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Who benefits from capital account liberalization? Evidence from firm-level credit ratings data☆

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A B S T R A C T

Using a novel panel data set on corporate foreign-currency credit ratings and capital account restrictions in advanced and emerging economies during 1995–2004, we find a strong positive effect of capital account liberalization on firms' credit risk, as measured by corporate credit ratings. As an identification strategy, we exploit within-country variation in firms' ability to obtain foreign currency and, thus, their ability to repay foreign currency debt. We find that liberalizing the capital account benefits significantly more those firms with more limited foreign currency access, namely, those producing nontradables. Our findings demonstrate a novel channel through which capital account restrictions affect economic outcomes, and they are robust to a broad range of alternative specifications.

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1. Introduction

Over the past four decades, the global economy has become ever more financially integrated, with the sum of cross-border assets and liabilities in the average country rising from about 50 percent of GDP in 1970 to over 400 percent in 2007. Starting in the mid-1980s, this trend has been accompanied also by a reduction in the extent of legal restrictions that countries impose on capital account transactions (See, e.g., Figure 1 in Quinn et al., 2011). However, only few advanced economies have completely eliminated capital controls; and more recent data indicate the possibility of a reversal of the previous trend towards freer capital markets, with several countries imposing new legal restrictions on capital account transactions or tightening existing ones (Schindler, 2009). Thus, the use of capital account restrictions is likely to remain an important and actively used policy instrument for countries aiming to limit or control the extent to which their economies are integrated with world financial markets.

However, despite the importance of capital controls, there remains considerable uncertainty regarding the relative costs and benefits of liberalizing the capital account. Although a large literature exists on the questions of how effective controls are, and through which channels they may operate, robust answers to these questions remain largely elusive. Among the many possible reasons for the lack of stronger results, two factors are likely to be important: the use of aggregated data in many studies, and the lack of sufficiently refined *de jure* measures of capital account openness. Aggregate data may hide important heterogeneities in the extent to which different subsets of an economy are affected, making it difficult to detect significant average effects. Finding a significant link between capital controls and economic outcomes is made difficult also by the fact that some of the most widely used capital controls indicators are crude, binary indicators which ignore variations in the degree of capital account restrictiveness.

In this paper, we address both shortcomings by studying a broad firm-level panel data set to explicitly address heterogeneities, and by using a new data set of capital controls which captures more subtle differences in capital control regimes across countries and time. The new capital controls index can also be disaggregated in novel ways, allowing for additional and innovative tests of our hypothesis. More specifically, we estimate the effects of capital account restrictions on firms' credit risk and thus on the conditions at which they can access credit in international capital markets. We study this channel in a broad panel data set using firm-level variation in long-term foreign-currency corporate credit ratings, a measure that is closely related to the cost of accessing international bond markets. In addition, credit ratings are also closely related to the pool of international investors firms can access as several regulations concerning international investors' investments in bonds are directly tied to credit ratings (Kisgen, 2006).

To identify the effects of capital account liberalization, we employ a difference-in-difference methodology similar to that in Rajan and Zingales (1998) by exploiting differences across firms/sectors in their access to foreign currency.[1] We argue that firms are able to issue foreign-currency debt if bondholders expect the issuing firms to eventually repay the debt. This requires the expectation of reasonably reliable future access to foreign currency. Given that credit ratings aim to measure a firm's credit worthiness for foreign currency debt, the ease with which a firm can obtain foreign currency should be reflected in the firm's ratings assessment.

As a proxy for such foreign currency access, we distinguish between whether a firm belongs to the tradables or the nontradables sector, on the grounds that firms in tradables have relatively easier access to foreign currency through their export earnings. Our key finding is that capital controls have a large negative effect on the credit ratings of firms in the nontradables sectors, while they are more neutral for firms in tradables sectors. Because tradables firms can generate foreign currency through exporting even when the capital account is restricted, lifting such restrictions has little impact on these firms' ability to issue foreign currency debt. By contrast, a restricted capital account does constrain firms in the nontradables sector in terms of issuing foreign currency debt. It is therefore intuitive that these

[1] Rajan and Zingales (1998) construct a measure of a firm's technological dependence on external finance and show that firms more in need of external finance grow faster in economies with more-developed financial markets.

firms derive more substantial benefits from lifting capital account restrictions since such liberalization effectively mitigates their credit constraints.

The empirical evidence for this credit channel is remarkably strong, surviving an array of robustness tests and alternative specifications. The paper adds to the growing literature exploiting within-country variation to measure the effects of capital account liberalization. It provides further evidence that capital controls do matter, and that their costs can be substantial. The findings also help understand why aggregate analyses have often found only small effects of capital controls, given that the effects may be concentrated in a subset of the economy.

The remainder of the paper proceeds as follows. Section 2 provides a brief review of the related literature, Section 3 presents our data, Section 4 discusses the empirical methodology and results, Section 5 summarizes robustness analyses, and Section 6 concludes.

2. A (brief) literature review

A broad literature exists on the various aspects of financial globalization and, in particular, the merits of attempts by policy makers to insulate themselves from global financial markets. We review here only a subset of related papers that help provide context to our paper. Earlier work in this literature has focused on aggregate outcomes and point to only weak evidence of a positive association between a more open capital account and economic outcomes. In surveys of the literature, Kose et al. (2009) and Edison et al. (2004) document these inconclusive results for economic growth as well as in regards to the effects of capital account liberalization on macroeconomic volatility. These results are surprising if one takes the view that countries who open their capital account should benefit from lower costs of capital and thus increased investment and higher growth (assuming that the interest rate in international financial markets is lower than the domestic rate prior to opening the capital account); see, for e.g., Henry (2003, 2007).

More recent work has started to reconcile the apparent disconnect between theory and empirics. Henry (2007) points out that while much of the empirical literature effectively tests for *permanent* growth effects, theory predicts only *temporary* growth effects on a country's transition to a new steady state. He suggests employing an event-study approach to focus more directly on these temporary growth effects. Focusing on equity markets, Henry (2000a, 2000b, 2007) and, using a different methodology, Bekaert and Harvey (2000), find that stock market liberalizations indeed tend to raise equity prices, lower the cost of capital and increase investment and growth, at least in the medium term, in line with theory. Others, including Dell'Ariccia et al. (2008) have noted that non-linearities in the effects of capital account liberalization may dilute average effects; for example, proper institutions or sufficiently developed financial markets may be preconditions for countries to fully reap the benefits of increased financial integration.

Other research suggests that the absence of more significant growth effects may be in part due to measurement issues. E.g., Bekaert et al. (2005) focus on (possibly) more precisely measured equity market liberalization events, while Quinn and Toyoda (2008) use a more finely measured capital account restrictions index; both find significant and strong growth effects arising from capital account liberalizations.

By contrast, a different strand of the literature has moved away from aggregate analysis by taking advantage of microeconomic data and gaining insights from within-country variation, typically at the firm-level. Our paper is most closely related to this "microeconomic" literature. Unlike the broader "aggregate" literature, studies in this literature typically find substantial costs of capital controls at the microeconomic level and little evidence of benefits from imposing controls (e.g., Forbes, 2007), although Chari and Henry (2004), also using firm-level data, find evidence that liberalization brings risk-sharing benefits.

Braun and Raddatz (2007) follow a similar approach to ours by exploiting differences between tradables and nontradables sectors, although their main interest is in the effects of domestic financial development on economic growth. They find that financial development is virtually irrelevant for tradable sectors, especially when the country is open to trade and capital flows, consistent with the notion that firms in tradable sectors, through their regular business activity, depend less on domestic financing. Our argument is similar, in that we find that firms in tradable sectors depend less on capital

account liberalization to the extent that their business activities allow them to access financing even when regular capital account transactions are restricted. In a somewhat related literature, Mendoza et al. (2009) examine how financial integration and differences in domestic financial development may interact to result in global financial imbalances using a calibration approach.

3. Data

This section presents the data that we use to explore the impact of capital account liberalization on corporate credit risk and thus on the conditions at which private firms have access to capital. As a measure of firm-level credit risk, we use firms' private foreign currency credit ratings issued by Standard and Poor's (S&P) as the dependent variable. We view credit ratings as a broad measure of a firm's credit risk, and we focus on foreign-currency ratings as most of emerging markets' international bonds issuances are in foreign currency (see Eichengreen et al., 2003).

