

Final report

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National Stock
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Financial market integration and firms' access to capital: Evidence from the National Stock Exchange in India¹

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Abstract

This paper empirically studies financial benefits of equity market integration at the firm level in emerging economies. It explores the unique setting of public firms cross-listing on a new domestic stock exchange, as a means to enhance their access to capital and overcome market frictions in previously fragmented equity markets. Following the opening of India's National Stock Exchange in the early 1990s, dual-listed firms increased investment relatively more than their peers which remained listed on the country's primary market (Bombay Stock Exchange), and this was more pronounced in firms considered financially constrained ex-ante. These results can be explained by larger equity offerings and reduced information asymmetries in raising new capital, subsequently to cross-listing. However, valuations of dual-listed firms which failed to sustain a more liquid trading environment for their shareholders returned to pre-cross-listing levels over time. This evidence suggests that financial liberalization in emerging markets can enhance firms' access to capital, but this may not be the most important benefit from shareholders' perspective.

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1. Introduction

Financial markets in emerging economies have experienced significant changes over the past two decades, both because of promoting financial market reforms on the inside, and better integrating with the world economy on the outside (e.g. Doidge et al., 2013). This paper focuses on the former, and in particular on the unique setting of public firms cross-listing on a new *domestic* stock exchange, as a means to enhance their access to capital and overcome market frictions in previously fragmented markets. Our experimental setting is the opening of the National Stock Exchange (henceforth ‘NSE’) in India in the early 1990s. NSE emerged as the country’s first exchange to adopt technological advances in trading, aimed to promote transparency in price formation, and overcome geographical limits in traditional floor-based trading systems. By promoting closer equity market integration, firms would have access to a larger and deeper investor base, while investors could attain greater diversification and lower transaction costs in trading.

The main goal of the paper is to study: i) whether cross-listing on the new market, defined as ability of the firm to list in both Bombay and newly created stock exchange, had any impact of on firm investment and financing, and, ii) whether financial benefits were more pronounced to firms with greater *ex-ante* financial constraints. These questions are important, as overcoming investment barriers and capital market frictions at home, is often cited by managers in emerging markets as a primary reason for pursuing a cross-listing overseas (e.g. Bancel and Mittoo, 2001; 2009).³ Given that cross-listing abroad may entail negative consequences to liquidity conditions in the home market from the migration of order flows (e.g. Domowitz et al., 1998), financial market reforms may attenuate this problem by reducing incentives to pursue a cross-border listing in the first place.

The opening of a new domestic stock exchange provides a unique opportunity to distinguish between competing cross-listing theories. In particular, because a second listing within a country’s borders entails less pronounced challenges to firm-level corporate governance than cross-listing on advanced capital markets (e.g. in US and UK markets), we can interpret observed changes in investment of dual-listed firms

³ See Karolyi (2006; 2012) for literature reviews of cross-listing theories and the underlying motives.

as more suggestive of the likely influence of reduced barriers to equity financing, rather than of ‘bonding’ to higher governance standards.

To test these ideas, we collect information for more than 850 firms cross-listing on the new stock exchange, within the first few years after opening, along with their peers in the country’s main market (Bombay Stock Exchange, henceforth ‘BSE’). Our results from a difference-in-differences model, which compares the investment of firms dual-listed on the NSE, to that of their peers which remained listed on the BSE, show that the former benefited from relatively higher investment subsequently to cross-listing, and this was more pronounced in firms with *ex-ante* financial constraints. These results are robust to testing for endogeneity in the cross-listing decision and support the view that greater equity market integration can reduce investment barriers and improve firms’ access to capital, particularly among financially-constrained firms.

In additional tests, we explore sources of higher investment. We identify capital and cost-of-capital implications of cross-listing. First, we show that firms which increased investment in the aftermath of cross-listing were associated with higher equity offerings. Hence, dual-listed firms engaged with more equity-financed investments than their peers in the BSE, and these results are stronger for firms which faced more severe difficulties in raising new capital prior to cross-listing. Second, we examine the role of firms’ information environment in the cross-listing decision. We find that cross-listing benefits, in the form of a reduced cost of capital, were more pronounced to firms with higher information asymmetries. Putting our findings together, our analysis proposes that dual-listed firms expanded their access to capital outside the geographical limits of fragmented markets, and benefited from reduced information asymmetries in raising new capital, pertinent to the advanced information technology in the new market.

However, cross-listing benefits were not uniform among dual-listed firms. Within this sample, we identify a cohort of firms which, although not associated with high external finance needs, cross-listed shares within the first few months after the new market’s opening. These firms expanded their shareholder base and benefited from higher stock liquidity and increased stock valuation over non-cross-listed firms in the primary market (BSE). These results are consistent with cross-listing theories which posit that greater risk sharing among investors subsequently to cross-listing can create a more liquid trading environment for the shares in the home market, with implications on firm’s cost of capital and stock valuation (e.g. Errunza and Miller, 2000).

In contrast, firms which took more time to complete cross-listing, were likely to use the new market mainly as a means to raise new equity for financing investments. It is this latter group of companies which our findings point out as the main beneficiaries of new equity offerings, in the aftermath of financial market liberalization. Nevertheless, in this cohort of firms, stock liquidity levels and valuations in the primary

market returned to pre-cross-listing levels over time. These results suggest that cross-listing valuation benefits were only transitory for firms which were not successful in sustaining a more liquid trading environment for their shareholders. Hence, equity market integration can be value-enhancing for domestic firms, conditional that they improve trading conditions for shareholders.

Overall, this paper contributes to the literature from three main perspectives. First, we show that financial market reforms in emerging economies can enhance firms' access to capital, with implications on firm financing and investment. Related work by Bris et al. (2006; 2014) reports similar results for European firms, after the adoption of the single European currency. Given that financial market liberalizations can reduce firms' incentives to pursue a cross-border listing in the first place, our work may also have implications on theories which stress out implications of the migration of trading intensity on home market liquidity conditions (e.g. Domowitz et al., 1998). Second, our experimental setting allows us to distinguish between competing theories in cross-listings. Given that cross-listing domestically may not entail significant changes in firm-level corporate governance, we can more safely interpret changes in firm investment as suggestive of the likely influence of reduced barriers in equity finance, rather than of 'bonding' to higher governance standards of advanced capital markets. Finally, we show that, although reduced information asymmetries can enhance firms' access to capital, they are valued distinctly by investors in emerging markets. Investors reward firms with an opportunity to create a more liquid shareholding environment with a valuation premium, possibly because these firms have inherent liquidity problems (e.g. due to concentrated ownership). Firms that fail to improve liquidity conditions for trading do not experience a permanent increase in valuation, and are valued similarly to non-cross-listed firms over time. These results are consistent with evidence by King and Segal (2009), who show that valuation benefits in US cross-listings are only transitory for firms which are not successful in gaining recognition and broadening their shareholder base. Collectively, our analysis proposes that enhanced access to capital is one, but perhaps, not the most important benefit of equity market integration from shareholders' perspective.

The rest of the paper is organized as follows. Section 2 summarizes the cross-listing theories and provides the background of the new market. Section 3 presents the data and the proposed methodology. Section 4 presents evidence of the pre-listing and post-listing behavior of dual-listed firms and discusses the main results of the paper. Section 5 presents results from tests on endogeneity. Section 6 explores potential sources of relaxed financial constraints. Finally, Section 7 concludes.

2. The cross-listing decision and the opening of the NSE

2.1 Why do firms cross-list their shares?

Theory and evidence propose two main motives associated with the cross-listing decision. The traditional view relates cross-border listings with the degree of segmentation and liquidity in domestic financial markets. Investment barriers, such as regulatory limits on foreign ownership and international capital flows, can place restrictions on firms' access to outside capital. This may induce managers to pursue a secondary listing of the firm's shares abroad, to expand the firm's investor base and increase its stock liquidity. Indeed, an enlarged and more liquid trading environment for shareholders is often cited by managers in surveys as a primary motive for cross-listing overseas (e.g. Bancel and Mittoo, 2001; 2009). This is accompanied by empirical evidence that cross-listing is associated with greater risk-sharing, which reduces investors' required returns, with implications on the firm's cost of capital and stock valuation (e.g. Miller, 1999; Foerster and Karolyi, 1999; Errunza and Miller, 2000; Bris et al., 2007).

More recent developments in the literature have challenged these theories, on the grounds that the increasing economic integration of markets around the world, especially in the aftermath of the Asian financial crisis and economic integration in Europe, was not accompanied by a declining number of international cross-listings. An alternative view, inspired by the work of Stulz (1999) and Coffee (1999; 2002), proposed that a firm's internal governance problems at home may be a primary motivation to pursue a secondary listing overseas. The main idea here, is that corporate insiders can credibly commit to reduce agency and information asymmetry problems with outside (minority) shareholders, by 'bonding' to higher disclosure and governance standards of advanced capital markets. A large amount of empirical work interpreted reductions in firms' cost of capital and permanent valuation gains as consistent with the more disciplined corporate environment after cross-listing, which imposed constraints on insiders' ability to derive private benefits of control (e.g. Reese and Weisbach, 2002; Doidge et al., 2009; Hail and Leuz, 2009). For example, Fresard and Salva (2010) investigated the value of firms' excess cash holdings and proposed that a revaluation of firms' liquid assets may be a channel through which cross-listing on more advanced capital market may increase the value of the firm.

In a similar vein, a strand in the literature focused on changes in the information environment of the firm after cross-listing, and argued that an enlarged investor base and additional disclosure in the new market can lower information asymmetries and trading costs for investors in the home market (e.g. Bailey et al., 2006; Chemmanur and Fulghieri, 2006; Fernandes and Ferreira, 2008). For example, the model by Chemmanur and Fulghieri (2006) suggests that this can take place through the choice of the stock exchange, while the work by Fernandes and Ferreira (2008) through greater informativeness of stock prices.

Although both 'market segmentation' and 'bonding' theories presented above, associate cross-listing with enhanced firm access to capital (i.e. through reduced investment barriers and improved firm-level

governance, respectively), implications of cross-listing on firm investment remain empirically underexplored. Lins et al. (2005) answer a question similar to ours, namely whether cross-listing on more advanced capital markets alleviates firms' financial constraints. Using the investment cash-flow sensitivity proposed by Fazzari et al. (1988) to measure external financial constraints, they show that enhanced access to foreign capital alleviated constraints of firms cross-listing on US stock markets. Differently from this work, we examine the benefits on firm investment which arise from firms' ability to overcome fragmented equity markets and reach trapped sources of capital within the country's borders. To do so, we adopt more recent developments in the literature on financial constraints. In particular, we use the indices proposed by the work of Kaplan and Zingales (1997), Whited and Wu (2006) and Hadlock and Pierce (2010) to measure firm-level financial constraints. Although developed on US data, these measures have been extensively used by non-US and cross-country studies (e.g. Bris et al., 2006; Bena et al., 2015), as a means to overcome concerns with different interpretations of the investment cash-flow sensitivity (See for example the discussion in Almeida et al. (2004)).

From a different perspective, our work is related to the study by Carvahlo and Pennacchi (2012). The authors study in another emerging economy, Brazil, the role of corporate governance in improving firm valuation when the firm voluntarily migrates its listing status to a 'premium' category in the stock exchange, with higher disclosure and governance requirements. They find evidence of increased trading volumes and higher stock valuation, which they interpret as suggestive of the 'bonding' hypothesis in cross-listings. Similar to their paper, we focus on developments in capital markets of transition economies which can improve corporate outcomes by reducing market frictions. However, we differ from this paper from two main perspectives. First, we study firms which are listed on two domestic stock exchanges simultaneously, rather than firms migrating to a new listing status. This allows us to interpret our results in the context of traditional cross-border listing theories. Second, the birth of a new stock exchange provides a unique opportunity to empirically examine theories which study the competition among different stock exchanges for order flows and liquidity (e.g. Chemmanur and Fulgieri, 2006).

Before proceeding with the description of the data and proposed methodology, we briefly present the background of the new stock market and how it might have enhanced firms' access to capital.

