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ABSTRACT

Using a novel panel data set for international corporate bonds and capital account restrictions in advanced and emerging economies, we find that restrictions on capital inflows produce a substantial and economically meaningful increase in corporate bond spreads. By contrast, we find no robust significant effect of restrictions on outflows. The effect of capital account restrictions on inflows is particularly strong for bonds maturing in the short-term, issued by small firms and in countries with underdeveloped financial markets. Additionally, the paper shows that capital account restrictions on inflows have a greater effect during periods of financial distress than during periods of financial stability. These results are suggestive of a causal interpretation of the estimated effects and establish a novel channel through which capital controls affect economic outcomes.

JEL CODE: F3, F4, G1, G3

KEY WORDS: Credit spreads; Capital account restrictions; Financial instability; Financial openness

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1. Introduction

Over the past four decades, the global economy has become ever more financially integrated, engendering not only a range of potential benefits, such as a more efficient allocation of capital and better risk diversification, but also greater vulnerability to shocks, as adverse shocks can more easily travel from one economy to another. Reflecting concerns about the risks of financial globalization, the belief that countries that routinely block capital flows, such as China and India, were insulated from financial turmoil during 2007-09 has spurred renewed interest in understanding the effects of capital controls (Ostry et al., 2010). In a re-assessment of the advantages and disadvantages of capital controls, researchers at the International Monetary Fund (IMF) now consider capital controls to be a useful part of the toolkit when countries have few other options (Blanchard and Ostry, 2012), while others have gone further in suggesting that capital controls could become a regular policy tool (Jeanne, Subramanian and Williamson, 2012). The change in sentiment is also reflected in the increased use of capital controls in recent years, indicating the possibility of a reversal of the previous trend toward freer capital markets.

Despite the potential benefits of capital controls from a prudential macroeconomic perspective, any such benefits should be weighed against the cost of constraining the financial opportunities of firms. Extant empirical research on capital account restrictions mainly focuses on the impact of stock market liberalizations and on their effect on the firms' cost of equity capital (see, e.g., Bae, Bailey, Mao, 2006; Henry, 2000a, 2000b, 2003; Mitton, 2006; Gupta and Yuan, 2009; Alfaro et al., 2014). However, recent studies show that debt issues in public markets are a more important source of capital than equity issues for firms and that debt markets are more internationalized than equity markets (Gozzi et al., 2010). Nevertheless, very little is known about the effects of capital controls on the cost of debt capital. Therefore,

improving our understanding of this link, as well as whether the effects of capital controls on the cost of debt capital are symmetric for restrictions on inflows and outflows, is an important area in which more research is needed.

In addition, the impact of capital account restrictions on firms' ability to finance their operations by issuing debt is likely shaped by a number of factors, including the time to maturity, the size of firms, the development and depth of domestic financial markets, and the broader economic environment. Thus, a number of important questions arise: Are bonds maturing in the short run more affected by capital controls? Do larger firms tend to have a greater capacity than small firms for mitigating the impact of regulatory restrictions? Are capital controls less binding in more developed financial markets in which domestic firms are less dependent on foreign lending than in less developed financial markets? Is the impact of controls magnified during times of financial distress?

This paper addresses all of these issues by using a new data set for corporate bonds placed in international markets by advanced and emerging market borrowers. The key finding is that restrictions on capital inflows produce a substantial and economically meaningful increase in corporate bond spreads. By contrast, there is no robust significant effect of outflow restrictions. The effect of capital account restrictions on inflows is particularly strong for bonds maturing in the short-term, issued by small firms, and issued in countries with underdeveloped financial markets. Additionally, the paper demonstrates that capital account restrictions on inflows have a greater effect during periods of financial distress than during periods of financial stability.

These findings are consistent with a causal interpretation in which restrictions on capital inflows worsen the conditions for firms' access to capital in international markets, rendering them more vulnerable to shocks, particularly when financial markets are under distress. They

are also consistent with the finding that capital controls have been asymmetric in recent decades, as they have been designed to discourage capital inflows (Reinhart and Smith, 2002). The main results of this paper are statistically significant even after we control for the standard determinants of corporate bond spreads, for the potential effects of other structural reforms, and for capital restrictions on outflows. Moreover, these results are robust to the inclusion of firm and time fixed effects.

The remainder of the paper is organized as follows. Section 2 provides a brief overview of the related literature. Section 3 describes the data and summary statistics. Section 4 presents our econometric framework and our main results. Section 5 explores some specific channels through which capital account restrictions affect corporate bond spreads. Section 6 presents a set of robustness checks. Section 7 concludes.

2. Related literature

Although a large body of research exists on the effects of capital account restrictions, whether it is optimal for countries to liberalize their capital accounts remains an open empirical question. While theory predicts that financial openness provides a number of benefits, empirical results are not conclusive. A number of studies suggest that reducing capital account restrictions leads to higher growth, productivity, investment, and equity prices (Bekaert et al., 2005, 2011; Gupta and Yuan, 2009; Henry, 2000a, 2000b; Quinn and Toyoda, 2008); lower consumption growth volatility (Bekaert et al, 2006); increased domestic financial access (Fischer and Valenzuela, 2013); reduced financial constraints (Love, 2003; Laeven, 2003; Harrison, Love and McMillan, 2004; Forbes, 2007); and better quality corporate credit ratings (Prati, Schindler and Valenzuela, 2012). Other studies, by contrast, argue that capital account restrictions may render economies less vulnerable to crises owing to their potential effect on

firms' capital debt structure (De Gregorio et al., 2000; Gallego and Hernandez, 2003) and reduce aggregate wage inequality (Larrain, 2014).

