The Market Perception of Firm Risks during Cross-listing Events

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ABSTRACT

To date, we know very little about how market perceives risks for the firms listing in overseas market. Questions on whether risk perceptions change prior to cross-listing and how specifically the risk structure changes remain largely unexplored. Prior research on firm-specific volatility finds that it is associated with stock price informativeness (Morck et al., 2000; Jin and Myers, 2006; Durnev et al. 2004) and that cross-listing is associated with higher firm-specific return variation in developed markets but a lower firm-specific return variation in emerging markets (Fernandes and Ferreira, 2008). In this paper we examine the step-by-step transition of the market perceptions of risks around the cross-listing events. Using a sample of 606 ADR firms, our analysis concludes that the home market perception of the risks around cross-listing is different depending on the level of ADR program chosen by the firm and the development level of the home market. Similar to prior research, we find that idiosyncratic variations relative to total variations tend to decrease after cross-listings; however, by examining risk variations prior to the listing date, we also find that this decrease is largely a reversal of increased relative idiosyncratic variations immediately before listing. Our findings suggest that the market typically perceives an increase in firm specific risks leading up to the cross-listing date, possibly due to rumors of cross-listing or disclosure of listing intentions by the firm. However, after the actual listing date these increased risk perceptions appear to subside back to either pre-listing levels or lower relative idiosyncratic risks in the long run, depending on ADR program level and market development.

Keywords: ADR, cross-listing, idiosyncratic risks, price informativeness

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1. Introduction

Researchers have explored valuation effects around cross-listing events and found evidence of abnormal performance. That is, cross-listed firms experience a pre-listing return run-up and a significant post-listing decline in returns (e.g., Foerster and Karolyi, 1999; Errunza and Miller, 2000; Sarkissian and Schill, 2008). During the volatile period of such corporate events, we know very little about how market perceives risks for the firms listing in overseas market. While prior studies have focused on how risk structures change after cross-listing, our primary research questions center not only around how risk perceptions change after cross-listing but also whether or not this perception changes before firms cross list as well. By taking this approach we seek to better understand how the risk structure of a firm may change throughout the cross-listing period. Gaining an understanding of these types of questions is important as understanding the long-term market perception of risks on such corporate events would allow firms to effectively manage short-term and long-term risks and for asset managers to control risks.

Rather than looking at price movements after cross-listings, we examine the step-by-step transition of the market perceptions of risks around the cross-listing events. We are particularly interested in the changes of the perception of risks from the home market. We rarely observe a cross-listing decision accompanied by an immediate fundamental change in terms of business products or value creation strategies. In other words, to the home market, the firm's positioning within its industry in the home market stays about the same as before and firm-specific factors such as manager's quality is assumed invariant with cross-listings. However, a cross-listing decision does make one particular firm stand out relative to its peers and the home market may perceive the firm differently from before. To address lingering questions such as these, we also examine whether firm-specific return variations change relative to the systematic risks, and, if so, when these changes tend to occur in the cross-listing process. We are particularly interested in whether these changes in risk perception are permanent or temporary. We know that cross-listing may lead to certain changes in the home market, such as trading volume and liquidity at home (Baruch et al. 2007; Halling et al. 2007), which may also lead to changes in different perception of

risks. If a firm's environment change leads stock prices to aggregate more firm-specific information, we would expect a change in firm's risk structure after the cross-listing event.

Many foreign firms cross-list in the U.S. market through depository receipts programs, known as American Depository Receipts (ADRs). In this paper we look at a sample of foreign firms that have ADR programs and derive the perception of risks using the home market share prices. To the best of our knowledge this is the first research paper to explore the short-term and long-term changes in the risk structure of a firm before and after the initial cross-listings, while separating the firms into three distinct ADR levels and home market developed or emerging classifications. Using a sample of ADR firms that are cross-listed at some point between January 1986 to January 2014, our analysis concludes that the home market perception of the risks around cross-listing is different depending on the level of ADR program chosen by the firm. When examining the year prior and the year after listing date we observe increases in relative idiosyncratic variations around the cross-listing date for the entire sample. However, we also find that these increases are only temporary and centered in the immediate periods surrounding the cross-listing date, with Level II and III firms actually stabilizing at lower relative idiosyncratic risk ratios in the year after cross-listing. We also find that the patterns of adjustment during the cross-listing event date differs depending on the level of cross listing, with the largest adjustments occurring with Level III listing firms. Not only do we notice differences in these adjustments depending on level of ADR, but we also observe differences depending on whether the firm's home market is a developed or emerging market. In developed markets we observe that relative idiosyncratic risks increase steadily during the lead-up to the cross listing date and then decrease back to similar levels after the cross-listing. However, the opposite pattern is observed for emerging markets. For emerging markets, the ratio drops prior to cross-listing and then increases back after the cross-listing. When separated into levels of ADR program, we observe that Level III idiosyncratic risks stabilize at lower levels after cross-listing for both emerging and developed markets, while this effect is only observed for Level II developed market ADRs. These results lend credence to the argument that the market perceives the firm-specific risks associated

with cross-lifting very differently depending on ADR program level and home market development. The remainder of the paper process as follows. We review the literature in Section 2 and develop the hypothesis in Section 3. Sections 4 and 5 present the data and methodology and discuss our empirical results. Section 6 concludes the paper.

2. Related Cross-listing Studies

Most cross-listing literature focuses on explaining why firms cross list in a foreign market. Many papers find evidence of a lower cost of capital, improved liquidity and increased firm value (see comprehensive reviews by Karolyi, 1998, 2006). Event studies with various samples document an immediate share price increase and positive post-listing abnormal returns (e.g., Jayaraman et al., 1993; Miller, 1999; Foerster and Karolyi, 1999).[1] A repeated theme in the empirical studies is that many cross-listed firms experience a pre-listing return run-up and a surprising post-listing decline (e.g., Foerster and Karolyi, 1999; Errunza and Miller, 2000; Sarkissian and Schill, 2008). A striking example would be the wavy curve of returns before and after listing as shown in Figure 1 of Sarkissian and Schill (2008). Errunza and Miller (2000) look at three years after a cross listing in the U.S. and find a significant decline of 42% in cost of capital. Sarkissian and Schill (2008) find a similar decline in the first five years post-listing with a global sample but detect no significant cost of capital reduction five to ten years following the listing. They argue the valuation gains from a reduction in the cost of capital are transitory and no permanent effect five to ten years following the listing. Instead of using realized returns as proxies for the costs of capital, Hail and Leuz (2009) employ accounting-cased valuation models and estimate a decrease in implied cost of capital between 70 and 120 basis points for firms with cross-listings on U.S. markets.

Another stream of literature looks at the total volatility changes after cross-listing and explores the information transmission between markets. Barclay et al. (1990) examine 16 NYSE firms that have

[1] Studies quoted here are mostly using a sample of non-U.S. firms that cross list in the U.S. There are studies on U.S. firms cross list outside of the U.S. They find the share price impact or abnormal returns small in general (e.g., Howe and Kelm, 1987; Barclay et al., 1990). Studies that focus on domestic dual listings also found insignificant price impact after listings (see literature review by McConnell et al., 1996).

secondary listings on Tokyo stock exchange and find no increase in total variance and Tokyo volume is negligible. They argue that informed traders prefer not to shift their trades abroad and there is no sufficient trading volume to disseminate private information; therefore, overseas listings have no impact in return variances. Howe et al. (1993) find significant increases in option-implied volatilities following a group of US firms that cross-listed overseas and attribute it to a higher level of noise trading. Although the results for US firms listing overseas are mixed, the evidence is *consistent* for non-U.S. firms cross-listed in the U.S. market. Jayaraman et al. (1993) study a sample 95 ADRs mostly from Japan and UK over the period 1983 to 1988, and find cross-listing is associated with an increase in total return volatility. They explain the increase as a result of informed traders trading in both markets. McConnell et al. (1996) summarize the evidence in the literature that international listings are associated with an increase in volatility but domestic listings are not.

