Universidade do Minho
Escola de Economia e Gestão

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The Real Economic Effects of Cross-Delisting from the United States: Evidence on Post-Operating Performance, Financial Constraints and Stock Crash Risk

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The Real Economic Effects of Cross-Delisting from the United States: Evidence on Post-Operating Performance, Financial Constraints and Stock Crash Risk

Tese de Doutoramento em Ciências Empresariais

Trabalho realizado sob a orientação do
Professor Doutor Gilberto Ramos Loureiro

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STATEMENT OF INTEGRITY

I hereby declare having conducted my thesis with integrity. I confirm that I have not used plagiarism or any form of falsification of results in the process of the thesis elaboration.

I further declare that I have fully acknowledged the Code of Ethical Conduct of the University of Minho.

University of Minho, 15 de Outubro de 2015

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Signature:

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"THE REAL ECONOMIC EFFECTS OF CROSS-DELISTING FROM THE UNITED STATES: EVIDENCE ON POST-OPERATING PERFORMANCE, FINANCIAL CONSTRAINTS AND STOCK CRASH RISK"

ABSTRACT

In this study we examine the economic consequences for firms that cross-delisted from a U.S. stock exchange. Using a sample of foreign firms that cross-delisted from U.S. exchange markets from 2000 to 2012, we investigate the long-term performance, the level of financial constraints, and the likelihood of stock price crashes after the cross-delisting event.

We document several new findings as follows: i) cross-delisted firms have less growth opportunities, in the long-run, than their cross-listed peers; ii) after the adoption of Rule 12h-6 of 2007, cross-delisted firms exhibit a significant decline in operating performance; iii) cross-delisted firms underperform their cross-listed peers as they experience negative average abnormal returns, especially in the post-cross-delisting period; iv) cross-delisted firms face higher financial constraints post-delisting than their cross-listed counterparts, and also tend to save more cash out of cash flows; v) the increase in financial constraints post-cross-delisting seems to be primarily driven by informational frictions that constrain access to external financing, which are stronger for firms from countries with weaker investor protection and less developed capital markets; vi) cross-delisted firms experience a significant increase in crash risk associated with earnings management in the post-delisting period relative to a control sample of cross-listed firms, and this effect is more pronounced for delisted firms from countries with weaker investor protection and poor quality of their information environment; vii) cross-delisted firms that engage in earnings management to inflate reported earnings prior to a seasoned equity offering are more likely to a subsequent stock price crash.

"OS EFEITOS ECONÓMICOS DA DESLISTAGEM DAS AÇÕES DOS MERCADOS DE CAPITAIS NORTE-AMERICANOS: EVIDÊNCIA *EX-POST* SOBRE O DESEMPENHO OPERACIONAL, RESTRIÇÕES FINANCEIRAS E RISCO DE QUEDA ABRUPTA NO PREÇO DAS AÇÕES"

RESUMO

Neste estudo analisam-se as consequências económicas da deslistagem de empresas estrangeiras listadas nos mercados acionistas dos Estados Unidos. Usando uma amostra de empresas estrangeiras listadas e deslistadas das bolsas de valores Norte-Americanas entre 2000 e 2012, investiga-se o desempenho (económico) de longo prazo, o nível de restrições financeiras e a probabilidade de queda abrupta no valor de mercado das ações após a deslistagem.

Os resultados empíricos deste estudo suportam as seguintes evidências: i) as empresas estrangeiras que se deslistam têm menores oportunidades de crescimento, no longo prazo, do que empresas estrangeiras comparáveis que permanecem listadas nos mercados Norte-Americanos; ii) as empresas estrangeiras que se deslistam após a adoção da norma 12h-6 de 2007, exibem um significativo decréscimo no seu desempenho operacional; iii) as empresas estrangeiras que se deslistam apresentam um desempenho no mercado de capitais inferior a um grupo de empresas comparáveis que se mantêm listadas, apresentando rendibilidades supranormais negativas, sobretudo no período após a deslistagem; iv) as empresas estrangeiras deslistadas enfrentam maiores restrições financeiras após a deslistagem por comparação com empresas similares que permanecem listadas e tendem também a conservar um nível mais elevado de reservas de caixa e equivalentes; v) o aumento das restrições financeiras no período após a deslistagem parece resultar de fricções no ambiente informacional que limitam o acesso ao financiamento externo, sendo esta evidência mais pronunciada para empresas estrangeiras originárias de países com menor nível de proteção legal aos investidores e com mercados de capitais menos desenvolvidos; vi) as empresas estrangeiras que se deslistam sofrem (por comparação com um grupo de empresas de controle com características similares) um aumento significativo no risco de queda abrupta no preço das suas ações relacionada com manipulação de resultados verificada, principalmente, no período após a deslistagem, sendo este efeito mais pronunciado para empresas estrangeiras originárias de países com menor nível de proteção legal aos investidores e com pior qualidade do seu ambiente informacional; vii) as empresas estrangeiras deslistadas que se envolvem em manipulação de resultados antes de uma nova oferta pública acionista são as que apresentam maior probabilidade de sofrerem uma queda abrupta no preço das suas ações.

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LIST OF ABBREVIATIONS

ADRs	American Depositary Receipt
BHARs	Buy-and-hold abnormal returns
CAPEX	Capital expenditures
CPI	Consumer Price Index
EBIT	Earnings before interest and taxes
EDGAR's	Electronic Data Gathering, Analysis, and Retrieval system
EM	Earnings Management
FE	Fixed Effects
GAAP	Generally Accepted Accounting Principles
GDP	Gross domestic product
IFRS	International Financial Reporting Standards
M&A	Mergers and acquisitions
NASDAQ	National Association of Securities Dealers Automated Quotations
NYSE	New York Stock Exchange
OTC	Over-The-Counter
OTCBB	Over-The-Counter Bulletin Board
PP	Percentage Points
PPE	Property, Plant and Equipment
PSM	Propensity Score Matching
R&D	Research and development
ROA	Return on Assets
ROE	Return on Equity
SD	Standard deviation
SDC	Securities Data Corporation
SEC	Securities and Exchange Commission
SEOs	Seasoned Equity Offerings
SIC	Standard Industrial Classification Code
SOX	Sarbanes-Oxley Act
TA	Total Assets
U.S.	United States

INTRODUCTION

The motivations and benefits for foreign firms to cross-listing their stocks on a United States (U.S.) stock exchange are widely discussed in previous literature (e.g., Foerster and Karolyi (1999), Miller (1999), Doidge (2004), Doidge, Karolyi and Stulz (2004), Doidge, Karolyi and Stulz (2009)). However, and especially in the last decade, more foreign firms are leaving U.S. exchange markets than coming, mainly after the passage of the Exchange Act Rule 12h-6 of March 21, 2007. During the period between 2000 and 2012, there are more foreign firms that cross-delisted from U.S. stock exchanges than new cross-listings. However, too little is known about the economic aftermath of cross-delisting. Using a sample of foreign firms listed and delisted from U.S. exchange markets over 2000-2012, we explore this research opportunity by investigating the effects of cross-delisting on i) post-operating performance, ii) financial constraints, and iii) stock crash risk.

Firstly, we investigate the long-term performance of cross-delisted firms from U.S. stock exchanges by providing evidence on operating performance and long-run stock returns performance of firms post-cross-delisting. Using the propensity score matching (PSM) technique, our results suggest that cross-delisted firms have less growth opportunities than matched cross-listed firms in the long run. Moreover, firms that cross-delist after the passage of Rule 12h-6 of 2007 exhibit a significant decline in operating performance. In contrast, before the adoption of the Rule 12h-6, cross-delisted firms seem to be affected by the cost of a U.S. listing in the pre-cross-delisting period. In addition, we provide evidence that cross-delisted firms underperform their cross-listed peers; cross-delisted firms experience negative average abnormal returns, especially in the post-delisting period.

Secondly, we investigate the impact of cross-delisting on firms' financial constraints and investment sensitivities. We test our hypotheses using a difference-in-differences methodology and also the PSM technique. We find that firms that cross-delisted from a U.S. stock exchange face stronger post-delisting financial constraints than their cross-listed counterparts. Following a cross-delisting, the sensitivity of investment-to-cash flow increases significantly and firms also tend to save more cash out of cash flows. Moreover, this increase appears to be primarily driven by informational frictions that constrain access to external financing. We document that information asymmetry

problems are stronger for firms from countries with weaker shareholders protection and for firms from less developed capital markets.

Finally, we test whether cross-delisted firms from the major U.S. stock exchanges experience an increase in crash risk associated with earnings management. We use different regressions techniques and alternate crash risk measures. Consistent with our prediction, we find that earnings management has a greater positive impact on stock price crash risk post-cross-delisting when compared to a sample of still cross-listed firms. Moreover, our results suggest that this effect is more pronounced for cross-delisted firms from countries with weaker investor protection and poorer quality of their information environment. We further examine whether managers' ability to manipulate earnings increases post-cross-delisting around seasoned equity offerings. Our evidence shows that cross-delisted firms that engage in earnings management to inflate reported earnings prior to a seasoned equity offering are more likely to observe a subsequent stock price crash.

CHAPTER 1 - POST-OPERATING PERFORMANCE OF CROSS-DELISTED FIRMS FROM U.S. STOCK EXCHANGES

1.1 INTRODUCTION

The United States (U.S.) stock exchanges, namely the New York Stock Exchange (NYSE) and the NASDAQ together, have the largest number of foreign listings for a given country. Foreign companies can access to the U.S. exchange markets by obtaining or issuing American Depositary Receipts (ADRs)[1] and are required to register with the Securities and Exchange Commission (SEC)[2]. In fact, the motivation and effects of cross-listings equity in U.S. exchanges have been extensively analyzed (e.g., Karolyi (2012)).

However, the number of foreign firms on U.S. exchanges has been decreasing in the last decade. According to the World Federation of Exchanges[3] statistics bureau, in 2000 there were registered about 970 foreign firms and in 2012 there were only about 814, meaning that more foreign firms delisted than listed on U.S. markets during that period.

Therefore, our study contributes with new evidence about post-operating performance and long-run stock returns performance of cross-delisted firms from U.S. exchange markets. A foreign firm will delist and terminate the SEC registration when the costs of a cross-listing outweigh the benefits. However, the SEC deregistration process was very difficult before the passage of Rule 12h-6 of March 21, 2007, which

[1] Foreign firms can obtain or issue equity financing by using Level 1, 2 or 3 ADRs. Level-1 ADR it is the only ADR' Level that may be unsponsored and, as a result, may be quoted only on the OTC market, such as OTCBB, OTCQX or Pink Sheets. A level-2 ADR provides shares listed and traded on the U.S. exchange markets. The Level-3 ADR is used when a company has made a public offering in the U.S. Firms also can obtain financing with private placements (Rule 144A ADR's), which do not require full SEC registration, accessed only by qualified institutional buyers through the "PORTAL" system. ADRs are quoted (and if it is the case, pay dividends) in US dollars and can be traded like the shares of any U.S.-based firm. See http://www.sec.gov/divisions/corpfin/internatl/foreign-private-issuers-overview.shtml.

[2] Foreign firms that have its securities listed on a U.S. exchange market and on the Over-The-Counter Bulletin Board (OTCBB) are required (under Section 12 (b) of the Securities Exchange Act of 1934) to fill periodically the Form 20-F (or 40-F for Canadian companies) with the SEC. As a registered firm, foreign firms are also mandated to fill Form 6-K for any relevant public information (i.e., relevant by any stock exchange on which a company's securities are traded). Furthermore, companies must register securities under the 1933 Securities Act when offering to sell securities in U.S. exchanges. In addition, a public offering demands to fill forms F-1, F-3, F-4, F-6 and F-8. A company may also voluntarily register with the SEC under rule 12(g). These forms can also be used to perform a "shelf" registration under Rule 415 of the 1933 Securities Act, whereby the registered securities are offered on a delayed or continuous basis. Companies can register without any active listing and can delist without deregister. Since 2002, foreign issuers are mandated to file all the stated forms electronically through the SEC EDGAR system. See http://www.sec.gov/divisions/corpfin/internatl/foreign-private-issuers-overview.shtml.

[3] http://www.world-exchanges.org.

made it easier for a foreign firm to deregister. Consistent with the notion of balancing costs and benefits of a U.S. exchange listing, previous studies reveal that foreign firms with specific characteristics are more likely to delist and to deregister. For example, Marosi and Massoud (2008) provide evidence that small foreign firms with low trading volume, with relatively low cross-listing premium, firms from industries in which takeover activity by foreign acquirers of U.S. targets is also relatively low, and with greater degree of insider control are more likely to deregister. Doidge, Karolyi and Stulz (2010) find that firms that deregister should have poor growth opportunities and hence raise few or no external funds at the time of deregistration and are not expected to do so in the future. Overall, much of this previous evidence is still consistent with the predictions of the "bonding" theory (e.g., Marosi and Massoud (2008), Doidge, Karolyi and Stulz (2010), Fernandes, Lel and Miller (2010)).

However, research is still scarce regarding the determinants of cross-delisting and little is known about the economic aftermath of cross-delisting. Thus, our study adds to the literature by providing evidence on the long-term performance of firms post-cross-delisting. Using a sample of foreign firms that listed and delisted from U.S. exchange markets over 2000-2012, we first investigate the motivations for cross-delisting and deregistration to identify the characteristics of firms that delisted in the pre- and in the post-Rule 12h-6, since it changed the procedure to terminate registration with the SEC. Cross-delisting and deregistration may be voluntary or involuntary. Obviously, the most relevant group is the voluntary one, since the involuntary group includes firms that were forced to leave the U.S. exchanges and to terminate the SEC registration. Foreign firms, like U.S.-based firms, can be suspended and delisted for not filling the requirements imposed by SEC regulations and other rules established by the U.S. exchange markets[4]. Therefore, those firms belong to the involuntary group. We will focus our analysis on cross-delisted firms because delisting is usually a first step prior to deregistration and the motivations are basically the same.

We conduct our empirical tests using a treatment group of 583 cross-delisted firms and a control sample of 564 firms that remaining cross-listed on U.S. markets from 42 countries. We implement the propensity score matching (PSM) technique to reduce the

[4] According to NYSE and NASDAQ Rules, a foreign stock can be suspended or delisted for falling below certain quantitative and qualitative continued listing criteria, such as the number of total shareholders, average monthly trading volume, number of publicly-held shares, average global market capitalization, and minimum bid price. See http://nysemanual.nyse.com/lcm/ and http://nasdaq.cchwallstreet.com.

selection bias and make both treatment and control groups more similar. We find that cross-delisted firms have less growth opportunities than a matched group of cross-listed firms, in the long-run. This result is significant for firms that voluntarily cross-delisted after the passage the Rule 12h-6, but is insignificant for firms that cross-delisted before. Moreover, voluntary cross-delisted firms after the Rule 12h-6 underperform cross-listed firms regarding operating efficiency and profitability. However, before the passage of the Rule 12h-6, our results suggest that there is a cost that foreign companies bear while cross-listed in a U.S. exchange market: one year after delisting, cross-delisted firms (before the Rule 12h-6) show higher profitability growth rates than comparable cross-listed firms, and this evidence remains up three years after delisting. A reasonable explanation for this evidence is that for this group of cross-delisted firms the cost of a U.S. listing outweighs the benefit.

In addition to the operating analysis, we also investigate the long-run stock returns performance of cross-delisted firms. We therefore follow Barber and Lyon (1997) and measure abnormal returns as the difference in one-year holding period returns between cross-delisted firms and a matched group of cross-listed firms. Consistent with prior research (e.g., Loughran and Vijh (1997)) we apply a matching approach based on the market value of equity and the book-to-market ratio. We find that cross-delisted firms underperform their comparable cross-listed firms; cross-delisted firms experience negative average abnormal return, especially in the post-delisting period.

The remaining of this chapter is organized as follows. Section 1.2 provides a review of literature pointing out the main hypotheses that explain the benefits and costs of cross-listing and about the determinants of cross-delisting and deregistration. Section 1.3 outlines the data and describes the sample. Section 1.4 presents and describes methodology and empirical results. Finally, section 1.5 presents the main findings and concludes.

1.2 LITERATURE REVIEW

Prior research on cross-listing provides evidence that a U.S. listing creates more incentives for firms to access external finance. Among several reasons for non–U.S. firms to cross-list into U.S. markets, some authors highlight that cross-listing overcomes barriers that segment capital markets, thus lowering information asymmetries (e.g.,

Stapleton and Subrahmanyam (1977), Errunza and Losq (1985), Eun and Janakirananan (1986), Alexander, Eun and Janakiramanan (1987)), others stress the benefits from a lower cost of capital (e.g., Mittoo (1992), Fanto and Karmel (1997), Errunza and Miller (2000), Bancel and Mittoo (2001), Reese and Weisbach (2002), Hail and Leuz (2009)), and others point out that firms raise more external funds after they enter in the U.S. markets (e.g., Lins, Strickland and Zenner (2005), Doidge, Karolyi and Stulz (2009)). Nevertheless, Coffee (1999, 2002) and Stulz (1999) argue that the main motivation for a firm to cross-list in a U.S. exchange market is driven by shareholders' legal protection. To overcome their corporate governance problems, firms can cross-list in capital markets with stronger legal and financial institutions such U.S. exchange markets that are subject to the public enforcement of the SEC; these mandatory regulations reduce the ability of controlling shareholders to extract private benefits at the expense of minority shareholders. Hence, corporate boards "bond" themselves to better governance which benefits minority shareholders. In sum, the "bonding" hypothesis postulates that a legal regime that protects minority shareholders provides a decrease in information asymmetries costs, thus lowering the cost of capital. Furthermore, the "bonding" effect may arise at both legal and reputational levels. Coffee (1999, 2002) emphasized the evidence of a legal "bonding" based on the argument that better enforcement of legal requirements provided by U.S. Institutions results in better corporate governance mechanisms due to a more demanding litigation environment increased by SEC's enforcement, which in turn demands enhanced disclosure and reconciliation to U.S. generally accepted accounting principles (GAAP). In addition, firms may also adopt a set of "bonding" activities that help the firm building its image of a well-governed corporation. Hence, the prospect of creating reputational capital (Stulz, 1999) induces the firm to observe certain standards that it is not forced to follow, as hiring reputable intermediaries such as investment bankers (e.g., Loureiro (2010)), auditors (e.g., Coffee (2002)), analyst coverage (e.g., Bushman, Piotroski and Smith (2005; 2004), Baker, Nofsinger and Weaver (2002), Lang, Lins and Miller (2003), Bailey, Karolyi and Salva (2006)), institutional investors (e.g., Bradshaw, Bushee and Miller (2004), Aggarwal, Dahiya and Klapper (2007)), and other capital market participants. Therefore, firms from countries with weaker investor protection regimes (e.g., from Civil Law countries) benefit more and are more likely to cross-list in countries such as the U.S. (e.g., La Porta *et al.* (1997; 1998)). The likelihood of cross-listing on a U.S. stock exchange is

also higher for firms that have higher growth opportunities, which results in higher cross-list premium (Doidge, Karolyi and Stulz, 2004). On the other side, a U.S. listing represents a cost for corporate insiders because it restricts their ability to consume private benefits (Karolyi, 2012). This argument is consistent with the lower likelihood of firms with a large controlling shareholder to cross-list in U.S. markets (e.g., Doidge (2004), Djankov *et al.* (2008), Doidge *et al.* (2009), Ayyagari and Doidge (2010)).

Nevertheless, since the passage of the Sarbanes-Oxley[5] (SOX) Act in 2002, the debate is more centered on whether higher compliance costs, redundancies with home market requirements and difficulties in the SEC deregistration process was driving to a loss of competitiveness of U.S. exchanges. The adoption of SOX augmented the number of foreign firms that move from U.S. exchange markets to London and Hong Kong exchanges. Moreover, after the adoption of SOX, more foreign firms simply choose to market under the rule 144A (only among institutional investors), avoiding all the disclosure and compliance requirements associated with a public offering. Under the predictions of "bonding" hypothesis, SOX requirements can be seen as a boost to investor confidence, improving investor protection and increasing the premium for a U.S. listing (e.g., Berger, Li and Wong (2005)). This suggests that SOX should affect positively larger firms with a higher level of pre-SOX disclosure, while might affect in a negative way less fast-growing, more financially-constrained, large dominant shareholder block, riskier and smaller firms originated from countries with underdeveloped capital markets and with weaker shareholder protection (Karolyi, 2012). On the other side of this debate, Zingales (2007) argues that for some foreign firms the compliance costs with SOX requirements outweigh the net benefits of a U.S. listing, which led those firms to choose to delist. He calls to this hypothesis the "loss of competitiveness hypothesis", which suggests that firms that are negatively affected by SOX tend to delist from U.S. markets. However, delisting may be relatively costly from a reputational perspective due to the potential risk of alienating firms' international investor base (Lang, Lins and Miller, 2003). Furthermore, delisting process does not remove the obligation to meet the SEC requirements, only deregistration[6] process

[5] Sarbanes-Oxley Act (SOX) is a U.S. federal law that predicts enhanced standards for all public companies in U.S.

[6] Before Rule 12h-6 of 2007, the voluntary process of deregistration from SEC was made by using Form 15. Issuers can voluntarily apply for deregistration if a company is eligible for it, i.e., if a company no longer meets the requirements of Section 12 (g)-4: (i) a foreign company may deregister if there are fewer than 300 U.S. resident shareholders; (2) or, alternatively, if the company's total assets in each of the three previous fiscal years are less than $US10 million, the security class may be deregistered if there are fewer

removes such obligation. Deregistering firms have characteristics that reduce the value of a cross-listing according to the "bonding" theory and generally market reacts negatively to deregistration announcements. Liu (2004) has investigated stock-price reactions of 103 foreign firms that involuntarily cross-delisted from U.S. markets over the 1990-2003 period and finds a 4.5% significant average decline. In the same period, Witmer (2005) finds a 6% decline for a sample of 116 foreign firms that cross-delisted from U.S. exchange markets. Contrarily, Li (2014) and Smith (2008) show a positive post-SOX stock-price reaction, in contrast with an insignificant negative pre-SOX stock-price reaction around cross-delisting announcement. Chaplinsky and Ramchand (2009) provide the most extensive study about the characteristics of cross-delisted firms. The authors considered a total of 724 foreign firms that delisted over the period from 1961 to 2004, 48 of which are considered as voluntary cross-delistings. Their findings reveal that those firms delisting after SOX have lower profitability, are smaller, have lower median assets and market capitalization, poorer preceding stock-price performance, and lower analyst coverage; the only exception are firms that delist due to mergers and acquisitions processes, which are closer in profitability and growth opportunities to foreign firms that remained cross-listed. Their results also suggest that larger, more profitable firms, with proportionally more U.S. trading volume, and more capacity to raise capital are more likely to remain cross-listed. Voluntary cross-delistings are more likely to occur for smaller, NASDAQ[7] quoted firms, and in circumstances where there are more firms from the same country cross-listed. In their published version[8], Chaplinsky and Ramchand (2012) show that the majority of firms that cross-delisted after SOX are from countries with stronger governance, and that have low volume trading, lower analyst coverage and lower capital raising activity when comparing with cross-listed firms. Also Daugherty and Georgieva (2011) investigate the impact of SOX on the cross-delisting behavior and point out that the potential gains

than 500 U.S. resident shareholders. To voluntarily terminate a listing, the NYSE requires that a firm gain the approval of its audit committee and Board of Directors before delisting, while NASDAQ simply requires a letter stating the reasons for delisting. An ADR program generally may be terminated by giving the depositary bank at least 30 days written notice of termination. See https://www.sec.gov/about/laws/sea34-12g.pdf.

[7] The NYSE is often considered to be more regulated, and more liquid than the NASDAQ exchange. NASDAQ may not provide the necessary "bonding" to justify the costs of cross-listing (Chaplinsky and Ramchand, 2009).

[8] We refer to the working paper version of 2009 of this paper because the published version does not contain so much information about delisted foreign firms' characteristics in the pre- and the post-SOX.

resulting from growth opportunities, country's legal environment and the length of presence in the U.S. are the main determinants of the cross-delisting decision.

On the side of deregistration, Marosi and Massoud (2008) concluded that post-SOX deregistration announcements have a less negative stock price effect than deregistration announcements in the pre-SOX period, consistent with stockholders recognizing the costs of SOX compliance. Their findings also suggest that the passage of SOX has reduced the net benefits of a U.S. exchange listing. This evidence is stronger for smaller firms, with lower trading volume and stronger inside control; those firms are more likely to deregister. Hostak *et al.* (2013) considered a sample of 84 voluntary foreign firms that deregistered after SOX and found a statistically significant negative stock-price reaction around deregistration announcement. Their findings suggest that firms with weaker corporate governance deregister to avoid the governance requirements of SOX; they concluded that the decision of deregistration did not benefit minority shareholders.

In the spirit of the legal "bonding", an easier deregistration process decreases the value of "bonding" since it increases the chance that insiders will force a firm to deregister in order to consume more private benefits (Fernandes, Lel and Miller, 2010). And if listing costs are not considered to be relevant, minority shareholders of firms deregistered are expected to be hurt by deregistration once it increases a corporate insider's discretion to extract private benefits at the expense of minority shareholders (Hostak *et al.*, 2013). On the other side, costs imposed on foreign firms by SOX outweigh the benefits of a U.S. listing for a significant part of cross-listed companies. In order to "release" those companies from such significant costs, on March 21, 2007, the Rule 12h-6[9] made it easier the deregistration process, which triggered a wave of foreign firms that decided to leave U.S. exchange markets. More firms deregister after Rule

[9] Under Rule 12h-6 of March, 21, 2007, foreign companies that have and maintain a foreign listing which is its primary trading market (for at least 12 months preceding deregistration), can qualify for deregistration if the average daily trading volume of the subject class in the U.S. for a recent 12-month period is no more than five percent of the average daily trading volume of that class of securities on a worldwide basis for the same period. Moreover, the registrant must not have sold securities in a registered offering in the United States during the 12 months preceding deregistration, except for specified exceptions noted in the rule. In addition, a registrant must have at least one year of Exchange Act reporting, be current in filing all reports under the Exchange Act, and have filed at least one Exchange Act annual report. Previous Rule 12g-4 applies (with an easier method of counting U.S.-resident holders), but the new eligibility conditions also apply. See http://www.sec.gov/divisions/corpfin/internatl/foreign-private-issuers-overview.shtml.

12h-6 in 2007 than after SOX in 2002. In this context, Doidge, Karolyi and Stulz (2010) investigate the drivers and motivations of deregistration after the passage of Rule 12h-6. Their study identified 141 firms that deregistered from U.S. exchanges between 2002 and 2008 and 75 deregistered after the passage of Rule 12h-6 in 2007. They concluded that, overall, their findings are consistent with the "bonding" hypothesis; firms that deregister are expected to have low growth opportunities, a low financing deficit or a surplus, and evidence of agency costs. Moreover, they also investigate the market reactions to deregistration announcements and found that those reactions are negative before Rule 12h-6, but less negative after the passage of that Rule. In addition, they find no evidence supporting the prediction of the loss of competitiveness hypothesis, i.e., that stock price reactions to SOX affect the deregistration decision. Also Fernandes, Lel and Miller (2010) provide evidence supporting "bonding" hypothesis. They find that stock price reactions to the passage of Rule 12h-6 are significantly negative for firms from countries with weaker investor protection and poor disclosure requirements. In contrast, they find no significant market reaction for deregistered firms from strong investor protection regimes.

Overall, previous findings indicate that cross-delisting and deregistration from U.S. stock markets are decisions driven by a combination of country's legal origin, informational environment, and also of firm-level characteristics such as operating performance variables. Those performance drivers appear to be related with changes in investment activity, growth and profitability of operating activities, and the size and scope of capital-raising activities occurring during the listing. Taken as together, previous results reveal that greater size and stronger U.S. market conditions decrease the probability of a delisting and deregistration (Chaplinsky and Ramchand, 2012). According to Karolyi (2012), larger firms seeking "bonding" benefits from a U.S. listing continue to pursue a U.S. exchange listing; although the costs of a U.S. listing have increased, the benefits of "bonding" continued to outweigh the costs of compliance with the SEC regulations.

1.3 SAMPLE CONSTRUCTION AND DATA

Our dataset consists of the universe of U.S. listed foreign firms on NYSE and NASDAQ over the period between 2000 to 2012. We include all firms that were already cross-listed and those that decided to cross-delist from U.S. exchanges markets[10], and terminate SEC registration over 2000-2012. We also include new listings that occurred during the same period. As our analysis requires the use of lagged variables, and to avoid reducing our sample period, we collect data prior to 2000[11] for all foreign firms included in our sample. Foreign firms that move from one major exchange to another are not treated as delists, whereas firms that move to the Over the Counter (OTC) market, OTCBB, or to the "Pink Sheets" are treated as delists.

We obtained a list of all foreign firms with equity shares registered and reporting with the SEC from the SEC's website[12]. That information was complemented and cross-checked with data obtained from other sources (namely, the list of ADRs provided by the depositary banks and the exchanges or OTC markets' websites). In fact, most foreign firms traded in the U.S. issue ADRs managed by a U.S. depositary banks such as the Bank of New York and Citibank[13]. However, because not all foreign issuers with U.S. traded equity securities use ADR programs (Canadian and Israeli firms, for example, are able to list their securities directly on U.S. exchanges), we also collected data directly from the websites of NYSE, NASDAQ, OTCBB and OTC Markets Portal[14].

We then matched cross-listings with Datastream/ Worldscope database to collect market variables and accounting data[15]. Mergers and acquisitions data are from the

[10] We focus on U.S. exchange markets (NYSE and NASDAQ) to ensure better data availability and more uniform listing requirements. Thus, we include only Level-2 and Level-3 ADRs.

[11] Our sample period starts in 2000 because information about foreign firms registered and reporting with the SEC is not available in 1995 and in 1999.

[12] http://www.sec.gov/edgar/searchedgar/companysearch.html.

[13] Bank of New York: http://www.adrbnymellon.com.

Citibank: https://www.citiadr.idmanagedsolutions.com.

[14] NYSE: https://www.nyse.com/get-started/international/documents-reports.

NASDAQ: http://www.nasdaq.com/screening/companies-by-industry.aspx?exchange=NASDAQ&market=ADR.

OTCBB: http://www.finra.org/industry/otcbb/otc-bulletin-board-otcbb.

OTC: http://www.otcmarkets.com.

[15] Missing data from the primary databases was complemented with hand-collected data from stock exchanges, depositary banks, SEC and cross-listed firms' websites.

Securities Data Corporation (SDC) database. Detailed information about all variables, including firm-, industry-, and country-level variables, is provided in Appendix 1.A.

To identify and understand the cross-delisting and deregistration reasons, we used SEC database, namely EDGAR's archive, and searched for all cross-delisting and deregistration announcements, and also for all Form 15's filed between 2000 and 2012.

We exclude financial firms (SIC codes between 6000 and 6999) and utilities (SIC codes between 4900 and 4949) because their accounting values are largely dependent on statutory rules. We also exclude firms with total assets lower than $10 million and for firms that are domiciled in tax off-shores[16], we find their "true" country of origin, i.e., we identify the management headquarters. Furthermore, we exclude observations with missing information on total assets, total sales, market capitalization, book value of equity and debt. Also, we require that firms have, at least, two years of observations. Thus, new listings in 2012 were dropped from the final sample. We winsorize the continuous variables (excluding the country-level variables) at both the bottom and top one percent tails to limit the effect of outliers. All variables expressed in U.S. dollars are Consumer Price Index (CPI) adjusted considering 2000 prices.

After the sample screening, we end up with 9,092 firm-year observations that correspond to 1,147 firms, 583 of which have cross-delisted during the 2000-2012 period.

1.3.1 Reasons of Cross-Delisting and Deregistration

Although being different processes, cross-delisting is a first step prior to deregistration process. The time gap between delisting and deregistration is mainly due to administrative reasons. For example, an ADR program will be closed within four or five months after the written notice of termination (Chaplinsky and Ramchand, 2012). However, the motivations are basically the same. Hence, prior research differentiates cross-delisting and deregistration between involuntary and voluntary. Involuntary cross-delisting or deregistration is due to reasons such as bankruptcy and disqualification to continue listed on U.S. exchange markets[17]. Foreign firms, like U.S.-based firms, can be suspended and deregistered by the SEC for rule violations. In contrast, voluntary

[16] We exclude all firms domiciled and managed in tax off-shores (e.g., Cayman Islands).

[17] See NYSE and NASDAQ rules in footnote 4.

delisting or deregistration can occur if firms meet the requirements imposed by SEC[18] to delist and terminate registration. After the passage of Rule 12h-6 of March 21, 2007, it became easier for those firms to deregister and managers usually point out several reasons why they decided to leave U.S. exchange markets. After analyzing those announcements[19] of firms that voluntarily cross-delisted and deregistered from U.S. exchange markets, we can summarize the reasons as follows: i) the significant costs, both direct and indirect, of preparing and filing the reports and forms that companies are required to; ii) the overall cost of a U.S. listing has increased substantially after SOX; iii) the costs of an ADR program outweigh the benefits due to the continued globalization of the capital markets; iv) the relatively small proportion of trading that takes place in the form of ADRs; v) the NYSE-Euronext markets' integration; vi) the adoption of International Financial Reporting Standards (IFRS) that makes compliance with GAAP redundant; vii) the reduced number of common shareholders of record; viii) the volatile economic conditions that have affected the firms' value in the last decade; ix) the increased sophistication and transparency of the capital markets worldwide is a substitute for the greater degree of shareholder protection offered by U.S. stock markets.

Taken together, all these reasons imply that being cross-listed on a U.S. stock exchange is not reasonable if costs outweigh the benefits of doing it.

In this context, firstly and according to Chaplinsky and Ramchand (2012), we classify delisting and deregistration in three main groups: 1) involuntary, 2) as result of mergers and acquisitions (M&A) activities, 3) and voluntary. Involuntary delistings correspond to those foreign firms that went bankrupt and were disqualified by NYSE or NASDAQ to maintain their listing or did not meet SEC registration requirements. M&As are considered as a single type independent from the strategy that originated those activities and in some analysis are included in the voluntary group. The voluntary group corresponds to those companies that made the decision to cross-delisted, and then to deregister. These firms were eligible under the SEC rules to deregister (see footnotes 6 and 9). Foreign firms that voluntarily cross-delisted fit into the following three categories: 1) firms that cross-delisted before March 21, 2007, and deregister under

[18] SEC rules for deregistration process is described in footnotes 6 and 9.

[19] We obtained the press release of delisting announcements for the most part of firms included in our dataset from the SEC's website.

Rule 12g-4[20]; 2) firms that cross-delisted after March 21, 2007, and deregister under Rule 12h-6; 3) "other reasons" includes firms that changed its headquarters to U.S.[21], went private and moved to OTCBB or to another OTC market. All reasons for delisting and deregistration are summarized in Appendix 1.B and the groups of cross-delisted firms used in descriptive and empirical analysis are summarized in Appendix 1.C.

Table 1.1 describes, by country, industry and year our final sample. The sample of cross-delisted firms is segmented by the reason of delisting. Panel A of Table 1.1 reports a total of 583 cross-delisted firms, 555 of which deregister over 2000-2012, what indicates that most of the cross-delisted firms effectively terminate their registration with the SEC. At the end of 2012, there were about 564 cross-listed firms. By cross-listed firms we mean foreign firms that do not delist over the course of our study and we will refer to them simply as cross-listed (in opposition to cross-delisted firms).

As observed in Panel A of Table 1.1, about 204 firms were removed by U.S. stock markets (7 of which declared bankruptcy), 131 delists result from M&As processes, 106 firms cross-delisted voluntarily before the passage of Rule 12h-6 of 2007, whereas 109 firms cross-delisted after the Rule 12h-6 (after March, 2007), and 33 delisted due to "other reasons" already mentioned. The final sample includes 42 countries, 19 of which are considered emerging markets[22]. The number of delisted firms from Common Law[23] countries is 360 (61.8%) and the number of cross-listed firms from those countries is 291 (51.6%), although Canada alone counts 194 delistings and 159 cross-listed firms in 2012. Civil Law countries exhibit 125 (21.4%) cross-delisted firms and 113 (20.0%) cross-listings in 2012. Regarding German and Scandinavian Law countries, we identify 98 (16.8%) cross-delistings and 160 (28.4%) cross-listed firms in 2012. In sum, even after removing Canada from the list of Common Law countries, those countries represent the highest number of delistings (42.7%), followed by Civil Law countries (32.1%).

[20] Rule 12g-4 is prior to Rule 12h-6 concerning deregistration process.

[21] These foreign firms are removed from the sample after delisting.

[22] This classification is in accordance with the Standard and Poor's Emerging Market Database for the year of 2000 and was collected from Standard & Poor's, Emerging Markets Factbook, 2001.

[23] We follow La Porta, Lopez-De-Silanes and Shleifer (2008) and assign firms according to the legal origin of domestic markets.

