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Cross-Listings and the Dynamics between Credit and Equity Returns

Patrick Augustin
McGill University

Feng Jiao
University of Lethbridge, Calgary

Sergei Sarkissian
McGill University and University of Edinburgh

Michael J. Schill
University of Virginia

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Send correspondence to Sergei Sarkissian, McGill University, Montreal, H3A 1G5, Canada; telephone: 514-398-4876. E-mail: sergei.sarkissian@mcgill.ca.

Abstract
We study how listing in multiple markets affects the dynamics between firms' credit default swap (CDS) and stock returns. We find that cross-listing increases (1) the sensitivity of CDS to stock returns, (2) the integration of CDS with world equity and bond markets, and (3) the statistical synchronicity of CDS and stock prices. Our results are stronger for firms with greater media attention, analyst and CDS coverage, and Google search intensity and for listings in familiar markets. We suggest that a firm's presence in global equity markets comes with an improvement in the credit-equity integration through a reduction of informational frictions. (*JEL* G12, G13, G14, G15)

The correlation between corporate debt and equity returns is low and varies over time, both at the firm and at the aggregate level. Standard asset pricing models in macrofinance find it difficult to reconcile this evidence. Even though researchers have made progress in explaining the time variation in joint stock and bond risks (Baele, Bekaert, and Inghelbrecht 2010; David and Veronesi 2013; Lee and Johnson 2014; Campbell, Pflueger, and Viceira 2015; Song 2017), joint credit-equity dynamics remains an active area of research (Duffee 2017), perhaps because correlations are a main input to asset allocation decisions.[1]

Researchers are also actively debating over the puzzling weak relation between equity and credit returns at the firm level. Collin-Dufresne, Goldstein, and Martin (2001) find a common component in the credit spread changes for a firm that is not accounted for by its stock returns. This result is surprising, as it is taken as given in structural models of credit risk pioneered by Merton (1974) that the relation between equity and debt valuations depends on a set of common risk factors. This has spurred many studies to understand the economics of the relation between stock and bond returns. Although some researchers support the existence of common factors (Fama and French 1993; Friewald, Wagner, and Zechner 2014; Koijen, Lustig, and Van Nieuwerburgh 2017), others suggest that risk premiums in both markets are driven by nonoverlapping risk factors (Schaefer and Strebulaev 2008; Choi and Kim 2018; Chordia et al. 2017).[2] In light of this disagreement, a natural question to ask is whether firm-level structural shocks to the factor exposures of stocks and bonds explain some of their puzzling comovement and integration over time.

One well-documented shock to the factor exposure of firms' stock prices is a foreign equity listing. An equity listing on a foreign exchange is typically associated with an increase in the global market exposure of these stocks (Stapleton and Subrahmanyam 1997; Alexander, Eun, and Janakiramanan 1987; Foerster and Karolyi 1999; Bekaert, Harvey, and Lumsdaine 2002).

[1] Other studies on the aggregate stock-bond relation include Keim and Stambaugh (1986), Barsky (1989), Shiller and Beltratti (1992), Campbell and Ammer (1993), Connolly, Stivers, and Sun (2005), Christiansen and Ronaldo (2007), Guidolin and Timmermann (2007), and Viceira (2012).

[2] See also, among many others, Blanco, Brennan, and Marsh (2005), Acharya and Johnson (2007), Ericsson, Jacobs, and Oviedo (2009), Norden and Weber (2009), Kapadia and Pu (2012), and Bao and Hou (2017).

Despite the notable and multidimensional benefits of cross-listings for firm *equity*, little attention has been devoted to understanding how cross-listing affects the dynamics of returns on firms' *nonequity* claims.[3] Yet it seems intuitive that cross-listing should also affect the prices of firms' debt, especially if stocks and bonds are priced by the common sources of risk or exhibit pricing spillovers.[4] While the spillover effects of cross-listing have been studied for firm's different equity claims (Gagnon and Karolyi 2009; Gagnon and Karolyi 2010), we examine the effects of foreign equity listing in credit markets.

Using a global sample of 241 equity cross-listing events made by 215 firms between 2001 and 2013, we examine how these corporate decisions affect debt securities traded on the same firm, and how foreign listing may affect a firm's joint dynamics of credit default swap (CDS) and stock returns. We use CDSs to approximate a firm's credit risk, as they allow for a cleaner comparison across countries and firms than bonds: they are neither contaminated by differences in covenants or legal differences in contracts, nor by declining contract maturities. We find that the foreign listing of a firm's equity is associated with a profound change in the relation between equity and debt returns.

Figure 1 presents preliminary evidence on the change in the relation between CDS and stock returns associated with foreign listings. The figure shows the average quarterly Pearson correlation coefficient between daily CDS and stock returns twelve quarters before and after the foreign listing event. The correlation before a firm's stock issuance overseas fluctuates at around -0.12, on average. Within the first year after the cross-listing event, this correlation substantially strengthens to below -0.20, reflecting an increase in correlation of approximately 70%. This

[3] Other documented benefits from foreign cross-listing include firm-specific information generation (Foucault and Gehrig 2008; Fernandes and Ferreira 2008; Foucault and Frésard 2012), increased firm visibility (Baker, Nofsinger, and Weaver 2002; Lang et al. 2003; Ahearne, Griever, and Warnock 2004), improved liquidity (Tinic and West 1974; Werner and Kleidon 1996; Domowitz, Glen, and Madhavan 1998), improved investor protection (Coffee 1999, 2002; Doidge, Karolyi, and Stulz 2004, 2007, 2009), cost of capital reduction (e.g., Alexander, Eun, and Janakiramanan 1988; Foerster and Karolyi 1999; Errunza and Miller 2000; Chambers, Sarkissian, and Schill 2018), easier foreign firm acquisitions (Tolmunen and Torstila 2005), facilitated equity offerings (Reese and Weisbach 2002), and enhanced product visibility (Saudagaran 1988; Mittoo 1992; Pagano, Roell, and Zechner 2002).

[4] See Gebhardt et al. (2005), Avramov et al. (2007), Asness, Moskowitz, and Pedersen (2013), Lee, Naranjo, and Sirmans (2016), and Israel, Palhares, and Richardson (2018).

increase in correlation appears to be permanent, as it remains at approximately the same higher level in absolute values in the following quarters.

We formally test the change in the dynamics between the prices of credit and equity securities following the listing of stocks abroad. Our tests are closely guided by the predictions of the Merton (1974) model, which provides qualitative and quantitative guidance on different measures that describe the relation between stocks and bonds. We conduct three main tests. First, we examine hedge ratios between credit and equity returns, following Schaefer and Strebulaev (2008), who document that even the simplest structural credit risk model does a good job in explaining corporate bond hedge ratios. Second, we conduct world market integration tests for our sample of CDSs and stocks, in the spirit of Alexander, Eun, and Janakiramanan (1988), Foerster and Karolyi (1999), and Karolyi and Wu (2018), among many others. Third, we examine the CDS-stock market integration using a nonparametric measure from Kapadia and Pu (2012), who focus on the synchronicity between CDS and stock price changes. We acknowledge that cross-listings are not necessarily randomly assigned. Thus, to mitigate concerns of endogeneity, we also examine changes in the credit-equity market dynamics of cross-listed firms relative to that of a matched sample of non-cross-listed firms, using a differences-in-differences (DiD) estimator.

Focusing first on hedge ratios, we find that the CDS return sensitivity to stock returns increases fourfold after the cross-listing. Importantly, these results are not only robust to the inclusion of market- and firm-level controls, but also to time trends in credit-equity correlations, unobserved but time-invariant firm characteristics, and unobservable time-varying characteristics at both the home and the host markets. Second, we investigate the changes in the exposures of CDS returns to the world and domestic equity and bond market risks around the time of the cross-listing. We find that the CDS return beta on the world equity market portfolio increases from 0.58 to 0.83. This suggests that foreign listings, by improving the comovement between firm CDS and stock returns, are associated with a significant increase in the integration of CDSs with the world equity market. The cross-listing effect on the domestic stock market beta is positive, but statistically insignificant. Cross-listing is also associated with significant increases in the sensitivity of a firm's CDS to the world and domestic bond markets with a larger increase in comovement with the world bond market. In addition, stock returns also appear to become more aligned with global bond markets. Third, we provide support for our main results using a nonparametric measure of credit-equity integration. We document a significant reduction in pricing discrepancies between firm CDS spreads and stock prices after a foreign listing of a firm's shares. We find an increase in integration of 50%, with more pronounced effects at shorter return horizons. This finding is not explained by a change in liquidity in either the stock or the CDS market after the foreign listing or by any mechanical effects due to firm leverage or volatility.

Next, we examine the economic channels that may lead to increases in credit-equity integration in response to multimarket listing. This question is particularly salient given the large capital structure arbitrage (CSA) trading that has proliferated over the past 20 years (Yu 2006; Duarte, Longstaff, and Yu 2007).[5] As a trading strategy that takes advantage of the lack of price synchronicity by trading a firm's CDSs and stocks, CSA activity could have eliminated or significantly reduced the weak integration of credit and equity securities at the firm level. We explore three channels: (1) a reduction in trading frictions, (2) a reduction in information frictions, and (3) an improvement in corporate governance.

One important by-product of cross-listing is a reduction in trading costs, which has been shown to prevent full alignment of the prices of almost identical securities (Pontiff 1996; Shleifer and Vishny 1996; Gagnon and Karolyi 2010; Kapadia and Pu 2012). A second outcome of cross-listing is a decrease in cross-border information costs (Baker, Nofsinger, and Weaver 2002; Lang, Lins, and Miller, 2003; Foucault and Frésard 2012), which in theory could affect the price dynamics of closely related securities (Peng and Xiong 2006). A third impact of cross-listing is

[5] CSA is a popular fixed income arbitrage strategy that aims to exploit mispricing across a company's debt and equity. CSA is typically implemented using CDS spreads, as it is easier to implement a short credit risk position by buying CDS contracts compared to shorting bonds (Mahanti et al. 2011; Asquith et al. 2013). Section 4 will discuss CSA in detail.

improvements in corporate governance due to better external monitoring, regulation, and investor protection (Stulz 1999; Huddart, Hughes, and Brunnermeier 1999; Doidge, Karolyi, and Stulz 2004, 2007, 2009), which has been shown to affect the synchronicity of equity returns (Morck, Yeung, and Yu 2000). Thus, we examine whether these frictions may prevent the full alignment of credit and equity security prices.

We provide evidence of the relative contribution of the three channels for the effects we document. Our most striking result is that increases in the sensitivity of firms' CDSs to stock returns are greater for firms with fewer informational frictions, as measured by their greater media attention, analyst coverage, Google search intensity, and for firms whose visibility increases more with cross-listings. This result holds when we jointly account for other explanations. Similarly, we find that the increase in credit-equity integration is stronger when firms cross-list in familiar countries, measured by geographical distance and cross-country equity market correlation. Overall, these findings lend support to theories of investor recognition (Merton 1987; Van Nieuwerburgh and Veldkamp 2009) and rational inattention (Duffie 2010; Peng and Xiong 2006), which suggest that important news or information is not fully impounded in security prices unless investors pay attention to it.[6]

Our main contribution is to show that cross-listings are associated with a strengthening of the synchronous dynamics between credit and equity returns, which are only typically weakly related, in contrast to the predictions of the Merton (1974) model. We provide suggestive evidence that informational frictions play an important role in limiting the efficient alignment of credit-equity price dynamics, and that cross-listings are instrumental in reducing these frictions. Lee, Naranjo, and Sirmans (2016) consider the existence of foreign listings on exchanges with stricter disclosure requirements as a possible determinant of lower comovement between corporate and sovereign CDS spreads, but they do not examine credit-equity integration at the firm level. Hilscher, Pollet, and Wilson (2015) analyze the relation between CDS-stock return

[6] Empirical studies in this area include, among others, Tetlock (2007), Barber and Odean (2008), Dellavigna and Pollet (2009), Hirschleifer, Lim, and Teoh (2009), and Da, Engelberg, and Gao (2011).

comovement and investor attention, but they focus on transitory changes in investor attention to earnings announcements in one market.

Our paper also adds to the vast literature on cross-listed securities, which, to the best of our knowledge, has almost exclusively been focused on equity securities. In particular, we show that equity cross-listings not only have strong implications on the return dynamics and integration of that asset class, as documented earlier (e.g., Alexander, Eun, and Janakiramanan 1988; Foerster and Karolyi 1999; Sarkissian and Schill 2009; Lewis 2017), but that they also induce similar spillovers in the risk-return relation of other asset classes (debt and its derivatives).[7]

1. Sensitivity of Credit Risk to Equity Risk

Structural models of credit risk link the relation between risky debt (*D*) and equity (*E*) through their dependence on common risk factors. In the seminal work by Merton (1974), the only state variable is a firm's asset value (*A*), which evolves randomly with constant asset volatility (σ_A). As both debt and equity are contingent claims on the asset value of the firm, the sensitivities of debt and equity are tied together through their common dependence on the value of the firm. Specifically, the sensitivity of the debt value with respect to equity (i.e., the hedge ratio, h^E) is given by (Schaefer and Strebulaev 2008):

$$h^E = \left(\frac{1}{\Delta^E} - 1\right)\left(\frac{1}{L} - 1\right) \approx \partial R^D / \partial R^E, \tag{1}$$

where R^D and R^E represent the returns on risky debt and equity, Δ^E is the sensitivity of equity with respect to asset value, and L is firm leverage, defined as the market value of debt divided by the market value of total assets. In Merton's model, the hedge ratio is a function of asset value, asset volatility, debt maturity, and the term structure of interest rates. We focus on asset volatility

[7] By showing that listing in multiple markets increases credit-equity integration, we also relate to studies that examine the impact of CDS trading on the corresponding bond and equity markets. Whereas Das, Kalimipalli, and Nayak (2014) show that CDS trading reduces bond market efficiency, Massa and Zhang (2012) argue that the existence of CDS reduces fire-sale risk in the face of liquidation pressures. Boehmer, Chava, and Tookes (2014) show that CDS trading reduces equity market liquidity and efficiency.

and leverage, since interest rates are common to all firms, and we control for them in our regression model. By using constant maturity CDS returns instead of corporate bond returns in our analysis, we also isolate the maturity dimension. This is important, since Bao and Hou (2017) show that long maturity bonds are more sensitive to equity returns than short maturity bonds.