The data set we study builds on that used in Borensztein et al. (2007) and covers the period 1995–2004 for firms in 11 industrial and 15 emerging economies.[2] The data set contains corporate credit ratings and accounting variables for all non-financial publicly traded firms with an S&P foreign-currency credit rating available in Bloomberg as of June 2005, with the exception of firms located in countries with a time-invariant sovereign foreign-currency credit rating of AAA during the whole period under study. The countries thus excluded from the data set are Austria, Germany, France, United Kingdom, Liechtenstein, Luxemburg, Netherlands, Norway and United States. All of the excluded countries are advanced economies with nearly fully liberalized capital accounts throughout the sample period and little or no variation in capital controls.[3] Thus, their exclusion matters little for our study, which focuses on the effects of changes in capital account regulations on firms.

To reduce potential error in data coding, we dropped all firm/year observations where any of the accounting variables exceeded the sample mean by more than five standard deviations (about one percent of the total sample). Thus, the final sample including our main independent variables and all our control variables consists of 2051 firm-year observations for 492 firms, which is quite representative of the whole universe of publically traded firms located in less developed economies and that have at some point issued corporate bonds. Our sample size is similar to other studies using comprehensive corporate credit rating data (see, e.g., Ferri et al., 2001).[4]

3.1. Foreign-currency corporate credit ratings

We use credit ratings for a number of reasons. First and foremost, focusing on ratings allows us to assemble a broad and consistent panel data set covering both advanced and emerging economies, while data coverage for spreads is more limited. Second, credit ratings allow us to understand one specific channel through which capital account liberalizations affect the cost of the capital for private firms, namely, a credit risk channel. Using corporate bond spreads it is difficult to differentiate between a credit risk and a liquidity channel—while spreads reflect both, ratings do not contain the liquidity element.[5] Third, capital account liberalizations are likely to have more permanent, or structural, effects on credit market conditions; credit ratings are therefore a preferable measure of credit risk as they are intended to measure the permanent, long-term and structural component of private risk, precisely the

[2] The countries included in the sample are Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Malaysia, Mexico, New Zealand, Peru, Philippines, Portugal, Spain, Sweden, and Thailand.

[3] Among the excluded countries, the median of our capital account index (discussed in more detail below) in each period is equal to 1 (i.e., full current account liberalization).

[4] Note that to be included in our sample (i.e., to have a corporate credit rating), a firm must be publicly traded and have access to international bond markets. Such firms tend to be larger and better-capitalized firms. This may work against us by creating an attenuation bias, as these firms likely benefit less from capital account liberalization that would bank-dependent firms that have fewer alternative sources of capital at their disposal.

[5] There is a rich recent empirical literature trying to disentangle the liquidity and credit risk components of corporate bonds spreads; see, for example, Chen et al. (2007), Covitz and Downing (2007), and Bao et al. (2011).

Table 1
Bond ratings and spreads.

Corporate credit rating	OAS	Number of bonds included in the index
A	199	23
BBB	298	176
BBB	458	140
BBB	877	132
CCC	1073	15
CCC	4709	1
C	2584	2
Grand total	434	489

Notes: This table reports average option-adjusted spreads (OAS) for corporate bond by credit rating. The option-adjusted spreads are expressed in basis points, as of 9/10/2010. The data are from Bank of America Merry Lynch (http://www.mlindex.ml.com). The bonds considered correspond to the bonds included in the Emerging Markets Corporate Plus Index (ICP0) index.

component that we seek to investigate in this study (see, e.g., Löffler, 2004; and Standard and Poor's, 2001).[6] Spreads measures by contrast are more likely to reflect systemic risk or short-term factors that might obscure the long-lasting effects of reforms.[7] Fourth, ratings are, in fact, one of the main determinants of corporate bond spreads, as Covitz and Downing (2007) and Ederington et al. (1987) have demonstrated, and as also reflected in the negative correlation between firms' ratings and corporate bond spreads shown in Table 1.

Lastly, ratings are also of interest in and of themselves as they matter in a number of other contexts. For example, some regulations concerning investments in bonds are directly tied to credit ratings, affecting not only the pool of international investors that firms can access but also their cost of debt capital (see, Kisgen and Strahan, 2010). In addition, credit ratings categories impose different costs on the firm. For instance, as Kisgen (2006) argues, "A firm's rating affects operations of the firms, access to other financial markets such as commercial paper, disclosure requirement for bonds…, and bond covenants, which can contain ratings triggers whereby a ratings change can result in changes in coupon rates or a forced repurchase of the bond". Therefore, understanding the determinants of corporate credit ratings is interesting by itself beyond an understanding of the determinants of the effective cost of a firm's external capital.

Standard and Poor's (2001) defines a foreign-currency credit rating as "A current opinion of an obligor's overall capacity to meet its foreign-currency-denominated financial obligations. It may take the form of either an issuer or an issue credit rating. As in the case of local currency credit ratings, a foreign currency credit opinion on Standard and Poor's global scale is based on the obligor's individual credit characteristics, including the influence of country or economic risk factors. However, unlike local currency ratings, a foreign currency credit rating includes transfer and other risks related to sovereign actions that may directly affect access to the foreign exchange needed for timely servicing of the rated obligation. Transfer and other direct sovereign risks addressed in such ratings include the likelihood of foreign exchange control and the imposition of other restrictions on the repayment of foreign debt". To compute a quantitative measure of credit ratings, we follow the existing literature (e.g., Cantor and Packer, 1996; Reinhart, 2002, and Borensztein et al., 2007) and map the credit rating categories into 21 numerical values, with the value of 21 corresponding to the highest rating (AAA) and 1 to the lowest (SD/D). See Table 2.

[6] Ratings are not perfect measures, but as Altman and Rijken (2004) note, concerns over their quality are typically in regards to the *timeliness* of ratings adjustments, less so regarding the *accuracy* of their ratings. Given our focus on annual frequencies, we are less concerned about the timing issue, which may be more relevant at higher frequencies.

[7] The high-frequency variability of spreads could be addressed in part by employing averaging techniques, such as Hodrick-Prescott filtering. However, even at lower frequencies ratings may diverge from spreads. For example, during much of this paper's sample period, emerging market spreads exhibited a secular downward trend over and above similar changes in ratings; thus, even filtered spreads may not reflect well the underlying fundamentals that we are concerned with in this paper.

Table 2
Bond ratings scale.

Interpretation	S&P rating	Assigned value
Investment-grade ratings		
Highest quality	AAA	21
High quality	AA+	20
	AA	19
	AA−	18
Strong payment capacity	A+	17
	A	16
	A−	15
Adequate payment capacity	BBB+	14
	BBB	13
Noninvestment-grade ratings		
Likely to fulfill obligations, ongoing uncertainty	BB+	11
	BB	10
	BB−	9
High-risk obligation	B+	8
	B	7
	B−	6
Currently vulnerable nonpayment obligation	CCC+	5
	CCC	4
	CCC−	3
Highly vulnerable to nonpayment	CC/C	2
Default	SD/C	1

Notes: This table report the values assigned to each S&P credit rating category. The credit rating categories are converted into numerical values, with the value of 21 corresponding to the credit rating with the highest quality (AAA) and 1 to the credit rating of the lowest quality (SD/D).

3.2. Capital account restrictions index

The measure of capital account restrictions is taken from a novel data set constructed by Schindler (2009). This new index (KA), like many other indices based on information provided in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER), provides more disaggregated information than other publicly available indices as it takes advantage of the more structured information provided in the AREAER starting in the 1996 issue. See Quinn et al. (2011, 2012) for detailed reviews of the various alternative measures of capital controls. In particular, we focus on the index' disaggregation into inflow and outflow controls which, as we discuss below, provides us with an alternative way of identifying the channels through which capital account liberalization affects firms. We also use in some specifications the aggregate index which is more finely gradated than existing indices and thus provides more precise measurement of countries' relative degree of restrictiveness.[8]

Although the aggregate index is highly correlated with other existing indices (see Schindler, 2009 and Quinn et al., 2011), we also estimate the main specifications using the several alternative capital control indicators, including those by Chinn and Ito (2007) (KAOPEN) and an updated version of Quinn's (1997) index (CAP100). We also use one of the subcomponents underlying the Chinn–Ito measure, namely, a binary capital account index (CAP) originally coded by Mody and Murshid (2005) and updated by Chinn and Ito (2007). In each case, higher scores indicate a more restricted capital

