Model (1.1)		Model (1.2)		Model (2.1)		Model (2.2)		Model (3.1)		Model (3.2)		Model (3.3)		Model (4.1)		Model (4.2)		Model (4.3)		Model (5)	
	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF
Listing characteristics																						
Traded indicator	-1.74	1.33	-1.63	1.34	-1.82	1.26	-1.68	1.27	-1.79	1.39	-1.66	1.40	-1.76	1.38	-1.97	1.43	-1.89	1.44	-1.98	1.43	-2.25	2.21
First listing indicator	0.80	1.33	0.87	1.33	2.20	1.31	2.28	1.31	0.86	1.34	1.02	1.34	0.86	1.34	2.23	1.33	2.47	1.33	2.23	1.33	0.99	1.44
Time listed/ traded	0.12	1.24	0.11	1.25	0.15	1.27	0.14	1.27	0.13	1.29	0.13	1.29	0.14	1.26	0.16	1.31	0.16	1.31	0.16	1.29	0.13	1.57
Same currency	0.41	1.88	0.70	1.98	0.88	1.96	1.15	2.02	0.70	1.61	1.14	1.75	0.74	1.61	1.14	1.68	1.49	1.74	1.12	1.68	1.12	1.64
DR indicator	0.24	2.40	-0.45	2.83	0.14	1.92	-0.53	2.19	0.14	2.44	-0.73	2.90	0.24	2.39	0.01	1.95	-0.88	2.25	0.05	1.92	-0.38	2.06
Price Level	0.17	1.74	0.11	1.76	0.17	1.77	0.08	1.80	0.18	1.73	0.05	1.79	0.17	1.73	0.23	1.78	0.05	1.85	0.23	1.78	0.14	1.93
Company characteristics																						
Company size	-0.30	1.93	-0.28	1.94	-0.32	2.07	-0.27	2.09	-0.29	2.05	-0.24	2.07	-0.30	2.05	-0.33	2.28	-0.25	2.33	-0.35	2.25	-0.39	2.62
Price-to-book ratio	0.01	1.03	0.01	1.03	-0.004	1.04	-0.003	1.04	0.02	1.05	0.02	1.05	0.02	1.05	0.02	1.12	0.02	1.12	0.02	1.12	0.02	1.12
Stock risk	6.47	1.28	5.55	1.28	6.50	1.40	5.30	1.40	7.38	1.30	6.48	1.30	7.57	1.30	6.44	1.42	5.40	1.42	6.31	1.41	7.33	1.46
Foreign sales	0.46	1.09	0.47	1.09	0.33	1.15	0.41	1.15	0.22	1.13	0.20	1.13	0.32	1.11	0.06	1.23	0.03	1.23	0.10	1.22	0.06	1.24
Foreign investors					1.38	1.37	1.12	1.37							1.33	1.37	1.00	1.37	1.43	1.36	1.39	1.40
Ownership concenration					-0.50	1.46	-0.30	1.47							-0.50	1.56	-0.25	1.56	-0.59	1.53	-0.55	1.61
Int. accounting standards	-0.63	1.34	-0.55	1.35	-0.06	1.29	0.04	1.30	-0.45	1.29	-0.38	1.30	-0.48	1.29	0.04	1.26	0.13	1.26	0.02	1.25	0.20	1.29
Return correlation	-1.79	1.54	-1.57	1.55	-1.36	1.80	-1.20	1.80	-1.95	1.65	-1.96	1.65	-2.04	1.64	-1.08	1.93	-1.23	1.93	-1.11	1.92	-1.59	1.98
US information factor	0.31	1.63	0.20	1.74	0.25	1.67	0.13	1.78	0.29	1.65	0.16	1.75	0.30	1.64	0.24	1.69	0.09	1.81	0.25	1.68	0.29	1.72
Foreign (non-US) inform. factor	-0.08	1.29	-0.05	1.32	-0.05	1.28	-0.02	1.31	-0.07	1.39	-0.04	1.41	-0.06	1.38	-0.07	1.41	-0.04	1.43	-0.06	1.39	-0.09	1.35
Market characteristics																						
Home emerging market	1.28	1.34	1.29	1.34	1.60	1.46	1.62	1.46	0.61	1.14	0.61	1.14	1.33	1.11	1.30	1.22	1.43	1.22	1.81	1.15	2.41	1.15
Common language	1.04	1.77	0.59	1.92	1.09	1.60	0.59	1.73	1.14	1.55	0.72	1.64	1.11	1.55	1.31	1.50	0.81	1.59	1.27	1.49	1.74	2.08