TABLE 1.1: Sample Description

Panel A – Sample Description by Country

	Cross-Delisted						Deregistered				Control
			Voluntary								
	Involuntary	M&A	Pre-Rule 12h-6	Post-Rule 12h-6	Other	Total	Involuntary	M&A	Voluntary	Total	Cross-listed
Argentina*	1	1	0	0	0	*2*	1	1	0	*2*	5
Australia	6	2	3	5	3	*19*	3	2	11	*16*	7
Austria	0	0	0	1	0	*1*	0	0	1	*1*	0
Belgium	1	0	0	1	0	*2*	1	0	1	*2*	2
Brazil*	8	4	0	0	1	*13*	8	4	1	*13*	17
Canada	91	55	19	10	19	*194*	86	55	39	*180*	159
Chile*	1	2	2	3	1	*9*	1	2	6	*9*	5
China*	18	1	1	2	1	*23*	17	1	4	*22*	108
Colombia*	0	0	0	0	0	*0*	0	0	0	*0*	1
Denmark	0	0	1	1	0	*2*	0	0	2	*2*	2
Finland	0	2	1	3	0	*6*	0	2	4	*6*	1
France	2	6	5	10	0	*23*	2	6	15	*23*	9
Germany	3	1	5	10	1	*20*	3	1	16	*20*	5
Greece*	2	2	1	1	0	*6*	1	2	2	*5*	24
Hong Kong	10	1	2	6	1	*20*	9	1	8	*18*	18
Hungary*	0	0	0	1	0	*1*	0	0	1	*1*	0
India*	2	0	0	2	0	*4*	2	0	2	*4*	9
Indonesia*	0	0	0	0	0	*0*	0	0	0	*0*	2
Ireland	4	2	3	0	0	*9*	4	2	3	*9*	8
Israel	23	3	7	4	1	*38*	18	3	12	*33*	53
Italy	0	0	3	3	0	*6*	0	0	6	*6*	5
Japan	1	0	3	4	1	*9*	1	0	8	*9*	15
Korea*	1	3	0	3	0	*7*	1	3	3	*7*	5
Luxembourg	1	2	3	2	0	*8*	1	2	5	*8*	5
Mexico*	7	2	6	1	0	*16*	7	2	7	*16*	17
Netherlands	4	6	9	7	0	*26*	3	6	16	*25*	11
New Zealand	0	1	2	0	0	*3*	0	1	2	*3*	1
Norway	0	3	0	3	1	*7*	0	3	4	*7*	8

Panel A – Sample Description by Country											
	Cross-Delisted						Deregistered				Control
			Voluntary								
	Involuntary	M&A	Pre-Rule 12h-6	Post-Rule 12h-6	Other	Total	Involuntary	M&A	Voluntary	Total	Cross-listed
Peru*	0	0	0	1	0	*1*	0	0	1	*1*	1
Philippines*	1	0	0	0	0	*1*	1	0	0	*1*	1
Poland*	0	0	1	0	0	*1*	0	0	1	*1*	0
Portugal	0	0	0	0	0	*0*	0	0	0	*0*	1
Russia*	0	2	1	1	0	*4*	0	2	2	*4*	3
Singapore	1	1	0	2	0	*4*	1	1	2	*4*	2
South Africa*	1	0	0	2	0	*3*	1	0	2	*3*	6
Spain	0	3	0	1	0	*4*	0	3	1	*4*	3
Sweden	0	3	8	1	1	*13*	0	3	9	*12*	1
Switzerland	1	1	1	4	0	*7*	1	1	5	*7*	5
Taiwan*	0	0	0	1	0	*1*	0	0	1	*1*	10
Turkey*	0	0	0	0	0	*0*	0	0	0	*0*	1
United Kingdom	13	21	18	13	1	*66*	13	21	32	*66*	28
Venezuela*	1	1	1	0	1	*4*	1	1	2	*4*	0
Total	***204***	***131***	***106***	***109***	***33***	***583***	***187***	***131***	***237***	***555***	***564***

TABLE 1.1: Sample Description *(Continued)*

Panel B – Sample Description by Industry

	Cross-Delisted						Deregistered				Control
			Voluntary								
	Involuntary	M&A	Pre-Rule 12h-6	Post-Rule 12h-6	Other	Total	Involuntary	M&A	Voluntary	Total	Cross-listed
Agriculture	0	2	1	1	0	*4*	0	2	2	*4*	4
Mining	26	9	3	3	3	*44*	25	9	7	*41*	84
Construction	4	1	0	4	0	*9*	4	1	4	*9*	10
Transportation	5	9	2	6	1	*23*	4	9	9	*22*	53
Oil	14	16	4	4	3	*41*	13	16	11	*40*	37
Communication	20	16	23	23	3	*85*	20	16	48	*84*	47
Manufacturing (low)	3	4	5	2	2	*16*	3	4	9	*16*	15
Manufacturing (med)	15	7	11	10	2	*45*	15	7	22	*44*	32
Manufacturing (Level I)	51	25	20	23	12	*131*	45	25	50	*120*	131
Manufacturing (Level II)	10	6	6	8	0	*30*	9	6	14	*29*	20
Manufacturing (Level III)	5	5	6	5	0	*21*	2	5	11	*18*	14
Services	39	27	20	15	5	*106*	35	27	38	*100*	95
Wholesale	6	2	2	3	1	*14*	6	2	6	*14*	10
Retail	5	2	2	2	1	*12*	5	2	5	*12*	10
Other	1	0	1	0	0	*2*	1	0	1	*2*	2
Total	***204***	***131***	***106***	***109***	***33***	***583***	***187***	***131***	***237***	***555***	***564***

TABLE 1.1: Sample Description *(Continued)*

Panel C – Sample Description by Year

	Cross-Delisted						Deregistered				Control
			Voluntary								
	Involuntary	M&A	Pre-Rule 12h-6	Post-Rule 12h-6	Other	Total	Involuntary	M&A	Voluntary	Total	Cross-listed
2000	3	8	0		2	*13*	3	8	2	*13*	232
2001	8	20	2		5	*35*	8	20	7	*35*	243
2002	13	21	15		5	*54*	13	21	19	*53*	265
2003	3	16	21		4	*44*	3	16	23	*42*	296
2004	3	10	18		3	*34*	2	10	20	*32*	325
2005	6	25	26		1	*58*	6	25	26	*57*	352
2006	19	13	24		1	*57*	19	13	24	*56*	387
2007	26	6		59	1	*92*	24	6	61	*91*	389
2008	28	0		15	5	*48*	27	0	18	*45*	399
2009	26	3		15	2	*46*	25	3	15	*43*	405
2010	20	3		9	1	*33*	17	3	9	*29*	479
2011	22	5		6	2	*35*	18	5	7	*30*	564
2012	27	1		5	1	*34*	22	1	6	*29*	564
Total	***204***	***131***	***106***	***109***	***33***	***583***	***187***	***131***	***237***	***555***	*4900*

Table 1.1 describes the sample by country of origin, industry and year over 2000-2012, excluding financial firms (SIC Code 6000-6999) and strictly regulated firms (SIC Code 4900-4949). Each panel reports the number of firms that cross-delisted and that deregistered, and also the number of cross-listed (control) firms included in the sample. Cross-delisted firms are divided by the reason of delisting according to the segmentation described in Appendix 1.C. Involuntary group of cross-delisted firms comprises firms that were removed by U.S. markets (7 of which declared bankruptcy). M&A group of cross-delisted includes mergers and acquisitions. Voluntary group of cross-delisted includes firms that delisted before and after the passage of the Rule 12h-6 in 2007. "Other" includes other reasons as firms that moved their headquarters to U.S., went private or moved to OTC. Deregistered group reports the number of firms that deregistered after delisting by involuntary, M&A and voluntary reasons. Reasons of cross-delisting and deregistration are described in Appendix 1.B. Panel A describes by country of origin the number of firms that cross-delisted and that deregistered, and the number of cross-listed firms included in the sample. Panel B describes by industry the number of firms that cross-delisted and that deregistered, and the number of cross-listed firms. We assign firms to industries using the classification scheme of Fama and French (1997) of 48 industry portfolios. We then aggregate industries according to Massachusetts Department of Workforce Development (document of 2007). Industry (low) includes: Food Products; Candy and Soda; Beverages; Tobacco; Textiles. Industry (med) includes: Consumer Goods; Apparel; Steel; Paper Supplies; Other Fabricated Products. High Tech Manufacturing (Level I) includes: Printing and Publishing; Healthcare; Medical Equipment; Pharmaceutical Products; Aircraft; Computers; Electronic Equipment; Measuring and Control Equipment. Communication is classified as High Tech Manufacturing level I but is considered alone. High Tech Manufacturing (Level II) includes: Chemicals; Rubber and Plastic Products; Machinery. Oil is classified as High Tech level Manufacturing II but is considered alone. High Tech Manufacturing (Level III) includes: Electrical Equipment; Automobiles and Trucks. Coal is classified as High Tech Manufacturing level III but is considered in the mining group. Panel C describes by year the number of firms that cross-delisted and that deregistered, and also the number of firm-year observations of cross-listed firms included in the sample over 2000-2012. *Denotes a country designated as an emerging market by Standard and Poor's Emerging Market Database.

Panel B of Table 1.1 reports, by industry, the number of cross-delisted, deregistered, and cross-listed firms included in our sample. We assign firms to industries using the classification of Fama and French (1997) of 48 industry portfolios. This industry classification scheme is based on the four-digit SIC code available on Datastream/ Worlscope. For brevity reasons of presentation, we aggregate industries according to Massachusetts Department of Workforce Development[24]. Altogether, Mining, Communication, High Tech Manufacturing[25] (level I), and Services are the most dynamic activity sectors, representing 63.3% of cross-listed and 62.8% of cross-delisted firms over 2000-2012.

Panel C of Table 1.1 describes the final sample by year. It is important to stress that 2007 is the record year with the highest number of firms leaving the U.S. exchanges; about 59 foreign firms voluntarily cross-delisted and 61 firms deregistered.

1.3.2 Descriptive Statistics

Cross-delisting creates a quasi-experiment where we can identify a treatment group of firms that cross-delist at some point in time over 2000-2012, and a control group composed by cross-listed firms. Thus, Table 1.2 compares characteristics of both treatment and control groups. The passage of the Rule 12h-6 of 2007 imposes a regime shift that is important to explore (Doidge, Karolyi and Stulz, 2010). Thus, our sample is divided in two subsets according two different periods of time. To differentiate the period before and after the passage of the Rule 12h-6, the first subset covers the 2000-2006 years (Panel A) and the second covers the 2007-2012 years (Panel B). We follow Doidge, Karolyi and Stulz (2010) and measure the characteristics of cross-delisted firms in the year before delisting takes place.

Panel A of Table 1.2 shows that treatment (cross-delisted) firms are smaller in size (*Total Assets*), have fewer growth opportunities (*Q*), smaller profitability (*ROA*), appear to be from more developed countries (*Gross Domestic Product (GDP) per capita*) and

[24] We follow the Massachusetts Department of Workforce Development, particularly their document of July 2007.

[25] High Tech Manufacturing (Level I) includes: Printing and Publishing; Healthcare; Medical Equipment; Pharmaceutical Products; Aircraft; Computers; Electronic Equipment; Measuring and Control Equipment. Communication is classified in the group of High Tech Manufacturing (level I), but in this analysis is considered alone.

with stronger private enforcement of investor rights (*Anti-Self-Dealing Index*). Over the same period, involuntary group of cross-delisted firms is revealed to be smaller in many dimensions when comparing with the cross-listed firms and the other groups of treatment firms. However, involuntary cross-delisted firms are originated, on average, from countries with higher *GDP per capita*, and with stronger investor protection rules (*Anti-Self-Dealing Index*). On the side of voluntary firms, they are smaller (*Total Assets*), but more levered (*Leverage*) than listed firms, display smaller growth opportunities (*Q* and *Sales Growth*), are less profitable (*ROA*) and are originated, on average, from countries with higher *GDP per capita*, but with investor protection regimes similar to cross-listed firms.

Taken together the results of Panel B of Table 1.2, the characteristics of cross-delisted firms have changed over the time, particularly the characteristics of voluntary group of treatment firms. Voluntary group overcome the control group of cross-listed firms in terms of *Total Assets* across the 2007-2012 period. However, voluntary treatment firms have a significant lower market capitalization than listed and seem to have lower growth opportunities (regarding *Sales Growth*). It is also interesting to notice that both groups of firms, treatment and control, present lower indicators of growth opportunities (*Q* and *Sales Growth*) in the post-Rule 12h-6, which may be related with the financial crisis of 2007-2008.

TABLE 1.2: Summary Descriptive Statistics

Panel A - Descriptive Statistics 2000-2006

	Control			Treatment											
				All				Involuntary				Voluntary: Pre-Rule			
	Mean	Median	N	Mean		Median	N	Mean		Median	N	Mean		Median	N
Total Assets	10, 200.00	1,732.93	2100	2,385.25	***	441.96 ***	295	1,094.18	***	306.85 ***	55	3,209.70	***	509.68 ***	106
Market Capitalization	11,300.00	1,763.52	2100	2,033.15	***	335.51 ***	295	1,329.56	***	246.28 ***	55	2,685.84	***	298.8 ***	106
Fixed Assets	0.38	0.35	2100	0.35	*	0.29 **	295	0.39		0.36	55	0.32	**	0.28 **	106
Turnover	0.67	0.60	2100	0.71		0.63	295	0.65		0.61	55	0.74	*	0.69 *	106
Q	2.18	1.56	2100	1.81	***	1.34 ***	295	2.11		1.54	55	1.74	***	1.32 ***	106
Sales Growth	0.12	0.09	2100	0.08		0.08	295	0.04		0.08	55	0.02	**	0.04 ***	106
ROA	0.06	0.08	2100	-0.05	***	0.01 ***	295	-0.04	***	0.00 ***	55	-0.08	***	0.02 ***	106
ROE	0.06	0.10	2100	-0.12	***	0.02 ***	295	-0.08	**	0.02 ***	55	-0.17	***	0.01 ***	106
Financing Deficit	0.05	0.00	2100	0.09	**	0.01 *	295	0.10	*	0.03	55	0.04		-0.02	106
Leverage	0.23	0.21	2100	0.25	**	0.21	295	0.28	*	0.26 *	55	0.24		0.20	106
Book-to-Market	0.60	0.44	2100	0.80	***	0.57 ***	295	0.82	*	0.51	55	0.77	**	0.58 ***	106
Anti-Self-Dealing Index	0.52	0.66	2100	0.55	***	0.66 ***	295	0.59	***	0.66 ***	55	0.51		0.66	106
GDP per capita	9.58	10.02	2100	9.96	***	10.10 ***	295	9.83	**	10.07	55	10.03	***	10.20 ***	106
Market Cap/GDP (%)	98.21	89.43	2100	102.31		103.24 ***	295	105.66		101.16 *	55	94.98		92.86	106

TABLE 1.2: Summary Descriptive Statistics *(Continued)*

Panel B – Descriptive Statistics 2007-2012

	Control			Treatment												
				All			Involuntary			Voluntary: Post-Rule						
	Mean	Median	N	Mean		Median		N	Mean		Median		N	Mean		Median		N
Total Assets	10, 200.00	945.84	2800	5,731.80	***	627.91	***	288	2,399.62	***	262.58	***	149	10,800.00		2,569.89	***	109
Market Capitalization	9,587.73	882.39	2800	3,704.61	***	630.49	***	288	1,795.03	***	211.58	***	149	6,517.27	***	1,906.10	**	109
Fixed Assets	0.36	0.31	2800	0.31	***	0.24	***	288	0.31	**	0.24	**	149	0.30	***	0.25	*	109
Turnover	0.62	0.57	2800	0.69	**	0.66	***	288	0.66		0.64		149	0.73	**	0.68	***	109
Q	1.93	1.44	2800	1.81		1.37		288	1.76	*	1.28	*	149	1.87		1.45		109
Sales Growth	0.09	0.09	2800	0.04	*	0.01	***	288	0.08		0.06	*	149	-0.04	***	-0.03	***	109
ROA	0.04	0.06	2800	-0.01	***	0.04	***	288	-0.02	***	0.03	***	149	0.02		0.06		109
ROE	0.04	0.08	2800	-0.02	*	0.06	**	288	-0.07	**	0.03	***	149	0.09		0.10		109
Financing Deficit	0.07	0.01	2800	0.08		0.03	*	288	0.10		0.04	*	149	0.05		0.02		109
Leverage	0.20	0.16	2800	0.24	***	0.23	***	288	0.21		0.15		149	0.27	***	0.28	***	109
Book-to-Market	0.76	0.53	2800	0.73		0.52		288	0.85		0.62		149	0.56	***	0.43	**	109
Anti-Self-Dealing Index	0.52	0.66	2800	0.53		0.66		288	0.57	***	0.66	***	149	0.48	***	0.38	***	109
GDP per capita	9.76	10.15	2800	10.02	***	10.42	***	288	9.93	**	10.42	*	149	10.10	***	10.37	***	109
Market Cap/GDP (%)	102.76	92.14	2800	124.80	***	107.66	***	288	123.83	**	107.31	***	149	130.00	***	107.66	***	109

Table 1.2 provides descriptive statistics for the control group of cross-listed firms and for the treatment group of firms, which includes all firms in our sample that have cross-delisted at some point in time between 2000 and 2012. The treatment group is described as "All" and segmented by involuntary and voluntary before ("Pre-Rule") and after ("Post-Rule") the passage of the Rule 12h-6. Panel A covers the 2000-2006 years before the passage of the Rule 12h-6, and Panel B covers the 2007-2012 years after the passage of the Rule 12h-6. Descriptive statistics are measured in the year before cross-delisting takes place. *Total assets* are in US$ million, reflecting 2000 prices. *Market capitalization* is in US$ million, reflecting 2000 prices, and is calculated as the year-end market price multiplied by the number of common shares outstanding. *Fixed Assets Ratio* is property, plant, and equipment scaled by total assets. *Turnover Ratio* is total sales scaled by total assets. *Q* is measured as the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *Sales Growth* is the percentage change in sales over a one-year period. *ROA* is earnings before interest and taxes scaled by total assets. *ROE* is net income after preferred dividends scaled by book value of equity. *Financing deficit* is the sum of dividends, net investments and net changes in working capital minus internal cash flows, scaled by lagged total assets (see Frank and Goyal, 2003). *Leverage* is the ratio of total debt to total assets. *Book-to-Market* is the book value of equity divided by the market value of equity. *Anti-Self-Dealing Index* measures shareholder's rights and ranges between 0 and 0.66 (see Djankov *et al.*, 2008). *GDP per capita* is the logarithm of GDP per capita. *Market Cap/GDP* is market capitalization divided by GDP, and expressed in percentage. All variables are defined in Appendix 1.A. Means, medians and the number of observations ("N") are reported for each variable. Differences in means are tested using *t*-statistic test (not reported) and differences in medians are tested using Wilcoxon rank sum test (not reported). ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

1.4 EMPIRICAL RESULTS

Some previous research studied the determinants of delisting (e.g., Chaplinsky and Ramchand (2012)), but little is known about the economic consequences of cross-delisting.

In this study, we contribute to the literature by providing evidence on the long-term performance of firms post-cross-delisting. First, we examine the post-operating performance of cross-delisted firms by comparing with a control group of matched cross-listed firms. Second, we analyze the long-run stock returns performance of cross-delisted firms relative to the same control group.

1.4.1 Post-Cross-Delisting Operating Performance

To measure operating performance, we use accounting-based variables commonly used in prior literature, as: i) *Sales Growth* to capture growth opportunities; ii) *Fixed Assets Ratio* (fixed assets to total assets) to measure changes in fixed investments; iii) *Turnover Ratio* (total sales to total assets) as a proxy for operating efficiency; iv) and *ROA* and *ROE* as measures of profitability. This analysis of performance is conducted to identify significant differences between the treatment group of cross-delisted firms and a control group of cross-listed firms over a period of three years following the cross-delisting year. Therefore, we estimate the average effect of the treatment (i.e., the cross-delisting event) on firms' operating performance in the post-delisting period. One problem that usually affects quasi-experimental studies is that individuals are not randomly assigned to treatment, meaning that firms with some type of characteristics may be more likely to cross-delist. If this is the case, our results may be affected by selection bias and endogeneity issues. To overcome this problem, we will use the propensity score matching (PSM) technique proposed by Rosenbaum and Rubin (1983). Therefore, each individual of the treatment group will be matched to an individual of the control group with identical pre-treatment characteristics. This means that each cross-delisted (treatment) firm will be matched with a cross-listed (control) firm with a similar propensity to cross-delist before treatment start (in the pre-treatment period).

Thus, we perform PSM selecting the nearest neighbour[26] with replacement[27]. The nearest neighbour algorithm with replacement allows that a control (cross-listed) firm can be used more than once as a match. This technique can often decrease bias because control firms that look similar to many treatment firms can be used multiple times (Caliendo and Kopeinig, 2008).

The first step of the PSM technique consists in estimating the probability of delisting using a probabilistic model. From this estimation we obtain, for each firm, the propensity scores that are used to match each treated firm with the closest non-treated firm. We estimate the propensity scores using the following probit model:

$$prob(Treat_i = 1) = \alpha_i + \varphi Z_{i,t-1} + \lambda_k + \eta_j + \gamma_t + \varepsilon_{it} \quad (1.1)$$

where $Treat_i$ is a binary variable that takes one if a firm is exposed to the treatment, i.e., a firm that cross-delists at some point over 2000-2012, and zero otherwise. $Z_{i,t-1}$ is a set of control variables (covariates) that affect the delisting decision. All covariates are lagged one period because we want to match treatment and control firms prior to the cross-delisting event. The set of covariates used to estimate the propensity scores are supposed to affect both the cross-delisting decision and the operating performance. Hence, we need to identify the drivers that impact the firm performance of both treatment and control groups. Based on the previous literature (Marosi and Massoud (2008), Doidge, Karolyi and Stulz (2010). Chaplinsky and Ramchand (2012)), we select the following set of covariates[28] $Z_{i,t-1}$: i) $SIZE_{i,t-1}$, the logarithm of total assets that controls for the impact of firm size on cross-listing decision; ii) $Q_{i,t-1}$, a proxy for growth opportunities, measured as the market value of equity plus the book value of assets minus the book value of equity scaled by the book value of total assets; iii)

[26] There are several algorithms to establish the matching process, which differ due to the different weighting regimes to evaluate the importance of each control for each treatment firm. In general, the choice for specific matching algorithms should be of minor importance and different algorithms should lead to similar results if the sample size is large enough (Smith and Todd, 2005).

[27] We apply matching technique with nearest neighbor and caliper, which corresponds to a propensity score range. Applying caliper matching means that a control firm will be matched with a treatment firm that lies within the range. The proper caliper was computed following Wang *et al.* (2013), and corresponds to 0.2 of propensity score standard deviation.

[28] These covariates ensure the quality of matching. The quality of matching is tested using the Likelihood-Ratio (LR) chi^2 test, which tests the goodness-of-fit of the probit model used in the propensity score estimation; if the propensity score is the most suitable one, the coefficients of such specification should be zero or close to zero. The *p*-value of Likelihood-ratio test (described in Table 1.3) is 0.526.

Financing Deficit$_{i,t-1}$, a proxy for needs of external financing, is the sum of dividends, net investments and net changes in working capital minus internal cash flows, scaled by lagged total assets (see Frank and Goyal, 2003); $Leverage_{i,t-1}$ is the ratio of total debt to total assets and is motivated by earlier evidence (e.g., Healy and Palepu (1990)) showing that highly levered firms are more prone to make decisions (such as cross-delisting) to preserve cash. We also include dummies to adjust the propensity score for country (λ_k), industry (η_j), and year (γ_t) effects. Table 1.3 reports the results.

TABLE 1.3: The Propensity Score Estimation

	Dependent Variable: $Treat_i$
	(1)
SIZE$_{i,t-1}$	-0.0839***
	(-20.16)
$Q_{i,t-1}$	-0.0569***
	(-11.21)
Financing Deficit$_{i,t-1}$	0.0086
	(0.32)
Leverage$_{i,t-1}$	0.3375***
	(8.79)
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Country Fixed Effects	Yes
Pseudo R-squared	0.2483
Observations	7,692
PROPENSITY SCORE	
LR chi^2 (*p* value)	(0.526)

Table 1.3 provides the marginal effects for the probit model set in equation (1.1). $Treat_i$ is a binary variable that takes one if a firm is exposed to the treatment, and zero otherwise. Covariates are lagged one period. *SIZE*$_{t-1}$ is the logarithm of total assets. Q_{t-1} is measured as the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *Financing Deficit* $_{t-1}$ is the sum of dividends, net investments and net changes in working capital minus internal cash flows, scaled by lagged total assets (see Frank and Goyal, 2003). *Leverage*$_{t-1}$ is the ratio of total debt to total assets. All variables are defined in Appendix 1.A. Robust *z*-statistic in parentheses. Model (1) includes year, country and industry fixed effects. The *p*-value of Likelihood-ratio (LR) test is also reported (in parentheses). ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

Table 1.3 reports marginal effects from the estimation of the probit model represented in equation (1.1). All coefficients are statistically significant at the one percent level, except *Financing Deficit*$_{i,t-1}$ that is insignificant. Results suggest that smaller firms are more likely to delist ($SIZE_{i,t-1}$), as firms with lower growth opportunities ($Q_{i,t-1}$), and higher debt ratios ($Leverage_{i,t-1}$).

In the second step, we match each firm from the treatment group (cross-delisted firms) with a firm from the control group (firms that remained cross-listed), from the same country, industry and year and with the closest propensity score. We then analyze the average treatment effects by computing the relative changes in operating performance from year *t-1* to *t*, *t+1*, *t+2* and *t+3*. We report differences in means and in medians of changes in operating performance for the group of cross-delisted firms and also for groups of involuntary and voluntary (before and after the passage of Rule 12h-6). Table 1.4 shows the results.

We observe in Table 1.4 insignificant differences between treatment and control firms, except for Δ*Sales Growth* and Δ*ROA*. Differences of Δ*Sales Growth* (which captures growth opportunities) are negative and significant in year *t+3* (relative to *t-1*), which suggests that cross-delisted firms decreased their growth opportunities post-cross-delisting compared to the control firms. Differences in means between treatment and control firms of changes in *ROA* show a significant increase from year one up three years after cross-delisting. These differences seem to be driven by voluntary group of firms that cross-delisted before the passage of the Rule 12h-6 in 2007 ("Pre-Rule"). In fact, regarding the results for that group, differences in means and medians of Δ*ROA* are significant over time. Moreover, differences are only significant one year after the cross-delisting takes place and not before, which could suggest that the cost of a U.S. listing exceeds the benefit for that group of cross-delisted firms. Hence, cross-delisting "release" those firms from costs that affect *ROA* negatively. However, this performance measure is based on accounting data, which are vulnerable to distortion by managers because accounting principles might be (somehow) subjective (e.g., when to recognize revenues or costs). Moreover, we provide evidence in Chapter 3 that managers are more prone to inflate earnings after a cross-delisting from a U.S. stock exchange because these firms are no longer under the surveillance of the SEC (and other U.S. Institutions).

TABLE 1.4: Differences in Operating Performance between Matched Groups of Treatment and Control

	All				Involuntary				Voluntary: Pre-Rule				Voluntary: Post-Rule			
	From *t-1* to:				From *t-1* to:				From *t-1* to:				From *t-1* to:			
	t	*t+1*	*t+2*	*t+3*	*t*	*t+1*	*t+2*	*t+3*	*t*	*t+1*	*t+2*	*t+3*	*t*	*t+1*	*t+2*	*t+3*
% Δ Sales Growth																
Mean (Treat-Control)	*-2.18*	*-6.71*	*-2.00*	***-11.64****	*-1.79*	*12.60*	*1.99*	*18.24*	*-0.48*	*-1.18*	*-2.98*	*-7.70*	*-6.97*	***-37.05****	*-6.31*	***-10.34****
t-test	(0.26)	(0.66)	(0.20)	(1.72)	(0.10)	(0.52)	(0.08)	(1.27)	(0.03)	(0.07)	(0.19)	(0.42)	(0.46)	(1.98)	(0.38)	(1.96)
Median (Treat-Control)	*-3.23*	*-0.41*	*-7.54*	***-13.74****	*-4.40*	*3.77*	*7.92*	*17.14*	*5.13*	*-13.43*	*1.07*	*-21.29*	*-8.14*	*-15.34*	*-9.13*	***-16.43****
z-test	(0.58)	(0.54)	(0.04)	(1.66)	(0.16)	(0.36)	(0.45)	(1.54)	(0.12)	(0.57)	(0.00)	(0.85)	(0.51)	(1.39)	(0.63)	(1.75)
% Δ Fixed Assets																
Mean (Treat-Control)	*-0.18*	*-0.21*	*-0.47*	*-0.59*	*-0.65*	***-2.48****	***-4.11*****	***-4.52****	*-0.23*	*0.13*	*-0.08*	*-0.09*	*0.37*	*0.65*	*0.94*	*0.78*
t-test	(0.55)	(0.44)	(0.77)	(0.77)	(0.67)	(2.12)	(2.79)	(2.42)	(0.45)	(0.17)	(0.10)	(0.09)	(0.82)	(1.10)	(1.28)	(0.87)
Median (Treat-Control)	*0.06*	*0.13*	*0.17*	*0.55*	*-0.03*	***-0.79*****	***-1.58****	***-1.85****	*-0.01*	*-0.04*	*0.04*	*-0.08*	*0.08*	*0.28*	*0.32*	*0.89*
z-test	(0.29)	(0.42)	(0.64)	(1.12)	(1.61)	(3.08)	(2.56)	(2.04)	(0.61)	(0.40)	(0.60)	(0.56)	(0.59)	(1.06)	(1.61)	(1.55)
% Δ Turnover Ratio																
Mean (Treat-Control)	*0.55*	*0.55*	*-0.32*	*-0.61*	*0.08*	*-0.52*	*-0.13*	*-0.03*	*1.89*	*3.21*	*3.13*	*2.27*	*0.51*	*-0.52*	***-4.54****	***-6.75*****
t-test	(0.66)	(0.50)	(0.25)	(0.43)	(0.03)	(0.14)	(0.03)	(0.01)	(1.53)	(1.62)	(1.49)	(0.84)	(0.42)	(0.32)	(2.41)	(2.88)
Median (Treat-Control)	*-0.88*	*-0.86*	*-0.46*	*-1.03*	*-0.23*	*-0.59*	*0.69*	*0.62*	*1.09*	*1.43*	*1.42*	*2.24*	*-1.02*	*-1.14*	***-3.02****	***-3.89*****
z-test	(0.57)	(0.25)	(0.35)	(0.31)	(0.97)	(0.59)	(0.45)	(0.34)	(1.53)	(1.63)	(1.45)	(1.08)	(1.11)	(1.08)	(2.29)	(2.62)
% Δ ROA																
Mean (Treat-Control)	*1.22*	***1.79****	***1.99****	***2.40****	*2.80*	*3.68*	*3.89*	*1.99*	*1.59*	***3.37****	***5.12*****	***7.38*****	*0.47*	*-0.19*	*0.48*	*-0.15*
t-test	(1.62)	(2.27)	(2.28)	(2.38)	(1.25)	(1.57)	(1.33)	(0.64)	(1.36)	(2.54)	(3.39)	(4.35)	(0.59)	(0.21)	(0.45)	(0.11)
Median (Treat-Control)	*0.09*	*0.51*	*0.37*	*0.27*	*0.20*	*1.16*	*1.86*	*0.92*	*0.37*	***1.00****	***2.38*****	***2.42*****	*-0.20*	*-0.26*	*-0.44*	*-1.00*
z-test	(0.82)	(1.15)	(1.40)	(1.27)	(0.45)	(1.48)	(1.42)	(0.51)	(1.39)	(2.36)	(3.71)	(4.23)	(0.37)	(1.05)	(0.46)	(1.49)
% Δ ROE																
Mean (Treat-Control)	*3.00*	*1.77*	*2.30*	*0.93*	*2.80*	*2.97*	*-4.70*	*-7.03*	*3.92*	*7.27*	*9.37*	***16.32****	*0.67*	*-5.26*	*-2.00*	***-12.89*****
t-test	(0.98)	(0.53)	(0.61)	(0.32)	(0.28)	(0.25)	(0.37)	(0.48)	(0.73)	(1.23)	(1.44)	(2.24)	(0.19)	(1.62)	(0.50)	(2.76)
Median (Treat-Control)	*-0.20*	*-0.22*	*0.21*	*0.00*	*-2.42*	*0.16*	*-0.37*	*-2.47*	*0.77*	*1.43*	***4.08****	***6.25****	*-0.31*	***-2.87*****	***-2.73****	***-5.44*****
z-test	(0.57)	(0.05)	(0.13)	(0.25)	(1.53)	(0.26)	(0.07)	(0.40)	(1.55)	(1.64)	(1.82)	(3.40)	(0.20)	(2.66)	(1.80)	(3.81)
# Treated	1191	934	728	554	175	124	93	69	292	249	236	223	381	307	222	148
# Control	1191	1073	1011	933	607	564	537	497	466	396	333	276	401	318	291	266

Table 1.4 provides the differences in means and medians, between cross-delisted firms and their matched control group, of changes in operating performance variables before and after the cross-delisting event. Matched samples are constructed using the PSM technique, where each treatment firm is matched to a control firm in the same country, industry and year and with the closest propensity score (nearest neighbor with replacement) estimated from equation (1.1). Percentage changes in operating performance are calculated cumulatively from year *t-1* to years *t*, *t+1*, *t+2* and *t+3*, respectively. This analysis is provided for the entire group of cross-delisted firms ("All") and for the following groups: involuntary and voluntary before ("Pre-Rule")

and after ("Post-Rule") the passage of the Rule 12h-6. For each group we compute the differences in means and medians between the treatment firms and their corresponding matched controls. *Sales Growth* is the percentage change in sales. *Fixed Assets Ratio* is property, plant, and equipment scaled by total assets. *Turnover Ratio* is total sales scaled by total assets. *ROA* is earnings before interest and taxes scaled by total assets. *ROE* is net income after preferred dividends scaled by book value of equity. Differences in means are tested using *t*- statistic test (*t*-statistics in parentheses) and differences in medians are tested using Wilcoxon rank sum test (*z*-statistics in parentheses). The number of observations ("#") is reported for both treatment and control groups. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

In contrast, the voluntary group of firms that cross-delisted after Rule 12h-6 ("Post-Rule") reveals significant negative differences relative to the matched group of control firms. From *t-1* to *t+3*, changes in *Sales Growth* display a significant negative difference in mean (median) of 10.34 percentage points (pp) (16.43pp), whereas Δ*Turnover Ratio* also shows a significant negative difference of 6.75pp (3.89pp) in mean (median). There are no significant differences of changes in *ROA*, but Δ*ROE* is about 12.89pp (5.44pp) lower in mean (median) for the treatment firms three years following cross-delisting. Overall, our results suggest that firms that cross-delisted after Rule 12h-6 have less growth opportunities, are less efficient, and profitability (measured by ΔROE) grows less than that of control firms; these effects persists up to three years following cross-delisting. Overall, we consider our last results consistent with the argument that firms cross-delist because they have less growth opportunities and this is persistent in the long run.

Concerning the performance of involuntary group, we only observe significant differences in Δ*Fixed Assets Ratio*, which means that involuntary cross-delisted firms invest less in fixed assets (in proportion of total assets) than its cross-listed peers.

1.4.2 Long-term Returns Performance

In addition to the previous analysis, we also investigate the long-run returns performance of cross-delisted firms. We analyze long-term performance using buy-and-hold abnormal returns (BHARs), following the approach of Barber and Lyon (1997). The authors argue that BHARs are closer to the actual investment experience because investors usually invest in assets and hold them for a certain period of time. We estimate abnormal buy-and-hold returns as the difference between the buy-and-hold return of a treatment firm and the buy-and-hold return of a matched control firm. Thus, the counterfactual is what an investor would have earned if he had invested the same amount of cash over the same period of time in the control firm. Furthermore, previous research document that long-run return performance is very sensitive to the benchmark used to estimate abnormal buy-and-hold returns (e.g., Barber and Lyon[29] (1997),

[29] Barber and Lyon (1997) identify three main sources of biases in calculating abnormal buy-and-hold returns: 1) "new listing bias", which arises since new listings tend to underperform benchmark indices, thus adding new firms to the index results in a positive bias to abnormal returns; 2) "rebalancing bias", which occurs because benchmark indices are periodically rebalanced whereas treatment

Kothari and Warner (1997), Lyon, Barber and Tsai (1999)), thus using a matching-firm approach instead of benchmark indices reduces significant bias.

Following the literature (e.g., Loughran and Vijh (1997)), we match each treatment firm with a firm from the control group (cross-listed firms) from the same country, year, and industry that has the closest market value of equity and the closest book-to-market. To obtain the best match and generate single pairs of matched firms, we use the PSM procedure without replacement and select the nearest neighbour. Buy-and-hold returns are compounded using monthly returns over a period of one year as follows:

$$BHAR_{i,T} = \prod_{t=1}^{T}\left[1 + R_{i,t}\right] - \prod_{t=1}^{T}\left[1 + \mathrm{E}\left(R_{Matched,t}\right)\right] \tag{1.2}$$

where $BHAR_{i,t}$ is buy-and-hold abnormal return for firm *i*. $\prod_{t=1}^{T}\left[1 + R_{i,t}\right]$ is the monthly compounded return of a one-year buy-and-hold investment in the stocks of treatment firm *i*. $\prod_{t=1}^{T}\left[1 + \mathrm{E}\left(R_{Matched,t}\right)\right]$ is the monthly compounded return of a one-year buy-and-hold investment in the stocks of the corresponding matched (control) firm. Table 1.5 reports the results.

Panel A of Table 1.5 reports the mean and the median of buy-and-hold returns for matched pairs of treatment and control firms. Differences in means and medians are statistically significant at the 10 percent level. On average, investors that hold the investment for one year in treatment firms earn 7 percentage points less what they would have earned if they had invested in the control firms.

firms are not, hence leading to a negative bias; 3) abnormal buy-and-hold returns are positively skewed and therefore the use of statistical *t*-test drives to incorrect inferences. Hence, these sources of bias can be reduced if matched firms are used instead of benchmark indexes.

TABLE 1.5: Pre- and Post-Cross-Delisting Return Performance

Panel A – Buy-and-hold returns for treatment and control firms

	Buy-and-hold return
MEAN	
Treatment	0.1236
Control	0.1943
Difference	***-0.0707****
t-test	1.72
MEDIAN	
Treatment	0.0017
Control	0.0435
Difference	***-0.0418****
z-test	1.80
# Matched Pairs	571

Panel B – Pre- and Post-Cross-Delisting Abnormal Returns

	Buy-and-hold abnormal return		
	Pre-Delisting	Post-Delisting	Difference (*Post-Pre*)
Mean	-0.0551	-0.1631	***-0.1080****
t-test			(1.79)
Median	-0.0512	-0.1052	*-0.0540*
z-test			(1.29)
No. Obs	389	182	

Table 1.5 reports mean and median statistics for buy-and-hold return and buy-and-hold abnormal returns. Matched samples are constructed using the PSM technique, where each treatment firm is matched to a control firm by year, country, industry, and with the closest propensity score (nearest neighbor without replacement) based on the logarithm of the market value of equity and the book-to-market ratio. Buy-and-hold returns are monthly returns compounded over a one-year period. Abnormal returns are monthly returns compounded over a one-year buy-and-hold investment in treatment firms less monthly returns compounded over a one-year buy-and-hold investment of the corresponding matching firms. Differences in means are tested using *t*-statistic test (*t*-statistic in parentheses) and differences in medians are tested using Wilcoxon rank sum test (*z*-statistic in parentheses). Panel A shows mean and median buy-and-hold returns for treatment and control firms. The number of matched pairs ("#") is also reported. Panel B reports the mean and median for abnormal buy-and-hold returns for the treatment group of firms, in the pre- and the post-cross-delisting period. The number of observations ("No. Obs") is also reported. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

Panel B of Table 1.5 provides the mean and the median of abnormal buy-and-hold returns for treatment firms in the pre- and in the post-cross-delisting period. We observe that the mean and median abnormal buy-and hold return are negative both in the pre- and in the post-cross-delisting period, being more negative in the post-delisting period. Moreover, the difference between pre- and post-cross-delisting is, on average, significant.