[8] Because a credit rating can only be assigned if the firm actually has issued foreign currency bonds, one would expect NT firms not to be in the sample in any country-year with a "fully" restricted capital account (KA = 0). However, the sample contains a small number of such observations (about .6 percent of the sample—one Mexican firm in 1995 and 12 Chinese firms during 2000–2004). This can be understood by noting that all capital account indices are merely approximations of the true capital account regime, with, say, 0 to be interpreted as denoting a highly restrictive regime, where the number and/or intensity of restrictions falls above some threshold, rather than a perfectly restricted one. In the often used binary indices, there is only one (implicit) threshold and values of 0 or 1 are therefore less meaningful. The more finely gradated index by Schindler (2009) that we use here improves on previous indices by providing more content to the 0 value, although it still cannot exclude cases where certain individual transactions are permitted.

account. The data sets by Mody–Murshid and Chinn–Ito also contain a binary index on the existence of export process surrender requirements (SURR) which we use in some specifications.[9]

3.3. Other corporate credit risk determinants

To control for variables that could affect corporate credit ratings directly, we include a broad set of variables: firm-specific performance indicators, other structural reforms, and macroeconomic variables. The choice of our firm-level variables is mainly based on the literature on discriminant analysis and on the determinants of corporate credit risk (Altman, 2000). Specifically, we consider variables capturing the firm's profitability (the ratios of earnings before interest and taxes (EBIT) to assets and of retained earnings to assets), leverage (ratio of equity to capital), liquidity (ratio of working capital to assets), interest coverage (ratio of EBIT to interest expense) and size (total assets).

We also consider, in some regressions, various other structural reform indices such as (financial) current account restrictions, trade barriers, and domestic financial development, as well as sovereign credit ratings and a set of macroeconomic controls. Macroeconomics controls include inflation, per-capita GDP, GDP growth, GDP volatility, and the current account deficit. Table 3 provides additional detail and sources for all variables.

4. Empirical analysis and main results

4.1. Baseline regressions

We aim to measure the effects of capital account liberalization on long-term foreign-currency private credit ratings, controlling for other factors that might affect private ratings independently. Thus, as a baseline specification, we estimate the equation

$$\begin{aligned} \textit{Private Credit Rating}_{ict} &= \textit{Constant} + \beta_{1\ldots m}\cdot\textit{Country Dummies} + \beta_{m+1\ldots n}\cdot\textit{Sector Dummies} \\ &\quad + \beta_{n+1\ldots n+10}\cdot\textit{Year Dummies} + \chi'\cdot\mathbf{X}_{ict} \\ &\quad + \delta\cdot\textit{Capital Account Liberalization}_{ct} + \varepsilon_{ict} \end{aligned} \tag{1}$$

where the dependent variable is firm i's private credit rating in country c at time t and $\mathbf{X}_{ict}$ is a vector including the firm-level control variables mentioned in the previous section.

In addition to firm-level characteristics, we also include country, industry and year fixed effects to control for all factors that are time-invariant but specific to a country or an industry, as well as for any time-specific effects that have affected all countries, for example, world business cycles, or other events that have affected world financial markets, such us the Asian and Russian crises or changes in international interest rates.[10] Furthermore, as discussed below, we additionally include in most regressions a country-specific sovereign ratings measure, which can vary over time, and which captures a broad range of country-year risk factors correlated with sovereign risk that may affect firms' credit ratings. Thus, the control variables we employ constitute a powerful set of controls.[11]

We estimate equation (1) by ordinary least squares with clustering of the errors by country and year. Table 4 reports in the first column the results from estimating equation (1). All variables have strong

[9] Focusing on *de jure*, rather than *de facto*, measures of financial integration is important in this context, since we are interested in the effects of countries' policy choices, rather than outcomes. See also Kose et al. (2009) who discuss in more detail the relative merits of *de jure* versus *de facto* indicators, and Mendoza (1993) who discusses the drawbacks of a class of *de facto* indicators. Binici et al. (2010) use both the Schindler (2009) and the Lane and Milesi-Ferretti (2007) data sets to examine the connection between capital controls and capital flows in terms of their levels and composition.

[10] One could also control for firm-level fixed effects, but given that credit ratings are slow-moving over time, eliminating the cross-firm variation makes the identification of our coefficient of interest more difficult as firm-level fixed effects would explain most of the variance in credit ratings.

[11] Given that the NT dummy is defined at the industry level, the inclusion of industry dummies in the baseline specification also controls for the possibility of different credit risk across nontradables and tradables firms. Omitting industry dummies and including a NT dummy instead leaves the results qualitatively unchanged (results available on request).

Table 3
Data summary and descriptive statistics, 1995–2004.

Variables	Observations	Mean	Standard deviation	Minimum	Maximum	Description	Source
Credit ratings							
Sovereign rating	2051	17.66	4.15	1	21	Numerical ratings scale (see Table 2)	Standard and Poor's
Corporate rating	2051	13.46	3.47	1	21	Numerical ratings scale (see Table 2)	Standard and Poor's
Firm-/sector-level variables							
EBIT/assets	2051	7.76	5.08	0.02	35.70	Percent	Bloomberg
Retained earnings/ assets	2051	18.12	17.24	−70.12	81.45	Percent	Bloomberg
Working capital/ assets	2051	6.73	14.91	−63.73	57.25	Percent	Bloomberg
Equity/ capital	2051	55.66	20.99	−37.67	100.00	Percent	Bloomberg
EBIT/interest expense	2051	6.05	1.34	−0.37	12.80	Percent (log)	Bloomberg
Size assets	2051	3.66	1.38	−3.84	8.11	Millions of 2000 US$, deflated by the CPI (log)	Bloomberg
NT	2051	0.46	0.50	0	1	Dummy = 1 if nontradable, 0 otherwise	Bloomberg, own construction
NEXP	2008			0	1	1 - Sectoral Share of Exports in Output	GTAP 7 database, own construction
Structural reform indicators							
DF	2051	0.48	0.30	0	1	Normalized index (1 = least regulated)	Abiad et al. (2008)
Banking	2051	0.86	0.15	0.27	1	Normalized index (1 = least regulated)	Abiad et al. (2008)
Securities	2051	0.95	0.13	0.33	1	Normalized index (1 = least regulated)	Abiad et al. (2008)
Trade	2051	0.67	0.26	0	1	Normalized index (1 = least regulated)	IMF (2008)
Current account	2018	0.60	0.29	0	1	Normalized index (1 = least regulated)	Quinn (1997), IMF (2008)
Macroeconomic variables							
Inflation	2051	3.02	4.68	−11.00	58.39	Annual CPI rate, percent	WDI
Current account	2051	0.17	3.61	−10.41	15.92	Current account surplus, percent of GDP	WDI
GDP growth	2051	2.86	3.89	−13.13	11.28	Annual real GDP growth, percent	WDI
GDP volatility	2051	6.54	8.28	0.65	47.47	Variance of previous 10 year GDP growth	WDI
Per-capita GDP	2051	9.62	0.96	5.96	10.55	Millions of US$ of 2000 (log)	WDI
Financial integration measures							
KA	2051	0.79	0.26	0	1	Normalized index (1 = least regulated)	Schindler (2009)
KA_IN	2051	0.78	0.27	0	1	Normalized index (1 = least regulated)	Schindler (2009)
KA_OUT	2051	0.81	0.30	0	1	Normalized index (1 = least regulated)	Schindler (2009)

Table 3 (*continued*)

Variables	Observations	Mean	Standard deviation	Minimum	Maximum	Description	Source
Kaopen	2051	1.86	1.14	−1.80	2.54	Index (higher = less restricted)	Chinn and Ito (2007)
CAP100	2051	55.95	28.72	0	100	Normalized index (100 = least regulated)	Quinn (1997), IMF (2008)
CAPRES	2051	26.89	16.63	0	50	Normalized index (50 = least regulated)	Quinn (1997), IMF (2008)
CAPNONRES	2051	29.07	14.36	0	50	Normalized index (50 = least regulated)	Quinn (1997), IMF (2008)
CAP	2051	0.70	0.46	0	1	Dummy (0 = capital account is restricted)	Chinn and Ito (2007), Mody and Murshid (2005)
SURR	2051	0.10	0.30	0	1	Dummy = 1 if surrender requirement in place	Chinn and Ito (2007), Mody and Murshid (2005)
Intlcapital	2051	1.67	1.14	0	3	Index (higher = less restricted)	Abiad et al. (2008)

explanatory power in the expected directions (except for the negative coefficient of working capital/assets). Notably, capital account openness has a strong positive effect on firms' credit ratings. This seems intuitive—in a country with a (relatively) open capital account, firms have more opportunities both of raising capital and of diversifying their assets. This would make firms more robust to shocks and less likely to default, thus resulting in a higher credit rating.