2.2 The opening of the NSE and cross-listed firms' access to capital

How relevant are cross-listing theories presented above, to firms' decision to cross-list on the NSE? Before the opening of the NSE, equity markets in India were fragmented by the presence of multiple local stock exchanges. These offered poor diversification options to investors and weak risk-sharing benefits to companies. The largest of these exchanges, the BSE, was offering broker-based floor-trading services to

investors with limited outreach across the country and weak structures for governance and regulation. Thomas (2006) notes that order execution was performed behind the scenes and the price formation was often directed by the private interests of brokerage firms, in the absence of an automated and transparent settlement and clearing of orders.

As part of policy-driven reforms, the NSE was established in 1994 as a demutualized form of organization, on par with stock exchanges of the western world, and in contrast to the broker-run structure of the BSE. Krishnamurti et al. (2003) show that the new market's organizational structure had implications on the level of transaction costs incurred by investors. But the most profound effect on domestic markets came from the adoption of advanced information technology, which would allow firms to overcome investment barriers set by previously fragmented markets. Specifically, the new market established an automated trading system which consolidated investors' orders from across the country through electronic matching of orders, in a single trading platform. As a result, traders from all over the country could bypass limitations of floor trading, and perform transactions with one another with greater transparency in price formation.

These developments suggest that the opening of the new market may have contributed to a closer integration in domestic equity markets. In particular, the new market may have lifted investment barriers and market frictions which inhibit investors with surplus funds to integrate with firms in need of capital. As a result, investment implications of cross-listing on the NSE can be approached from the theoretical angle of 'market segmentation' views, which posit that cross-listing firms may overcome barriers to entry, and benefit from an enlarged investor base and enhanced access to outside funding. Similar to Lins et al. (2005), we argue that this benefit should be more pronounced to firms facing greater difficulties in raising outside capital *ex-ante*, i.e. to financially constrained firms. Moreover, given that the main incremental reform was the new market's adoption of advanced information technology in trading, we argue that firms' relaxed constraints would associate with reduced information asymmetries subsequently to cross-listing. We explore empirically these arguments in our multivariate tests below. Right next, we present the data and the methodology proposed to perform these tests.

3. Data and methodology

3.1 Description of data

The equities segment of the NSE commenced its operations in late 1994. Figure 1 shows that more than 350 BSE-listed firms completed a secondary listing on the new market within the first few months on the year of opening. The number of dual-listed firms increased more than twofold in 1995 and it dropped substantially over the following years. Overall, almost 80% of all firms cross-listing on the NSE during the

1990s completed listing within the first two years of the NSE opening, i.e. in 1994 and 1995. For the scope of our empirical analysis, we treat this group of dual-listed firms as the ‘treatment’ group. The main interest of the paper is to compare the investment behavior of the treatment group with that of their peers listed on BSE, which did not pursue a secondary-listing (‘control’ or ‘benchmark’ firms).

Data on Indian public firms are extracted by the *Prowess* database, compiled by the Center for Monitoring the Indian Economy (CMIE). Prowess provides detailed balance sheet and stock market data for the years starting in 1991. To avoid including firm-years which may associate with the Asian financial crisis at the end of the 1990s, we collect data for the period 1991-8. This allows us enough years before the opening of the new market (1991-3), and in the aftermath (1996-8), to study changes in corporate outcomes for firms which completed listing in years 1994 and 1995, i.e. NSE 94’ and NSE 95’ firms, respectively.

We identify firms cross-listed on the NSE as follows. From the full sample of BSE-listed firms, we drop firms in which the controlling shareholder (‘promoter’) is the government or foreign-denominated entities. We also drop firms with years of incorporation after 1990, to avoid including newly-established firms in our sample that would likely be classified as financially constrained. Hence, our sample of cross-listed firms are firms already listed on the BSE, with first trading on the NSE in 1994 or 1995. We identify 856 such firms, which together with their peers listed on the BSE, create a pool of 2,740 Indian firms.

Table 1 presents summary statistics for the main variables of interest, which appear in multivariate tests discussed below. In particular, we present mean values for dual-listed firms before and after cross-listing their shares on the new market, and we compare them against those of (unmatched) benchmark firms. Evidence from the univariate analysis shows that the average dual-listed firm increased its total assets and reduced its debt-to-assets ratio after cross-listing on the NSE. In addition, cross-listing associated positively with foreign expansion, as evidenced by the positive and statistically significant difference in the fraction of firms’ foreign sales. Moreover, cross-listing had positive spill-over effects on firms’ stock liquidity. Our univariate analysis results suggest that shareholders of cross-listed firms may have benefited from a more liquid trading environment in the primary market (BSE).⁴ This evidence is consistent with previous research, which suggests that cross-listing can lower information asymmetry and trading costs in the home market (e.g. Chemmanur and Fulghieri, 2006).

When compared against their peers listed on the BSE, dual-listed firms increased investment relatively more in the period after cross-listing. Specifically, their investment as a ratio of assets was 2.5 percentage

⁴ We use the number of zero daily stock returns in a fiscal year as a proxy for firms’ stock illiquidity levels. Large numbers of zero returns can be associated with high transaction costs and a more illiquid environment, which deter informed investors from trading. Cross-country evidence shows that this measure outperforms alternatives (e.g. bid-ask spread) in capturing firms’ stock liquidity in emerging markets, and particularly in the Indian setting (e.g. Lesmond, 2005; Bekaert et al., 2007).

points higher before cross-listing and 2.9 percentage points higher in the aftermath. This represents an economically significant increase of 6% $(=(0.029-0.025)/0.068)$. This finding, although preliminary at this stage, provides some early support to the argument that cross-listing on the new stock exchange may have improved firms' access to capital and enhanced their ability to finance investment.

3.2 Methodology

Our main specification is a difference-in-differences model which measures differences in firm investment between dual-listed firms and their BSE-listed peers, before and after cross-listing on the new market. In particular, for our sample in which firm i is observed annually at year t , we estimate the relation between cross-listing and firm investment by the following regression:

$$CAPEX_{it} = \alpha_i + \theta_t + \beta X_{it} + \delta_1 After_{it} + \delta_2 (After_{it} \times Constrained_i) + \varepsilon_{it} \quad (1)$$

where $CAPEX$ is firms' capital investment measured as the change in fixed assets to total assets. $After$ is a dummy variable taking values one for firm-years after a firm is cross-listed on the NSE and zero otherwise. X is a vector of time-varying regressors which control for differences in firm's financial characteristics. These include firms' size ($Assets$), debt ($Leverage$), profitability ($PBITDA$) and investment opportunities ($Sales Growth$).⁵ The model includes also firm fixed-effects (α_i) and year dummies (θ_t) to control for time-invariant unobserved differences across firms and common time trends, respectively.

To disentangle financing implications of cross-listing depending on firms' financial constraints, we also include among the regressors an interaction term of the 'After' variable with an indicator which takes values one if firm i was classified as 'constrained' ($Constrained$). This term will capture the incremental impact of cross-listing on firm investment which might associate with firms' financial constraints. Firms are classified as financially constrained, after assigning values based on the indices proposed by the work of Kaplan and Zingales (1997), Whited and Wu (2006) and Hadlock and Pierce (2010). These are estimated based on pre-cross-listing data, to alleviate endogeneity concerns with the cross-listing decision. Definitions of the indices and details on their synthesis based on Indian data are provided in the Appendix (Annex B).

⁵ Definitions of all variables are provided in the Appendix (Annex A).

3.3 Investment dynamics

The underlying assumption in our difference-in-differences framework, is that if the new stock market improved firms' access to outside capital, differences in investment between dual-listed firms and their peers listed on the BSE would grow larger subsequently to cross-listing. To test this 'parallel trends' argument, we examine the evolution of firm investment with respect to the cross-listing event. In particular, we use a fixed-effects model in which firm investment (CAPEX) is regressed on a set of event-year indicator variables: *Before2*, *Before1*, *After0*, *After1*, *After2* and *After3+*, which equal one for the firm-year observation n -years ($n = 0, 1, 2, 3+$) before or after the firm cross-lists its shares on the NSE, and zero otherwise.

$$CAPEX_{it} = \beta_0 + \sum_{s=-2}^{-1} \Gamma_s \textit{Before}(-s)_{it} + \sum_{s=0}^4 \Gamma_s \textit{After}(s)_{it} + \alpha_i + \theta_t + \varepsilon_{it} \quad (2)$$

In our proposed specification, *Before* is an indicator taking values one if it is (s) years before cross-listing on the NSE, and *After* is an indicator that equals one if it is (s) years following cross-listing. The inclusion of firm fixed effects α_i allows to study variations in investment around the cross-listing event relative to their peers listed on the BSE, while the use of year dummies δ_t accounts for common time trends.

Results in column (1) of Table 2 show that the investment of dual-listed firms was on average statistically indistinguishable from that of their peers before cross-listing. However, it grew larger in the aftermath and these differences likely persisted for at least three years after cross-listing. These results support statistics from the univariate analysis presented in the previous section, that cross-listing likely facilitated improved investment behaviors. Columns (2) and (3) present results separately for the group of companies completing cross-listing within the first year of the opening of the new market (NSE 94'), and those cross-listing subsequently (NSE 95'), relative to their peers which remained listed on the BSE. Evidence shows that the real-effects of cross-listing were likely more pronounced to firms completing listing with a delay, although their levels of spending on investment became comparable to that of their peers in the long-run.

Next, we explore whether differences in investment subsequently to cross-listing can be associated with more pronounced changes in cross-listed firms' growth opportunities. Columns (4) to (6) track down changes in firms' annual rates of sales growth, but do not report supporting evidence. Finally, in the remaining columns, we explore changes in firms' stock liquidity in the primary market (BSE) after cross-listing. In column (7), we find that cross-listed firms were associated with significant improvements in the liquidity and trading environment of their shares in the primary market, relative to non-cross-listed firms. These results suggest that the new market facilitated greater homogeneity in the level of transaction costs

borne by investors in the primary market (BSE), which can be explained by reduced information barriers and other market frictions associated with floor-trading, following the opening of the NSE.

However, this evidence masks important differences between the NSE 94' and NSE 95' listing cohorts (columns 8 and 9). In particular, the former experienced severe deterioration in their stock liquidity levels in the year after cross-listing, which nevertheless diminished in the aftermath. In contrast, the latter benefited from higher stock liquidity right after the cross-listing event, but this was only transitory. This discrepancy in results can be explained by theories which highlight that cross-listing increases liquidity in the home market as long as the benefit of getting access to a more 'liquid' market outweighs the disadvantage of migration of trading in the new market (e.g. Domowitz et al., 1998).

In our setting, the negative spill-overs effects of cross-listing on stock liquidity conditions in the primary market (BSE), are consistent with the view that the opening of the new market was associated with a migration of order flows and liquidity from the existing market. On the back of advanced information technology and more stringent rules in trading, the new market facilitated greater trading activity which likely reduced trading volumes and negatively affected liquidity conditions in the primary market. Our results show that this was likely more pronounced to dual-listed firms which engaged with equity offerings subsequently to cross-listing (i.e. NSE 95' firms), as they might have experienced a relatively greater diversion of order flows in the new market. However, these effects appear only transitory, at least for the NSE 94' listing cohort, as intermarket competition between the BSE and the NSE likely reduced trading costs and brokerage fees in the primary market, causing trading to flow back to the BSE. Indeed, anecdotal evidence suggests that soon after the opening of the NSE, the BSE adopted similar trading and information technology, bridging the differences in trading costs with the new market, and removed market frictions associated with floor trading (e.g. Krishnamurti et al., 2003).

Overall, our event-year analysis provides some early support to the argument that the opening of the NSE facilitated improved liquidity conditions and an enlarged investor base to firms cross-listing shares on the new market. These results are consistent with 'market segmentation' explanations in cross-listing which point out that by overcoming fragmented markets, firms can attain greater risk sharing, with implications on their trading costs and their ability to finance investment. However, these effects were not uniformly distributed across firms or over time, which suggests that different firms may have different incentives to cross-list on the new market. In the section below, we shed more light on these motives by examining the *ex-ante* financial characteristics of firms which pursued a secondary listing of their shares.