In a table below, we describe, using comparative statics of the Merton (1974) model, how asset volatility and leverage affect various common measures of the degree of comovement between stocks and bonds. Specifically, we show the impact of their changes on the hedge ratio, $h^E \approx \partial R^D / \partial R^E$, the covariance between debt and equity returns, $Cov(R^D, R^E)$, as well as the CDS and stock price synchronicity, $I\ (R^{CDS} \times R^E < 0)$, where I is the indicator function. Since CDS returns are positive and equity returns negative with increases in credit risk, synchronicity is associated with $R^{CDS} \times R^E < 0$. These comparative statics provide a natural benchmark against which we can compare the observed price dynamics of equity and debt around cross-listings.[8]

Metric	Name	Asset volatility	Leverage
1. $h^E \approx \partial R^D / \partial R^E$	Hedge ratio (sensitivity)	+	+
2. $Cov(R^D, R^E)$	Covariance (exposure)	+	+
3. $I\ (R^{CDS} \times R^E < 0)$	Synchronicity	–	+

Intuitively, bond returns become more sensitive to equity returns as firms become more credit risky, since risky debt behaves more like an equity claim on firm assets. We find that credit risk and, therefore, the hedge ratio and the covariance, are increasing in both asset volatility and leverage (drop in asset value). For safe debt, for which the option to default in a structural credit risk model is deep out-of-the-money, prices of bonds are not very sensitive to movements in asset value. Hence, the debt-to-equity sensitivity is low. Finally, the CDS-stock

[8] Internet Appendix Section A.1.1 also provides derivations for model extensions with stochastic volatility (Heston 1993).

price synchronicity shows opposite signs for the two variables: it is decreasing in asset volatility and increasing in leverage. Collin-Dufresne, Goldstein, and Martin (2001) and Schaefer and Strebulaev (2008), among others, argue that a large fraction of corporate bond returns is explained by factors unrelated to structural credit risk models. Thus, a change in the sensitivity of corporate bond returns to stock returns could indirectly arise through a change in the dependence of both bond and equity returns on common risk factors after firm-specific events. One such event is cross-listing, which often changes a firm's exposure to global risks (Alexander, Eun, and Janakiramanan 1988; Foerster and Karolyi 1999; Lewis 2017). It is known that cross-listings do not increase leverage; on the contrary, they are believed to enhance a firm's equity market value (Doidge, Karolyi, and Stulz 2004, 2007, 2009). Also, there is no consistent evidence that cross-listings increase firm volatility (Howe, Madura, and Tucker 1993; Domowitz, Glen, and Madhavan 1998). We confirm (in unreported results) that cross-listing in our sample is not associated with an increase in firm leverage or asset volatility. The fact that cross-listing is not accompanied by changes in volatility or leverage makes the profound change in the CDS-stock correlation shown in Figure 1 more intriguing. Importantly, the opposite predictions of asset volatility on hedge ratios and synchronicity provide for useful counterfactuals to rule out mechanical changes in the CDS-equity relation due to changes in volatility.

2. Data and Summary Statistics

Our sample covers a period from January 2001 to December 2013 and consists of 241 cross-listings of firms for which we are able to identify valid stock and CDS price information up to 2 years after the cross-listing event. For some tests, we rely on a reduced sample of 79 firms, for which we require a minimum of 1 year of stock and CDS return history, both before and after the cross-listing event. We first discuss the cross-listing data, then the CDS and stock price information, as well as other data sources that we use.

2.1 Cross-listing data

Our sample of cross-listings covers the period from 2001 to 2011. Our cross-listing sample is shorter by 2 years than the overall sample, as we require a minimum of 2 years of stock and CDS return information after the cross-listing. Most of the information comes from the Sarkissian and Schill public database, which provides the geography of foreign listings until 2006.[9] We further supplement this information with cross-listings data directly obtained from stock exchanges around the world, as well as the CRSP database for foreign listings in the United States. We retain only those cross-listings for which we can identify valid CDS price information. This procedure yields 241 cross-listings across 40 home and 28 host markets, representing 215 unique firms with traded CDS contracts. Among these firms, 190 firms have just one foreign listing, 24 firms have two listings, and one firm has three listings.

Table 1 shows the home and host market frequency distribution of our sample of firms that maintain both an equity cross-listing and a CDS contract. We find that the home market with the largest number of outgoing firms is France (24) and the host market with the largest number of incoming firms is the United States (86). The pairs of countries with the largest number of cross-listings are U.K. firms listing in the United States (15), Indian firms listing in Luxembourg (14), and Canadian firms listing in the United States (14). Table A.1 of the Internet Appendix provides additional sample statistics by year and by industry.

2.2 CDS and stock return data

We approximate the return on a company's debt over a risk-free benchmark with the CDS spread. We use the CDS spread as it is less contaminated by covenants and contractual differences than bonds, providing a better direct comparison in cross-country studies.[10] We source the CDS information from one of the leading CDS data providers, IHS Markit. The

[9] See http://sergei-sarkissian.com/data.html.

[10] In frictionless markets, the CDS spread is equivalent to the spread of the bond over a risk-free benchmark (Duffie 1999), although frictions may, at times, disrupt this arbitrage relation (see Mitchell and Pulvino 2012; Bai and Collin-Dufresne 2013; and the references therein).

market for CDS trading is global, so unlike equity returns, the credit returns we use are not necessarily attributable to any particular country. The starting date of our sample is dictated by the availability of CDS data. Starting from 2001, Markit provides daily CDS spread quotes for over 3,000 firms worldwide using a network of market makers from large partner banks. We use daily U.S. dollar-denominated 5-year CDS contracts written on senior debt, since they are the most widely traded and liquid. We choose contracts that contain the modified restructuring (MR) clause, as this is the default contract by convention in the United States, which represents the largest proportion of firms in our sample, up to the implementation of the "Big Bang" Protocol in 2009.[11] We also use the number of quoting dealers in the computation of the mid-market spread as a proxy for CDS coverage. We match our cross-listing sample with CDS data, requiring each cross-listed firm to have an underlying CDS contract available. Of the 215 firms in our sample, 186 have a single CDS contract, whereas 29 have multiple traded contracts written on different subsidiaries. Hence, we obtain a total of 278 firm-specific CDS-stock pairs for our cross-listing sample period between 2001 and 2013, which is the focus of our analysis.

Lastly, we match the sample of cross-listed firms with Datastream, I/B/E/S, and Compustat Global to obtain the daily U.S. dollar-denominated equity returns, analyst coverage, and annual financial fundamentals, respectively, over the same 2001–2013 period. The match is done manually based on the firm's name, country of origin, industry, and other public information from the company's website. We only obtain the analyst coverage and financial fundamentals from the home market determined by the firm's headquarter location. The analyst coverage from I/B/E/S is the total number of unique analysts providing earnings forecasts for a firm during the 12-month period before the fiscal year end.[12] We remove all firms from our sample identified as delisted by Datastream. We complement our data with several global

[11] After the implementation of the Big Bang Protocol, the conventional CDS contract in the United States specifies no restructuring. In Europe, the contract by convention specifies modified restructuring. Importantly, we need to examine a sample of equivalent contracts, to avoid having our results be driven by cross-sectional differences in restructuring credit event clauses (Berndt, Jarrow, and Kang 2007).

[12] Given the different accounting standards across countries, the financial fundamentals from Compustat Global are retrieved with the following filters. All accounting numbers are denominated in U.S. dollars. If multiple accounting standards exist, we choose the report by descending order of preference: IFRS, GAAP, and the domestic standard.

macroeconomic and financial control variables from the Federal Reserve Bank of St. Louis, such as the CBOE options-implied volatility index, the daily change in the default spread (i.e., the difference in yields between BAA and AAA corporate bonds), and the daily change in the U.S. term spread, which is the difference in yields between 10-year Treasury bonds and 3-month Treasury bills.

Table 2 presents the timing of a firm's CDS trading initiation in relation to the placement of a firm's cross-listing. We split the sample into three subperiods: at least 3 months prior to the cross-listing date, 6 months surrounding the cross-listing event, and more than 3 months after the cross-listing date. We find that the number of CDS initiations occurring before and after cross-listings is about the same (123 and 129). In 26 cases (about 10% of the cross-listing sample), the CDS issuance occurs essentially at the same time as the firm's cross-listing. Thus, the ability to trade in both a firm's equity and credit securities increases, when foreign listings are scheduled to be issued. It is important to emphasize that the main identification for our tests relies on *only* those firms that have at least 1 year of stock and CDS price information before and after the cross-listing event. Firms from the United Kingdom, France, and the United States provide the largest number of CDS contracts, 30, 29, and 24, respectively.

Table 3 shows the average means and standard deviations of firm CDS data, equity returns, and other firm characteristics across all home markets. We provide statistics for the two samples we use for the analysis: the overall sample of 241 cross-listed firms and the reduced sample of 79 firms with a minimum of 1 year of CDS and stock return information before and after the cross-listing event (Table A.2 of the Internet Appendix provides home market statistics). The statistics in panel A indicate that the return on CDS contracts is positive (1 bps per day), as is the daily equity return (0.5 bps per day). The correlation between stock and CDS returns, ρ, is negative 0.14, reflecting the low unconditional CDS-stock comovement also documented in other studies. Based on the firm characteristics reported in panel B, the average firm in the overall sample has a market capitalization of $29 billion, return on assets (*ROA*) of 4%, leverage of 24%, measured as the long-term debt divided by the sum of the long-term debt and the market value of equity, a price-to-book ratio (*P/B*) of 2.62, and is covered by 21 analysts. Firm size is the only characteristic that shows a significant difference between the overall and reduced samples. In this case, the market capitalization of firms in the overall sample is about 30% smaller than that of firms in the reduced sample.

3. Results

Following the predictions of the Merton (1974) model for hedge ratios, covariance, and bond-stock return synchronicity outlined in Section 1, we conduct three main tests on the joint dynamics of firm CDS and equity returns following the cross-listing. First, in the spirit of Schaefer and Strebulaev (2008), we estimate in Subsection 3.1 the changes in the sensitivity of CDS returns to stock returns (*the hedge ratio*) following cross-listing. To mitigate endogeneity concerns, we also analyze the change in credit-equity market dynamics of cross-listed firms relative to that of a matched control sample of non-cross-listed firms. In Subsection 3.2, we discuss a set of world market integration tests (*covariance*) and analyze changes in the exposure (betas) of CDS and stock returns to global and local risk factors for the reduced sample of CDS and stocks, in the spirit of Alexander, Eun, and Janakiramanan (1988), Foerster and Karolyi (1999), and Karolyi and Wu (2018). Finally, in Subsection 3.3, we examine CDS-stock market integration using a nonparametric measure proposed by Kapadia and Pu (2012), which focuses on the synchronicity between CDS and equity returns.

3.1 Sensitivity of CDS returns to equity returns

Following the first prediction of Merton's (1974) model, we examine the change in the sensitivity of the CDS return of firm *i* at time *t*, $R_{i,t}^{CDS}$, to the corresponding stock return, $R_{i,t}^{E}$, using the following regression model:[13]

[13] The return on the CDS contract is computed as the change in the natural logarithm of the price of the CDS contract between two adjacent dates. We use it as an approximation of the true bond return to compare time variation in the relation between equity and debt.

$$R_{i,t}^{CDS} = a_0 + b_1 R_{i,t}^{E} + b_2 CL_i \times R_{i,t}^{E} + b_3 CL_i + c_1 R_{i,t-1}^{E} + c_2 CL_i \times R_{i,t-1}^{E} + d_1' X_{i,t} + d_2' Y_t + \alpha_i + \gamma_j + \delta_t + \varepsilon_{i,t}, \quad (2)$$

where CL_i is a dummy variable, which equals 1 after firm i cross-lists and 0 otherwise.[14] The inclusion of time-varying firm-level and country-level control variables, $X_{i,t}$ and Y_t, is of utmost importance, since the decision to list firm shares on a foreign exchange often coincides with the outperformance of home and host markets for cross-listed securities (Sarkissian and Schill 2009). We include firm fixed effects α_i and either home or host market fixed effects γ_j to account for unobserved firm-level and country heterogeneity, as well as time fixed effects δ_t to account for unobservable common macroeconomic and financial variables.[15] Firm controls include leverage, equity volatility, ROA, and the P/B ratio. We cluster the standard errors by both firm and time. In the regression model in Equation (2), we extend the specifications in Acharya and Johnson (2007), Schaefer and Strebulaev (2008), and Hilscher, Pollet, and Wilson (2015) to account for cross-listing events. It allows us to test for a change in the sensitivity of credit to equity returns in response to the information released when a firm cross-lists its shares. Thus, the coefficient of primary interest in our study is b_2.

Table 4 displays the overall impact of cross-listings on the hedge ratio between CDS and stock returns using Equation (2). The specification in Column 1 does not include control variables. We find that both the contemporaneous and the lagged stock returns are negatively and significantly (at the 1% level) related to CDS returns, even when firms are listed on domestic exchanges only. However, the low magnitude of these relations ($|b_1|$ = 0.13 and $|c_1|$ = 0.09) indicates that the equity and CDS markets are effectively segmented. More importantly, we see that the coefficient b_2 on the interactive term $CL_i \times R_{i,t}^{E}$ is also negative and significant, but its magnitude (0.21) substantially exceeds that of b_1. The coefficient c_2 on the lagged term $CL_i \times$

[14] We omit a country subscript to ease the notation. We also examine models without time fixed effects but common control variables, including the MSCI world index return, $R_{w,t}$, the residuals from regressing the home market MSCI country index return on the world index return, $R_{c,t}$, and the daily change in the CBOE volatility index, ΔVIX_t.
[15] In the most conservative specification, we also control for the interaction of (daily) time and home or host market fixed effects to absorb the possible influence of any unobserved time-varying home country characteristics.

$R^E_{i,t-1}$ is also negative and significant at the 5% level, but it is five times smaller in magnitude than b_2. This suggests that cross-listing placements are primarily associated with enhancements in the contemporaneous price dynamics between firms' equity and credit sensitive securities.