Appendix 4.3 continued

	Model (1.1)		Model (1.2)		Model (2.1)		Model (2.2)		Model (3.1)		Model (3.2)		Model (3.3)		Model (4.1)		Model (4.2)		Model (4.3)		Model (5)	
	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF	estimate	VIF
Geographic distance	0.68	3.08			0.91	2.77			0.52	5.34			0.78	3.43	1.00	5.70			1.15	3.38	1.00	4.41
Host US			3.18	4.60			3.79	3.74			3.83	8.50					5.37	7.98				
Geographic distance residual			-0.20	1.31			-0.22	1.35			-0.39	1.28					-0.14	1.41				
Investor protection Home	-1.61	1.83	-1.30	1.86	-1.12	1.79	-0.90	1.80														
Investor protection dif									1.05	3.11	1.37	3.15	1.76	1.78	0.66	3.73	1.23	3.82	1.06	2.13	-0.62	4.59
IT laws enforced Home	-1.20	1.81	-1.09	1.82	-0.90	2.12	-0.77	2.13														
IT laws enforced dif									0.20	2.51	0.70	2.57	0.81	1.86	0.40	3.60	1.20	3.70	0.88	2.27	-0.07	5.06
Accounting opacity Home	-1.57	1.45	-0.60	1.49	-1.73	1.50	-0.42	1.55														
Accounting opacity dif									2.56	2.31	3.03	2.32	1.88	2.13	3.24	3.19	4.31	3.23	3.00	3.11	3.21	3.71
Trading costs Home	0.23	2.15	1.47	2.37	0.26	2.28	1.75	2.52														
Trading costs dif									1.05	2.32	-0.28	2.52	0.34	1.94	0.35	2.35	-0.87	2.48	0.14	2.20	-0.48	2.57
Market size dif									0.41	7.53	0.16	7.96			0.22	8.43	-0.09	8.86			0.32	8.71
Market liquidity dif									-0.14	3.08	-0.22	3.19	-0.13	3.06	-0.22	5.28	-0.35	5.53	-0.22	5.27	-0.18	6.18
Industry specialization									0.78	1.21	0.85	1.21	0.31	1.17	-0.09	1.29	0.17	1.29	-0.33	1.26	-0.49	1.49
Foreign stock concentration																					-2.81	1.54
Intercept	-6.82	0	-4.28	0	-9.84	0	-6.29	0	-8.54	0	-5.83	0	-10.01	0	-12.40	0	-6.84	0	-13.19	0	-10.75	0
Adj. R-sq	0.423		0.441		0.476		0.504		0.462		0.489		0.457		0.497		0.540		0.496		0.619	
N observations	81,917		81,917		51,846		51,846		63,602		63,602		63,602		40,889		40,889		40,889		24,061	
N foreign accounts	1,714		1,714		1,476		1,476		1,329		1,329		1,329		1,145		1,145		1,145		593	

Chapter 5

Conclusion

The thesis examines the effects of cross-listing and cross-trading in international stock exchanges, on the stock of European companies in terms of the impact on their price, liquidity and volatility, and the distribution of trading volume in a changing listing and trading environment.

In particular, the three empirical issues addressed in each empirical chapter of the thesis are as follows. First, chapter 2 analyses the effect of international cross-listing on shareholders' wealth and the determinants of these effects across various foreign destination markets and across time. Second, chapter 3 evaluates the changes in the liquidity and volatility of stocks after cross-listing and cross-trading. Third, chapter 4 examines the determinants of the distribution of foreign equity trading volumes both at a stock exchange level and at a firm level. Overall, the findings of the thesis show that the wealth of shareholders, stock liquidity and volatility, and the trading volume of European stocks are significantly affected by international cross-listing and cross-trading. However, the effects are sensitive to host stock exchanges and regulatory provisions.