It is possible, however, that the capital account variable actually proxies overall macro conditions, to the extent that capital account openness is correlated with other macroeconomic factors, for example, because it often coincides with other types of structural reforms. We examine the issue of other reforms explicitly below in Section 4, but for now, we add to our baseline regression a measure of sovereign ratings. There are several reasons for doing this. First, sovereign ratings are an important determinant of firm ratings, as Standard and Poor's notes itself[12] and consistent with existing research (Borensztein et al., 2007). And second, both overall macro conditions and structural reforms are good predictors of sovereign ratings (see IMF, 2008),[13] suggesting that sovereign ratings are a convenient proxy variable to control for these other determinants of credit ratings. Thus, given that sovereign ratings change in response to sufficiently large changes in a country's macroeconomic environment, their inclusion, in addition to country, year and industry fixed effects, helps reduce omitted variable bias.

To focus more directly on capital account liberalization, we control only for the effect of sovereign ratings on corporate ratings that is unrelated to capital account liberalization. For this purpose, we follow Eichengreen and Mody (2000) by first regressing sovereign ratings on the capital account variable and then using the residual from that equation in our main equation. The resulting sovereign ratings residual still contains all of the macroeconomic information other than capital controls that affects sovereign ratings assessments and thus can be viewed as a parsimonious control for macroeconomic characteristics not related to capital account openness (see Cantor and Packer, 1996, and IMF, 2008, on the determinants of sovereign ratings). While this is largely a presentational choice in regards to the key findings of this paper, we discuss this issue, and subtleties associated with it, in more detail in the robustness section below.

[12] According to Standard and Poor's (2001), "Sovereign credit risk is always a key consideration in the assessment of the credit risk of […] corporates. Sovereign risk comes into play because the unique, wide-ranging powers and resources of a national government affect the financial and operating environments of entities under its jurisdiction.".

[13] Standard and Poor's (2001) divides its analytical framework for sovereign credit ratings into nine categories: political risk, income and economic structure, economic growth prospects, fiscal flexibility, general government debt burden, offshore and contingent liabilities, monetary flexibility, external liquidity and external debt burden. Consistent with this, Cantor and Packer (1996) find that upwards of 90% of the variance in sovereign ratings can be explained by macro variables such as per-capita GDP, GDP growth, GDP growth volatility, inflation and the current account balance. Other related empirical studies include Carling et al. (2007), Nickell et al. (2000), and Ludvigson and Ng (2005).

Table 4
Capital account restrictions, foreign currency access and corporate ratings.

	(1)	(2)	(3)
EBIT/assets	0.046*** (0.013)	0.043*** (0.013)	0.031** (0.013)
EBIT/interest expense	0.326*** (0.075)	0.367*** (0.072)	0.387*** (0.077)
Retained earnings/assets	0.030*** (0.005)	0.029*** (0.005)	0.029*** (0.004)
Working capital/assets	−0.021*** (0.006)	−0.025*** (0.005)	−0.025*** (0.005)
Equity/capital	0.024*** (0.006)	0.023*** (0.005)	0.025*** (0.005)
Size	0.822*** (0.090)	0.769*** (0.082)	0.771*** (0.081)
Sovereign credit rating residual		0.503*** (0.045)	0.499*** (0.044)
KA	2.093*** (0.617)	2.743*** (0.323)	1.162*** (0.441)
KA × NT			2.485*** (0.431)
Observations	2051	2051	2051
R-squared	0.69	0.72	0.72

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

The results from the revised baseline, reported in column 2 of Table 4, are virtually the same, except for the capital account coefficient which becomes even stronger. The finding of a strong direct effect of capital account openness on corporate credit ratings is, in itself, an interesting finding—other authors have found capital account liberalization to affect investment and growth (see, e.g., Henry, 2000a, 2000b, 2003), but our finding provides evidence on a channel through which such effects may occur. Namely, capital account liberalization increases average corporate credit ratings, and higher credit ratings, in turn, improve access to credit by allowing firms to borrow at a lower cost as higher ratings are associated with lower corporate bond spreads (see Table 1). This may lead to higher investment and economic growth. Also, as Kisgen (2006) notes, regulations on bonds investment restrict the extent to which some investors, such as banks or pension funds, are allowed to invest in a firm's bonds with a given ratings level; thus, in addition to lowering the cost of such capital, ratings also matter for the size of a given firm's pool of potential investors.

These results, however, are silent on how precisely firms' ratings are affected by capital account liberalization. Establishing a plausible mechanism for these effects is important for being able to distinguish the observed effects from other explanations. For example, the results at this point leave open the possibility that capital account liberalization may simply proxy other concurrent events, such as simultaneous reform in other sectors. If so, the results may simply establish that better overall macro management improves the economy, including corporates' average credit worthiness. In the following, we address these issues by refining our analysis. In particular, we provide evidence that capital account liberalization affects firms' credit access in ways that are specific to the restrictiveness of capital account regulations, thus establishing a novel and distinct channel for the effects of capital account liberalization.

Specifically, we propose a channel that emphasizes the fact that credit ratings reflect firms' *foreign currency risk*. Namely, firms issuing foreign currency debt require access to foreign currency for servicing that debt. Such access will typically be more difficult in countries that impose restrictions on capital account transactions. However, capital controls will be less restrictive for firms that can obtain foreign currency through channels not affected by capital account restrictions—by implication, then, these firms will derive smaller benefits from capital account liberalization than others. For example, firms in the export sector can obtain foreign currency through their regular export activities and therefore do not need to rely on domestic foreign exchange markets; lifting capital account restrictions should therefore benefit relatively more the non-exporting firms.[14]

[14] While we do not have firm-level data on the currency composition of firms' debt, Cowan and De Gregorio (2007) show that during 1993–2002, the share of foreign-currency debt of Chilean firms in tradable sectors was about 2½ times larger than that of firms in NT sectors (see their Table 6.8).

Table 5
Baseline regressions for subset of continuously rated firms.

	(1)	(2)	(3)
EBIT/assets	0.077*** (0.025)	0.075*** (0.025)	0.067*** (0.025)
EBIT/interest expense	0.254*** (0.107)	0.279*** (0.107)	0.288*** (0.106)
Retained earnings/assets	0.028*** (0.006)	0.032*** (0.006)	0.031*** (0.006)
Working capital/assets	−0.035*** (0.008)	−0.040*** (0.008)	−0.039*** (0.008)
Equity/capital	0.038*** (0.008)	0.035*** (0.008)	0.038*** (0.008)
Size	1.295*** (0.111)	1.255*** (0.113)	1.257*** (0.112)
Sovereign credit rating residual		0.411*** (0.073)	0.424*** (0.076)
KA	1.030 (0.873)	1.522*** (0.552)	−0.324 (0.792)
KA × NT			2.398*** (0.563)
Observations	678	678	678
R-squared	0.813	0.826	0.830

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings. The sample is restricted to those firms that (a) had a credit rating at the beginning of the sample period and (b) resided in countries that exhibited some changes in the degree of capital account liberalization. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

We test our hypothesis that capital account restrictions affect businesses through a foreign currency access channel in column 3 of Table 4. We do this by interacting the capital account openness variable with a binary variable indicating whether a firm is in the nontradables (NT = 1) or the tradables sector (NT = 0). The direct effect of capital account openness is smaller, but still positive and highly significant. By comparison, the coefficient on the KA × NT interaction is more than twice as large and also highly significant. To calculate the total effects, we obtain that a unit increase in capital account openness raises the average credit rating of firms in the tradables sector by 1.162 notches, while it raises those of firms in the NT sector by 3.647 (the sum of 1.162 and 2.485), more than three times the effect for tradables firms.[15]

We interpret this finding as strong evidence in support of our hypothesis. That is, the effects of capital account liberalization are uneven across firms in an economy, in line with firms' relative access to foreign currency. While removing capital account restrictions, on average, yields benefits for all firms in terms of improved credit ratings, it has a substantially larger effect on firms with previously more restricted access to foreign currency. Thus, while capital account liberalization does not benefit all actors in an economy, it can have substantial benefits for some groups. To put the results into perspective, a corporate rating increase by 3 notches corresponds to a change from BBB to A. The descriptive statistics in Table 1 suggest that such a ratings change is associated with a corresponding spread reduction on the order of 100 basis points.

The finding that not all firms benefit may also help understand why the existing literature on the growth effects of capital account liberalization has not found the strong effects some have expected: our results show that existing restrictions are not equally binding for all firms, but for those firms for which they are, lifting these restrictions can have substantial benefits—aggregate analyses that, by definition, focus on averages, will therefore not be able to pick up these differences across firms and likely find more limited overall effects.