As emphasized by Prati, Schindler, and Valenzuela (2012), three factors are likely to largely account for the lack of conclusive empirical results on capital account restrictions: the use of aggregated data, the potential presence of endogeneity bias, and the lack of sufficiently refined measures of financial openness. Aggregate data may hide important heterogeneities to the extent that different subsets of an economy are affected, making it difficult to detect significant average effects. In addition, most widely used capital control indicators are crude measures that ignore variations in the degree of capital account restrictiveness, further curtailing the possibility of elucidating the potential costs and benefits of financial openness. Finally, the current and future performance of a country may influence the decision of policy makers to financially integrate with the rest of the world. Therefore, estimations that do not control for potential endogeneity may produce biased results.

This paper addresses the shortcomings of the literature in at least three ways. First, the broad, bond-level panel data set that is used in this paper allows us to explore a variety of heterogeneities that are suggestive of a causal interpretation of the estimated effects. We explore four primary dimensions through which capital controls could have a differentiated effect on corporate credit spreads: time to maturity, firm size, domestic financial development, and global financial distress. If the relationship between capital controls and corporate credit risk reflects merely a simple correlation caused by common variables such as macroeconomic or global factors rather than a causal effect, heterogeneous effects would not be found. However, we find that all these effects are significant and economically relevant.

The strategy of exploiting potential heterogeneous effects is also used in recent research that examines the effects of stock market liberalization but that lacks suitable instruments to

address endogeneity directly. For instance, Mitton (2006) reports that the effect of stock market liberalization on firm performance is significantly stronger among firms that pay out lower dividends. Forbes (2007) shows that smaller firms experienced more significant financial constraints than larger firms during the 1991-1998 Chilean *encaje*. Alfaro, Chari, and Kanczuk (2014) find that the stock returns of large firms and the largest exporting firms were less affected by the imposition of capital controls in Brazil during 2008-2009.

Second, the use of microeconomic data also allows us to attenuate potential endogeneity problems. Given that capital account liberalizations during times of financial market distress may generate complaints about selling off the country at fire sale prices, policymakers tend to be more inclined to eliminate capital controls during times of financial stability (Summers, 1994). Therefore, results from studies that utilize country-level measures of firm performance, such as stock price indexes (see, e.g., Henry, 2000b), are more likely to be driven by reverse causality bias than studies that use micro-level data. In addition, using bond-level data allows us to attenuate problems associated with omitted variables in three ways: a) with firm fixed effects that control for endogeneity arising from time-invariant firm characteristics, b) with time fixed effects that control for endogeneity arising from variation in global factors, such as the world business cycle or the fad effect of capital account liberalizations, and c) with bond- and firm-level variables that control for bond and firm characteristics that change over time.

Third, this paper uses detailed measures of capital account restrictions that capture more subtle differences in capital control regimes across countries and time. Moreover, our data on capital controls can be disaggregated in novel ways (e.g., by direction of flows or type of transactions), allowing for additional and innovative tests of our hypotheses. Such innovative tests are important, as identifying a significant link between capital controls and economic outcomes is complicated by the fact that some of the most widely used capital controls

indicators are crude, binary indicators that ignore variations in the degree of capital account restrictiveness.

A number of studies indirectly assess the impact of removing capital controls on the cost of capital by measuring how capital controls affect firm financing constraints and stock prices (Love, 2003; Laeven, 2003; Harrison, Love and McMillan, 2004; Forbes, 2007; Alfaro, Chari, and Kanczuk, 2014). Nonetheless, to our knowledge, this is the first empirical paper to directly study how capital account restrictions affect the cost of debt financing, as measured by corporate bond spreads, and whether this effect is asymmetric across different types of capital account restrictions.

3. Data

For the purpose of this paper, we merge two novel data sets. The first data set contains information on corporate bonds placed in international markets by developed and emerging market borrowers. The second data set contains information on capital account restrictions. The merged data covers the sample period from 2005:Q1 to 2009:Q2.

The data set for international corporate bonds builds on the one used in Valenzuela (2013). It considers all fixed-rate bonds denominated in U.S. dollars available in Bloomberg as of June 2009, with the exception of bonds issued by firms located in the U.S. or England.[1] The majority of bonds that are included in our sample correspond to Yankee bonds, Euro-Dollar bonds, and Global bonds.

[1] These two countries have fully liberalized capital accounts throughout the sample period. Thus, their exclusion matters little for our study, which focuses on the effects of changes in capital account regulations on corporate bond spreads.

We construct our data set for capital account restrictions by using the methodology introduced by Schindler (2009), which is based on information provided in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER).

To reduce the potential for errors in the coding of the data, we clean the data set in four ways. First, we eliminate the top and bottom 0.5% of the spreads from our analysis. Second, we drop all observations in the accounting variables that exceed the sample mean by more than five standard deviations. Third, we do not consider bonds issued in countries where the total number of observations is fewer than 30. Fourth, we restrict the sample to bonds that are issued by firms with a Standard and Poor (S&P) credit rating between AAA and B-. After cleaning the data, we obtain a final sample including all of our control variables that contains 3,740 bond-quarter observations.