Besides informed trading increasing return volatility, studies suggest firm-specific volatility is associated with stock price informativeness (Morck et al., 2000; Jin and Myers, 2006; Durnev et al. 2004). The rationale is that higher levels of firm-specific return as a fraction of total variation signals "more information-lader stock prices" as those firms exhibit higher association between current returns and future earnings – therefore higher price informativeness (Durnev et al. 2003). Fernandes and Ferreira (2008) use a non-U.S. firm's idiosyncratic risk ($log((1- R^2)/R^2)$) as a proxy for stock price informativeness to investigate the change in information environment after cross-listing. They find that cross-listing is associated with higher firm-specific return variation in developed markets but a lower firm-specific return variation in emerging markets. Dasgupta et al. (2010) use ADR as an information event and return synchronicity (R^2) as a measure of price informativeness. Using SEO and ADR listings as settings for substantial information disclosure, they find return synchronicity is lower at the time of information disclosure as greater firm-specific information impounded in stock prices, and significantly higher after the disclosure. They argue that stock return synchronicity R^2 increases with improved firm transparency. It is to this line of literature that this paper seeks to add. By separating our sample into ADR program

levels and market development levels, we are better able to observe how the market may perceive cross-listing decisions differently. Additionally, by using a regime baseline well in advance of the cross-listing date, we are able to observe the build-up in risk perceptions before the cross-listing date to observe whether or not market perceptions shift in anticipation of a cross-listing as well as after the listing date.

3. ADR Programs and Hypothesis

There are three levels of ADR facilities firms commonly initiate.[2] Level I ADRs are traded Over-the-Counter (OTC) through the OTC Bulletin Board and/or the Pink Sheets. Level I ADR programs currently require minimal SEC registration: The issuer seeks exemption from the SEC's traditional reporting requirements under Rule 12g3-2(b). With that exemption, the company agrees to publish specified non-U.S. disclosure documents in English on an ongoing basis on its Internet Web.[3] The depositary, working with the issuer, also files the Form F-6 registration statement with the SEC in order to establish the program.

Level II ADRs are listed on a U.S. exchange: The New York Stock Exchange (NYSE) or quoted on the Nasdaq Stock Market (Nasdaq). When a foreign company wants to set up a Level II program, it must file a F-6 registration statement with the SEC and is subject SEC regulation. In addition, the company is required to file a Form 20-F annually. Form 20-F is the basic equivalent of an annual report (Form 10-K) for a U.S. company. In their filings, the company is required to follow GAAP standards. In addition, the company's annual reports and any interim financial statements are required submitted on a regular, timely basis to the SEC.

Level III ADRs are the most high-profile form of sponsored ADR program. They are issued as a public offering of securities on a U.S. exchange. Level III ADR programs must comply with various SEC rules, including the full registration and reporting requirements of the SEC's Exchange Act. Besides the

[2] Private placement based on Rule144A is not included here given the least information content.
[3] Prior to 2008, foreign issuers are required to make a written application and submit subsequent non-US disclosure documents to SEC. See discussion on Amendments to Exchange Act Rule 12g3-2(B).
http://www.sec.gov/news/speech/2008/spch082708ebs.htm (accessed June 17, 2016).

Form F-6 registration statement, and Form 20-F registration statement like for Level II ADRs, Level III ADRs are also required to file Form F-1 to register the equity securities underlying the ADRs that are offered publicly in the U.S. for the first time, including a prospectus to inform potential investors about the company and the risks inherent in its businesses, the offering price for the securities, and the plan for distributing the shares. In addition, annual reports and any interim financial statements of this company are required to be submitted on a regular, timely basis to the SEC and to all registered public shareholders. Level III ADRs allow issuers to raise capital and greater visibility in the US market. Generally, companies that choose either a Level II or Level III program will attract a significant number of U.S. investors.

Hypothesis 1

With all ADR events, we expect the market perception of risk changes start before the actual listing date and will adjust as firms go through the listing process, which is consistent with previous studies market price responses. We expect the changes to occur differently depending on the level of ADR program chosen by the firm.

With the minimum registration requirements for Level I ADRs, we expect the market perception of risk changes as a normal information pulse – that is, a slight higher firm specific risk relative to systematic risks after listing decision is known and go back to the previous state once the stock prices absorbed this information. We expect foreign firms that cross-list on the US exchange (Level II and Level III) will experience a bigger change in risks given the extent of SEC disclosure requirements and exchange requirements than Level I ADRs. We expect the relative firm-specific risk will increase temporarily before the listing due to the market anticipation of the event.

Hypothesis 2

Level III firms are those that issue capital during the ADR listing and thus have the highest reporting and disclosure requirements upon listing the U.S. as an ADR. As a result, we expect larger

changes in market perception of risks for Level III ADRs given both listing and security issuance effects. In other words, we hypothesize that the market perception of risks for Level III ADRs will change more during cross-listing as it includes effects of much higher disclosure requirements from both cross-listing and security issuance than Level I and Leven II ADRs.

Hypothesis 3

We expect that perceptions of risk will differ depending on whether the home market is an emerging or developed market. Firms from countries with weak investor protection are more likely to list in US and conduct a capital raising at listing (Reese and Weisbach 2002 – see also Boubakri Cosset Samet 2010). Given this prior research, we expect to see larger changes in firm-specific variations from emerging market firms than those from developed markets given the greater extent of information disclosure. We posit this because the increased visibility for emerging market firms internationally flows back to impact the home market trading. However, Halling et al. (2008) find that domestic turnover rate increases in the cross-listing year and remains higher for firms based on developed markets but not for emerging market firms. Thus, it is also reasonable to expect that there may be lower variations for firms from emerging markets.

4. Data and methodology

Our investigation focuses on the effect of cross-listing on the long-term changes in the local information environment. Specifically, we focus on the step-by-step (regime-by-regime) transition of relative systematic and unsystematic risk of returns of cross-listed firms from emerging and developed markets. We compile a list of 996 cross-listings occurring between January 1986 and January 2014 for firms that are publicly traded. The initial sample is constructed from the depository programs listed by

J.P. Morgan, BNY Mellon, Deutsche Bank, and Citibank.[4] As these databases do not contain a complete list of ADR programs, we also pulled ADR information from CRSP and Compustat to be sure we picked up those ADRs that had delisted over our sample period. A comparison of listing data between the different sources yielded a few inconsistencies and these were resolved by hand checking company filings using SEC EDGAR. We collect data on the sample daily returns as well as the corresponding returns on the respective local index from Compustat Global which limited our sample back to 1986. We recognize that the cross-listing process spans time prior to the effective date of the cross-listing but we use the effective cross-listing date to demarcate the before and after periods.

We classify the cross-listings into levels as discussed in Section 3:

(1) Level I – OTC – no regulatory and reporting constraint

(2) Level II – exchange-listed – formal reporting requirements

(3) Level III – exchange-listed – formal reporting requirements + capital raising

We construct a 714-day window for each firm and its respective index centered around the cross-listing date (-357,+357). Our final dataset consists of 754 firms for which data is complete throughout the study period[5]. Of these 754 firms, 606 are classified as Levels I, II, or III. We categorize the cross-listed firms' home market as emerging or developed and present a breakdown of the count in Table 1. Our study focuses on the differences between the three classifications (Levels I, II and III) as well as the type of the home market (emerging vs. developed). Accordingly, we end up with six groupings of interest.

Our goal is to examine the local information environment surrounding firm's cross-listings, specifically using the shifts in the local market's perception of the risk associated with these cross-listings, so we follow the methodology presented by Semaan and Drake (2011, 2016) to decompose and compare the risk, and proceed to examine the long-term variance of returns and its components using the following set of tests performed on each of the six groupings:

[4] The depository bank databases were downloaded from www.adr.com, www.adrbnymellon.com/, www.adr.db.com and www.citiadr.idmanagedsolutions.com/www/drfront_page.idms respectively.
[5] The sample is larger when we shrink the analysis period to 140 days. For that analysis, we have complete data for 928 firms.

- Changes in the average total, systematic, and idiosyncratic variances;
- Changes in the relative idiosyncratic variance to total variance

We employ this methodology as it allows for a clear picture of how the risk structure of each group changes over both the year prior and the year after the cross-listing date.

4.1. Estimating changes in average total, systematic and idiosyncratic variances

For this test, we estimate a daily time-series on each stock's total variance, $\sigma^2(R_{it})$, using a 30-day moving window. We then estimate the average total variance for each grouping as:

$$\sigma_{gt}^2 = \frac{\sum_{i=1}^{n_t} \sigma^2(R_{it})}{n_t} \quad (1)$$

where n_t is the total number of firms in the respective group on day t.

For this analysis, we define seven different regimes covering seven different 102-day periods centered on the cross-listing period:

Regime 1: The period extending from 357 to 256 days before the cross-listing date.

Regime 2: The period extending from 255 to 152 days before the cross-listing date.

Regime 3: The period extending from 153 to 50 days before the cross-listing date.

Regime 4: The period extending from 51 days before to 50 days after the cross-listing date.

Regime 5: The period extending from 51 to 152 days after the cross-listing date.

Regime 6: The period extending from 153 to 254 days after the cross-listing date.

Regime 7: The period extending from 255 to 357 days after the cross-listing date.