In Column 2 of Table 4, we find that the coefficient b_1 drops to 0.06 in absolute value when we include contemporaneous firm-level and market-level control variables in the specification, but it remains statistically significant. The introduction of these variables also leads to a reduction in the magnitude of coefficient b_2 to 0.16, still reflecting a 300% increase in the hedge ratio associated with cross-listing. The relative difference in the values of coefficients b_1 and b_2, which has now increased, emphasizes the profound differences that exist in credit-equity sensitivity before and after cross listing. The magnitude and significance of the relation between CDS and the lagged stock returns is effectively unaffected by the addition of controls. A further inclusion of time fixed effects (Column 3), and even the interaction of time with host or home market fixed effects (Columns 4 and 5, respectively), does not alter the qualitative or quantitative picture obtained in previous specifications.[16]

Although Table 4 establishes an important relation between credit-equity sensitivity and cross-listing, it does not establish causation. It could be that poor credit-equity sensitivity predicts cross-listing. In response, we verified that the decision to cross-list is not driven by the existing level of CDS-stock comovement using a multinomial logistic regression. Table A.11 of the Internet Appendix reports these results.

To further verify that our findings in Table 4 (i.e., an increase in the sensitivity between firm CDS and stock returns after cross-listing) are not related to selection based on firm- or country-specific characteristics, we examine the properties of a matched control sample of firms without cross-listings but with similar firm characteristics and correlation between CDS and stock returns. The matched sample is constructed by minimizing the normalized four-

[16] A subsample analysis for the 2001–2007 and the 2008–2013 periods suggests that our conclusions are unaffected in different sample periods, although the increase in hedge ratios following cross-listing is more pronounced in the 2008–2013 period than in the 2001–2007 period. These results are available on request.

dimensional Euclidean distance between the sample of cross-listed and 2,016 non-cross-listed firms based on four important (demeaned and standardized) firm characteristics: the leverage ratio, the correlation between CDS and stock returns, the credit rating, and market capitalization. The correlation between CDS and stock returns is a particularly important matching criterion, as it ensures that we match firms on past trends in their credit-equity dynamics. Credit ratings, which we map into a numerical rating scheme ranging from AAA = 1 to C = 21, correspond to the S&P long-term credit ratings from Compustat RatingsXpress. We also require a matched firm to be headquartered in the same region as the cross-listed firm, using the United Nations geoscheme, which classifies countries in six regions: North America, Latin America and the Caribbean, Europe, Africa, Asia, and Oceania.[17] We match firms with replacement based on the closest normalized Euclidean distance, using the firm characteristics corresponding to the year immediately prior to the year of the cross-listing. Matched firms are assigned a pseudo-cross-listing date identical to that of the corresponding cross-listed firm. The total sample of non-cross-listed firms from which the matching firms are selected is 2,016, and the sample of uniquely matched firms is 202. We compare the statistics of cross-listed and matched firms and find that the firm characteristics for both samples are statistically indistinguishable from each other, suggesting efficient matching results. Table A.3 of the Internet Appendix reports these results.

Table 5 shows the impact of cross-listing on the hedge ratios of a firm's CDS and stock returns for cross-listed and matched firms. The dependent variable, daily CDS returns, as well as all controls and fixed effects used in Table 4. Column 1 of Table 5 reports the results of this same specification on the matched control sample of firms that did not cross-list. We note a negative and significant relation (both contemporaneous and lagged) between CDS and stock returns for matched firms. Moreover, their estimates are very close to those of cross-listed firms found in Column 1 of Table 4, which we report again in Column 2 of Table 5 for ease of

[17] We also examine propensity-score matching using the results in Table A.11 of the Internet Appendix, imposing the restrictions that a matched firm is headquartered in the same country as the cross-listed firm or that it operates in the same industry based on the two-digit SIC code. Our results are unchanged and available on request.

reference. This formally underscores the matching quality as the matched and cross-listed samples have similar unconditional hedge ratios. Second, we observe that the coefficient b_2 on the interactive term $CL_i \times R^E_{i,t}$ for matched firms in Column 1 is negative, but insignificant, and its magnitude is almost ten times smaller than that for cross-listed firms (Column 2). We perform the DiD estimation between the two firm samples by adding a dummy variable that indicates the treatment firms and present the results in Column 3. These results confirm that the increase (more negative coefficient) in the sensitivity between CDS and stock returns after foreign listing is statistically significant over and above that observed for the matched sample, as the coefficient on the triple interaction variable has a *t*-statistic of 2.77. The estimations for the results in Columns 4–7 account for the control variables and time fixed effects to assure that the documented effects are not driven by unobserved common shocks. Next, we include interactions of daily time fixed effects and either home or host market fixed effects and report the results in Columns 6 and 7, respectively. This mitigates our concerns that the results may be driven by macroeconomic changes in the home or host markets. The fact that the addition of country-time fixed effects does not change our results further underscores the robustness of our findings, which are firm-specific, and likely arise due to foreign listing. Across all specifications, the average treatment effect is economically large and significant, and it changes only little in magnitude, between 0.13 and 0.19 in absolute value. Thus, the results in Tables 4 and 5 show the important role of cross-listings in improving the sensitivity between debt and equity markets.[18]

We further examine how CDS spread changes are related to stock returns at leads and lags of the cross-listing event for both the treatment and the matched control groups, following the empirical identification design of Angrist and Pischke (2009, chapter 3).[19] Figure 2 plots the credit-equity sensitivity around the cross-listing and pseudo-cross-listing date for the treatment and the matched firms. We observe that only the coefficients on interaction effects for the

[18] The negative and significant coefficient b_2 is robust to variations in the estimation of Equation (2). Alternative specifications include country fixed effects, a subsample of observations with no stale quotes, and a subsample of observations with at least 1 year of CDS trading before the cross-listing event. Results are available on request.
[19] Table A.12 of the Internet Appendix details the regression specification and provides the results.

treatment group are significant after the cross-listing, doubling in magnitude from 0.108 to 0.205 over 2 years following the cross-listing, while the coefficients on interaction effects prior to the listing are not. The patterns of the lagged effects are interesting on their own, as they indicate that the CDS-stock return sensitivity becomes stronger over time. For the sample of matched firms, all interaction coefficients are statistically indistinguishable from zero (apart from the 3-year lag coefficient, which is significant at the 10% level only). Results with leads and lags at the quarterly frequency, which are reported in Table A.12 of the Internet Appendix, are stronger. The insignificance of the coefficients in the 2 years before the cross-listing further validates the parallel trend assumption, which is a necessary condition for a valid DiD framework. These tests suggest that cross-listings play a role in the observed changes of credit-equity dynamics.

3.2 World market integration tests

The "globalization" effect associated with equity cross-listing has been shown to impact a firm's common factor exposure (Errunza and Losq 1985; Alexander, Eun, and Janakiramanan 1987, 1988; Foerester and Karolyi 1999; Karolyi and Wu 2018). Common factors drive the covariance between CDS and equity returns, as discussed in the context of the Merton (1974) model in Section 1. Our setup thus provides an opportunity to test whether an increase in the CDS hedge ratios can be (indirectly) associated with a greater integration of CDS and stock returns with the world stock and bond market factors.

Indeed, as cross-listed firms' equity securities are documented to become more integrated with world capital markets (e.g., Karolyi 2006), one may expect those firms' credit securities to become more integrated with world equity markets as well. In parallel, the globalization of the firm may afford improved integration between equity returns and world and domestic credit factors. Also, since foreign listing increases the return sensitivity of a firm's CDS to its own stock, one should also observe an increase in the comovement of the CDS with the firm's domestic equity market.

The world- ($R_{i,w}^{stock}$) and country-specific ($R_{i,c}^{stock}$) stock market factors are measured by the returns on the MSCI World and country-specific equity market indices. The world ($R_{i,w}^{bond}$) and country-specific ($R_{i,c}^{bond}$) bond market factors are measured by the Citigroup World and country Government Bond Index returns. All country indices for both the stock and the bond markets are orthogonalized with respect to their corresponding world markets. Our benchmark integration model (IM-1) to test the above conjectures is given as follows:

$$\left.\begin{matrix} R_{i,t}^{E} \\ R_{i,t}^{CDS} \end{matrix}\right\} = \alpha_i + \beta_{i,w}^{stock} R_{w,t}^{stock} + \beta_{i,c}^{stock} R_{c,t}^{stock} + \beta_{i,w}^{bond} R_{w,t}^{bond} + \beta_{i,c}^{bond} R_{c,t}^{bond} + \varepsilon_{i,t}, \quad (4)$$

where $\beta_{i,w}^{stock}$ and $\beta_{i,c}^{stock}$ ($\beta_{i,w}^{bond}$ and $\beta_{i,c}^{bond}$) are the world and local stock (bond) market betas of firm *i*, with respect to the corresponding stock (bond) return indices. To be included in the estimation, a firm must have at least 1 year of stock and CDS return history before and after the cross-listing event. Recall that this reduced sample comprises 79 such firms.

Under the assumption that firm equity (CDS) is integrated with the world stock market, its world stock market beta must be equal to 1 (–1). However, if a firm's security is not integrated with the world stock market before the cross-listing, then its respective beta will be less than unity in absolute value.[20] Given our findings in Tables 4 and 5, we expect a firm's CDS to be less integrated with (or exposed to) the world stock market than firm equity before cross-listing. For CDS bond market betas, we expect a positive sign for both the world and the local bond market betas. Indeed, higher (lower) credit spreads or returns are associated with bad (good) market conditions, which are typically characterized by positive (negative) returns on government bonds, when demand for safe and liquid assets increases (decreases). The actual strength of the exposure to these risks depends on the integration level between firm CDS and the bond factors.

While model IM-1 serves as our base model, we consider several alternative nested asset pricing models. More specifically, we include (1) foreign exchange risk factors based on the

[20] As globally traded securities, we also anticipate lower exposure of CDS returns to local stock markets (again with a negative sign), both before and after cross-listing. However, if cross-listing increases firm CDS exposure to global equity markets, then we should observe some increase in exposure to the local equity market as well.

Solnik (1974) ICAPM (IM-2), (2) the intermediary asset pricing factor from the He, Kelly, and Manela (2017) model (IM-3), and (3) global and domestic size and book-to-market factors based on the Fama-French (1993) 3-factor model (IM-4). The foreign exchange risk factors are the dollar risk and carry trade risk factors from Lustig, Roussanov, and Verdelhan (2011). We use the Fama-French (1993) factors to approximate the partial segmentation model of Karolyi and Wu (2018) due to incomplete access to their domestic stock market factors.[21] For consistency with our benchmark model IM-1, all of our other asset pricing models also include world and country-specific stock and bond returns.

Table 6 reports the estimation results. We also report the cross-sectional average estimates of each respective beta before cross-listing for both the stock and the CDS returns. For each beta coefficient, $\Delta\beta$ denotes the difference between the respective betas estimated before and after the cross-listing. Columns 1 and 2 show the estimates using the benchmark model IM-1. Based on the equity market factors alone, the average world and domestic market betas of firms in our sample before the cross-listing are 1.075 and 0.835, respectively. Since, in theory, the average β_w across all firms in the world is unity for perfectly integrated markets, we can infer that the firms in our sample are fairly well integrated with the world market portfolio (even before placing shares in foreign markets). This might be expected, as our sample is dominated by large firms from developed markets (e.g., De Santis and Gerard 1997; Sarkissian and Schill 2014). In contrast, the cross-listing is associated with large changes in the firms' sensitivity to the world and domestic bond factors. The beta on the world bond factor is 0.489 prior to cross-listing and then increases by a significant 0.178 after the cross-listing. The beta on the domestic bond market is -0.575 prior to the cross-listing and then increases in magnitude by a significant 0.249 after the cross-listing.[22] The results suggest that cross-listing is associated with a marked increase in the comovement of equity returns with bond market factors.

[21] Karolyi and Wu (2018) find that the "trivial," not-theory-driven partial segmentation version of the Fama-French model with global and local firm attributes is close in performance to their theoretical segmentation model.
[22] Expectedly, stock returns are negatively correlated with government bond returns at the country level due to shifts in asset allocation in different market conditions, but the average correlation with the world bond market is positive, reflecting similar performance by equity and global debt markets.

In Column 2 of Table 6, we can see that before cross-listing, β_w^{stock} and β_c^{stock} of CDS returns are -0.579 and -0.120, respectively. After the foreign listing, both these estimates increase in magnitude by 0.247 and 0.144, respectively, thus becoming -0.826 for the world market beta and -0.264 for the domestic beta. The change in the world market beta is economically and statistically significant. Therefore, it appears that the well-documented globalization effects from cross-listings predicted for equity securities carry forward to a firm's credit securities. CDS returns also become significantly more integrated with the world and domestic bond markets. The changes in magnitude are economically important, with an increase of 0.464 and 0.834 for the global and domestic bond market factors, respectively. Thus, equity returns become more closely aligned with global bond market factors, and CDS returns become more closely aligned with global stock market factors after cross-listing.

The remaining columns of Table 6 present the results when Equation (4) is enhanced with the foreign exchange risk, the intermediary capital risk, or the Fama-French global and domestic risk factors. Across all these columns, stock (CDS) returns continue to show a significantly higher exposure to world market bond (stock) factors after cross-listing events. Also, as before, CDS returns gain more exposure to bond factors, especially domestically, after cross-listing. For models IM-2 and IM-4, we also observe some increase in the exposure of CDS returns to the domestic stock market index at the 10% significance level. The changes in CDS and stock return sensitivities to the additional risk factors associated with the enhanced models are insignificant around the listing. The only exception is the marginal increase in the sensitivity of stock returns to intermediary capital risk for model IM-3.