4. Multivariate tests

4.1 Who goes public on the NSE?

We start our analysis by examining the *ex-ante* financial characteristics of firms cross-listing on the NSE. Following the respective literature, we use a probit and a Cox-proportional hazard model to predict cross-listing based on company characteristics (e.g. Pagano et al., 2002; Doidge et al., 2009; King and Segal, 2009). These models essentially predict from a set of firms that are not listed on the NSE in year $t - 1$, those that are more likely to be listed in year t .

$$NSE_{it}^{listing} = \beta X_{it-1} + \theta_t + \varepsilon_{it} \quad (3)$$

The dependent variable is a dummy variable that takes values one if firm i listed its shares on the NSE in year t and zero otherwise ($NSE_{it}^{listing}$). The choice of control variables X is motivated by studies such as Doidge et al. (2004) and Fresard and Salva (2010), and aims to capture differences in financial characteristics across firms, associated with the cross-listing decision. These include firms' size (*Assets*) and age (*Age*), to capture differences in their level of information asymmetries or their ability to incur the listing costs in the new market; the fraction of foreign sales (*FX Sales*), to capture differences in product market exposure; the growth rate of sales (*Sales Growth*) and industry-median market-to-book ratios (*Industry M2B*), to capture differences in firm-level investment opportunities and growth across industries; firms' capital structure (*Industry Leverage*), measured at the industry level to circumvent endogeneity concerns with the cross-listing decision, as well as firms' profitability (*PBITDA*), dividend payouts (*DIV_dummy*), and group affiliation (*Group*) to capture differences in firms' external financial constraints. Finally, we control for differences in firms' stock illiquidity (*ILLIQ_BSE*), as it has been proposed as a quantitatively important determinant for cross-listing shares in the new market.

Evidence from the first column in Table 3 shows that larger young firms with good investment opportunities, were more likely to cross-list shares on the new market. The positive and significant coefficient of stock illiquidity further suggests that a larger and deeper investor base may be motivating the cross-listing decision. Hence, cross-listing on the NSE may have been driven by firms' need to fund growth, particularly among firms with larger information asymmetry and liquidity problems in the primary market. Our inferences remain broadly unchanged if we use duration analysis in column (2). This implies that our results are not sensitive to the type of model used to predict cross-listing.

Differences between the NSE 94' and NSE 95' listing cohorts discussed in the previous section, motivates us to explore potential differences in their financial characteristics prior to the cross-listing decision. To do so, we add interaction terms of all regressors with a dummy variable indicating firms listing on the NSE in

1995. We perform these tests using the probit and Cox-proportional hazard models and present results in the remaining columns.

Our results show that firms cross-listing on the NSE with a delay (i.e. NSE 95') were on average smaller, with higher growth ratios relative to their industry peers, and greater stock illiquidity problems in the primary market. Importantly, these firms had low profitability, were less likely to pay a dividend prior to cross-listing, and did not have access to a group's internal capital markets. Putting these findings together, this type of financial characteristics are more likely to belong to firms which the literature would associate with larger financial constraints. Indeed, studies such as Fazzari et al. (1988), Almeida et al. (2004) and Hadlock and Pierce (2010) propose that smaller young firms with good investment projects but low profitability and payouts, are likely to face severe finance frictions. An explanation for this finding is that firms which completed listing with a delay can be considered as more 'constrained', to the extent that they might miss some of the eligibility criteria for cross-listing shares in the new market in the year of opening.⁶ Hence, firms which lacked a track record of reported profits and payouts to cross-list shares on the inauguration year, may have been associated with more severe financial constraints and share some of the financial attributes of the NSE 95' listing cohort.

4.2 Dual-listed firms and firm investment

This section presents the main results of the paper, after using the model specification in equation (1). In particular, it examines whether cross-listing on the NSE improved firms' access to capital and facilitated greater investment spending among financially constrained firms. Results are presented in Table 4 for the full sample of dual-listed firms, and separately for the NSE 94' and NSE 95' listing cohorts. Firms are classified as financially constrained, based on the indices proposed by the work of Kaplan and Zingales (1997), Whited and Wu (2006) and Hadlock and Pierce (2010).

Models (1) to (3) present results after using the Kaplan and Zingales (1997) index for measuring firm-level financial constraints. Evidence shows that dual-listed firms increased investment in the aftermath of cross-listing shares on the new market, but this was likely to apply to the NSE 95' listing cohort, and particularly among firms likely to be associated with financial constraints. These results are robust to controlling for firms' financial characteristics, firm fixed effects and common trends.⁷ They support the view that the

⁶ The NSE sets out a set of pre-requisites for cross-listing which includes, among others, a record of distributable profits and dividend payouts in at least two of the last three years before application for listing is made. Detailed information on NSE listing criteria can be found at http://www.nseindia.com/getting_listed/content/eligibility_criteria.htm

⁷ F-test results at the bottom of Table 4 show that the equality of the 'After' variable with its interaction term can be rejected at 1% significance levels.

opening of the NSE reduced market frictions and enhanced firms' access to capital, particularly among firms facing difficulties in raising outside capital.

Results in the remaining columns are not robust to using the alternative indices of financial constraints, namely the WW-index (columns (4) to (6)), and the SA-index (columns (7) to (9)). An explanation for this discrepancy might be that firm financial attributes which these indices associate with financial constraints, do not match the profile of firms which increased investment subsequently to cross-listing, as presented in the previous section. For example, the SA-index identifies small and young firms as 'constrained'. However, evidence from Table 3 shows that larger young firms were likely to cross-list on the NSE, hence making classification of constrained firms based on only these two characteristics in our sample misleading. Similarly, the WW-index identifies firms which have low investment opportunities relative to their peers in the industry as 'constrained'. In contrast, firms pursuing a secondary-listing on the NSE were firms which belonged to product markets with good growth potential, and individually had good investment opportunities. On the other hand, the KZ-index classifies firms as 'constrained', which have high debt, good investment opportunities but low profitability, i.e. characteristics that fit better the description of firms listing on the NSE with a delay, possibly because of missing some of the listing requirements for profitability and payouts in the first place.

Overall, evidence in this section supports the view that cross-listing shares on the new market facilitated real benefits to domestic firms, in the form of increased investment. This was more likely to apply to *ex-ante* financially constrained firms, as proposed by the Kaplan and Zingales (1997) index. Given that the literature is still lacking a proper definition of financial constraints for emerging market companies, and drawing on the discussion above, we feel that this index is more appropriate in our setting for capturing firm-level financial constraints.

5. Tests of endogeneity

As noted earlier, the cross-listing decision is not a random decision received by the manager, and hence its relation to investment may suffer from endogeneity concerns. To mitigate these concerns, in this section we employ a number of robustness tests. First, we use propensity score matching to control for observable differences between 'treated' (dual-listed firms) and 'control' firms (BSE-listed peers) in financial characteristics associated with the cross-listing decision. Second, we perform a treatment effects model to control for the impact of possible unobservable differences across firms prior to the cross-listing event. Finally, we perform an instrumental variables model to mitigate concerns that cross-listing and firm investment may be jointly determined by some correlated factor included in the error term of the investment regression.

5.1 Propensity score matching

We start this section with our results using propensity score matching. Contrary to our fixed effects model presented above, propensity score matching is a non-parametric technique aimed to reduce the potential selection bias in estimating the causal effects of cross-listing on firm investment. In particular, the concern here is that characteristics of dual-listed firms before cross-listing may also explain why these firms increase their investment relatively more afterwards. To address this concern, we match dual-listed firms with their peers listed on the BSE on a set of covariates associated with the listing decision. Our goal is to find close matches of dual-listed firms within the pool of firms that were eligible to cross-list on the NSE but chose not to. The matching starts with a probit model in which the treatment dummy is regressed on the same set of explanatory variables, as those included in Table 3. Then, using the propensity scores or else the predicted probabilities from the estimated probit regression, we find for each dual-listed firm-year observation, the nearest-neighbor match of benchmark firm-year observations which minimizes the absolute difference in propensity scores and falls in the common support area. Results of these tests are presented in Table 5. Results are presented for dual-listed firms against their matched firms, and separately for the NSE 94' and NSE 95' listing cohorts. For each test, changes in investment are reported in detail for treated (dual-listed), non-treated (benchmark) and control (matched benchmark) group of firms.

Mean tests indicate that both treated and control firms experienced a large drop in investment during our period of study, which is consistent with univariate statistics presented above.⁸ The difference-in-differences matching estimator shows that the drop in investment was likely less pronounced to firms with a secondary listing on the new market (0.012). In particular, although the average dual-listed firm would drop investment by 3 percentage points during this period, its matched peer in the BSE would drop investment by 1.2 percentage points more.

In further tests, we find close matches from the BSE group separately for firms cross-listing within the opening year of the NSE (NSE 94') and those cross-listing later (NSE 95'). We find that differences in changes in investment were statistically significant only for the latter group of firms, in support of our previous findings. Hence, results in this section show that differences in investment responses of dual-listed firms after cross-listing on the new market are robust to matching methods.

5.2 Treatment effects

⁸ The outburst of the Asian financial crisis at the end of the 1990s likely explains firms' reductions in investment. For example, Gopalan and Gormley (2013) show that the collapse of India's stock markets in 1997-8 had negative implications on the investment of public firms, particularly among those likely to face more severe external financial constraints.

Propensity score matching rests on the assumption the cross-listed firms and their peers in BSE can be matched on observable pre-listing financial characteristics. However, they may also differ along unobservable dimensions, which might relate to the cross-listing decision. Hence, our findings may be contaminated by self-selection bias. In this section, we present and discuss results from a treatment effects model to control for this bias.

Specifically, the model proceeds in two stages. In the first stage, we run a probit model to explain the cross-listing decision using the same set of firm financial characteristics (X) as reported in Table 3. The dependent variable, NSE^{dmy} , is an indicator taking values one for dual-listed firms and zero otherwise. The model yields estimates for the inverse Mills ratio ($Mills$), which is included as a second step in the investment regression to control for the potential selection bias, under the assumption that the error terms of the two equations are jointly bivariate normal. In particular, the model specification is the following.

$$NSE_i^{dmy} = \gamma X_{it-1} + \theta_t + u_{it}$$

$$CAPEX_{it} = \alpha_i + \theta_t + \beta X_{it} + \delta_1 After_{it} + \delta_2 (After_{it} \times Constrained_i) + Mills_{it} + \varepsilon_{it} \quad (4)$$

Results of the first-stage regression are reported in the Appendix (Annex C), while those of the second stage in Table 6. Results from the outcome regression in column (1) shows that cross-listing had a positive and significant impact on the investment of financially constrained firms, even after controlling for the influence of the selection bias in the cross-listing decision. In columns (2) and (3), we find that these results were more pronounced to NSE 95' dual-listed firms, in support of our previous findings.

5.3 Instrumental variables

Finally, we employ an instrumental variables model to investigate the impact of cross-listing on firm investment. Contrary to the treatment effects model presented above, this test assumes that the 'After' dummy enters endogenously in the model, because both a firm's investment and the cross-listing decision may be influenced by a common unobserved factor, which is included in the error term of equation (1). To mitigate this concern, one has to identify a variable which might relate to firm investment only through the cross-listing decision.

We propose and use the distance from a firm's headquarters to the primary market (BSE) as an instrument for the potentially endogenous decision to cross-list shares on the new market.⁹ The motivation is based on

⁹ Prowess provides information for the address and postcode of sample firms' headquarters. We measure 'distance' as the geographical distance between the firm's postcode and the postcode of the BSE in Mumbai.

prior research which uses the physical proximity to capital markets as an exogenous source of variation in the level of firm opacity. For example, Saunders and Steffen (2011) use the distance of the firm to London capital markets as an identification variable to explore differences in borrowing costs between public and private companies. Their argument is that distance is associated with the listing decision but not to loan spreads between the two types.