In addition to the univariate analysis, we also examine the pre- and the post-cross-delisting abnormal buy-and-hold return by estimating equation (1.3).

$$BHAR_{i,t} = \alpha_i + \beta_1 Delist_{i,t} + \lambda_k + \eta_j + \gamma_t + \varepsilon_{it} \quad (1.3)$$

where $BHAR_{i,t}$ is buy-and-hold abnormal return from equation (1.2). $Delist_{i,t}$ is an indicator variable equal to one if treatment firm i is delisted in year t, and zero otherwise. We also include dummies to control for country, λ_k, industry, η_j, and year, γ_t. Table 1.6 shows the results.

TABLE 1.6: Abnormal Return Performance

	Dependent Variable: Buy-and-hold abnormal return		
	(1)	(2)	(3)
Delist$_{i,t}$	-0.2048**	-0.2048*	-0.2477*
	(-1.98)	(-1.80)	(-1.83)
Constant	0.4777**	0.4777*	-0.0718**
	(2.35)	(1.67)	(-2.06)
Year Fixed Effects	Yes	Yes	No
Industry Fixed Effects	Yes	Yes	No
Country Fixed Effects	Yes	Yes	No
Observations	571	571	571
R-squared	0.104	0.104	0.021

Table 1.6 reports regression estimates of equation (1.3) using different specifications. The dependent variable is *buy-and-hold abnormal return* and is measured as monthly returns compounded over a one-year buy-and-hold investment in treatment firms less monthly returns compounded over a one-year buy-and-hold investment in matching firms. *Delist*$_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. In model (1) we cluster standard errors at firm- and year-level, and in model (2) standard errors are clustered at country- and year-level. In model (3) we estimate equation (1.3) using Fama and MacBeth's (1973) procedure. Regressions include year, industry, and country fixed effects. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

As we observe in Table 1.6, the coefficient β_1 is negative and statistically significant in all models. In model (1) we cluster standard errors at firm- and year-level, and in model (2) standard errors are clustered at country- and year-level. In model (3) we estimate equation (1.3) using the Fama and MacBeth's (1973) procedure. As an example, in model (1) the abnormal buy-and-hold return declines 20.48 percentage points relative to the pre-delisting period. This result suggests that cross-delisted firms underperform their matching pairs, especially in the post-delisting period.

1.5 MAIN CONCLUSIONS

In this chapter we examine the post-operating performance and the long-run stock returns performance of cross-delisted firms from U.S. stock markets. Using a sample of foreign firms listed and delisted on U.S. exchange markets over 2000-2012, we end up with 583 cross-delisted firms used as a treatment sample and 564 cross-listed firms used as a control sample; overall, our sample comprises 42 countries.

Our results provide evidence that cross-delisted firms have less growth opportunities than a matched group of cross-listed firms in the long run. Moreover, we document a significant decline in operating performance for the voluntary group of firms that delisted after the passage of Rule 12h-6 in 2007. Thus, that group of voluntary delistings (after Rule 12h-6) seems to have lower growth opportunities in the long run than a matched group of cross-listed firms, which is consistent with the evidence provided by Doidge, Karolyi and Stulz, (2010). Furthermore, cross-delisted firms after the Rule seem to be less efficient and less profitable than their cross-listed counterparts. However, results for the group of firms that cross-delisted before the passage of the Rule 12h-6 are different. Our findings suggest that the cost of a U.S. listing affect negatively those cross-delisted firms' profitability in the pre-cross-delisting period; one year after delisting, cross-delisted firms exhibit higher profitability growth rates than comparable cross-listed firms and this result persists until three years after delisting. This evidence supports the argument that if a U.S. listing is no longer valuable so the costs outweigh the benefits.

In addition, we also provide evidence of a negative abnormal buy-and-hold return, in the pre- and post-cross-delisting period, for the treatment group of cross-delisted firms. Results from multivariate analysis show that the abnormal buy-and-hold return declines 20.48 percentage points in the post-cross-delisting. This last evidence suggests that cross-delisted firms underperform their matched pairs, mainly in the post-delisting period.

APPENDIX 1.A – Definitions and Sources of the variables

VARIABLE	DEFINITION	SOURCE
Firm-level		
Book-to-Market	The book value of equity divided by the market value of equity.	Worldscope and Datastream
Buy-and-hold abnormal returns (BHARs)	Monthly compounded return of a one-year buy-and-hold investment in the stocks of treatment firms less monthly compounded return of a one-year buy-and-hold investment in the stocks of the corresponding matched firms.	Datastream
Delist	Indicator variable that takes one if a treatment firm delisted in a given year over 2000-2012, and zero otherwise.	SEC website, Datastream and Citibank
Financing Deficit	Numerator: the sum of cash dividends, net investments, and net changes in working capital, less internal cash flows (net income, depreciation and amortization expenses, and deferred taxes). Denominator: lagged total assets (see Frank and Goyal, 2003). Deferred taxes are set to zero when they are missing.	Worldscope
Fixed Assets Ratio	Property, Plant and Equipment (PPE) divided by total assets.	Worldscope
Leverage	Total debt (short-term plus long-term debt) divided by total assets.	Worldscope
Market Capitalization	Market price (year-end) multiplied by the number of common shares outstanding, denominated in US dollars and converted at fiscal year-end exchange rates.	Datastream
Market value of equity	Logarithm of the market value of equity.	Datastream
Return on Assets (ROA)	Earnings before interest and taxes (EBIT) divided by lagged total assets.	Worldscope
Return on Equity (ROE)	Net income after preferred dividends divided by book value of equity.	Worldscope
Sales Growth	Percentage change in sales over a given period.	Worldscope
SIZE	Logarithm of total assets.	Worldscope
(Tobin's) *Q*	Numerator: market value of equity plus book value of assets minus book value of equity. Denominator: book value of assets.	Worldscope
Total Assets	Total Assets in U.S. dollars, converted at fiscal year-end exchange rates.	Worldscope
Treat	Binary variable that takes one if a firm cross-delists at some point over 2000-2012, i.e., if a firm is included in the treatment group, and zero otherwise.	SEC website, Datastream and Citibank
Turnover Ratio	Total sales divided by total assets.	Worldscope
Industry-Level		
INDUSTRY	Classification scheme proposed by Fama and French (1997), based on 48 Industry Portfolios.	Fama and French (1997)

VARIABLE	DEFINITION	SOURCE
SIC CODE	Four-digit Standard Industrial Classification (SIC) Code.	Datastream
Country-Level		
Anti-Self–Dealing Index	Index that measures shareholder's rights. The index ranges between 0 and 0.66.	Djankov *et al.* (2008)
GDP per Capita (GDP/PC)	Logarithm of GDP per capita.	Worldbank
Market Capitalization to GDP (%)	Market capitalization divided by Gross domestic product (GDP), expressed in percentage.	Worldbank

APPENDIX 1.B – Reasons for cross-delisting and deregistration

CATEGORY	REASON
INVOLUNTARY	
Bankruptcy	Firms that declared bankruptcy.
Revoked by SEC	Registration was revoked by SEC for not fill the imposed requirements.
Removed by NYSE	Listing removed by NYSE for not meet the imposed requirements.
Removed by NASDAQ	Listing removed by NASDAQ for not meet the imposed requirements.
Mergers & Acquisitions	
M&A	Firms delisted following a merger or acquisition process.
VOLUNTARY	
Pre-Rule 12h-6	Firms delisted and then deregistered before the passage of the Rule 12h-6 (deregistration under the Rule 12g-4).
Post-Rule 12h-6	Firms delisted and then deregistered under the Rule 12h-6 (became effective on March 21, 2007).
Changed its headquarters to U.S.	Firms that moved their headquarters to U.S. and are no longer considered as foreign.
Going private	Firms that went private.
Moved to OTCBB	Firms that delisted from U.S. exchange markets and moved to OTCBB.
Moved to OTC	Firms that delisted from U.S. exchange markets and moved to another OTC.

APPENDIX 1.C – Groups of Cross-delisted firms

GROUP	REASON
INVOLUNTARY	
Involuntary	Firms that declared bankruptcy or whose listings were removed by U.S. markets - NYSE or NASDAQ - for not meet the imposed requirements.
Mergers & Acquisitions	
M&A	Firms delisted following a merger or acquisition process.
VOLUNTARY	
Pre-Rule 12h-6	Firms delisted before the passage of the Rule 12h-6 (deregistration under the Rule 12g-4).
Post-Rule 12h-6	Firms delisted under the Rule 12h-6 (became effective on March 21, 2007).
Other reasons	Firms that moved their headquarters to U.S., went private or moved to OTCBB or to another OTC.

CHAPTER 2 - CROSS-DELISTING, FINANCIAL CONTRAINTS AND INVESTMENT SENSITIVITIES

2.1 INTRODUCTION

A considerable number of studies document that cross-listing in the United States (U.S.) generates several potential benefits. For instance, by cross-listing in a U.S. stock exchange, foreign companies have to comply with more stringent disclosure standards and better legal protection of minority investors (Coffee, 1999, 2002; Stulz, 1999). Among other things, these rules can reduce opportunities for insider trading (Coffee, 2007), improve firms' access to external finance (e.g., Reese and Weisbach (2002)), relax financial constraints (e.g., Lins, Strickland and Zenner (2005)), and reduce the cost of capital (e.g., Errunza and Miller (2000), Reese and Weisbach (2002), Hail and Leuz (2009)). The required compliance with the SEC rules represents an obvious cost for firms that cross-list in the U.S. This cost has increased after the adoption of Sarbanes-Oxley Act (SOX) in 2002, making it more difficult for some foreign firms to maintain a U.S. listing. Therefore, on March 21, 2007, the Securities Exchange Commission (SEC) adopted the Rule 12h-6[30], which made it easier for a foreign firm to leave a U.S. exchange market. After the passage of Rule 12h-6, more foreign firms delisted from a U.S. stock exchange than in the post-SOX period in 2002. This regime shift motivated some recent studies to explore the determinants and the economic effects of cross-delisting (e.g., Marosi and Massoud (2008), Doidge, Karolyi and Stulz (2010), Fernandes, Lel and Miller (2010), Chaplinsky and Ramchand (2012)). However, the literature has not yet addressed the effects of delisting on firms' real investment decisions.

In this chapter, our purpose is to fill this gap in the literature by analyzing the real economic consequences of cross-delisting from a U.S. exchange and by investigating the post-cross-delisting financial constraints and investment sensitivities. Our study contributes to this literature in two ways. First, we document an adverse effect on the financial constraints of firms that cross-delist. For instance, after cross-delisting, firms exhibit a higher degree of financial constraints compared to the control group of firms that remained cross-listed. We show empirically that the investment-to-cash flow

[30] Section 1.2 of Chapter 1 provides a detailed description of Rule 12h-6 of March 21, 2007.

sensitivity of cross-delisted firms is significantly higher than that of the control group of cross-listed firms. Furthermore, we examine the sensitivity of cash-to-cash flow and find evidence that cross-delisted firms, on average, save more cash out of cash flows than cross-listed firms. Second, we investigate a possible reason to explain the increase in the financial constraints post-cross-delisting – the deterioration of the information environment with the consequent rise in information asymmetry. We do so by testing how the investment sensitivity to stock prices is affected by negative informational shocks before and after the cross-delisting. We borrow the arguments of the "learning" hypothesis (e.g., Bond, Edmans and Goldstein (2012), Foucault and Frésard (2012)) and postulate that when stock prices are more informative, managers are able to make better investment decisions and, therefore, we should observe a positive sensitivity of investment to stock prices. When firms are hit by a negative informational shock, stock prices become less informative, which translate into a lower investment-to-price sensitivity. To perform this test, we use two measures that should capture the change in the informational content of stock prices: changes in bid-ask spread, and changes in the research and development (R&D) expenses. We find that a negative shock to the informational content of stock prices has a stronger impact on the investment-to-price sensitivity in the post-cross-delisting period. In other words, adverse changes in the information environment make stock prices less informative to managers, especially in the post-cross-delisting period.

We test our hypotheses using a treatment group of firms that delist at some point during our sample period – 2000 to 2012 – and two separate control groups of firms: i) a primary control group of foreign firms that remained listed in a U.S. exchange across our sample period; ii) an alternate control group of never-cross-listed firms, i.e., firms that have never been listed in any market other than the domestic market. Using the control group of never-cross-listed firms should allow us to better control for confounding effects around cross-delisting. Those confounding effects may arise from economic and financial events that are unrelated to cross-delisting, such as potential consequences of the financial crisis of 2007-2008. Thereby, our final sample consists of 583 treatment firms, 564 control firms that remained cross-listed throughout the sample period, and 10,397 control firms that have never been cross-listed over the sample period; overall, our sample includes 42 countries.

To test our main hypotheses, we first employ the Lemmon and Zender's (2010) modification test of Shyam-Sunder and Myers (1999) to show that financial constraints are different from debt capacity. Next, we employ a difference-in-differences methodology and use propensity score matching (PSM) to reduce the selection bias that might affect the baseline results. Our main results show that firms become more financially constrained after cross-delisting and that investment-to-price sensitivity reacts more negatively in the post-cross-delisting period to adverse informational shocks; our findings are robust to the use of alternative measures of investment, different estimation techniques, and alternate measures of financial constraints and information asymmetry proxies. Consistent with the "bonding" hypothesis, we also show that firms from countries with poor information disclosure requirements and weaker investor protection regimes are more penalized in their financial constraints after cross-delisting.

The remaining of this chapter is organized as follows. Section 2.2 provides a review of the related literature and outlines our research hypotheses. Section 2.3 describes the data and the methodology. Section 2.4 presents the empirical results. Section 2.5 summarizes our main conclusions.

2.2 LITERATURE REVIEW AND RESEARCH HYPOTHESES

The "bonding" hypothesis of Stulz (1999) and Coffee (1999, 2002) posits that foreign firms that cross-list in the U.S. commit themselves to higher levels of financial disclosure and transparency to meet the more stringent SEC requirements and, therefore, improve their standards of corporate governance, which helps reduce their cost of capital. The benefits from cross-listing in the U.S. (in particular on a stock exchange) are expected to be greater for firms that face more financial constraints in their home markets. Financial constraints occur when capital markets frictions impose a wedge between the costs of internal and external financing sources. Previous studies of La Porta *et al.* (1997, 1998), La Porta, Lopez-De-Silanes and Shleifer (2008), and Djankov *et al.* (2008) argue that firms are less financially constrained in economies with more developed capital markets, suggesting that those firms have more ability to take advantage of their growth opportunities. However, as noted by Karolyi (2012), very few studies examine the corporate investment activity of U.S. cross-listed firms. Lins,

Strickland and Zenner (2005) are one of the first (and one of the few) to provide evidence that firms from emerging markets improve access to external financing following a U.S. listing, thereby relaxing financing constraints. The authors document that those firms make almost no mention to capital constraints three years after their U.S. listing[31]. Their argument is that improvements (relative to a firm's home market) in shareholder protection and liquidity help reduce the effects of information asymmetry, which in turn relaxes financial constraints. To test their predictions, they use a sample of foreign listings on U.S. exchange markets, over the period 1986-1996, and employed the Fazzari, Hubbard and Petersen (1988) methodology by testing the investment sensitivity to cash flow. The intuition behind this methodology is that the sensitivity of investment to the firm's cash flow is positively related to the degree of financial constraints. When that sensitivity is higher, firms tend to pay less dividends, thus the payout ratio can be used as a proxy for the firm's level of financial constraints, as it indicates whether the firm has or not enough internal funds.

The recent increase in the number of cross-delistings from U.S. exchange markets motivates additional empirical research on the effects of such delistings. Despite the fact that compliance with SOX (of 2002) provisions have increased the cost of cross-listing, it was mainly after the passage of Rule 12h-6 of 2007 that the number of foreign firms leaving U.S. markets has spiked. The previous literature on cross-delistings is consistent with the "bonding" hypothesis by showing that when foreign firms cross-delist from a U.S. exchange they observe the contrary effect to when they cross-listed. On average, firms observe a reduction in their market value post-cross-delisting and market generally reacts negatively to deregistration[32] announcements (Marosi and Massoud, 2008; Doidge, Karolyi and Stulz, 2010; Fernandes, Lel and Miller, 2010; Hostak *et al.,* 2013). As for the reasons to cross-delist from a U.S. exchange market, we can identify in prior research two main sets of explanations (Marosi and Massoud, 2008; Doidge, Karolyi and Stulz, 2010; Fernandes, Lel and Miller, 2010). The first relates to two important changes in the regulatory environment of the U.S. markets: (i) the more demanding regulatory requirements imposed by the SOX in 2002, and (ii) the passage of Rule 12h-6 of 2007, which made the deregistration process easier. Previous studies

[31] Lins, Strickland and Zenner (2005) obtain this information from the notes in the annual form 20F that firms are required to file with the SEC.

[32] Delisting and deregistration processes are explained in detail in Chapter 1, although it is worth to note that deregistration process always implies delisting from U.S. exchange markets and delisting is usually a previous step of deregistration.

have found a significant negative stock price reaction to deregistration announcements before the adoption of Rule 12h-6 (e.g., Marosi and Massoud (2008)), although statistically insignificant after the Rule (Doidge, Karolyi and Stulz, 2010; Fernandes, Lel and Miller, 2010). Nevertheless, Fernandes, Lel and Miller (2010) show that the stock price reaction is significant and negative for countries with poor quality of the information environment, as well for firms from countries with weak investor protection regimes (e.g., countries with French Civil Law legal origin and with low levels of judicial efficiency). They interpret their results as being consistent with the "bonding" hypothesis; firms that deregister no longer benefit from being under the surveillance of the U.S. markets regulators.

The second set of reasons for cross-delisting and deregistration is related to the determinants and economic consequences at the firm-level. Foreign firms face a trade-off between the costs and benefits of remaining listed on a U.S. exchange; for some types of firms, however, the cost may outweigh the benefits. Doidge, Karolyi and Stulz (2010) find that firms that deregister have poor growth opportunities and little need for external finance. They also find that foreign firms with more agency problems have worse stock-price reactions to the adoption of the Rule 12h-6 due to investors recognizing an increase in the costs of information asymmetry.

Nevertheless, prior research has not yet documented the real economic consequences of cross-delisting, in particular the impact on corporate investment. Given this gap in the literature and taking all the above evidence together, we develop our research hypotheses about the effects of cross-delisting on firms' financial constraints and investment sensitivities. We borrow from the previous literature (e.g., Fazzari, Hubbard and Petersen (1988), Lins, Strickland and Zenner (2005)) the idea that a financially constrained firm is one that displays a significant investment sensitivity to cash flow. Consistent with previous evidence (e.g., Lins, Strickland and Zenner (2005)), cross-listing in the U.S. should allow foreign firms to relax the financial constraints they face in their home markets. If this is the case, it follows that a cross-delisting should have the reverse effect. Even when the firm's need for external financing is low, delisting from a U.S. exchange might lead to a higher cost of capital, given that the quality of the firm's information environment deteriorates as it is no longer under the stringent disclosure requirements imposed by the SEC. Hereupon, we develop our first testable hypothesis:

Hypothesis 1: The investment-to-cash flow sensitivity should increase following a cross-delisting from a U.S. exchange market.

Almeida, Campello and Weisbach (2004) present an alternative model to test the level of financial constraints. Basically, instead of investment, they test the cash-to-cash flow sensitivity, where "cash" is given by the ratio of cash and marketable securities to total assets. The rationale to study the cash-to-cash flow sensitivity is that more constrained firms should display a systematic propensity to save cash out of cash flows. Therefore, it is not likely that the information content of cash flows over cash holdings could be attributed to its ability to predict future investment opportunities. Almeida, Campello and Weisbach (2004) argue that cash-to-cash flow sensitivity is positively correlated with proxies for financial constraints and that this relation is systematically stronger and less ambiguous than what we can observe using instead the investment-to-cash flo sensitivity. This argument leads us to our second hypothesis:

Hypothesis 2: The cash-to-cash flow sensitivity should increase following a cross-delisting from a U.S. exchange market.

According to the "bonding" hypothesis, foreign firms that cross-list in the U.S., in particular on exchange markets, benefit from an improvement in their information environment (Coffee, 1999, 2002; Stulz, 1999). This improvement allows not only firms to become more transparent to outside investors, but also stock prices become more informative to insiders, as traders from both markets (domestic and foreign) can impart information about the firms' growth prospects. Foucault and Frésard (2012) use this argument to show that managers can learn from more informative stock prices and use that "learning" to make better investment decisions. Empirically, this would result in a higher sensitivity of investment to stock prices (Durnev, Morck and Yeung, 2004; Chen, Goldstein and Jiang, 2007) after the cross-listing (Foucault and Frésard, 2012). Indeed, the fact that firms can attract more foreign investors, especially from countries that are relevant for the firm's growth opportunities (as shown in Loureiro and Taboada (2015)), can improve the information quality of stock prices as outsiders impound new information into prices that was not known to managers. In the particular context of cross-listings, Foucault and Frésard (2012) show that foreign firms that cross-list in a

U.S. exchange observe an increase in their investment-to-price sensitivity. We posit that a reverse effect should occur when foreign firms delist from a U.S. stock exchange, in particular for those that observe a deterioration in their information environment. As noted by Foucault and Frésard (2012), some foreign firms may delist from U.S. markets just because the gain in terms of stock price informativeness has decreased and is no longer relevant. In those cases, we should not observe any effect on the investment-to-price sensitivity post-cross-delisting. However, many firms may cross-delist for other unrelated reasons and lose the "bonding" benefits of being cross-listed, thus deteriorating their information environment. Those firms would face more informational frictions after cross-delistings, increase the levels of information asymmetry, and reduce the quality of stock price informativeness for managers. Therefore, for firms that suffer a negative informational shock we would expect a decrease in the sensitivity of investment to stock prices. Based on these ideas we formulate our last hypothesis:

Hypothesis 3: The adverse effect of cross-delisting on investment-to-price sensitivity should be positively correlated to the increase in firm's information asymmetry post-cross-delisting.

2.3 DATA AND METHODOLOGY

2.3.1 Data

Starting from the universe of foreign firms cross-listed on the major U.S. stock exchanges, we identified all cross-delistings that occurred between 2000 and 2012. We use firms listed on major stock exchanges to ensure better data availability and more uniform listing requirements. We obtain a list of all foreign firms with equity shares registered and reporting with the SEC from the SEC's website. Next, we search on EDGAR's archive for all Form 15's filed between 2000 and 2012. With this information, we track firms that delisted during our sample period. Most firms traded in the U.S. issue American Depositary Receipts (ADRs), which are managed by a U.S. depositary bank such as the Bank of New York or Citibank. Thereby, we complement the data obtained from SEC's sources with these obtained from the websites of NYSE,

NASDAQ, OTCBB and OTC Portal. Information from all different sources is manually cross-checked. Firms that move from one major exchange to another are not treated as delisted, whereas firms that delist from an exchange market and move to an OTC market or "Pink Sheets" are treated as delisted.

For each firm, we collect the market value of equity, total assets, capital expenditures, sales, cash flows, and additional variables used in the empirical tests for the sample period[33]. We exclude financial firms (SIC codes between 6000 and 6999) and utilities (SIC codes between 4900 and 4949) because their accounting figures are ruled by special statutory requirements. To reduce the effect of outliers, all the variables are winsorized at the 1% in each tail of the distribution. All variables in U.S. dollars are Consumer Price Index (CPI) adjusted considering 2000 prices.

We further eliminate observations with negative or missing information on sales, market value, capital expenditures, book value of equity, and debt. Following prior literature (e.g., Loureiro and Taboada (2015)), we exclude firms with total assets lower than $10 million to make firms more comparable across countries. We exclude firms that only listed in 2012 because we required at least two years of observations.

We collect financial data from the Worldscope database. Bond rating information is from the Securities Data Corporation (SDC) database. Industry- and country-level variables are collected from a variety of other sources. All variables are described in detail in Appendix 2.A.

This data screening procedure results in a final longitudinal panel of 583 treatment firms, a primary control group of 564 firms that remained cross-listed over the sample period, and an alternate control group of 10,397 firms that have never been cross-listed over our sample period 2000-2012, nor in the three years prior to the beginning of the period. Our final sample includes firms from 42 countries.

2.3.2 Sample Description

Table 2.1 describes our sample by country, including the number of observations and the number of firms that have been cross-listed on U.S. exchange markets from

[33] To be able to use three years of lagged variables and guarantee a full coverage over our sample period 2000-2012, we collect accounting data items from 1997 onwards.

2000 to 2012. Additionally, we provide the same information for the treatment group, and the two control groups of cross-listed and never-cross-listed firms.

Overall, the main sample comprises 1,147 foreign firms, 583 treatment (cross-delisted) firms and 564 control (cross-listed) firms. Aiming to address confounding effects around delisting event, we also use an alternate control sample of 10,397 purely domestic listed firms (the "never-cross-listed" control group). Hence, the treatment group has 4,187 firm-year observations[34], the primary control group of cross-listed firms counts for 4,891 firm-year observations, and the alternate control group of never-cross-listed firms counts for 87,965 observations.

Overall, most of the cross-delisted firms are from Common Law countries (61.8%), followed by French Law countries (21.4%) in the middle, and German-Scandinavian[35] Law countries (16.8%) in the bottom.

[34] Although using the same sample than in Chapter 1, we lose some observations in the study presented in this Chapter because we eliminate observations with missing information on capital expenditures.

[35] We follow La Porta, Lopez-De-Silanes and Shleifer (2008) and assign firms according to the legal origin of domestic markets. This partition is also described in section 1.3.1 of Chapter 1.

TABLE 2.1: Sample Description by Country

	Full Sample (Exchange)		Treatment			Control			
						Cross-listed		Never-cross-listed	
	No. Firms	Obs.	No. Firms	Obs. **Pre**	Obs. **Post**	No. Firms	Obs.	No. Firms	Obs.
Argentina*	7	71	2	11	1	5	60	27	249
Australia	26	138	19	81	40	7	57	83	581
Austria	1	6	1	6	6	0	0	47	538
Belgium	4	26	2	12	1	2	14	44	489
Brazil*	30	295	13	93	16	17	202	42	506
Canada	353	2,188	194	869	200	159	1,319	178	1,571
Chile*	14	129	9	54	31	5	75	80	836
China*	131	592	23	77	2	108	515	1,724	11,727
Colombia*	1	5	0	0	0	1	5	22	189
Denmark	4	39	2	14	8	2	25	59	732
Finland	7	40	6	27	19	1	13	72	902
France	32	236	23	131	83	9	105	340	3,592
Germany	25	147	20	88	86	5	59	201	1,573
Greece	30	167	6	25	3	24	142	137	1,052
Hong Kong	38	253	20	102	33	18	151	684	5,710
Hungary	1	12	1	12	3	0	0	18	167
India*	13	112	4	26	13	9	86	989	6,563
Indonesia*	2	30	0	0	0	2	30	277	2,571
Ireland	17	128	9	39	16	8	89	10	53
Israel	91	704	38	191	71	53	513	84	606
Italy	11	109	6	42	22	5	67	95	923
Japan	24	272	9	71	30	15	201	1,021	11,193
Korea*	12	88	7	28	12	5	60	1,161	9,819
Luxembourg	13	86	8	56	29	5	30	8	53
Mexico*	33	302	16	101	73	17	201	51	555
Netherlands	37	246	26	142	68	11	104	68	661
New Zealand	4	24	3	11	24	1	13	44	364
Norway	15	111	7	47	22	8	64	91	694
Peru*	2	22	1	9	6	1	13	68	635
Philippines*	2	20	1	7	0	1	13	67	632
Poland*	1	2	1	2	11	0	0	192	1,284
Portugal	1	13	0	0	0	1	13	41	444
Russia*	7	58	4	37	12	3	21	163	689
Singapore	6	54	4	30	13	2	24	463	3,924
South Africa*	9	92	3	16	18	6	76	135	1,219
Spain	7	46	4	28	2	3	18	57	649
Sweden	14	74	13	61	63	1	13	171	1,467
Switzerland	12	106	7	42	21	5	64	63	683
Taiwan	11	104	1	9	3	10	95	567	5,271
Turkey*	1	13	0	0	0	1	13	217	1,949
United Kingdom	94	666	66	338	148	28	328	522	4,529
Venezuela*	4	20	4	20	23	0	0	14	121
All Countries	**1,147**	**7,846**	**583**	**2,955**	**1,232**	**564**	**4,891**	**10,397**	**87,965**

Table 2.1 describes the number of firms ("No. Firms") and the total number observations ("Obs.") for the full sample of cross-listings, and for cross-delisted and control firms by country of origin. We exclude financial firms (SIC Code 6000-6999) and strictly regulated firms (SIC Code 4900-4949). *Exchange* consists of all firms that have been listed on U.S. exchange markets over 2000-2012. *Treatment* is the subsample of firms in our sample that have cross-delisted at some point in time between 2000 and 2012. "Pre" and "Post" are the corresponding number of observations for the treatment firms before and after the cross-delisting event. *Control* includes two control groups: 1) control group of firms that remained listed over the sample period; 2) control group of never-cross-listed firms. *Denotes a country designated as an emerging market by Standard and Poor's Emerging Market Database.

Table 2.2, Panel A, provides descriptive statistics for the main firm-level variables by treatment group, control group of cross-listed firms, and control group of never-cross-listed firms. Panel B of Table 2.2 reports univariate tests of the difference in means and medians, between treatment and control groups, for all the main variables.

In Panel A of Table 2.2 we observe that the treatment group displays, on average, lower total assets, lower *Q* and *Sales Growth* (i.e., lower growth opportunities), and lower corporate profitability (*ROA*) than the control group of cross-listed firms. The average investment ratio is also lower for treatment firms, however this difference is statistically significant but not economically large. Treatment firms are more levered, and display higher probability of financial distress (measured by *O-Score*) when comparing with cross-listed firms. Panel B of Table 2.2 shows that the differences in means and medians between treatment and control group of cross-listed firms are statistically significant at the 1 percent level, except for *Financing Deficit* that is insignificant.

Regarding the comparison between treatment firms and never-cross-listed firms, on average, treatment firms are larger, have higher *Q*, and higher leverage, but are less profitable than never-cross-listed firms. Moreover, the differences between treatment and control group of never-cross-listed firms are statistically significant at the 1 percent level.

TABLE 2.2: Summary Descriptive Statistics

Panel A: Descriptive Statistics

									CONTROL							
Sample:	Full Sample				Treatment				Cross-listed				Never-cross-listed			
	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD	N
Total Assets	8,101.29	989.55	20,600.00	9,078	5,209.68	812.71	12,200.00	4,187	10,575.10	1,260.78	25,400.00	4,891	590.88	135.72	1,533.19	87,965
Investment	0.30	0.20	0.37	9,078	0.29	0.18	0.39	4,187	0.32	0.21	0.36	4,891	0.34	0.15	0.72	87,965
Cash Flow	0.06	0.08	0.17	9,078	0.04	0.07	0.18	4,187	0.08	0.10	0.16	4,891	0.07	0.07	0.11	87,965
Cash Holdings	0.22	0.13	0.25	9,078	0.21	0.12	0.25	4,187	0.23	0.15	0.25	4,891	0.16	0.11	0.17	87,965
Q	1.94	1.42	1.62	9,078	1.82	1.35	1.50	4,187	2.05	1.49	1.75	4,891	1.50	1.15	1.06	87,965
Sales Growth	0.08	0.07	0.47	9,078	0.05	0.05	0.45	4,187	0.10	0.09	0.48	4,891	0.07	0.07	0.32	87,965
ROA	0.04	0.06	0.17	9,078	0.02	0.05	0.18	4,187	0.06	0.07	0.16	4,891	0.07	0.06	0.12	87,965
O-Score	0.08	0.02	0.16	9,025	0.10	0.03	0.19	4,159	0.06	0.01	0.13	4,866	0.12	0.05	0.19	87,525
Financing Deficit	0.07	0.02	0.26	9,078	0.07	0.02	026	4,187	0.08	0.02	0.26	4,891	0.04	0.00	0.22	87,965
Leverage	0.23	0.21	0.20	9,078	0.25	0.24	0.21	4,187	0.21	0.18	0.19	4,891	0.23	0.21	0.19	87,965

TABLE 2.2: Summary Descriptive Statistics *(Continued)*

Panel B - Univariate Comparisons between Treatment and Control Groups

Control Sample:	**Cross-listed firms**		**Never-cross-listed firms**	
	Differences in Means	*Differences in Medians*	*Differences in Means*	*Differences in Medians*
Total Assets	-5,365.42 ***	448.06 ***	4,618.79 ***	676.99 ***
	(13.14)	(8.14)	(24.59)	(48.55)
Investment	-0.028 ***	-0.034 ***	-0.053 ***	0.028 ***
	(3.50)	(8.26)	(8.21)	(10.08)
Cash Flow	-0.043 ***	-0.025 ***	-0.036 ***	0.001 ***
	(11.97)	(12.26)	(12.94)	(5.56)
Cash Holdings	-0.026 ***	-0.030 ***	0.044 ***	0.005 ***
	(4.99)	(7.67)	(11.41)	(5.33)
Q	-0.242 ***	-0.140 ***	0.309 ***	0.194 ***
	(7.23)	(8.50)	(13.66)	(20.04)
Sales Growth	-0.056 ***	-0.038 ***	-0.025 ***	-0.022 ***
	(5.74)	(8.44)	(3.59)	(6.33)
ROA	-0.043 ***	-0.026 ***	-0.052 ***	-0.016 ***
	(11.95)	(12.40)	(18.39)	(15.99)
O-Score	0.043 ***	0.014 ***	-0.025 ***	-0.023 ***
	(12.34)	(17.12)	(8.22)	(20.95)
Financing Deficit	-0.008	-0.001	0.030 ***	0.015 ***
	(0.55)	(0.75)	(7.31)	(7.68)
Leverage	0.042 ***	0.064 ***	0.019 ***	0.031 ***
	(9.88)	(9.62)	(5.59)	(3.06)

Table 2.2 provides descriptive statistics for the full sample of treatment and control groups of cross-listed and never-cross-listed firms, between 2000 and 2012. *Total Assets* are in US$ million, reflecting 2000 prices. *Investment* is capital expenditures scaled by lagged PPE. *Cash Flow* is net income plus depreciation and amortization expenses scaled by lagged total assets. *Cash Holdings* is the ratio of cash and marketable securities scaled by lagged total assets. *Q* is measured as the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *Sales Growth* is the percentage change in sales over a one-year period. *ROA* is measured as earnings before interest and taxes scaled by total assets. *O-Score* is a measure of predictive financial distress proposed by Ohlson (1980). *Financing deficit* corresponds to the sum of dividends, net investments and net changes in working capital minus internal cash flows, scaled by lagged total assets (see Frank and Goyal, 2003). *Leverage* is the ratio of total debt to total assets. All variables are defined in Appendix 2.A. Panel A shows the mean, median, standard deviation ("SD") and the number of observations ("N") for all our main variables. Panel B reports the differences in means and medians between cross-delisted firms and control groups of cross-listed and never-cross-listed firms. Differences in means are tested using *t*-statistic test (*t*-statistics in parentheses) and differences in medians are tested using Wilcoxon rank sum test (*z*-statistics in parentheses). ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

2.3.3 Measuring the Investment-to-Cash Flow Sensitivity

To test hypothesis 1 – that investment-to-cash flow sensitivity is expected to increase post-cross-delisting – we follow the previous literature (e.g., Fazzari, Hubbard and Petersen (1988), Lins, Strickland and Zenner (2005)) and employ a difference-in-differences methodology. Our baseline specification is the following equation:

$$I_{i,t} = \alpha_i + \beta_1 CF_{i,t} + \beta_2 Treat_i + \beta_3 Delist_{i,t} + \beta_4 CF_{i,t} \times Treat_i \times Delist_{i,t} + \\ + \beta_5 CF_{i,t} \times Treat_i + \beta_6 CF_{i,t} \times Delist_{i,t} + \beta_7 Delist_{i,t} \times Treat_i + \gamma_1 Q_{i,t-1} + \\ \gamma_2 SIZE_{i,t-1} + \lambda_k + \eta_j + \gamma_t + \varepsilon_{i,t} \quad (2.1)$$

where the dependent variable $I_{i,t}$ is a measure of corporate investment for firm *i* in year *t.* In most of regressions, $I_{i,t}$ is measured as the ratio of capital expenditures scaled by lagged property, plant and equipment (PPE). $CF_{i,t}$ is the net income plus depreciation and amortization expenses scaled by lagged total assets. $Treat_i$ is an indicator variable equal to one if firm *i* is included in our treatment group, and zero otherwise. $Delist_{i,t}$ is an indicator variable equal to one if treatment firm *i* is delisted in year *t*, and zero otherwise. $Q_{i,t-1}$ controls for growth opportunities and corresponds to normalized stock price, measured as the market value of equity plus the book value of assets minus the book value of equity scaled by the book value of total assets. The variable $SIZE_{i,t-1}$, the logarithm of total assets, is included to control for the impact of firm size on corporate investment decisions. In our main regressions we also include dummies to control for country, λ_k, industry, η_j, and year, γ_t. Because of fixed effects framework, some of the coefficients in Equation (2.1) drop out due to collinearity.

Regarding our baseline specification (1), the main coefficient of interest is β_4 ($CF_{i,t} \times Treat_i \times Delist_{i,t}$), which captures the change in investment-to-cash flow sensitivity following the cross-delisting event for our treatment group, relative to the control groups. Per hypothesis 1, we predict a positive coefficient β_4, which means an increase in investment-to-price sensitivity after cross-delisting.