3.3 Pricing discrepancies

Next, we test for a reduction in credit-equity pricing discrepancies following cross-listing. We borrow from Kapadia and Pu (2012), who propose a simple test of integration between CDS and equity markets that captures price discrepancies (lack of synchronicity) in changes of firms' CDS spreads, P^{CDS}, and stock prices, P^{E}. It is assumed that CDS and equity markets are aligned if

CDS and stock returns move in opposite directions ($R^{CDS} \times R^E < 0$). Like in the Merton (1974) model, an increase in firm value increases both equity and debt values, with the latter corresponding to a decrease in credit spread. Both markets are neither aligned nor misaligned when $R^{CDS} \times R^E = 0$. Finally, the two markets are assumed to be misaligned if CDS spread and equity price changes move in the same direction, $R^{CDS} \times R^E > 0$. Kapadia and Pu (2012) define the integration measure κ_i between CDS and stock markets of firm *i* based on the frequency of such synchronicity discrepancies. Thus, at a given date *k* and for a given return horizon of τ days, CDS and equity returns are defined as $R_{i,k}^{E,\tau} = \ln(P_i^E(k+\tau)/P_i^E(k))$ and $R_{i,k}^{CDS,\tau} = \ln(P_i^{CDS}(k+\tau)/P_i^{CDS}(k))$. The indicator function $I\left[R_{i,k}^{CDS,\tau} \times R_{i,k}^{E,\tau} > 0\right]$ is equal to 1 if there is a pricing discrepancy and 0 otherwise. For a given period, a firm may then have *M* observations of CDS spread and stock price changes of τ trading days, based on which it is possible to compute the statistical integration measure:

$$\kappa_i = \sum_{k=1}^{M-\tau} I\left[R_{i,k}^{CDS,\tau} \times R_{i,k}^{E,\tau} > 0\right], \tag{5}$$

where all pricing discrepancy measures are computed over nonoverlapping time intervals.[23]

Table 7 shows the frequency of price discrepancies for five intervals of τ being equal to 1, 5, 10, and 20 days. We report the means and standard deviations of the frequencies of CDS and stock market alignment, $R^{CDS} \times R^E < 0$, no relation, $R^{CDS} \times R^E = 0$, and misalignment, $R^{CDS} \times R^E > 0$, before and after the cross-listing event. The last two columns of the table report the difference in the pricing discrepancy for each of its three cases before and after the cross-listing, Diff(After – Before), and the corresponding absolute *t*-statistic. Panel A reports the results for the overall sample of firms. Cross-listing is associated with an improvement in the synchronicity between CDS spread and stock returns. First of all, the instances of alignments between the two markets ($R^{CDS} \times R^E < 0$) go up significantly for all four estimation intervals. For example, for a 1-day interval, the alignment between the markets occurs 50.9% of the time after the cross-listing

[23] We have verified all tests with 90-day rolling windows, and the results are qualitatively and quantitatively similar.

as opposed to only 33.7% before the cross-listing. Second, the instances of no relation between CDS and stock markets ($R^{CDS} \times R^{E} = 0$) after the listing go down significantly for the three shortest estimation intervals of 1, 5, and 10 days. This decrease is the most profound for $\tau = 1$, for which the drop equals 24.9% (38.5% – 13.6%). Finally, we also observe a substantial decrease in the frequency of misalignment between the two markets. It is negative for $\tau = 5$, 10, 20 and negative and significant for $\tau = 5$, 20.[24]

The price discrepancy measures exclusively rely on the concordance of CDS and stock prices. This is useful, as it enables a direct mapping of κ_i into the Kendall's tau coefficient, K_i, defined as $K_i = 4\kappa_i/(M(M-1)) - 1$, which has the advantage of having well-known statistical properties to test for inference. For perfectly synchronous CDS and equity returns, $K_i = -1$; the higher is its value, the less integrated is the capital structure of a firm. Panel B of Table 7 examines the Kendall's tau measure over the same return horizons of 1 to 20 days. We report the results for the cross-listing sample (the treatment firms) and the matched control samples (the control firms). Kendall's tau measure decreases (i.e., increases in integration) after cross-listings for both the treatment and the control firms. This is expected, as we have directly matched firms on their past CDS-stock return correlation trend. We see however that the increase in integration is significantly higher for the cross-listed firms than for the matched control firms, as shown by the significant DiD estimator for return horizons of 1 and 5 days.

While the price discrepancy test results are suggestive of an increase in the synchronicity between a firm's CDS and stock returns after a firm cross-lists, we now proceed to more formal tests of integration that control for any systematic variation by firm and time. In particular, we exploit the cross-sectional differences and time series variation in the Kapadia and Pu (2012) integration measure, κ_i, focusing on return horizons of 5 days.[25] Similar to those authors, for the regression analysis we apply a log-transformation to the Kendall correlation measure. More

[24] Similar results, which are available on request, are obtained for a reduced sample of 79 firms with at least 1 year before and 1 year after stock and CDS returns.

[25] We have verified our results for different return horizons, and their statistical significance is higher for shorter periods, as expected.

specifically, we examine whether credit-equity integration increases (i.e., a more negative measure of integration) after the cross-listing event by significantly great amount for the sample of cross-listed firms than for the sample of matched firms without a cross-listing. We run the following panel regression:

$$\bar{K}_{i,t} = a_0 + b_1 CL_i + b_2 D_i \times CL_i + c_1' X_{i,t} + \alpha_i + \delta_t + \varepsilon_{i,t}, \quad (6)$$

where the dependent variable is the transformed Kendall correlation, and D_i is a dummy variable that equals 1 for a cross-listing and 0 for a matched firm. Firm controls $X_{i,t}$ include nine firm-specific characteristics: the proportion of trading days with stale returns in the 5-year CDS spread, *ZeroSpread*, the proportion of trading days with zero stock returns, *ZeroRet*, the natural logarithm of the number of traded shares, *TrVolume*, the idiosyncratic volatility of the residuals from regressing firm-specific stock returns on the MSCI world index return and MSCI country index returns, *IVol*, as well as *Leverage*, *EqVol*, *MkCap*, *Depth*, and *Illiquidity* defined earlier.

The results in Table 8 confirm our conjecture. The interactive treatment indicator D_i with the cross-listing dummy, *CL*, is significant at the 1% level in all specifications. This finding is robust to the inclusion of daily time fixed effects, and both time-varying observable and time-invariant unobservable firm-specific control variables. The economic increase in integration is large too. The magnitude of the coefficient on the $D_i \times CL_i$ term ranges from 0.043 in Column 4 to 0.051 in Column 2. Given that the average magnitude of the integration measure before cross-listing is 0.096 (in absolute value) at the 5-day return horizon, this corresponds to a 50% increase in integration. Importantly, our effects are not affected after controlling for a battery of CDS and stock liquidity measures.[26] This suggests that the increase in credit-equity integration after cross-listing cannot be fully explained by a change in liquidity in any of those two markets.

Figure 3 visually underscores our results. In this plot, using a return horizon of 5 days, we show the (moving average and detrended) dynamics of the integration measures for the samples

[26] Table A.10 of the Internet Appendix provides more conservative estimates with quarter-country (either home or host) fixed effects. The coefficients remain statistically significant, but the magnitude decreases to 0.038 and 0.017, corresponding to a 40% and 18% in integration, respectively.

of cross-listed and matched firms. We find a marked increase in integration between CDS and stock returns among cross-listed firms (i.e., a decrease in the integration measure) that is not observed for the sample of matched control firms.

4. Discussion

We discuss in Section 4.1 three economic channels by which cross-listings may affect credit-equity return dynamics: (1) a reduction in trading frictions, (2) a reduction in information frictions, and (3) an improvement in corporate governance. We present our findings in Section 4.2, examine their joint impact in Section 4.3, and present direct evidence on the dynamics of frictions around the cross-listing event in Section 4.4.

4.1 Economic channels of credit-equity integration

The lack of a price alignment between a firm's debt and equity securities may induce arbitrage opportunities. Capital structure arbitrage (CSA) is a trading strategy that capitalizes on deviations from the Merton model assumptions of synchronous debt and equity prices. For example, if debt prices fail to simultaneously reflect information that is reflected in equity prices, an arbitrageur can take a position in the mispriced debt security and hedge firm risk with an offsetting equity position, holding the position until the relative mispricing is eliminated through market forces.[27] In essence, CSA is a classic statistical arbitrage convergence trade. CSA has greatly increased in popularity since the development of the CDS market in the early 2000s (Currie and Morris 2002; Yu 2006; Duarte, Longstaff, and Yu 2007), as the CDS market provides a more cost-effective way to execute the trade due to the higher liquidity and lower short sale constraints of CDS relative to corporate bonds (Blanco, Brennan, and Marsh 2005;

[27] Implementing CSA is typically accomplished through practical standard structural models, one example being the CreditGrades model (Finkelstein et al. 2002). Structural models connect a company's equity and debt prices through a limited number of state variables, for example, a firm's asset value. Thus, they may be used to track the evolution of credit spreads and provide timely signals of when a firm's credit becomes impaired. If stock and bond prices deviate from model predictions, investors may potentially benefit from trading jointly in both securities of the same firm, effectively betting on the price convergence of the two securities.

Mahanti et al. 2011; Asquith et al. 2013). A growing number of firms indeed experience CDS initiation in the run-up to the cross-listing event, as documented in Table 2.

The trading behavior of investors who employ CSA strategies is expected to improve the synchronicity of credit and equity returns. We investigate three channels by which cross-listing can affect such shifts in trading activity: (1) a reduction in trading frictions, (2) a reduction in information frictions, and (3) an improvement in corporate governance.

As a first channel, debt and equity synchronicity is expected to improve if cross-listing is associated with a significant reduction in trading costs in both debt and equity markets. Kapadia and Pu (2012) suggest that existing limits to arbitrage in both stock and credit markets prevent synchronicity between CDS and stock returns, and Gagnon and Karolyi (2010) find similar results for multimarket equity trading. Das and Hanouna (2009) observe that CDS spreads respond to equity market liquidity and relate their finding to CSA trading activity. Many studies show that cross-listings are associated with a reduction in trading costs in equity markets (Tinic and West 1974; Werner and Kleidon 1996; Domowitz, Glen, and Madhavan 1998). Cross-listing can reduce both direct and indirect trading costs, where indirect trading costs include, for example, holding costs (Pontiff 2006; Gagnon and Karolyi 2010) or limited capital (Shleifer and Vishny 1997).

The second channel is that cross-listing is associated with a substantial reduction in cross-border information frictions, which may come in several forms. Cross-listing is associated with changes in information disclosure in the host market. It has been shown to improve a firm's informational environment (Baker, Nofsinger, and Weaver 2002; Lang et al. 2003; Ahearne, Griever, and Warnock 2004) and to increase the informativeness of firms' stock prices (Fernandes and Ferreira 2008; Foucault and Gehrig 2008; Foucault and Frésard 2012). Greater information is associated with increased visibility of the firm and increased attention of cross-border investors. Such changes in the information environment around the firm can significantly affect the return comovement across different types of its securities (Merton 1987; Peng and Xiong 2006; Hirshleifer et al. 2009; Duffie 2010).

The third channel is that cross-listing is associated with improvements in corporate governance. Many argue that cross-listing affects external monitoring, regulation, and investor protection (Huddart, Hughes, and Brunnermeier 1999; Stulz 1999; Doidge, Karolyi, and Stulz 2004, 2007, 2009). Morck, Yeung, and Yu (2000) demonstrate a substantial variation in the synchronicity of equity returns with respect to the corporate governance characteristics of the markets in which they trade. Thus, we propose that variation in cross-border institutions affects the trading propensity of CSA-type traders.

The act of cross-listing might help lower frictions in the target market. Alternatively, managers may decide to cross-list into a specific market because they believe that frictions in that market are likely to go down in the future. Below, we provide suggestive evidence on three channels (trading friction reduction, information friction reduction, and governance improvement), through which cross-listing may facilitate improvement in credit-equity dynamics. Our tests do not, however, document causation. We leave a detailed analysis on the causal relation between cross-listings and frictions for future research.

4.2 Empirical tests of economic channels of credit-equity integration

While it is challenging to isolate the specific impact of each channel, we examine whether cross-sectional differences in the increase in sensitivity of credit to equity returns is associated with firm- or country-specific characteristics that correlate with measures of trading frictions, information frictions, and corporate governance.

We use five proxies for trading frictions: the quarterly volatility of firm's equity returns, that is, equity volatility (*EqVol*); a firm's leverage ratio (*Leverage*); the idiosyncratic volatility of the residuals from regressing firm-specific stock returns on the MSCI world and country index returns (*IVol*); the Amihud (2002) illiquidity measure based on price impact (*Illiquidity*); and trading volume defined as the natural logarithm of the dollar value of traded shares (*TrVolume*).

For information frictions, we also use five measures: stock analyst (*Analyst coverage*) and CDS broker coverage (*CDS coverage*); firm advertising and promotional expenses

(*Advertising*), as firms also may be more visible if they spend more on marketing expenses; media attention using the firm-specific event volume from RavenPack News Analytics Dow Jones edition (*Media*), which captures relevant information from Dow Jones Newswires, regional editions of the *Wall Street Journal*, *Barron's*, and *MarketWatch* (Kolasinski, Reed, and Ringgenberg 2013; Dang, Moshirian, and Zhang 2015); and retail investor attention through the Google search volume index (*Search*) following Da, Engelberg, and Gao (2011).[28] The cross-sectional variation in the impact of cross-listing on informational frictions may be due also to cross-market characteristics. We use two proxies to capture the cross-border familiarity between the markets: geographic proximity (*Geographic proximity*) of the countries, measured as the great circle distance between the capital cities of the home and host markets for cross-listings (Sarkissian and Schill 2004); and cross-country equity correlation (*Cross-country correlation*), measured as the average stock market index return correlation between the home and host markets of cross-listed firms.

For firm-level governance measures, we follow Roberts (2015) and use tangibility (*Tangibility*) and collateral (*Collateral*) to capture the degree of monitoring costs. We also use two proxies for country-level governance: the country level rule of law measure (*Rule of law*), based on the anti-self-dealing index from Djankov et al. (2008); and the stringency of disclosure standards imposed by the host market (*Disclosure requirement*). Following Bae, Tan, and Welker (2008), we compute a country-level disclosure measure using 21 separate accounting reporting practices.

Using these characteristics, we divide all firms into those with high or low frictions based on the median value of each characteristic in the year before the cross-listing (High-Low Level). In addition, we divide all firms into those with a high improvement in frictions from 1 year before to 1 year after the cross-listing (High-Low Change). Then we measure the change in

[28] Although a firm's market capitalization is an additional obvious proxy, we omit this measure, because it is difficult to attribute to a particular channel.

CDS-stock return comovement from before to after the cross-listing.[29] The tests in Table 9 are based on a specification similar to that used for Column 5 of Table 5 and represent triple DiD estimates. Therefore, each regression coefficient in this panel represents a separate regression and indicates the differential change in the CDS-stock return sensitivity around the cross-listing event for firms in the top 50th percentile relative to those in the bottom 50th percentile of the distribution of each metric, where firms are compared to a matched firm that did not cross-list.