Note that the sample that is used in this paper contains only firms that issue international bonds denominated in U.S. dollars. Given that only certain types of firms choose, and are able to access offshore financing, the results in this paper cannot be extrapolated to the entire universe of firms. However, research on international debt financing denominated in U.S. dollars is important. Gozzi et al. (2010) indicate that debt issues in public markets are a more important source of capital for firms than equity issues and that debt markets are more internationalized than equity markets. In emerging market economies, approximately 28% of the total amount raised through equity issues is raised abroad, while debt issues abroad represent 47% of the total amount raised through debt issues. In developed economies, equity and debt issues abroad represent 8% and 35%, respectively, of the total amount raised. Moreover, international debt issues tend to be denominated in foreign currencies, particularly U.S. dollars (Hausmann and Panizza, 2011; Gozzi et al., 2012). As demonstrated in Valenzuela (2013), the data on corporate bond spreads that are used in the paper are representative of the

universe of bonds denominated in U.S. dollars. Therefore, the presented results are unlikely to be driven by sample selection bias.[2]

3.1. Corporate bond spreads

The dependent variable is the corporate *option-adjusted spread* (OAS) from Bloomberg Professional. The OAS measures the yield on a corporate bond in excess of a comparable U.S. Treasury security, after accounting for the value of any embedded option (Fabozzi, 2006).[3] The use of the OAS in this study is important, as many corporate bonds contain embedded options. Indeed, approximately 60% of the bonds in our sample contain contingent cash flows owing to call, put or sink features. Notably, the OAS methodology does not affect the main results in this paper, as they are robust to the use of a subsample of bonds without embedded options. The OAS of a bond without any embedded option (i.e., a non-callable bond) is computed as the constant spread that must be added to the spot interest rate to make the price of the risk-free bond identical to the observed market price of the corporate bond.

3.2. Capital account restrictions

In line with Schindler (2009), this paper uses two measures of capital account restrictions that allow us to identify the channels through which capital account restrictions affect corporate bond spreads. The first measure captures capital account restrictions on inflows (KA_IN). This measure is the simple average of eight dummy variables that capture

[2] Valenzuela (2013) compares the average OASs from his data with OAS indexes reported by Bank of America (BofA) Merrill Lynch for identical credit rating categories. Although some discrepancies exist between the series, the indexes constructed from the data set used in this paper adequately mimic the behavior of the BofA Merrill Lynch OAS indexes.

[3] For details on the OAS computation see Cavallo and Valenzuela (2010). Other studies using OASs include, for example, Becchetti et al. (2010), Huang and Kong (2003), and Pedrosa and Roll (1998).

restrictions on capital account transactions that involve (1) the sale or issue of financial assets abroad by residents and (2) the purchase of financial assets locally by nonresidents.

The second measure represents capital account restrictions on outflows (KA_OUT). This measure is the simple average of eight dummy variables that capture restrictions on capital account transactions that involve (1) the sale or issue of financial assets locally by nonresidents and (2) the purchase of financial assets abroad by residents. Table I reports the transaction categories that are used in this study and that are subject to capital account restrictions according to the AREAER.

3.3. Other corporate bond spread determinants

To control for all variables that could directly affect corporate bond spreads, in all specifications, we consider the standard determinants of corporate bond spreads according to structural credit risk models and the empirical literature on the determinants of corporate bond spreads (Merton, 1974; Collin-Dufresne et al., 2001; Campbell and Taksler, 2003). We also consider a comprehensive set of country-level variables to control for the potential effects of other reforms that may affect a country's growth prospects.

At the bond level, our baseline regressions control for years to maturity, issue size, and coupon rate. At the firm level, control variables include the S&P corporate credit rating, to reflect the long-term and structural components of default risk (Löffler, 2004), as well as the issuer's equity volatility and a standard set of accounting variables (Campbell and Taskler, 2003). Firm-level performance indicators in our empirical model include firm size and the ratios of operating income to sales, short-term debt to total debt, and total debt to assets.

Since financial, macroeconomic, and political reforms are usually part of an entire package of structural reforms, to ensure that our results do not capture the effects of other

contemporaneous reforms, we include a set of country-level variables in all our regressions. In line with Bekaert, Campbell and Lundblad (2011), we consider private credit to GDP, private bond market capitalization to GDP, public bond market capitalization to GDP, trade to GDP, and political risk.[4] Additionally, we also consider the growth rate of the economy and the GDP per capita to control for growth opportunities and economic development. Finally, because sovereign credit ratings are a significant determinant of corporate credit risk (Borensztein et al., 2013), we also include them as part of our control variables.

Table II presents the definitions, units, and sources of the variables that are used in this paper, and Table III reports the descriptive statistics of the variables.

4. Empirical analysis and main results

The central aim of this study is to explore whether capital account restrictions affect corporate bond spreads while distinguishing between the effect of capital account restrictions on inflows (KA_IN) and the effect of capital account restrictions on outflows (KA_OUT). Our baseline econometric model is thus as follows:

$$\text{Bond Spread}_{bfct} = \alpha + \beta X_{bfct} + \varphi Y_{fct} + \delta Z_{ct} + \gamma KA\_IN_{ct} + \theta KA\_OUT_{ct} + \mathbf{A}_f + \mathbf{B}_t + \varepsilon_{bfct},$$

where the subscript *'bfct'* refers to bond *b*, firm *f*, country *c,* and time *t*. $\mathbf{A}_f$ is a vector of either industry or firm dummy variables that account for industry or firm fixed effects, depending on the regression. Industry and firm fixed effects control for endogeneity arising from time-invariant industry and firm characteristics, respectively. $\mathbf{B}_t$ is a vector of time dummy variables

[4] The political risk measure is a survey-based assessment of political stability contained in the ICRG database.

accounting for time fixed effects that control for variations in global factors such as the world business cycle or the fad effect of capital account liberalization. X_{bfct} is a set of bond characteristics, Y_{fct} is a set of firm-level performance indicators, Z_{ct} is a set of macroeconomic variables, and ε_{bfct} is the error term. Our main parameters of interest are γ and θ.