2.3.4 Financial Constraints Criteria

Financial constraints are more severe the higher is the information asymmetry of the firm, which can lead to credit rationing when accessing external financing sources. There is, however, a fine line between financially constrained and unconstrained firms. If we define a financially constrained firm as one for which it is more difficult to obtain external rather than internal financing, then virtually, all firms could be classified as so (Kaplan and Zingales, 1997). Therefore, there is a comprehensive number of approaches to sort firms into financially constrained and unconstrained categories. Since we do not have strong prior empirical evidence about which approach is the best, we start with five alternative criteria to assign firms in constraint and unconstraint groups.

i) *Payout ratio*. We use this measure in the spirit of Fazzari, Hubbard and Petersen (1988), and compute it following Almeida, Campello and Weisbach (2004) as the ratio of total distributions to shareholders (both dividends and stock repurchases) divided by the operating income (see Appendix 2.B). Every year, firms are classified as financially constrained (unconstrained), whenever they are in the bottom (top) three deciles of annual payout, respectively.

ii) *KZ* index. Proposed by Lamont, Polk and Saá-Requejo (2001) and based on empirical results of Kaplan and Zingales (1997), this index was applied to our data through a linearization process described in Appendix 2.B. Firms in the top (bottom) three deciles of the KZ index are considered financially constrained (unconstrained). We allow firms to change their financial constraints status over our sample period.

iii) *WW index*. Proposed by Whited and Wu (2006); similar to what we did for the KZ index (see Appendix 2.B), we consider firms in the top (bottom) three deciles of the WW index as financially constrained (unconstrained), respectively. Again, we allow firms to change their financial constraints status over the sample period.

iv) *SIZE.* Measured as the logarithm of total assets; SIZE has been used in the literature as a proxy for financial constraints (e.g., Gilchrist and Himmelberg (1995)); we follow this literature and classify firms as financially constrained (unconstrained) if the size of their assets is in the bottom (top) tercile.

v) *BOND RATING*. In line with Almeida, Campello and Weisbach (2004), we collected data on firms' bond ratings and classify those firms that have never had

their public debt rated during our sample period as financially constrained, provided that they have some public debt outstanding. However, the lack of information for most of the firms in our sample led us to adopt an alternative approach. Earlier studies (e.g., Whited (1992), Kashyap, Lamont and Stein (1994), Gilchrist and Himmelberg (1995), Almeida, Campello and Weisbach (2004), Lemmon and Zender (2010)) interpret the presence of rated debt as a signal that firms can access relatively low-cost debt markets, suggesting a large debt capacity. We must notice though that some firms may simply chose not to issue (rated) debt, although they have the capacity to do so. To minimize these concerns, we follow Lemmon and Zender (2010) and use a predictive (logit) model of whether a firm has a bond rating in a given year. The dependent variable is one if a firm has a debt rating in a given year, and zero otherwise. The covariates in the logit regression are *SIZE* (log of total assets), *ROA* (earnings before interest and taxes scaled by total assets), the *Fixed Assets* ratio (measured as property, plant, and equipment scaled by total assets), the (*Tobin's*) *Q* (normalized stock price, measured as market value of equity plus book value of assets less book value of equity scaled by book value of total assets), the *Leverage* ratio (total debt scaled by total assets), *AGE* (the logarithm of the number of years since the firm first appeared on Datastream), and the *Standard Deviation* (STDEV) of stock returns. All of the covariates are lagged one period[36] and are described in Appendix 2.A. Appendix 2.C reports the logit estimation results. Firms are classified as financially constrained (unconstrained) if the estimated probability of having a rated debt falls into the bottom (top) terciles of the distribution.

Table 2.3 presents summary statistics on the level of investment and cash holdings of financially constrained and unconstrained firms. Using the *Payout Ratio*, *WW* index, *SIZE*, and *Rating* criteria, we observe that financially constrained firms invest more and hold more cash than unconstrained firms. This difference is statistically significant, except for investment when we classify firms based on the *WW* index. Using the *KZ* index gives quite different results: more financially constrained firms as the ones that invest less and hold less cash.

[36] We also include Industry, year and country fixed effects.

TABLE 2.3: Summary Statistics of Investment and Cash holdings across financially constrained (unconstrained) firms

	Investment=Capex-to-lagged PPE				Cash holdings=Cash-to-lagged TA			
	Mean	Median	SD	N	Mean	Median	SD	N
i) Payout Ratio								
Constrained (C)	0.34	0.19	0.46	2,929	0.29	0.19	0.30	2,929
Unconstrained (U)	0.24	0.19	0.25	2,841	0.15	0.10	0.16	2,841
(C)=(U) (p-value)	*(0.000)*	*(0.909)*			*(0.000)*	*(0.000)*		
ii) KZ Index								
Constrained (C)	0.21	0.14	0.27	2,723	0.10	0.07	0.11	2,723
Unconstrained (U)	0.46	0.29	0.50	2,723	0.40	0.32	0.32	2,723
(C)=(U) (p-Value)	*(0.000)*	*(0.000)*			*(0.000)*	*(0.000)*		
iii) WW Index								
Constrained (C)	0.31	0.21	0.36	2,372	0.24	0.16	0.24	2,372
Unconstrained (U)	0.30	0.20	0.39	2,372	0.21	0.12	0.26	2,372
(C)=(U) (p-Value)	*(0.401)*	*(0.000)*			*(0.063)*	*(0.000)*		
iv) SIZE								
Constrained (C)	0.40	0.23	0.50	2,572	0.36	0.29	0.32	2,572
Unconstrained (U)	0.22	0.19	0.17	2,853	0.12	0.09	0.11	2,853
(C)=(U) (p-Value)	*(0.000)*	*(0.000)*			*(0.000)*	*(0.000)*		
v) Rating								
Constrained (C)	0.30	0.17	0.40	2,495	0.22	0.14	0.25	2,495
Unconstrained (U)	0.26	0.20	0.24	2,498	0.16	0.10	0.19	2,498
(C)=(U) (p-Value)	*(0.000)*	*(0.000)*			*(0.000)*	*(0.000)*		

Table 2.3 shows summary statistics for *Investment* and *Cash holdings* for the groups of financially constrained ("C") and unconstrained ("U") firms, namely the mean, median, standard deviation ("SD") and the number of observations ("N"). *Investment* is capital expenditures scaled by lagged PPE. *Cash holdings* is the ratio of cash and marketable securities scaled by lagged total assets. *Payout ratio* is total distributions scaled by operating income, as described in Appendix 2.B. Firms are ranked as financially constrained (unconstrained) those in the bottom (top) terciles of annual payout. *KZ index* proposed by Lamont, Polk and Saá-Requejo (2001) is described in Appendix 2.B. Firms in the top (bottom) three deciles of the KZ index ranking are considered financially constrained (unconstrained). *WW index* proposed by Whited and Wu (2006) is described in detail in Appendix 2.B. Firms in the top (bottom) terciles of the WW index are considered financially constrained (unconstrained). *SIZE* is the logarithm of total assets. *Rating* is estimated using the model proposed by Lemmon and Zender (2010) that predicts whether a firm has a bond rating in a given year. Financially constrained (unconstrained) in terms of *SIZE* and *Rating* are those in the bottom (top) terciles of the variables. Differences in means are tested using *t*-statistic test (*t*-statistics in parentheses) and differences in medians are tested using Wilcoxon rank sum test (*z*-statistics in parentheses). ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

From the results in Table 2.3, we conclude that it seems more reliable to use *Payout ratio*, *SIZE* and *Rating*, rather than *KZ* or *WW* indexes, to classify firms in terms of their level of financial constraints. In fact, some studies also claim that *KZ* index is not a reliable measure (Almeida, Campello and Weisbach (2004); Chang and Song, 2013); as for the *WW* index, because it includes *SIZE*, which is already by itself a measure for financial constraints, may also be a limitation. Another valid concern is to assess whether these proxies measure financial constraints or just debt capacity. If a firm is financially unconstrained it is more likely to fund its financing deficit with debt than to issue equity, while for a financially constrained firm that has restricted access to bond markets it is more likely to fund its deficit issuing equity (e.g., Lemmon and Zender

(2010), Chang and Song (2013)). Assuming that debt capacity holds constant, firms should use debt to fund small financing deficits, but will choose equity when external financing needs start to increase (Lemmon and Zender, 2010). Therefore, we employ the Lemmon and Zender (2010) modification test of Shyam-Sunder and Myers (1999) to test the quality of our measures of financial constraints controlling for debt capacity concerns. Hence, we will test the following equation:

$$\Delta LEV_{i,t} = \alpha_i + \beta_1 Financing\ Deficit_{i,t} + \beta_2 Financing\ Deficit_{i,t}^2 + \lambda_k + \eta_j + \gamma_t + \varepsilon_{i,t} \quad (2.2)$$

where $\Delta LEV_{i,t}$ corresponds to changes in the *Leverage* ratio, measured as total debt (short-term plus long-term debt) scaled by total assets, of firm *i* in year *t*. $Financing\ Deficit_{i,t-1}$ is the sum of dividends, net investments and net changes in working capital minus internal cash flows, scaled by lagged total assets (see Frank and Goyal (2003)). λ_k controls for the country effects. η_j controls for the industry effects. γ_t controls for the year effects.

According to Lemmon and Zender (2010), firms with no concerns over debt capacity will use essentially debt to cover their financial deficit, therefore, β_1 should be positive and significant[37], whereas firms with more concerns over debt capacity (i.e., more financially constrained firms) will only use debt to cover small deficits and issue equity to cover larger deficits. That being the case, we should expect β_2 to be negative and statistically significant and β_1 still positive, but weakly or not statistically significant. Assuming that financial constraints and debt capacity are closely related, i.e. firms with less concerns over debt capacity should be less financially constrained, we use equation (2.2) to infer about the quality of our measures of financial constraints. We do so by estimating equation (2.2) on groups of financially constrained and unconstrained firms classified according to our proxies – *Payout ratio*, *KZ* index, *WW* index, *SIZE*, and *Rating*. If our measures are good at identifying firms with more limited debt capacity, then we should observe a negative and statistically significant coefficient β_2 in the group of financially constrained firms. It is worth noting, however, that limited debt capacity is just a form of financial constraints (Lemmon and Zender, 2010). Other

[37] Note that Lemmon and Zender (2010) assume pecking order firms; thus, provided that firms have debt capacity, financing deficits will first be funded by debt.

aspects, such as higher levels of information asymmetry between insiders and investors are also expected to increase financial constraints (Chang and Song, 2013).

In Table 2.4 we show estimations of equation (2.2) using subsamples of constrained and unconstrained firms classified upon our main proxies of financial constraints.

The results indicate that firms classified as financially constrained are indeed those with lower debt capacity as the coefficients β_2 are negative and statistically significant, whereas coefficients β_1 are insignificant. This is true for all measures except for the *KZ* and *WW* indexes. Therefore, hereafter, we will rely on the *Payout ratio*, *SIZE*, and *Rating* as our main measures of financial constraints.

TABLE 2.4: Lemmon and Zender (2010) modified test for financing constraints

	Dependent variable: changes in leverage									
FC criterion:	**Payout Ratio**		**KZ Index**		**WW Index**		**SIZE**		**Rating**	
	C	U	C	U	C	U	C	U	C	U
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Financing deficit$_{i,t}$	0.2182	0.4955***	0.3184***	0.0847	0.1569	0.1455	0.1619	0.3966***	0.1029	0.7909***
	(1.38)	(3.39)	(4.76)	(0.54)	(1.10)	(1.08)	(0.83)	(4.64)	(0.98)	(4.88)
Financing deficit$^2_{i,t}$	-0.3784**	-0.3849**	-0.0050	-0.3485*	-0.0944	-0.2502**	-0.3582*	-0.2209***	-0.3291***	-0.6165**
	(-2.40)	(-2.10)	(-0.04)	(-1.72)	(-0.58)	(-2.19)	(-1.82)	(-2.59)	(-3.62)	(-2.45)
Constant	0.2739	0.0740	0.0744	-0.0743	0.0695	0.8791	1.3741***	0.1727***	-0.0844	1.1249***
	(0.85)	(0.58)	(0.32)	(-0.14)	(0.34)	(1.12)	(3.23)	(6.56)	(-0.43)	(7.18)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2,087	2,577	2,565	1,830	1,989	1,968	1,496	2,839	2,050	2,297
R-squared	0.045	0.070	0.096	0.053	0.029	0.069	0.059	0.061	0.079	0.068

Table 2.4 shows regression estimates of equation (2.2) for the groups of financially constrained ("C") and unconstrained ("U") firms according to five criteria of financial contraints. *Payout ratio* is measured as total distributions scaled by operating income described in Appendix 2.B. Firms are ranked as financially constrained (unconstrained) those in the bottom (top) terciles of annual payout. *KZ* index proposed by Lamont, Polk and Saá-Requejo (2001) and is described in Appendix 2.B. Firms in the top (bottom) terciles of the *KZ* index ranking are considered financially constrained (unconstrained). *WW* index proposed by Whited and Wu (2006) is described in detail in Appendix 2.B. Firms in the top (bottom) terciles of the WW index ranking are considered financially constrained (unconstrained). *SIZE* is measured as logarithm of total assets. *Rating* is estimated using the model proposed by Lemmon and Zender (2010) that predicts whether a firm has a bond rating in a given year. Financially constrained (unconstrained) in terms of *SIZE* and *Rating* are those in the bottom (top) terciles of the variables. The dependent variable is changes in *Leverage*, which is measured as the percentage change in total debt over a one-year period. *Financing deficit* corresponds to the sum of dividends, net investments and net changes in working capital minus internal cash flows, scaled by lagged total assets (see Frank and Goyal, 2003). *Financing deficit*^{2} is the square of *Financing deficit*. All variables are defined in Appendix 2.A. In all models standard errors are clustered by year- and firm-level. Regresssions include year, country and industry fixed effects. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

2.4 EMPIRICAL RESULTS

2.4.1 Investment-to-Cash Flow Sensitivity Following Cross-Delisting from U.S. Exchange Markets

To test whether investment-to-cash flow sensitivity increases post-cross-delisting (hypothesis 1), we estimate several alternative specifications of equation (2.1). Table 2.5 shows the results.

As in previous studies (e.g., Fazzari, Hubbard and Petersen (1988), Lins, Strickland and Zenner (2005)), we find that investment is positively related with cash flow. The coefficient β_1 ($CF_{i,t}$) is statistically significant across all models. Consistent with our first hypothesis, we predict a positive and statistically significant coefficient β_4 ($CF_{i,t} \times Treat_i \times Delist_{i,t}$), suggesting that post-cross-delisting firms will face more restrictions to access external financing, thus making investments more dependent on internal sources. The coefficient β_4 captures the changes in investment sensitivity to cash flow after cross-delisting for our treatment group, relative to the control groups of cross-listed and never-cross-listed firms. Using our baseline (model (1)) as an example, a one-standard-deviation increase in $Cash\ Flow$ (0.17 – see Panel A of Table 2.2) represents an increase of 0.009 in investment prior to the cross-delisting event for the average treatment firm, which is associated with a 2.8% increase in investment[38]. In the post-cross-delisting, the increase in investment associated with a one-standard-deviation increase in $Cash\ Flow$ is 0.0422, which corresponds to a 14.1% increase[39].

The coefficients of *SIZE* and Q have the expected sign: $Q_{i,t-1}$ is positively related with investment because it captures the growth opportunities, and $SIZE_{i,t-1}$ is negatively related with investment suggesting that larger firms tend to invest significantly less as a percentage of total assets.

[38] The sum of coefficients is (0.2366+-0.1864) x 0.17=0.0085. The mean of our investment variable is 0.30 (from Panel A of Table 2.2). Therefore, a 0.0085 increase is equivalent to a 2.8% (0.0085/0.30) increase in investment.

[39] The sum of coefficients is (0.2366+0.1979+-0.1864) x 0.17=0.0422. Thus, a 0.0422 increase is equivalent to a 14.1% (0.0422/0.30) increase in investment.

TABLE 2.5: Investment-to-cash flow sensitivity

Panel A: Investment-to-cash flow sensitivity. Main Results

	Dependent variable: Capex-to-lagged PPE					
	Control group: Cross-listed				Control group: Never-cross-listed	
	Baseline	Country	Firm FE	Matched Sample	Baseline	Matched Sample
	(1)	(2)	(3)	(4)	(5)	(6)
CF_t	0.2366***	0.2327***	0.2935***	0.1430*	0.3959***	0.1773*
	(3.82)	(3.35)	(3.71)	(1.77)	(9.53)	(1.65)
$Treat_i$	-0.0020	-0.0020		0.0021	0.0878***	0.0351
	(-0.18)	(-0.21)		(0.13)	(5.17)	(1.51)
$Delist_t$	-0.0345**	-0.0470***	-0.0205	-0.0411**	-0.0536**	-0.0497*
	(-1.98)	(-3.11)	(-1.19)	(-2.10)	(-2.21)	(-1.71)
CF_t x $Delist_t$ x $Treat_i$	0.1979**	0.1757***	0.2428**	0.1908**	0.2263*	0.2173*
	(2.07)	(2.88)	(2.36)	(2.06)	(1.78)	(1.77)
CF_t x $Treat_i$	-0.1864**	-0.1713**	-0.1531	-0.0735	-0.2848***	-0.1305
	(-2.26)	(-2.56)	(-1.41)	(-0.54)	(-2.78)	(-0.85)
Q_{t-1}	0.0571***	0.0581***	0.0629***	0.0582***	0.0771***	0.0888***
	(10.57)	(10.25)	(10.28)	(8.00)	(16.20)	(8.94)
$SIZE_{t-1}$	-0.0338***	-0.0310***	-0.0600***	-0.0348***	-0.0667***	-0.0583***
	(-8.73)	(-6.34)	(-5.05)	(-10.08)	(-23.85)	(-8.52)
Constant	0.5523***	0.6661***	1.0373***	0.5710***	0.7394***	0.4855***
	(6.04)	(5.46)	(6.30)	(6.31)	(15.62)	(6.45)
Firm FE	No	No	Yes	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	Yes	Yes	Yes
Country FE	Yes	No	No	Yes	Yes	Yes
Observations\	9,078	9,078	9,078	5,376	92,152	6,642
R-squared	0.199	0.181	0.117	0.201	0.129	0.153
PROPENSITY SCORE						
LR chi^2 (p value)				(0.731)		(0.100)
$[CF + CF \times Delist \times Treat + CF \times Treat]$	0.2481***	0.2371***	0.3832***	0.2603**	0.3374**	0.2641*
p-value	(0.008)	(0.000)	(0.000)	(0.011)	(0.038)	(0.097)

TABLE 2.5: Investment-to-cash flow sensitivity *(Continued)*

Panel B: Investment-to-cash flow sensitivity. Robustness tests

Control Group:	Cross-listed				Never-cross-listed			
			Matched sample				Matched sample	
Dependent variable:	Capex-to-TA	Asset Growth	Capex-to-TA	Asset Growth	Capex-to-TA	Asset Growth	Capex-to-TA	Asset Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CF_t	0.1808***	0.7009***	0.1709***	0.5562***	0.1934***	0.9178***	0.1466***	0.7944***
	(8.00)	(11.26)	(4.88)	(3.84)	(16.49)	(28.07)	(5.31)	(10.86)
$Treat_i$	0.0037	-0.0240**	0.0015	-0.0253	0.0325***	0.0463***	0.0157***	0.0221
	(0.90)	(-1.97)	(0.32)	(-1.42)	(7.49)	(2.65)	(2.90)	(1.28)
$Delist_t$	-0.0181***	-0.0221	-0.0188***	-0.0206	-0.0252***	-0.0598***	-0.0189***	-0.0374***
	(-3.09)	(-1.59)	(-3.04)	(-1.35)	(-4.96)	(-3.38)	(-3.27)	(-3.71)
CF_t x $Delist_t$ x $Treat_i$	0.0880***	0.3150***	0.0908***	0.2832***	0.1165***	0.2559**	0.1189***	0.2335**
	(2.86)	(2.80)	(2.85)	(2.51)	(3.72)	(2.23)	(3.82)	(2.03)
CF_t x $Treat_i$	-0.1492***	-0.1368	-0.1401***	0.0243	-0.1493***	-0.2953***	-0.1992***	-0.1271
	(-5.36)	(-1.45)	(-3.31)	(0.15)	(-5.61)	(-3.18)	(-3.77)	(-1.06)
Q_{t-1}	0.0178***	0.0613***	0.0163***	0.0697***	0.01274***	0.0353***	0.0201***	0.0706***
	(9.94)	(8.20)	(6.72)	(6.45)	(13.27)	(8.64)	(8.02)	(8.12)
$SIZE_{t-1}$	-0.0103***	-0.0304***	-0.0103***	-0.0289***	-0.0080***	-0.0192***	-0.0081***	-0.0275***
	(-5.97)	(-7.99)	(-5.58)	(-7.37)	(-12.75)	(-11.43)	(-5.52)	(-7.00)
Constant	0.1830***	0.2890***	0.2101***	0.1783***	0.1225***	0.0267	0.1120***	0.2069**
	(5.34)	(3.11)	(6.13)	(2.10)	(9.59)	(0.59)	(3.78)	(2.11)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,078	9,078	5,384	5,384	92,152	92,152	6,647	6,647
R-squared	0.267	0.236	0.259	0.239	0.144	0.220	0.222	0.266
$[CF + CF \times Delist \times Treat + CF \times Treat]$	0.1196***	0.8791***	0.1216***	0.8637***	0.1606***	0.8784***	0.0663***	0.9008***
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 2.5 reports regression estimates of equation (2.1) using different specifications. The dependent variable is *Investment*, which is measured as capital expenditures scaled by lagged PPE. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. *Treat* is a dummy variable equal to one for firms included in our treatment group, and zero otherwise. *Delist* $_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. *Q* is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *SIZE* is the logarithm of total assets. All variables are defined in Appendix 2.A. In Panel A, models (1)-(4) show results for the full sample using the primary control group of cross-listed firms. In model (4) we use a control matched sample of cross-listed firms. Firms

are matched by country, year, industry, and *SIZE* using the using PSM technique (nearest neighbor with replacement). Models (5) and (6) show results using the alternate control group of never-cross-listed firms. In all models, except for model (2), standard errors are clustered by firm and year; in model (2) standard errors are clustered by country and year. The *p*-value of Likelihood-ratio (LR) test is also reported (in parentheses). Panel B reports regression estimates of equation (2.1) using two alternate measures of corporate investment: capital expenditures scaled by lagged total assets and assets growth, which is measured as the percentage change in total assets over a one-year period. Models (1) and (2) show results for the full sample using the primary control group of cross-listed firms. In Models (3) and (4) we use a control matched sample of cross-listed firms. Models (5)-(8) show results using the alternate control group of never-cross-listed firms; models (5) and (6) show results for the full sample and models (7) and (8) show results of a control matched sample of never-cross-listed firms. In all models standard errors are clustered by firm and year. Regressions include year, industry, and country, and firm fixed effects. The last two rows show the sum and the respectively *p*-value of the coefficients $[CF + CF \times Delist \times Treat + CF \times Treat]$. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

We estimate different specifications of equation (2.1) to check the robustness of our baseline results. In model (2), we cluster standard errors at country- and year-level, and in model (3) we use firm fixed effects, instead of country and industry fixed effects. Results in both models are similar in sign and magnitude to the ones shown in the baseline model.

In model (4) we use a matched sample of treatment and control group of cross-listed firms. This robustness check is justified due to the construction of our treatment and control groups, which raises several concerns. For instance, the decision to cross-delist can be involuntary or voluntary[40], meaning that, in general, firms are not randomly assigned to the treatment group; thus, in our analyses we need to deal with potential sample selection biases. The act of cross-delisting, *per se*, is a quasi-experiment where we can identify a treatment group of companies that cross-delist, and a control group not subject to the same treatment. One problem in quasi-experimental studies is that one is not able to observe the counterfactual, i.e., there may be some omitted variables that simultaneously affect the decision to cross-delist and our outcome variables (e.g., firms' investment decisions). Therefore, we use the Propensity Score Matching (PSM) methodology proposed by Rosenbaum and Rubin (1983). In the PSM procedure we match each treatment firm to a control firm in the same industry, country, year, and with the closest *SIZE* (which is also one of our financial constraints criterion); we use PSM technique selecting the nearest neighbor with replacement, to find the best match(es) for each treatment firm.

As shown in model (4), the results are very similar to what we find when using a non-matched control sample, namely we still find a positive and statistically significant β_4.

To mitigate concerns about confounding events (e.g., changes in economic or regulatory environment that are unrelated to the cross-delisting event) around the same time of cross-delisting, we estimate our baseline model using a control sample of non-matched (model (5)) and matched (model (6)) sample of never-cross-listed firms. The results are similar to what we found before.

In Panel B of Table 2.5 we estimate equation (2.1) using two different measures of corporate investment: capital expenditures scaled by lagged total assets minus cash and

[40] Firms can be forced to delist from U.S. exchanges mainly due to disqualification to continue listed, or can simple decide to cross-delist. Difference between voluntary and involuntary delisting is extensively described in section 1.3.1 of Chapter 1.

short-term investments and assets growth. Assets growth captures all investment activities, such as acquisitions and divestitures[41]. We estimate the regressions using the same type of control samples – matched and non-matched cross-listed and never-cross-listed firms. Once again, the results show coefficients of the same sign and similar statistical to the ones uncovered before.

Taken together, the results in Table 2.5 provide strong evidence supporting hypothesis 1.

2.4.1.1 Investment-to-Cash Flow Sensitivity: Additional Robustness Checks

We proceed our robustness checks by analyzing the reasons why firms cross-delist and how they may interfere with the positive effect on investment-to-cash flow sensitivity post-cross-delisting documented in the previous section. Foreign firms may cross-delist from U.S. exchange markets for a variety of reasons and motivations. We first divide cross-delisted firms in two groups, depending on whether the delisting was voluntary or involuntary. Cross-listed firms in the U.S. can be suspended and involuntarily delisted from U.S. exchange markets due, for example, to violations of stock exchanges rules, while others may decide to voluntarily cross-delist even if they meet the requirements imposed by the markets' regulators. After the passage of Rule 12h-6 of 2007, cross-delisting became easier and less costly, thus a larger and more diversified number of firms voluntarily cross-delisted[42]; this would happen whenever the anticipated gains did not cover the costs of remaining listed on a U.S. stock exchange. Therefore, we further subdivide voluntary cross-delisting into two different periods: pre- and post- the passage of Rule 12h-6. We estimate equation (2.1) by each group and show the results in Table 2.6.

[41] Kumar and Ramchand (2008) provide evidence that over 40% of their sample of cross-listed firms in U.S. exchange markets acquire a U.S. local firm after they cross-list.

[42] See Chapter 1 for a broader discussion on the effects of the passage of Rule 12h-6.

TABLE 2.6: Investment-to-cash flow sensitivity. Subsamples of treatment group

	Dependent variable: Capex-to-lagged PPE							
Subsample:	Involuntary	Voluntary						
					Legal Origin			
					High		*Low*	
		All	Pre-Rule	Post-Rule	Pre-Rule	Post-Rule	Pre-Rule	Post-Rule
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CF_t	0.2428***	0.2233***	0.2206***	0.2258***	0.1441	0.1367	0.7069***	0.7361***
	(3.68)	(3.62)	(3.44)	(3.45)	(1.50)	(1.39)	(2.98)	(4.20)
$Treat_i$	0.0117	-0.0176	-0.0056	-0.0349*	0.0172	-0.0535*	0.0215	0.0023
	(0.76)	(-1.24)	(-0.22)	(-1.78)	(0.40)	(-1.71)	(0.54)	(0.05)
$Delist_t$	-0.0306	-0.0271	-0.0449	0.0288	-0.0750	-0.0357	0.0232	-0.1562**
	(-0.69)	(-1.38)	(-1.53)	(0.88)	(-1.51)	(0.71)	(0.48)	(-2.22)
CF_t x $Delist_t$ x $Treat_i$	0.2523*	0.2187*	0.2301*	0.2594*	0.4503	0.1675	0.2124*	0.7998**
	(1.66)	(1.77)	(1.86)	(1.67)	(1.51)	(0.12)	(1.66)	(2.04)
CF_t x $Treat_i$	-0.0960	-0.2511**	-0.2912*	-0.3017**	-0.3556	-0.2637	-0.3863*	-0.6690**
	(-1.11)	(-2.60)	(-1.78)	(-2.49)	(-1.51)	(-1.19)	(-1.76)	(-2.32)
Q_{t-1}	0.0563***	0.0538***	0.0535***	0.0523***	0.0496***	0.0477***	0.454***	0.0434**
	(8.77)	(10.28)	(11.13)	(9.50)	(7.36)	(7.19)	(4.49)	(2.47)
$SIZE_{t-1}$	-0.0376***	-0.0325***	-0.0325***	-0.0347***	-0.0305***	-0.0305***	-0.0325***	-0.0380***
	(7.23)	(-7.69)	(-6.39)	(-6.68)	(-4.68)	(-4.48)	(-3.22)	(-4.14)
Constant	0.6919***	0.5617***	0.6017***	0.5329***	0.8360***	0.4714***	0.5316***	0.5725***
	(4.45)	(6.14)	(5.36)	(4.03)	(5.35)	(3.80)	(3.25)	(4.36)
(β_4Pre-Rule =β_4Post-Rule) (*p*-value)			(0.887)		(0.388)		(0.003)	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,175	7,794	5,818	6,078	3,079	3,080	1,410	1,519
R-squared	0.202	0.202	0.205	0.209	0.180	0.178	0.289	0.298

Table 2.6 reports regression estimates of equation (2.1) for different subgroups of treatment firms; *Involuntary* group comprises firms that were forced to leave U.S. markets; *Voluntary* group includes firms that decided to leave U.S. exchange markets before ("Pre") and after ("Post") the passage of Rule 12h-6 of 2007. We re-estimate equation (2.1) by subsamples of treatment firms as described before. Legal Origin is an indicator of institutional quality (e.g., La Porta, Lopez-De-Silanes and Shleifer (2008)), which assigns firms in high (low) group depending if they are from Common (Civil) Law countries. The dependent variable is *Investment*, which is measured as capital expenditures scaled by lagged PPE. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. *Treat* is a dummy variable equal to one for firms included in our treatment group, and zero otherwise. $Delist_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. *Q* is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *SIZE* is the logarithm of total assets. All variables are defined in Appendix 2.A. Is also reported the *p*-value of a *z*-test that evaluates whether the coefficient $\beta_4(CF_{i,t} \times Delist_{i,t} \times Treat_i)$ is equal across voluntary subsamples of before ("Pre") and after ("Post") the

passage of Rule 12h-6. In all models standard errors are clustered by firm and year. Regressions include year, industry, and country fixed effects. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

In models (1) to (4) we observe that the coefficient β_4 of the main variable of interest ($CF_{i,t} \times Treat \times Delist_{i,t}$), is positive and statistically significant. In line with the results uncovered in the previous section, those results show that post-cross-delisting the investment-to-cash flow increased, suggesting that these firms became more financially constrained. The magnitude of coefficient β_4 is larger for the group of involuntary cross-delistings – 0.252 versus 0.219 for the group of voluntary cross-delistings; both statistically significant at the 10% level.

In models (5) to (8) of Table 2.6, we estimate the same regressions on subsamples of voluntary cross-delistings of firms from Common Law and Civil Law countries, following the typical classification of previous literature (e.g., La Porta *et al.* (1997; 1998), La Porta, Lopez-De-Silanes and Shleifer (2008), Djankov *et al.* (2008)) and assign firms according to the legal origin, i.e., from Common Law countries in the high group of shareholder protection and firms from Civil Law[43] countries in the low group. We find no significant change in investment-to-cash-flow sensitivity after cross-delisting for firms from Common Law countries. This evidence is consistent with the argument that firms from Common Law countries have already stronger investor protection regimes and stronger information disclosure requirements than firms from Civil Law countries, which facilitates the access to external financing in their home markets. This is also consistent with the "bonding" hypothesis that predicts a lower marginal benefit of cross-listing in the U.S, for firms coming from countries with better shareholder protection. Similarly, the reverse effect of cross-delisting should be less severe for firms from these same types of countries.

To address concerns of possible confounding events occurring in the post-cross-delisting period for a considerable number of firms that can also affect their investment-to-cash flow sensitivity[44], we perform a robustness check to test the validity of our identification strategy. If the increase in investment-to-cash flow sensitivity following cross-delisting is associated with the cross-delisting event, this increase should emerge around the delisting event and be persistent after that. To test this prediction we follow previous studies (Hail, Tahoun and Wang, 2014; Loureiro and Taboada, 2015) and

[43] Firms assigned in the low group are from French Civil Law countries.

[44] One example would be the financial crisis of 2007. If a considerable number of firms cross-delisted before or around the financial crisis, then the increase in investment-to-cash sensitivity may be driven by the post-crisis negative impact on firms' financial constraints than by the cross-delisting event.

create the following indicator variables: the pre-delisting event (*Pre Event*) – a dummy variable that is one for years *t-2* and *t-1* relative to delisting event, and zero otherwise; the delisting event (*Event*) – a dummy variable that is one for year *t* relative to delisting event, and zero otherwise; and the post-delisting event (*Post Event*) – a dummy variable that is one for -years *t+1*, *t+2, and t+3* relative to delisting event, and zero otherwise. We interact each of the indicator variables (*Pre Event*, *Event*, and *Post Event*) with $CF_{i,t}$ and estimate equation (2.3) using only the sample of cross-delisted firms.

$$I_{i,t} = \alpha_i + \beta_1 CF_{i,t} + \beta_2 Pre\ Event_{i.t} + \beta_3 Event_{i,t} + \beta_4 Post\ Event_{i,t} + \beta_{5_{i,t}} CF_{i,t} \times Pre\ Event_{i,t} + \beta_6 CF_{i,t} \times Event_{i,t} + \beta_7 CF_{i,t} \times Post\ Event_{i,t} + \gamma_1 Q_{i,t-1} + \gamma_2 SIZE_{i,t-1} + \lambda_k + \eta_j + \gamma_t + \varepsilon_{i,t} \quad (2.3)$$

where $I_{i,t}$ is measured as the ratio of capital expenditures scaled by lagged PPE. $CF_{i,t}$ is the net income plus depreciation and amortization expenses scaled by lagged total assets. $Pre\ Event_{i,t}$, $Event_{i,t}$, $Post\ Event_{i,t}$, are the same as before. $Q_{i,t-1}$ is the market value of equity plus the book value of assets minus the book value of equity scaled by the book value of total assets. $SIZE_{i,t-1}$ is the logarithm of total assets. Regresssions include year, country and industry fixed effects.

To be consistent with previous results, we expect the coefficient β_5 to be insignificant and the coefficients β_6 and β_7 to be positive and statistically significant, meaning that the increase in investment-to-cash flow sensitivity should occur after the cross-delisting event. Table 2.7 shows the results.

We estimate equation (2.3) considering the treatment group (model (1)) and the subsample of voluntary cross-delistings (model (2)). According to our expectations, the coefficients β_6 and β_7 are positive and significant across models.

Overall, these findings provide support to our hypothesis 1, i.e., that increase in investment-to-price sensitivity materializes after the cross-delisting event.

TABLE 2.7: Investment-to-cash flow sensitivity. Event time analysis

	Dependent variable: Capex-to-lagged PPE	
	Treatment	Voluntary
	(1)	(2)
CF_t	0.0949	0.0252
	(1.25)	(0.26)
Pre Event	0.0018	-0.0053
	(0.12)	(-0.28)
Event	-0.0589***	-0.0504**
	(-2.75)	(-2.06)
Post Event	-0.0385*	-0.0392*
	(-1.75)	(-1.77)
CF_t x Pre Event	-0.0618	-0.0916
	(-0.72)	(-0.74)
CF_t x Event	0.2759*	0.4577**
	(1.75)	(2.36)
CF_t x Post Event	0.2057*	0.2926**
	(1.66)	(2.05)
Q_{t-1}	0.0663***	0.0579***
	(7.05)	(4.68)
$SIZE_{t-1}$	-0.0351***	-0.0316***
	(-7.75)	(-4.97)
Constant	0.5578***	0.5235***
	(5.80)	(4.23)
(CF_t x Pre Event=CF_t x Event) (*p*-value)	(0.024)	(0.002)
(CF_t x Post Event=CF_t x Event) (*p*-value)	(0.734)	(0.424)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Country FE	Yes	Yes
Observations	4,187	2,903
R-squared	0.217	0.226

Table 2.7 reports the regression estimates for equation (2.3) for our treatment group of firms (model 1), and including only the subsample of *Voluntary* delistings in model (2). The dependent variable is *Investment*, which is measured as capital expenditures scaled by lagged property, plant and equipment. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. $Delist_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. *Q* is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *SIZE* is the logarithm of total assets. All variables are defined in Appendix 2.A *Pre Event* is an indicator variable that is one for years *t-2* and *t-1* relative to delisting event, and zero otherwise. *Event* is an indicator variable that is one for year *t* relative to delisting event, and zero otherwise. *Post Event* is an indicator variable that is one for -years *t+1*, *t+2, and t+3* relative to delisting event, and zero otherwise. In all models standard errors are clustered by firm and year. Regressions include year, industry and country fixed effects. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

As a last robustness test, we use a matched sample of treatment and control group of cross-listed firms based on the same covariates of model (4) of Table (2.5), but instead of *SIZE*, we use the other financial constraints criteria as covariates: the *Payout Ratio* and *Rating*. Once again, we estimate the propensity scores based on year, industry, country and the two alternate financial constraints, using the nearest neighbor technique (with replacement). Table 2.8 shows the results.