Panel A.1 of Table 9 shows the test results related to each of the trading friction proxy variables. Focusing on the levels, we find that firms that have greater equity and idiosyncratic volatility are associated with lower credit-equity integration after cross-listing.[30] The fact that the level of trading frictions is relevant for a firm's credit-equity integration is consistent with Kapadia and Pu (2012). However, firms with greater price impact, as measured by the Amihud (2002) illiquidity measure, feature greater price comovement after the foreign listing, although statistically significant at the 10% level only. Turning to the changes in firm characteristics, we find greater credit-equity sensitivity for firms that have an improvement in dollar trading volume and for firms that experience a larger change in liquidity around the cross-listing event.

Panel A.2 of Table 9 documents a greater increase in credit-equity sensitivity following the cross-listing for 4 of 5 proxies for information using sorts based on characteristic levels. The economic differences are important, as the coefficient estimates are mostly greater than those for the trading friction proxies, with the greatest cross-sectional difference found for higher levels of media attention (all variables are demeaned and standardized for comparability). We also find support for a greater increase in CDS-stock return sensitivity if firms' stock tickers are more searched for in Google. The results based on changes in the attention proxies provide further support for the fact that investor attention is a significant determinant in explaining cross-sectional differences in credit-equity price dynamics following cross-listings.

[29] Our different metrics weakly correlate across categories, so they capture different firm characteristics.

[30] We also examined the frequency of zero stock returns and zero CDS spread changes. The interpretation of these results is ambiguous, as a reduction in staleness is only relevant if CDS spreads and stock returns become more synchronous. Subsection 3.3 presents a more detailed examination of the change in price concordance.

We also examine the cross-sectional differences in the CDS-stock return relation after the cross-listing for sample splits based on firm corporate governance characteristics. Our estimates in panel A.3 of Table 9 suggest that our firm-level governance proxies are not as relevant to the increased cross-market integration following a cross-listing.

Panel B of Table 9 shows the results for subsamples sorted on market-level investor information and corporate governance characteristics. We again observe in panel B that cross-listings in close-by countries are significantly more conductive to improving the comovement between CDS and stock returns. The magnitude of the DiD coefficient is similar to that of firm-level measures of attention and is economically significant. In unreported results, we also observe that U.S.-placed listings lead to a smaller increase in CDS-stock comovement than those placed in other countries. This seemingly puzzling outcome is well explained by the location of listings and is consistent with our results on the familiarity impact based on geographic proximity: the vast majority of U.S. cross-listings in our sample come from distant countries. Panel B also shows our estimations with two country-level governance proxies: rule of law and the stringency of disclosure standards imposed by the host market. Similar to firm governance proxies, an improvement in investor protection and disclosure standards following the cross-listing does little to explain the increased synchronicity between stock and CDS returns after the event.

4.3 Trading or information frictions

Our next step is to examine the relative importance of each channel in credit-equity dynamics, using double DiD specifications (i.e., double sorts). To facilitate our analysis, we focus on those characteristics that we found to be significant in the "univariate" DiD tests in Table 9.

Table 10 reports our findings. We denote D_T as a dummy variable, which is equal to 1 if the trading frictions characteristic is above the median, and 0 otherwise. Likewise, D_I is a dummy variable, which is equal to 1 if the information friction characteristic is above the median, and 0 otherwise. Again, we only report the estimates for the two DiD coefficients,

$D_T \times CL_i \times R_{i,t}$, and $D_I \times CL_i \times R_{i,t}$, and the interaction effect, $D_T \times D_I \times CL_i \times R_{i,t}$. Focusing on the sorts in the average level of firm-specific characteristics associated with trading and information frictions prior to the cross-listing in panel A (level tests), we find stronger support for stock and CDS analyst coverage, as well as the media attention measure. For all three measures, we document a significant coefficient for the simple DiD coefficient associated with the information friction characteristic, but no consistent significance for the DiD coefficient associated with trading frictions. For some specifications, investor attention and firm-level visibility provide explanatory power for the cross-sectional differences in credit-equity sensitivity, after conditioning on high and low equity volatility. The Google search volume intensity is insignificant in the specifications that combine it with the idiosyncratic volatility and liquidity measures. This may be justified as the Google search volume proxies for *retail* investor attention, while CDS are traded exclusively by *institutional* investors.

Turning to the sample sorts based on characteristic changes in panel B, the results tend to favor investor attention as a channel of credit-equity sensitivity, rather than improvements in trading frictions. Most notably, we find explanatory power from CDS analyst coverage, as the corresponding DiD coefficient is robust across estimations.

To summarize, we provide supportive evidence that information friction proxies, such as institutional attention and firm visibility, provide explanatory power for cross-sectional differences in the increase in CDS hedge ratios following cross-listing. These results remain robust after tests that take into account interactions in both information and trading frictions. While these findings are dominant for measures of institutional investor attention, they are less pronounced for measures of retail investor attention and advertising expenses. Similarly, we find that greater changes in stock trading volume provides explanatory power for the greater increase in CDS-stock price hedge ratios, as can the level of equity and idiosyncratic volatility. Equity and idiosyncratic volatility are also likely correlated with the creation of firm-specific information.

4.4 Evidence on frictions

Our interpretation is that cross-listings raise institutional investor and media attention, thereby promoting greater CSA activity. While the levels of CDS and equity trading costs appear to be impediments to CSA, cross-sectional differences in credit-equity dynamics are better explained by cross-sectional differences in information frictions. Thus, our evidence suggests that information frictions are important in explaining the relation between cross-listing and changes in credit-equity dynamics.[31]

Figure 4 examines the dynamics of our trading, information, and governance frictions around cross-listing. For both the cross-listed and matched control firms, we construct an index associated with trading frictions, information frictions, and corporate governance. Each index is constructed as the equally weighted average of the demeaned and standardized z-scores of each characteristic pertaining to a category. All variables are mapped into a monthly frequency by taking monthly averages of daily frequency variables and by assigning identical values to months within each quarter when variables are available at the quarterly frequency. We adjust the indices, so that higher values of each index reflect greater frictions, and then scale each index by subtracting the respective starting value (at month t = -15) from each monthly observation. The evidence in Figure 4 suggests a significant reduction in both trading (plot A) and information frictions (plot B) for listing firms around the cross-listing event. This pattern is not experienced by the matched control firms. On the other hand, the data provide little support for an improvement in the firm-specific corporate governance around cross-listing (plot C).

To provide formal support for the patterns observed in Figure 4, we report in Table 11 the results from the following panel regression:

$$X_{i,t} = a_0 + b_1 CL_i + b_2 D_i \times CL_i + \alpha_i + \delta_t + \varepsilon_{i,t}, \quad (6)$$

[31] Figure A.1 of the Internet Appendix illustrates how media attention spikes shortly after the cross-listing and then converges to a level that is permanently higher than the average level prior to the listing, consistent with the finding of a permanent increase in credit-equity sensitivity following the listing of shares abroad.

which is estimated over the months [-15, -3] and [+3, +15] around cross-listing events. The dependent variable $X_{i,t}$ is the trading frictions index, the information frictions index, or the governance index, computed at the firm level; as before, D_i is a dummy variable that equals 1 for a cross-listing firm and 0 for a matched firm. We include firm fixed effects, α_i, and (monthly) time fixed effects, δ_t. The standard errors are clustered by firm and time. The findings in Table 11 support the evidence presented in Figure 4. We document a significant reduction in both trading and information frictions around the cross-listing event, which is not experienced by the matched control firms. These results hold irrespective of the inclusion of fixed effects. The data provide, on the other hand, little support for an improvement in firm-specific corporate governance around cross-listing.

5. Conclusions

The dynamics between a firm's credit and equity returns change after foreign equity listings. We document this change for a global sample of equity cross-listings between 2001 and 2013. Guided by several predictions of the Merton (1974) model, we conduct three main tests that demonstrate how a firm's presence in global capital markets can influence the price informativeness and integration between a firm's credit and equity securities.

First, we find that after a firm's cross-listing, the CDS-stock return sensitivity (hedge ratio) increases substantially (60% to 300%, depending on the model specification). This impact is unique to cross-listed firms and cannot be replicated for a matched control sample of non-cross-listed firms. Second, we show that the exposure of a CDS contract to the world and domestic equity market increases after cross-listing, and that the increase in the world equity market beta dominates that of the domestic market. Similarly, a firm's equity returns become more exposed to global bond risks after cross-listing. Third, we compute a statistical measure of credit-equity integration and show that cross-listings increase the synchronicity between CDS and stock prices.

Our findings lend the greatest support to theories of rational inattention and investor recognition, which suggest that information frictions may impede the alignment between credit and equity returns. This view is supported by the cross-sectional differences in improvements of the credit-equity sensitivity that are positively associated with measures that correlate with investor attention and visibility in financial markets: media attention, analyst coverage in stock and CDS markets, Google search intensity, and market familiarity. We also find that trading frictions can partially explain the reduction in pricing discrepancies. Our interpretation is that cross-listing is associated with the production of firm-specific information. This raises the attention of institutional investors and generates more credit-equity arbitrage activity, which helps align the prices of credit and equity securities traded on the same firm.

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Table 1
Frequency distribution of cross-listings by host and home markets

Home \ Host	ARE	AUT	AUS	BEL	BRA	CAN	CHL	COL	DNK	FIN	FRA	DEU	HKG	IND	ITA	JPN	LUX	MEX	NLD	NOR	PPL	PRT	SGP	ESP	SWE	SWZ	GBR	USA	Total
Arab Emirates																											1		1
Australia																							1				1	3	5
Belgium															1		2											2	5
Brazil													1															5	6
Canada					1		1	1											1									14	18
Chile																											1	1	2
China																											1	1	2
Colombia																												1	1
Czech Republic																					1								1
Finland															1				1										2
France				1											11	2	1		1							1	1	6	24
Germany		1													9				1							1		3	15
Greece			1																								1	1	3
Hong Kong																												1	1
Hungary																					1								1
Iceland																									1				1
India	1																14										3	2	20
Indonesia																	1												1
Ireland																											1	4	5
Italy											3	1																1	5
Japan											1		1														2	7	11
Kazakhstan																	2												2
Korea																1	5										1	3	10
Liechtenstein																										1			1
Luxembourg											2													1			2	1	6
Mexico																												2	2
Netherlands											2	1			4		1											5	13
New Zealand			2																										2
Norway																												1	1
Portugal																			1										1
Qatar																											1		1
Russia												1															2		3
Singapore													1				1											1	3
Spain															1				1			1							3
Sweden									1	1										1								1	4
Switzerland											1																	3	4
Taiwan																	10											1	11
Ukraine																												1	1
United Kingdom											2		1	1			1		1						1	1		15	23
United States						5					3					1		1	4							3	3		20
Total	1	1	3	1	1	5	1	1	1	1	14	3	4	1	27	4	38	1	11	1	2	1	1	1	2	7	21	86	241

This table provides the 2001–2011 distribution of cross-listed firms with traded CDS contracts for home and host markets shown with ISO-3 country codes. Firms with cross-listings from the Sarkissian and Schill public database are matched with the IHS Markit CDS data to ensure the availability of CDS contracts.

Table 2
Chronology of CDS initiation relative to cross-listing events

	CDS initiation month relative to the cross-listing month			
Home market	Before 3 months	Within ± 3 months	After 3 months	Total
Arab Emirates			1	1
Australia	3	1	1	5
Belgium	3		5	8
Brazil	2		4	6
Canada	8	1	11	20
Chile			2	2
China			2	2
Colombia			1	1
Czech Republic	1			1
Finland	1		1	2
France	15	5	9	29
Germany	12	2	2	16
Greece	1		2	3
Hong Kong			1	1
Hungary			1	1
Iceland			2	2
India	5	1	14	20
Indonesia			1	1
Ireland	1	1	5	7
Italy	3	2	4	9
Japan	6	1	4	11
Kazakhstan	2			2
Korea	4		6	10
Liechtenstein			1	1
Luxembourg	2	2	3	7
Mexico	1		1	2
Netherlands	13		3	16
New Zealand		1	1	2
Norway		1	1	2
Portugal	1			1
Qatar	1			1
Russia	2		1	3
Singapore	2		2	4
Spain	2		1	3
Sweden	2		2	4
Switzerland	1	1	4	6
Taiwan	6	2	3	11
Ukraine	1			1
United Kingdom	12	3	15	30
United States	10	2	12	24
Total	123	26	129	278

This table reports statistics for the timing of the introduction of trading in the firms' CDS securities relative to the firms' cross-listing event. The sample period of cross-listing events runs from 2001 to 2011; the sample period of CDS events runs from 2001 to 2013.

Table 3
Summary statistics of firm characteristics by home market

A. Descriptive statistics of sample of daily CDS and equity returns

		CDS characteristic									
		Spread (%)		Coverage (#)		Return (%)		Equity return (%)			
Home market	Obs.	Mean	SD	Mean	SD	Mean	SD	Mean	SD	ρ	Stale
Overall sample (241 firms)	369,571	1.639	4.143	5.801	3.224	0.010	5.391	0.005	2.750	-0.14	0.17
Reduced sample (79 firms)	169,788	1.308	2.562	6.179	3.188	0.012	4.994	0.006	2.928	-0.15	0.17

B. Descriptive statistics of annual firm characteristics

	MkCap ($bln)		ROA		Leverage		P/B		Analysts (#)	
Home market	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Overall sample (241 firms)	28.73	19.14	0.039	0.070	0.243	0.151	2.620	6.451	20.8	11.3
Reduced sample (79 firms)	41.88	41.48	0.036	0.067	0.236	0.150	1.516	5.620	21.9	11.5

This table shows the mean and standard deviation of firm CDS spread levels, coverage, returns, and equity returns (panel A) and of five other characteristics (panel B) of firms with cross-listings and traded CDSs. The sample period is 2001–2013. The overall sample contains 241 firms with available stock and CDS returns. The reduced sample contains only firms with at least 1 year of stock and CDS returns before and after the cross-listing event, and there are 79 such firms. *CDS spread* is the firm's 5-year CDS spread. *CDS coverage* denotes the number of dealer quotes used in the computation of the 5-year mid-market spread. Both these variables come from IHS Markit. *Equity returns* (as a percentage) come from Datastream. ρ is the Pearson correlation coefficient between equity and *CDS returns* (as a percentage). Stale is the proportion of stale quotes (i.e., no change in spreads) among 5-year CDS contracts. Firms' financial accounting information comes from Compustat Global. *MkCap* is the market capitalization in billion U.S. dollars; *ROA* is the return on assets; *Leverage* is the long-term debt, divided by the sum of long-term debt and market value of equity; and *P/B* is the price-to-book ratio. *Analysts* is the number of analysts covering a firm from I/B/E/S database.