A few additional comments are in order regarding these results. First, the results may be driven by different initial conditions in NT and tradables firms. For example, if the latter exhibit systematically higher ratings than the former, independent of the capital account regime, then our regressions may not be able to detect a strong increase in tradables firms' ratings following capital account liberalization, simply because they have less room for improvement. We can rule out this possibility: the

[15] While the binary tradable/nontradable classification is an imperfect measure, it is preferable over alternative measures for a number of reasons. We elaborate on these in the robustness section and, importantly, show that using actual export shares leaves the main results intact.

sample properties are almost identical in both sets of firms, and indeed ratings are slightly higher in NT firms with a mean of 13.4, compared to 13.2 in tradables.[16]

Second, while higher credit ratings can both reduce the cost of credit and provide access to a broader investment pool, there may be additional "quantity" effects associated with a more liberal capital account regime unrelated to changes in ratings, simply because a freer capital account may provide firms at any given rating with an increased pool of funds. Presumably, this additional quantity effect benefits equally tradables and NT firms, but in any case, the interpretation we give to our results in this paper focuses only on improved credit access that arises because of a change in ratings.

And third, there is the possibility of selection bias. If capital account liberalization benefits non-tradables firms more than others, then this could provide for an incentive for them to issue foreign currency debt and obtain a foreign credit rating. To the extent that the new firms have different risk characteristics, this could contribute to the estimated positive coefficient of the KA $\times$ NT interaction. To explore whether this potential selection bias is driving our results, we re-estimate our baseline regressions in Table 5 by restricting the sample to only firms that (a) had a credit rating at the beginning of our sample period, and (b) resided in countries that exhibited some change in the degree of capital account liberalization. Although the average effect of capital account liberalization weakens, more importantly, the coefficient on the KA $\times$ NT interaction remains positive and highly significant with a similar magnitude as that in Table 4. Thus, the impact of capital account liberalization on improved foreign-currency credit ratings is equally important for newly rated as for previously rated firms.

At the same time, as new firms start to borrow more heavily in foreign currency following a capital account liberalization, the higher foreign currency exposure may tend to lower these firms' ratings, thus biasing the estimated coefficient towards zero (i.e., working against us). Overall, therefore, we conclude that selection bias is unlikely to be a key driver of our main findings.

4.2. Narrowing down the channels

We further explore the differential effects of capital account openness in column 2 of Table 6, where we break down the capital account variable into two subcomponents, inflow controls and outflow controls. The ability to do so in a panel data set is one of the key novel features of the capital control measures in Schindler (2009).[17] When including the subindices separately in the regression, including their interactions with the NT dummy, the direct effect of capital controls remains highly significant on the inflows side, but disappears on the outflow side. Conversely, no statistically significant difference emerges for firms in the NT sector for inflows, while outflow controls appear to only affect firms in the NT sector.

We interpret this result as providing additional support for our hypothesis. In particular, an important factor in rating agencies' assessments is whether companies have a steady flow of foreign exchange that allows them to service foreign exchange bonds. Thus, the extent to which firms are sheltered against exchange rate fluctuations will matter. For example, in the event of a currency devaluation, companies in the tradables sector still have access to foreign currency through their export proceeds while NT companies would obtain less foreign exchange for any given amount of revenues in domestic currency.

Liberalizing capital outflows would make it easier for NT firms to convert domestic currency into foreign currency, and more generally, being able to invest abroad would enable NT firms to hedge against foreign exchange rate risk as it would allow them to accumulate foreign assets that pay a steady stream of foreign exchange independent of exchange rate fluctuations, and which they can tap into in

[16] In a sense, this is surprising: given the fact that NT firms find it more difficult to borrow in foreign currency, we may expect them to have lower ratings on average. However, precisely because of this, only the relatively stronger NT firms may be able to borrow in foreign currency, which may compensate for their otherwise lower credit rating. While this is speculative, we are less concerned about these possible selection issues in the actual empirical analyses as the various firm-level variables we employ should control for much of the heterogeneity across firms.

[17] To construct these subindices, we broadly follow the approach taken in Schindler (2009) by calculating the unweighted average overall inflow (outflow) related transactions of all asset categories. We exclude the bond category since data on bond restrictions do not exist prior to 1997. This avoids the need to splice the data series in 1997 but does not affect the results.

Table 6
Narrowing down the channels.

	(1)	(2)
EBIT/assets	0.031** (0.013)	0.028** (0.012)
EBIT/interest expense	0.387*** (0.077)	0.392*** (0.078)
Retained earnings/assets	0.029*** (0.004)	0.029*** (0.004)
Working capital/assets	−0.025*** (0.005)	−0.025*** (0.005)
Equity/capital	0.025*** (0.005)	0.026*** (0.005)
Size	0.771*** (0.081)	0.770*** (0.081)
Sovereign credit rating residual	0.499*** (0.044)	0.517*** (0.047)
KA	1.162*** (0.441)	
KA × NT	2.485*** (0.431)	
KA_IN		1.626*** (0.449)
KA_IN × NT		0.24 (0.499)
KA_OUT		−0.33 (0.553)
KA_OUT × NT		2.299*** (0.499)
Observations	2051	2051
R-squared	0.72	0.72

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

the event of a devaluation. Hence, liberalizing outflows should matter more for NT firms, exactly as we find in column 2 of Table 6.[18] By contrast, liberalizing capital inflows will improve credit access for all firms, independent of their export status, and it is not clear why one should benefit more than the other. The positive coefficient on inflows but not on the differential NT interaction in the second column of Table 6 is consistent with this view.

In sum, the results suggest that NT firms benefit from both inflows (better credit access) and outflows (foreign exchange access) while tradables companies benefit predominantly from inflows (better credit access), consistent with a larger overall effect of capital account liberalization for the former, as we found in column 3 of Table 4.

A direct test of our foreign currency channel is possible through a binary variable reported by Chinn and Ito (2007) on the surrender requirements of export proceeds (based on information from the IMF's AREAER). A key link for the identification strategy used in column 3 of Table 4 is the assumption that firms in the tradables sector do in fact have better access to foreign currency through their export activities. If a country requires the surrender of export proceeds, however, exporting firms should be in no better position to access foreign currency than firms that do not export. As a consequence, the differential effect of removing overall capital account restrictions on the different types of firms that we found earlier should disappear in the presence of export surrender requirements.

In Table 7 we test this argument by re-estimating our baseline specification (column 3, Table 4), adding interactions of the key variables with the surrender requirements variable (SURR). The results are reported in column 1 of Table 7. To more easily read these results, we report in Table 8 the total coefficients for each subgroup of interest based on the results from column 1 in Table 7. When no surrender requirements are in place (SURR = 0), we replicate the results from column 3 in Table 4, with the effect of capital account openness statistically larger for firms in the NT sector than others.

Any statistically significant difference between the coefficients disappears, however, when firms are required to surrender their export proceeds (SURR = 1). That is, when export firms are required to surrender their foreign exchange receipts, capital account restrictions matter for them as much as for

[18] By contrast, an exchange rate appreciation would benefit NT firms in terms of foreign currency access. However, what is likely to matter for ratings assessment is the downward risk, that is, the probability of not being able to service debt. Upward risk in foreign currency receipt is less likely to matter for lenders. What matters for the reasoning in the text, however, is the relative importance of export demand risk for tradables firms (following a currency appreciation) and the foreign exchange risk for NT firms (following a currency depreciation). The signs and statistical significance of the results suggest that the latter is economically more important than the former.

Table 7
Foreign currency access and export surrender requirements.

	(1)	(2)	(3)	(4)	(5)
KA	1.284*** (0.457)	1.144** (0.539)	0.74 (0.590)	0.65 (0.646)	3.317** (1.573)
KA × SURR	2.061** (0.881)	2.467*** (0.942)	3.832*** (1.256)		
KA × NT	2.231*** (0.449)	2.232*** (0.448)	2.868*** (0.491)	2.925*** (0.505)	−0.36 (2.345)
KA × SURR × NT	−1.88 (1.524)	−1.85 (1.528)	−4.079* (2.258)		
SURR		−0.28 (0.317)	−1.069* (0.614)		
SURR × NT			1.22 (0.798)		
Observations	2051	2051	2051	1840	211
R-squared	0.72	0.72	0.72	0.7	0.81

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

NT firms. Thus, lifting capital account restrictions results in statistically indistinguishable benefits for both groups of firms. Notably, the differential effect depending on whether surrender requirements are in place derives entirely from tradables firms—as Table 7 shows, the total coefficient for NT firms is not significantly different whether SURR is equal to 1 or to 0. Again, this is according to our hypothesis that NT firms have less access to foreign currency in the first place, hence, whether or not surrender requirements are in place matters little for them.