In the presence of fragmented markets, firms geographically away from the BSE may have been facing disproportionately larger information asymmetry problems with outside investors and consequently suffer from higher monitoring costs, which might reduce their ability to raise new capital or raise capital more costly. The opening of the NSE, and in particular the adoption of electronic trading, might have helped these firms to overcome investment barriers, expand their shareholder base outside the BSE region, and gain from an improved information environment to a larger extent than their peers closer to the main market. Therefore, we argue that firms' location with respect to the BSE was likely to affect their investment behavior in the years after the opening of the NSE, through the cross-listing decision.

To test the above arguments, we adopt an instrumental variables approach in which we first estimate the probability of going public on the NSE as a function of the firm's distance to the BSE, and then use the fitted values as an instrument to explain differences in firm investment. In particular, our proposed model specification is the following.

$$NSE_{it} = (Distance_i \times Post94_t) + X_{it} + \alpha_i + \theta_t + \varepsilon_{it}$$

$$CAPEX_{it} = NSE_{it} + (NSE_{it} \times Constrained_i) + X_{it} + \alpha_i + \theta_t + \eta_{it} \quad (5)$$

In the model, *NSE* takes values one for firm-years after a firm becomes cross-listed on the new market and zero otherwise, *Distance* is the logarithm of the geographical distance between a firm's headquarter offices and the BSE location, and *Post94* is a dummy variable which takes values one for the years that followed the opening of the NSE (and zero before). As in previous tests, *CAPEX* is the level of firm investment, *Constrained* is an indicator taking values one if a firm is classified as financially constrained based on Kaplan and Zingales (1997) index, and *X* is a set of control variables presented in Section 4.1.

Results of this section are presented in Table 7. Column (1) presents evidence from a probit model which explains the cross-listing decision as a function of the firm's distance to the BSE. Results show a positive relation between the two variables. This implies that a firm was more inclined to pursue a secondary listing, the further away it was from the primary market. In column (2), we use the fitted values from the first-stage regression to explain differences in firm-level investment across firms. Results support our previous

findings that dual-listed firms increased investment relatively more than their peers in the BSE after cross-listing, and this was likely to apply to financially constrained firms.

In columns (2a) and (2b), we repeat these tests after including firms' financial characteristics as control variables. We continue to find a positive influence of the instrumented cross-listing dummy on firm investment, however distance loses explanatory power among the regressors. Finally, in the remaining columns, we attempt a model which additionally accounts for firm fixed effects to control for unobserved differences across firms which might relate to cross-listing and investment. We find that distance was associated positively with the decision to cross-list shares on the new market, and this had a positive influence on firm's subsequent ability to finance investment, particularly among financial constrained firms. These results complement our previous findings by suggesting that the positive relation between cross-listing and investment appears robust to the potential endogeneity in the cross-listing decision.

6. Additional tests

6.1 Variability within dual-listed firms

An implication of our results so far, is that firms completing listing with a delay had financial attributes that matched more closely those of firms which the literature would describe as financially constrained. If so, we would expect to find differences in the rate of change in investment *within* the sample of dual-listed firms, with the investment of constrained firms growing larger the longer it took the firm to complete listing on the NSE. To examine this hypothesis, we sort firms into groups according to their listing date and compare their changes in investment after cross-listing. In particular, we create three dummy variables taking values one for firms completing listing within the first four-month period of 1995 (*Late1*), within the second (*Late2*) and within the third (*Late3*), and zero for firms listing in year 1994.¹⁰ We interact these dummies with the 'After' variable and add another interaction term with the constraints indicator 'KZc' to capture differences in the change in the investment behavior of constrained firms depending on their time of listing. Results of these tests are presented in Table 8.

In column (1), we start by comparing the investment of the aggregate group of NSE 95' listing firms to that of the NSE 94' listing cohort, and in the remaining columns, we break the former group into the subgroups described above. Overall, our results suggest that firms which completed listing with a time-lag increased investment relatively more in the aftermath, and these differences grow larger the longer it took the firm to complete listing on the NSE after its opening. These results give rise to a positive relation between the time

¹⁰ We use a four-month period to allow a balanced number of firms per period. As such, the number of firms per cohort is large enough to allow a good fit for model specifications.

a firm took to enter the new market and the change in its subsequent investment. To the extent that this time difference might associate with the severity of constraints faced by the firm when entering the new market (as implied by their financial characteristics), these findings support our inferences that the new market may enhanced firms' access to capital and benefited relatively more financially constrained firms.

6.2 Exploring sources of relaxed constraints

Finally, in this section we shed more light on the possible channels through which cross-listing on the NSE may have enhanced firms' access to capital. Specifically, we focus on capital and cost-of-capital implications on firm investment. First, we examine whether firms cross-listing on the new market issued more equity. This would provide more direct evidence that cross-listed firms were associated with higher equity-financed investments subsequently to the opening of the NSE. Second, we examine the role of the information environment of the firm, to understand better whether cross-listing benefits in the cost of capital might associate with reduced information asymmetries.

6.2.1 Increased access to equity capital

This section tests the hypothesis that increased investment in the aftermath of cross-listing was associated with enhanced access to capital in the form of equity finance. This should be more pronounced to the NSE 95' listing cohort, which our evidence associates with more pronounced changes in investment after cross-listing. To test this hypothesis, we perform our instrumental variables analysis this time exploring the (instrumented) impact of cross-listing on net new equity issues. We measure firms' net equity issues, using information from firms' cash flow statements provided by Prowess and we present results in Table 9.

Results from the second-stage regressions in columns (1) and (2) show that going public on the NSE had a positive influence on firms' equity offerings. Consistent with our previous findings, these results were likely to apply to firms which belonged to the NSE 95' listing cohort, which represent more closely firms likely to have been financially constrained.¹¹

In the rest of the columns, we repeat tests this time studying the influence of cross-listing on net new debt issues. Results show only weak evidence that cross-listing enhanced firms' access to debt capital (e.g. through reputational effects). This provides further support that results capture an increased ability of the firm to finance projects using new equity, rather than an overall improved access to outside capital after

¹¹ Diagnostic tests show that the variable of distance passes the threshold for the F-test of weak instruments (the F-statistic is 42.79).

cross-listing. Hence, this section supports our previous inferences that firms cross-listing on the new market engaged with higher equity-financed investments, and this was more pronounced to financially constrained firms.

6.2.2 Reduced information asymmetries

Theories suggest that firms cross-listing for the purpose of raising new capital, would benefit from more informative stock prices and lower monitoring costs which reduce the cost of external finance (e.g. Karolyi, 2012). Hence, better information production in the new market may have a direct financing benefit to cross-listed firms in the form of a lower cost of capital. Other things equal, this should be more pronounced to firms with higher growth opportunities and firms with higher external financing needs. However, advanced information and trading technology of the NSE could also convey cross-listing benefits to the cost of capital indirectly, by allowing firms to open up to a country-wide shareholder base, which could increase risk-sharing and enhance the firms' stock liquidity. Hence, by cross-listing on the NSE, Indian firms could overcome entry barriers of previously fragmented markets, which could translate into a more liquid trading environment for their stocks and a valuation premium over non-cross-listed firms.

To test these arguments, we propose three alternative measures to capture differences in the information environment across firms. Specifically, we use the dispersion of annual earnings per share measured over the period 1991-1993, the variation in monthly stock returns in the period before the opening of the NSE (from March 1992 to October 1994) and the average ratio of intangible assets to total assets during the period 1991-1993. We use financial data before the opening of the NSE to mitigate endogeneity concerns with the cross-listing decision. As a result, firms are classified as 'opaque' if their respective values are above the industry median and 'non-opaque' otherwise.

The motivation for choosing these proxies is based on prior work which has studied changes in stock returns and earnings-based measures to infer changes in the information environment of the firm after cross-listing. For example, Fernandes and Ferreira (2008) associate cross-listed emerging market companies with reduced stock return volatility, consistent with the view that increased analyst coverage may inhibit informed traders (e.g. controlling shareholders) from actively trading. Similarly, Bailey et al. (2006) study changes in returns around earnings announcements to infer changes in the information environment of the firm. The main idea here is that when a firm commits to increased levels of financial disclosure, it can reduce information costs borne by outside investors and increase the precision of the information about the firm, which can manifest in a lower cost of capital. From a different perspective, the fraction of intangible assets held by the firm may correlate with its level of information asymmetry. This argument is consistent with theories and

evidence that firms with low collateral values and limited pledgeable cash flows may associate with severe frictions with outside investors (e.g. Brown et al., 2009).

Table 10 presents results of tests on corporate outcomes, after accounting for differences in firms' levels of information asymmetry. Specifically, results are presented in four different panels, with the outcome variables being firm investment estimated by capital expenditures (Panel A), cost of capital estimated by firms' monthly stock returns averaged over the year (Panel B), stock illiquidity estimated by the number of zero daily trading returns in BSE (Panel C) and stock valuation estimated by firms' market capitalization in BSE (Panel D). Results of these tests are presented for subsamples of firms based on their location with respect to that of the BSE.

Evidence from Panel A1 shows that dual-listed firms increased investment relatively more in the post-NSE era, and this was likely more pronounced to firms which faced higher information asymmetries *ex-ante*. For example, column (1) shows that cross-listing allowed more 'opaque' firms to increase investment by 2.3 percentage points more than their peers, subsequently to cross-listing on the NSE. This evidence suggests that greater transparency in trading shares in the new market likely reduced information problems for the firm, with implications on its capital-raising activities. More detailed tests in Panel A2 show that these effects likely held for both NSE 94' and NSE 95' listing cohorts, depending on the proxy for information asymmetry, which is consistent with results from the event-year analysis in Table 2.

In Panel B, we examine changes in firms' (realized) stock returns as a proxy for changes in their implied cost of capital.¹² We find that cross-listing was associated with a reduction in the cost of capital, and this was likely more pronounced to firms facing greater information problems *ex-ante*, regardless of their time of listing. This evidence can be explained by an information-based argument, according to which cross-listing in a market with greater information and trading technology may allowed firms to overcome barriers to information flow and gain from a reduction in risk-premium required by investors for lesser-known firms (e.g. Merton, 1987).

In Panel C, we examine whether reduced information asymmetries had any positive spill-over effects on the liquidity of shares traded on the primary market (BSE). Results show that intermarket information linkages had positive implications on firms' trading environment in the primary market, consistent with existing theories (e.g. Domowitz et al., 1998). Specifically, firms with greater information asymmetry problems were likely to experience larger reductions in the stock illiquidity of their shares in the BSE. This evidence lends empirical support to our previous inferences, that the opening of the NSE and the adoption

¹² We follow the literature in using realized (absolute) stock returns as a proxy for investors' expected or required stock returns (e.g. Errunza and Miller, 2000; Sarkissian and Schill, 2009).

of advanced information technology in trading promoted greater equity market integration by reducing barriers to information flows. Evidence from detailed tests in Panel C2 further shows that these results were likely to apply to NSE 94' firms, which were less likely to be associated with capital-raising motives in cross-listing. In contrast, for NSE 95' firms, the diversion of trading activity in the new market as a result of new equity offerings, was not accompanied by significant improvements in liquidity conditions in the primary market.

Finally, results in Panel D show that the informational advantage of cross-listing in the new market was associated with a valuation premium in the primary market. More detailed tests show that this was more pronounced to NSE 94' firms. In contrast, we find only weak valuation benefits for dual-listed firms which failed to sustain a more liquid trading environment for their shareholders (i.e. NSE 95' dual-listed firms).

Putting our findings together, BSE-listed firms which expanded their shareholder base to include investors from across the country, benefited from lower trading costs, a lower cost of capital and increased stock valuation over non-cross-listed firms. These results are suggestive of the financial benefits of equity market integration at the firm level. Notably, the cross-listing premium was weak for firms that expanded their shareholder base to raise new capital, but were not associated with persistent improvements in their home-market stock liquidity (i.e. NSE 95' firms). This result suggests that dual-listed firms which improved the trading environment for investors were rewarded by higher market valuations, and this effect was distinct from the overall improvement in firms' access to capital.