Table 4
Impact of cross-listing on CDS and stock return hedge ratios

Variable	(1)	(2)	(3)	(4)	(5)
$R^E_{i,t}$	-0.127***	-0.055***	-0.121***	-0.093***	-0.103***
	(4.13)	(2.87)	(4.12)	(3.33)	(3.26)
$CL_i \times R^E_{i,t}$	-0.205***	-0.155***	-0.209***	-0.224***	-0.210***
	(5.61)	(5.57)	(5.92)	(6.58)	(5.46)
$R^E_{i,t-1}$	-0.090***	-0.084***	-0.093***	-0.078***	-0.085***
	(4.61)	(4.39)	(4.71)	(3.69)	(3.54)
$CL_i \times R^E_{i,t-1}$	-0.039**	-0.040**	-0.042**	-0.067***	-0.063***
	(2.00)	(2.06)	(2.12)	(3.27)	(2.64)
CL_i	0.075***	0.068***	0.066**	0.098*	0.072
	(4.09)	(3.74)	(2.15)	(1.72)	(1.39)
$R^{CDS}_{i,t-1}$	-0.045***	-0.045***	-0.058***	-0.121***	-0.133***
	(4.41)	(4.38)	(5.99)	(10.01)	(10.11)
$Leverage_{i,t}$		-0.104	-0.192	-0.194	-0.426
		(0.88)	(1.31)	(0.78)	(1.53)
$EqVol_{i,t}$		0.049***	0.078***	0.096***	0.088***
		(5.67)	(8.10)	(6.56)	(5.65)
$ROA_{i,t}$		0.271*	0.256	0.453*	-0.194
		(1.71)	(1.26)	(1.95)	(0.51)
$P/B_{i,t}$		0.115	0.766	0.113	-0.913
		(0.74)	(0.90)	(1.00)	(1.55)
$R_{c,t}$		-0.261***	-0.260***	-0.244***	
		(10.09)	(10.24)	(10.35)	
$R_{w,t}$		-0.629***			
		(19.59)			
ΔVIX_t		-0.012***			
		(4.68)			
Time FEs			Yes	Yes	Yes
Host × Time FEs				Yes	
Home × Time FEs					Yes
Obs.	367,085	367,023	366,887	340,547	323,188
R^2	.036	.055	.087	.267	.279

This table shows the impact of cross-listings on the hedge ratio of a firm's CDS and stock returns. The sample period is 2001–2013, and the data are daily. The dependent variable is the CDS return, $R^{CDS}_{i,t}$. $R^E_{i,t}$ is the gross equity return of firm *i* at date *t*. CL_i is a dummy variable, which equals 1 after firm *i* cross-lists and 0 otherwise. $R_{w,t}$ is the MSCI world index return, $R_{c,t}$ contains the residuals from a regression of the home market MSCI country index returns on the world index returns. *Leverage* is the long-term debt, divided by the sum of long-term debt and market value of equity; *EqVol* is the equity volatility; *ROA* is the return on assets; *P/B* is the price-to-book ratio; and *VIX* is the CBOE volatility index. CDS returns come from IHS Markit. Firm and equity market returns come from Datastream. Firms' accounting information comes from Compustat Global. Each regression includes firm fixed effects and a constant, for which the estimated coefficient are not shown. Most regressions also contain daily time fixed effects. Home (Host) × Time FEs denotes the interaction of home (host) country and time fixed effects. The standard errors are clustered by firm and by date. The absolute *t*-statistics are in parentheses. The number of observations and the adjusted R^2 are also reported. $^*p < .1$; $^{**}p < .05$; $^{***}p < .01$.

Table 5
Impact of cross-listing on CDS and stock return hedge ratios for cross-listed and matched firms

	Matched	Cross-listed	DiD				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$R^{E}_{i,t}$	-0.124***	-0.127***	-0.123***	-0.066***	-0.111***	-0.090***	-0.069***
	(6.96)	(4.13)	(6.97)	(3.63)	(6.53)	(6.58)	(4.50)
$CL_i \times R^{E}_{i,t}$	-0.029	-0.205***	-0.029	-0.025	-0.029	-0.055	-0.087**
	(0.66)	(5.61)	(0.66)	(0.80)	(0.72)	(1.26)	(2.36)
$R^{E}_{i,t-1}$	-0.101***	-0.090***	-0.099***	-0.062***	-0.094***	-0.0795***	-0.063***
	(7.70)	(4.61)	(7.71)	(4.27)	(7.13)	(6.06)	(3.83)
$CL_i \times R^{E}_{i,t-1}$	-0.009	-0.039**	-0.079	-0.023	-0.012	-0.029	-0.059**
	(0.32)	(2.00)	(0.30)	(0.92)	(0.45)	(0.96)	(2.06)
CL_i	0.058***	0.075***	0.067***	0.069***	0.075***	0.069**	0.128***
	(3.33)	(4.09)	(5.68)	(5.90)	(3.84)	(1.99)	(2.73)
$R^{CDS}_{i,t-1}$	-0.078***	-0.045***	-0.058***	-0.058***	-0.067***	-0.146***	-0.145***
	(5.62)	(4.41)	(6.64)	(6.57)	(7.68)	(12.35)	(12.67)
$D_i \times R^{E}_{i,t}$			-0.040	0.006	-0.009	-0.011	-0.033
			(0.09)	(0.20)	(0.21)	(0.30)	(1.00)
$D_i \times R^{E}_{i,t-1}$			0.794	-0.025	0.021	-0.099	-0.021
			(0.28)	(0.88)	(0.01)	(0.36)	(0.73)
$D_i \times CL_i \times R^{E}_{i,t}$			-0.176***	-0.134***	-0.186***	-0.187***	-0.146***
			(2.77)	(2.94)	(3.10)	(3.04)	(2.74)
$D_i \times CL_i \times R^{E}_{i,t-1}$			-0.034	-0.020	-0.035	-0.042	-0.016
			(0.94)	(0.57)	(0.98)	(1.07)	(0.42)
Controls				Yes	Yes	Yes	Yes
Time FEs					Yes	Yes	Yes
Home × Time FEs						Yes	
Host × Time FEs							Yes
Obs.	286,986	367,085	654,070	654,070	653,983	551,209	566,015
R^2	.017	.036	.027	.045	.060	.265	.258

This table shows the impact of cross-listing on the sensitivity of a firm's CDS and stock returns for cross-listed firms and matched non-cross-listed firms. The sample period is 2001–2013. The matched sample is constructed using a Euclidean distance-based matching algorithm, as described in Table A.3 of the Internet Appendix. Matched firms use a pseudo-cross-listing date identical to the corresponding cross-listed firm. The dependent variable is the daily CDS return, $R^{CDS}_{i,t}$. $R^{E}_{i,t}$ is the gross equity return for firm *i* at date *t*. CL_i is a dummy variable, which equals 1 after firm *i* cross-lists and 0 otherwise. D_i is a dummy variable that equals 1 for a cross-listed firm and 0 for a matched firm. All control variables are the same as those used in Table 4, but their estimates are not reported. CDS returns come from IHS Markit. Firm and market equity returns come from Datastream and CRSP, respectively. Firms' financial accounting information comes from Compustat Global. DiD are the estimates of the differences-in-differences tests. Each regression includes firm fixed effects and a constant, for which the estimated coefficients are not shown. Some regressions also contain daily time fixed effects. Home (Host) × Time FEs is the interaction of home (host) country and daily time fixed effects. The standard errors are clustered by firm and time. The absolute *t*-statistics are in parentheses. The number of observations and the adjusted R^2 are also reported. *$p < .1$; **$p < .05$; ***$p < .01$.

Table 6
World market integration test results before and after cross-listing events

	IM-1		IM-2		IM-3		IM-4	
	Equity	Credit	Equity	Credit	Equity	Credit	Equity	Credit
β_w^{stock}	1.075	-0.579	1.078	-0.577	1.072	-0.558	0.965	-0.837
$\Delta\beta_w^{stock}$	0.007	-0.247**	-0.002	-0.262**	0.003	-0.262**	0.076	-0.331**
β_c^{stock}	0.835	-0.120	0.833	-0.141	0.836	-0.126	0.859	-0.202
$\Delta\beta_c^{stock}$	-0.037	-0.144	-0.034	-0.144*	-0.039	-0.142	-0.081	-0.240*
β_w^{bond}	0.489	0.129	0.480	0.189	0.489	0.236	0.519	0.388
$\Delta\beta_w^{bond}$	0.178**	0.464**	0.182**	0.333*	0.177**	0.353*	0.284**	0.391**
β_c^{bond}	-0.575	0.285	-0.590	0.397	-0.562	0.398	-0.736	0.394
$\Delta\beta_c^{bond}$	-0.249*	0.834**	-0.221	1.010***	-0.259*	1.059***	-0.125	1.013**
β_{RX}			-0.001	-0.022				
$\Delta\beta_{RX}$			0.029	0.063				
β_{FX}			-0.004	-0.079				
$\Delta\beta_{FX}$			0.007	-0.054				
β_{IM}					0.003	-0.056		
$\Delta\beta_{\text{IM}}$					0.008*	0.003		
$\beta_{\text{smb\_g}}$							-0.039	-0.969
$\Delta\beta_{\text{smb\_g}}$							0.105	-0.406
$\beta_{\text{smb\_l}}$							0.113	-0.148
$\Delta\beta_{\text{smb\_l}}$							-0.084	-0.092
$\beta_{\text{hml\_g}}$							0.195	-0.585
$\Delta\beta_{\text{hml\_g}}$							0.277	0.109
$\beta_{\text{hml\_l}}$							0.312	0.233
$\Delta\beta_{\text{hml\_l}}$							-0.016	-0.395

This table shows world market integration tests for equity and CDS returns around cross-listing using integration model IM-1 and its extensions. The sample period is 2001–2013. The dependent variable is the firm's stock or CDS return in excess of the 1-month Treasury bill. The CDS return data come from Markit. The stock and bond market data come from Datastream. All returns are denominated in U.S. dollars. β_w^{stock} (β_w^{bond}) is the world stock (bond) market beta, β_c^{stock} (β_c^{bond}) is country stock (bond) beta before cross-listing. $\Delta\beta$ shows the average difference between the betas before and after cross-listings and its level of significance. Integration models IM-2, IM-3, and IM-4 also report the betas of CDS and stock returns to currency factors (dollar risk, β_{RX}, and carry trade, β_{FX}), the intermediary capital factor, β_{IM}, and the Fama-French global and domestic HML and SMB factors, receptively. The estimation is for each firm 1 year before and 1 year after cross-listing, excluding the event day. Only firms with at least 1 year of stock and CDS returns before and after cross-listing are included in estimations, and there are 79 such firms. The two stock market factors are the excess returns on the world market equity index (*MSCI World*) and a firm's domestic equity index, orthogonal to the world market. The two bond factors are the Citigroup World Government Bond Index return in U.S. dollars and the Citigroup Government Bond Index return in each home market orthogonal to the first index. The currency factors come from Lustig, Roussanov, and Verdelhan (2011). The intermediary capital factor comes from He, Kelly, and Manela (2017). The Fama-French domestic *HML* (*SMB*) factor is the regional *HML* (*SMB*) factor orthogonal to the global *HML* (*SMB*) factor. *p < .1; **p < .05; ***p < .01.

Table 7
Kapadia and Pu (2012) pricing discrepancies before and after cross-listing

	Interval (τ)	Before cross-listing Mean	Before cross-listing SD	After cross-listing Mean	After cross-listing SD	Diff (after – before)	*t*-stat
A. Pricing discrepancy measure for the overall sample of firms							
$I\ (R^{CDS} \times R^{E} < 0)$	1	0.337	0.148	0.509	0.122	0.171***	7.88
	5	0.487	0.131	0.600	0.104	0.119***	5.97
	10	0.553	0.136	0.610	0.102	0.057***	2.98
	20	0.558	0.186	0.616	0.171	0.058**	2.03
$I\ (R^{CDS} \times R^{E} = 0)$	1	0.385	0.251	0.136	0.166	-0.249***	7.37
	5	0.132	0.170	0.045	0.105	-0.087***	2.62
	10	0.070	0.131	0.028	0.091	-0.041**	2.33
	20	0.075	0.114	0.048	0.175	-0.027	1.14
$I\ (R^{CDS} \times R^{E} > 0)$	1	0.276	0.111	0.355	0.067	0.079***	5.38
	5	0.378	0.084	0.354	0.068	-0.023*	1.91
	10	0.373	0.100	0.361	0.081	-0.012	0.85
	20	0.367	0.128	0.336	0.101	-0.031*	1.70
B. Kendall's tau measure for a reduced sample of cross-listed and matched firms							
Cross-listing sample	1	-0.055	0.131	-0.161	0.112	-0.106***	6.29
	5	-0.096	0.150	-0.225	0.166	-0.131***	6.78
	10	-0.152	0.215	-0.260	0.163	-0.108***	4.14
	20	-0.183	0.212	-0.297	0.171	-0.114***	4.21
Matched sample	1	-0.051	0.081	-0.100	0.082	-0.049***	3.76
	5	-0.073	0.123	-0.143	0.126	-0.070***	4.41
	10	-0.074	0.224	-0.159	0.149	-0.085***	3.19
	20	-0.112	0.238	-0.194	0.213	-0.081***	2.68
DiD test	1					-0.057***	3.06
	5					-0.061**	2.34
	10					-0.023	0.63
	20					-0.033	0.53

This table reports the price synchronicity results of Kapadia and Pu (2012) before and after cross-listing. The sample period is 2001–2013. Panel A shows the means and standard deviations of pricing discrepancies between stock prices and CDS spreads; panel B provides the same statistics for Kendall's tau for the cross-listed and matched firms, using only firms with at least 1 year of stock and CDS returns before and after cross-listing. There are 79 such firms. The pricing discrepancy measure depends on the concordance of CDS spread and stock returns: $I\ (R^{CDS} \times R^{E} > 0)$, $I\ (R^{CDS} \times R^{E} = 0)$, or $I\ (R^{CDS} \times R^{E} < 0)$. Here, I is an indicator function, R_i^{CDS} and R_i^{E} are the CDS spread and stock returns, computed using the logarithmic changes in stock prices, P_i^{E}, and CDS spreads, P_i^{CDS}, of firm i: $R_{i,k}^{E,\tau} = \ln(P_i^{E}(k+\tau)/P_i^{E}(k))$, $R_{i,k}^{CDS,\tau} = \ln(P_i^{CDS}(k+\tau)/P_i^{CDS}(k))$; $\tau = [1, 5, 10, 20]$ corresponds to the return horizon in days. The equity and CDS markets are aligned if $I\ (R^{CDS} \times R^{E} < 0)$; they are neither aligned nor misaligned if $I\ (R^{CDS} \times R^{E} = 0)$; and they are misaligned if $I\ (R^{CDS} \times R^{E} > 0)$. All pricing discrepancy measures are computed over nonoverlapping time intervals. Kendall's tau correlation is computed as $K_i = 4\kappa_i / (M(M-1)) - 1$, where κ_i is the integration measure:

$$\kappa_i = \sum_{k=1}^{M-\tau} I\left[R_{i,k}^{CDS,\tau} \times R_{i,k}^{E,\tau} > 0\right].$$

The last two columns indicate the pricing discrepancy difference before and after the cross-listing event, Diff (After – Before), and the corresponding absolute *t*-statistic. *$p < .1$; **$p < .05$; ***$p < .01$.