Given that the sample used in this paper includes bond issued by firms located in countries easing or tightening capital account restrictions at different moments of time, our specification including firm and time fixed effects is analogous to a difference-in-differences estimator in a setting with multiple-treatment-groups and multiple-time-periods (Imbens and Wooldridge, 2009). The identification assumption is that the control firms (bonds), independently of whether they are located in countries that have already easing or tightening capital account restrictions or have not, are exposed to similar global shocks as the treated firms (bonds) around changes in the degree of financial openness. We believe this is a plausible assumption given the homogeneous nature of the bonds included in the sample (i.e., international bonds denominated in U.S. dollars).

Table IV presents the results from the estimation of the baseline regression by ordinary least squares (OLS) with errors clustered by bond. Columns 1 and 2 report the results for our baseline specification with industry and firm fixed effects, respectively. The results suggest that capital account restrictions on inflows and outflows have sharply asymmetric effects: capital account restrictions on inflows increase corporate bond spreads with a statistically significant and economically meaningful magnitude. That is, one-standard-deviation increase in KA_IN increases corporate bond spreads by between 37 and 55 basis points. By contrast, capital account restrictions on outflows tend to decrease corporate bond spreads; however, this result is not robust to the inclusion of firm fixed effects.

The result regarding the effect of capital account restrictions on inflows seems intuitive for two reasons. First, firms residing in a country with restrictions on capital inflows have fewer opportunities for raising foreign capital. Second, when capital account restrictions on inflows are in place, firms incur additional costs when raising capital. These higher costs can arise from a variety of channels. They can result from the higher taxes or fees on capital flows related to the capital account restriction. Additionally, financial resources can become more expensive as a result of the restricted supply. On top of that, the reduced market liquidity resulting from the restricted capital flows might also increase the liquidity premium in debt markets.[5]

Fewer or more expensive sources of capital make firms notably more vulnerable by reducing their ability to diversify, to exploit profitable investment opportunities, and to rollover existing debt denominated in foreign currency. Moreover, in the context of structural credit risk models, higher financing costs reduce firm equity value and increase default probabilities and credit spreads.

The asymmetric effect of different types of capital controls highlights the importance of distinguishing between the effect of capital account restrictions on inflows and the effect of capital account restrictions on outflows, as they are policy tools with different purposes. Usually, capital controls on inflows have been used as a crisis prevention tool, while capital controls on outflows have a long tradition of use as a crisis containment tool (Demirguc-Kunt and Serven, 2010). Therefore, studies using aggregate indexes of capital account restrictions

[5] Studies on equity markets suggest that stock markets tend to become more liquidity following capital control liberalizations (Levine and Zervos, 1998) and that increased stock market liquidity reduce the equity premium (Ahimud and Mendelson, 1986; Amihud et al, 1997). There is also a rich literature that shows that debt market illiquidity is a significant determinant of corporate bond spreads (Chen, Lesmond, and Wei, 2007; Covitz and Downing, 2007; Bao, Pan and Wang, 2010; Valenzuela, 2013).

may hide important asymmetries to the extent that different types of controls have different effects in financial markets, making it difficult to detect significant average effects.

Most of the coefficients for our control variables have the expected signs, and many of them are significantly associated with corporate credit spreads. Consistent with the predictions of structural credit risk models, the results from our specification *including* firm-fixed effects show that equity volatility is positively related to credit spreads (Merton, 1974; Campbell and Taskler, 2003). As expected, firms with higher quality credit ratings exhibit smaller credit spreads, and the short-term debt over total debt ratio is positive and highly significant in the regression. This last result is consistent with the argument that a higher proportion of short-term debt exposes firms to rollover risk (Gopalan, Song and Yerramilli, 2013; Valenzuela, 2013). At the macro level, the results indicate that trade over GDP, sovereign credit ratings, and economic growth are negatively related to credit spreads. On the other hand, a higher ratio of public bond market capitalization to GDP is associated with higher credit spreads. This finding is consistent with findings indicating that countries with excessive debt are more prone to costly financial crises (Arcand, Berkes and Panizza, 2012; Law and Singh, 2014) and that high levels of sovereign debt are likely to affect corporate bond spreads through sovereign risk (Borensztein, Cowan and Valenzuela, 2013).

5. Narrowing down the channels

This section explores whether potential heterogeneities exist in the impact of capital account restrictions on corporate bond spreads and whether they are consistent with a causal relationship between capital controls and the cost of debt. Specifically, we examine whether time to maturity, firm size, domestic financial development, and global financial distress exacerbate or attenuate the effects of capital controls.

5.1. Bond maturity

Capital account restrictions on inflows may have a stronger effect on the spread of bonds maturing in the short-term for at least three reasons. First, existing evidence shows that the introduction of capital controls shifts the composition of capital inflows to longer maturities, making it difficult to roll over short-term debt (Forbes, 2007). Second, as documented by Reinhart and Smith (2002), investors may expect capital controls to be transitory. In such a case, investors would expect firms to face greater difficulty in rolling over debt maturing in the short-term, but not necessarily debt maturing in the long-term. Third, we could also expect a differentiated effect on the corporate bond spread as a function of time to maturity because a longer time to maturity also grants firms more time to find alternative sources of financing.

To test this hypothesis, Column 1 of Table V adds the interaction of KA_IN and KA_OUT with the bond time to maturity. The results show that bonds maturing in the short-term are more affected by restrictions on capital inflows than bonds maturing in the long-run. Specifically, a one-standard-deviation increase in KA_IN corresponds to a 114, 67, and 31 basis-point increase in the spreads of bonds with a time to maturity of 1 year, 5 years, and 8 years, respectively.