In summary, results in this section provide support to our previous findings that better market integration in emerging economies can have implications on real-firm decisions such as financing and investment, through an expanded shareholder base and a reduction in the cost of capital. We identify that reduced information asymmetries with outside investors may be a channel that this might have worked. However, the informational advantages of cross-listing can go well beyond the capital market access story, and convey cross-listing valuation benefits when accompanied by reduced market frictions and persistent improvements in investors' trading environment. This evidence suggests that enhanced access to capital is one, but perhaps not the most important benefit of equity market integration from shareholders' perspective.

7. Conclusion

This paper explores the unique setting of firms cross-listing on a new domestic stock exchange, as a means to enhance their access to capital and overcome market frictions in previously fragmented markets. The National Stock Exchange in India was the country's first stock exchange to adopt technological advances

in trading and overcome geographical limits and market frictions, set by traditional floor-based trading systems. Subsequently to cross-listing, firms would have access to a larger and deeper investor base, while investors could attain greater diversification and lower transaction costs in trading.

Our empirical analysis shows that dual-listed firms increased investment relatively more than their peers which remained listed on the primary market (Bombay Stock Exchange). These results were more pronounced to firms which were *ex-ante* more financially constrained, and are robust to testing for endogeneity in the cross-listing decision. They expand previous studies which highlight the role of reduced investment barriers in international cross-listings (e.g. Lins et al., 2005), by suggesting that financial market integration can improve firms' access to capital within the country's borders. Hence, financial market reforms which promote market integration can reduce incentives to pursue a cross-border listing in the first place, and thereby alleviate negative implications on home market liquidity conditions (e.g. Domowitz et al., 1998).

We also provide evidence of the underlying source of higher investment levels. We find that dual-listed firms embarked on higher equity offerings subsequently to cross-listing shares on the new market. Also, we find that cross-listing benefits in the form of reduced cost of capital were more pronounced to firms with higher information asymmetries. These results suggest that advanced information and trading technology in the new market may have attenuated the cost of raising new capital.

However, our results propose that reduced information asymmetries and enhanced access to capital may be distinct benefits of market integration at the firm-level. In particular, investors rewarded dual-listed firms which improved trading conditions with a permanent valuation premium over non-cross-listed firms. In contrast, cross-listing valuation benefits were only transitory for firms which were not successful in sustaining a more liquid trading environment for their shareholders. We interpret these results as suggestive that equity market integration can improve firms' access to capital in emerging economies, but this may not be the most important benefit from shareholders' perspective.

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Appendix

Annex A. Variables definition

VARIABLE	DEFINITION
Assets	$\text{Ln}(\text{Assets})$
Age	$\text{Ln}(\text{Number of years since incorporation})$
FX Sales	Foreign sales/Total sales
Sales Growth	$\Delta \text{Sales}_t / \text{Sales}_{t-1}$
M2B	Market values of assets / Book value of assets
Industry M2B	Industry median of the market-to-book ratio
Leverage	Debt / Assets
Industry Leverage	Industry median of the debt-to-assets ratio
PBITDA	Earnings before interest, taxes and depreciation / Assets
Group	Dummy taking values one for group firms, zero otherwise
DIV_dummy	Dummy taking values one if firm paid dividend on that year, zero otherwise
ILLIQ	$\text{Ln}(1 + \text{number of zero daily returns})$, a proxy for stock illiquidity
CAPEX	Change in net fixed assets to Assets
Distance	$\text{Ln}(1 + \text{geographical distance in kilometers to BSE from firms' headquarters})$
Equity issues	Net equity issues to Assets
Debt issues	Net debt issues to Assets

Annex B. Measures of financial constraints

We measure firms' financial constraints based on the indices proposed by Kaplan and Zingales (1997), Whited and Wu (2006) and Hadlock and Pierce (2010). Firms are assigned values based on 1993 data, i.e. one year before the opening of the NSE. We then classify firms as 'constrained' or 'unconstrained' according to whether their index values are in the top or bottom tercile, respectively. Details on the composition of financial constraints measures are provided below.

• KZ index

KZ index is derived from Kaplan and Zingales (1997) and formulated in the subsequent work of Lamont et al. (2001). Each firm is assigned a value of financial constraints based on the formula:

$$KZ = -1.002 \text{ Cash flow} + 0.283 Q + 3.139 \text{ Leverage} - 39.368 \text{ Dividends} - 1.315 \text{ Cash}$$

where *Cash flow* is the sum of net income before extraordinary items and depreciation deflated by capital measured by PPE (property, plant and equipment), *Q* is the market-to-book ratio measured as the sum of book value of assets plus the market value of common equity less the book value of common equity all deflated by the book value of assets, *Leverage* is the ratio of the book value of total debt to the sum of book value of total debt and book value of common equity, *Dividends* is the ratio of dividends to capital and *Cash* is the ratio of cash holdings to capital.

• WW index

WW index is derived from Whited and Wu (2006). Each firm is assigned a value of financial constraints based on the formula:

$$WW = -0.091 \text{ Cash flow} - 0.062 \text{ DIV_dummy} + 0.021 \text{ LTD} - 0.041 \text{ Assets} + 0.102 \text{ Industry Sales Growth} - 0.035 \text{ Sales Growth}$$

where *Cash flow* is firm's cash flow to total assets, *DIV_dummy* is a dummy taking values one if the firm paid a cash dividend on that particular year and zero otherwise, *LTD* is long-term debt to total assets, *Assets* is the natural logarithm of firms' total assets, *Industry Sales Growth* is firm's median industry sales growth and *Sales Growth* is firm's sales growth.

• **SA index**

SA index is derived from Hadlock and Pierce (2010). Each firm is assigned a value of financial constraints based on the formula:

$$SA = -0.737 \text{ Size} + 0.043 \text{ Size}^2 - 0.040 \text{ Age}$$

where *Size* is the natural logarithm of firms' total assets and *Age* is the natural logarithm of years since incorporation.

Annex C. First-stage regressions in dealing with self-selection

This Table presents results from first-stage regressions in dealing with the self-selection problem as described in Section 5.2. The regression is a probit model in which the dependent variable is a dummy variable taking values one for dual-listed firms (column 1), dual-listed firms as of 1994 (column 2), dual-listed firms as of 1995 (column 3) and zero for benchmark firms (See equation (4)). All specifications include a set of control variables associated with the decision to go public and year dummies. Definitions of these variables are provided in the Appendix (Annex A). Standard errors are clustered at the firm level and p-values are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

	NSE (1)	NSE 94 (2)	NSE 95 (3)
Assets _{t-1}	1.417*** (0.000)	1.191*** (0.000)	0.278*** (0.000)
Age _{t-1}	-0.449*** (0.000)	-0.127 (0.121)	-0.230*** (0.000)
FX Sales _{t-1}	0.007* (0.071)	0.012** (0.011)	0.004 (0.215)
Sales Growth _{t-1}	-0.164* (0.075)	-0.272** (0.030)	0.045 (0.484)
Industry M2B _t	1.089*** (0.000)	0.777*** (0.002)	0.016 (0.923)
PBITDA _{t-1}	5.413*** (0.000)	4.643*** (0.000)	2.228*** (0.000)
Industry Leverage _t	-0.612 (0.282)	-1.768** (0.016)	0.388 (0.356)
Group	0.238*** (0.010)	0.031 (0.843)	0.408*** (0.000)
ILLIQ_BSE _{t-1}	-0.035 (0.329)	-0.131** (0.021)	0.120*** (0.000)
constant	-10.823*** (0.000)	-10.537*** (0.000)	-3.137*** (0.000)
Year dummies	X	X	X
Pseudo R ²	0.614	0.562	0.135
Obs.	9,086	9,086	9,086

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Figure 1: NSE cross-listings

This figure provides information on the number of BSE-listed firms completing a secondary listing on the NSE during the 1990s. The equities segment of NSE commenced operations in late 1994. More than 350 BSE-listed firms completed a secondary cross-listing on NSE within the first year of opening. The number of dual-listed firms increased more than twofold in 1995 and it dropped substantially the following years. Overall, almost 80% of all dual-listed firms completed listing within the first two years after the NSE opening, i.e. in 1994 and 1995. Source: *Prowess*



Table of Results

Table 1: Summary statistics

This Table presents summary statistics for firms with a secondary listing of their shares on the NSE (dual-listed firms) versus their peers listed on the BSE (benchmark firms). *Assets* is the natural logarithm of firms' total assets. *Sales Growth* is the one-year change in sales to lagged sales, *FX Sales* is the ratio of foreign-to-total sales, *Leverage* is the debt-to-assets ratio, *PBITDA* is earnings before interest, taxes and depreciation scaled by firms' assets, *CAPEX* is firms' capital investment measured as the change in net fixed assets plus depreciation to total assets, *ILLIQ_BSE* is the natural logarithm of one plus the number of zero daily trading returns of firms' stock traded in the BSE over the year. Results from t-tests on mean differences are provided separately for dual-listed firms, before and after listing on the NSE, as well as compared against the benchmark firms. *,**,*** indicate significance at 10%, 5% and 1% respectively.

	NSE cross-listed firms			BSE-listed firms		
	Before (1)	After (2)	Diff. (2) - (1)	All years (3)	Diff. (1) - (3)	Diff. (2) - (3)
Assets	8,082 [2,708]	8,721 [3,100]	0.639***	5,864 [8,754]	2.172***	3.016***
Sales Growth	0.160 [1,802]	0,025 [2,891]	-0.135***	0,021 [6,013]	0.068***	0.022***
FX Sales	7,865 [2,691]	9,375 [3,088]	1.510***	4,510 [8,733]	3.730***	4.911***
Leverage	0,419 [2,681]	0,408 [3,070]	-0.011**	0,448 [8,157]	-0.041***	-0.030***
PBITDA	0,151 [2,665]	0,125 [3,096]	-0.026***	0,100 [8,611]	0.039***	0.032***
CAPEX	0.068 [1,895]	0.046 [3,042]	-0.023***	0,032 [6,365]	0.025***	0.029***
ILLIQ_BSE	4,021 [2,604]	3,483 [3,347]	-0.538***	3,648 [11,514]	0.163***	0,051

Table 2: Investment dynamics

This Table presents the evolution of dual-listed firms' investment (CAPEX), annual rate of sales growth (Sales Growth) and stock liquidity in the primary market (ILLIQ_BSE)) with respect to the cross-listing event. The model in all specifications is a fixed-effects regression in which the variables of interest are regressed on event-year indicators, *Before2*, *Before1*, *After0*, *After1*, *After2* and *After3+*, controlling for firm fixed-effects and year dummies (See equation (2)). The indicators equal one for the firm-observation n -years ($n = 0, 1, 2, 3+$) before or after listing on the NSE and zero otherwise. Results are presented for dual-listed firms against their peers which remained listed on the BSE, as well as separately for those which listed in 1994 (NSE 94'), and those which completed listing in 1995 (NSE 95'). Standard errors are corrected for heteroskedasticity and clustered at the firm level. P-values are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

	CAPEX			Sales Growth			ILLIQ_BSE		
	NSE All	NSE 94'	NSE 95'	NSE All	NSE 94'	NSE 95'	NSE All	NSE 94'	NSE 95'
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Before2	0.008 (0.100)		0.009 (0.124)	-0.043*** (0.008)		-0.024 (0.259)	0.312*** (0.000)	0.248*** (0.000)	0.354*** (0.000)
Before1	0.009 (0.122)	-0.001 (0.931)	0.011* (0.069)	-0.001 (0.956)	0.054** (0.020)	0.014 (0.509)	0.450*** (0.000)	0.442*** (0.000)	0.504*** (0.000)
After0	0.013** (0.020)	0.006 (0.441)	0.016*** (0.009)	-0.021 (0.285)	0.031 (0.188)	0.007 (0.746)	0.415*** (0.000)	0.715*** (0.000)	0.248*** (0.000)
After1	0.014** (0.017)	0.010 (0.137)	0.015** (0.019)	-0.027 (0.167)	0.083*** (0.000)	-0.037* (0.079)	0.328*** (0.000)	0.360*** (0.000)	0.250*** (0.000)
After2	0.015** (0.012)	0.014* (0.055)	0.014** (0.029)	-0.045** (0.024)	0.038 (0.112)	-0.048** (0.032)	0.343*** (0.000)	0.124* (0.089)	0.446*** (0.000)
After3+	0.010* (0.094)	0.005 (0.453)	0.007 (0.222)	-0.041** (0.047)	0.034 (0.110)	-0.043* (0.053)	0.227*** (0.003)	0.046 (0.601)	0.414*** (0.000)
constant	0.049*** (0.000)	0.048*** (0.000)	0.047*** (0.000)	0.095*** (0.000)	0.070*** (0.000)	0.091*** (0.000)	4.165*** (0.000)	4.188*** (0.000)	4.208*** (0.000)
Firm F.E.	X	X	X	X	X	X	X	X	X
Year F.E.	X	X	X	X	X	X	X	X	X
adj. R ²	0.093	0.096	0.093	0.123	0.103	0.118	0.146	0.137	0.125
Obs.	11,296	8,097	9,558	10,706	7,621	9,098	17,465	13,572	15,407

Table 3: Who goes public on the NSE?