Table 8
Credit-equity integration before and after cross-listing for cross-listed and matched firms

	(1)	(2)	(3)	(4)	(5)	(6)
CL_i	0.026**	0.027**	0.026**	0.024*	0.024*	0.026**
	(2.04)	(2.15)	(2.05)	(1.91)	(1.91)	(2.05)
$D_i \times CL_i$	-0.049***	-0.051***	-0.049***	-0.043**	-0.047***	-0.048***
	(2.84)	(3.00)	(2.87)	(2.53)	(2.76)	(2.85)
Leverage	-0.023	-0.018	-0.024	-0.018	-0.019	-0.021
	(0.63)	(0.50)	(0.66)	(0.50)	(0.52)	(0.57)
EqVol	0.011	0.015	0.011	0.067	0.053	-1.280
	(0.15)	(0.20)	(0.15)	(0.92)	(0.07)	(1.48)
MkCap	0.060	0.069	0.059	0.010	0.065	0.069
	(0.91)	(1.09)	(0.90)	(0.14)	(0.93)	(1.06)
ZeroSpread	-0.013					
	(0.09)					
Depth		-0.070***				
		(5.41)				
ZeroRet			-0.028			
			(0.66)			
Illiquidity				0.011***		
				(3.67)		
TrVolume					0.034	
					(1.27)	
IVol						1.385
						(1.60)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8,850	8,850	8,850	8,712	8,712	8,850
R^2	.431	.435	.431	.440	.437	.434

This table reports the results of the panel regression:

$$\bar{K}_{i,t} = a_0 + b_1 CL_i + b_2 D_i \times CL_i + c_1{}' X_{i,t} + \alpha_i + \delta_t + \varepsilon_{i,t},$$

for the reduced sample where the dependent variable is the transformed Kendall correlation, defined as $0.5 ln[(1 + K)/(1 - K)]$. CL_i is a dummy variable, which equals 1 after firm *i* cross-lists and 0 otherwise. D_i is a dummy variable that equals 1 for a cross-listed firm and 0 for a matched firm. Firm controls include nine firm-specific characteristics. *ZeroSpread* is the proportion of trading days with stale returns in the 5-year CDS spread. *ZeroRet* is the proportion of trading days with zero stock returns. *TrVolume* is the natural logarithm of the number of traded shares. *IVol* is the idiosyncratic volatility of the residuals from regressing firm-specific stock returns on the MSCI world index return and MSCI country index returns. *Leverage*, *EqVol*, *MkCap*, *Depth*, and *Illiquidity* are defined in the captions of Tables 3 and 4. The sample period is 2001–2013. All variables are measured at the quarterly frequency. Firm α_i and quarterly time fixed effects δ_t are included in all specifications. Each regression specification includes a constant, for which the estimate is not reported in the results. The standard errors are clustered by firm and by time. The absolute *t*-statistics are reported in parentheses. The number of observations and the adjusted R^2 are also reported. *$p < .1$; **$p < .05$; ***$p < .01$.

Table 9
Impact of cross-listing on CDS and stock returns hedge ratios by firm and country characteristics

		High-low (level)		High-low (change)	
		Coefficient	*t*-stat	Coefficient	*t*-stat
A. Firm characteristics					
A.1 Trading frictions	*EqVol*	0.248***	(4.65)	-0.022	(0.34)
	Leverage	-0.070	(1.17)	-0.076	(1.09)
	IVol	0.180***	(2.75)	-0.010	(0.16)
	Illiquidity	-0.119*	(1.94)	-0.104*	(1.70)
	TrVolume	-0.093	(1.46)	-0.159**	(2.53)
A.2 Information frictions (attention/visibility)	*Analyst coverage*	-0.242***	(3.85)	-0.189***	(3.19)
	CDS coverage	-0.294***	(4.88)	-0.197***	(3.24)
	Advertising	-0.115	(1.62)	0.029	(0.31)
	Media	-0.354***	(5.52)	0.042	(0.65)
	Search	-0.190**	(2.25)	-0.025	(0.33)
A.3 Governance	*Tangibility*	-0.022	(0.37)	-0.039	(0.61)
	Collateral	0.077	(0.01)	-0.033	(0.49)
B. Country characteristics					
B.1 Familiarity	*Geographic proximity*	-0.243***	(4.13)		
	Cross-country correlation	-0.242***	(3.08)		
B.2 Governance	*Rule of law*	-0.098	(1.39)		
	Disclosure requirement	0.010	(0.31)		

This table shows the impact of cross-listing on the sensitivity of a firm's CDS and stock returns for subsamples classified according to firm- and country-specific characteristics. We split all firms into "High" and "Low" subsamples, based on the median value of the characteristic 1 year before the cross-listing event. Alternatively, we split firms into "High" and "Low" subsamples, based on the median change of the characteristic from 1 year before to 1 year after the cross-listing event. For each subsample, we run the same regressions used in Table 5 (specification 5). The dependent variable is the daily CDS return, $R_{i,t}^{CDS}$. All regressions contain firm fixed effects, a constant, and daily time fixed effects. The standard errors are clustered by firm and by time. The sample period is 2001–2013. The results come from the differences-in-differences (DiD) test between the two subsamples for the impact of cross-listing on the relation between contemporaneous stock returns and CDS returns ($CL_i \times R_{i,t}^{E}$). CDS returns come from IHS Markit. Firm and equity market returns come from Datastream. Firms' financial accounting information comes from Compustat Global. *EqVol* is the quarterly equity volatility. *Leverage* is the leverage ratio. *IVol* is the idiosyncratic volatility of the residuals from regressing firm-specific stock returns on the MSCI world and country index returns. *Illiquidity* is the Amihud (2002) illiquidity measure based on the price impact. *TrVolume* is the log of the dollar value of traded shares. *Analyst coverage* is the number of analysts covering a firm after cross-listing minus that before cross-listing, and their numbers come from I/B/E/S database. *CDS coverage* is the number of dealers providing quotes for the computation of midmarket CDS spreads. *Advertising* represents the cost of advertising media and promotional expenses. *Media* is the Dow Jones Average Event Volume from RavenPack. *Search* is the Google search volume index. *Tangibility* and *Collateral* are borrower characteristics, which come from Roberts (2015). *Geographic proximity* is the great circle distance between the capital cities of the home and host markets for cross-listings. *Cross-country correlation* is the average correlation of returns on market indices between home and host markets of cross-listed firms over the sample period. *$p < .1$; **$p < .05$; ***$p < .01$.

Table 10
Comparison between trading cost and information cost characteristics

A. High-low (level)

		EqVol	*IVol*	*Amihud*
Analyst coverage	$D_T \times CL_i \times R^E_{i,t}$	0.188**	-0.035	0.014
	$D_I \times CL_i \times R^E_{i,t}$	-0.169**	-0.352***	-0.270***
	$D_T \times D_I \times CL_i \times R^E_{i,t}$	0.164*	0.332**	0.030
CDS coverage	$D_T \times CL_i \times R^E_{i,t}$	0.050	0.024	-0.076
	$D_I \times CL_i \times R^E_{i,t}$	-0.226***	-0.163*	-0.269***
	$D_T \times D_I \times CL_i \times R^E_{i,t}$	0.380***	0.093	0.211*
Media	$D_T \times CL_i \times R^E_{i,t}$	0.171**	-0.156	0.247***
	$D_I \times CL_i \times R^E_{i,t}$	-0.199***	-0.456***	-0.194**
	$D_T \times D_I \times CL_i \times R^E_{i,t}$	0.111	0.394***	0.257**
Search	$D_T \times CL_i \times R^E_{i,t}$	0.142	0.047	0.148
	$D_I \times CL_i \times R^E_{i,t}$	0.275***	0.128	0.135
	$D_T \times D_I \times CL_i \times R^E_{i,t}$	-0.118	0.107	-0.187

B. High-low (change)

		Amihud	*Trading volume*
Analyst coverage	$D_T \times CL_i \times R^E_{i,t}$	0.035	-0.134
	$D_I \times CL_i \times R^E_{i,t}$	-0.106	-0.140
	$D_T \times D_I \times CL_i \times R^E_{i,t}$	-0.223*	-0.048
CDS coverage	$D_T \times CL_i \times R^E_{i,t}$	-0.063	0.058
	$D_I \times CL_i \times R^E_{i,t}$	-0.251***	-0.188**
	$D_T \times D_I \times CL_i \times R^E_{i,t}$	0.259**	0.035

This table shows the impact of cross-listing on the sensitivity of a firm's CDS and stock returns. We split all firms into "High" and "Low" subsamples, based on the median value of the characteristic 1 year before the cross-listing event (panel A). Alternatively, we split firms into "High" and "Low" subsamples, based on the median change of the characteristic from 1 year before to 1 year after the cross-listing event (panel B). The daily CDS return, $R^{CDS}_{i,t}$, is regressed on daily stock returns: $R^E_{i,t}$, $R^E_{i,t-1}$, and their interactions with the cross-listing dummy, CL_i, as before. In addition, we also triple interact $R^E_{i,t}$ and $R^E_{i,t-1}$ with both CL_i and a dummy variable standing for limits to arbitrage or visibility characteristic of a firm. D_T equals to 1 if the trading frictions characteristic is above the median and 0 otherwise. D_I equals to 1 if the information frictions characteristic is above the median and 0 otherwise. All regressions also contain control variables (used in Table 4, specification 3), firm fixed effects, a constant, and daily time fixed effects. The standard errors are clustered by firm and by time. The sample period is 2001–2013. Table 9 defines all firm characteristic variables. *$p < .1$; **$p < .05$; ***$p < .01$.

Table 11
Frictions and governance indices before and after cross-listing for cross-listed and matched firms

	Trading frictions index			Information frictions index			Governance index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CL_i	-0.004	-0.004	0.224	-0.085	-0.097*	0.136**	-0.014	-0.017	-0.060**
	(0.29)	(0.32)	(1.67)	(1.30)	(1.88)	(1.99)	(0.32)	(0.54)	(2.15)
$D_i \times CL_i$	-0.202***	-0.198***	-0.215***	-0.189***	-0.178***	-0.211***	0.005	0.003	-0.011
	(5.39)	(5.08)	(6.05)	(2.82)	(2.95)	(3.96)	(0.19)	(0.09)	(0.29)
Firm FEs	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Time FEs	No	No	Yes	No	No	Yes	No	No	Yes
Obs.	3,636	3,636	3,634	3,636	3,636	3,634	3,595	3,595	3,590
R^2	.057	.645	.696	.045	.804	.867	.001	.977	.979

This table reports the results of the panel regression:

$$X_{i,t} = a_0 + b_1 CL_i + b_2 D_i \times CL_i + \alpha_i + \delta_t + \varepsilon_{i,t},$$

where $X_{i,t}$ is the trading frictions index, the information frictions index, or the governance index. CL_i is a dummy variable, which equals 1 after firm i cross-lists and 0 otherwise. D_i is a dummy variable that equals 1 for a cross-listed firm and 0 for a matched firm. The sample period is 2001–2013. The estimation window covers [-15, -3] and [+3, +15] months around (pseudo-)cross-listing events. All variables are measured at the monthly frequency. Firm α_i and (monthly) time fixed effects δ_t are included in some specifications. Specifications (1), (4), and (7) also include D_i. Each regression specification includes a constant, for which the estimate is not reported in the results. The standard errors are clustered by firm and by time. The absolute t-statistics are reported in parentheses. The number of observations and the adjusted R^2 are also reported. *$p < .1$; **$p < .05$; ***$p < .01$.