The findings of the thesis have several important implications for companies, international investors, stock exchange authorities, and to the regulators of financial industry. Furthermore, the findings represent international perspectives as they are based on the experience of companies from various European countries that are cross-listed in various international stock markets. The sample is also significant in that it represents a substantial portion of foreign stocks listed internationally. Finally, the analysis of European stocks allows an evaluation of the implications for the relative competitiveness of European, British and American equity markets.

Chapter 2 examines the first empirical issue: the effects of cross-listings on shareholders' wealth. The effects on shareholders' wealth are measured by abnormal returns around the announcement of a decision to cross-list and also around the cross-listing event. Abnormal returns are compared across cross-listings on European, British and American host

markets and over time. The potential determinants of the effect of cross-listings on shareholders' wealth are identified based on various theoretical explanations including market segmentation, legal bonding, liquidity, investor recognition, proximity preference, market timing, and business strategy. This study also examines the impact of recent significant developments in capital markets, such as the introduction of a single currency, the Euro, in Europe and the adoption of the Sarbanes- Oxley Act (SOX) in the US, which may have affected the net benefits arising from international cross-listings. Finally, the chapter evaluates the change in the explanatory power of the determinants before and after the introduction of the Euro in Europe and before and after the adoption of SOX in the US.

The findings of chapter 2 suggest that, on average, international cross-listings have a significant positive impact on shareholders' wealth. However, the impact varies by host markets. The effect is positive and significant if the stocks are cross-listed in the American and in the British stock exchanges (3.3% and 2.7% cumulative abnormal returns respectively) while it remains statistically insignificant if they are cross-listed within European stock markets. In addition, there is a significant time-specific variation in the wealth effects of cross-listings that can be partly attributed to the recent developments in international capital markets. The adoption of SOX in the US is associated with a significant reduction in the gains from listing in the US markets, especially for smaller companies. In contrast, the shareholder gains from cross-listing in the UK have increased significantly in recent years. This has been driven by the gains from AIM listings on the London stock exchange (AIM was established in the late 1990s) suggesting that the observed gain is primarily driven by the experience of smaller companies. The introduction of a single currency in Europe, however, has had no significant impact on shareholders' gains from cross-listings within the Euro zone. Furthermore, the results reveal the importance of company characteristics, such as company size, industry, growth opportunities and previous foreign listing experience, in explaining the effect of cross-listings on shareholders' wealth. Empirically, there is support for market segmentation theory applied to cross-listings in the US, for investor recognition theory applied to cross-listings within the Euro zone and to cross-listings that take place in the US after the adoption of SOX, and for proximity preference applied to listings in the UK. Also there is strong empirical support for business strategy theory. Overall, the findings emphasize the changing nature of the determinants of the benefits of cross-listings across different host markets and in the face of regulatory changes.

The findings of chapter 2 have practical implications for several groups of market participants. For company managers, increase in shareholders' wealth is the ultimate goal of a corporate decision to cross-list. In this respect, the findings indicate that there is a significant cross-sectional difference in the net benefits of cross-listings across host markets and company characteristics. From an investor's point of view, the findings contribute to a better understanding of the sources of value creation around cross-listings in different international markets. Finally, the findings on the impact of the Euro, AIM, and SOX on the net benefits of cross-listings in Europe, the UK and the US accordingly, should be of particular importance for financial market authorities and regulators.