This Table presents results from examining the ex-ante financial characteristics of firms cross-listing on the NSE. The dependent variable in all regressions is a dummy variable that takes values one if firm i listed on the NSE in year t and zero otherwise (See equation (3)). Columns (1) and (3) present results from probit models. Columns (2) and (4) present results from Cox-proportional hazard models. Interaction terms are added in columns (3) and (4) to examine differences in cross-listing motives of the NSE 95th listing cohort. Standard errors are clustered at the firm level and p-values are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)
Assets _{t-1}	0.463*** (0.000)	0.811*** (0.000)	0.510*** (0.000)	0.781*** (0.000)
Age _t	-0.158*** (0.000)	-0.175*** (0.000)	-0.334*** (0.000)	-0.395*** (0.000)
FX Sales _{t-1}	0.004** (0.022)	0.010*** (0.000)	-0.001 (0.841)	0.010* (0.085)
Sales Growth _{t-1}	0.293*** (0.007)	0.075 (0.501)	-0.005 (0.978)	-0.246 (0.265)
Industry M2B _t	0.680*** (0.000)	0.813*** (0.000)	2.876*** (0.000)	1.091*** (0.000)
PBITDA _{t-1}	2.652*** (0.000)	4.857*** (0.000)	1.989** (0.012)	4.895*** (0.000)
Industry Leverage _t	0.833** (0.037)	-0.038 (0.937)	0.697 (0.376)	-3.113*** (0.004)
Group	0.273*** (0.000)	0.304*** (0.000)	0.523*** (0.000)	1.184*** (0.000)
ILLIQ_BSE _{t-1}	0.070*** (0.008)	0.145*** (0.000)	-0.253*** (0.000)	-0.169*** (0.001)
DIV_dummy _{t-1}	0.256*** (0.000)	0.377*** (0.000)	0.532*** (0.000)	1.068*** (0.000)
NSE 95 × Assets _{t-1}			0.117 (0.150)	-0.459*** (0.000)
NSE 95 × Age _t			0.556*** (0.000)	0.530*** (0.000)
NSE 95 × FX Sales _{t-1}			0.017*** (0.003)	-0.005 (0.391)
NSE 95 × Sales Growth _{t-1}			0.753*** (0.009)	0.414* (0.082)
NSE 95 × Industry M2B _t			-5.980*** (0.000)	-1.259*** (0.000)
NSE 95 × PBITDA _{t-1}			3.449*** (0.004)	-1.867 (0.107)
NSE 95 × Industry Leverage _t			-2.170	4.330***

			(0.100)	(0.000)
NSE 95 × Group			-0.484***	-1.218***
			(0.002)	(0.000)
NSE 95 × ILLIQ_BSE _{t-1}			1.611***	1.073***
			(0.000)	(0.000)
NSE 95 × DIV_dummys _{t-1}			-0.863***	-1.166***
			(0.000)	(0.000)
constant	-5.722***		-7.614***	
	(0.000)		(0.000)	
Year dummies	X		X	
pseudo R ²	0.271	0.096	0.527	0.120
Obs.	3,127	6,829	3,127	6,829

Table 4: Dual-listing on the NSE and firm investment

This Table presents results from regressing firms' capital investment (*CAPEX*) on firm financial characteristics, an indicator capturing years after listing on NSE (*After*) and its interaction term with a dummy variable identifying financially constrained firms (See equation (1)). *KZc*, *WWc* and *SAc* take values one for firms classified as constrained before the opening of NSE (on year 1993) and zero otherwise, following the methodology proposed in the work by Kaplan and Zingales (1997), Whited and Wu (2006) and Hadlock and Pierce (2010), respectively. Definitions of the indices are provided in the Appendix (Annex B). Results are presented for dual-listed firms and their peers which remained listed on the BSE, as well as separately for the NSE 94' and NSE 95' listing cohorts. All specifications include firm fixed-effects and year dummies. P-values of F-tests which test the statistical difference between the 'After' variable and its interaction term are provided at the bottom of the table. Standard errors are corrected for heteroskedasticity and clustered at the firm level. P-values are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

	NSE All	NSE 94'	NSE 95'	NSE All	NSE 94'	NSE 95'	NSE All	NSE 94'	NSE 95'
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
After	-0.011**	0.003	-0.020***	0.000	0.002	-0.003	-0.002	-0.003	-0.001
	(0.027)	(0.702)	(0.003)	(0.989)	(0.776)	(0.707)	(0.653)	(0.523)	(0.870)
After × KZc	0.011*	-0.007	0.022***						
	(0.050)	(0.347)	(0.004)						
After × WWc				-0.003	-0.005	-0.001			
				(0.559)	(0.455)	(0.914)			
After × SAc							-0.015	-0.015	-0.016
							(0.169)	(0.200)	(0.323)
Assets	0.029***	0.029***	0.031***	0.028***	0.029***	0.030***	0.032***	0.030***	0.035***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales Growth	0.046***	0.045***	0.041***	0.046***	0.044***	0.043***	0.046***	0.044***	0.044***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	-0.025***	-0.032***	-0.028***	-0.023***	-0.027***	-0.029***	-0.031***	-0.038***	-0.032***
	(0.005)	(0.002)	(0.003)	(0.008)	(0.006)	(0.002)	(0.002)	(0.001)	(0.002)
PBITDA	-0.033*	-0.045**	-0.030*	-0.026	-0.035*	-0.021	-0.040**	-0.050**	-0.027
	(0.058)	(0.028)	(0.096)	(0.130)	(0.077)	(0.240)	(0.031)	(0.018)	(0.161)
constant	-0.154***	-0.144***	-0.159***	-0.145***	-0.138***	-0.149***	-0.168***	-0.138***	-0.178***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm F.E.	X	X	X	X	X	X	X	X	X

Year F.E.	X	X	X	X	X	X	X	X	X
adj. R ²	0.129	0.133	0.131	0.125	0.128	0.128	0.132	0.133	0.137
Obs.	7,144	5,024	5,969	8,382	5,960	6,972	6,900	4,853	5,815
F-test	0.027	0.455	0.002	0.737	0.555	0.896	0.258	0.405	0.374

Table 5: Propensity score matching

This Table compares differences in investment of dual-listed firms after cross-listing shares in the new market (NSE), to those experienced by matched firms which remained listed in the primary market (BSE). Firms are matched using propensity score matching. Section 5.1 presents details of the matching methods. Figures reported are firm capital investments to assets ratios. Results are presented for dual-listed firms against their matched firms, and separately for the NSE 94' and NSE 95' listing cohorts. For each test, changes in investment are reported in detail for treated (dual-listed), non-treated (benchmark) and control (matched benchmark) group of firms.

NSE All	Before	After	Diff.
Treated firms (Dual-listed)	0.067	0.038	-0.029
Non-treated firms (BSE-listed)	0.046	0.009	-0.037
Difference (t-value)	0.021 (14.11)	0.029 (25.91)	0.008 (4.89)
Treated firms (Dual-listed matched)	0.066	0.036	-0.030
Control firms (BSE-listed matched)	0.050	0.008	-0.042
Difference (t-value)	0.016 (2.45)	0.028 (5.74)	0.012 (1.73)

NSE 94'	Before	After	Diff.
Treated firms (Dual-listed)	0.071	0.044	-0.027
Non-treated firms (BSE-listed)	0.047	0.009	-0.037
Difference (t-value)	0.025 (12.01)	0.035 (24.12)	0.010 (4.69)
Treated firms (Dual-listed matched)	0.071	0.043	-0.028
Control firms (BSE-listed matched)	0.028	-0.007	-0.035
Difference (t-value)	0.043 (4.22)	0.050 (6.60)	0.007 (0.69)

NSE 95'	Before	After	Diff.
Treated firms (Dual-listed)	0.065	0.035	-0.030
Non-treated firms (BSE-listed)	0.047	0.009	-0.037
Difference (t-value)	0.019 (11.17)	0.026 (20.13)	0.007 (3.62)
Treated firms (Dual-listed matched)	0.065	0.035	-0.030
Control firms (BSE-listed matched)	0.067	0.026	-0.040
Difference (t-value)	-0.002 (0.45)	0.008 (2.83)	0.010 (2.34)

Table 6: Treatment effects

This Table examines cross-listing benefits on firm investment, after controlling for the potential selection bias in the cross-listing decision. The dependent variable in all regressions is firms' capital investment (*CAPEX*). *After* is a dummy variable which takes values one for firm-years after listing on NSE and zero otherwise. The financial constraints indicator (*KZc*) takes values one if the index value of the firm proposed by Kaplan and Zingales (1997) belongs to the top tercile, and zero otherwise. Details on the construction of the index are provided in the Appendix (Annex B). All specifications include the inverse Mills ratio estimated from the first-stage selection regression. Results of these tests are presented in the Appendix (Annex C). Results are presented for dual-listed firms, and separately for the NSE 94' and NSE 95' listing cohorts. P-values of F-tests which test statistical differences of the *After* variable and its interaction term are provided at the bottom of the table. Standard errors are corrected for heteroskedasticity and clustered at the firm level. P-values are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)
After	-0.016*** (0.004)	0.005 (0.425)	-0.028*** (0.000)
After × KZc	0.019*** (0.002)	-0.002 (0.789)	0.030*** (0.000)
Mills	0.025*** (0.000)		
Mills 94		0.026*** (0.000)	
Mills 95			0.025*** (0.004)
Assets	0.052*** (0.000)	0.052*** (0.000)	0.043*** (0.000)
Sales Growth	0.034*** (0.000)	0.032*** (0.000)	0.033*** (0.000)
Leverage	-0.015 (0.147)	-0.027** (0.025)	-0.009 (0.395)
PBITDA	-0.015 (0.438)	-0.021 (0.337)	-0.008 (0.675)
constant	-0.345*** (0.000)	-0.377*** (0.000)	-0.274*** (0.000)

Firm F.E.	X	X	X
Year F.E.	X	X	X
adj. R ²	0.146	0.146	0.142
Obs.	5,786	4,024	4,797
F-test (p-value)	0.014	0.577	0.000

Table 7: Instrumental variables

This Table presents results from an instrumental variable analysis which uses the proximity to the primary listing venue (BSE) as an instrument for cross-listing on the new market (NSE). Columns with an indication (a) report results from the first-stage regression, as described in equation (5). Column (1a) reports results from a probit model in which an indicator taking values one for firm-years after a firm cross-lists (and zero otherwise) is regressed on its geographical distance to the BSE (*Distance*), interacted with a dummy variable taking values one for firm-years following the opening of the new market (*Post94*). Column (2a) includes additionally a set of control variables associated with firm investment. Column (3a) includes additionally firm fixed effects. The rest of the columns present results from the outcome regression which explores firm investment as a function of the (instrumented) cross-listing dummy variable (NSE), and its interaction term with the Kaplan and Zingales (1997) financial constraints indicator (*KZc*). The financial constraints indicator (*KZc*) takes values one if the index value of the firm based on 1993 data belongs to the top tercile, and zero otherwise. Details on the construction of the index are provided in the Appendix (Annex B). P-values of standard errors are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