TABLE 2.8: Investment-to-cash flow sensitivity. Matched samples

	Dependent variable: Capex-to-lagged PPE	
Financial Constraint criterion:	Payout Ratio	Rating
	(1)	(2)
CF_t	0.0315	0.0689
	(0.20)	(0.57)
$Treat_i$	-0.0116	0.0013
	(-0.54)	(0.07)
$Delist_t$	-0.0481**	-0.0447**
	(-2.49)	(-2.38)
CF_t x $Delist_i$ x $Treat_i$	0.1748*	0.2053**
	(1.84)	(2.11)
CF_t x $Treat_i$	0.0397	-0.0139
	(0.22)	(-0.10)
Q_{t-1}	0.0598***	0.0595***
	(7.70)	(7.19)
$SIZE_{t-1}$	-0.0339***	-0.0343***
	(-8.36)	(-8.40)
Constant	0.5360***	0.5403***
	(5.92)	(5.71)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Country FE	Yes	Yes
Observations	5,116	4,950
R-squared	0.206	0.193
PROPENSITY SCORE		
LR chi^2 (*p* value)	(0.731)	(0.100)
$[CF + CF \times Delist \times Treat + CF \times Treat]$	0.2460**	0.2603**
p-value	(0.014)	(0.011)

Table 2.8 shows regression estimates of equation (2.1) using a matched sample of treatment and control group of firms. Firms are matched by country, year, industry, and by two alternate financial constraint criteria: *Payout Ratio* and *Rating*. The dependent variable is *Investment*, which is measured as capital expenditures scaled by lagged property, plant and equipment. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. *Treat* is a dummy variable equal to one for firms included in our treatment group, and zero otherwise. $Delist_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. *Q* is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *SIZE* is the logarithm of total assets. All variables are defined in Appendix 2.A. In model (1) we use *Payout Ratio*, measured as total distributions scaled by operating income, as described in Appendix 2.B. In model (2) we use *Rating*, which is estimated using the model proposed by Lemmon and Zender (2010) that predicts whether a firm has a bond rating in a given year. In all models standard errors are clustered by firm and year. Regressions

include year, industry and country fixed effects. Matched samples are constructed using the PSM technique, where each treatment firm is matched to a control firm by year, country, industry, and *Payout ratio/ Rating*, by selecting the nearest neighbor (with replacement). The *p*-value of Likelihood-ratio (LR) test is also reported (in parentheses). The last two rows show the sum and the respectively *p*-value of the coefficients $[CF + CF \times Delist \times Treat + CF \times Treat]$. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

As shown in Table 2.8, the results are very similar to what we find in our baseline specification; we still uncover a positive and statistically significant β_4. This additional test corroborates our previous results.

Taking model (1) as an example, a one-standard-deviation increase in $Cash\ Flow$ (0.17 – from Panel A of Table 2.2) represents an increase in the post-delisting investment of 0.0418 is associated to 13.9% increase[45].

This last test also gives additional evidence in support of hypothesis 1.

2.4.2 Cash-to-Cash Flow Sensitivity around and Following Cross-Delisting from U.S. Exchange Markets

Our prior results show an increase in investment sensitivity to cash flow after cross-delisting that we interpreted as firms becoming more financially constrained post-cross-delisting. However, even in the absence of financial constraints, we may observe a positive relationship between investment and cash flow if cash flows contain information about the relation between investment demand and growth opportunities. Thus, following Almeida, Campello and Weisbach (2004), an alternative is to test the sensitivity of cash holdings (rather than investment) to cash flow. The authors show that financial constraints are related to a firm's propensity to save cash out of cash inflows, which they refer to as the cash flow sensitivity of cash. Thus, financially unconstrained firms should not display a systematic propensity to save cash, while firms that are constrained should have a positive cash-to-cash flow sensitivity. One advantage of using this model rather than the investment-to-cash flow sensitivity is to avoid concerns of potential multicollinearity problems when including Q and $Cash\ Flow$ because both variables capture growth opportunities. Therefore, there is a stream of literature initiated by Kaplan and Zingales (1997) that argue that the higher investment-to-cash flow sensitivity of constrained firms documented by Fazzari, Hubbard and Petersen (1988)

[45] The sum of coefficients is (0.0315+0.1748+0.0397) x 0.17=0.0418. Thus, a 0.0418 increase is equivalent to a 13.9% (0.0418/0.30) increase in investment.

probably is being affected by a measurement error in the construction of Q variable[46] (e.g., Erickson and Whited (2000), Gomes (2001), Alti (2003), Moyen (2004), Chen and Chen (2012)).

Given our previous results, and per hypothesis 2, we predict a significant and positive relation between cash holdings and cash flow for treatment firms following the cross-delisting. To test this hypothesis, we re-estimate equation (2.1) replacing the dependent variable by cash holdings, measured as cash and marketable securities scaled by lagged total assets.

Table 2.9 shows the results of our estimations. Consistent with hypothesis 2, we find that the firms in the treatment group exhibit a higher propensity to save cash out of cash flows post-cross-delisting as the coefficient β_4 $(CF_{i,t} \times Treat_i \times Delist_{i,t})$ is positive and significant in all regression models. Taking model (1) as an example, a standard deviation increase in $Cash\ Flow$ (0.17 – Panel A of Table 2.2) represents an increase of 0.004 in cash prior to the cross-delisting that represents a 1.8% increase[47]. Following cross-delisting, the increase in cash associated with a one-standard deviation increase in $Cash\ Flow$ is 0.0302, which corresponds to a 13.7% increase[48]. The results are qualitatively identical when we use matched and non-matched control samples of cross-listed and never-cross-listed firms and different combinations of year, country, industry, and firm fixed-effects and clustered standard errors by country and year. Altogether, this evidence suggests that cross-delisted firms save more cash out of cash flows surrounding and after cross-delisting, which can be interpreted as a sign of these firms facing higher financial constraints following the cross-delisting event.

[46] For instance, as argued by Gomes (2001), the financial constraints status should be included in the market value of the firm and should also be captured by Q. Therefore, the collinearity between cash flow and Q suggests that any sizable measurement error in the construction of Q can reduce the overall correlation between Q and investment and augment the correlation between investment and cash flow.

[47] The sum of coefficients is (-0.0087+0.0321) x 0.17=0.004. The mean of cash variable is 0.22 (from Panel A of Table 2.2). Therefore, a 0.004 increase is equivalent to a 1.8% (0.004/0.22) increase.

[48] The sum of coefficients is (-0.0087+0.0321+0.1540) x 0.17=0.0302. Thus, a 0.0302 increase is equivalent to a 13.7% (0.0302/0.22) increase.

TABLE 2.9: Cash-to-cash flow sensitivity. Main Results

	Dependent variable: Cash and Marketable securities-to-lagged total assets					
	Control group: Cross-listed				Control group: Never-cross-listed	
	Baseline	Country	Firm FE	Matched Sample	Baseline	Matched Sample
	(1)	(2)	(3)	(4)	(5)	(6)
CF_t	-0.0087	0.0001	0.1579***	-0.1679**	0.2533***	-0.0239
	(-0.17)	(0.00)	(3.50)	(-2.45)	(14.84)	(-0.52)
$Treat_i$	0.0003	-0.0091		-0.0075	0.1063***	0.0776***
	(0.03)	(-1.02)		(-0.54)	(11.26)	(7.81)
$Delist_{i,t}$	-0.0388***	-0.0514***	-0.0344***	-0.0345***	-0.0400***	-0.0474***
	(-3.46)	(-4.52)	(-3.57)	(-2.71)	(-3.51)	(-3.42)
CF_t x $Delist_t$ x $Treat_i$	0.1540**	0.1304**	0.1261*	0.1636**	0.1291*	0.1048*
	(2.19)	(2.05)	(1.85)	(2.31)	(1.93)	(1.68)
CF_t x $Treat_i$	0.0321	0.0309	-0.0359	0.1940**	-0.3099***	0.0518
	(0.49)	(0.41)	(-0.60)	(2.49)	(-6.38)	(0.88)
Q_{t-1}	0.0457***	0.0452***	0.0314***	0.0441***	0.0365***	0.0497***
	(12.45)	(7.17)	(8.91)	(10.11)	(15.81)	(12.08)
$SIZE_{t-1}$	-0.0360***	-0.0326***	-0.0789***	-0.0317***	-0.0158***	-0.0264***
	(-13.67)	(-9.34)	(-11.45)	(-10.17)	(-20.79)	(-11.46)
Constant	0.5284***	0.5754***	1.2064***	0.4999***	0.1404***	0.3501***
	(7.94)	(8.91)	(12.80)	(6.49)	(8.62)	(5.24)
Firms FE	No	No	Yes	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	Yes	Yes	Yes
Country FE	Yes	No	No	Yes	Yes	Yes
Observations	9,078	9,078	9,078	5,384	92,152	6,647
R-squared	0.405	0.368	0.178	0.199	0.254	0.161
PROPENSITY SCORE						
LR chi^2 (p value)				(0.731)		(0.100)
$[CF + CF \times Delist \times Treat + CF \times Treat]$	0.1774***	0.1614***	0.2481***	0.1897***	0.0725	0.1327**
p-value	(0.003)	(0.001)	(0.000)	(0.002)	(0.238)	(0.017)

Table 2.9 reports regression estimates of equation (2.1) using different specifications. The dependent variable is *Cash Holdings*, which is measured as the ratio of cash and marketable securities scaled by lagged total assets. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. *Treat* is a dummy variable equal to one for firms included in our treatment group, and zero otherwise. $Delist_t$ is an indicator variable equal to one if a treatment firm is delisted in year t, and zero otherwise. Q is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *SIZE* is the logarithm of total assets. All variables are defined in Appendix 2.A. Models (1)-(4) show results for the full sample using the primary control group of cross-listed firms. In model (4) we use a control matched sample of cross-listed firms. Firms are matched by country, year, industry, and *SIZE* using the using PSM technique (nearest neighbor with replacement). Models (5) and (6) show results using the alternate control group of never-cross-listed firms. In all models, except for model (2), standard errors are clustered by firm and year; in model (2) standard errors are clustered by country and year. The p-value of Likelihood-ratio (LR) test is also reported (in parentheses). Regressions include year, industry, country, and firm fixed effects in different combinations as indicated in the table, respectively. The last two rows show the sum and the respectively p-value of the coefficients $[CF + CF \times Delist \times Treat + CF \times Treat]$. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

As an additional test of hypothesis 2, we follow Almeida, Campello and Weisbach (2004) and use an alternative approach in which a firms' decision to change its cash holdings is modeled as a function of a number of sources and uses of cash, such as capital expenditures, net acquisitions, changes in noncash net working capital, and changes in short-term debt. Hence, we estimate the following equation:

$$CASH_{i,t} = \alpha_i + \beta_1 CF_{i,t} + \beta_2 Treat_i + \beta_3 Delist_{i,t} + \beta_4 CF_{i,t} \times Treat_i \times Delist_{i,t} + \beta_5 CF_{i,t} \times Treat_i + \beta_6 CF_{i,t} \times Delist_{i,t} + \beta_7 Delist_{i,t} \times Treat_i + \gamma_1 Q_{i,t-1} + \gamma_2 SIZE_{i,t-1} + \gamma_3 Expenditures_{i,t} + \gamma_4 Acquisitions_{i,t} + \gamma_5 \Delta NWC_{i,t} + \gamma_6 STD_{i,t} + \lambda_k + \eta_j + \gamma_t + \varepsilon_{i,t} \quad (2.4)$$

where $CASH_{i,t}$ is the ratio of cash and marketable securities scaled by lagged total assets of firm *i* in year *t*. $CF_{i,t}$ is the net income plus depreciation and amortization expenses scaled by lagged total assets. $Treat_i$ is an indicator variable equal to one if firm *i* is included in our treatment group, and zero otherwise. $Delist_{i,t}$ is an indicator variable equal to one if treatment firm *i* is delisted in year *t*, and zero otherwise. $Q_{i,t-1}$ is the market value of equity plus the book value of assets minus the book value of equity scaled by the book value of total assets. $SIZE_{i,t-1}$ is the logarithm of total assets. $Expenditures_{i,t}$ is capital expenditures scaled by lagged total assets. $Acquisitions_{i,t}$ is net assets from corporate acquisitions scaled by lagged total assets. $\Delta NWC_{i,t}$ is the change in non-cash net working capital scaled by lagged total assets. $STD_{i,t}$ corresponds to the change in short-term debt scaled by lagged total assets. Again, in our main regressions we also control for country, industry and year fixed effects and cluster standard errors by firm and year. Table 2.10 reports the results of estimations of equation (2.4).

TABLE 2.10: Cash-to-cash flow sensitivity. Robustness tests

	Dependent variable: Cash and Marketable securities-to-lagged total assets					
	Control group: Cross-listed				Control group: Never-cross-listed	
	Baseline	Country	Firm FE	Matched Sample	Control	Matched Sample
	(1)	(2)	(3)	(4)	(5)	(6)
CF_t	0.0441	0.0499	0.1677***	-0.1256	0.2514***	0.0094
	(0.78)	(0.56)	(3.65)	(-1.52)	(15.48)	(0.20)
$Treat_i$	0.0004	-0.0086		-0.0099	0.0972***	0.0742***
	(0.04)	(-0.96)		(-0.73)	(10.38)	(7.56)
$Delist_t$	-0.0394***	-0.0525***	-0.0276***	-0.0349***	-0.0365***	-0.0362***
	(-3.85)	(-3.65)	(-2.90)	(-2.97)	(-3.48)	(-3.54)
CF_t x $Delist_{,t}$ x $Treat_i$	0.1534**	0.1368**	0.0953*	0.1613**	0.1171*	0.1000*
	(2.26)	(2.15)	(1.73)	(2.35)	(1.94)	(1.65)
CF_t x $Treat_i$	0.0116	0.0124	-0.0163	0.1836**	-0.2638***	0.0548
	(0.16)	(0.16)	(-0.27)	(2.05)	(-5.55)	(0.97)
Q_{t-1}	0.0454***	0.0449***	0.0302***	0.0435***	0.0351***	0.0488***
	(11.92)	(6.66)	(8.54)	(9.54)	(15.49)	(11.11)
$SIZE_{t-1}$	-0.0353***	-0.0316***	-0.0729***	-0.0308***	-0.0145***	-0.0257***
	(-13.33)	(-8.77)	(-10.41)	(-9.75)	(-19.71)	(-11.17)
$Expenditures_t$	-0.1174**	-0.0958	0.0141	-0.1268*	-0.0868***	-0.1199**
	(-2.52)	(-1.55)	(0.30)	(-1.94)	(-10.76)	(-2.29)
$Acquisitions_t$	-0.1404***	-0.1712***	-0.1084***	-0.1320*	-0.1541***	-0.2304***
	(-2.57)	(-4.12)	(-3.27)	(-1.89)	(-6.50)	(-2.89)
ΔNWC_t	-0.0004	-0.0004	0.0000	-0.0009	-0.0001	-0.0005
	(-0.46)	(-0.76)	(-0.03)	(-0.83)	(-0.78)	(-0.84)
ΔShort Term $Debt_t$	0.0086***	0.0081***	0.0074***	0.0096***	0.0421***	0.0169***
	(4.92)	(3.30)	(4.90)	(3.89)	(28.80)	(4.73)
Constant	0.5267***	0.5723***	1.1261***	0.5074***	0.1308***	0.3323***
	(7.77)	(8.63)	(11.74)	(6.28)	(7.98)	(5.25)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	Yes	Yes	Yes
Country FE	Yes	No	No	Yes	Yes	Yes
Observations	8,841	8,841	8,841	5,249	91,604	6,533
R-squared	0.412	0.373	0.188	0.194	0.277	0.159
PROPENSITY SCORE						
LR chi^2 (p value)				(0.731)		(0.100)
$[CF + CF \times Delist \times Treat + CF \times Treat]$	0.2091***	0.1991***	0.2467***	0.2193***	0.1047*	0.1642***
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.068)	(0.002)

Table 2.10 reports regression estimates of equation (2.4) using different specifications. The dependent variable is *Cash Holdings*, which is measured as the ratio of cash and marketable securities scaled by lagged total assets. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. *Treat* is a dummy variable equal to one for firms included in our treatment group, and zero otherwise. $Delist_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. *Q* is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *SIZE* is the logarithm of total assets. *Expenditures* represent capital expenditures scaled by lagged total assets. *Acquisitions* represent corporate acquisitions scaled by lagged total assets. *ΔNWC* is the changes in noncash net working capital scaled by lagged total assets. *Δ Short-Term Debt* corresponds to changes in short-term debt scaled by lagged total assets. All variables are defined in Appendix 2.A. Models (1)-(4) show results for the full sample using the primary control group of cross-listed firms. In model (4) we use a control matched sample of cross-listed firms. Firms are matched by country, year, industry, and *SIZE* using PSM technique (nearest neighbor with replacement). Models (5) and (6) show results using the alternate control group of never-cross-listed firms. Regressions include year, industry, country, and firm fixed effects in different combinations as indicated in the table, respectively. The *p*-value of Likelihood-ratio (LR) test is also reported (in parentheses). The last two rows show the sum and the respectively *p*-value of the coefficients $[CF + CF \times Delist \times Treat + CF \times Treat]$. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

Overall, the sign and magnitude of our main coefficient of interest, β_4, does not differ from the results in Table 2.9. We can conclude that, on average, delisted firms save more of cash out of cash flows than the firms in the control groups. The coefficients of *Expenditures* and *Acquisitions* are negative in (almost) all regressions. This can be explained by the fact that, at some point in time, firms must pay for those investment activities. The coefficients on *ΔNWC* are not significant and on *ΔSTD* display significant and positive estimatives, which is consistent with the argument that changes in short-term debt could be a substitute for cash (Almeida, Campello and Weisbach (2004)).

In addition, we replicate previous tests of investment-to-cash flow sensitivity analisys using equation (2.4), aiming to provide further support to hypothesis 2. Table 2.11 reports the results.

In Panel A of Table 2.11 we replicate tests of Table 2.6 and estimate equation (2.4), using the subsample of voluntary cross-delistings by groups of pre- and post-Rule 12h-6, ranking firms in high (low) group according to the legal origin (e.g., La Porta, Lopez-De-Silanes and Shleifer (2008)). Again, the coefficient β_4 is significant and positive across estimations, except for models (4) and (5) using the high (Common Law) subgroup. The increase in cash-to-cash flow sensitivity post-cross-delisting is stronger for firms from low (Civil Law) group both in the pre- and in the post-Rule 12h-6.

Moreover, we also replicate tests of Table 2.8, using a matched sample of treatment and control group of cross-listed firms based on industry, country, year and two alternate financial constraints criteria, *Payout Ratio* and *Rating*. As shown in Panel B of Table 2.11, the results are very similar to what we find in our previous tests; we still find a positive and statistically significant β_4.

Overall, these results give further support to hypothesis 2.

TABLE 2.11: Cash-to-cash flow sensitivity. Robustness tests

Panel A: Cash-to-cash flow sensitivity. Robustness tests. Subsamples of treatment group

	Dependent variable: Cash and Marketable securities-to-lagged total assets						
				Legal Origin			
				High		*Low*	
	Voluntary	Pre-Rule	Post-Rule	Pre-Rule	Post-Rule	Pre-Rule	Post-Rule
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CF_t	0.0356	0.0522	0.0495	-0.0410	-0.0477	0.2302**	0.2125**
	(0.61)	(0.88)	(0.85)	(-0.55)	(-0.65)	(2.44)	(2.51)
$Treat_i$	-0.0014	-0.0034	-0.0099	-0.0218	-0.0499**	0.0071	0.0164
	(-0.13)	(-0.18)	(-0.69)	(-0.75)	(-2.38)	(0.29)	(0.46)
$Delist_t$	-0.0498***	-0.0627***	-0.0124	-0.0557**	0.0078	-0.0633***	0.0177
	(-5.16)	(-4.09)	(-0.84)	(-2.04)	(0.38)	(-4.06)	(0.56)
CF_t x $Delist_t$ x $Treat_i$	0.2628***	0.2613**	0.1622*	0.3233	0.1212	0.1623**	0.2361*
	(3.25)	(2.31)	(1.87)	(1.77)	(0.79)	(1.95)	(1.79)
CF_t x $Treat_i$	-0.0993	-0.0948	-0.0044	-0.0443	0.0617	-0.3269*	-0.1630
	(-1.35)	(-1.03)	(-0.05)	(-0.34)	(0.58)	(-1.80)	(-1.58)
Q_{t-1}	0.0423***	0.0421***	0.0437***	0.0477***	0.0458***	0.0119*	0.0235***
	(10.48)	(9.93)	(10.16)	(8.89)	(8.47)	(1.83)	(3.60)
$SIZE_{t-1}$	-0.0369***	-0.0383***	-0.0386***	-0.0374***	-0.0377***	-0.0396***	-0.0352***
	(-12.79)	(-10.86)	(-10.91)	(-7.88)	(-7.78)	(-5.88)	(-4.64)
$Expenditures_t$	-0.0783	-0.1192**	-0.1011**	-0.0345	0.0249	-0.0071	-0.0541
	(-1.47)	(-2.10)	(-1.98)	(-0.34)	(0.28)	(-0.10)	(-0.67)
$Acquisitions_t$	-0.1381***	-0.1529***	-0.1521***	-0.2040***	-0.1481**	-0.0493	-0.409
	(-2.73)	(-2.70)	(-3.26)	(-2.95)	(-2.42)	(-0.57)	(-0.63)
ΔNWC_t	0.0001	-0.0000	0.0005	0.0002	0.0006	-0.0003	0.00082
	(0.08)	(-0.01)	(0.45)	(0.22)	(0.54)	(-0.21)	(0.46)
ΔShort Term $Debt_t$	0.0092***	0.0089***	0.0094***	0.0060***	0.0065***	0.0114***	0.0082**
	(5.14)	(5.82)	(4.34)	(4.35)	(3.25)	(2.66)	(2.55)
Constant	0.5664***	0.5424***	0.5031***	0.7986***	0.6919***	0.5802***	0.5038***
	(8.08)	(6.82)	(7.78)	(5.93)	(7.79)	(5.00)	(4.97)
(β_4Pre-Rule =β_4Post-Rule) (p-value)		(0.460)		(0.833)		(0.845)	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,594	5,662	5,924	2,935	2,937	1,402	1,511
R-squared	0.427	0.425	0.448	0.392	0.402	0.411	0.574

TABLE 2.11: Cash-to-cash flow sensitivity. Robustness tests *(Continued)*

Panel B - Cash-to-cash flow sensitivity. Robustness tests. Matched samples

	Dependent variable: Capex-to-lagged PPE	
Financial Constraint criterion	Payout ratio	Rating
	(1)	(2)
CF_t	-0.0407	-0.1043
	(-0.07)	(-1.31)
$Treat_i$	-0.0090	-0.0015
	(-0.06)	(-0.12)
$Delist_t$	-0.0393***	-0.0407***
	(-3.32)	(-3.37)
CF_1 x $Delist_t$ x $Treat_i$	0.1529**	0.1622**
	(2.22)	(2.40)
CF_t x $Treat_i$	0.0650	0.1323
	(0.87)	(1.54)
Q_{t-1}	0.0442***	0.0465***
	(9.98)	(10.67)
$SIZE_{t-1}$	-0.0321***	-0.0324***
	(-10.35)	(-9.03)
$Expenditures_t$	-0.1327*	-0.1140*
	(-1.82)	(-1.68)
$Acquisitions_t$	-0.1461**	-0.1091*
	(-2.09)	(-1.70)
ΔNWC_t	-0.0014	-0.0016**
	(-1.24)	(-2.08)
ΔShort Term $Debt_t$	0.0084***	0.0085***
	(2.87)	(3.81)
Constant	0.5186***	0.5381***
	(6.67)	(6.51)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Country FE	Yes	No
Observations	5,014	4,826
R-squared	0.410	0.410
PROPENSITY SCORE		
LR chi^2 (*p* value)	(0.731)	(0.100)
$[CF + CF \times Delist \times Treat + CF \times Treat]$	0.1772***	0.1902***
p-value	(0.000)	(0.002)

Table 2.11 reports regression estimates of equation (2.4) using different specifications. The dependent variable is *Cash Holdings*, which is measured as the ratio of cash and marketable securities scaled by lagged total assets. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. *Treat* is a dummy variable equal to one for firms included in our treatment group, and zero otherwise. $Delist_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. *Q* is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. *SIZE* is the logarithm of total assets. *Expenditures* represent capital expenditures scaled by lagged total assets. *Acquisitions* represent corporate acquisitions scaled by lagged total assets. *ΔNWC* is the changes in noncash net working capital scaled by lagged total assets. *Δ Short-Term Debt* corresponds to changes in short-term debt scaled by lagged total assets. All variables are defined in Appendix 2.A. Panel A reports regression estimates for Voluntary group of treatment firms, further divided in before ("Pre") and after ("Post") the passage of Rule 12h-6 of 2007 in models (2)-(7). In models (4)-(7), we re-estimate equation (2.4) according to Legal Origin, which is an indicator of institutional quality (e.g., La Porta, Lopez-De-Silanes and Shleifer (2008)). Then, we assign firms in high (low) group depending if they are from Common (Civil) Law countries. Is also reported the *p*-value of a *z*-test that evaluates whether the coefficient $\beta_4(CF_{i,t} \times Delist_{i,t} \times Treat_i)$ is equal across voluntary subsamples of before ("Pre") and after ("Post") the passage of Rule 12h-6. Panel B shows regression estimates of equation (2.4) using a matched sample of treatment and a control group of cross-listed firms. Firms are matched by country, year, industry, and by two alternate financial constraint criteria: *Payout Ratio* and *Rating*. In model (1) we use *Payout Ratio*, measured as total distributions scaled by operating

income, as described in Appendix 2.B. In model (2) we use *Rating*, which is estimated using the model proposed by Lemmon and Zender (2010) that predicts whether a firm has a bond rating in a given year. In all models standard errors are clustered by firm and year. Regressions include year, industry, country, and firm fixed effects. The last two rows show the sum and the respectively *p*-value of the coefficients $[CF + CF \times Delist \times Treat + CF \times Treat]$. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

2.4.3 Investment Sensitivity to Information Content of Stock Prices around and Following Cross-Delisting from U.S. Exchange Markets

Our results so far show an increase in investment and cash sensitivities to cash flow following cross-delisting. We now test the impact of cross-delisting on the information content impounded into stock prices. Per the "bonding" hypothesis, a U.S. cross-listing is associated with a significant improvement in a firm's informational environment. Not only because foreign firms have to commit to higher standards of information disclosure, but also because cross-listing in the U.S. attracts more analysts coverage (e.g., Lang, Lins and Miller (2003), Bailey, Karolyi and Salva (2006)). If this is so, we should expect that cross-delisting produces the opposite effects, i.e., a deterioration of the firm's information environment and consequent increase in information asymmetries. Indeed, this effect may partially explain the evidence we found so far that post-cross-delisting firms become more financially constrained – a deterioration in the firm's information environment raises the cost of external financing and stresses the firm's financial constraints resulting in an increased sensitivity of investment and cash-to-cash flow. A way to determine the quality of the information environment is to test how informative stock prices are for managers to make their investment decisions. If the information content impounded into stock prices is high, then stock prices are more informative and help managers to make better investment decisions. Empirically, if stock prices become more informative to managers, we should observe a higher sensitivity of investment to stock prices (Bond, Edmans and Goldstein, 2012; Foucault and Frésard, 2012). Thus, firms that suffer larger adverse information shocks should observe a decrease in their investment-to-price sensitivity. In our hypothesis 3, we posit that firms that are more severely affected by a negative shock to their information environment post-cross-delisting should have a reduction in their investment-to-price sensitivity.

We use two proxies of information asymmetry to capture negative information shocks suffered by firms after their cross-delisting. Our first measure of information

asymmetry, as in Brennan and Subrahmanyam (1996), is the bid-ask spread – the difference between bid and ask prices, calculated as the annual median of the daily difference between bid and ask prices, and scaled by the mean of bid and ask prices. Our second proxy for information asymmetry is the change in R&D expenses; the rationale for using this measure is that the presence of intangible assets are positively correlated with information asymmetry due to economic uncertainty relating to intangibles (Barth and Kasznik, 1999; Aboody and Lev, 2000; Barth, Kasznik and McNichols, 2001, Loureiro and Taboada, 2015).

To test our hypothesis 3 we follow Loureiro and Taboada (2015) and compute changes, on an annual basis, for our two measures of information asymmetry, bid-ask spread and R&D expenses. Then, we compute changes on these measures around the cross-delisting year (*t*), from years *t-1 to t+1* and *t-2 to t+3*. Based on these changes, we create a dummy variable ($INF_{i,t}$) that is one for firms with values above median, and zero otherwise. Thus, when $INF_{i,t}$ is one, it means that the firm suffered an adverse information shock. We estimate the following equation considering only the treatment group:

$$I_{i,t} = \alpha_i + \beta_1 Q_{i,t-1} + \beta_2 Delist_{i.t} + \beta_3 INF_{i,t} + \beta_4 Q_{i,t-1} \times Delist_{i,t} \times INF_{i,t} + \beta_5 Q_{it-1} \times Delist_{i,t} + \beta_6 Q_{it-1} \times INF_{i,t} + \beta_7 Delist_{i,t} \times INF_{i,t} + + \gamma_1 CF_{i,t} + \gamma_2 SIZE_{i,t-1} + \lambda_k + \eta_j + \gamma_t + \varepsilon_{i,t} \quad (2.5)$$

where $I_{i,t}$ is measured as the ratio of capital expenditures scaled by lagged PPE. $Q_{i,t-1}$ is the market value of equity plus the book value of assets minus the book value of equity scaled by the book value of total assets. $Delist_{i,t}$ is an indicator variable equal to one if treatment firm *i* is delisted in year *t*, and zero otherwise. $INF_{i,t}$ is defined as before. $CF_{i,t}$ is the net income plus depreciation and amortization expenses scaled by lagged total assets. $SIZE_{i,t-1}$ is the logarithm of total assets. We expect that firms that suffered a more severe information shock (*INF=1*) post-cross-delisting, observe a decrease in the quality of the information content impounded into their stock prices, i.e., a lower investment-to-price sensitivity. Hence, we expect a negative coefficient of our main variable of interest $\beta_4(Q_{i,t-1} \times Delist_{i,t} \times INF_{i,t})$. Table 2.12 shows the results.

TABLE 2.12: Investment sensitivity to stock prices and information schocks post-cross-delisting

	Dependent variable: Capex-to-lagged PPE			
Information proxy:	Bid-Ask spread		R&D	
	(*t-1*;*t+1*)	(*t-2*;*t+3*)	(*t-1*;*t+1*)	(*t-2*;*t+3*)
	(1)	(2)	(3)	(4)
Q_{t-1}	0.0650***	0.0665***	0.0608**	0.0604***
	(5.73)	(5.28)	(5.02)	(5.27)
$Delist_t$	-0.0871*	-0.0926*	-0.1136**	-0.1162**
	(-1.81)	(-1.89)	(-2.49)	(-2.59)
INF_t	-0.0181	0.0028	-0.0614	-0.0349
	(-0.24)	(0.04)	(-1.06)	(-1.24)
Q_{t-1}x $Delist_t$ x INF_t	-0.1246***	-0.1004**	-0.1443***	-0.0919***
	(-2.71)	(-2.44)	(-4.01)	(-3.66)
Q_{t-1}x $Delist_t$	0.0329	0.0353	0.0530*	0.0562*
	(1.15)	(1.14)	(1.88)	(1.79)
Q_{t-1}x INF_t	0.0147	-0.0101	0.0396	0.0199
	(0.36)	(-0.31)	(1.32)	(1.58)
$Delist_t$ x INF_t	0.1562*	0.1329*	0.2117***	0.1243***
	(1.71)	(1.77)	(2.74)	(3.24)
CF_t	0.1174**	0.1153*	0.1210**	0.1204**
	(1.99)	(1.89)	(2.09)	(2.03)
$SIZE_{t-1}$	-0.0355***	-0.0359***	-0.0353***	-0.0355***
	(-8.29)	(-8.43)	(-7.85)	(-8.06)
Constant	0.5011***	0.4986***	0.5066***	0.5100***
	(5.13)	(4.96)	(5.11)	(5.11)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	No
Country FE	Yes	Yes	No	No
Observations	4,187	4,187	4,187	4,187
R-squared	0.220	0.221	0.223	0.219
$[Q + Q \times Delist \times INF + Q \times Delist + Q \times INF]$	-0.0120*	-0.0087	0.0091*	0.0446***
p-value	(0.083)	(0.198)	(0.099)	(0.008)

Table 2.12 reports regression estimates of equation (2.5). We use two proxies of information asymmetry: 1) the *Bid-Ask spread is* measured as annual median of the daily difference between bid and ask prices, scaled by the mean of bid and ask prices; 2) and *R&D* expenses. We compute changes on these measures around the cross-delisting year (*t*), from years *t-1 to t+1* and *t-2 to t+3*. The dependent variable is *Investment*, which is measured as capital expenditures scaled by lagged PPE. *Q* is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. $Delist_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. *INF* is set to one for firms whose changes in *Bid-Ask spread* and in *R&D* expenses are above median, and zero otherwise. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. *SIZE* is the logarithm of total assets. All variables are defined in Appendix 2.A. In all models standard errors are clustered by firm and year. Regressions include year, industry and country fixed effects. The last two rows show the sum and the respectively *p*-value of the coefficients $[Q + Q \times Delist \times INF + Q \times Delist + Q \times INF]$. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

In models (1) and (2) of Table 2.12 we measure the information shock using changes in bid-ask spreads, and in models (3) and (4) we use changes in R&D. The results show a negative and statistically significant coefficient β_4, which means that the information content of stock prices decreases following the cross-delisting event for firms that suffered a greater deterioration in their information environment. The economic magnitude of coefficient β_4 is very similar in all regressions, however larger in the models (1) and (3) that capture changes in information asymmetry between *t-1 to t+1* relative to the cross-delisting event in year *t*. Taking model (1) as an example, for the average treatment firm, a one-standard-deviation increase in Q (1.50, for the treatment group) represents an increase of 0.12 in investment prior to cross-delisting or a 41.2% increase[49]. In contrast, in the post-cross-delisting the increase in investment associated with a one-standard-deviation increase in Q is -0.018, which corresponds to a decrease of 6.2%[50].

In our final tests, we explore cross-country variations of the impact of cross-delisting on the quality of firm's information environment, depending on whether they are from countries with stronger or weaker shareholder protection. According to Bailey, Karolyi and Salva (2006), the ("bonding") benefits from cross-listing on a U.S. exchange are more pronounced for firms from countries in which information disclosure requirements are lower. If this is the case, cross-delisted firms from countries with higher standards of financial disclosure should experience no change in investment-to-price sensitivity after cross-delisting. McLean, Zhang and Zhao (2012) document that investor protection is positively associated with stock price sensitivity; firms from countries with poor information disclosure requirements and poor shareholder protection may benefit the most from an improvement in the information environment and reach higher standards of corporate governance. Such improvements can mitigate agency problems and encourage investors to gather private information and, by trading, make stock prices more informative (Fernandes and Ferreira, 2008).

We then analyze whether firms from countries with higher governance standards and more developed capital markets are less penalized in the quality of their stock price

[49] The sum of coefficients is (0.0650+0.0147) x 1.50=0.12. The mean of investment for the treatment group is 0.29. Thus, a 0.12 increase is equivalent to a 41.2% (0.12/0.29) increase.

[50] The sum of coefficients is (0.0650+-0.1246+0.0329+0.0147) x 1.50=-0.018. Thus, a 0.018 decrease is equivalent to a 6.2% (-0.018/0.29) decrease.

informativeness post-cross-delisting conditional on having an adverse information shock. We use the *Disclosure* requirements index proposed by La Porta, Lopez-De-Silanes and Shleifer (2006) as a proxy for the quality of information environment at the country-level, and the stock market capitalization scaled by GDP as proxy for capital markets development. We then assign each firm to *High* (*Low)* levels of each measure if the firm is from a country with above (below) the median value. We re-estimate equation (2.5) for each group and show the results in Table 2.13.

The results show a more negative and statistically significant coefficient β_4 for firm from countries with weaker disclosure requirements (*Low* Disclosure) and less developed capital markets (*Low* stock market capitalization-to-GDP). This means that mainly firms from these countries suffer an effective deterioration in the information quality of their stock prices as a consequence of a negative information shock post-cross-delisting. In contrast, the coefficient β_4 is only statistically significant in models (3) and (5) for firms from countries with higher disclosure standards and developed financial markets However, the magnitude of the coefficient β_4 in model (3) is about half of the size of the coefficient in model (4) – *Low* market capitalization to GDP – and, more importantly, the *z*-test for the equality of β_4 between models (3) and (4) is statistically different from zero, meaning that the documented negative impact on stock price quality is indeed significantly stronger for countries from less developed markets. Also the coefficient β_4 of model (5) - *High* Disclosure – is of small magnitude than coefficient in model (6). Again, coefficients in both models are statistically different; the *z*-test for the equality of β_4 between models (5) and (6) is statistically different from zero.

In sum, we find support for our *Hypothesis 3* and conclude that firms that observe a greater increase in information asymmetry post-cross-delisting effectively suffer a greater reduction in the information quality of their stock prices with real consequences on investment decisions. Lower stock price informativeness leads to higher costs of external financing, increasing firm's financial constraints. Therefore, this evidence reveals a potential mechanism – the deterioration of the information environment – to explain our prior results that post-cross-delisting firms become more financially constrained. This conclusion is consistent with the idea of foreign firms losing the "bonding" benefits when they cross-delist from a U.S. exchange.