5.2. Firm size

Previous evidence supports the idea that firm size is a relevant variable for determining the effects of capital controls on the cost of financing for firms. Both Forbes (2007) and Edwards (1999) find that financial constraints were significantly greater for smaller firms than for large firms during the *encaje* adopted in Chile between 1991 and 1998. Additionally, Alfaro,

Chari, and Kanczuk (2014) find that the cumulative abnormal stock returns of large firms were less affected by the imposition of capital controls in Brazil during 2008-2009.

Column 2 of Table V shows that the effect of capital controls on credit spreads is particularly strong for smaller firms. While an increase of one standard deviation in KA_IN for the firms in the 75th percentile increases their corporate bond spreads by 19 basis points, this effect grows to 69 basis points for firms in the 25th percentile.

The finding that capital controls have a heterogeneous effect depending on the size of the firm implies that, in addition to increasing financing costs, capital controls also generate inefficiencies in the allocation of capital across firms. Such inefficiencies in capital allocation could have important negative effects on the economy since smaller firms are typically the main drivers of growth and employment.

5.3. Domestic financial development

When a country imposes capital controls, a well-developed local financial system can act as a substitute for firms' financing needs. Additionally, more sophisticated local capital markets potentially provide the scope for financial innovations that allow for circumvention of capital controls (Klein and Olivei, 2008). Both effects reduce the negative impact of the capital controls on the financing costs of firms in countries with well-developed domestic financial markets.

In effect, Columns 3 and 4 of Table V show that higher levels of local financial development, proxied by the ratios of private credit to GDP and private bond market capitalization to GDP, reduce the negative impact of capital controls on corporate bond spreads. The magnitude of the effect is both statistically and economically significant. Specifically, a one-standard-deviation increase in KA_IN increases corporate bond spreads by

between 45 and 48 basis points in countries with a low level of local financial development, corresponding to countries in the 25th percentile of private credit to GDP and private bond market capitalization to GDP. This effect is much smaller (even negative) in countries with high levels of local financial development: -16 and 4 basis points for countries in the 75th percentile for the respective proxy variables.

5.4. Periods of financial distress

We have argued that, through a variety of channels, capital account restrictions on inflows render accessing international sources of financing more difficult and/or expensive for firms. Then, during periods of global financial distress, one would expect firms in countries with capital account restrictions to face relatively deeper financing problems. Thus, when market illiquidity and financial stability worsen, capital account restrictions should play a more important role.

To test for this possibility, Column 5 adds the interactions of capital controls on inflows (KA_IN) and capital controls on outflows (KA_OUT) with the Gamma measure of market illiquidity. The Gamma measure, constructed by Bao, Pan, and Wang (2011) by using information from the U.S. secondary corporate bond markets, corresponds to the negative of the autocovariance of bond price changes. Since transitory price movements produce negatively serially correlated price changes, the Gamma measure creates a meaningful measure of debt market illiquidity that captures the impact of illiquidity on prices. Column 6 adds the interactions of capital controls on inflows (KA_IN) and capital controls on outflows (KA_OUT) with a measure of financial instability, namely, the VIX index. Specifically, the VIX index is a measure of the implied volatility of the S&P500 index options.

All the coefficients for the interaction terms between restrictions on inflows and the measures of market illiquidity and financial instability are positive and highly significant. In particular, a one-standard-deviation increase in KA_IN increases corporate bond spreads by 42 basis points when market liquidity is high (as indicated by values in the 25th percentile of the Gamma measure) and by 52 basis points when market liquidity is low (as indicated by values in the 75th percentile of the Gamma measure). Regarding the effect of financial stability, a one-standard-deviation increase in KA_IN increases corporate bond spreads by 32 and 70 basis points when financial instability is low and high, respectively (as indicated by values in the 25th and 75th percentiles of the VIX index, respectively). These results suggest that capital account restrictions on inflows indeed have a greater effect during times of financial distress than during times of financial stability.

6. Robustness

In this section, we perform a set of analyses to check whether our results could be driven by biases arising from other factors. First, we explore whether the effect of capital account restrictions on corporate bond spreads is affected by the specific type of transaction (instrument) that is being restricted. We then examine whether our results are robust to the use of different subsamples of countries and bonds. Overall, we show that our previous results are robust to alternative specifications and subsamples.

6.1. Capital account restrictions by type of securities

Capital flows are far from being homogeneous, and each type of flow has its own characteristics. The wide variety of characteristics might affect the way that bond spreads react when capital controls are imposed in different types of capital flows. To rule out the possibility

that the heterogeneity of capital account restrictions could be biasing our results, we replicate our baseline regressions while allowing for more disaggregated measures of capital account restrictions. In particular, we take advantage of the disaggregation of the Schindler (2009) data presented in Table I and explore the effect of imposing capital account restrictions on corporate bond spreads for each type of transaction: shares, bonds, money market instruments, and collective investments.

Table VI reports the results and shows that capital account restrictions on inflows continue to have a positive and significant effect on corporate bond spreads for restrictions on the issuance/trade of shares, bonds, and collective investments. Restrictions on money market instruments are also positively correlated with credit spreads; however, the coefficient is not statistically significant. The finding that the coefficient is considerably larger in the case of restrictions on bonds than in the case of restrictions on the issuance/trade of other financial assets is consistent with the status of debt as the primary financing tool for corporations. In addition, the results show that restrictions on capital inflows tend to increase credit spreads regardless of the type of transaction, suggesting that alternative sources of capital are substitutes for each other. We do not find that capital controls on outflows have a robust, significant effect on corporate bond spreads.