To present a clear picture of risk structure changes over the cross-listing period, we use Regime 1 as our

base period throughout our tests.

We proceed in our analysis by estimating the average daily variance per regime during the entire study period[6]. We use a dummy-variable event analysis on the moving-average total variance for each grouping, σ^2_{gt}, and use 6 dummy variables to examine the changes in the variance under the seven aforementioned regimes:

$$\sigma^2_{gt} = \alpha_{gt} + \phi_{2gt}(D_{2g}) + \phi_{3gt}(D_{3g}) + \phi_{4gt}(D_{4g}) + \phi_{5gt}(D_{5g}) + \phi_{6gt}(D_{5g}) + \phi_{7gt}(D_{7g}) + e_{gt} \quad (2)$$

where D_{2g}, D_{3g}, D_{4g}, D_{5g}, D_{6g} and D_{7g} are dummy variables for regimes 2 through 7, respectively and the coefficients of these dummy variables, ϕ_{2g}, ϕ_{3g}, ϕ_{4g}, ϕ_{5g}, ϕ_{6g} and ϕ_{7g}, capture the level change in the average total variance under the respective regimes. As mentioned earlier, Regime 1, is used as the base case; therefore, if ϕ_{2g} is positive and significant, this indicates that the variance for group g is greater in Regime 2 than in Regime 1.

We then employ difference-in-difference tests to more directly compare the three listings across the type of home market (emerging vs. developed).[7] We proceed to regress the return of the ith stock for the trading day t, R_{it}, on the respective local market index returns for that trading day, R_{Mt}:

$$R_{it} = \alpha_i + \beta_i R_{Mt} + e_{it} \quad (3)$$

where α_i is the intercept, β_i is the stock i's beta, and e_{it} is the stock-specific residual. We then separate the

[6] For all regressions in subsections 3.2 through 3.4, we also use an alternative approach to calculating the total variance and its components using non-overlapping 21-day observations, where the variance of each 21-day period is calculated based on the daily returns throughout that period similar to Campbell, Lettau, Malkiel and Xu (2001). The results from this alternative approach remained consistent with our findings in Section 5. The results are available upon request.

[7] For equation 2 for example, we estimate the following equation: $\sigma^2_{i,j} = \alpha_i + \varphi_{2i}D_2 + \varphi_{3i}D_3 + \varphi_{4i}D_4 + \varphi_{5i}D_5 + \varphi_{6i}D_6 + \varphi_{7i}D_7 + \lambda D_{DEV} + \psi_2(D_2.D_{DEV}) + \psi_3(D_3.D_{DEV}) + \psi_4(D_4.D_{DEV}) + \psi_5(D_5.D_{DEV}) + \psi_6(D_6.D_{DEV}) + \psi_7(D_7.D_{DEV}) + e_{i,j}$. Where j is variance component (idiosyncratic, systematic, or total); i is listing type (1, 2 or 3); D2, D3, D4, D5, D6 and D7 are dummy variables that take on the value 1 during regimes 2,3,4,5,6 and 7 respectively, and zero otherwise. D_{DEV} is a dummy variable that takes on the value 1 if the home country is in developed economy and 0 if it is in emerging economy. Our intercept (α) represents the average value for the respective variance measure during Regime 1 for emerging economies and λ would hence capture the difference between the average value for the respective variance measure in a developed economy in Regime 1 and that of the emerging economy. Ψ_2, Ψ_3, Ψ_4, Ψ_5, Ψ_6, and Ψ_7 would capture the difference in difference between developed and emerging economies at the respective regime.

total variance of each stock's excess returns into systematic and idiosyncratic components:

$$\sigma^2(R_{it}) = \beta_i^2 \sigma^2(R_{Mt}) + \sigma^2(e_{it}) \tag{4}$$

We construct a daily time-series on the stock's beta, as well as its systematic and idiosyncratic components of the variance using a 30-day moving window. Using these daily series for the individual stocks, we define the average idiosyncratic variance for each group g on day *t*, $IDIO_{gt}$, as:

$$IDIO_{gt} = \frac{\sum_{i=1}^{n_t} \sigma^2(e_{it})}{n_t} \tag{5}$$

We define the average systematic variance for group g on day *t*, SYS_{gt}, as:

$$SYS_{gt} = \frac{\sum_{i=1}^{n_t} \beta_{it}^2 \sigma^2(R_{Mt})}{n_t} \tag{6}$$

We then proceed to estimate equation (2), once using the average daily $IDIO_{gt}$ and then again using the average daily SYS_{gt} per regime as the dependent variable. The application of equation (2) to these different components of risk allows us to identify whether any shifts in these types of risk take place for the groups.

4.2. Estimating changes in the relative idiosyncratic variance to total variance

Next, we focus on relative changes in the relative idiosyncratic risk component of each group. Accordingly, we examine each group's ratio of idiosyncratic variance to its total variance[8], δ_{gt}:

[8] This methodology is similar to Fernandes and Ferreira (2008) who used the $(\log((1-R^2)/R^2))$ as a proxy for stock price informativeness to investigate the change in information environment after cross-listing.

$$\delta_{gt} = \frac{IDIO_{gt}}{\sigma^2_{gt}} \tag{7}$$

The interpretation of this ratio is that if relative idiosyncratic risk increases vis-à-vis total risk, δ_{gt} will increase.

Again, we employ a dummy-variable event analysis on the average daily δ_{gt} for each group under the 7 regimes:

$$\delta_{gt} = \alpha_{gt} + \phi_{2gt}(D_{2g}) + \phi_{3gt}(D_{3g}) + \phi_{4gt}(D_{4g}) + \phi_{5gt}(D_{5g}) + \phi_{6gt}(D_{5g}) + \phi_{7gt}(D_{7g}) + e_{gt} \tag{8}$$

where the coefficients of the dummy variables, the ϕ_{ig} provide information on the changes in δ_{gt} similar to equation (2), and again employ a difference-in difference analysis to more directly compare the groups. All our tests of significance are based on the heteroskedasticity and autocorrelation consistent (HAC) Newey-West standard errors.

5. Results

We provide the results and discussion on changes in idiosyncratic, systematic and total variances across the seven regimes by listing type in Section 5.1, the results and discussion on changes in idiosyncratic, systematic and total variances by listing type and home market type in Section 5.2. In Section 5.3 we discuss the results associated with the changes in the ratio of idiosyncratic to total variance by listing type, and discuss the results associated with the changes in the ratio across the 7 regimes by listing type and home market type in Section 5.4.

5.1. Changes in idiosyncratic, systematic and total variance by listing type

We estimate equation (2) for each of the three variance measures for each of the three listing levels separately across the seven temporal regimes and present the results in Table 2. We present the

results in panels A, B and C for the Idiosyncratic, systematic and total variance respectively.

We find that the idiosyncratic risk for Level I listings decreases prior to the cross-listing date in Regimes 3 then increases again following the cross-listing date in Regime 5 then returns to levels similar to Regime 1 in Regime 7. In other words, it exhibits a temporary sinusoidal pattern that re-adjusts following the cross listing date and stabilizes at a level similar to that in Regime 1. This pattern of changes in idiosyncratic variance is markedly different for listing Level types II and III. In both these cases, the idiosyncratic variance increases in regimes 3 and 4 and stabilizes in Regime 7 at levels higher than Regime 1. Similar patterns are again exhibited in the systematic and total variance across the three cross-listing types. For better illustration of the results, we calculate the average value for each variance estimate in each regime relative to Regime 1 only if the associated difference with Regime 1 is significant at the 5% level and present these results in panels A through C of Figure 1.

Overall, we conclude that this initial result supports our first hypothesis that the market perception of risk surrounding cross-listings starts prior to the actual listing date and the changes will differ across the different types of cross-listings.

5.2. Changes in idiosyncratic, systematic and total variance by listing type and by home market type

We again estimate equation (2) for each of the three variance measures for each of the three listing levels separately as well as for each of the two types of home markets (emerging and developed) across the seven temporal regimes and present the results in Table 3. We also estimate the difference-in-difference between the two home market types for each variance estimate across each of the seven regimes and present the results in panels A, B and C for the Idiosyncratic, systematic and total variance respectively. The DID results are presented as a third column for each variance-listing group for clarity.

Similar to the results in Section 5.1 above, we find that the patterns of risk adjustment do differ across the different listing types in general. However, consistent with Hypothesis 3, we also observe additional substantial distinctions among the groups depending on the whether the home market is

defined as emerging or developed.