TABLE 2.13: Investment sensitivity to stock prices. Robustness tests

	Dependent variable: Capex-to-lagged PPE							
Information proxy:	bid-ask spread				R&D			
Governance proxy ranking:	Disclosure		Market cap-to-GDP		Disclosure		Market cap-to-GDP	
	High	*Low*	*High*	*Low*	*High*	*Low*	*High*	*Low*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Q_{t-1}	0.0693***	0.0513***	0.0469***	0.0803***	0.0645***	0.0453***	0.0458***	0.0733***
	(5.08)	(3.73)	(3.75)	(5.94)	(4.57)	(3.15)	(3.70)	(4.70)
$Delist_{,t}$	-0.1299*	-0.0854	-0.0945	-0.1052*	-0.1511**	-0.1081*	-0.1270**	-0.1237**
	(-1.76)	(-1.34)	(-1.44)	(-1.91)	(-2.24)	(-1.77)	(-2.08)	(-2.07)
INF_t	0.0859	-0.0842*	-0.0029	-0.1813***	-0.0001	-0.1589**	-0.0117	-0.1506***
	(1.09)	(-1.87)	(-0.04)	(-2.75)	(-0.34)	(-2.30)	(-0.26)	(-2.67)
Q_{t-1} x $Delist_t$ x INF_t	-0.0928	-0.1274**	-0.0858*	-0.2028**	-0.1285*	-0.2065***	-0.0924	-0.1955***
	(-1.62)	(-2.08)	(-1.82)	(-2.01)	(-1.95)	(-3.01)	(-1.64)	(-3.22)
Q_{t-1} x $Delist_t$	0.0513	0.0414	0.0302	0.0567	0.0715*	0.0582	0.0444	0.0790**
	(1.20)	(1.01)	(0.85)	(1.63)	(1.92)	(1.33)	(1.29)	(2.06)
Q_{t-1} x INF_t	-0.0383	0.0384	-0.0124	0.1429**	0.0141	0.0894**	0.0046	0.0900***
	(-1.32)	(1.64)	(-0.49)	(2.47)	(0.42)	(1.98)	(0.21)	(2.82)
$Delist_{i,t}$ x INF_t	0.0360	0.2369**	0.0593	0.3025*	0.1220	0.3522***	0.1323	0.2559***
	(0.34)	(2.09)	(0.60)	(1.95)	(1.02)	(3.20)	(1.43)	(2.86)
CF_t	0.0738	0.2160**	0.1381*	0.0673	0.0844	0.2120**	0.1443*	0.0885
	(0.91)	(2.00)	(1.82)	(0.74)	(1.04)	(2.03)	(1.86)	(1.09)
$SIZE_{t-1}$	-0.0477***	-0.0351***	-0.0469***	-0.0261***	-0.0469***	-0.0356***	-0.0461***	-0.0267***
	(-6.27)	(-4.36)	(-6.29)	(-6.17)	(-6.09)	(-4.27)	(-6.22)	(-6.06)
Constant	0.7702***	0.6147***	0.4005***	0.5198***	0.7532***	0.6296***	0.3923***	0.5271***
	(4.99)	(5.26)	(3.51)	(7.45)	(4.71)	(4.67)	(4.16)	(8.37)
(β_4Pre-Rule =β_4Post-Rule) (*p*-value)	(0.000)		(0.000)		(0.000)		(0.000)	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,815	1,884	2,019	2,168	1,815	1,884	2,019	2,168
R-squared	0.216	0.259	0.183	0.321	0.214	0.267	0.180	0.326

Table 2.13 reports regression estimates for equation (2.5). We use two proxies of information asymmetry: 1) the *Bid-Ask spread* is measured as annual median of the daily difference between bid and ask prices, scaled by the mean of bid and ask prices; 2) and *R&D* expenses. We compute changes on these measures around the cross-delisting year (*t*), from years *t-1 to t+1*. The dependent variable is *Investment*, which is measured as capital expenditures scaled by lagged PPE. *Q* is the market value of equity plus book value of assets minus book value of equity scaled by the book value of assets. $Delist_t$ is an indicator variable equal to one if a treatment firm is delisted in year *t*, and zero otherwise. *INF* is

set to one for firms whose changes in *Bid-Ask spread* and in *R&D* are above median, and zero otherwise. *Cash Flow* is the net income plus depreciation and amortization expenses scaled by lagged total assets. *SIZE* is the logarithm of total assets. *Disclosure* is the disclosure requirements index proposed by La Porta, Lopez-De-Silanes and Shleifer (2006). *Market cap-to-GDP* is a financial indicator from World Bank. We assign firms based on *Disclosure index* and *Market capitalization* scaled by GDP as high or low according if they are above or below the median of these variables values, respectively, in their countries. All variables are defined in Appendix 2.A. Is also reported the *p*-value of a *z*-test that evaluates whether the coefficient $\beta_4(Q_{i,t-1} \times Delist_{i,t} \times INF_{i,t})$ is equal across voluntary subsamples of *High* and *Low*. In all models standard errors are clustered by firm and year. Regressions include year, industry and country fixed effects. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

2.5 MAIN CONCLUSIONS

In this chapter we provide new evidence about the real economic effects of cross-delisting from U.S. stock exchanges on firms' financial constraints and investment sensitivities. We use cross-delistings as a quasi-experiment and employ a difference-in-differences methodology to test our main hypotheses that post-cross-delistings firms become more financially constrained and their information deteriorates. Our sample consists of 583 firms from 38 countries that cross-delisted from a U.S. exchange (treatment firms), 564 cross-listed control firms, and 10,397 never-cross-listed control firms, over the period of 2000-2012. We document an increase in investment- and cash-to-cash flow sensitivities following a cross-delisting from U.S. exchange markets for our group of treatment firms compared to each of the control groups of cross-listed or never-cross-listed firms. This result is quite persistent and does not depend on whether the cross-delisting was voluntary or involuntary; it does not depend also on whether the cross-delisting occurred before or after the Rule 12h-6 of 2007, which that made deregistrations and cross-delistings easier and less costly. This evidence supports our argument that post-cross-delisting firms become more financially constrained. We also show that this effect is stronger for firms from Civil Law countries; thus, keeping all else equal, firms that face weaker domestic shareholder protection seem to lose more after cross-delisting from U.S. stock exchanges.

As the increase in financial constraints may, in part, be related to a deterioration in firm's information environment post-cross-delisting, we further investigate whether stock prices become less informative for managers following the cross-delisting. We find that investment-to-price sensitivity decreases after cross-delisting for firms that increased their information asymmetry (higher bid-ask spreads or R&D expenses) around the delisting event. This finding might help to explain the increasing sensitivity of investment to internal funds; cross-delisted firms face higher financial constraints, which can be partially driven by asymmetry deterioration in their information environment and in turn enhances the firms' cost of capital.

Overall, our findings are consistent with the "bonding" hypothesis; if foreign firms are able to improve their information environment after cross-listing on a U.S. exchange market, especially when those firms come from countries with poor shareholder protection and less developed financial markets, then we expect to find the opposite

effect when they leave the U.S. markets. Our study provides evidence that this is the case and that there are adverse real economic consequences that affect firms' investment decisions.

APPENDIX 2.A – Definitions and Sources of the variables

VARIABLE	DEFINITION	SOURCE
Firm-level		
Acquisitions	Net assets from acquisitions divided by lagged total assets.	Worldscope
AGE	Logarithm of the number of years since firms appeared for the first time in Database.	Datastream
Assets Growth	Percentage change in total assets over a one-year period.	Worldscope
Bid-Ask spread	Yearly median of the daily difference between bid and ask prices, scaled by the mean of bid and ask prices.	Datastream
Bond Rating	Bond rating from the Standard and Poor's agency.	SDC and Datastream
Capex-to-TA	Capital expenditures (CAPEX) divided by lagged total assets (TA).	Worldscope
Cash Flow	Net income plus depreciation and amortization expenses divided by lagged total assets.	Worldscope
Cash Holdings	Cash and marketable securities divided by lagged total assets.	Worldscope
Delist	Dummy variable that equals one if a firm is delisted from US exchange markets (NYSE or NASDAQ) in a given year, and zero otherwise.	SEC website, Datastream and Citibank
Expenditures	Capital expenditures scaled by lagged total assets.	Worldscope
Financing Deficit	Numerator: the sum of cash dividends, net investments, and net changes in working capital, less internal cash flows (net income, depreciation and amortization expenses, and deferred taxes). Denominator: lagged total assets (see Frank and Goyal, 2003). Deferred taxes are set to zero when they are missing.	Worldscope
Fixed Assets ratio	Property, Plant and Equipment (PPE) divided by total assets.	Worldscope
Investment	Capital expenditures (CAPEX) divided by lagged property, plant and equipment (PPE).	Worldscope
Leverage ratio	Total debt (short-term plus long-term debt) divided by total assets.	Worldscope
Market capitalization	Market price (year-end) multiplied by the number of common shares outstanding, denominated in US dollars and converted at fiscal year-end exchange rates.	Datastream
O-Score	$O=1.3-0.4X_1+6.0X_2-1.4X_3+0.8X_4-2.4X_5-1.8X_6+0.3X_7-1.7X_8-0.5X_9$ X_1=log(total assets); X_2=total liabilities-to-total assets; X_3=net working capital-to-total assets; X_4=current liabilities-to-current assets;X_5=1 (if total liabilities exceeds total assets) or 0 otherwise;X_6=net income-to-total assets;X_7=cash flow from operations-to-total liabilities;X_8=1 (if net income was negative for the last two years) or 0 otherwise; X_9=changes in	Ohlson (1980)

VARIABLE	DEFINITION	SOURCE
	net income scaled by the net income for the last 2 years.	
R&D	Changes in research and development (R&D) expenses. R&D is set to zero when it is missing.	Worldscope
Rating	Probability of a firms' debt being rated predicted by a logistic model proposed by Lemmon and Zender (2010).	Worldscope
Return on Assets (ROA)	Earnings before interest and taxes (EBIT) divided by lagged total assets.	Worldscope
Sales Growth	Sales growth is measured as the percentage change in sales over year t-1 to t	Worldscope
SIZE	Logarithm of total assets.	Worldscope
Standard deviation stock returns	Standard deviation of weekly firm-specific returns.	Datastream
(Tobin's) *Q*	Numerator: market value of equity plus book value of assets minus book value of equity. Denominator: book value of assets.	Worldscope
Total Assets (TA)	Total Assets in US dollars, converted at fiscal year-end exchange rates.	Worldscope
Treat	Dummy variable that equals 1 if a firm is included in the treatment group or 0 otherwise.	SEC website, Datastream and Citibank
ΔNet Working capital (ΔNWC)	Current assets excluding cash and marketable securities divided by current liabilities. Changes in NWC is scaled by lagged total assets.	Worldscope
ΔShort-Term Debt (ΔSTD)	Changes in short-term debt scaled by lagged total assets.	Worldscope
Industry-Level		
INDUSTRY	Classification according Fama and French 48 Industry Codes.	Fama and French (1997)
SIC CODE	4-digit Standard Industrial Classification (SIC) Code.	Datastream
Country-Level		
Anti-Self–Dealing Index	Index that measures shareholder's rights. The index ranges between 0 and 0.66.	Djankov *et al.* (2008)
Legal Origin	Indicator variable that equals one for Common Law (Civil Law) countries and zero otherwise.	La Porta, Lopez-De-Silanes and Shleifer (2008)
Market cap-to-GDP	Market capitalization divided by Gross domestic product (GDP).	World Bank

APPENDIX 2.B – Measures of Financial Constraints

I. PAYOUT RATIO

Following Almeida, Campello and Weisbach (2004), the *Payout ratio* is the ratio of cash dividends plus repurchases of common and preferred stock[51] to operating income, thus we have

Payout ratio = (Cash Dividends + Repurchases) / Operating Income

II. KZ INDEX

The KZ INDEX is calculated adopting Lamont, Polk and Saá-Requejo (2001) method:

$$KZ = -1.001909CF_{i,t} + 0.2826389Q_{i,t} + 3.139193DEBT_{i,t} - 39.36780TDIV_{i,t} - 1.314759CASH_{i,t}$$

where, $CF_{i,t}$ is Cash Flow (income before extraordinary items plus depreciation and amortization expenses) divided by lagged PPE; $Q_{i,t}$ is measured as total liabilities plus market value of equity plus preferred stock[52] minus deferred taxes divided by the total capital (sum of long- and short-term debt plus total shareholders' equity); $DEBT_{i,t}$ is the sum of total long- and short-term debt divided total capital; $TDIV_{i,t}$ is the sum of cash dividends of common and preferred dividends divided by lagged PPE; $CASH_{i,t}$ is cash and short-term investments divided by lagged PPE.

III. WW INDEX

$$WW = 0.091CF_{i,t} + 0.021TLTA_{i,t} - 0.062DIVPOS_{i,t} - 0.044LNTA_{i,t} + 0.102ISG_{i,t} + 0.035SG_{i,t}$$

where, $CF_{i,t}$ is Cash Flow (income before extraordinary items plus depreciation and amortization expenses) divided by total assets; $TLTA_{i,t}$ is the sum of total long- and short-term debt divided by divided by total assets; $DIVPOS_{i,t}$ is a dummy variable that takes one if the firm pays dividends and zero otherwise; $LNTA_{i,t}$ is the logarithm of total assets; $ISG_{i,t}$ is the firm's 3-digit industry sales growth; $SG_{i,t}$ is the annual percentage change in sales.

[51] Repurchases of common and preferred stock are set to zero when they are missing.

[52] Preferred stock is set to zero when it is missing.

APPENDIX 2.C – Logit Regression Predicting Bond Rating

	Dependent Variable: *Bond Rating*
	(1)
$SIZE_{t-1}$	0.2578***
	(13.96)
ROA_{t-1}	0.0969
	(0.57)
FIXED $ASSETS_{t-1}$	-0.4526***
	(-2.99)
Q_{t-1}	0.0848***
	(4.66)
$LEVERAGE_{t-1}$	-1.9061***
	(-11.64)
AGE_{t-1}	-0.1857**
	(-2.26)
$STDEV_{t-1}$	-0.5576
	(-0.58)
Constant	-0.9346
	(-1.31)
Year FE	Yes
Industry FE	Yes
Country FE	Yes
Observations	8,064
R-squared	0.145

This Table reports the results from a logit regression predicting the probability of a firm debt being rated in a given year. We follow Lemmon and Zender (2010) and use a predictive (logit) model of whether a firm has a bond rating in a given year. The dependent variable is one if a firm has a debt rating in a given year, and zero otherwise. The covariates in the logit regression are *SIZE* (log of total assets), *ROA* (earnings before interest and taxes scaled by total assets), the *Fixed Assets* ratio (measured as property, plant, and equipment scaled by total assets), the (*Tobin's*) *Q* (normalized stock price, measured as market value of equity plus book value of assets less book value of equity scaled by book value of total assets), the *Leverage* ratio (total debt scaled by total assets), *AGE* (the logarithm of the number of years since the firm first appeared on Datastream), and the *Standard Deviation* (STDEV) of stock returns. All of the covariates are lagged one period and are described in Appendix 2.A. Regressions include year, industry and country fixed effects. Robust *z*-statistic in parentheses. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively

CHAPTER 3 - EARNINGS MANAGEMENT AND STOCK PRICE CRASHES POST-CROSS-DELISTING

3.1 INTRODUCTION

Foreign firms that cross-list on a United States (U.S.) stock exchange commit themselves to a set of financial disclosure requirements, in general more stringent than the domestic reporting requirements, imposed by the Securities and Exchange Commission (SEC), and in accordance with U.S. generally accepted accounting principles (GAAP). This new legal environment brings important benefits to the firms as their corporate governance improves, as explained in the "bonding hypothesis" of Coffee (1999, 2002) and Stulz (1999). Moreover, Lang, Lins and Miller (2003) argue that this stricter regulatory environment mitigates managers' ability to manipulate financial information. Those authors document that cross-listed firms on U.S. exchanges engage less in earnings management than cross-listed firms on other non-U.S. exchanges. Higher levels of earnings management mean that managers have more latitude to manipulate information and withhold bad news, resulting in a higher level of firm opacity as the financial statements become less informative (e.g., Jin and Myers (2006), Kothari, Shu and Wysocki (2009)). Therefore, firms where managers are more engaged in earnings management are more likely to observe, in the near future, a stock price crash, i.e., a sudden and sharp decline of their stock prices. Based on these arguments, we predict that after foreign firms cross-delist from the U.S. stock exchanges, as their legal environment becomes less strict (a reverse "bonding" effect), managers will have more incentives to use earnings management to withhold bad news. Therefore, we expect that post-cross-delisting firms will experience an increase in their crash risk associated with earnings management.

We test our main hypotheses using a treatment group of 583 cross-delisted firms from the major U.S. stock exchanges (4,192 firm-years observations) and a control group of 564 cross-listed firms (4,900 firm-year observations). Our final sample includes 42 countries. We follow previous literature on stock price crash risk (e.g., Hutton, Marcus and Tehranian (2009), Kim, Li and Zhang (2011a ; 2011b), Boehme, Fotak and May (2014), DeFond *et al.* (2015), Fauver, Loureiro and Taboada (2015)) and use different regressions techniques and alternate crash risk measures. Our findings

show a significant increase in crash risk associated with earnings management in the post-cross-delisting period relative to a control group of firms that remained cross-listed. Moreover, we find that this effect is more pronounced when foreign firms are from less developed countries (lower Gross Domestic Product (GDP) per capita) and countries with weaker shareholder protection (La Porta, Lopez-De-Silanes and Shleifer, 2008), whereas firms from countries with stronger investor protection are less likely to engage in earnings management post-cross-delisting. This result is consistent with Leuz, Nanda and Wysocki (2003), who find that earnings management tends to be more pronounced in weaker investor protection regimes and poor information environments. Our results also support the idea that delisted firms with more opaque information environments (i.e., those with higher bid-ask spreads or more R&D expenses) are more prone to engage in earnings management. This effect is significantly higher in the post-delisting period relative to the pre-delisting period. Taken together, our evidence is consistent with the arguments of the "bonding" hypothesis in the sense that our results suggest a reverse "bonding" effect after the firm cross-delists and is no longer under the stricter legal environment imposed by the U.S. market regulators.

We further extend our analysis to the issuance of new equity to relate our findings with other studies that document a greater incidence of earnings management around these corporate events. For instance, Teoh, Welch and Wong (1998) provide evidence that, prior to an equity issuance, managers have stronger motivation to manipulate the firm's financial information; this evidence adds support to the hypothesis that seasoned equity offerings (SEOs) can also be proceeded by stock price crashes. Indeed, there is a growing literature on earnings management around SEOs associated with stock price crashes (Boehme, Fotak and May, 2014; Fauver, Loureiro and Taboada, 2015). We thus examine whether managers of cross-delisted firms engage in more earnings management around SEOs in the post-cross-delisting period. Although the equity issuance activity is significantly lower in the post-cross-delisting period, we still observe that post-cross-delisting firms engage in more earnings management prior to the SEO than when they are cross-listed, which also reflects the greater incentives of managers to manipulate earnings around SEOs when the firms have no longer to comply with the stricter disclosure requirements imposed by the SEC.

The empirical findings of our study contribute to the growing literature of stock crash risk that has received greater attention since the financial crisis of 2007-2008

(Hutton, Marcus and Tehranian, 2009; Kim, Li and Zhang, 2011a, 2011b; Boehme, Fotak and May, 2014; DeFond *et al.*, 2015, Fauver, Loureiro and Taboada, 2015) and to the vast literature on the benefits of cross-listing on a U.S. stock exchange (e.g. Stulz (1999), Coffee (1999, 2002), Doidge, Karolyi and Stulz (2004), Doidge, Karolyi and Stulz (2009)) by showing signs of a reverse "bonding" effect after cross-delisting, especially in firms with poor information environments, from less developed countries, or countries with weaker shareholder protection

The remainder of this chapter proceeds as follows. Section 3.2 provides a review of the related literature and outlines our research hypotheses. Section 3.3 describes our data and the methodology. Section 3.4 discusses the empirical results. Section 3.5 concludes.

3.2 LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

There is, to some extent, an institutional guarantee that cross-listed firms in U.S. stock exchanges are held to similar standards as U.S. domestic firms, meaning that, on average, foreign firms benefit from an improvement in their information environment and financial transparency after cross-listing (Lang, Lins and Miller, 2003). This rationale is based on the assumption post-cross-listing, due to the more stringent disclosure requirements, that managers have lower incentives to manipulate the financial reporting process. Consistent with this view, Lang, Lins and Miller (2003) show that managers of firms cross-listing in U.S. exchanges are less prone to engage in earnings management and that financial reporting is more strongly correlated with stock prices. Their findings are based on a matched sample of cross-listed firms on U.S. stock exchanges and cross-listed firms on non-U.S exchanges. Additionally, Leuz, Nanda and Wysocki (2003) point out that investor protection is the key driver of earnings management activity around the world. They examine cross-country differences in earnings management and find that stronger protection of minority investors' rights mitigate insiders' incentives to manage reported earnings because they have little to cover from investors. Further, they find a negative relation between corporate governance measures and earnings management proxies based on discretionary

accruals[53]. Discretionary accruals are considered a measure of financial reporting opacity because it masks some information about the firm's fundamentals (Sloan, 1996).

Managers can use their accounting discretion to manipulate financial reporting and manage the flow of information to the market. For instance, managers can manipulate financial information disclosure by accelerating the reporting of future revenues or delaying the reporting of current costs to hide poor current performance. Conversely, managers can withhold information about strong current performance to create reserves in the future. These movements create a smoothing effect, making earnings less variable than the firm's true economic performance (Leuz, Nanda and Wysocki, 2003). However, the amount of information that can be delayed or withheld by managers is limited and they tend more often to withhold bad news than good news (Kothari, Shu and Wysocki, 2009). Consequently, as Jin and Myers (2006) refer, at some point in time all bad news will come out simultaneously, leading to a crash in the stock price. Indeed, some recent empirical literature on stock price crashes (e.g., Hutton, Marcus and Tehranian (2009), Kim, Li and Zhang (2011a ;2011b), Boehme, Fotak and May (2014), DeFond *et al.* (2015), Fauver, Loureiro and Taboada (2015)) provide evidence that firms that withhold significant amount of negative news for an extend period of time experience a sudden crash in stock price when the true information is revealed. Thereby, previous literature on crash risk considers earnings management based on discretionary accruals as a reliable predictor of crash risk. We combine these two branches of the literature to analyze how the relation between crash risk and earnings management changes after firms cross-delist from a U.S. stock exchange and that are no longer under the SEC disclosure requirements. If we believe that a reverse "bonding" effect will occur post-cross-delisting, then we should expect a higher sensitivity of crash risk to earnings management. However, it is also important to emphasize that the quality of financial reporting is strongly affected by regulatory enforcement, legal environment and managerial incentives (e.g., Lang, Lins and Miller (2003), Lang, Raedy and Yetman (2003), Leuz, Nanda and Wysocki (2003), Lang, Raedy and Wilson (2006)). Consistent

[53] Accruals can be decomposed in discretionary and nondiscretionary. The discretionary component of accruals identifies management decisions, while the nondiscretionary component reflects operating business conditions. According to prior research on earnings management (e.g., Healy (1985), DeAngelo (1986), Jones (1991), Dechow, Sloan and Sweeney (1995)), discretionary accruals is considered a well-fitted proxy for earnings quality because it reflects management decisions.

with "bonding" hypothesis, Lang, Raedy and Yetman (2003) find that cross-listed firms on U.S. exchanges have better information environment than non-cross-listed firms, which is associated with higher market valuations. Therefore, it is expected that strong regulatory enforcement and disclosure standards provided by a cross-listing in U.S. exchanges should reduce managers' capacity to manipulate information. This argument stresses the importance of legal systems in protecting investors' rights (e.g., La Porta *et al.* (1998), La Porta, Lopez-De-Silanes and Shleifer (2008)), which limits incentives to mask firm's true performance (Leuz, Nanda and Wysocki, 2003)). Furthermore, the level of opacity (i.e., information asymmetry) also affects the relation between earnings management and crash risk. Firms with more information asymmetry that engage in earnings management are even more likely to suffer crash risk (e.g., Hutton, Marcus and Tehranian (2009), Kim, Li and Zhang (2011a; 2011b)). Consistent with this view, previous international evidence on crash risk (e.g., Jin and Myers (2006), Fauver, Loureiro and Taboada (2015)), supports that corporate managers in more opaque informational environments should find it easier to withhold bad news and, consequently, should experience higher crash risk. Thereby, we predict that cross-delisted firms with poor quality of information environment that terminate reporting requirements with the SEC, should be motivated to engage in higher levels of earnings management.

Based on that previous evidence, we formulate our first hypotheses.

Hypothesis 1a: After cross-delisted from U.S. exchange markets, firms that engage in earnings management will experience higher crash risk.

Hypothesis 1b: The increase in crash risk associated with earnings management should be stronger for cross-delisted firms from countries with weaker institutional quality and firms with information asymmetry.

Prior literature shows that managers manipulate financial reporting through discretionary accruals to inflate firms' earnings prior to an SEO (e.g., Boehme, Fotak and May (2014), Fauver, Loureiro and Taboada (2015)). Managers will be more motivated to issue equity when they have information about a decline in future earnings (Ross, 1977), or when they have the perception that the stock price is overvalued (Graham and Harvey, 2001; Baker and Wurgler, 2002). Previous research also finds

support that equity issuance is associated with poor operating performance subsequent to an SEO (e.g., Teoh, Welch and Wong (1998), Cohen and Zarowin (2010)).

Recently, Boehme, Fotak and May (2014) find evidence that prior equity issues predict current stock price crashes. They use a sample of U.S.-domiciled firms and provide some interesting results: (i) SEOs involving the sale of secondary shares[54] are even more likely to crash relative to those that do not involve secondary sales; (ii) crash risk is not mitigated by the degree of monitoring from equity analysts and reputable underwriters. Using a cross-country sample of European countries, Fauver, Loureiro and Taboada (2015) find that equity issuers experience a significant increase in crash risk in the post-SEO period; this effect is more pronounced for firms in poor information environments that engage in earnings management prior to an SEO. Based on those previous findings, we formulate our final hypothesis.

Hypothesis 2: Cross-delisted firms from U.S. exchange markets will experience higher crash risk subsequent to an SEO, especially those with more aggressive earnings management prior to the SEO.

3.3 DATA AND METHODOLOGY

3.3.1 Data

Our initial sample, collected from the SEC's website, includes all foreign firms with equity shares registered and reporting with the SEC. Information about delistings is from EDGARS's archive, Form 15F filed between 2000 and 2012. Based on this information, we identified firms that cross-delisted and those that remained listed during our sample period.

We cross-checked and complemented information collected from SEC's website with information from other sources, including Bank of New York, Citibank, NYSE, NASDAQ, OTCBB and OTC Markets Portal.

Financial data are from the Worldscope database and stock price data are from Datastream. As a standardized procedure in literature, we exclude financial firms (SIC

[54] Secondary shares are shares that exist prior to an offering and are sold by either insiders (officers or directors) or large blockholders.

codes between 6000 and 6999) and utilities (SIC codes between 4900 and 4949) because their accounting figures are ruled by special statutory requirements. We also eliminate observations with total assets under $10 million, with negative or missing information on assets, sales, market and book value of equity. To reduce the effect of outliers, all the variables are winsorized at 1% in each tail. We measure all monetary variables in millions of 2000 US dollars.

Data on SEOs are from Thomson Financial's Securities Data Corporation (SDC); we collected information on the issuance date, the proceeds raised in each issue, the market(s) where the security was issued, and the offer price. Then, we follow Corwin (2003) and exclude all securities that do not represent pure equity shares (e.g., unit offers, rights, mutual conversions, equity offerings by closed-end investment funds, real estate investment trusts, unit investment trusts). This screen process leads to a treatment group of 583 cross-delisted firms (4,192 firm-years observations), and a control group of 564 cross-listed firms (4,900 firm-year observations); our final sample includes 42 countries. Our treatment group includes all firms that have delisted at some point between 2000 and 2012, while the control group includes all firms that remained cross-listed. Other variables, namely industry-level and country-level variables, are collected from a variety of sources. All variables are described in Appendix 3.A.

3.3.2 Stock Price Crashes and Firm-specific Returns

To estimate crash risk measures, first we estimate firm-specific weekly returns. As DeFond *et al.* (2015), we use weekly returns to mitigate measurement problems associated with low frequent trading and issues related with inaccurate return distributions associated with daily returns. We estimate firm-specific weekly returns from the model below, using the local market index and a world market index. As in Hutton, Marcus and Tehranian (2009), we include lead and lag domestic (world) stock market returns to account for nonsynchronous trading.

$$R_{i,t} = \alpha_i + \beta_{i,t-1}R_{m,t-1} + \beta_{i,t}R_{m,t} + \beta_{i,t+1}R_{m,t+1} + \beta^{w}_{i,t-1}R_{w,t-1} + \beta^{w}_{i,t}R_{w,t} + \beta^{w}_{i,t+1}R_{w,t+1} + \varepsilon_{i,} \quad (3.1)$$

where $R_{i,t}$ is firm i's stock return in week t; $R_{m,t}$ is the domestic market index return in week t; $R_{w,t}$ is the return on the world market index in week t, and $\varepsilon_{i,t}$ is firm i's weekly firm-specific return. Following prior literature (e.g., Boehme, Fotak and May (2014), Fauver, Loureiro and Taboada (2015)), we construct our measure of firm-specific return as the natural logarithm of one plus the firm-specific return ($\varepsilon_{i,t}$). The firm-specific log-return is denoted as *RETURN*.

We use alternate measures of crash risk. As in Hutton, Marcus and Tehranian (2009) and Boehme, Fotak and May (2014), our first crash risk measure is an indicator variable *CRASH*, which equals one if a firm experiences one or more stock price crashes during the current year t and zero otherwise. A stock price crash, in year t, occurs whenever the firm-specific weekly return of firm i falls by 3.09[55] or more standard deviations below its mean in that same year. Because cross-delisting announcements can themselves lead to stock price crashes, we eliminate those that happened around the cross-delisting announcement.

Panel A of Table 3.1 reports the number of firms that experienced a stock price crash in each year between 2000 and 2012, as well as the incidence of stock price crashes per year by treatment (pre- and post-) and control group. In Panel B of Table 3.1, we observe an incidence of stock price crashes of 19.5% (23.8%) in our firm-year panel of the pre- (post-) treatment group. The proportion of cross-delisted firms that register stock crashes in the post-delisting period is 4.3pp higher than in the pre-delisting period and this difference is statistically significant. Panel C of Table 3.1 shows that the incidence of stock price crashes is of 20.7% (17.3%) in our firm-year panel of the treatment (control) group. The difference between groups is statistically significant, which means that the treatment group registers a higher proportion (3.4pp) of stock crashes than the control group of cross-listed firms.

[55]As in Hutton, Marcus and Tehranian (2009), the cutoff of 3.09 standard deviations is chosen to generate a frequency of 0.1% in the normal distribution.

TABLE 3.1: Frequency of Stock Price Crashes

Panel A – Frequency of Stock Price Crashes

	No. Firms with Stock Price Crashes			% Firms with Stock Price Crash		
	Treatment		Control	Treatment		**Control**
	PRE	POST		PRE	POST	
2000	53	0	23	13.5%	0.0%	13.5%
2001	85	3	43	21.6%	17.6%	21.6%
2002	90	9	59	25.0%	24.3%	25.0%
2003	57	8	34	17.4%	16.7%	17.4%
2004	63	13	47	19.7%	21.7%	19.7%
2005	59	20	62	20.6%	26.0%	20.6%
2006	45	16	57	18.1%	18.4%	18.1%
2007	47	28	75	28.1%	19.2%	28.1%
2008	45	48	102	37.5%	31.4%	37.5%
2009	13	36	97	15.1%	24.2%	15.1%
2010	14	28	56	23.7%	18.2%	23.7%
2011	5	45	85	17.9%	30.2%	17.9%
2012	0	39	110	0.0%	26.2%	0.0%
Total	*576*	*293*	*850*	*19.5%*	*23.8%*	*17.3%*

Panel B – Univariate Comparisons: Pre- and Post-Cross-Delisting

	Pre	**Post**	**Difference**
No. Firm-years with Stock Price Crashes	576	293	
% Firms with Stock Price Crashes	19.5%	23.8%	**-4.3pp** ***
t-test			(18.95)

Panel C – Univariate Comparisons: Treatment and Control Group

	Treatment	**Control**	**Difference**
No. Firm-years with Stock Price Crashes	869	850	
% Firms with Stock Price Crash	20.7%	17.3%	**3.4pp** ***
t-test			(22.44)

Table 3.1 reports the frequency of stock price crashes for our sample divided by treatment and control group across 2000-2012 period. The treatment sample consists of 583 cross-delisted firms (4,192 firm-year observations) and the control group consists of 564 cross-listed firms (4,900 firm-year observations) from 42 countries. For a firm *i* in year *t*, a stock price crash is identified if the firm-specific weekly return is 3.09 or more standard deviations below the mean of that year. Firm-specific return for firm *i* in year *t* are estimated using the market model from equation (3.1) and is computed as the logarithm of one plus firm-specific return. Panel A describes by year and by treatment (pre- and post-cross-delisting) and control group the number ("No.") of firms that experienced stock price crashes and the proportion of firms that experienced stock price crashes (expressed in %). Panel B shows the proportion of treatment firms that experienced stock price crashes pre- and post-cross-delisting over 2000-2012. Panel C shows the proportion of treatment and control firms that experienced stock price crashes over 2000-2012. Differences are expressed in percentage points (pp). ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

A flaw of the variable *CRASH* is that it does not capture the asymmetry in the return distribution; when the left tail of stock returns distribution is fatter and longer than the right tail, firms are more prone of experiencing extreme negative stock returns (DeFond *et al.*, 2015). To overcome this issue, in the multivariate analysis we use two measures initially proposed by Chen, Hong and Stein (2001) and used in several other studies (e.g., Chen, Hong and Stein (2001), Kim, Li and Zhang (2011a ; 2011b), Boehme,

Fotak and May (2014), DeFond *et al.* (2015)), namely the negative skewness – *NSKEWN* – and down-to-up volatility – *DUVOL*. The *NSKEWN* is defined as the negative one multiplied by the skewness of the firm-specific weekly returns in a given year. This measure captures the magnitude of left-ward skewness of the firm's weekly returns; it will be greater when firm's returns are more negatively skewed. Hence, larger values of *NSKEWN* indicate greater crash risk. The other alternate measure of crash risk is the down-to-up volatility (*DUVOL),* defined as the standard deviation of the firm-specific weekly returns that are below the firm's mean divided by the standard deviation of the firm-specific weekly returns that are above the firm's mean in a given year. *DUVOL* captures asymmetric volatilities between negative and positive returns. Once again, larger values of *DUVOL* indicate greater crash risk.

Hypothesis 1a posits that cross-delisted firms that engage in earnings management will experience subsequent increases in crash risk. Consistent with previous literature (e.g., Hutton, Marcus and Tehranian (2009)), we use the total value of discretionary accruals as a proxy for earnings management. High values of discretionary accruals suggest that managers manipulate the financial information to distort reported earnings, thus masking the true firm's performance. To test hypothesis 1a we follow the literature (see e.g., Chen Hong and Stein (2001), Kim, Li and Zhang (2011a), (2011b), Boehme, Fotak and May (2014)) and model the propensity of cash risk as function of earnings management. We use information from year *t-1* to predict crashes in year *t* and estimate several specifications of equation (3.2).

$$Crash\ Risk_{i,t} = \alpha_i + \beta_1 EM_{i,t-1} + \beta_2 Delist_{i,t} + \beta_3 Treat_i + \beta_4 EM_{i,t-1} \times Delist_{i,t} \times Treat_i + \beta_5 EM_{i,t-1} \times Delist_{i,t} + \beta_6 EM_{i,t-1} \times Treat_i + \beta_7 Delist_{i,t} \times Treat_i + \gamma_1 \left(Control\ firm - level_{i,t-1}\right) + \lambda_k + \eta_j + \gamma_t + \varepsilon_{i,t} \quad (3.2)$$

where $Crash\ Risk_{i,t}$ is the dependent variable that corresponds to the alternate measures of crash risk (*NSKEWN* and *DUVOL)* for firm *i,* in year *t*. $EM_{i,t-1}$ is an indicator variable that equals one for firms above median of discretionary accruals in their country, and zero otherwise. $Delist_{i,t}$ is an indicator variable that equals one starting in year *t+1* after the cross-delisting event, and zero otherwise. $Treat_i$ is an indicator variable that equals one if firm *i* is included in our treatment group in year *t*,

and zero otherwise. The treatment group includes all firms in our sample that have cross-delisted at some point in time between 2000 and 2012. Consistent with previous studies (e.g., Chen Hong and Stein (2001), Kim, Li and Zhang (2011a; 2011b), Boehme, Fotak and May (2014)), our set of controls includes the following variables: $TURN_{i,t-1}$ is the annual change in the average monthly share turnover in the previous year (*t-1*); $SIZE_{i,t-1}$ is the natural logarithm of the market value of equity in year *t-1*; $STDEV_{i,t-1}$ is the standard deviation of weekly firm-specific returns in year *t-1*; $RETURN_{i,t-1}$ is the average firm-specific weekly return in year *t-1*; $ROA_{i,t-1}$ is the net income before extraordinary items scaled by total assets in year *t-1*; $LEVERAGE_{i,t-1}$ is the short-term plus long-term (total) debt scaled by total assets in year *t-1*; $ALPHA_{i,t-1}$ is the natural logarithm of one plus the intercept (alpha) estimated from equation (3.1) in the prior year, which captures whether the firm outperformed or underperformed the market; $MB_{i,t-1}$ is the market value of equity divided by the book value of equity in year *t-1*; $DISACCRUAL_{i,t-1}$ is the absolute value of discretionary accruals[56], estimated according the modified Jones' (1991) model (Dechow, Sloan and Sweeney 1995). We estimate discretionary accruals as the residuals from equation (3.3):

$$\frac{ACCRUALS_{i,t}}{TA_{i,t-1}} = \alpha_0 \frac{1}{TA_{i,t-1}} + \beta_1 \frac{\Delta REVENUES_{i,t}}{TA_{i,t-1}} + \beta_2 \frac{PPE_{i,t}}{TA_{i,t-1}} \tag{3.3}$$

where $ACCRUALS_{i,t} = \left(\Delta CA_{i,t} - \Delta CASH_{i,t}\right) - \left(\Delta CL_{i,t} - \Delta STD_{i,t}\right) - DEP_{i,t}$;$\Delta CA_{i,t}$ is the change in current assets, $\Delta CASH_{i,t}$ is the change in cash and equivalents of cash, $\Delta CL_{i,t}$ is the change in current liabilities, $\Delta STD_{i,t}$ is the change in short-term debt included in current liabilities, and $DEP_{i,t}$ is depreciation and amortization expenses, scaled by lagged total assets ($TA_{i,t-1}$); $\Delta REVENUES_{i,t}$ is computed as the change in sales minus receivables scaled by lagged total assets; $PPE_{i,t}$ is property, plant and equipment scaled by lagged total assets.

Since the probability of a stock crash in year *t* is likely to be positively correlated with crashes in year *t-1*, we add $NSKEWN_{t-1}$ and $DUVOL_{t-1}$ to our set of control variables. In our main regressions we also include country, λ_k, industry, η_j, and year, γ_t,

[56] Equation (3.3) is run separately by industry. We assign firms to industries using the classification scheme of Fama and French (1997), based on 48 industry portfolios. For further details, see section 1.3.1 of Chapter 1.

dummies to control for invariant characteristics across these dimensions. Because of this fixed effects framework, some of the coefficients in equation (3.2) drop out due to collinearity. We cluster standard errors at both country- and year-level.

Table 3.2 reports descriptive statistics for all the variables described above.