	NSE (1a)	CAPEX (1b)	NSE (2a)	CAPEX (2b)	NSE (3a)	CAPEX		
						NSE All (3b)	NSE 94' (3c)	NSE 95' (3d)
NSE		-0.012 (0.454)		0.091 (0.598)		0.012 (0.877)	-0.020 (0.810)	-0.012 (0.889)
NSE × KZc		0.021*** (0.001)		0.011*** (0.000)		0.012 (0.170)	0.010 (0.320)	0.021** (0.037)
Assets			1.338*** (0.000)	-0.101 (0.662)	0.185*** (0.000)	0.025* (0.070)	0.032** (0.045)	0.031* (0.057)
Sales Growth			-0.532*** (0.000)	0.099 (0.282)	-0.046*** (0.000)	0.047*** (0.000)	0.046*** (0.000)	0.042*** (0.000)
Leverage			-0.773*** (0.001)	0.056 (0.678)	-0.074* (0.092)	-0.022** (0.046)	-0.030** (0.014)	-0.025** (0.034)
PBITDA			3.150*** (0.000)	-0.353 (0.516)	0.065 (0.406)	-0.037** (0.047)	-0.054** (0.014)	-0.034* (0.082)
Distance × Post94	0.065*** (0.000)		0.005 (0.804)		0.010** (0.031)			
constant	-0.695*** (0.000)	0.054*** (0.002)	-9.901*** (0.000)	0.806 (0.637)	-1.330*** (0.000)	-0.129 (0.203)	-0.165 (0.146)	-0.160 (0.172)
Firm F.E.		X		X	X	X	X	X
Year dummies	X	X	X	X	X	X	X	X

Adj. or ps. R ²	0.048	0.095	0.627	0.128	0.470	0.132	0.139	0.135
Obs.	10,130	5,234	7,335	5,682	9,807	6,688	4,682	5,538

Table 8: Variability within dual-listed firms

This Table examines how relaxed financial constraints associated with the time of listing on the new market. The dependent variable is firms' capital investment (*CAPEX*). *After* takes values one for years after listing on the new market and zero otherwise. The financial constraints indicator (*KZc*) takes values one if the index value of the firm based on 1993 data belongs to the top tercile, and zero otherwise. Details on the construction of the index are provided in the Appendix (Annex B). *Late* takes values one for firms listing on the NSE in 1995 and zero for firms listing in 1994. *Late1* takes values one for firms listing during the first four-month period of 1995 and zero for firms listing in 1994. *Late2* takes values one for firms listing during the second four-month period in 1995 and zero for firms listing in 1994. *Late3* takes values one for firms listing during the third four-month period in 1995 and zero for firms listing in 1994. All specifications include control variables (defined in the Annex A), firm fixed effects and year dummies. Standard errors are corrected for heteroskedasticity and clustered at the firm level. P-values are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)
After × KZc	-0.008 (0.229)	-0.008 (0.257)	-0.008 (0.216)	-0.008 (0.287)
After × Late	-0.021*** (0.009)			
After × Late × KZc	0.030*** (0.002)			
After × Late1		-0.007 (0.494)		
After × Late1 × KZc		0.015 (0.248)		
After × Late2			-0.030*** (0.005)	
After × Late2 × KZc			0.039*** (0.004)	
After × Late3				-0.030** (0.035)
After × Late3 × KZc				0.043** (0.019)
Assets	0.026*** (0.000)	0.017*** (0.001)	0.027*** (0.000)	0.026*** (0.000)
Sales Growth	0.056*** (0.000)	0.068*** (0.000)	0.059*** (0.000)	0.066*** (0.000)
Leverage	-0.002 (0.893)	0.013 (0.511)	-0.012 (0.507)	-0.001 (0.978)
PBITDA	-0.015 (0.612)	-0.040 (0.332)	-0.010 (0.798)	-0.040 (0.448)
constant	-0.163***	-0.097**	-0.165***	-0.167***

	(0.000)	(0.034)	(0.000)	(0.008)
Firm F.E.	X	X	X	X
Year F.E.	X	X	X	X
adj. R ²	0.124	0.121	0.132	0.133
Obs.	3,295	2,041	2,092	1,512
After × KZc = After × Late × KZc	0.011	0.186	0.008	0.024
After × Late = After × Late × KZc	0.002	0.321	0.002	0.016

Table 9: External financing

This Table examines cross-listing implications on new equity and debt offerings of dual-listed firms. Figures depicted stem from an instrumental variables model which uses firm proximity to the primary listing venue (BSE) as an instrument for the cross-listing dummy. Models (1) and (2) present results for new equity offerings. Models (3) and (4) present results for new debt offerings. Definitions of control variables are provided in the Appendix (Annex A). Diagnostic tests on endogeneity are reported at the bottom of the table. P-values of standard errors are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

	Equity issues		Debt issues	
	(1)	(2)	(3)	(4)
NSE 95'	0.049*** (0.004)		0.025* (0.089)	
NSE 94'		-0.061*** (0.002)		-0.030* (0.080)
Assets	-0.005*** (0.000)	0.006 (0.125)	-0.002* (0.051)	0.004 (0.140)
Age	0.003* (0.071)	0.001 (0.488)	0.002* (0.088)	0.001 (0.355)
FX Sales	-0.001*** (0.000)	-0.000*** (0.000)	-0.000 (0.751)	0.000 (0.262)
Industry M2B	0.049*** (0.000)	0.045*** (0.000)	0.019*** (0.000)	0.016*** (0.000)
Sales Growth	0.007* (0.060)	0.006 (0.118)	0.007** (0.013)	0.005* (0.058)
Industry Leverage	0.002 (0.910)	-0.002 (0.927)	0.010 (0.416)	0.008 (0.531)
PBITDA	-0.003 (0.868)	0.037** (0.018)	-0.003 (0.802)	0.021 (0.128)
Group	-0.008** (0.017)	-0.003 (0.172)	-0.005* (0.063)	-0.002 (0.195)
Constant	-0.047*** (0.000)	-0.099*** (0.000)	-0.030*** (0.001)	-0.057*** (0.005)
Weak instrument (F-test)	42.79***	54.92***	36.93***	53.45***
Endogenous (p-value)	0.003	0.011	0.027	0.035
Obs.	3,005	3,005	3,493	3,493

Table 10: Informational advantages of cross-listing

This Table explores reduced information asymmetries as a channel for greater capital market access in cross-listings. Panel A tests implications of cross-listing on firms' capital investment (CAPEX). Panel B presents results on firms' cost of equity capital, proxied by the natural logarithm of (realized) monthly stock returns in BSE averaged over the year. Panel C presents results on firms' stock liquidity, measured as the natural logarithm of one plus the number of zero trading days in BSE over the year. Panel D tracks down firms' stock valuation measured by the natural logarithm of firms' market capitalization on BSE. All panels are presented in subsamples based on firms' proximity to the primary market. Firm opacity measures used are the dispersion of annual earnings per share for the period 1991-3 (column 1), the variation in monthly stock returns for the period March 1992 to October 1994 (column 2), and the average ratio of intangible to total assets for the period 1991-3 (column 3). Firms are denoted as 'opaque' if their relative measure is above the industry median, 'non-opaque' otherwise. *LateAfter* is a dummy variable taking values one for the years after 1995 and zero for the years before 1994. Standard errors are corrected for heteroskedasticity and clustered at the firm level. P-values are depicted in parentheses with ***, **, * indicating statistical significance at 1%, 5% and 10% respectively.

Panel A: Capital expenditures

PANEL A1	Distance > Sample median			Distance < Sample median		
	(1)	(2)	(3)	(4)	(5)	(6)
LateAfter	-0.009 (0.104)	-0.004 (0.422)	-0.026*** (0.000)	-0.041*** (0.000)	-0.029*** (0.000)	-0.060*** (0.000)
LateAfter × opaque (1)	-0.008 (0.220)	-0.016** (0.016)	0.026*** (0.000)	0.005 (0.522)	-0.022*** (0.007)	0.042*** (0.000)
LateAfter × NSE × opaque (2)	0.023*** (0.009)	-0.003 (0.833)	0.013** (0.041)	-0.006 (0.538)	-0.010 (0.638)	-0.013** (0.049)
LateAfter × NSE × non-opaque (3)	0.009 (0.118)	0.009 (0.120)	0.016** (0.027)	0.001 (0.928)	-0.010 (0.139)	0.009 (0.365)
Sales Growth	0.051*** (0.000)	0.050*** (0.000)	0.050*** (0.000)	0.055*** (0.000)	0.054*** (0.000)	0.054*** (0.000)
Industry Sales Growth	-0.030* (0.067)	-0.029* (0.079)	-0.027* (0.090)	-0.026 (0.305)	-0.023 (0.335)	-0.016 (0.513)
constant	0.043***	0.043***	0.042***	0.039***	0.040***	0.039***
adj. R ²	0.138	0.141	0.148	0.151	0.155	0.167
Firm & Year F.E.	X	X	X	X	X	X
Obs.	4,036	4,043	4,043	2,932	2,940	2,949
(1) = (2)	0.021	0.377	0.203	0.480	0.627	0.000
(2) = (3)	0.185	0.385	0.726	0.591	0.988	0.067

PANEL A2	Distance > Sample median			Distance < Sample median		
	(1)	(2)	(3)	(4)	(5)	(6)
LateAfter	-0.009 (0.103)	-0.004 (0.422)	-0.026*** (0.000)	-0.041*** (0.000)	-0.029*** (0.000)	-0.060*** (0.000)
LateAfter × opaque (0)	-0.008 (0.219)	-0.016** (0.016)	0.026*** (0.000)	0.005 (0.521)	-0.022*** (0.007)	0.042*** (0.000)
LateAfter × NSE94 × opaque (1)	0.012 (0.357)	0.034*** (0.000)	0.016** (0.034)	-0.003 (0.805)	0.005 (0.713)	-0.013 (0.109)
LateAfter × NSE95 × opaque (2)	0.028*** (0.005)	-0.005 (0.689)	0.011 (0.128)	-0.008 (0.466)	-0.012 (0.606)	-0.012 (0.112)
LateAfter × NSE94 × non-opaque (3)	0.008 (0.335)	0.002 (0.797)	0.004 (0.699)	0.009 (0.338)	-0.005 (0.517)	0.024* (0.051)
LateAfter × NSE95 × non-opaque (4)	0.010 (0.136)	0.012** (0.049)	0.021*** (0.007)	-0.005 (0.581)	-0.014* (0.076)	0.000 (0.980)
Sales Growth	0.051*** (0.000)	0.050*** (0.000)	0.050*** (0.000)	0.055*** (0.000)	0.053*** (0.000)	0.054*** (0.000)
Industry Sales Growth	-0.031* (0.060)	-0.029* (0.075)	-0.030* (0.064)	-0.025 (0.307)	-0.023 (0.327)	-0.017 (0.484)
constant	0.043*** (0.000)	0.043*** (0.000)	0.043*** (0.000)	0.040*** (0.000)	0.040*** (0.000)	0.039*** (0.000)
adj. R ²	0.138	0.142	0.148	0.151	0.155	0.169
Firm & Year F.E.	X	X	X	X	X	X
Obs.	4,036	4,043	4,043	2,932	2,940	2,949
(0) = (1)	0.220	0.000	0.396	0.629	0.148	0.000
(0) = (2)	0.011	0.481	0.179	0.421	0.732	0.000
(1) = (2)	0.296	0.000	0.537	0.656	0.508	0.897
(3) = (4)	0.826	0.174	0.137	0.196	0.277	0.101
(1) = (3)	0.766	0.000	0.364	0.418	0.525	0.012
(2) = (4)	0.121	0.211	0.335	0.811	0.942	0.382