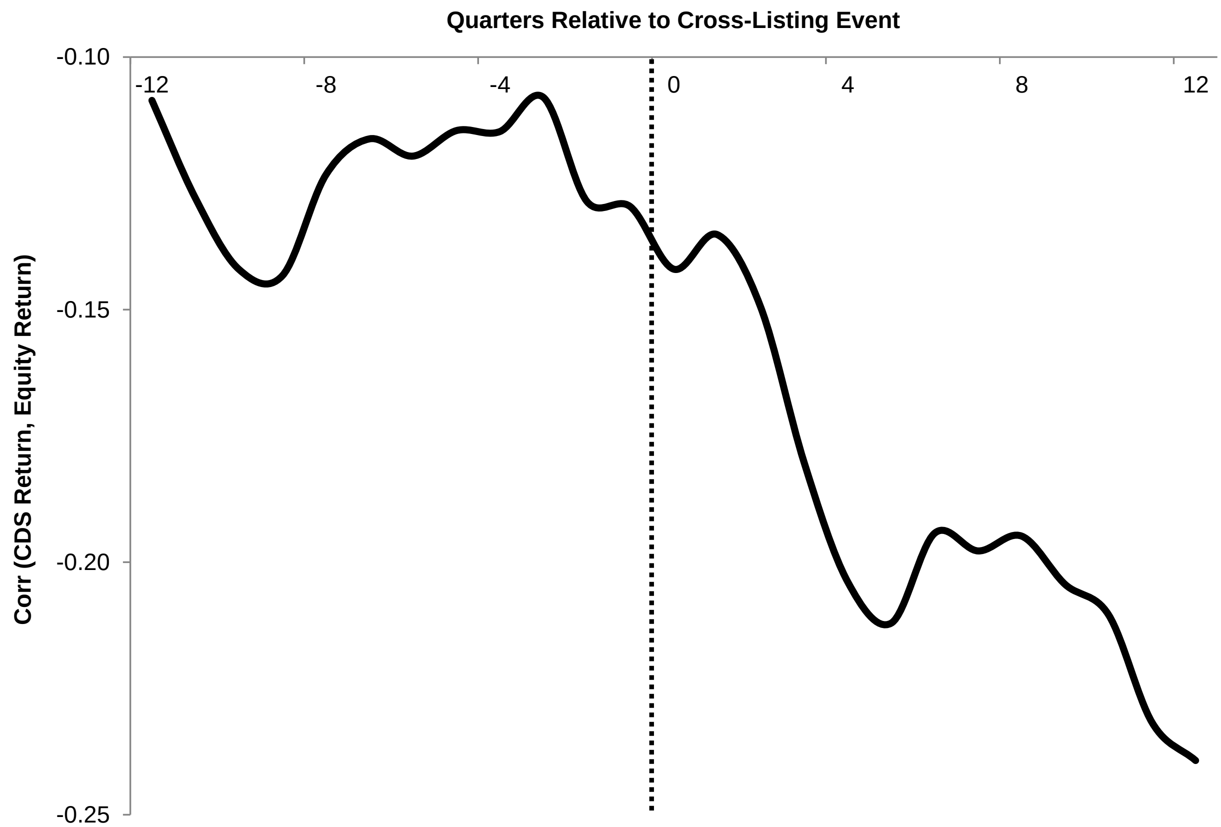


Figure 1
Correlation between CDS and stock returns around cross-listing
This figure shows the average quarterly Pearson correlation coefficient between daily CDS and stock returns around the cross-listing event. Each point on the plot represents the average correlation over three adjacent quarters (*t*-1, *t*, and *t*+1). The sample period is 2001–2013, and it includes 241 cross-listing events related to 278 CDS-stock pairs. CDS returns come from IHS Markit, and stock returns come from Datastream.

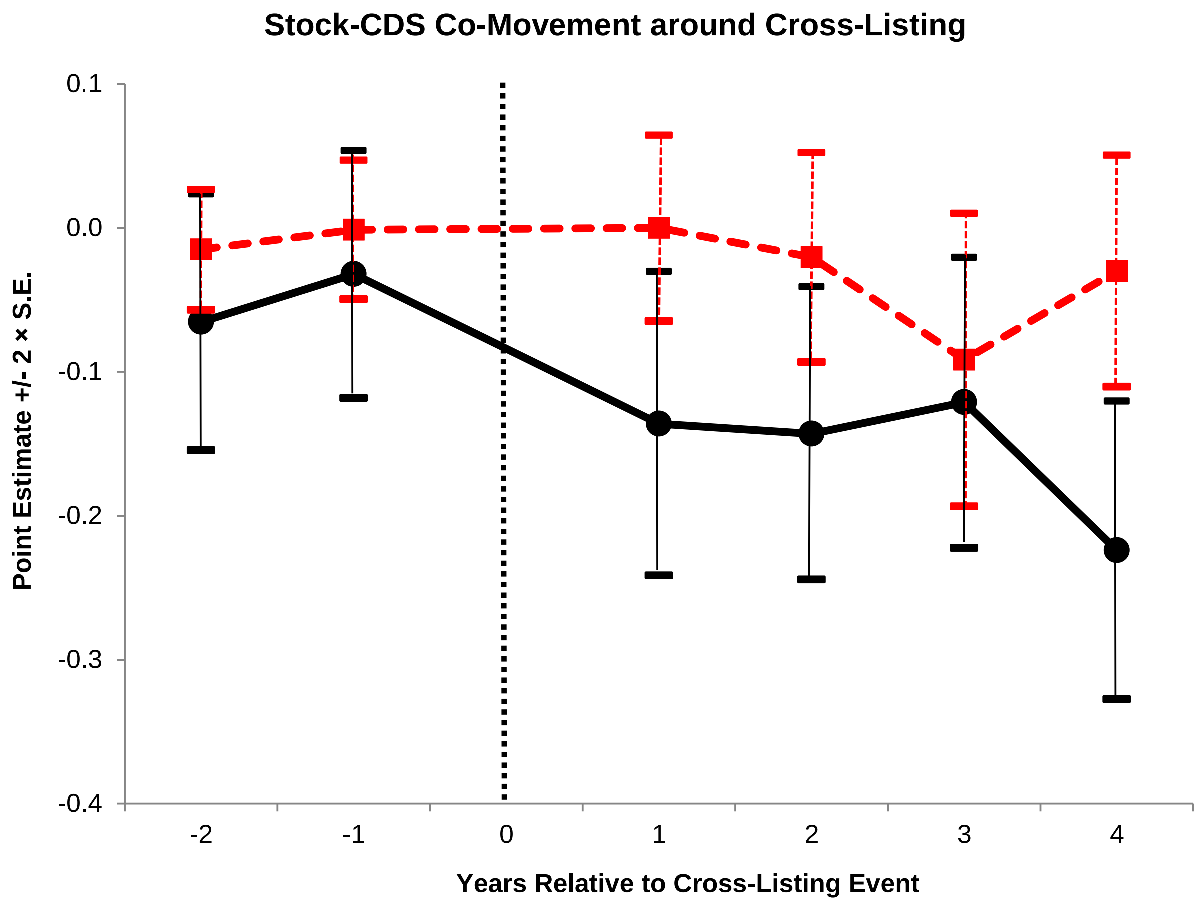


Figure 2

Hedge ratios of CDS and stock returns for the treated and matched samples around cross-listing

This figure depicts the estimated coefficient on the interaction term between the stock return and an indicator variable that defines the number of years around the cross-listing event. The solid curve is based on the cross-listing sample; the dashed curve is based on the matched control sample. The years before the cross-listing thus characterize anticipatory effects of the change in CDS-stock comovement in reaction to the future cross-listing, while the years after the cross-listing characterize the change in CDS-stock comovement that is a result of the cross-listing. The sample period is 2001–2013, and it includes 241 cross-listing events related to 278 CDS-stock pairs. CDS returns come from Markit, and firm returns come from Datastream.

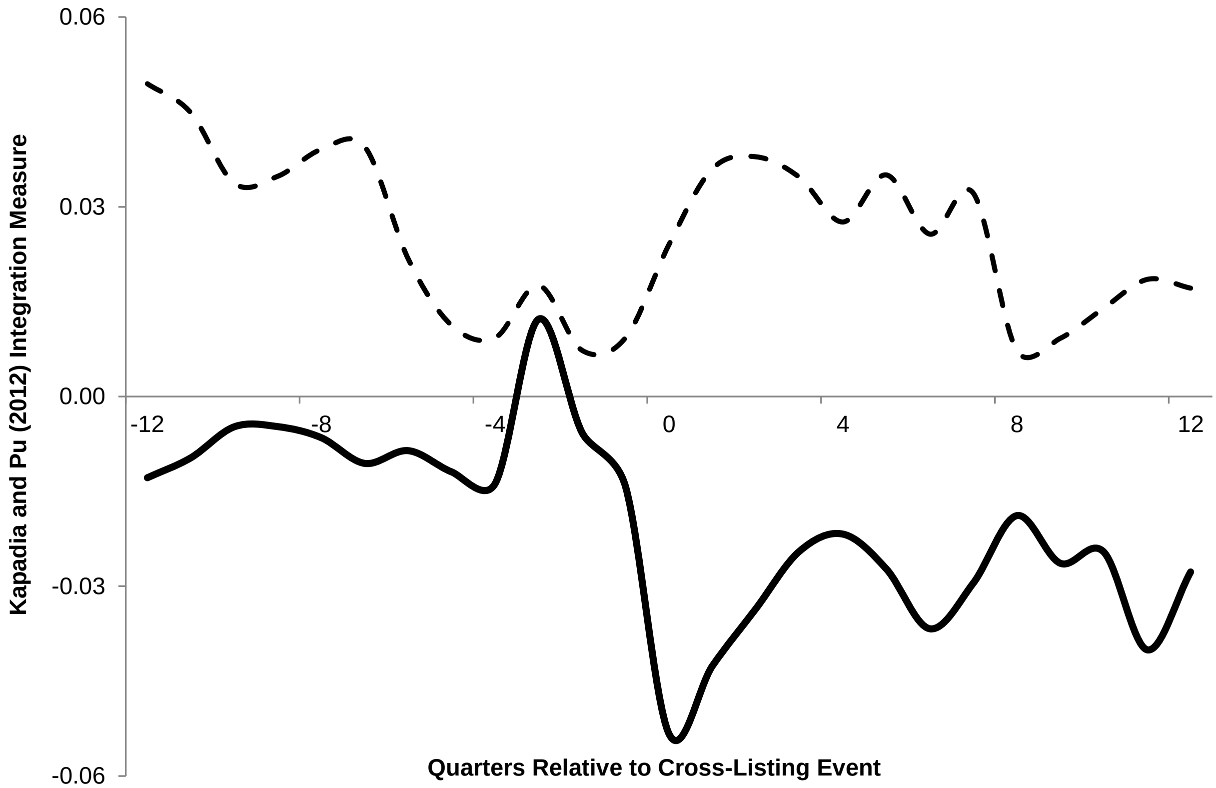
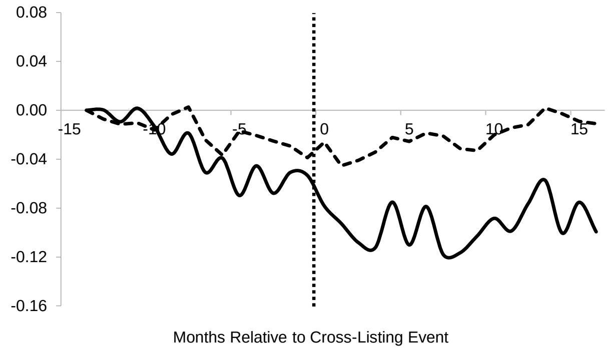


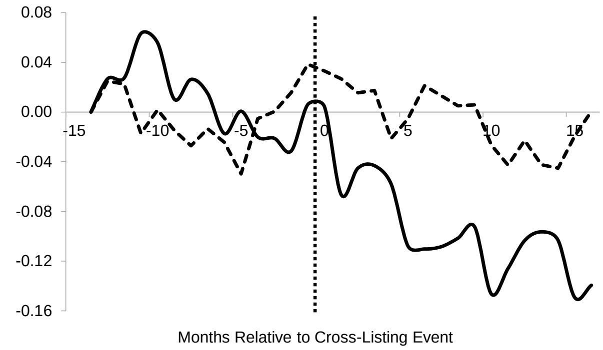
Figure 3

Dynamics of statistical integration measures for the treated and matched samples around cross-listing

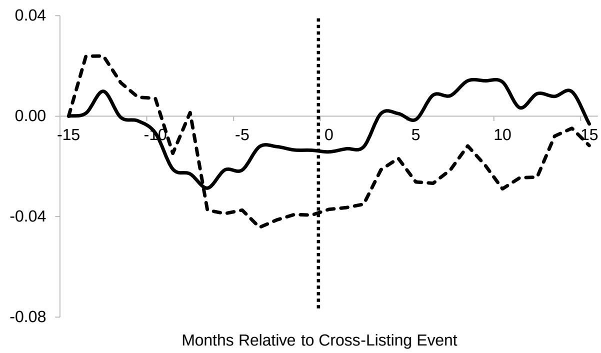
This figure depicts the Kapadia and Pu (2012) integration measure between daily CDS and stock returns for the cross-listing and matched samples of firms around the cross-listing event. The solid curve is based on the cross-listing sample; the dashed curve is based on the matched control sample. Each point on the plot represents the average integration measure over three adjacent quarters (*t*-1, *t*, and *t*+1), after the time series has been detrended. The sample period is 2001–2013, and it includes 241 cross-listing events related to 278 CDS-stock pairs. CDS returns come from Markit, and stock returns come from Datastream.



Plot A. Trading frictions index



Plot B. Information frictions index



Plot C. Governance index

Figure 4

Dynamics of trading frictions, information frictions, and governance

This figure illustrates the dynamics of indices pertaining to trading frictions (plot A), information frictions (plot B), and governance frictions (plot C), around cross-listing events. We construct each index as the equally weighted average of the demeaned and standardized z-scores of each characteristic pertaining to a category, after adjusting each category such that a greater value reflects greater frictions. All variables are mapped into a monthly frequency by taking monthly averages of daily frequency variables and by assigning identical values to months within each quarter when variables are available at the quarterly frequency. We scale the index for each group by subtracting the starting value at month t = -15 from each observation. In each plot, we depict the indices for the cross-listing firms (solid line) and the matched control firms (dashed line) from 15 months before to 15 months after the cross-listing event. The trading frictions index is computed based on a firm's monthly equity volatility; the leverage ratio; idiosyncratic volatility, computed based on the residuals from regressing firm-specific stock returns on the MSCI world and country index returns; the Amihud illiquidity measure based on price impact; and trading volume measured as the natural logarithm of the dollar value of traded shares. The information frictions index is computed based on stock analyst coverage, measured by the number of equity analysts covering a firm after cross-listing; CDS coverage, computed as the number of dealers providing quotes for the computation of mid-market CDS spreads; media attention measured as the Dow Jones Average Event Volume from RavenPack; search intensity based on the Google search volume index. The governance index is computed using the tangibility and collateral values as defined in Roberts (2015).