The adjustment in both the idiosyncratic and total variances for Level I listings, again exhibits a sinusoidal pattern but is almost diametrically opposite depending on the home market type. While the idiosyncratic and total variance increased in regimes leading up to the cross listing regime, and then decreased in the later regimes for developed home markets, it decreased first then increased in later regimes for emerging markets. This demonstrates that the aggregate results on the idiosyncratic and total variance of Level I listings obtained in the earlier section are driven by the larger sample size of the developed market. For the systematic variance however, these differences in the adjustment patterns between emerging and developed home markets are not present. In both types of markets, the systematic variance drops in Regime 3 or 4, that is at or shortly before the cross listing date, increases in the immediate regimes following the cross listing and then stabilize at levels similar to Regime 1 in Regime 7.

The adjustment patterns differ for Level II and III groups in comparison. For Level II developed market firms, the idiosyncratic variance exhibits a temporary increase following the cross listing date but then returns to pre-cross listing levels later. Level II emerging market firms, however, exhibit a very sharp increase in the idiosyncratic and total variances following the cross listing regime and keep increasing reaching levels that are approximately three times higher in Regime 7 as compared to Regime 1. For Level III firms, the adjustment pattern for both types of markets are again similar, but here we find that it's the developed markets that exhibit the sharpest increases in the post cross listing regimes. The differences in the pattern of systematic variance adjustment for Levels II and III listings again vary depending on the type of home market. While systematic variance increases in the regimes leading up to Regime 4 for Level II types, it drops again during Regime 4 only to increase again in later regimes, lending support to our third hypothesis

The decomposition of types coupled with the DID analysis in this section clearly highlight the differences in the market's perception of cross listed firms depending on the listing level as well as the

home market type. Results based on aggregating the groups by all types of home markets, as presented in Section 5.1, or by all level listings, as presented in earlier research, will be skewed in favor of the group with the largest representative sample in the aggregate.

We recognize the challenge of translating the results in Table 3 into adjustment patterns. Therefore, and for clearer illustration of the results, we again calculate the average value for each variance estimate by listing and home market types in each regime relative to Regime 1 only if the associated difference with Regime 1 is significant at the 5% level and present these results in panels A through C of figure 2.

5.3. Changes in the ratio of idiosyncratic to total variance by listing type

We estimate equation 8 for the ratio of idiosyncratic to total variance (δgt) to examine the proportional change in risk components by listing type across the seven regimes and present the results in Table 4. We find that the relative idiosyncratic risk for Level I firms increases temporarily in the pre-cross listing periods leading up to Regime 4, then decreases in later regimes and returns, in Regime 7, to levels similar to those of Regime 1. This implies that changes in the relative firm-specific variations for Level I firms is temporary and occurs in the periods surrounding the cross-listing date. We observe similar but more pronounced changes in the ratio for Level II firms surrounding the cross listing date but the ratio drops even further in Regime 7 to levels lower than Regime 1. Consistent with Hypothesis 2, we find that this same behavior is even more pronounced in Level III firms. The ratio drops by almost 4% in Regime 7 as compared to Regime 1.

For better illustration of the results in Table 4, we calculate the average value for each ratio in each regime relative to Regime 1 only if the associated difference with Regime 1 is significant at the 5% level and present these results in Figure 3. The results from Level II and III seen in Figure 3 lend support to the argument that the market adjustments for risk actually precede the cross-listing date and are potentially more closely associated with period of the cross-listing intention announcement or rumors of possible cross-listing.

These results highlight two important contentions: Increases in relative idiosyncratic variations are temporary and centered in the immediate periods surrounding the cross listing date, and the patterns of adjustment differ depending on the level of cross listing. Furthermore, if one were to use the cross listing period (ie, Regime 4) as the basis and starting point for their analysis, then they would observe a consistent drop in the relative idiosyncratic variation across all three cross listing levels. The choice of starting at the cross-listing period instead of measuring prior to the listing date could explain some of the results reported in earlier research that find only drops in idiosyncratic variation post-cross listing.

5.4. Changes in the ratio of idiosyncratic to total variance by listing and market type

We again estimate equation (8) for the ratio of idiosyncratic to total variance for each of the three listing levels separately as well as for each of the two types of home markets (emerging and developed) across the seven temporal regimes and present the results in Table 5. We also estimate the DID between the two home market types for each estimate across each of the seven regimes and present the results as a third column for each listing group for clarity.

Here, again, we find that ratio of idiosyncratic to total variance drops following the cross listing for both developed and emerging firms. However, this ratio had increased in the periods leading up to the cross listing date and when we compare the levels in Regime 7 to Regime 1, we do not find any evidence of differences. This seems to further support our earlier observation on the aggregate that the adjustment in the relative idiosyncratic risk for Level I firms is temporary. Further noticeable in these results is that the increase in the ratio for the emerging group occurs primarily in the regimes preceding the cross listing and actually starts declining during the cross listing regime. For the developed markets group, however, the ratio reaches its apex during the cross listing regime and decreases afterwards.

The differences between the emerging and developed groups are more pronounced for Level II and III listings, lending support to our third hypothesis. For Level II listing, we find that the ratio for the developed markets increases steadily in the lead-up to the cross listing date and decreases in the following

periods to return to levels lower in Regime 7 as compared to Regime 1. For the emerging markets group, the pattern of adjustment seems to move in the opposite direction of that of the developed markets'. The ratio drops in Regime 3 then increases steadily to stabilize in Regime 7 at levels similar to Regime 1. Comparable results are observed for Level III listings with the added distinction that for both types of home markets, the relative idiosyncratic risk stabilizes at levels lower in Regime 7 to those of Regime 1. Similar to previous sections, we calculate the average value for the ratio by listing and home market types in each regime relative to Regime 1 only if the associated difference with Regime 1 is significant at the 5% level and present these results in panels A through C of Figure 4.

6. Conclusion

Prior empirical research on cross-listing has found that cross-listed firms experience a pre-listing return run-up and a significant post-listing decline in returns (e.g., Foerster and Karolyi, 1999; Errunza and Miller, 2000; Sarkissian and Schill, 2008). However, during the volatile period of such corporate events, we know very little about how market perceives risks for the firms listing in overseas market. Questions on whether risk perceptions change prior to cross-listing and how specifically the risk structure changes remain largely unexplored. It is important to understand the long-term market perception of risks on such corporate events for firms to effectively manage short-term and long-term risks and for asset managers to control risks. Prior research on firm-specific volatility finds that it is associated with stock price informativeness (Morck et al., 2000; Jin and Myers, 2006; Durnev et al. 2004). Studies that examine cross-listing firm's idiosyncratic risk find that cross-listing is associated with higher firm-specific return variation in developed markets but a lower firm-specific return variation in emerging markets (Fernandes and Ferreira, 2008) and that return synchronicity is lower at the time of information disclosure as greater firm-specific information impounded in stock prices, and significantly higher after the disclosure (Dasgupta et al., 2010). It is to this line of literature that we seek to add insight.

We examine the step-by-step transition of the market perceptions of risks around the cross-listing events. We are particularly interested in the changes of the perception of risks from the home market as a

firm's positioning within its industry in the home market stays about the same as before and firm-specific factors such as manager's quality is assumed invariant with cross-listings. Using a sample of foreign firms with an ADR program, we examine whether or not firm-specific return variations increase relative to the systematic risks and whether or not these changes appear to be permanent or temporary. To this point, we explore the short-term and long-term changes in the risk structure of a company before and after the initial cross-listings, while separating the firms into the three ADR levels and home market developed or emerging classifications

Our results are consistent with prior research that suggests that the riskiness of a firm during a cross-listing in the U.S. is not viewed in a uniform manner by the market. We add additional insight into these differences by exploring the short-term and long-term changes in the risk structure of a firm before and after the initial cross-listings, while separating the sample into three distinct ADR levels and home market developed or emerging classifications. Using a sample of 606 ADR firms and examining the risk structure changes in both the year before and after cross-listing, our analysis concludes that the home market perception of the risks around cross-listing is different depending on the level of ADR program chosen by the firm. Using a methodology similar to that of Drake and Semaan (2011, 2016) we find that, while relative idiosyncratic variations increase around the cross-listing date for the entire sample, this increase appears to be only short-term with all levels of ADR program decreasing after the cross listing date. While Level I programs stabilize at similar risk levels after cross-listing, Level II and III firms actually stabilize at lower relative idiosyncratic risk ratios after cross-listing. Changes are observed across all levels of ADR program but Level III listing firms have the largest adjustments as compared to Level II and I firms. In addition, the development of the home market shows a marked difference between different ADR levels. When we separate the sample into emerging and developed markets by levels, we find that Level III idiosyncratic risks stabilize at lower levels after cross-listing for both emerging and developed markets, while this effect is only observed for Level II developed market ADRs. Taken together, our findings suggest that the market typically perceives an increase in firm specific risks leading

up to the cross-listing date, possibly due to rumors of cross-listing or disclosure of listing intentions by the firm. However, after the actual listing date these increased risk perceptions appear to subside back to either pre-listing levels or lower relative idiosyncratic risks in the long run, depending on ADR program level and market development.