Panel B: Cost of capital

PANEL B1	Distance > Sample median			Distance < Sample median		
	(1)	(2)	(3)	(4)	(5)	(6)
LateAfter	-0.051 (0.773)	-0.209 (0.205)	0.798*** (0.000)	0.245 (0.270)	-0.172 (0.440)	0.430 (0.116)
LateAfter × opaque (1)	0.182 (0.413)	0.510** (0.024)	0.182 (0.420)	0.007 (0.983)	0.745** (0.011)	-0.338 (0.265)
LateAfter × NSE × opaque (2)	-1.340*** (0.000)	-0.408 (0.276)	-0.857*** (0.000)	-0.880*** (0.004)	-0.234 (0.630)	-0.709*** (0.003)
LateAfter × NSE × non-opaque (3)	-0.584*** (0.001)	-0.657*** (0.000)	-0.789*** (0.000)	-0.800*** (0.001)	-0.509** (0.021)	-0.926*** (0.002)
Sales Growth	-0.130 (0.359)	-0.053 (0.713)	-0.114 (0.426)	-0.458** (0.013)	-0.406** (0.028)	-0.454** (0.013)
Industry Sales Growth	-0.293 (0.545)	-0.204 (0.672)	-0.213 (0.657)	0.320 (0.660)	-0.015 (0.982)	0.363 (0.597)
constant	0.410***	0.383***	0.401***	0.228**	0.250**	0.230**
adj. R ²	(0.000)	(0.000)	(0.000)	(0.037)	(0.018)	(0.033)
Firm & Year F.E.	0.096	0.100	0.092	0.060	0.076	0.062
Obs.	X	X	X	X	X	X
(1) = (2)	2,027	2,030	2,033	1,463	1,468	1,471
(2) = (3)	0.000	0.071	0.004	0.101	0.130	0.424

PANEL B2	Distance > Sample median			Distance < Sample median		
	(1)	(2)	(3)	(4)	(5)	(6)
LateAfter	-0.054 (0.761)	-0.213 (0.198)	0.810*** (0.000)	0.245 (0.271)	-0.158 (0.479)	0.432 (0.114)
LateAfter × opaque (0)	0.183 (0.412)	0.511** (0.023)	0.181 (0.423)	0.006 (0.983)	0.743** (0.011)	-0.338 (0.265)
LateAfter × NSE94 × opaque (1)	-1.679*** (0.000)	-0.352 (0.108)	-1.133*** (0.000)	-0.818** (0.037)	-1.473*** (0.001)	-0.654** (0.012)
LateAfter × NSE95 × opaque (2)	-1.174*** (0.000)	-0.415 (0.304)	-0.707*** (0.002)	-0.942*** (0.006)	-0.150 (0.765)	-0.760** (0.011)
LateAfter × NSE94 × non-opaque (3)	-0.811*** (0.000)	-0.843*** (0.000)	-0.981*** (0.001)	-0.807*** (0.002)	-0.422* (0.089)	-0.965** (0.023)
LateAfter × NSE95 × non-opaque (4)	-0.454**	-0.538***	-0.685***	-0.796***	-0.581**	-0.907***

	(0.024)	(0.002)	(0.003)	(0.004)	(0.021)	(0.006)
Sales Growth	-0.122	-0.050	-0.105	-0.457**	-0.402**	-0.450**
	(0.392)	(0.729)	(0.462)	(0.013)	(0.030)	(0.014)
Industry Sales Growth	-0.313	-0.222	-0.208	0.314	0.119	0.372
	(0.520)	(0.647)	(0.664)	(0.667)	(0.868)	(0.588)
constant	0.401***	0.379***	0.393***	0.229**	0.248**	0.230**
	(0.000)	(0.000)	(0.000)	(0.036)	(0.019)	(0.033)
adj. R ²	0.099	0.102	0.094	0.059	0.076	0.060
Firm & Year F.E.	X	X	X	X	X	X
Obs.	2,027	2,030	2,033	1,463	1,468	1,471
(0) = (1)	0.000	0.037	0.000	0.165	0.000	0.506
(0) = (2)	0.001	0.081	0.018	0.089	0.176	0.396
(1) = (2)	0.123	0.869	0.116	0.757	0.018	0.720
(3) = (4)	0.115	0.112	0.266	0.967	0.502	0.887
(1) = (3)	0.024	0.093	0.685	0.982	0.039	0.531
(2) = (4)	0.030	0.779	0.948	0.739	0.441	0.738

Panel C: Stock liquidity (BSE)

PANEL C1	Distance > Sample median			Distance < Sample median		
	(1)	(2)	(3)	(4)	(5)	(6)
LateAfter	-0.221**	-0.187*	-0.050	-0.604***	-0.993***	-0.674***
	(0.032)	(0.071)	(0.600)	(0.000)	(0.000)	(0.000)
LateAfter × opaque (1)	0.190	0.046	-0.191	-0.229	0.684***	-0.005
	(0.193)	(0.748)	(0.168)	(0.240)	(0.000)	(0.978)
LateAfter × NSE × opaque (2)	-0.448***	0.067	-0.208*	-0.272	-0.440**	-0.455***
	(0.001)	(0.716)	(0.086)	(0.102)	(0.038)	(0.003)
LateAfter × NSE × non-opaque (3)	-0.243**	-0.328***	-0.436***	-0.456***	-0.099	-0.326**
	(0.013)	(0.001)	(0.000)	(0.001)	(0.492)	(0.019)
Sales Growth	-0.120*	-0.116*	-0.120*	-0.007	0.037	-0.008
	(0.069)	(0.081)	(0.070)	(0.928)	(0.660)	(0.919)
Industry Sales Growth	0.161	0.113	0.149	-0.277	-0.359	-0.306
	(0.516)	(0.651)	(0.550)	(0.510)	(0.354)	(0.431)
constant	3.832***	3.843***	3.840***	3.874***	3.839***	3.861***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R ²	0.150	0.152	0.150	0.150	0.164	0.148
Firm & Year F.E.	X	X	X	X	X	X
Obs.	4,080	4,086	4,086	3,017	3,025	3,033
(1) = (2)	0.013	0.939	0.944	0.897	0.001	0.151
(2) = (3)	0.218	0.060	0.141	0.384	0.181	0.525

PANEL C2	Distance > Sample median			Distance < Sample median		
	(1)	(2)	(3)	(4)	(5)	(6)
LateAfter	-0.220**	-0.188*	-0.048	-0.597***	-0.988***	-0.668***
	(0.032)	(0.070)	(0.617)	(0.000)	(0.000)	(0.000)
LateAfter × opaque (0)	0.190	0.046	-0.191	-0.229	0.685***	-0.006
	(0.193)	(0.746)	(0.168)	(0.241)	(0.000)	(0.976)
LateAfter × NSE94 × opaque (1)	-0.809***	-0.443***	-0.612***	-0.569***	-0.978**	-0.687***
	(0.000)	(0.007)	(0.000)	(0.002)	(0.019)	(0.000)
LateAfter × NSE95 × opaque (2)	-0.274*	0.100	-0.026	-0.008	-0.349	-0.244
	(0.051)	(0.601)	(0.836)	(0.963)	(0.103)	(0.118)
LateAfter × NSE94 × non-opaque (3)	-0.563***	-0.622***	-0.698***	-0.718***	-0.356**	-0.655***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.019)	(0.000)
LateAfter × NSE95 × non-opaque (4)	-0.101	-0.176*	-0.316***	-0.281**	0.111	-0.134

	(0.321)	(0.080)	(0.002)	(0.033)	(0.442)	(0.329)
Sales Growth	-0.113*	-0.111*	-0.111*	0.001	0.044	0.001
	(0.086)	(0.094)	(0.092)	(0.991)	(0.591)	(0.994)
Industry Sales Growth	0.137	0.086	0.142	-0.267	-0.345	-0.301
	(0.576)	(0.728)	(0.563)	(0.524)	(0.371)	(0.439)
constant	3.829***	3.842***	3.837***	3.866***	3.832***	3.854***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R ²	0.158	0.159	0.158	0.157	0.170	0.154
Firm & Year F.E.	X	X	X	X	X	X
Obs.	4,080	4,086	4,086	3,017	3,025	3,033
(0) = (1)	0.000	0.069	0.088	0.319	0.000	0.033
(0) = (2)	0.075	0.850	0.492	0.512	0.002	0.451
(1) = (2)	0.000	0.007	0.000	0.000	0.146	0.000
(3) = (4)	0.000	0.000	0.000	0.000	0.000	0.000
(1) = (3)	0.195	0.365	0.628	0.521	0.161	0.888
(2) = (4)	0.314	0.200	0.070	0.208	0.075	0.597

Panel D: Market Capitalization (BSE)

PANEL D1	Distance > Sample median			Distance < Sample median		
	(1)	(2)	(3)	(4)	(5)	(6)
LateAfter	-0.872***	-0.716***	-0.975***	-0.858***	-0.503***	-1.176***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LateAfter × opaque (1)	-0.086	-0.408***	0.139	0.038	-0.743***	0.574***
	(0.481)	(0.000)	(0.208)	(0.838)	(0.000)	(0.001)
LateAfter × NSE × opaque (2)	0.267*	-0.311*	0.206*	0.079	-0.107	-0.169
	(0.052)	(0.086)	(0.061)	(0.665)	(0.795)	(0.268)
LateAfter × NSE × non-opaque (3)	0.238***	0.139	0.275***	0.024	-0.267*	0.328**
	(0.009)	(0.144)	(0.007)	(0.855)	(0.052)	(0.017)
Sales Growth	0.307***	0.275***	0.294***	0.425***	0.374***	0.419***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Industry Sales Growth	0.968***	0.945***	0.989***	0.309	0.366	0.301
	(0.000)	(0.000)	(0.000)	(0.364)	(0.257)	(0.356)
constant	6.160***	6.169***	6.160***	5.961***	5.979***	5.965***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R ²	0.421	0.439	0.426	0.361	0.384	0.375
Firm & Year F.E.	X	X	X	X	X	X
Obs.	3,986	3,990	3,991	2,856	2,863	2,868
(1) = (2)	0.130	0.683	0.730	0.905	0.176	0.011
(2) = (3)	0.858	0.028	0.649	0.806	0.711	0.015

PANEL D2	Distance > Sample median			Distance < Sample median		
	(1)	(2)	(3)	(4)	(5)	(6)
LateAfter	-0.872***	-0.715***	-0.980***	-0.858***	-0.508***	-1.179***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LateAfter × opaque (0)	-0.086	-0.408***	0.139	0.038	-0.744***	0.574***
	(0.481)	(0.000)	(0.207)	(0.838)	(0.000)	(0.001)
LateAfter × NSE94 × opaque (1)	0.424**	1.351***	0.473***	0.029	2.074***	-0.052
	(0.025)	(0.000)	(0.002)	(0.889)	(0.007)	(0.761)
LateAfter × NSE95 × opaque (2)	0.192	-0.418**	0.087	0.122	-0.475	-0.275
	(0.205)	(0.017)	(0.466)	(0.554)	(0.195)	(0.112)
LateAfter × NSE94 × non-opaque (3)	0.347***	0.164	0.259*	0.267	-0.205	0.450**
	(0.007)	(0.174)	(0.060)	(0.108)	(0.185)	(0.026)
LateAfter × NSE95 × non-opaque (4)	0.189*	0.125	0.282**	-0.139	-0.318**	0.258*

	(0.062)	(0.222)	(0.015)	(0.321)	(0.030)	(0.080)
Sales Growth	0.304***	0.268***	0.289***	0.416***	0.366***	0.416***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Industry Sales Growth	0.978***	0.963***	0.963***	0.325	0.357	0.297
	(0.000)	(0.000)	(0.000)	(0.335)	(0.269)	(0.363)
constant	6.161***	6.170***	6.163***	5.962***	5.983***	5.969***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R ²	0.422	0.442	0.429	0.365	0.391	0.376
Firm & Year F.E.	X	X	X	X	X	X
Obs.	3,986	3,990	3,991	2,856	2,863	2868
(0) = (1)	0.060	0.000	0.131	0.979	0.000	0.037
(0) = (2)	0.250	0.968	0.795	0.811	0.533	0.005
(1) = (2)	0.233	0.000	0.012	0.632	0.002	0.153
(3) = (4)	0.239	0.730	0.875	0.011	0.351	0.352
(1) = (3)	0.735	0.000	0.297	0.368	0.003	0.057
(2) = (4)	0.987	0.007	0.241	0.294	0.689	0.019

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