6.2. Additional robustness checks

In this subsection, we explore whether our results are robust to the use of different subsamples. First, we replicate our baseline model while *excluding* high-income countries to ensure that countries with higher degrees of development are not biasing the results. Such bias may arise because liberalization is likely to be nonrandom, with policymakers more inclined to open up when countries have reached a certain level of development. Column 1 of Table VII

shows that the coefficients for capital controls on inflows remain positive and highly significant. In fact, this coefficient becomes stronger when we use the subsample of low- and middle-income economies.

Next, we focus on ruling out potential biases that could arise from our measurement of corporate bond spreads. The OAS analysis is a standard approach in financial markets for computing the value of the eventual embedded option of bonds. However, this methodology may introduce some errors into our dependent variable measurement. To explore whether the use of OAS methodology is biasing our results, in Column 2 of Table VII, we replicate our baseline specification while including only a sample of bonds without embedded options. Our results remain qualitatively unchanged in comparison to our previous results.

7. Conclusions

Although a large body of research exists on the effects of capital account restrictions, whether it is optimal for countries to liberalize their capital accounts remains an open empirical question. This paper fills a gap in the literature by showing that capital account restrictions do have a significant effect on the cost of debt capital for firms, as proxied by corporate bond spreads, and that this effect is asymmetric across different types of restrictions.

The paper's major finding is that capital account restrictions on inflows significantly increase corporate bond spreads. Consistent with a causal interpretation, the results show that this effect is particularly strong in bonds maturing in the short-term, issued by small firms, and issued in countries with underdeveloped financial markets. Moreover, the paper shows that capital account restrictions on inflows have a greater effect during periods of financial distress than during periods of financial stability. Overall, these results are consistent with findings that restrictions on capital inflows worsen the conditions for firms' access to capital in international

markets, rendering them more vulnerable to shocks, particularly when financial markets are in distress.

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Table I
Types of capital transactions potentially subject to restrictions

Inflows (KA_IN)	Outflows (KA_OUT)
Shares or other securities of a participating nature	
Purchase locally by nonresidents	Sale or issue locally by nonresidents
Sale or issue abroad by residents	Purchase abroad by residents
Money market instruments	
Purchase locally by nonresidents	Sale or issue locally by nonresidents
Sale or issue abroad by residents	Purchase abroad by residents
Bonds or other debt securities	
Purchase locally by nonresidents	Sale or issue locally by nonresidents
Sale or issue abroad by residents	Purchase abroad by residents
Collective investment securities	
Purchase locally by nonresidents	Sale or issue locally by nonresidents
Sale or issue abroad by residents	Purchase abroad by residents

Table II
Description of variables

This table describes the variables that are used in the empirical model, including the variable names, descriptions, units, and sources.

	Description	Units	Source
Bond Characteristc			
Option adjusted spread	Option-adjusted spread	Basis points	Bloomberg
Years to maturity	Years to maturity	Years	Bloomberg
Issue size	Amount issued	US$ (in *log*)	Bloomberg
Coupon rate	Coupon bond	Basis points	Bloomberg
Firm Specific			
Equity volatility	Standard deviation of the day to day logarithmic price changes for the previous 180 days.	Percent	Bloomberg
Credit rating	S&P firm rating, long term debt, foreign currency	(1=D, …, 21=AAA)	S&P
Operating income to sales	Operating income divided by net sales.	Ratio	Bloomberg
ST debt to total debt	Short term debt divided by total debt.	Ratio	Bloomberg
Total debt to asset	Total debt divided by total assets.	Ratio	Bloomberg
Size	Total assets	Millions of US$ (in *log*)	Bloomberg
Capital Account Restrictions			
Capital account restrictions on inflows (KA_IN)	Restrictions on capital inflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on outflows (KA_OUT)	Restrictions on capital outflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on inflows: Shares	Restrictions on share trading capital inflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on outflows: Shares	Restrictions on share trading capital outflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on inflows: Bonds	Restrictions on bond trading capital inflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on outflows: Bonds	Restrictions on bond trading capital outflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on inflows: Money Market	Restrictions on money market capital inflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on outflows: Money Market	Restrictions on money market capital outflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on inflows: Collective Investment	Restrictions on collective investments capital inflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Capital account restrictions on outflows: Collective Investment	Restrictions on collective investments capital outflows	Index: 0=unrestricted to 1=restricted	Schindler (2009)
Country Risk			
Private credit to GDP	Private Credit divided by GDP	Ratio	FDSD
Private bond market capitalization to GDP	Private bond market capitalization divided by GDP	Ratio	FDSD
Public bond market capitalization to GDP	Public bond market capitalization divided by GDP	Ratio	FDSD
Trade to GDP	Exports plus imports divided by GDP	Ratio	WDI
Political risk	Assessment of the political stability in a country.	Index: 0=high risk to 100=low risk	ICRG
Growth	GDP growth rate	Rate	WDI
GDP per capita	GDP divided by total population	Constant 2000 US$	WDI
Sovereign credit rating	S&P sovereign rating, long term debt, foreign currency	(1=D, …, 21=AAA)	S&P
Distress Measures			
Gamma measure	Negative of the autocovariance of price changes	Basis points	Bao et al. (2010)
VIX	Chicago Board Options Exchange Market Volatility Index	Percentage points	Bloomberg

Table III
Descriptive statistics

This table reports the descriptive statistics for all variables listed below.