The gains in shareholders' wealth around cross-listing documented in chapter 2 could be driven by the improvement in the stock's information environment and, accordingly, in stock liquidity and volatility after cross-listing. Chapter 3 analyses empirically the impact of international cross-listing and multimarket trading on stock liquidity and volatility. Different dimensions of stock liquidity are captured by trading costs, trading volumes, and turnover ratios, while stock return variation and intraday stock price deviation are used to measure volatility. First, the liquidity and volatility of cross-listed companies are compared against those of non-cross-listed companies. Given the endogenous nature of a cross-listing decision, I use Heckman's (1979) procedure to control for a potential self-selection bias. For a robustness test, I use time series analysis to evaluate changes in the liquidity and volatility before and after a foreign listing. In addition, chapter 3 also investigates the differences between the impact of cross-listing and cross-trading. Unlike cross-listing, cross-trading does not impose additional disclosure requirements but offers similar trading opportunities for investors.

The results of chapter 3 indicate a significant improvement in trading costs and stock return volatility. The results hold even after controlling for several potentially responsible factors such as the change in company size, accounting practices, financial analyst coverage and stock trading volumes after cross-listing and cross-trading. The reduction in trading costs and stock return volatility after cross-listing and cross-trading is particularly profound for smaller companies. Supplementary analysis on the evolution of the liquidity and volatility before and after cross-listing reveals that the documented improvements are sustained in the long-run after the change in the listing status. In regards to the difference between the impact of cross-listing and the impact of cross-trading, cross-listing enhances the stock's total trading volumes more

substantially than cross-trading due to significantly higher trading volumes on the foreign stock exchange(s) after cross-listing. Nevertheless, cross-trading, similar to cross-listing, improves stock liquidity and volatility in the company's home market. Overall, the documented difference in the impact of cross-listing and cross-trading on the liquidity and volatility of the stock is considerably smaller than predicted. This finding highlights the importance of alternative channels of information dissemination in improving the firm's information environment after cross-listing and cross-trading. Such channels include greater production of stock-specific information by more traders after cross-listing and cross-trading and increased competition among traders. Finally, the findings suggest that the implications of cross-listing and cross-trading vary depending on the level of development of the company's home market. While a cross-listing is beneficial in terms of liquidity and volatility for companies from developed markets, it has no positive impact for companies from emerging markets.

The findings of chapter 3 should be of considerable importance to companies that are considering a foreign listing and also to international investors. From a company's perspective, stock liquidity and volatility directly affect transaction costs and the perceived riskiness of the stock, which, in turn, has an effect on the company's cost of equity capital. The results suggest that for companies from developed markets cross-listing and cross-trading result in a significant decrease in the bid-ask spread, an increase in stock trading volumes, and a reduction in stock return volatility. From the perspective of international investors such findings suggest that investors could trade the stocks of cross-listed and cross-traded firms at a lower transaction cost and could have higher price certainty as well.

Chapter 4 investigates the third empirical issue of the thesis: the determinants of the distribution of trading volumes of stocks that trade on various stock markets. The understanding of what determines the location of trading of cross-listed stocks is important because the benefits of cross-listing such as the gains in shareholders' wealth and the improved stock liquidity and volatility documented in chapter 2 and chapter 3 are feasible if the cross-listing results in active trading on the foreign stock exchange. The determinants of the distribution of trading volume are analysed from both stock exchange and firm specific perspectives. First, from a stock exchange point of view, the chapter evaluates the ability of the major international exchanges to attract trading volumes of foreign equity. This ability is measured by a stock exchange's average fraction of the total trading volumes of cross-listed stocks. The determinants

of a stock exchange's ability to attract foreign equity trading, or the pull factors of foreign trading volumes, are examined using cross-sectional regression analysis. In addition, the study compares the ability of two types of markets – regulated stock exchanges and non-regulated markets (e.g., over-the-counter markets, alternative markets and trading platforms) to attract foreign equity trading. Second, from a company's point of view, the chapter examines stock-specific determinants of the trading volume distribution. Foreign trading volume distribution on a stock level is quantified by the stock's trading volume share on the foreign exchange in the stock's total trading volume. Finally, the firm level analysis is extended to further examine the firm level determinants separately for the major stock exchanges.