The results are largely the same in columns 2 and 3 where we separately include SURR and also (in column 3) its interaction with NT. In columns 4 and 5 of Table 7, we report the results from estimating the baseline equation from column 1 separately for the sub samples where SURR = 1 (column 5) and where SURR = 0 (column 4). Once again, firms in the NT sector experience a statistically different benefit from capital account openness only when no surrender requirements are in place. An important caveat is that variation in SURR is limited, with only 211 out of 2051 observations reporting actual surrender requirements in place. Nevertheless, the interactions with SURR represent a direct test of our postulated foreign currency channel, and the results are strong evidence in support of that channel.

The analysis so far leaves open the possibility that the significant interaction effect stands in for other omitted variables. For example, profitability or other business activities of tradable and NT firms are likely to be affected by capital account liberalizations, and possibly so in different ways. We test for this possibility by examining whether the NT dummy picks up the effects of firm-level variables. In Table 9, we augment our baseline regression by interacting also the firm-level variables with the KA variable. The results also show that some other channels may be relevant. For instance, larger firms seem to benefit more from capital account liberalization. But once again, the key coefficient on the KA × NT interaction remains highly significant and on the same order of magnitude in all specifications reported in that table. Thus, while we cannot be sure to have fully eliminated a possible bias from omitted variables, the differential effect of capital account openness on NT firms compared to others appears to be highly robust to controlling for other potential channels.[19]

Overall, the results suggest that liberalizing the capital account is likely to benefit an economy through improved credit access for firms, especially for those in NT sectors. Much of the discussion in the related academic and policy literature, however, has been concerned with the potential vulnerabilities that opening the capital account may bring. Indeed, based on our findings, it is those firms without foreign currency earnings that, following capital account liberalization, obtain the biggest improvement in terms of access to foreign currency borrowing through better ratings. Thus, besides its benefits in terms of improved access to credit, liberalizing the capital account may also result in increased currency mismatch.

[19] As many of the firm-level characteristics are correlated with the business cycle, the inclusion of the various firm-specific variables can also be seen as a proxy for the domestic business cycle. Thus, one interpretation of Table 9. is that business cycle effects do not seem to matter for our key findings.

Table 8
Total coefficients based on column 1, Table 7.

	Tradable	Nontradable	Statistically different?
SURR = 0	1.28	3.52	Yes
SURR = 1	3.35	3.70	No
Statistically different?	Yes	No	

Notes: This table reports the total impact of capital account liberalization on corporate credit ratings for four subgroups of firms, based on whether a firm is in the tradable or a nontradables sector, and whether or not the firm is located in a country where surrender requirements are in place. The table also reports whether the coefficients in a given column/row are statistically different.

How important is this concern? The extent of currency mismatch will depend on the extent to which better access to foreign currency credit actually translates into higher foreign-currency leverage. Some related work suggests such leverage effects may be small: using a similar data set, Ağca et al. (2008) find that capital account liberalization does not appear to increase corporate leverage.[20] Thus, capital account liberalization does not, on average, seem to worsen currency mismatch in the economy. Also, calling for tighter capital controls to prevent risks of mismatch in NT firms would come at the expense of all firms in the economy which, as the coefficient on KA suggests, benefit strongly from capital account liberalization. Thus, while there are risks and benefits of capital account liberalization that policy makers need to balance, the empirical evidence suggests that the risks, at least in terms of increased currency mismatch, appear limited.

5. Robustness

5.1. Alternative measures of nontradability

The binary NT classification used so far is an imperfect measure. Arguably, actual export shares are more direct proxies for firms' access to foreign exchange. For example, the *Global Trade Analysis Project* (GTAP) provides information on sectoral export shares (the GTAP database and documentation is available at https://www.gtap.agecon.purdue.edu/). However, using such data is potentially problematic. The sectoral definitions in the GTAP differ from those in Bloomberg, the source of our firm-level data, and matching the two data sets thus involves a degree of judgment. Using actual export shares may also introduce a bias in the estimated coefficients: for example, the trade literature has shown that exporting firms tend to be more productive than non-exporters (see, e.g., Clerides et al., 1998; Bernard and Jensen, 1999), thus, corporate credit ratings and firms' decisions about how much to export may be jointly driven by the same underlying (unobserved) firm characteristics; export behavior may also respond endogenously to better access to credit, suggesting the possibility of reverse causality. The binary and essentially exogenous (to the individual firm) NT classification we use in our baseline is less vulnerable to these issues.

Nevertheless, with these caveats in mind, we re-estimate our baseline specification using three different versions of actual export share measures. We construct these export shares by matching the sectors as defined in Bloomberg with those in GTAP, and by using one minus the sector's average share of the value of exports to the value of output as our proxy for nontradability. Table 8 reports the previous baseline results (using the NT dummy) in column 1, as well as the results based on three different export shares measures: country-specific sectoral shares (column 2), average sectoral shares across all countries in the sample (column 3) and sectoral export shares based on US data only (column

[20] Ağca et al. (2008) go further and conclude that financial reforms (domestic and external) do not improve credit access. We take the view that a "quantity effect" (or its absence) is not evidence for a lack of improved credit access—even with an unchanged credit volume, lower costs of credit through improved credit ratings make firms better off. Also, better access to credit may also facilitate the entry of new firms, thus increasing overall credit volume, even if not necessarily affecting leverage levels of those firms in the sample. Thus, credit ratings are in our view a more meaningful proxy for firms' credit constraints than quantity measures, such as corporate leverage.

Table 9
Alternative non-linear effects of capital account liberalization.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EBIT/assets	0.033 (0.031)	0.031** (0.013)	0.0378*** (0.013)	0.029** (0.012)	0.033** (0.013)	0.028** (0.013)	0.060 (0.043)
EBIT/interest expense	0.388*** (0.078)	0.373** (0.162)	0.356*** (0.087)	0.401*** (0.077)	0.373*** (0.087)	0.423*** (0.076)	0.675*** (0.217)
Retained earnings/assets	0.029*** (0.004)	0.029*** (0.004)	−0.010 (0.015)	0.028*** (0.004)	0.029*** (0.004)	0.029*** (0.004)	−0.040*** (0.014)
Working capital/assets	−0.025*** (0.005)	−0.025*** (0.005)	−0.024*** (0.005)	0.011 (0.010)	−0.025*** (0.005)	−0.024*** (0.005)	0.035*** (0.011)
Equity/capital	0.025*** (0.006)	0.025*** (0.006)	0.025*** (0.005)	0.026*** (0.005)	0.016 (0.011)	0.024*** (0.006)	0.017 (0.013)
Size	0.771*** (0.081)	0.771*** (0.081)	0.778*** (0.081)	0.772*** (0.082)	0.770*** (0.081)	0.027 (0.202)	0.168 (0.183)
Sovereign credit rating residual	0.499*** (0.044)	0.500*** (0.045)	0.515*** (0.046)	0.473*** (0.045)	0.503*** (0.044)	0.477*** (0.044)	0.458*** (0.045)
KA	1.187** (0.570)	1.076 (1.078)	0.277 (0.622)	1.546*** (0.507)	0.481 (1.008)	−2.117** (1.040)	−0.968 (1.625)
KA × NT	2.481*** (0.439)	2.489*** (0.443)	2.586*** (0.453)	1.987*** (0.523)	2.561*** (0.472)	2.302*** (0.396)	1.659*** (0.465)
KA × EBIT/assets	−0.003 (0.039)						−0.032 (0.052)
KA × EBIT/interest expense		0.016 (0.164)					−0.333 (0.269)
KA × retained earnings/assets			0.049*** (0.018)				0.085*** (0.016)
KA × working capital/assets				−0.046*** (0.016)			−0.073*** (0.015)
KA × equity/capital					0.012 (0.014)		0.010 (0.018)
KA × size						0.964*** (0.236)	0.787*** (0.228)
Observations	2051	2051	2051	2051	2051	2051	2051
R-squared	0.721	0.722	0.725	0.724	0.722	0.729	0.736

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 10
Alternative measures of nontradability.