	Mean	Std. Dev.	Min.	Max.
Bond Characteristc				
Option adjusted spread	3.02	3.05	0.32	26.71
Years to maturity	5.80	2.31	0.09	13.97
Issue size	19.64	0.88	10.92	21.82
Coupon rate	6.79	1.63	4.00	11.75
Firm Specific				
Equity volatility	37.56	18.86	12.57	140.69
Credit rating	13.22	2.70	6	20
Operating income to sales	0.16	0.15	-0.87	0.72
ST debt to total debt	0.14	0.13	0.00	0.94
Total debt to asset	0.29	0.12	0.00	0.77
Size	9.67	1.31	5.38	12.74
Capital Account Restrictions				
Restrictions on inflows (KA_IN)	0.17	0.24	0	1
Restrictions on outflows (KA_OUT)	0.24	0.36	0	1
Restrictions on inflows: Shares	0.36	0.32	0	1
Restrictions on outflows: Shares	0.25	0.39	0	1
Restrictions on inflows: Bonds	0.09	0.25	0	1
Restrictions on outflows: Bonds	0.24	0.37	0	1
Restrictions on inflows: Money Market	0.09	0.25	0	1
Restrictions on outflows: Money Market	0.21	0.36	0	1
Restrictions on inflows: Collective Investment	0.12	0.31	0	1
Restrictions on outflows: Collective Investment	0.25	0.40	0	1
Country Risk				
Private credit to GDP	1.24	0.54	0.10	1.84
Private bond market capitalization to GDP	0.32	0.17	0.00	0.73
Public bond market capitalization to GDP	0.42	0.14	0.09	0.92
Trade to GDP	0.96	0.78	0.25	4.38
Political risk	81.96	7.24	55.00	94.00
Growth	2.75	1.87	-0.26	10.67
GDP per capita	20.43	9.67	1.03	41.21
Sovereign credit rating	18.74	3.75	1	21
Distress Measures				
Gamma measure	18.99	24.79	3.09	103.19
VIX	22.29	10.98	10.27	60.72

Table IV
Corporate bond spreads and capital account restrictions

This table reports estimates from a panel regression of corporate option-adjusted spreads against the variables listed below. All regressions control for bond and time fixed effects. The sample covers the period from 2005:Q1 to 2009:Q2. Robust standard errors, clustered at the bond level, are presented in parentheses below each coefficient estimate. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Bond Characteristc		
Years to maturity	0.028	0.019
	(0.028)	(0.013)
Issue size	-0.020	0.062
	(0.059)	(0.052)
Coupon rate	0.132***	0.054
	(0.042)	(0.036)
Firm Specific		
Equity volatility	0.043***	0.037***
	(0.007)	(0.008)
Credit rating	-0.395***	-0.682***
	(0.052)	(0.145)
Operating income to sales	-2.418***	-0.792
	(0.494)	(0.695)
ST debt to total debt	1.564***	2.459***
	(0.565)	(0.683)
Total debt to asset	0.381	-0.752
	(0.561)	(1.218)
Size	-0.048	0.215
	(0.073)	(0.295)
Capital Account Restrictions		
Capital account restrictions on inflows (KA_IN)	1.546***	2.299***
	(0.528)	(0.722)
Capital account restrictions on outflows (KA_OUT)	-1.022***	-0.150
	(0.242)	(0.292)
Country Risk		
Private credit to GDP	-0.586***	0.807
	(0.204)	(0.674)
Private bond market capitalization to GDP	1.165**	-2.885
	(0.534)	(1.903)
Public bond market capitalization to GDP	0.858*	8.882***
	(0.451)	(1.969)
Trade to GDP	-0.023	-2.605**
	(0.093)	(1.062)
Political risk	0.018	0.089***
	(0.023)	(0.030)
Growth	0.027	-0.139***
	(0.065)	(0.039)
GDP per capita	0.012	0.137
	(0.013)	(0.113)
Sovereign credit rating	-0.080	-0.261*
	(0.075)	(0.147)
Observations	3,740	3,740
Adjusted R-squared	0.694	0.801
Industry Fixed Effects	YES	NO
Firm Fixed Effects	NO	YES
Time Fixed Effects	YES	YES

Table V
Narrowing down the channels

This table reports estimates from a panel regression of corporate option-adjusted spreads against the variables listed below. The sample covers the period from 2005:Q1 to 2009:Q2. Robust standard errors are presentedin parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
KA_IN	5.257***	14.041**	4.814***	4.225***	1.466***	0.006
	(1.253)	(5.635)	(1.375)	(1.325)	(0.538)	(0.656)
KA_IN x Years to maturity	-0.497***					
	(0.139)					
KA_IN x Size		-1.268**				
		(0.596)				
KA_IN x Private credit to GDP			-3.285**			
			(1.352)			
KA_IN x Private bond market capitalization to GDP				-10.866**		
				(5.077)		
KA_IN x Gamma					0.040***	
					(0.014)	
KA_IN x VIX						0.111***
						(0.033)
KA_OUT	-1.542***	0.132	0.961	0.022	-0.124	0.320
	(0.489)	(3.704)	(1.084)	(0.629)	(0.384)	(0.646)
KA_OUT x Years to maturity	0.225***					
	(0.064)					
KA_OUT x Size		-0.023				
		(0.373)				
KA_OUT x Private credit to GDP			-1.251			
			(1.128)			
KA_OUT x Private bond market capitalization to GDP				0.108		
				(1.570)		
KA_OUT x Gamma					-0.008	
					(0.009)	
KA_OUT x VIX						-0.027
						(0.020)
Observations	3,740	3,740	3,740	3,740	3,740	3,740
Adjusted R-squared	0.803	0.802	0.802	0.802	0.805	0.805
Control Variables	YES	YES	YES	YES	YES	YES
Firm Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects	YES	YES	YES	YES	YES	YES