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Table 1. Count of cross-listed firms broken down by cross-listing classification, type of home market and study window.

Cross-listed firms are classified based on the type of their cross-listings (1,2 or 3) and their home markets are classified as Emerging or Developed. The table provides the count of firms for which we have non-missing data for each group classification and type of home-country combination.

Home Market	Cross-listing Classification	Study Window (-1,+1)	Study Window (-70,+70)	Study Window (-357,+357)
Emerging	1	166	152	110
Developed	1	490	464	376
Emerging	2	27	19	18
Developed	2	78	75	62
Emerging	3	28	23	14
Developed	3	38	31	26
Emerging	4	22	21	21
Developed	4	147	143	127
	TOTAL	**996**	**928**	**754**

Table 2. Idiosyncratic, Systematic and Total Variance values by listing type across different regimes

We estimate the equation (2) for the total variance and its systematic and idiosyncratic components for each listing type:

$$\sigma_{ij}^2 = \alpha_{ij} + \phi_{2ij}(D_{2ij}) + \phi_{3ij}(D_{3ij}) + \phi_{4ij}(D_{4ij}) + \phi_{5ij}(D_{5ij}) + \phi_{6ij}(D_{5ij}) + \phi_{7ij}(D_{7ij}) + e_{ij}$$

Where j is variance component (idiosyncratic, Systematic, or Total); i is listing Level (1, 2 or 3); D2, D3, D4, D5, D6 and D7 are dummy variables that take on the value 1 during regimes 2,3,4,5,6 and 7 respectively, and zero otherwise. Hence, our intercept represents the average value for the respective variance measure during regime 1, the listing period. Newey-West P-values are presented in parentheses below each parameter.

	Level 1	**Level 2**	**Level 3**
A. Idiosyncratic Variance			
α	0.000813	0.000371	0.000394
	(0.0000)	(0.0000)	(0.0000)
φ_2	-0.000049	0.000007	-0.000018
	(0.0000)	(0.6584)	(0.1546)
φ_3	-0.000077	0.000000	-0.000017
	(0.0000)	(0.9836)	(0.1755)
φ_4	-0.000035	-0.000001	0.000085
	(0.0013)	(0.9508)	(0.0000)
φ_5	0.000002	0.000119	0.000168
	(0.8843)	(0.0000)	(0.0000)
φ_6	0.000073	0.000112	0.000143
	(0.0000)	(0.0000)	(0.0000)
φ_7	0.000020	0.000236	0.000123
	(0.0727)	(0.0000)	(0.0000)
B. Systematic Variance			
α	0.000117	0.000127	0.000140
	(0.0000)	(0.0000)	(0.0000)
φ_2	-0.000001	0.000019	0.000004
	(0.3181)	(0.0000)	(0.3866)
φ_3	-0.000007	0.000037	-0.000017
	(0.0000)	(0.0000)	(0.0003)
φ_4	-0.000005	0.000022	0.000003
	(0.0000)	(0.0000)	(0.5546)
φ_5	0.000004	0.000031	0.000039
	(0.0005)	(0.0000)	(0.0000)
φ_6	0.000003	0.000031	0.000026
	(0.0079)	(0.0000)	(0.0000)
φ_7	-0.000001	0.000042	0.000069
	(0.4386)	(0.0000)	(0.0000)
C. Total Variance			
α	0.000930	0.000498	0.000534
	(0.0000)	(0.0000)	(0.0000)
φ_2	-0.000050	0.000026	-0.000014
	(0.0000)	(0.1239)	(0.3420)
φ_3	-0.000084	0.000037	-0.000034
	(0.0000)	(0.0323)	(0.0192)
φ_4	-0.000040	0.000021	0.000088
	(0.0004)	(0.2065)	(0.0000)
φ_5	0.000006	0.000150	0.000207
	(0.6109)	(0.0000)	(0.0000)
φ_6	0.000076	0.000143	0.000169
	(0.0000)	(0.0000)	(0.0000)
φ_7	0.000019	0.000278	0.000192
	(0.0984)	(0.0000)	(0.0000)

Table 3. Idiosyncratic, Systematic and Total Variance values by listing type and home market type (emerging vs. Developed) across different regimes

We estimate the equation (2) for the total variance and its systematic and idiosyncratic components for each listing type:

$$\sigma_{ij}^2 = \alpha_{ij} + \phi_{2ij}(D_{2ij}) + \phi_{3ij}(D_{3ij}) + \phi_{4ij}(D_{4ij}) + \phi_{5ij}(D_{5ij}) + \phi_{6ij}(D_{5ij}) + \phi_{7ij}(D_{7ij}) + e_{ij}$$

Where j is variance component (idiosyncratic, Systematic, or Total); i is listing Level (1, 2 or 3); D2, D3, D4, D5, D6 and D7 are dummy variables that take on the value 1 during regimes 2,3,4,5,6 and 7 respectively, and zero otherwise. Hence, our intercept represents the average value for the respective variance measure during regime 1, the listing period. The equation is expanded to incorporate difference-in-difference (DID) between emerging and developed home markets. The results of the DID are presented in separate columns for each cross-listing level for clearer presentation. Newey-West P-values are presented in parentheses below each parameter.