	(1)	(2)	(3)	(4)
	NT dummy	Export shares		
		Individual	Average	US
EBIT/assets	0.031** (0.013)	0.040*** (0.014)	0.029** (0.014)	0.040*** (0.014)
EBIT/interest expense	0.387*** (0.077)	0.364*** (0.072)	0.402*** (0.073)	0.371*** (0.075)
Retained earnings/assets	0.029*** (0.004)	0.027*** (0.005)	0.026*** (0.005)	0.027*** (0.005)
Working capital/assets	−0.025*** (0.005)	−0.025*** (0.005)	−0.022*** (0.005)	−0.024*** (0.005)
Equity/capital	0.025*** (0.005)	0.025*** (0.005)	0.025*** (0.005)	0.025*** (0.005)
Size	0.771*** (0.081)	0.766*** (0.082)	0.729*** (0.083)	0.752*** (0.084)
Sovereign credit rating residual	0.499*** (0.044)	0.521*** (0.043)	0.519*** (0.043)	0.523*** (0.043)
KA	1.162*** (0.441)	1.959*** (0.429)	−0.11 (0.501)	0.14 (0.862)
KA × nontradability measure	2.485*** (0.431)	0.937*** (0.322)	3.302*** (0.397)	2.756*** (0.785)
Observations	2051	2008	2008	2008
R-squared	0.72	0.72	0.73	0.72

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings and compares different measures of a firm's exposure to external trade: col. 1 uses the nontradables dummy used previously; cols. 2–4 use the share of exports in total sales, based on a firm's individual data, the average but country-specific share in its sector, and the average export share based on US data applied to all countries. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

4). The specification in column 4 is similar to that used by Rajan and Zingales (1998) who used US estimates of sectoral dependence on external finance as a benchmark for all countries in their sample; the specification in column 3 is an intermediate version.

Our main result holds: in each of the specifications in Table 10, the coefficient on the interaction of KA and the nontradability variable is positive, sizeable and highly statistically significant. Thus, liberalizing the capital account benefits disproportionately those firms who export less and who, as a consequence, have less access to foreign currency. The size of the interaction coefficient varies substantially, it being smallest when individual countries' sectoral export shares are used (column 2). This may be a result of the endogeneity bias mentioned earlier; namely, average export shares may be endogenously higher in those countries with more liberalized capital accounts, thus underestimating the effect that capital account liberalization has on firms that export less. Indeed, firms in countries with relatively less restricted capital accounts (averaged over the sample period) export nearly twice as much as those in countries with more restricted capital accounts. More specifically, the (unconditional) mean of the export share is about .13 in countries where the average KA is above its median, compared to about .24 in others. Given that the average or US-based measures are less prone to such endogeneity bias, the estimated interaction coefficients are substantially larger in columns 3 and 4, and on the same order of magnitude as that based on the NT dummy (column 1).

5.2. Direct versus indirect effects of capital controls

In Table 4, we show a significant effect of KA on credit ratings, and particularly so for NT firms, but across specifications, we also find a highly significant effect of sovereign ratings. We interpreted these findings as evidence for independent effects of both sovereign ratings and capital account regulations on firms' credit ratings, but arguably, the fact that we use the sovereign ratings residual, rather than the actual sovereign ratings variable, leaves the results open to alternative interpretations. More specifically, suppose that capital account restrictions have no direct effect on firms' credit ratings and only affect them through sovereign ratings such that

$$\textit{Private Credit Rating}_{ict} = \textit{Constant} + \alpha \cdot \textit{Sovereign Rating}_{ct} + \beta' \cdot \mathbf{X}_{ict} + \varepsilon_{ict}$$

Table 11
The sovereign ratings channel.

	(1)	(2)	(3)	(4)
EBIT/assets	0.031** (0.013)	0.031** (0.013)	0.027** (0.012)	0.024** (0.012)
EBIT/interest expense	0.387*** (0.077)	0.387*** (0.077)	0.393*** (0.077)	0.394*** (0.077)
Retained earnings/assets	0.029*** (0.004)	0.029*** (0.004)	0.029*** (0.004)	0.028*** (0.004)
Working capital/assets	−0.025*** (0.005)	−0.025*** (0.005)	−0.026*** (0.005)	−0.025*** (0.005)
Equity/capital	0.025*** (0.005)	0.025*** (0.005)	0.025*** (0.005)	0.026*** (0.005)
Size	0.771*** (0.081)	0.771*** (0.081)	0.781*** (0.079)	0.777*** (0.081)
Sovereign credit rating residual	0.499*** (0.044)		0.398*** (0.044)	
Sovereign credit rating		0.499*** (0.044)		0.454*** (0.044)
Sovereign credit rating residual × NT			0.208*** (0.044)	
Sovereign credit rating × NT				0.098*** (0.030)
KA	1.162*** (0.441)	−1.237*** (0.454)	1.315*** (0.466)	−0.6 (0.492)
KA × NT	2.485*** (0.431)	2.485*** (0.431)	2.202*** (0.493)	1.419** (0.557)
Observations	2051	2051	2051	2051
R-squared	0.72	0.72	0.73	0.72

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

where, for ease of notation, $\mathbf{X}_{ict}$ now contains all other determinants of private credit ratings (including fixed effects), and

$$Sovereign\ Rating_{ct} = \delta \cdot KA_{ct} + \gamma \cdot Sovereign\ Rating\ Residual_{ct}.$$

Substituting the latter expression into the former implies

$$\begin{aligned} Private\ Credit\ Rating_{ict} &= \alpha \cdot (\delta \cdot KA_{ct} + \gamma \cdot Sovereign\ Rating\ Residual_{ct}) + \beta' \cdot \mathbf{X}_{ict} + \varepsilon_{ict} \\ &= \alpha\delta \cdot KA_{ct} + \alpha\gamma \cdot Sovereign\ Rating\ Residual_{ct} + \beta' \cdot \mathbf{X}_{ict} + \varepsilon_{ict} \\ &= \phi \cdot KA_{ct} + \lambda \cdot Sovereign\ Rating\ Residual_{ct} + \beta' \cdot \mathbf{X}_{ict} + \varepsilon_{ict}. \end{aligned}$$

Thus, it is possible to estimate a significant effect of KA on private credit ratings even if the true effect occurs exclusively through sovereign ratings. This may affect the interpretation of our main results if, for example, firms in NT sectors are more influenced by the sovereign rating than other firms, that is, α is larger for NT firms. This possibility is plausible if domestic macroeconomic conditions are relatively more important for firms in NT sectors, whose private credit ratings would therefore be more strongly influenced by the sovereign rating. If so, our main regressions may simply pick up a stronger dependence of NT firms on the sovereign rating, rather than a stronger direct effect of KA on these firms' ratings.

We address this issue in a number of ways. First, we note that the differential effects we observed across inflow and outflow controls are not easy to explain if the effects work entirely through sovereign ratings. Second, more formally, in Table 11 we replicate our baseline equation (column 1) and also re-estimate it using the "raw" sovereign ratings variable rather than the estimated residual (column 2). As expected from the above equations, the KA coefficients change, but importantly, the non-linearity for NT firms remains. In columns 3 and 4, we additionally allow for a non-linearity in the sovereign ratings themselves. If all effects occurred indirectly through sovereign ratings, the coefficients of KA should become insignificant, both for KA and its interaction with NT, especially in column 4, where we again use the "raw" sovereign ratings variable. The fact that they remain significant suggests that KA affects private credit ratings directly, over and above its indirect effects through sovereign ratings.[21]

[21] Note that because all of the regressors in the first stage also appear in the second stage, the coefficient of sovereign ratings ("raw" or residual) is identical in columns 1 and 2. The equality in coefficients does not apply to columns 3 and 4 because the first-stage regression does not capture the sovereign ratings non-linearity we allow for in the second stage.

Conversely, the fact that the non-linearity for sovereign ratings is also significant indicates that both direct and indirect effects play a role.

However, and most importantly, that both direct and indirect effects may matter does not affect our key message: the finding remains that NT firms are substantially more affected by changes in capital controls than other firms, and whether this effect is direct, or indirect through changes in sovereign ratings, has no bearing on the fact that we have identified a subset of firms for which capital account restrictions have important implications.

5.3. Structural reforms and macroeconomic conditions

We also examine the possibility that the capital account variable may pick up other contemporaneous reform. To some extent, this possibility is limited by the fact that we include the sovereign ratings measure which captures other reforms, as we argued above and as also reported in IMF (2008). However, in Table 12 we report the results from more explicitly testing this possibility by including a number of other reform indicators, such as domestic financial sector reform and trade liberalization indicators, based on a newly constructed IMF database (see IMF, 2008). We add these variables, separately and simultaneously, to our baseline specification, both with and without an interaction with the NT indicator. In each case, we modify the sovereign ratings residual by also including in the first-stage regression the additional reform variable we consider; that is, the sovereign ratings residual is always "purged" of the main reform variables in any given specification.