Table VI
Capital account restrictions by type of securities

This table reports estimates from a panel regression of corporate option-adjusted spreads against the variables listed below. All regressions control for bond and time fixed effects. The sample covers the period from 2005:Q1 to 2009:Q2. Robust standard errors, clustered at the bond level, are presented in parentheses below each coefficient estimate. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Shares	**Bonds**	**Money Market**	**Collective Investment**
	(1)	(2)	(3)	(4)
Bond Characteristc				
Years to maturity	0.019	0.018	0.019	0.019
	(0.013)	(0.013)	(0.013)	(0.013)
Issue size	0.062	0.060	0.062	0.063
	(0.052)	(0.051)	(0.052)	(0.052)
Coupon rate	0.055	0.054	0.057	0.057
	(0.036)	(0.036)	(0.036)	(0.036)
Firm Specific				
Equity volatility	0.037***	0.037***	0.036***	0.036***
	(0.008)	(0.008)	(0.008)	(0.008)
Credit rating	-0.679***	-0.688***	-0.661***	-0.670***
	(0.145)	(0.145)	(0.147)	(0.145)
Operating income to sales	-0.836	-0.708	-0.879	-0.902
	(0.695)	(0.697)	(0.696)	(0.693)
ST debt to total debt	2.444***	2.469***	2.485***	2.491***
	(0.682)	(0.681)	(0.680)	(0.681)
Total debt to asset	-0.641	-0.761	-0.737	-0.880
	(1.224)	(1.207)	(1.260)	(1.243)
Size	0.218	0.227	0.180	0.191
	(0.295)	(0.296)	(0.299)	(0.299)
Capital Account Restrictions				
Capital account restrictions on inflows	0.556**	3.417***	0.983	1.772***
	(0.248)	(0.843)	(0.666)	(0.673)
Capital account restrictions on outflows	-0.349	0.278	0.613	-0.185
	(0.246)	(0.247)	(0.377)	(0.259)
Country Risk				
Private credit to GDP	0.955	0.077	0.717	1.120
	(0.697)	(0.688)	(0.687)	(0.728)
Private bond market capitalization to GDP	-3.130	-1.203	-2.569	-4.253**
	(1.960)	(1.964)	(1.802)	(2.162)
Public bond market capitalization to GDP	8.652***	7.406***	9.444***	10.437***
	(1.992)	(1.866)	(2.262)	(2.436)
Trade to GDP	-2.359**	-3.461***	-3.077***	-2.994***
	(1.122)	(1.082)	(1.060)	(1.039)
Political risk	0.092***	0.082***	0.103***	0.084***
	(0.029)	(0.029)	(0.030)	(0.029)
Growth	-0.149***	-0.125***	-0.142***	-0.143***
	(0.039)	(0.039)	(0.039)	(0.038)
GDP per capita	0.147	0.117	0.145	0.144
	(0.112)	(0.112)	(0.113)	(0.114)
Sovereign credit rating	-0.250*	-0.308**	-0.318**	-0.310*
	(0.144)	(0.145)	(0.151)	(0.158)
Observations	3,740	3,740	3,740	3,740
Adjusted R-squared	0.801	0.802	0.801	0.801
Firm Fixed Effects	YES	YES	YES	YES
Time Fixed Effects	YES	YES	YES	YES

Table VII
Subsamples

This table reports estimates from a panel regression of corporate option-adjusted spreads against the variables listed below. All regressions control for bond and time fixed effects. The sample covers the period from 2005:Q1 to 2009:Q2. Robust standard errors, clustered at the bond level, are presented in parentheses below each coefficient estimate. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Low and Middle Income Countries	**Bonds without Embedded Options**
	(1)	(2)
Bond Characteristc		
Years to maturity	0.036	0.045**
	(0.038)	(0.018)
Issue size	0.434**	0.028
	(0.190)	(0.069)
Coupon rate	-0.013	-0.002
	(0.057)	(0.048)
Firm Specific		
Equity volatility	0.065**	-0.014
	(0.029)	(0.010)
Credit rating	-0.957**	-0.331*
	(0.370)	(0.186)
Operating income to sales	-1.003	0.218
	(1.203)	(0.971)
ST debt to total debt	0.729	-0.001
	(1.109)	(0.662)
Total debt to asset	1.137	1.613
	(1.360)	(1.627)
Size	0.479	0.913
	(0.498)	(0.817)
Capital Account Restrictions		
Capital account restrictions on inflows (KA_IN)	3.400**	3.244***
	(1.449)	(0.901)
Capital account restrictions on outflows (KA_OU	-0.164	-0.450
	(0.489)	(0.474)
Country Risk		
Private credit to GDP	13.937***	0.268
	(3.587)	(1.404)
Private bond market capitalization to GDP	-24.823***	2.974
	(8.223)	(3.864)
Public bond market capitalization to GDP	22.608***	3.150*
	(5.685)	(1.666)
Trade to GDP	-10.292***	-8.706***
	(3.558)	(1.809)
Political risk	0.078**	0.036
	(0.034)	(0.036)
Growth	-0.313***	-0.279***
	(0.086)	(0.060)
GDP per capita	0.329	0.698***
	(0.668)	(0.191)
Sovereign credit rating	-0.551***	-0.363***
	(0.178)	(0.137)
Observations	913	1,073
Adjusted R-squared	0.864	0.823
Firm Fixed Effects	YES	YES
Time Fixed Effects	YES	YES

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