	Level 1			**Level 2**			**Level 3**		
	Emerging	**Developed**	**D-I-D Dev-Em**	**Emerging**	**Developed**	**D-I-D Dev-Em**	**Emerging**	**Developed**	**D-I-D Dev-Em**
A. Idiosyncratic Variance									
α	0.000521	0.000902	**0.000381**	0.000422	0.000358	**-0.000064**	0.000511	0.000325	**-0.000186**
	(0.0000)	(0.0000)	**(0.0000)**	(0.0000)	(0.0000)	**(0.0216)**	(0.0000)	(0.0000)	**(0.0000)**
φ_2	0.000008	-0.000063	**-0.000071**	0.000075	-0.000008	**-0.000084**	-0.000058	0.000001	**0.000059**
	(0.2728)	(0.0000)	**(0.0065)**	(0.2716)	(0.3073)	**(0.0358)**	(0.0142)	(0.9619)	**(0.0259)**
φ_3	0.000024	-0.000105	**-0.000129**	-0.000002	0.000001	**0.000003**	-0.000125	0.000044	**0.000169**
	(0.0014)	(0.0000)	**(0.0000)**	(0.9782)	(0.9312)	**(0.9487)**	(0.0000)	(0.0023)	**(0.0000)**
φ_4	0.000033	-0.000051	**-0.000084**	0.000024	-0.000008	**-0.000031**	-0.000021	0.000145	**0.000167**
	(0.0000)	(0.0003)	**(0.0011)**	(0.7193)	(0.3165)	**(0.4124)**	(0.3408)	(0.0000)	**(0.0000)**
φ_5	-0.000003	0.000008	**0.000011**	0.000335	0.000040	**-0.000295**	0.000047	0.000238	**0.000192**
	(0.6812)	(0.5853)	**(0.6737)**	(0.0000)	(0.0000)	**(0.0000)**	(0.0313)	(0.0000)	**(0.0000)**
φ_6	-0.000018	0.000104	**0.000122**	0.000471	-0.000022	**-0.000493**	0.000019	0.000216	**0.000196**
	(0.0170)	(0.0000)	**(0.0000)**	(0.0000)	(0.0049)	**(0.0000)**	(0.3728)	(0.0000)	**(0.0000)**
φ_7	0.000029	0.000021	**-0.000008**	0.000903	-0.000009	**-0.000912**	0.000033	0.000175	**0.000142**
	(0.0001)	(0.1404)	**(0.7558)**	(0.0000)	(0.2698)	**(0.0000)**	(0.1317)	(0.0000)	**(0.0000)**
B. Systematic Variance									
α	0.000123	0.000115	**0.000372**	0.000198	0.000109	**-0.000154**	0.000148	0.000136	**-0.000198**
	(0.0000)	(0.0000)	**(0.0000)**	(0.0000)	(0.0000)	**(0.0000)**	(0.0000)	(0.0000)	**(0.0000)**
φ_2	-0.000003	-0.000001	**-0.000069**	0.000058	0.000012	**-0.000130**	0.000020	-0.000006	**0.000033**
	(0.2929)	(0.5553)	**(0.0106)**	(0.0000)	(0.0003)	**(0.0021)**	(0.0016)	(0.3650)	**(0.2794)**
φ_3	-0.000012	-0.000005	**-0.000122**	0.000106	0.000021	**-0.000083**	-0.000019	-0.000017	**0.000171**
	(0.0000)	(0.0001)	**(0.0000)**	(0.0000)	(0.0000)	**(0.0465)**	(0.0024)	(0.0121)	**(0.0000)**
φ_4	0.000008	-0.000010	**-0.000101**	0.000074	0.000008	**-0.000097**	-0.000021	0.000018	**0.000206**
	(0.0036)	(0.0000)	**(0.0001)**	(0.0000)	(0.0092)	**(0.0172)**	(0.0004)	(0.0046)	**(0.0000)**
φ_5	0.000009	0.000003	**0.000005**	0.000030	0.000026	**-0.000299**	-0.000005	0.000067	**0.000263**
	(0.0009)	(0.0526)	**(0.8635)**	(0.0004)	(0.0000)	**(0.0000)**	(0.3933)	(0.0000)	**(0.0000)**
φ_6	0.000001	0.000004	**0.000125**	0.000008	0.000032	**-0.000469**	0.000007	0.000037	**0.000227**
	(0.6284)	(0.0055)	**(0.0000)**	(0.3383)	(0.0000)	**(0.0000)**	(0.2429)	(0.0000)	**(0.0000)**
φ_7	0.000002	-0.000002	**-0.000013**	0.000057	0.000029	**-0.000940**	0.000012	0.000103	**0.000232**
	(0.3475)	(0.1137)	**(0.6359)**	(0.0000)	(0.0000)	**(0.0000)**	(0.0304)	(0.0000)	**(0.0000)**
C. Total Variance									
α	0.000645	0.001020	**0.000372**	0.000620	0.000467	**-0.000154**	0.000659	0.000461	**-0.000198**
	(0.0000)	(0.0000)	**(0.0000)**	(0.0000)	(0.0000)	**(0.0000)**	(0.0000)	(0.0000)	**(0.0000)**
φ_2	0.000006	-0.000064	**-0.000069**	0.000133	0.000003	**-0.000130**	-0.000039	-0.000005	**0.000033**
	(0.5269)	(0.0000)	**(0.0106)**	(0.0605)	(0.7116)	**(0.0021)**	(0.1277)	(0.7677)	**(0.2794)**
φ_3	0.000012	-0.000110	**-0.000122**	0.000104	0.000021	**-0.000083**	-0.000143	0.000028	**0.000171**
	(0.1552)	(0.0000)	**(0.0000)**	(0.1359)	(0.0215)	**(0.0465)**	(0.0000)	(0.1253)	**(0.0000)**
φ_4	0.000040	-0.000061	**-0.000101**	0.000097	0.000000	**-0.000097**	-0.000042	0.000163	**0.000206**
	(0.0000)	(0.0000)	**(0.0001)**	(0.1529)	(0.9614)	**(0.0172)**	(0.0769)	(0.0000)	**(0.0000)**
φ_5	0.000006	0.000010	**0.000005**	0.000365	0.000066	**-0.000299**	0.000042	0.000305	**0.000263**
	(0.5082)	(0.4804)	**(0.8635)**	(0.0000)	(0.0000)	**(0.0000)**	(0.0701)	(0.0000)	**(0.0000)**
φ_6	-0.000017	0.000108	**0.000125**	0.000479	0.000011	**-0.000469**	0.000026	0.000253	**0.000227**
	(0.0537)	(0.0000)	**(0.0000)**	(0.0000)	(0.2553)	**(0.0000)**	(0.2603)	(0.0000)	**(0.0000)**
φ_7	0.000031	0.000019	**-0.000013**	0.000960	0.000020	**-0.000940**	0.000046	0.000278	**0.000232**
	(0.0003)	(0.1990)	**(0.6359)**	(0.0000)	(0.0281)	**(0.0000)**	(0.0511)	(0.0000)	**(0.0000)**

Table 4. Ratio of Idiosyncratic to Total Variance by listing type across different regimes

We estimate the equation (8) for the total variance and its systematic and idiosyncratic components for each listing type:

$$\delta_i = \alpha_i + \phi_{2i}(D_{2i}) + \phi_{3i}(D_{3i}) + \phi_{4i}(D_{4i}) + \phi_{5i}(D_{5i}) + \phi_{6i}(D_{5i}) + \phi_{7i}(D_{7i}) + e_i$$

Where δ is the ratio of idiosyncratic to total variance; i is listing Level (1, 2 or 3); D2, D3, D4, D5, D6 and D7 are dummy variables that take on the value 1 during regimes 2,3,4,5,6 and 7 respectively, and zero otherwise. Hence, our intercept represents the average value for the ratio during regime 1, the listing period. Newey-West P-values are presented in parentheses below each parameter.

Ratio of Idiosyncratic to Total Variance			
	Level 1	**Level 2**	**Level 3**
α	0.808020 (0.0000)	0.700070 (0.0000)	0.723090 (0.0000)
φ_2	-0.003420 (0.0040)	0.008750 (0.0094)	-0.020960 (0.0000)
φ_3	0.004290 (0.0003)	0.001720 (0.6061)	0.000759 (0.8713)
φ_4	0.009370 (0.0000)	0.017380 (0.0000)	0.011620 (0.0106)
φ_5	0.000184 (0.8739)	0.015990 (0.0000)	0.009410 (0.0293)
φ_6	0.005120 (0.0000)	-0.005950 (0.0661)	0.008910 (0.0389)
φ_7	0.001800 (0.1232)	-0.006680 (0.0398)	-0.026940 (0.0000)

Table 5. Ratio of Idiosyncratic to Total Variance by listing type and home market type type (emerging vs. Developed) across different regimes

We estimate the equation (8) for the total variance and its systematic and idiosyncratic components for each listing type:

$$\delta_i = \alpha_i + \phi_{2i}(D_{2i}) + \phi_{3i}(D_{3i}) + \phi_{4i}(D_{4i}) + \phi_{5i}(D_{5i}) + \phi_{6i}(D_{5i}) + \phi_{7i}(D_{7i}) + e_i$$

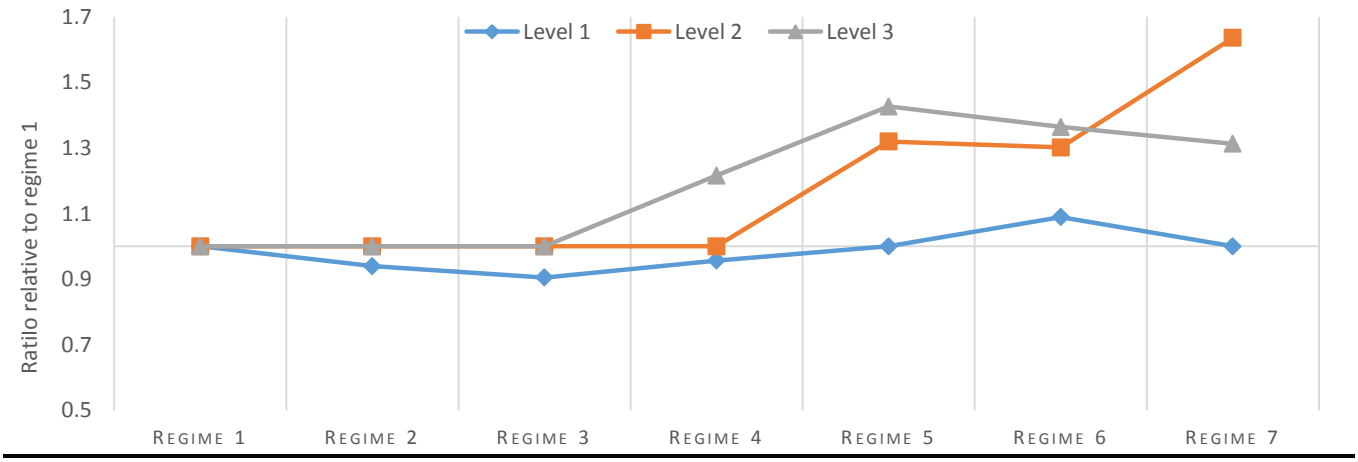
Where δ is the ratio of idiosyncratic to total variance; i is listing Level (1, 2 or 3); D2, D3, D4, D5, D6 and D7 are dummy variables that take on the value 1 during regimes 2,3,4,5,6 and 7 respectively, and zero otherwise. Hence, our intercept represents the average value for the ratio during regime 1, the listing period. The equation is expanded to incorporate difference-in-difference (DID) between emerging and developed home markets. The results of the DID are presented in separate columns for each cross-listing level for clearer presentation. Newey-West P-values are presented in parentheses below each parameter.