TABLE 3.2: Descriptive Statistics

	Full Sample					
	N	Mean	25th pctl.	Median	75th pctl.	Std. dev.
NSKEWN	9,092	-0.1467	-0.5745	-0.1552	0.2645	0.8721
DUVOL	9,092	1.0338	0.7938	0.9762	1.2035	0.3657
TURN	8,124	-0.0024	-0.0126	-0.0002	0.0111	0.0576
SIZE	9,092	13.6840	11.9576	13.6663	15.4462	2.3109
STDEV	9,092	0.0627	0.0355	0.0524	0.0779	0.0388
RETURN	9,092	-0.0033	-0.0076	-0.0020	0.0024	0.0106
ROA	9,092	-0.0077	-0.0313	0.0333	0.0770	0.1748
LEVERAGE	9,092	0.2287	0.0367	0.2075	0.3542	0.2009
ALPHA	9,902	0.0006	-0.0323	0.0003	0.0055	0.0110
MB	9,092	2.7950	1.0630	1.8384	3.2989	3.8576
DISACCR	9,092	0.0000	-0.0348	0.0023	0.0361	0.0802

Table 3.2 provides descriptive statistics for the full sample over 2000-2012. The treatment sample consists of 583 cross-delisted firms (4,192 firm-years observations) and the control group consists of 564 cross-listed firms (4,900 firm-year observations) from 42 countries. We exclude financial firms (SIC codes between 6000 and 6999) and utilities (SIC codes between 4900 and 4949) and firm-year observations with total assets under $10 million and with negative or missing information on total assets, sales, market and book value of equity. *NSKEWN* is the negative one multiplied by the skewness of firm-specific weekly returns in a given year. *DUVOL* - "down-to-up" volatility – is the standard deviation of below the mean firm-specific weekly returns divided by the standard deviation of above the mean firm-specific weekly returns in a given year. *TURN* is the yearly change in the average monthly share turnover in year *t-1*. *SIZE* is the logarithm of the market value of equity in year *t-1*. *STDEV* is the standard deviation of weekly firm-specific returns in year *t-1*. *RETURN* is the logarithm of one plus the residual estimated from equation (3.1) in year *t-1*. *ROA* is the net income before extraordinary items scaled by total assets in year *t-1*. *LEVERAGE* is the total debt scaled by total assets in year *t-1*. *ALPHA* is the natural logarithm of one plus the intercept (alpha) estimated from equation (3.1) in year *t-1*. *MB* is the market value of equity divided by the book value of equity in year *t-1*. *DISACCR* is the absolute value of discretionary accruals, estimated using the modified Jones' (1991) model (Dechow, Sloan and Sweeney, 1995) in year *t-1*. All variables are defined in Appendix 3.A.

3.3.3 Seasoned Equity Offerings (SEOs)

Table 3.3 shows the number of equity issuances by country over our sample period. Each year we qualify firms as issuers if they have raised equity in the prior year. We show the number of issuers and non-issuers for three separated groups: (i) post-cross-delisting group includes all firms that issued equity after being effectively cross-delisted[57]; (ii) treatment group includes all firms in our sample that have cross-delisted

[57] Moreover, we compare equity issuance date with delisting date to ensure that firms were already delisted.

at some point between year 2000 and year 2012; (iii) control group of firms that remained cross-listed firms over the sample period.

TABLE 3.3: Seasoned Equity Offerings by Country

Group:	Post Cross-Delisting				Treatment				Control			
	Issuers		Non-Issuers		Issuers		Non-Issuers		Issuers		Non-Issuers	
Country	No. Firms	Obs.	No. Firms	Obs.	No. Firms	Obs.	No. Firms	Obs.	No. Firms	Obs.	No. Firms	Obs.
Argentina*	0	0	0	0	0	0	2	12	3	4	4	56
Australia	5	6	5	22	13	27	16	94	6	9	7	48
Austria	0	0	1	5	1	4	1	8	0	0	0	0
Belgium	0	0	0	0	0	0	2	13	1	1	2	13
Brazil*	0	0	2	14	3	4	13	105	12	20	17	182
Canada	11	13	42	131	74	104	193	973	98	214	151	1,104
Chile*	0	0	6	25	4	6	9	79	3	4	5	71
China*	0	0	0	0	5	5	21	74	15	29	108	486
Colombia*	0	0	0	0	0	0	0	0	1	1	1	3
Denmark	1	1	1	5	1	3	2	19	0	0	2	25
Finland	0	0	3	15	4	5	5	41	1	3	1	12
France	3	5	14	61	15	28	23	186	4	6	9	99
Germany	5	6	16	63	12	28	20	146	4	9	5	50
Greece	0	0	1	2	5	6	5	22	21	37	23	105
Hong Kong	2	3	6	22	5	11	20	124	6	13	18	138
Hungary	0	0	1	2	1	2	1	13	0	0	0	0
India*	0	0	2	10	1	1	4	38	3	5	9	81
Indonesia*	0	0	0	0	0	0	0	0	1	1	2	29
Ireland	1	1	2	12	5	8	7	47	5	12	7	77
Israel	1	1	10	56	14	15	34	247	25	36	52	477
Italy	1	1	3	17	2	7	6	57	3	5	5	62
Japan	3	5	6	17	7	12	9	89	8	11	15	190
Korea*	1	1	3	6	2	3	7	37	4	6	5	54
Luxembourg	0	0	5	24	4	5	8	80	2	5	4	25
Mexico*	0	0	11	61	1	1	16	173	8	14	17	187
Netherlands	1	1	11	53	12	24	26	186	7	10	10	94
New Zealand	1	2	3	19	1	2	3	33	1	2	1	13
Norway	2	2	4	16	4	7	7	62	4	9	8	55
Peru*	0	0	1	5	0	0	1	15	0	0	1	15
Philippines*	0	0	0	0	1	1	1	6	0	0	1	15
Poland*	1	1	1	9	1	2	1	11	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	1	3	1	12
Russia*	0	0	3	9	0	0	4	49	1	1	2	20
Singapore	1	1	2	10	2	4	4	38	0	0	2	24
South Africa*	3	4	3	11	3	6	3	28	5	18	6	58
Spain	1	1	0	0	4	8	4	22	2	2	2	16
Sweden	3	6	8	48	6	11	12	113	0	0	1	15
Switzerland	0	0	4	17	5	8	7	55	4	8	5	56
Taiwan	0	0	1	2	1	1	1	11	5	11	10	84
Turkey*	0	0	0	0	0	0	0	0	1	5	1	7
United Kingdom	9	16	26	102	38	70	65	414	15	24	28	304
Venezuela*	0	0	3	20	0	0	4	43	0	0	0	0
All Countries	**56**	**77**	**210**	**891**	**257**	**429**	**567**	**3,763**	**280**	**538**	**548**	**4,362**

Table 3.3 describes the number of equity issuers and non-issuers by post-cross-delisting group, treatment group of cross-delisted firms and control group of cross-listed firms. Each year we qualify firms as issuers if they raise equity in the prior year (*t-1*). Each group reports the number of firms ("No. Firms") and the number of firm-year observations ("Obs."). Post-cross-delisting group includes all firms that cross-delisted at some point in time over 2000-2012 Treatment group includes all firms that are exposed to a treatment, i.e., cross-delisting. Control group includes all cross-listed firms in the sample. *Denotes a country designated as an emerging market by Standard and Poor's Emerging Market Database.

We observe in table 3.3 that firms included in treatment group issue more equity in the pre- than in the post-cross-delisting period. The proportion of SEOs is 35% in the pre-delisting period, against 10% in the post-delisting period. This result is not surprising because one of the main motivations for the cross-listing decision mentioned in literature is related to capital raisings (e.g. Lins, Strickland and Zenner (2005), Doidge, Karolyi and Stulz (2009)).

In table 3.4 we show descriptive statistics for issuers and non-issuers in the treatment and control groups. Issuers have higher crash risk than non-issuers (treatment group displays a significant difference), are larger in size ($SIZE_{t-1}$), engage in more earnings management ($DISACCR_{t-1}$) and are less profitable (ROA_{t-1}) than non-issuers. In panel B, we show that the unconditional probability of a stock crash is 25.6% (20.1%) for treatment (control) firms that issued seasoned equity in the prior year. Conversely, the unconditional probability of a crash is only 20.1% (17.0%) among treatment (control) firms that did not issue seasoned equity in the prior year. The difference between issuers and non-issuers is significant in both groups. Results provided in Panel B of Table 3.4 corroborate the previous findings of Boehme, Fotak and May (2014).

TABLE 3.4: Seasoned Equity Offerings and Stock Price Crashes: Univariate Comparisons

Panel A – Differences in means and medians between Issuers and Non-Issuers

	Treatment Group								Control Group							
	Issuers			Non-Issuers					Issuers			Non-Issuers				
	N	Mean	Median	N	Mean	Median	*Differences in Means (p-value)*	*Differences in Medians (p-value)*	N	Mean	Median	N	Mean	Median	*Differences in Means (p-value)*	*Differences in Medians (p-value)*
NSKEWN	429	-0.033	-0.090	3,763	-0.190	-0.190	***0.000***	***0.001***	538	-0.078	-0.135	4,362	-0.122	-0.132	*0.222*	*0.603*
DUVOL	429	1.082	1.033	3,763	1.027	0.955	***0.004***	***0.000***	538	1.069	1.012	4,362	1.046	0.989	*0.144*	*0.104*
TURN	417	-0.001	-0.001	3,435	-0.002	0.000	*0.760*	*0.424*	503	-0.005	-0.001	3,779	-0.003	0.000	*0.404*	*0.824*
SIZE	429	13.790	13.607	3,763	13.262	13.280	***0.000***	***0.000***	538	14.256	14.118	4,362	13.967	13.996	***0.018***	***0.056***
STDEV	429	0.071	0.060	3,763	0.066	0.0532	***0.019***	***0.007***	538	0.061	0.055	4,362	0.056	0.048	***0.006***	***0.000***
RETURN	429	-0.006	-0.004	3,763	-0.003	-0.002	***0.000***	***0.000***	538	-0.004	-0.003	4,362	-0.003	-0.002	***0.006***	***0.014****
ROA	429	-0.065	0.005	3,763	-0.030	0.024	***0.000***	***0.000***	538	0.008	0.032	4,362	0.015	0.044	***0.028***	***0.003***
LEVERAGE	429	0.237	0.219	3,763	0.251	0.246	*0.520*	*0.325*	538	0.210	0.168	4,362	0.211	0.181	*0.621*	*0.797*
ALPHA	429	-0.002	-0.001	3,763	0.001	0.000	***0.000***	***0.000***	538	0.001	0.000	4,362	0.001	0.000	*0.399*	*0.562*
MB	429	3.243	2.180	3,763	2.549	1.624	*0.126*	***0.002***	538	3.443	2.495	4,362	2.884	1.943	***0.042***	***0.000***
DISACCR	429	-0.001	0.004	3,763	-0.004	0.000	*0.489*	*0.271*	538	0.006	0.007	4,362	0.003	0.003	*0.319*	*0.504*

Panel B – Seasoned Equity Offerings and Frequency of Stock Price Crashes: Univariate Comparisons within Treatment Group

Group:	**Treatment**			**Control**		
	Issuers vs. Non-Issuers			Issuers vs. Non-Issuers		
	Firms that conducted an SEO in the prior fiscal year	Firms that did not conducted an SEO in the prior fiscal year	Difference	Firms that conducted an SEO in the prior fiscal year	Firms that did not conducted an SEO in the prior fiscal year	Difference
No. Firm-years	429	3,763		538	4,362	
% Firms with Stock Price Crash	25.6%	20.1%	**5.5pp *** (11.86)**	20.1%	17.0%	**3.1pp *** (8.94)**

Table 3.4 reports univariate comparisons between equity issuers and non-issuers over 2000-2012. Each year we qualify firms as issuers if they raise equity in the prior year (*t-1*). Panel A provides the differences in means and medians between equity issuers and non-issuers divided by treatment and control group and reports the number of observations ("N"). *NSKEWN* is the negative one multiplied by the skewness of firm-specific weekly returns in a given year. *DUVOL* - "down-to-up" volatility – is the standard deviation of below the mean firm-specific weekly returns divided by the standard deviation of above the mean firm-specific weekly returns in a given year. *TURN* is the yearly change in the

average monthly share turnover in year *t-1*. *SIZE* is the logarithm of the market value of equity in year *t-1*. *STDEV* is the standard deviation of weekly firm-specific returns in year *t-1*. *RETURN* is the logarithm of one plus the residual estimated from equation (3.1) in year *t-1*. *ROA* is the net income before extraordinary items scaled by total assets in year *t-1*. *LEVERAGE* is the total debt scaled by total assets in year *t-1*. *ALPHA* is the natural logarithm of one plus the intercept (alpha) estimated from equation (3.1) in year *t-1*. *MB* is the market value of equity divided by the book value of equity in year *t-1*. *DISACCR* is the absolute value of discretionary accruals, estimated using the modified Jones' (1991) model (Dechow, Sloan and Sweeney, 1995) in year *t-1*. All variables are defined in Appendix 3.A. Differences in means are tested using *t*- statistic test (not reported) and differences in medians are tested using Wilcoxon rank sum test (not reported). Panel B shows the proportion of firms that experienced stock price crashes by whether the firm has conducted an SEO in the prior year. For a firm *i* in year *t*, a stock price crash is identified if the firm-specific weekly return is 3.09 or more standard deviations below the mean of that year. Firm-specific return for firm *i* in year *t* is estimated from equation (3.1) and is computed as the logarithm of one plus firm-specific return. Differences are expressed in percentage points (pp). ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

Per hypothesis 2, cross-delisted firms should experience higher crash risk subsequent to an SEO, in the post-cross-delisting period, and this crash risk should increase if managers manipulate financial reporting prior to the SEO. To test this prediction we model crash risk as a function of earnings management and equity issuance and estimate different specifications of equation (3.4).

$$Crash\ Risk_{i,t} = \alpha_i + \beta_1 SEO_{i,t-1} + \beta_2 EM_{i,t-2} + \beta_3 Delist_{i,t} + \beta_4 SEO_{i,t-1} \times EM_{i,t-2} \times Delist_{i,t} + \beta_5 SEO_{i,t-1} \times Delist_{i,t} + \beta_6 SEO_{i,t-1} \times EM_{i,t-2} + \beta_7 Delist_{i,t} \times EM_{i,t-2} + \gamma_1 (Control\ firm - level_{i,t-1}) + \lambda_k + \eta_j + \gamma_t + \varepsilon_{i,t} \quad (3.4)$$

where $Crash\ Risk_{i,t}$ is the dependent variable that corresponds to the alternate measures of crash risk (*NSKEWN* and *DUVOL)* for firm *i,* in year *t*. *NSKEWN* is the negative one multiplied by the skewness of firm-specific weekly returns in a given year. *DUVOL* - "down-to-up" volatility – is the standard deviation of below the mean firm-specific weekly returns divided by the standard deviation of above the mean firm-specific weekly returns in a given year. $SEO_{i,t-1}$ is an indicator variable that equals one if a firm raised equity in its home country in year *t-1*, and zero otherwise. $EM_{i,t-2}$ is an indicator variable that equals one for firms above the median of accruals in their country in the year before equity issue and zero otherwise. $Delist_{i,t}$ is an indicator variable that equals one starting in *t+2* after to the cross-delisting event*,* and zero otherwise; starting in *t+2* ensures that earnings are reported after the delisting event and in the year prior to the SEO. $\gamma(\cdot)$ is a vector of the following control variables as described before, which includes: $TURN_{i,t-1}$ is the annual change in the average monthly share turnover in the previous year; $SIZE_{i,t-1}$ is the natural logarithm of the market value of equity in year *t-1*; $STDEV_{i,t-1}$ is the standard deviation of weekly firm-specific returns in year *t-1*; $RETURN_{i,t-1}$ is the average firm-specific weekly return in year *t-1*; $ROA_{i,t-1}$ is the net income before extraordinary items scaled by total assets in year *t-1*; $LEVERAGE_{i,t-1}$ is the short-term plus long-term (total) debt scaled by total assets in year *t-1*; $ALPHA_{i,t-1}$ is the natural logarithm of one plus the intercept (alpha) from equation (3.1) in the prior year; $MB_{i,t-1}$ is the market value of equity divided by the book value of equity in year *t-1*; $DISACCRUAL_{i,t-1}$ is the absolute value of discretionary accruals, estimated

according the modified Jones' (1991) model (Dechow, Sloan and Sweeney 1995), defined as before in equation (3.3). We also include crash risk variables $NSKEWN_{t-1}$ and $DUVOL_{t-1.}$ We cluster standard errors at year- and country-level, allowing for the error term to be correlated for firms within a country.

In Table 3.5 we report Pearson correlation coefficients for our main variables. We observe that all measures of crash risk (*NSKEWN*, *DUVOL* and *CRASH)* are positively correlated with SEOs in the prior year. Consistent with prior studies (e.g., Defond *et al.* (2015), Fauver, Loureiro and Taboada (2015)), *NSKEWN* and *DUVOL* are also correlated with size, firm-specific returns, profitability, market to book ratio, alpha and with one-year lagged crash risk measures.

TABLE 3.5: Correlation Matrix

	1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*	*9.*	*10.*	*11.*	*12.*	*13.*	*14.*	*15.*
1.$NSKEWN_t$	1														
2.$DUVOL_t$	0.8208*	1													
3.$CRASH_t$	0.5808*	0.5674*	1												
4.$TURN_{t-1}$	0.0139	0.0107	0.0119	1											
5.$SIZE_{t-1}$	0.1434*	0.0849*	-0.0074	0.0517*	1										
6.$STDEV_{t-1}$	-0.0950*	-0.0497*	0.0393*	0.0815*	-0.5535*	1									
7.$RETURN_{t-1}$	0.0927*	0.0329*	-0.0032	0.1140*	0.2621*	-0.2872*	1								
8.ROA_{t-1}	0.0935*	0.0410*	0.0069	0.0111	0.3995*	-0.4109*	0.2923*	1							
9.$LEVERAGE_{t-1}$	0.0046	-0.0151	0.0100	0.0182	0.1144*	-0.0546*	-0.0102	-0.0216	1						
10. $ALPHA_{t-1}$	0.0638*	0.0492*	0.0173	0.1156*	0.0754*	0.1106*	0.6979*	0.1548*	-0.0619*	1					
11. MB_{t-1}	0.0312*	0.0461*	0.0155	0.0301*	0.2044*	-0.0026	0.1054*	0.0477*	-0.0735*	0.1537*	1				
12.$DISACCR_{t-1}$	0.0073	0.0187	-0.0106	-0.0215	0.0071	-0.0319*	-0.0005	0.1465*	-0.0021	0.0019	-0.0090	1			
13.SEO_{t-1}	0.0339*	0.0372*	0.0258*	0.0707*	0.0545*	0.0692*	0.0149	-0.0327*	-0.0123	0.0356*	0.0500*	-0.0197	1		
14.$NSKEWN_{t-1}$	0.0449*	0.0271*	0.0217	0.0075	0.0749*	-0.0296*	-0.2865*	0.0145	0.0258*	-0.2797*	-0.0139	-0.0123	0.0101	1	
15.$DUVOL_{t-1}$	-0.0042	0.0243*	0.0263*	-0.0249	-0.0351*	0.0334*	-0.6066*	-0.0848*	0.0276*	-0.5053*	-0.0688*	0.0088	-0.0369*	0.8185*	1

Table 3.5 reports the correlation matrix for all main variables for our full sample over 2000-2012. We exclude financial firms (SIC codes between 6000 and 6999) and utilities (SIC codes between 4900 and 4949) and firm-year observations with total assets under $10 million and with negative or missing information on total assets, sales, market and book value of equity. *NSKEWN* is the negative one multiplied by the skewness of the firm-specific weekly returns in a given year. *DUVOL* - "down-to-up" volatility – is the standard deviation of below the mean firm-specific weekly returns divided by the standard deviation of above the mean firm-specific weekly returns in a given year. *CRASH* is an indicator variable that equals one if a firm experiences one or more stock price crashes during a given year and zero otherwise. For a firm *i* in year *t*, a stock price crash is identified if the firm-specific weekly return is 3.09 or more standard deviations below the mean of that year. *TURN* is the yearly change in the average monthly share turnover in year *t-1*. *SIZE* is the logarithm of the market value of equity in year *t-1*. *STDEV* is the standard deviation of weekly firm-specific returns in year *t-1*. *RETURN* is the logarithm of one plus the residual estimated from equation (3.1) in year *t-1*. *ROA* is the net income before extraordinary items scaled by total assets in year *t-1*. *LEVERAGE* is the total debt scaled by total assets in year *t-1*. *ALPHA* is the natural logarithm of one plus the intercept (alpha) estimated from equation (3.1) in year *t-1*. *MB* is the market value of equity divided by the book value of equity in year *t-1*. *DISACCR* is the absolute value of discretionary accruals, estimated using the modified Jones' (1991) model (Dechow, Sloan and Sweeney, 1995) in year *t-1*. *SEO* is an indicator variable that equals one if a firm raised equity in its home country in year *t-1*, and zero otherwise. All variables are defined in Appendix 3.A.* indicates significance at least at the 10% level.

3.4 EMPIRICAL RESULTS

3.4.1 Earnings Management and Crash Risk

To test empirically hypothesis 1a, we estimate various specifications of equation (3.2). Our purpose is to examine if cross-delisted firms that engage in earnings management post-cross-delisting experience an increase in crash risk. Therefore, our main coefficient of interest is $\beta_4(EM_{i,t-1} \times Delist_{i,t} \times Treat_i)$, which captures the change in crash risk associated with earnings management in the post-cross-delisting period for the treatment group relative to the control group of cross-listed firms. We expected this coefficient to be positive and statistically significant. Table 3.6 reports the results.

In models (1) through (3) of Panel A, Table 3.6, we present results using *NSKEWN*, while in models (4) through (6) we show results for the alternate measure *DUVOL*. We find a positive and statistically significant coefficient β_4 in our regressions using *NSKEWN*, but not using *DUVOL*. As an example, results in model (1) show that cross-delisted firms with discretionary accruals above-median in their country experience an increase in crash risk, post-cross-delisting, of 0.074[58] that corresponds to 8.5%[59] of the standard deviation, while experience a significant change in crash risk of -0.028[60] in the pre-cross-delisting period. We run different specifications of equation (3.2) to check the robustness of the baseline model. In models (2) and (4) we use firm fixed effects. The economic magnitude of the coefficient β_4 in model (2) is larger than the baseline but in estimation (4) it remains insignificant. To mitigate the possibility that our baseline results are driven by differences in firm characteristics between treated and control group, we re-estimate equation (3.2) using a matched sample of treatment and control firms. We adopt the Propensity Score Matching (PSM) methodology to match each treatment firm with a control firm with identical pre-treatment characteristics (industry,

[58] The sum of coefficients $\beta_1 EM_{i,t}+\beta_4 EM_{i,t-1} \times Delist_{i,t} \times Treat_i+\beta_6 EM_{i,t-1} \times Treat_i$=-0.0050+0.1020+-0.0233=0.0737 and the *p*-value of the *F*-test for the significance of the sum is 0.0991.

[59] In Table 2 we observe that the standard deviation of *NSKEWN* is 0.871.

[60] The sum of coefficients $\beta_1 EM_{i,t}+\beta_6 EM_{i,t} \times Treat_{i,t}$=-0.0050+-0.0233=-0.0283 and is statistically significant (*p*-value of the *F*-test 0.0475).

country, year, and log of total assets[61]). Propensity score was performed using the nearest neighbor algorithm with replacement, which allows that a control (cross-listed) firm can be used more than once as a match. Thus, models (3) and (6) are estimated using matched samples; the results are similar in sign to the baseline results, although of different economic magnitude

Taken altogether, we find partial evidence to support hypothesis 1a, i.e. that the sensitivity of stock prices crashes increases post-cross-delisting for the average cross-delisted firm. Although the two main variables of crash risk – *NSKEWN* and *DUVOL* – are highly correlated (0.82), the results are only statistically significant for the first measure. One possible reason is that differences in economic, institutional, and regulatory environments might undermine our results. We account for such differences in hypothesis 1b. Consistent with Leuz, Nanda and Wysocki (2003), weak investor protection and weak financial reporting standards give managers more latitude to manipulate earnings reporting. On the contrary, countries with stronger degrees of legal investor protection tend to be associated with lesser degrees of earnings management. Motivated by this literature, we test our hypothesis 1b that the increase in stock crash risk associated with earnings management post-cross-delisting should be stronger for foreign firms from less developed countries and countries with weaker shareholder protection. Thus, we re-estimate equation (3.2) separately for countries with high (low) investor protection and high (low) economic development. We follow literature (e.g., La Porta *et al.* (1997; 1998), La Porta, Lopez-De-Silanes and Shleifer, (2008), Djankov *et al.* (2008)) and assign firms according to the legal origin, i.e., from Common Law countries in the high group of shareholder protection and firms from Civil Law countries in the low group. Similarly, we assign firms into two groups– high and low – in terms of the economic development of their home countries, depending on whether GDP per capita is above (high group) or below (low group) the median value of all countries in the sample. This classification is consistent with the notion that the enforcement and quality of national institutions is correlated with economic development of the countries (La Porta, Lopez-De-Silanes and Shleifer, 2008). Panel B of Table 3.6 shows the results.

TABLE 3.6: Earnings Management and Crash Risk

Panel A: Earnings Management and Crash Risk

	Baseline	Firm FE	Matched	Baseline	Firm FE	Matched
Dependent Variable:		*NSKEWN*			*DUVOL*	
	(1)	(2)	(3)	(4)	(5)	(6)
EM_{t-1}	-0.0050	-0.0198	-0.0180	0.0051	0.0002	-0.0048
	(-0.21)	(-0.72)	(-0.33)	(0.55)	(0.01)	(-0.24)
$Delist_t$	-0.0878**	-0.0652	-0.1128***	-0.0577***	-0.0512*	-0.0657***
	(-2.09)	(-0.93)	(-2.98)	(-4.97)	(-1.84)	(-2.80)
$Treat_i$	0.0361		0.0575*	0.0329***		0.0403***
	(1.26)		(1.73)	(3.78)		(3.10)
EM_{t-1} x $Treat_I$ x $Delist_t$	0.1020***	0.1300*	0.0515**	0.0176	0.0411	0.0067
	(2.70)	(1.76)	(2.52)	(0.81)	(1.36)	(0.30)
EM_{t-1} x $Treat_i$	-0.0233	-0.0161	-0.0059	-0.0022	-0.0149	0.0062
	(-0.71)	(-0.32)	(-0.09)	(-0.15)	(-0.74)	(0.27)
$TURN_{t-1}$	-0.1202***	-0.1886	-0.0293	-0.0484	-0.0349	-0.0103
	(-3.96)	(-0.93)	(-0.28)	(-1.02)	(-0.43)	(-0.20)
$SIZE_{t-1}$	0.0647***	0.1958***	0.0763***	0.0240***	0.1177***	0.0279***
	(7.00)	(9.63)	(7.84)	(4.55)	(13.56)	(6.29)
$STDEV_{t-1}$	0.3206	-0.0471	0.4378	0.1861	-0.5019**	0.2100
	(0.43)	(-0.07)	(0.42)	(0.69)	(-2.00)	(0.74)
$RETURN_{t-1}$	3.9595	1.3729	2.0936	-0.8292	-1.0788	-1.6287
	(1.29)	(0.54)	(0.57)	(-0.47)	(-0.97)	(-0.88)
ROA_{t-1}	0.2357***	0.1891*	0.2427***	0.0338**	0.0199	0.0361*
	(3.20)	(1.76)	(3.06)	(2.07)	(0.46)	(1.71)
$LEVERAGE_{t-1}$	0.0013	0.2038	0.0859	0.0066	0.1088**	0.0507*
	(0.02)	(1.57)	(0.96)	(0.20)	(2.02)	(1.77)
$ALPHA_{t-1}$	1.9641	0.5580	3.4332	2.8973***	0.3918	4.0690***
	(1.33)	(0.24)	(1.46)	(3.03)	(0.43)	(3.24)
MB_{t-1}	-0.0041*	-0.0082**	-0.0040	0.0008	-0.0032**	-0.0001
	(-1.67)	(-2.27)	(-1.22)	(0.56)	(-2.23)	(-0.06)
$DISACCR_{t-1}$	-0.0014	0.0937	0.0192	0.0525	0.0673	0.0310
	(0.01)	(0.65)	(0.25)	(0.79)	(1.14)	(0.80)
$NSKEWN_{t-1}$	0.0384*	-0.1064***	0.0244			
	(1.79)	(-6.72)	(1.16)			
$DUVOL_{t-1}$				0.0358*	-0.0984***	0.0420**
				(1.68)	(-5.33)	(2.12)
Constant	-0.9980**	-2.8326***	-1.1868***	0.6474***	-0.4249***	0.3684***
	(-2.53)	(-9.19)	(-5.14)	(4.23)	(-3.21)	(5.11)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	No	Yes	No
Industry FE	Yes	No	Yes	Yes	No	Yes
Country FE	Yes	No	Yes	Yes	No	Yes
Observations	7,027	7,027	4,300	7,027	7,027	4,300
R-squared	0.065	0.058	0.077	0.062	0.09	0.081
PROPENSITY SCORE						
LR chi^2 (p value)			(0.493)			(0.493)
$[EM + EM \times Delist \times Treat + EM \times Treat]$	0.0737*	0.0941*	0.0276*	0.0205	0.0264	0.0081
p-value	(0.099)	(0.0915)	(0.087)	(0.300)	(0.291)	(0.371)

TABLE 3.6: Earnings Management and Crash Risk *(Continued)*

Panel B: Earnings Management and Crash Risk. The impact of institutional quality

Quality proxy:	Legal Origin				GDP per Capita			
Dependent variable:	*NSKEWN*		*DUVOL*		*NSKEWN*		*DUVOL*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High	*Low*	*High*	*Low*	*High*	*Low*	*High*	*Low*
EM_{t-1}	0.0072	-0.0835	0.0142	-0.0456*	-0.0145	0.0023	0.0006	0.0084
	(0.19)	(-1.08)	(1.13)	(-1.65)	(-0.37)	(0.05)	(0.05)	(0.47)
$Delist_t$	-0.0341	-0.1873	-0.0349	-0.0895**	-0.0175	-0.2589**	-0.0281	-0.1350***
	(-0.42)	(-1.07)	(-1.07)	(-2.11)	(-0.29)	(-2.52)	(-1.05)	(-6.36)
$Treat_i$	0.0415	0.0453	0.0458***	0.0025	-0.0012	0.0707	0.0281	0.0386**
	(1.00)	(0.40)	(2.72)	(0.08)	(-0.05)	(1.35)	(1.26)	(2.24)
EM_{t-1} x $Treat_i$x $Delist_t$	0.0543	0.2958*	-0.0015	0.0855**	0.0294	0.2931*	-0.0099	0.0948**
	(1.15)	(1.67)	(-0.08)	(1.99)	(1.65)	(1.87)	(-0.44)	(2.19)
EM_{t-1} x $Treat_i$	-0.0588**	0.0563	-0.0247*	0.0542	0.0113	-0.0522	0.0130	-0.0134
	(-2.52)	(0.41)	(-1.88)	(1.43)	(0.00)	(-0.63)	(0.72)	(-0.50)
$TURN_{t-1}$	0.0182	-0.2069	0.0250	-0.0986	-0.1470	-0.1188	-0.1079*	0.0092
	(0.09)	(-1.06)	(0.25)	(-0.79)	(-0.70)	(-0.46)	(-1.88)	(0.09)
$SIZE_{t-1}$	0.0698***	0.0684***	0.0269***	0.0259***	0.0658***	0.0613***	0.0241***	0.0238***
	(8.11)	(3.84)	(5.12)	(3.15)	(6.32)	(7.34)	(3.93)	(6.50)
$STDEV_{t-1}$	-0.1152	1.7697	0.0603	0.7650	0.2777	0.2784	-0.0205	0.3579
	(-0.14)	(1.04)	(0.23)	(1.37)	(0.32)	(0.26)	(-0.06)	(1.06)
$RETURN_{t-1}$	4.2627	4.0633	-1.6106	0.5032	0.2398	7.1007***	-3.7183	1.9856
	(1.07)	(0.67)	(-0.98)	(0.15)	(0.04)	(7.07)	(-1.25)	(1.41)
ROA_{t-1}	0.1501***	0.5678**	0.0313	0.0209	0.1651**	0.4432**	0.0115	0.0910
	(3.86)	(2.22)	(1.38)	(0.29)	(2.47)	(2.61)	(0.37)	(1.62)
$LEVERAGE_{t-1}$	0.0017	0.0743	-0.0003	0.0384	0.0614	-0.0246	0.0262	-0.0005
	(0.01)	(0.43)	(-0.01)	(0.61)	(0.61)	(-0.35)	(0.73)	(-0.01)
$ALPHA_{t-1}$	1.8765	-0.0778	3.1500***	1.7721	3.5806	1.1565	4.5986**	1.5217
	(0.62)	(-0.12)	(2.77)	(1.17)	(1.24)	(1.13)	(2.38)	(1.65)
MB_{t-1}	-0.0027	-0.0220***	0.0006	-0.0049*	-0.0045	-0.0046	0.0003	0.0017
	(-0.72)	(-2.78)	(0.28)	(-1.94)	(-1.28)	(-0.67)	(0.17)	(0.63)
$DISACCR_{t-1}$	0.0708	-0.3955	0.1131	-0.1394	-0.0523	0.0399	0.0498	0.0556
	(0.36)	(-1.53)	(1.49)	(-1.44)	(-0.42)	(0.12)	(1.10)	(0.45)
$NSKEWN_{t-1}$	0.0255	0.0285			-0.0106	0.0894***		
	(1.13)	(0.59)			(-0.48)	(2.99)		
$DUVOL_{t-1}$			0.0108	0.0567			-0.0055	0.0758***
			(0.42)	(1.37)			(-0.18)	(2.65)
Constant	-1.9850***	-1.6102	0.2563***	0.4823***	-1.4592***	-0.7538***	0.2919***	0.7509
	(-13.73)	(0.00)	(4.98)	(3.36)	(-5.74)	(8.41)	(3.58)	(0.00)
$(\beta_4 High = \beta_4 Low)$ (*p*-value)	(0.099)		(0.073)		(0.094)		(0.032)	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,954	1,817	3,954	1,817	3,991	3,058	3,991	3,058
R-squared	0.075	0.082	0.077	0.094	0.059	0.102	0.067	0.086

Panel A of Table 3 6 reports regression estimates of equation (3.2) using different specifications. The dependent variable is one of the two alternate crash risk measures: *NSKEWN* is the negative one multiplied by the skewness of the firm-specific weekly returns in a given year. *DUVOL* - "down-to-up" volatility – is the standard deviation of below the mean firm-specific weekly returns divided by the standard deviation of above the mean firm-specific weekly returns in a given year. *EM* is an indicator variable that equals one for firms above median of discretionary accruals in their country, and zero otherwise. *Delist* is an indicator variable that equals one starting in year *t+1* after the cross-delisting event in year *t,* and zero otherwise. *Treat* is a dummy variable equal to one for firms included in our treatment group, and zero otherwise. The set of control variables includes: *TURN* is the yearly change in the average monthly share turnover in the previous year *(t-1)*; *SIZE* is the logarithm of the market value of equity in year *t-1*; *STDEV* is the standard deviation of weekly firm-specific returns in year *t-1*; *RETURN* is the logarithm of one plus the residual estimated from equation (3.1) in year *t-1*; *ROA* is the net income before extraordinary items scaled by total assets in year *t-1*; *LEVERAGE* is the total debt scaled by total assets in year *t-1*; *ALPHA* is the natural logarithm of one plus the intercept (alpha) estimated from equation (3.1) in year *t-1*; *MB* is the market value of equity divided by the book value of equity in year *t-1*; *DISACCR* is the absolute value of discretionary accruals, estimated using the modified Jones' (1991) Model (Dechow, Sloan and Sweeney, 1995) in year *t-1*. All variables are defined in Appendix 3.A. Country, industry and year fixed

effects are included in all regressions, except in models (2) and (4) whereas we only include firm and year fixed effects. In models (3) and (6) we use a matched sample; each firm from treatment group is matched by year, industry, country and with the closest log of total assets, to a firm from the control group of cross-listed firms. Robust *t*-statistics standard errors clustered at both country- and year-level are shown in parentheses. The *p*-value of Likelihood-ratio (LR) test is also reported (in parentheses). The last two rows show the sum and the respectively *p*-value of the coefficients $[EM + EM \times Delist \times Treat + EM \times Treat]$. Panel B of Table 3.6 reports regression estimates of equation (3.2) but performed separately for high (low) groups. We rank firms based on Legal Origin and GDP per capita. Legal Origin is an indicator of institutional quality (e.g., La Porta, Lopez-De-Silanes and Shleifer (2008)); based on this indicator, we assign firms in high (low) group depending if they are from Common (Civil) Law countries. GDP per capita is an economic indicator collected from the World Bank All variables are defined in Appendix 3.A. Regressions include year, industry, and country fixed effects (FE). Robust *t*-statistics with standard errors clustered at both country- and year-level are shown in parentheses. It is also reported the *p*-value of a *z*-test that evaluates whether the coefficient $\beta_4(EM_{i,t-1} \times Delist_{i,t} \times Treat_i)$ of high group is equal to the coefficient of low group. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

As we expected, both measures of crash risk (*NSKEWN* and *DUVOL*) are positively correlated with earnings management in the post-delisting period for firms ranked in the low groups, being insignificant for firms ranked in the high groups. Regarding the legal system, we observe that for cross-delisted firms from countries with weaker shareholder protection - models (2) and (4) - coefficient β_4 is positive and statistically significant using any of the alternate crash risk measures. Results are similar in sign and economic magnitude for the subsample of firms from less economically developed countries – models (6) and (8). Taking coefficients in model (2) as an example, the results show that cross-delisted firms with discretionary accruals above-median from countries with weaker investor protection have an increase in crash risk of 0.27[62] (or 30% of its standard deviation)[63] post-cross-delisting, compared to the control group of cross-listed firms from countries with similar legal environment. This result is consistent with the view that cross-delisted firms from countries with stronger legal systems, stronger investor protection rules, and stricter disclosure standards are less likely to engage in earnings management, and consequently, are less prone to experience stock price crashes.

Overall, our evidence is consistent with the idea that, after cross-delisting from a U.S. stock exchange, firms from countries with weaker shareholder protection suffer a deterioration in their corporate governance standards, which can be interpreted as a reserve "bonding" effect. In this study, we document an increase in crash risk associated with earnings management, which might be a consequence of that deterioration in the firms' corporate governance.

[62] The sum of coefficients $\beta_1 EM_{i,t-1} + \beta_4 EM_{i,t-1} \times Delist_{i,t} \times Treat_i + \beta_6 EM_{i,t-1} \times Treat_i$=-0.0835+0.2958+0.0563=0.269 and the *p*-value of the *F*-test for the significance of the sum is 0.0981.