The findings discussed in chapter 4 suggest that the ability to attract and maintain foreign equity trading varies significantly across the major stock exchanges. A cross-sectional regression analysis of a stock exchange's fraction of the total trading volumes of cross-listed stocks reveals that this ability is positively associated with the stock exchange's organizational efficiency, the level of market liquidity, the quality of investor protection, and the enforcement of insider trading regulation. The results also show that regulated stock exchanges are significantly more successful in attracting trading volumes of foreign stocks than non-regulated markets. From a company's perspective, this finding is consistent with the view that a cross-listing on a regulated exchange is more likely to result in active foreign trading than an admission to trade in a non-regulated market. Furthermore, the findings highlight the importance of stock characteristics, particularly company size and stock risk, and of listing characteristics, such as currency and duration of listing, in explaining the distribution of trading volumes between the foreign and the home markets. Particularly, smaller companies have higher fractions of trading taking place on foreign exchange(s). Finally, the chapter provides separate evidence on firm level determinants of foreign trading volume distribution by stock exchanges. Such evidence is helpful in understanding the expected levels of trading activity on various stock exchanges for a stock with particular characteristics.

The findings of chapter 4 have practical implications for four main groups of financial market participants. First, for stock exchanges the findings contribute to better understanding of factors that determine a stock exchange's competitive position within the industry. The evidence can be used by stock exchanges to focus their marketing efforts on targeting particular types of foreign companies for listing, especially those which are likely to have higher trading volumes.

Second, for cross-listed companies the chapter provides evidence on strategies to maximize the benefit of cross-listing and cross-trading in terms of active stock trading on foreign market(s). Active foreign equity trading is crucial for cross-listed companies because it determines the net benefits of international cross-listings in terms of reduced transaction costs, increased firm value, and better price discovery in the foreign market(s). Third, for international investors, knowledge of the location of trading of foreign stocks is essential as it allows investors to minimize the costs of trading foreign equity. Finally, for financial market regulators to have empirical evidence that regulated markets with investor protection and enforced insider trading laws have a superior ability to attract and maintain trading of foreign equity should be of considerable importance.

On the whole, the findings of this thesis are supportive of the statement that on average an international cross-listing is beneficial for companies and their shareholders in terms of the market value of the firm and improved liquidity and reduced price volatility. However, these benefits vary significantly across firms and destination foreign markets. Chapter 2 provides evidence that cross-listings on American exchanges, on average, result in a higher increase in shareholders' wealth than cross-listing on other host markets. However, the gains from cross-listing in the US have diminished in recent years. Moreover, evidence in chapter 4 support the idea that the American exchanges have a superior ability to attract trading of European stocks in terms of absolute trading volumes and also in terms of the foreign fraction of the total trading volume. Overall, the US capital market, although arguably losing its competitive edge, is still an important cross-listing destination for European companies. The British capital market is the second most important market both in terms of the effects on shareholders' wealth (chapter 2) and stock liquidity enhancements, particularly for companies from emerging markets (chapter 4). Finally, European exchanges continue to attract listings of firms based in other European countries despite significant integration processes within the European Union. However, on average, firms do not experience any obvious benefit from cross-listing within European markets (chapter 2).

Recommendations for Future Research:

While the thesis has examined the economic consequences of cross-listing and trading on multiple foreign exchanges, there is still a need for further research to continue on this topic.

- The findings of this thesis, as well as earlier studies, suggest that cross-listing leads to an increase in shareholders' wealth. It is possible that such an increase in wealth could be due to a reduction in the cost of transaction, a reduction in risk or a combination of both. Therefore, it would be interesting to examine the possible sources of the value enhancement, i.e. to split the gains into the effects of the reduction in the cost of equity capital and the transaction costs. So far there is no evidence in the literature on how cross-listings and admissions to trade on various foreign markets outside of the US affect the company's cost of capital.
- Chapter 3 of this thesis investigates the impact of cross-listing and cross-trading on various markets on the stock liquidity and volatility. However, it would also be useful to compare this impact across different host markets.
- Finally, further research on the economic consequences of cross-listings in major international financial markets by companies from non-European markets, especially from Asian markets, which have recently demonstrated significant economic growth and increasing integration into the world financial markets, would help to provide a more complete understanding of the effects of international cross-listings.

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