A. Idiosyncratic Variance

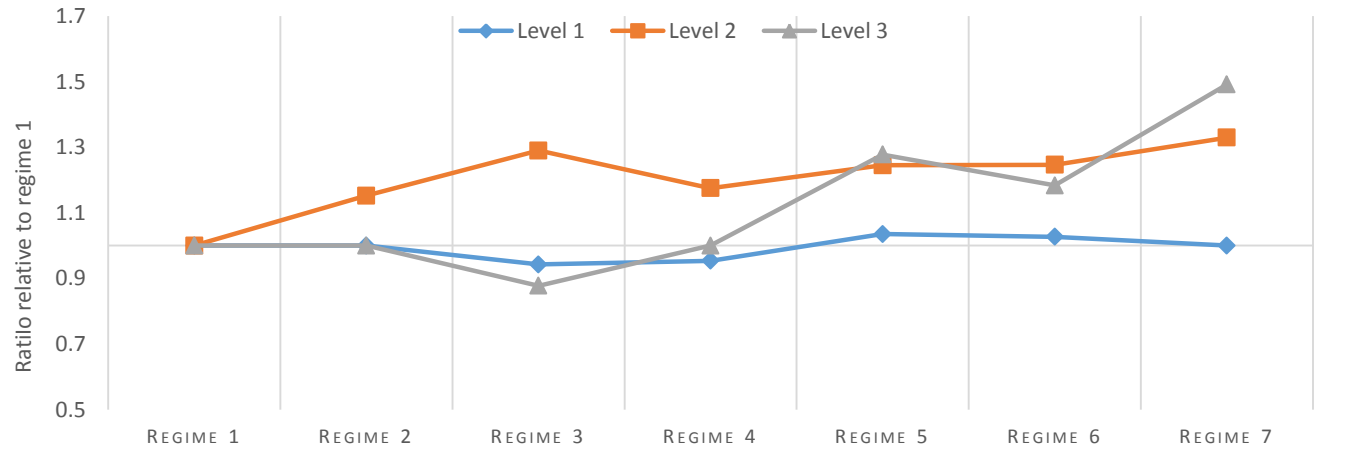
	Level 1			**Level 2**			**Level 3**		
	Emerging	**Developed**	**D-I-D Dev-Em**	**Emerging**	**Developed**	**D-I-D Dev-Em**	**Emerging**	**Developed**	**D-I-D Dev-Em**
α	0.810800	0.807180	**-0.003620**	0.695490	0.701250	**0.005760**	0.766460	0.698840	**-0.067630**
	(0.0000)	(0.0000)	**(0.0728)**	(0.0000)	(0.0000)	**(0.3295)**	(0.0000)	(0.0000)	**(0.0000)**
φ_2	0.013340	-0.008810	**-0.022160**	-0.014210	0.014100	**0.028310**	-0.057110	-0.001160	**0.055960**
	(0.0000)	(0.0000)	**(0.0000)**	(0.0644)	(0.0001)	**(0.0008)**	(0.0000)	(0.8478)	**(0.0000)**
φ_3	0.018560	-0.000293	**-0.018850**	-0.074580	0.020290	**0.094870**	-0.059460	0.035570	**0.095030**
	(0.0000)	(0.8292)	**(0.0000)**	(0.0000)	(0.0000)	**(0.0000)**	(0.0000)	(0.0000)	**(0.0000)**
φ_4	0.007740	0.009840	**0.002100**	-0.049880	0.035120	**0.085000**	-0.009650	0.020560	**0.030210**
	(0.0007)	(0.0000)	**(0.4411)**	(0.0000)	(0.0000)	**(0.0000)**	(0.1811)	(0.0004)	**(0.0012)**
φ_5	-0.006020	0.002120	**0.008140**	0.005310	0.020030	**0.014720**	0.003030	0.009900	**0.006870**
	(0.0083)	(0.1143)	**(0.0028)**	(0.4418)	(0.0000)	**(0.0556)**	(0.6620)	(0.0709)	**(0.4405)**
φ_6	0.002240	0.005980	**0.003740**	0.013470	-0.012440	**-0.025910**	-0.026110	0.027890	**0.053990**
	(0.3291)	(0.0000)	**(0.1723)**	(0.0506)	(0.0007)	**(0.0008)**	(0.0002)	(0.0000)	**(0.0000)**
φ_7	0.003650	0.001180	**-0.002470**	0.010240	-0.012290	**-0.022520**	-0.041660	-0.020070	**0.021590**
	(0.1138)	(0.3839)	**(0.3698)**	(0.1385)	(0.0008)	**(0.0035)**	(0.0000)	(0.0002)	**(0.0159)**

Figure 1. Average Idiosyncratic, Systematic and Total Variance by listing type for each regime relative to regime 1

A. Relative Idiosyncratic variance



B. Relative Systematic Variance



C. Relative Total Variance

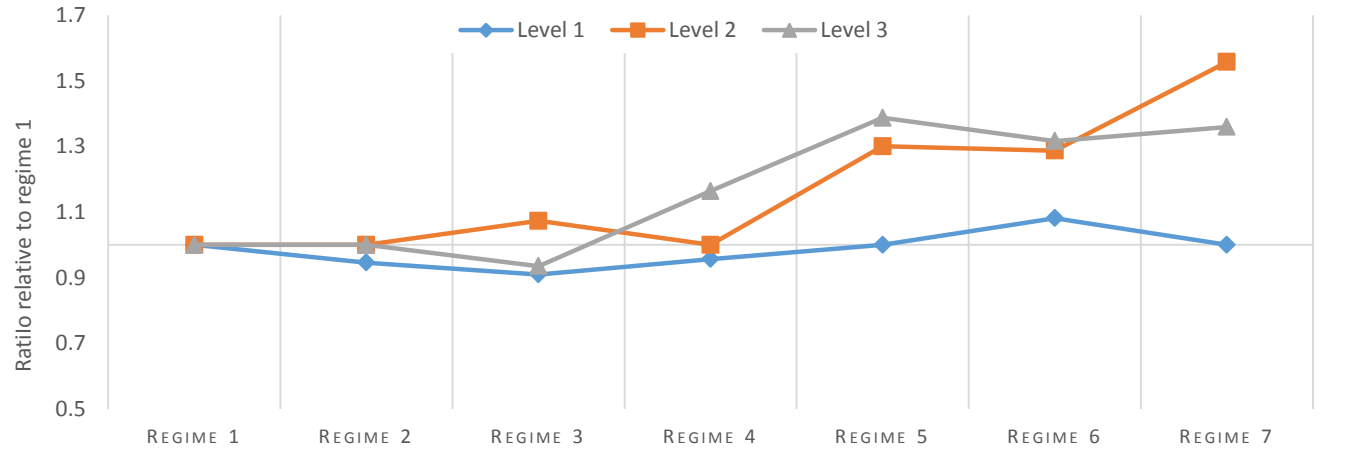
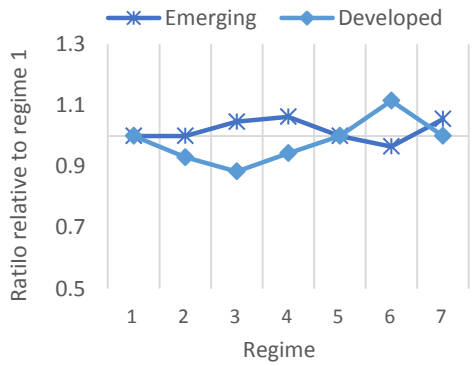


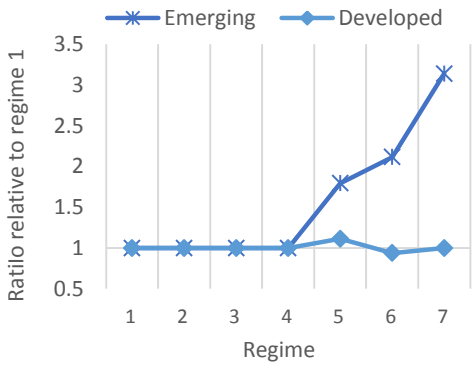
Figure 2. Average Idiosyncratic, Systematic and Total Variance by listing type and by home market type for each regime relative to regime 1.