[63] For this subsample, the standard deviation of *NSKEWN* is 0.9079.

Additionally to country-level factors that may affect the overall quality of the firms' information environment, we also analyze, under hypothesis 1b, firm-specific characteristics that may as well affect the quality of their information environment. Managers in more opaque firms may find it easier to withhold the disclosure of bad news, increasing the probability of a subsequent stock price crashes (e.g., Jin and Myers (2006), Fauver, Loureiro and Taboada (2015)). Thereby, our hypothesis 1b predicts that the sensitivity of crash risk to earnings management in the post-cross-delisting period should be higher for more opaque firms. i.e., those with higher levels of information asymmetry. To test this hypothesis, we use two alternate proxies of information asymmetry. Our first proxy is the bid-ask spread, which is positively correlated with information asymmetry (e.g., Brennan and Subrahmanyam (1996)). We measure bid-ask spread as the annual median of the daily difference between bid and ask prices, scaled by the midpoint. Our second proxy is the change in R&D expenses. Aboody and Lev (2000) argue that R&D expenses contribute to information asymmetry between insiders and outsider investors due to the scarcity of public information on R&D activity and its impact on firm's value. Using these two proxies, we create an indicator variable, INF, that is equal to one for firms with information asymmetry above the median in their countries, and zero otherwise. This indicator of poor information environment is restricted to the interval (*t-3*; *t+3*), relative to cross-delisting in year. Then, we create a triple interaction variable that captures earnings management and the information environment quality in the post-cross-delisting period, $EM \times Delist \times INF$. We estimate equation (3.5) considering only the treatment group to mitigate mixed and confounding effects.

$$Crash\ Risk_{i,t} = \alpha_i, + \beta_1 EM_{i,t-1} + \beta_2 Delist_{i,t} + \beta_3 INF_{i,t} + \beta_4 EM_{i,t-1} \times Delist_{i,t} \times INF_{i,t} + \beta_5 EM_{i,t-1} \times Delist_{i,t} + \beta_6 EM_{i,t-1} \times INF_{i,t} + \beta_7 Delist_{i,t} \times INF_{i,t} + \gamma_1 \left(Control\ firm - level_{i,t-1}\right) + \lambda_k + \eta_j + \gamma_t + \varepsilon_{i,t} \quad (3.5)$$

where $Crash\ Risk_{i,t}$ is the dependent variable that corresponds to the two alternate measures of crash risk explained above (*NSKEWN* and *DUVOL)* for firm *i,* in year *t*. *NSKEWN* is the negative one multiplied by the skewness of firm-specific weekly returns in a given year. *DUVOL* - "down-to-up" volatility – is the standard deviation of below the mean firm-specific weekly returns divided by the standard deviation of above

the mean firm-specific weekly returns in a given year. $EM_{i,t-1}$ is an indicator variable that equals one for firms above median of discretionary accruals in their country and zero otherwise. $Delist_{i,t}$ is an indicator variable equal to one starting in *t+1* relative to delisting event in year *t,* and 0 otherwise. $INF_{i,t}$ is an indicator variable that is equal to one for firms above the median in their countries for each measure of information asymmetry (bid-ask spread and R&D), and 0 otherwise. $\gamma(\cdot)$ is a vector of the following control variables as described before: $TURN_{i,t-1}$ is the change in the average monthly share turnover in the previous year; $SIZE_{i,t-1}$ is the natural logarithm of the market value of equity in year *t-1*; $STDEV_{i,t-1}$ is the standard deviation of weekly firm-specific return in year *t-1*; $RETURN_{i,t-1}$ is the average weekly firm-specific return in year *t-1*; $ROA_{i,t-1}$ is the net income before extraordinary items scaled by total assets in year *t-1*; $LEVERAGE_{i,t-1}$ total debt scaled by total assets in year *t-1*; $ALPHA_{i,t-1}$ is the natural logarithm of one plus the intercept (alpha) estimated from equation (3.1) in the prior year; $MB_{i,t-1}$ is the market value of equity divided by the book value of equity in year *t-1*; $DISACCRUAL_{i,t-1}$ is the absolute value of discretionary accruals, estimated according the modified Jones' (1991) Model (Dechow, Sloan and Sweeney 1995), defined as before in equation (3.3). We also include crash risk variables in year *t-1,* $NSKEWN_{t-1}$ and $DUVOL_{t-1.}$ Table 3.7 displays the results.

TABLE 3.7: Earnings Management, Crash Risk and Information Environment

Dependent variable:	*NSKEWN*		*DUVOL*	
Information Environment Proxy:	bid-ask spread	R&D	bid-ask spread	R&D
	(1)	(2)	(3)	(4)
EM_{t-1}	0.0290	-0.0025	0.0171	0.0089
	(0.72)	(-0.06)	(0.87)	(0.63)
$Delist_t$	-0.0746	-0.1191**	-0.0711***	-0.0772***
	(-1.25)	(-2.03)	(-2.80)	(-2.85)
INF_t	0.1369*	0.0642	0.0590**	0.0064
	(1.80)	(1.50)	(2.03)	(0.34)
EM_{t-1} x $Delist_t$ x INF_t	0.3527***	0.1387**	0.0874**	0.0707*
	(14.47)	(2.16)	(2.02)	(1.69)
EM_{t-1} x $Delist_t$	-0.0327*	0.0488	-0.0117	-0.0052
	(-1.86)	(0.97)	(-0.62)	(-0.18)
EM_{t-1} x INF_t	-0.1664*	-0.0781**	-0.0489	-0.0274
	(-1.86)	(-2.23)	(-1.31)	(-1.09)
$Delist_t$ x INF_t	-0.2242	-0.1105	-0.0569	-0.0435
	(-1.61)	(-1.59)	(-0.92)	(-1.60)
$TURN_{t-1}$	-0.0086	-0.0249	0.0012	-0.0042
	(-0.04)	(-0.13)	(0.02)	(-0.06)
$SIZE_{t-1}$	0.0725***	0.0731***	0.0235***	0.0238***
	(6.72)	(7.21)	(4.34)	(4.64)
$STDEV_{t-1}$	0.3427	0.3382	0.2070	0.2089
	(0.30)	(0.29)	(0.58)	(0.59)
$RETURN_{t-1}$	0.5534	0.3433	-1.1832	-1.1838
	(0.15)	(0.09)	(-0.58)	(-0.59)
ROA_{t-1}	0.1788*	0.1803*	0.0088	0.0077
	(1.95)	(1.88)	(0.33)	(0.28)
$LEVERAGE_{t-1}$	0.0448	0.0510	0.0481	0.0515
	(0.44)	(0.47)	(1.49)	(1.55)
$ALPHA_{t-1}$	5.0275**	5.1326**	4.3416***	4.3048***
	(2.27)	(2.27)	(3.45)	(3.43)
MB_{t-1}	-0.0055	-0.0058	0.0002	0.0001
	(-1.16)	(-1.22)	(0.09)	(0.02)
$DISACCR_{t-1}$	0.0099	0.0185	-0.0178	-0.0106
	(0.07)	(0.13)	(-0.37)	(-0.21)
$NSKEWN_{t-1}$	0.0216	0.0213		
	(0.75)	(0.75)		
$DUVOL_{t-1}$			0.0578**	0.0587**
			(2.21)	(2.22)
Constant	-1.8107***	-1.8521***	0.5541***	0.5510***
	(-14.60)	(-13.88)	(4.14)	(4.26)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Observations	3,280	3,280	3,280	3,280
R-squared	0.080	0.078	0.091	0.089
$[EM + EM \times Delist \times INF + EM \times Delist + EM \times INF]$	0.1826**	0.1069**	0.0439	0.0470**
p-value	(0.012)	(0.047)	(0.137)	(0.014)

Table 3.7 reports regression estimates of equation (3.5). The dependent variable is one of the two alternate crash risk measures: *NSKEWN* is the negative one multiplied by the skewness of the firm-

specific weekly returns in a given year. *DUVOL* - "down-to-up" volatility – is the standard deviation of below the mean firm-specific weekly returns divided by the standard deviation of above the mean firm-specific weekly returns in a given year. *EM* is an indicator variable that equals one for firms above median of discretionary accruals in their country, and zero otherwise. *Delist* is an indicator variable that equals one starting in year *t+1* after the cross-delisting event in year *t,* and zero otherwise. *INF* is an indicator variable that is equal to one for firms above the median in their countries for each measure of information asymmetry - bid-ask spread and changes in R&D - and zero otherwise. We use two information asymmetry proxies: 1) the *Bid-Ask spread is* measured as the yearly median of the daily difference between bid and ask prices, scaled by the midpoint; 2) and annual changes in R&D. The set of control variables includes: *TURN* is the yearly change in the average monthly share turnover in the previous year *(t-1)*; *SIZE* is the logarithm of the market value of equity in year *t-1*; *STDEV* is the standard deviation of weekly firm-specific returns in year *t-1*; *RETURN* is the logarithm of one plus the residual estimated from equation (3.1) in year *t-1*; *ROA* is the net income before extraordinary items scaled by total assets in year *t-1*; *LEVERAGE* is the total debt scaled by total assets in year *t-1*; *ALPHA* is the natural logarithm of one plus the intercept (alpha) estimated from equation (3.1) in year *t-1*. *MB* is the market value of equity divided by the book value of equity in year *t-1*; *DISACCR* is the absolute value of discretionary accruals, estimated using the modified Jones' (1991) Model (Dechow, Sloan and Sweeney, 1995). All variables are defined in Appendix 3.A. Country, industry and year fixed effects are included in all regressions. Robust *t*-statistics with standard errors clustered at both country- and year-level are shown in parentheses. The last two rows show the sum and the respectively *p*-value of the coefficients [$EM + EM \times Delist \times INF + EM \times Delist + EM \times INF$]. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

The results in Table 3.7 provide evidence that firms with higher levels of information asymmetry are more prone to stock price crashes associated with earnings management post-cross-delisting. The coefficient β_4 is statistically significant in all models. As an example, we observe in model (1) that cross-delisted firms with above-the-median discretionary accruals and poor information environment experience a significant increase in crash risk of 0.183[64] that correspond to 19% of the standard deviation[65], whereas in the pre-cross-delisting the change in cash risk is -0.137[66]. As predicted by hypothesis .1b, firms with higher levels of information asymmetry that engage in earnings management after cross-delisting tend to have significantly higher crash risk. Again, a possible explanation for such effect may be the fact that after cross-delisting firms no longer will be under the stringent disclosure requirements imposed by SEC and by others U.S. institutions. Overall, our results provide evidence supporting hypothesis 1b.

[64] The sum of coefficients $\beta_1 EM_{i,t-1} + \beta_4 EM_{i,t-1} \times Delist_{i,t} \times INF_{i,t} + \beta_5 EM_{i,t-1} \times Delist_{i,t} + \beta_6 EM_{i,t-1} \times INF_{i,t}$=-0.0290+0.3527+-0.0327+-0.1664=0.1826 and the *p*-value of the *F*-test for the significance of the sum is 0.0116.

[65] For treatment group the standard deviation of *NSKEWN* is 0.9387.

[66] The sum of coefficients $\beta_1 EM_{i,t-1} + \beta_6 EM_{i,t-1} \times INF_{i,t}$=0.0290+-0.1644=-0.1374 and is statistically significant (*p*-value of the *F*-test 0.0222).

3.4.2 Seasoned Equity Offerings, Earnings Management and Crash Risk

Our results so far suggest that after cross-delisting firms that engage in earnings management experience an increase in crash risk, in particular when their specific information environment is weaker (either because they are more opaque or the quality of their national institutions is poorer). In this section, we analyze a particular corporate event – the issuance of new equity – that has been shown to be highly related with the practice of earnings management (e.g. Teoh, Welch and Wong (1998), Cohen and Zarowin (2010)) and with subsequent stock crashes (e.g. Hutton, Marcus and Tehranian (2009), Fauver, Loureiro and Taboada (2015)). Per our hypothesis 2, we expect that, after cross-delisting, firms that engage in earnings management around SEOs are more likely to experience a stock crash. We follow the literature (Hutton, Marcus and Tehranian, 2009; Kim, Li and Zhang, 2011a, 2011b; Boehme, Fotak and May, 2014) and first estimate a probabilistic model that estimates the probability of a stock crash as a function of issuing seasoned equity, having high levels of earnings management, cross-delisting, and including the set of control variables defined in section 3.2. In this analysis we use only the treatment group to mitigate mixed and confounding effects. Our dependent variables are the following: 1) *CRASH* equals one if a firm experiences one or more stock price crashes[67] in a given year *t* and zero otherwise; 2) *CRASH_ NSKEW* equals one for firms above the median crash risk – measured by *NSKEWN* – in their country and zero otherwise; 3) *CRASH_ DUVOL* equals one for firms above the median crash risk – measured by *DUVOL* – in their country and zero otherwise. We include in all estimations year, industry and country fixed effects. From the results shown in Table 3.8, after controlling for known predictors of stock prices crashes, we find robust evidence that stock crashes are more likely to occur after the issuance of seasoned equity.

[67] For a firm *i* in year *t*, a stock price crash is identified if the firm-specific weekly return is 3.09 or more standard deviations below the mean of that year.

TABLE 3.8: SEOs and Crash Risk. Probabilistic Analysis

Dependent variable:	*CRASH*		*CRASH_ NSKEW*		*CRASH_ DUVOL*	
	(1)	(2)	(3)	(4)	(5)	(6)
SEO_{t-1}	0.0441*	0.0438*	0.0757**	0.0759**	0.0805**	0.0806**
	(1.68)	(1.65)	(2.38)	(2.38)	(2.51)	(2.51)
EM_{t-2}	0.0112	0.0113	-0.0129	-0.0128	0.0112	0.0114
	(0.73)	(0.74)	(-0.68)	(-0.68)	(0.59)	(0.60)
$Delist_t$	-0.0136	-0.0121	0.0002	0.0009	-0.0730**	-0.0721**
	(-0.56)	(-0.50)	(0.01)	(0.03)	(-2.40)	(-2.37)
$TURN_{t-1}$	0.0521	0.0379	-0.0785	-0.0801	0.0715	0.0636
	(0.43)	(0.31)	(-0.49)	(-0.53)	(0.48)	(0.42)
$SIZE_{t-1}$	0.0099*	0.0092*	0.0366***	0.0366***	0.0279***	0.0277***
	(1.80)	(1.68)	(5.25)	(5.29)	(4.06)	(4.04)
$STDEV_{t-1}$	0.9128***	0.9400***	0.2239	0.2417	0.4762	0.4933
	(3.03)	(3.09)	(0.58)	(0.63)	(1.24)	(1.28)
$RETURN_{t-1}$	-0.9606	-0.1498	1.0221	1.5343	-0.2600	0.2953
	(-0.79)	(-0.11)	(0.65)	(0.91)	(-0.17)	(0.18)
ROA_{t-1}	0.1238**	0.1206**	0.1016*	0.1010*	0.0896	0.0882
	(2.56)	(2.49)	(1.68)	(1.66)	(1.48)	(1.46)
$LEVERAGE_{t-1}$	0.0683	0.0684	-0.0198	-0.0204	0.0263	0.0259
	(1.53)	(1.53)	(-0.36)	(-0.37)	(0.48)	(0.47)
$ALPHA_{t-1}$	0.6469	0.8168	2.036	2.1083	2.9566**	3.0361**
	(0.58)	(0.72)	(1.45)	(1.47)	(2.06)	(2.11)
MB_{t-1}	0.0020	0.0019	-0.0031	-0.0031	0.0027	0.0027
	(1.04)	(1.00)	(-1.25)	(-1.26)	(1.10)	(1.09)
$DISACCR_{t-1}$	-0.1242	-0.1268	0.0004	-0.0017	0.0957	0.0943
	(-1.39)	(-1.42)	(0.00)	(-0.02)	(0.86)	(0.85)
$NSKEWN_{t-1}$	0.0034		0.0092		0.0063	
	(0.39)		(0.83)		(0.57)	
$DUVOL_{t-1}$		0.0433		0.0349		0.0342
		(1.64)		(1.04)		(1.03)
Year FE	Yes	Yes	Yes		Yes	Yes
Industry FE	Yes	Yes	Yes		Yes	Yes
Country FE	Yes	Yes	Yes		Yes	Yes
Observations	3,264	3,264	3,280	3,280	3,277	3,277
Pseudo R-squared	0.057	0.058	0.051	0.051	0.043	0.043
Actual Probability	0.236	0.236	0.479	0.479	0.488	0.488

Table 3.8 provides the marginal effects from a probit model that estimate the impact of seasoned equity issuance in year *t-1* on the probability that a firm experiences a stock price crash in year *t*. *CRASH* is an indicator variable that equals one if a firm experiences one or more stock price crashes during a given year and zero otherwise. For a firm *i* in year *t*, a stock price crash is identified if the firm-specific weekly return is 3.09 or more standard deviations below the mean of that year. *CRASH_ NSKEW* is an indicator variable that equals one for firms above their country's median for variable *NSKEWN* and zero otherwise. *CRASH_ DUVOL* is an indicator variable that equals one for firms above their country's median for variable *DUVOL* and zero otherwise. *EM* is an indicator variable that equals one for firms above median of accruals in their country in the prior year to an SEO and zero otherwise. *Delist* is an indicator variable that equals one starting in year *t+1* after the cross-delisting event in year *t,* and zero otherwise. *SEO* is an indicator variable that equals one if the firm conducted a public seasoned equity offering during the prior year and zero otherwise. *TURN* is the yearly change in the average monthly share turnover in the previous year *(t-1)*. *SIZE* is the logarithm of the market value of equity in year *t-1*. *STDEV* is the standard deviation of weekly firm-specific returns in year *t-1*. *RETURN* is the logarithm of one plus the residual estimated from equation (3.1) in year *t-1*. *ROA* is the net income before extraordinary items scaled by total assets in year *t-1*. *LEVERAGE* is the total debt scaled by total assets in year *t-1*. *ALPHA* is the natural logarithm of

one plus the intercept (alpha) estimated from equation (3.1) in year *t-1*. *MB* is the market value of equity divided by the book value of equity in year *t-1*. *DISACCR* is the absolute value of discretionary accruals, estimated using the modified Jones' (1991) Model (Dechow, Sloan and Sweeney, 1995) in year *t-1*. All variables are defined in Appendix 3.A. Country, industry and year fixed effects are included in all regressions. Robust *z*-statistic in parentheses. Pseudo R-squared measures how much of the variation of the dependent variable is explained by the regression. Actual Probability reports fraction of crashes observed in data. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

We observe in Table 3.8 that the coefficient of SEO_{t-1} is positive and statistically significant in all regressions. Moreover, when we use *CRASH_ NSKEW* or *CRASH_ DUVOL* as dependent variables the statistical significance of the coefficient of SEO_{t-1} is larger. A possible explanation is that *CRASH* does not capture the asymmetry in the distribution of stock return, therefore being less efficient to capture risk than the other two variables. In models (1) and (2) the coefficient of SEO_{t-1} is associated with an increase of 4.4% in the probability of a stock crash in the subsequent year. This effect is larger when we use the other two alternate crash risk measures: 7.6% (8%) when using *CRASH_ NSKEW* (*CRASH_ DUVOL*), respectively.

Previous evidence shows that an increase on crash risk should be stronger for firms that engage in earnings manipulation to inflate their earnings prior to the SEO (e.g., Fauver, Loureiro and Taboada (2015)). The rationale behind this hypothesis is that, following an SEO, if bad news about inflated earnings are revealed to the market, firms should experience a sudden drop in stock prices. Per hypothesis 2, we expect this effect to be stronger for cross-delisted firms, post-cross-delisting, as the quality of their information environment tends to deteriorate and managers have more incentives to engage in earnings management. To test this hypothesis we estimate different specifications of equation (3.4). To address concerns about unobservable country-specific characteristics that may affect crash risk, we match equity issuers with non-issuers by PSM. We implement PSM by first estimating a probit regression to model the probability of being an equity issuer using as covariates all variables included in the vector $\gamma(\cdot)$, as described in model (3.4). Then, we match each issuer to a non-issuer in the same country, year and industry and with the closest propensity score.

TABLE 3.9: SEOs, Earnings Management and Crash Risk

Dependent Variable:	*NSKEWN*		*DUVOL*	
	Baseline	Matched	Baseline	Matched
	(1)	(2)	(3)	(4)
SEO_{t-1}	0.1266	0.1505*	0.0287	0.0328
	(1.57)	(1.81)	(1.10)	(1.20)
EM_{t-2}	-0.0084	0.0242	0.0023	0.0093
	(-0.28)	(0.57)	(0.16)	(0.40)
$Delist_t$	-0.0271	0.0654	-0.0547**	-0.0273
	(-0.43)	(0.84)	(-2.18)	(-0.82)
SEO_{t-1} x EM_{t-2} x $Delist_t$	0.4118**	0.4714**	0.1136*	0.1298*
	(1.99)	(2.07)	(1.66)	(1.72)
SEO_{t-1} x $Delist_t$	-0.2975*	-0.3334**	-0.0703	-0.0761
	(-1.94)	(-2.44)	(-1.13)	(-1.30)
SEO_{t-1} x EM_{t-2}	0.0258	0.0090	0.0085	0.0079
	(0.23)	(0.08)	(0.20)	(0.18)
EM_{t-2} x $Delist_t$	-0.0113	-0.1017	0.0023	-0.0311
	(-0.13)	(-1.04)	(0.07)	(-0.78)
$TURN_{t-1}$	-0.0555	-0.5418	-0.0066	-0.2121
	(-0.27)	(-1.16)	(-0.10)	(-1.22)
$SIZE_{t-1}$	0.0734***	0.0620***	0.0247***	0.0196**
	(5.33)	(2.82)	(4.98)	(2.27)
$STDEV_{t-1}$	0.1940	0.1857	0.1666	-0.1829
	(0.18)	(1.11)	(0.54)	(-0.38)
$RETURN_{t-1}$	0.0944	-0.3214	-1.2653	-3.1291
	(0.03)	(-0.08)	(-0.66)	(-1.17)
ROA_{t-1}	0.1776**	0.1782**	0.0050	-0.0053
	(2.12)	(2.31)	(0.20)	(-0.12)
$LEVERAGE_{t-1}$	0.0444	0.0221	0.0466	0.0773*
	(0.34)	(0.14)	(1.33)	(1.75)
MB_{t-1}	-0.0057	-0.0032	0.0001	0.0009
	(-1.24)	(-0.45)	(0.04)	(0.24)
$DISACCR_{t-1}$	0.0212	0.3591	-0.0065	0.1905*
	(0.11)	(1.52)	(-0.09)	(1.88)
$ALPHA_{t-1}$	5.1402**	4.5835	4.3159***	5.3186***
	(2.41)	(1.28)	(3.66)	(2.84)
$NSKEWN_{t-1}$	0.0207	0.0242		
	(0.92)	(1.06)		
$DUVOL_{t-1}$			0.0594**	0.0592*
			(2.54)	(1.77)
Constant	-1.8174***	-0.3288	0.5385***	0.5330***
	(-8.18)	(-0.66)	(5.83)	(3.33)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Observations	3,280	1,741	3,280	1,741
R-squared	0.079	0.097	0.087	0.101
PROPENSITY SCORE				
LR chi^2 (p value)		0.9220		0.9220
$[SEO + SEO \times Delist \times EM + SEO \times Delist + SEO \times EM]$	0.2687*	0.2975***	0.0805	0.0944**
p-value	(0.073)	(0.010)	(0.183)	(0.038)

Table 3.9 reports regression estimates of equation (3.4) using different specifications. The dependent variable is one of the two alternate crash risk measures: *NSKEWN* is the negative one multiplied by the skewness of the firm-specific weekly returns in a given year. *DUVOL* - "down-to-up" volatility – is the standard deviation of below the mean firm-specific weekly returns divided by the standard deviation of above the mean firm-specific weekly returns in a given year. *Delist* is an indicator variable that equals one starting in year *t+2* after the cross-delisting event in year *t,* and zero otherwise. *EM* is an indicator variable that equals one for firms above median of accruals in their country and zero otherwise. The set of control variables includes: *TURN* is the yearly change in the average monthly share turnover in the previous year *(t-1)*; *SIZE* is the logarithm of the market value of equity in year *t-1*; *STDEV* is the standard deviation of weekly firm-specific returns in year *t-1*; *RETURN* is the logarithm of one plus the residual estimated from equation (3.1) in year *t-1*; *ROA* is the net income before extraordinary items scaled by total assets in year *t-1*; *LEVERAGE* is the total debt scaled by total assets in year *t-1*; *ALPHA* is the natural logarithm of one plus the intercept (alpha) estimated from equation (3.1) in year *t-1*; *MB* is the market value of equity divided by the book value of equity in year *t-1*; *DISACCR* is the absolute value of discretionary accruals, estimated using the modified Jones' (1991) Model (Dechow, Sloan and Sweeney, 1995) in year *t-1*. All variables are defined in Appendix 3.A. Models (1) and (3) are baseline estimations. In Models (2) and (4), we use a matched sample; each year we match firms from issuers group to firms from non-issuers group from the same year, industry, country and with the closest propensity score based on the probability of being an equity issuer. Robust *t*-statistics standard errors clustered at country-level are shown in parentheses. Country, industry and year fixed effects are included in all regressions. The *p*-value of Likelihood-ratio (LR) test is also reported (in parentheses). The last two rows show the sum and the respectively *p*-value of the coefficients $[\beta_1 SEO_{i,t-1} + \beta_4 SEO_{i,t-1} \times EM_{i,t-2} \times Delist_{i,t-1} + \beta_5 SEO_{i,t-1} \times Delist_{i,t} + \beta_6 SEO_{i,t-1} \times EM_{i,t-2}]$. ***, ** and * mean statistical significance at the 1 percent level, 5 percent level and 10 percent level, respectively.

Results in Table 3.9 show that our main coefficient of interest $\beta_4(SEO_{i,t-1} \times EM_{i,t-2} \times Delist_{i,t})$ is positive and significant in all models. This evidence is consistent with the hypothesis that post-cross-delisting managers are more prone to delay the release of bad news prior to an SEO, which increases the likelihood of a stock crash. Taking the coefficients in model (1) as an example, equity issuers with above-median discretionary accruals experience a significant increase of 0.152[68] (or 16%[69] of its standard deviation) in crash risk before cross-delisting, but the difference is even greater (0.267)[70] in the post-cross-delisting period.

Overall, results provide strong support for hypothesis 2; post cross-delisting firms that engage in earnings management prior to the SEO have a higher probability of a stock crash subsequent to the SEO.

[68] The sum of coefficients $\beta_1 SEO_{i,t-1} + \beta_6 SEO_{i,t-1} \times EM_{i,t-2}$=0.1266+0.0258=0.1524 and the *p*-value of the *F*-test for the significance of the sum is 0.0719.

[69] For treatment group the standard deviation of *NSKEWN* is 0.9387.

[70] The sum of coefficients $\beta_1 SEO_{i,t-1} + \beta_4 SEO_{i,t-1} \times EM_{i,t-2} \times Delist_{i,t-1} + \beta_5 SEO_{i,t-1} \times Delist_{i,t} + \beta_6 SEO_{i,t-1} \times EM_{i,t-2}$=0.1266+0.4118+-0.2975+0.0258=0.2667 and the *p*-value of the *F*-test for the significance of the sum is 0.0731.

3.5 MAIN CONCLUSIONS

In this study, we examine whether cross-delisted firms from the major U.S. stock exchanges experience an increase in crash risk associated with earnings management post-cross-delisting. We test our research hypotheses using a treatment sample of 583 cross-delisted firms from U.S. exchange markets and a control group of 564 cross-listed firms; overall, our study includes 42 countries. We employ different regressions techniques and alternate measures of crash risk. As expected, we uncover a significant increase in crash risk associated with earnings management for cross-delisted firms after the cross-delisting event, which is more pronounced when firms are from countries with weaker shareholder protection (namely, Civil Law countries and countries with lower GDP per capita). Thus, our evidence is consistent with the idea that cross-delisted firms from countries with weaker shareholder protection suffer a deterioration in their corporate governance levels after leaving the U.S. stock exchanges.

Furthermore, we analyze how information asymmetry at firm-level impacts the sensitivity of crash risk to earnings management. As we predicted, more opaque firms with higher levels of information asymmetry experience an increase in crash risk associated with earnings management.

We also test whether manager's ability to manipulate earnings prior to an SEO increases in the post-cross-delisting. We find that cross-delisted firms that engage in earnings management prior to an SEO have a higher probability of a stock price crash subsequent to the SEO.

Taken together, our results are consistent with the prediction that after a cross-delisting from a U.S. stock exchange, managers are more motivated to manipulate financial information, particularly in weaker legal regimes. We interpret this as a reverse "bonding" effect; cross-delisted firms suffer a deterioration in their corporate governance standards in the post-cross-delisting because they are no longer subject to the SEC regulations nor under the surveillance of others U.S. Institutions.

APPENDIX 3.A – Definitions and Sources of the variables

VARIABLE	DEFINITION	SOURCE
Firm-level		
ALPHA	Logarithm of one plus the intercept (alpha) estimated from equation (3.1).	Datastream
Bid-Ask spread	Yearly median of the daily difference between bid and ask prices, scaled by the mean of bid and ask prices.	Datastream
CRASH	Indicator variable that equals one if a firm experiences one or more stock price crashes during the current year t and zero otherwise. For a firm i in year t, a stock price crash is identified if the firm-specific weekly return is 3.09 or more standard deviations below the mean of that same year.	Datastream
CRASH_ DUVOL	Indicator variable that equals one for firms above their country's median for variable DUVOL and zero otherwise.	Datastream
CRASH_ NSKEW	Indicator variable that equals one for firms above their country's median for variable NSKEWN and zero otherwise.	Datastream
Delist	Dummy variable that equals one if a firm is delisted from US exchange markets (NYSE or NASDAQ) in a given year, and zero otherwise.	SEC website, Datastream and Citibank
DISACCR	The absolute value of total accruals estimated via modified Jones (1991) Model, as in Dechow, Sloan and Sweeney (1995): $$\frac{\text{ACCRUALS}_{i,t}}{\text{TA}_{i,t-1}} = \alpha_0 \frac{1}{\text{TA}_{i,t-1}} + \beta_1 \frac{\Delta\text{REVENUES}_{i,t}}{\text{TA}_{i,t-1}} + \beta_2 \frac{\text{PPE}_{i,t}}{\text{TA}_{i,t-1}}$$ where $\text{ACCRUALS}_{i,t} = (\Delta\text{CA}_{i,t} - \Delta\text{CASH}_{i,t}) - (\Delta\text{CL}_{i,t} - \Delta\text{STD}_{i,t}) - \text{DEP}_{i,t}$, $\Delta\text{CA}_{i,t}$ is the change in current assets, $\Delta\text{CASH}_{i,t}$ is the change in cash and equivalents of cash, $\Delta\text{CL}_{i,t}$ is the change in current liabilities, $\Delta\text{STD}_{i,t}$ is the change in short-term debt included in current liabilities, and $\text{DEP}_{i,t}$ is depreciation and amortization expenses, scaled by lagged total assets $\text{TA}_{i,t-1}$; $\Delta\text{REVENUES}_{i,t}$ is computed as the change in sales minus receivables scaled by lagged total assets; $\text{PPE}_{i,t}$ is property, plant and equipment scaled by lagged total assets. Discretionary accruals are then estimated as the residuals from equation (3.3). $$\text{DISACCR} = \frac{\text{TACCR}_{i,t}}{\text{TA}_{i,t-1}} - \left(\hat{\alpha}_0 \frac{1}{\text{TA}_{i,t-1}} + \hat{\beta}_1 \frac{\Delta\text{REVENUES}_{i,t}}{\text{TA}_{i,t-1}} + \hat{\beta}_2 \frac{\text{PPE}_{i,t}}{\text{TA}_{i,t-1}}\right)$$	Worldscope
DUVOL	"Down-to-up" volatility defined as the standard deviation of below the mean weekly firms-specific return in year t divided by the standard deviation of above the mean firm-specific return in year t.	Datastream
EM (Earnings Management)	Indicator variable that equals one for firms above median of discretionary accruals in their countries and zero otherwise.	Worldscope

VARIABLE	DEFINITION	SOURCE
INF (Information)	Indicator variable that equals one for firms with above country's median for each measure of information asymmetry (bid-ask spread and R&D). This indicator of information environment is restricted to the interval (t-3; t+3), relative to cross-delisting in year t.	Datastream and Worldscope
LEVERAGE	Total debt (short-term debt plus long-term debt) divided by total assets.	Worldscope
Log Total Assets	Logarithm of total assets.	Worldscope
MB	The market value of equity divided by the book value of equity.	Worldscope
NSKEWN	Negative skewness defined as negative one multiplied by the skewness of the firm-specific weekly returns over a given year.	Datastream
R&D	Changes in research and development (R&D) expenses. R&D is set to zero when it is missing.	Worldscope
RETURN	Yearly average of the firm's weekly firm-specific log-returns.	Datastream
ROA	Net income before extraordinary items divided by total assets.	Worldscope
SEO	Indicator variable that equals one if a firm conducted a public seasoned equity offering during in its home country the prior year, and zero otherwise.	SDC
SIZE	Logarithm of market value of equity.	Worldscope
STDEV	Standard deviation of weekly firm-specific returns.	Datastream
Total Assets (TA)	Total Assets in U.S. dollars, converted at fiscal year-end exchange rates.	Worldscope
Treat	Indicator variable that equals one if a firm is included in the treatment group, and zero otherwise. Treatment group includes all firms that cross-delist at some point in time over 2000-2012.	SEC website, Datastream and Citibank
TURN	Annual change in the average monthly share turnover between t-1 and t-2. Monthly share turnover is defined as monthly trading volume (shares) divided by total number of shares outstanding during that month.	Datastream
Industry-Level		
INDUSTRY	Classification scheme proposed by Fama and French (1997), based on 48 Industry Portfolios.	Fama and French (1997)
SIC CODE	4-digit Standard Industrial Classification (SIC) Code.	Datastream
Country-Level		
GDP per Capita	Logarithm of GDP per capita.	Worldbank
Legal Origin	Indicator variable that equals one for Common Law (Civil Law) countries and zero otherwise.	La Porta, Lopez-De-Silanes and Shleifer (2008)

CONCLUSION

In this study we document the economic consequences of cross-delisting on long-term performance, on the level of financial constraints, and on stock crash risk.

We use the universe of foreign firms cross-listed on U.S. exchange markets that later cross-delisted between 2000 and 2012; in total we use 583 cross-delisted firms and 564 cross-listed firms (as a control sample) from 42 countries.

Our results provide evidence that cross-delisted firms have less growth opportunities than their cross-listed counterparts. Furthermore, we find a significant decline in operating performance for the voluntary group of firms that cross-delisted after the passage of Rule 12h-6 in 2007. In contrast, firms that cross-delisted before the adoption of the Rule 12h-6 seem to be affected by the cost of a U.S. listing in the pre-cross-delisting period, supporting the argument that a U.S. listing is no longer reasonable if costs outweigh the benefits. In addition, we also provide evidence of a negative abnormal return, in the pre- and post-cross-delisting period, for the treatment group of cross-delisted firms; cross-delisted firms underperform their matched pairs, mainly in the post-cross-delisting period.

Concerning the consequences on real investment decisions, we find an increase in investment- and cash-to-cash flow sensitivities following a cross-delisting from U.S. exchange markets for our group of treatment (cross-delisted) firms compared to a primary group of cross-listed firms and an alternate group of or never-cross-listed firms. This result is quite persistent and does not depend on whether the cross-delisting was voluntary or involuntary nor on whether the cross-delisting occurred before or after the Rule 12h-6 of 2007. We show that such evidence supports our hypothesis that firms post-cross-delisting become more financially constrained and we also argue that this effect is stronger for firms from Civil Law countries. Additionally, we find that investment-to-price sensitivity decreases after cross-delisting for firms that increased their information asymmetry (higher bid-ask spreads or R&D expenses) around the delisting event. This finding might help to explain the increasing sensitivity of investment to internal funds; cross-delisted firms face higher financial constraints, which can be partially driven by a deterioration in their information environment that enhances the firms' cost of capital.

In addition, we also examine the stock price crash risk associated with earnings management post-cross-delisting; we uncover a significant increase in crash risk associated with earnings management for cross-delisted firms post-cross-delisting. As predicted, our results document that cross-delisted firms from countries with weaker legal regimes suffer a deterioration in their corporate governance standards after leaving the U.S. stock exchanges. We also observe that more opaque cross-delisted firms with higher levels of information asymmetry experience an increase in crash risk associated with earnings management. Moreover, cross-delisted firms that engage in earnings management prior to an SEO have a higher probability of a stock price crash subsequent to the SEO.

Overall, our findings are consistent with the predictions of "bonding" hypothesis; if foreign firms are able to improve their information environment after cross-listing on a U.S. exchange market, especially when those firms come from countries with poor shareholder protection and less developed financial markets, then the opposite effect seems to happen when they leave the U.S. markets. We interpret this as a reverse "bonding" effect; cross-delisted firms experience a deterioration in their corporate governance standards in the post-cross-delisting period because they are no longer subject to the SEC regulations nor under the surveillance of others U.S. Institutions.

Nevertheless, we must acknowledge that our empirical findings are subject to several caveats. First of all, this investigation relies on a very small number of observations in the post-cross-delisting period. Although our starting point is the universe of all cross-listed and cross-delisted firms, after a cross-delisting from U.S. stock markets, the coverage by Datastream/ Worldscope reduces significantly. Second, if voluntary, cross-delisting decision is endogenous so the treatment sample is not random. If firms self-select to cross-delist, some factors may simultaneously affect the cross-delisting decision and investment decisions. We address this issue by implementing the PSM methodology, which is widely accepted in the literature, but can hardly eliminate the problem completely (although it is considerably mitigated). Finally, our variables that capture growth opportunities, investment, information asymmetry, earnings management and crash risk are very difficult to measure. Our findings are contingent to the ability of these measures to appropriately and consistently capture the real effects.

However, our results raise many interesting questions. We document that cross-delisted firms have less growth opportunities than a matched control sample of cross-listed firms. In contrast, we also document that cross-delisted firms face higher financial constraints in the post-cross-delisting period. Are minority investors hurt by cross-delisting? And the other stakeholders (e.g., bondholders) will be also hurt? What is the role of institutional investors on cross-delisting decision and its economic consequences?

Therefore, further research is required to answer those questions and deeply investigate the impact of cross-delisting on corporate governance.

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