A. Relative Idiosyncratic Variance

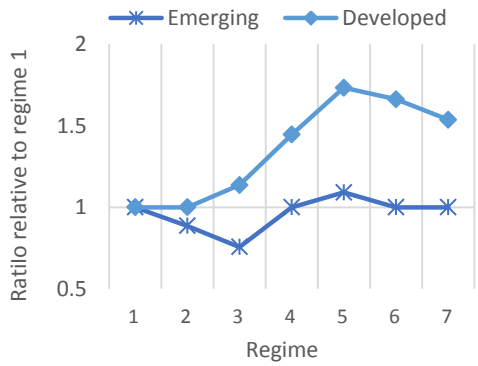
Level 1



Level 2

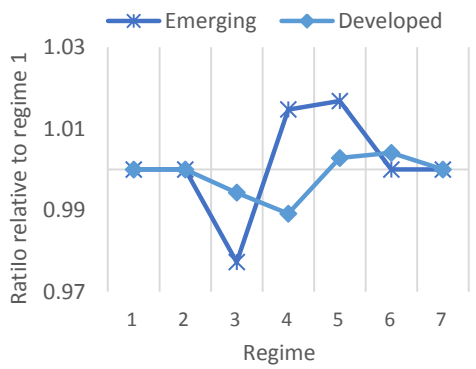


Level 3

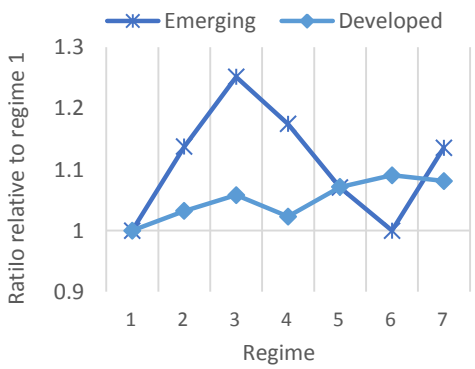


B. Relative Systematic Variance

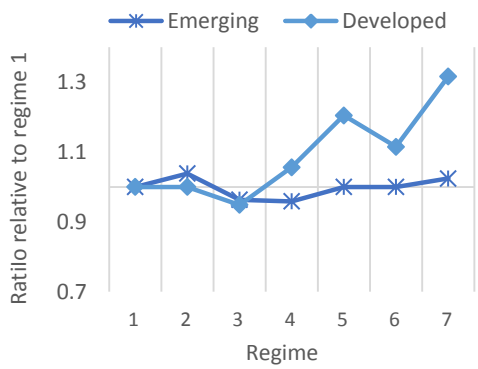
Level 1



Level 2

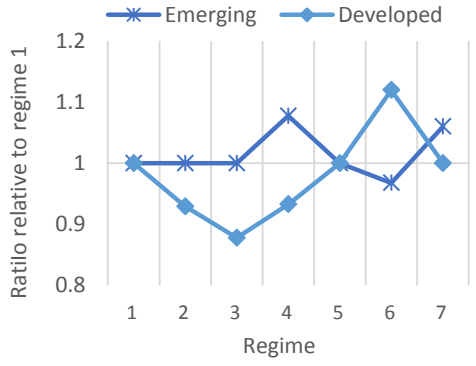


Level 3

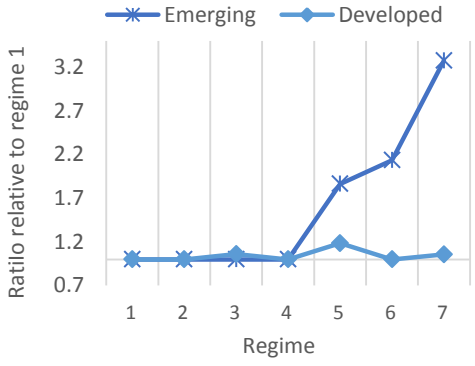


C. Relative Total Variance

Level 1



Level 2



Level 3

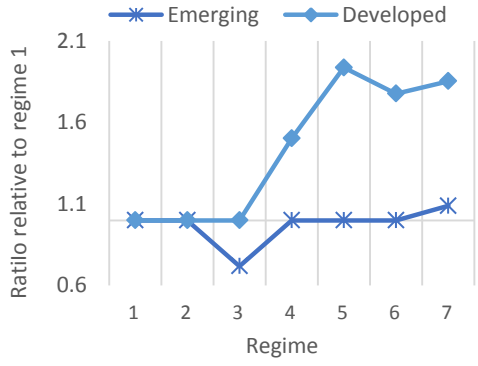


Figure 3. Average ratio of Idiosyncratic to Total Variance by listing type for each regime relative to regime 1.

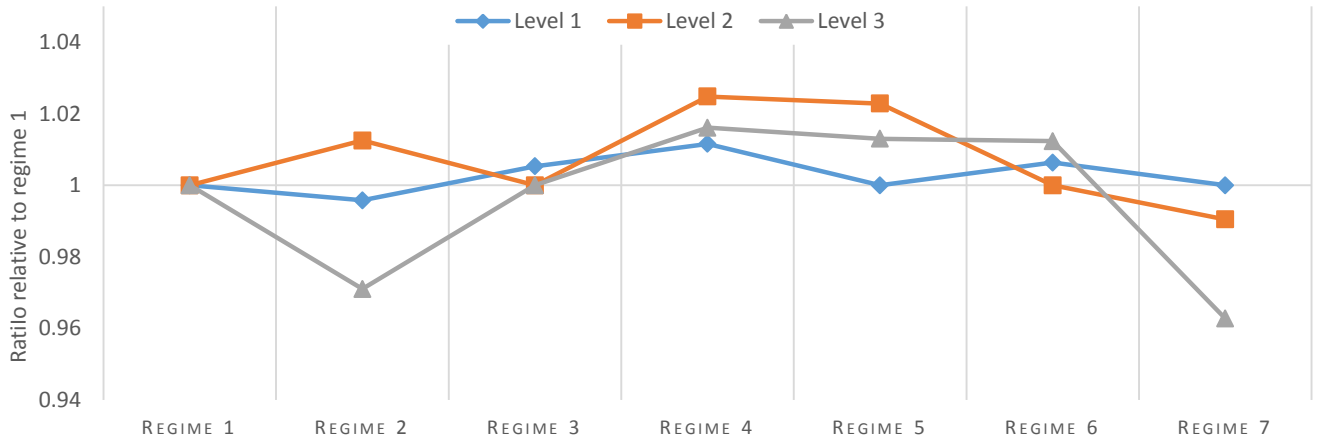
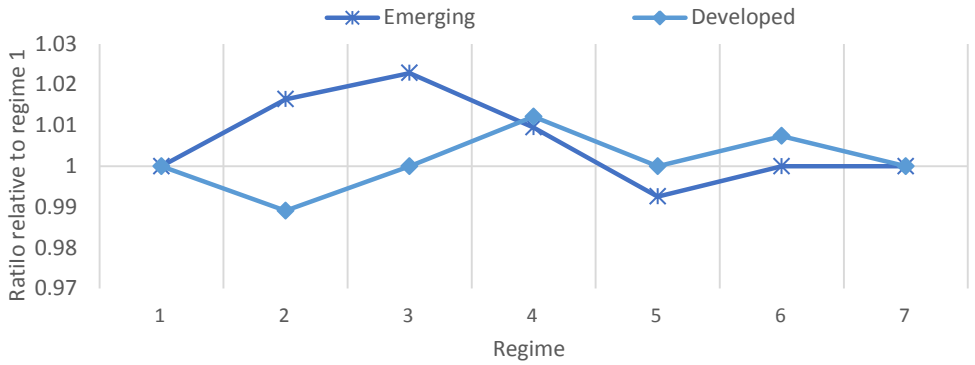
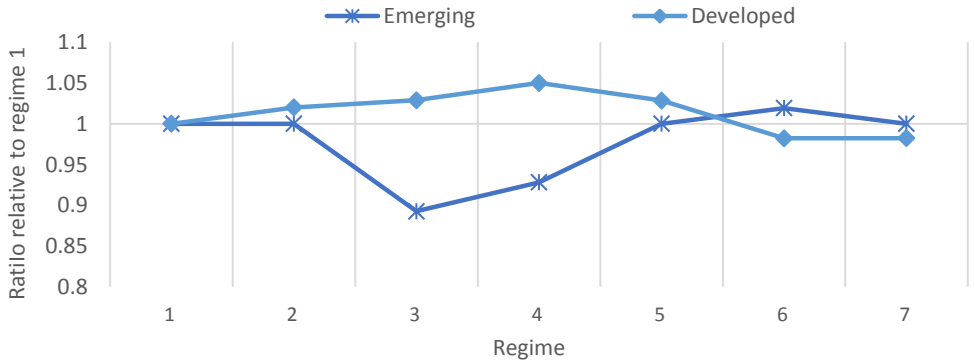


Figure 4. Average ratio of Idiosyncratic to Total variance by listing type and by home market type for each regime relative to regime 1.

A. Listing Type 1



B. Listing Type 2



C. Listing Type 3