Remarkably, Table 12 shows that the key coefficient on the interaction of capital account openness and NT remains virtually unchanged and highly significant across all specifications reported in that table. Thus, the differential effect of capital account openness on NT is highly robust and not an artifact from omitting other reform indicators. This result holds whether we only include the direct reform effects, separately or jointly (columns 1–4), or whether we also include, for each reform, an interaction with NT (columns 5–8).

The effects of reforms indicators for domestic financial systems and current account regulations are in the expected direction (positive sign) and (marginally) significant. They do not, however, appear to affect NT firms any differently than other firms. Controlling for domestic financial development is potentially important insofar as one might expect that in countries with better developed domestic financial systems, not being able to tap international financial markets may therefore be less of a constraint. However, the results in Table 12 show that the differential effect on tradables and non-tradables firms remains broadly unchanged even when controlling for domestic financial development (columns 1 and 5), suggesting that being able to access international financial markets appears to be valuable even in countries with well-developed domestic financial markets.[22]

However, the results are substantially different for the trade indicator, which measures the importance of import tariffs. The overall effect is large and negative and highly significant, while that on the NT interaction is positive and significant. A possible explanation for these results is that a reduction in import tariffs (that is, an increase in the trade reform indicator, see Table 3 for a description of the data) is likely to reduce the cost of imported inputs, but it may also increase import competition for firms in the tradables sector, with some of them facing a higher probability of going out of business and becoming unable to service their debt. The estimated coefficients suggest that the negative effects of import tariff reductions dominate, thus resulting in downgrading of corporate ratings on average, perhaps because the focus of rating agencies on credit risk makes them give a greater weight to the higher probability of default of firms negatively affected by trade liberalization than to the higher profitability of those that benefit from it. The positive interaction term confirms the expected smaller negative average effects of trade liberalization on NT firms.[23]

[22] One could also argue that the coefficient of capital account liberalization is itself a function of domestic financial sector development. In work not reported here, we also interacted capital controls, as well as the KA $\times$ NT interaction, with domestic finance, but these were not statistically significant.

[23] However, while the effects are significantly smaller (in absolute terms) for NT firms than for others, the total coefficient remains negative even for NT firms. This is, in itself, a striking result which we consider an area for future research.

Table 12
Alternative structural reforms.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sovereign credit rating residual	0.495*** (0.045)	0.497*** (0.042)	0.492*** (0.046)	0.483*** (0.046)	0.495*** (0.045)	0.500*** (0.043)	0.492*** (0.046)	0.486*** (0.046)
KA	0.875* (0.502)	1.014** (0.419)	0.359 (0.661)	−0.009 (0.714)	0.779 (0.527)	1.599*** (0.488)	0.501 (0.700)	0.685 (0.799)
KA × NT	2.517*** (0.432)	2.541*** (0.428)	2.893*** (0.425)	2.959*** (0.422)	2.667*** (0.463)	1.573*** (0.547)	2.630*** (0.519)	1.743*** (0.576)
Domestic finance	2.565* (1.463)			0.721 (2.012)	2.859* (1.565)			1.495 (2.113)
Trade		−11.316*** (2.973)		−11.298*** (3.954)		−13.097*** (3.102)		−12.814*** (4.084)
Current account			2.056* (1.091)	2.541** (1.035)			1.704 (1.210)	1.794 (1.247)
Domestic finance × NT					−0.521 (0.870)			−1.383 (1.102)
Trade × NT						4.062*** (1.420)		4.042*** (1.418)
Current account × NT							0.655 (1.016)	1.356 (1.381)
Observations	2051	2051	2018	2018	2051	2051	2018	2018
R-squared	0.723	0.723	0.724	0.726	0.723	0.724	0.725	0.727

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 13
Alternative macroeconomic control variables.

	(1)	(2)	(3)	(4)	(5)	(6)
EBIT/assets	0.031** (0.013)	0.031** (0.013)	0.031** (0.013)	0.031** (0.013)	0.031** (0.013)	0.031** (0.013)
EBIT/interest expense	0.387*** (0.076)	0.387*** (0.077)	0.402*** (0.080)	0.386*** (0.077)	0.381*** (0.076)	0.397*** (0.079)
Retained earnings/assets	0.029*** (0.004)	0.029*** (0.004)	0.028*** (0.004)	0.029*** (0.004)	0.029*** (0.004)	0.029*** (0.004)
Working capital/assets	−0.025*** (0.005)	−0.025*** (0.005)	−0.025*** (0.005)	−0.025*** (0.005)	−0.025*** (0.005)	−0.025*** (0.005)
Equity/capital	0.025*** (0.005)	0.025*** (0.005)	0.025*** (0.006)	0.025*** (0.005)	0.025*** (0.006)	0.025*** (0.006)
Size	0.771*** (0.081)	0.771*** (0.081)	0.785*** (0.081)	0.771*** (0.082)	0.775*** (0.082)	0.787*** (0.081)
Sovereign credit rating residual	0.499*** (0.044)	0.503*** (0.050)	0.481*** (0.047)	0.497*** (0.047)	0.470*** (0.043)	0.465*** (0.055)
KA	1.162*** (0.441)	1.170*** (0.438)	0.990** (0.451)	1.146** (0.447)	0.593 (0.514)	0.528 (0.515)
KA × NT	2.485*** (0.431)	2.489*** (0.433)	2.725*** (0.432)	2.485*** (0.431)	2.509*** (0.429)	2.760*** (0.432)
GDP growth	0.000 (0.007)					0.002 (0.007)
GDP per capita		−0.163 (0.712)				−0.376 (0.780)
GDP volatility			−0.016 (0.015)			−0.031 (0.020)
Current account balance				−0.005 (0.023)		0.046 (0.029)
Inflation					−0.047*** (0.013)	−0.053*** (0.012)
Observations	2051	2051	2023	2048	2051	2020
R-squared	0.722	0.722	0.725	0.722	0.724	0.727

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 14
Alternative capital account measures.

	(1)	(2)	(3)	(4)	(5)
	KA	KAOPEN	CAP100	CAP	INTLCAPITAL
EBIT/assets	0.031** (0.013)	0.032** (0.012)	0.032** (0.012)	0.040*** (0.013)	0.036*** (0.013)
EBIT/interest expense	0.387*** (0.077)	0.393*** (0.076)	0.391*** (0.076)	0.371*** (0.072)	0.377*** (0.072)
Retained earnings/assets	0.029*** (0.004)	0.029*** (0.004)	0.029*** (0.004)	0.029*** (0.005)	0.029*** (0.004)
Working capital/assets	−0.025*** (0.005)	−0.025*** (0.005)	−0.026*** (0.005)	−0.025*** (0.005)	−0.026*** (0.005)
Equity/capital	0.025*** (0.005)	0.024*** (0.005)	0.024*** (0.005)	0.024*** (0.005)	0.024*** (0.005)
Size	0.771*** (0.081)	0.782*** (0.081)	0.767*** (0.082)	0.771*** (0.081)	0.764*** (0.081)
Sovereign credit rating residual	0.499*** (0.044)	0.491*** (0.041)	0.494*** (0.043)	0.516*** (0.040)	0.505*** (0.044)
Capital account measure	1.162*** (0.441)	0.842** (0.366)	2.121*** (0.541)	0.809*** (0.252)	0.014 (0.677)
Capital account measure × NT	2.485*** (0.431)	2.307*** (0.415)	2.753*** (0.567)	0.528** (0.241)	2.200*** (0.782)
Observations	2051	2063	2067	2067	2067
R-squared	0.722	0.724	0.721	0.719	0.719

Notes: This table reports estimates from a panel regression of S&P foreign-currency corporate credit ratings using alternative capital account measures (see text for descriptions). Were applicable, the capital account measure was rescaled to the [0,1] interval and inverted so that a score of 1 implies an unrestricted capital account. The panel data set covers the period 1995–2004. All regressions include industry, country, and time-fixed effects. Standard errors clustered at the country-year level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Related to this, we also explored specifications where macroeconomic conditions are included. As with structural reforms, broad macroeconomic conditions are likely to be already reflected in the sovereign ratings measure, but a single measure cannot, of course, capture all dimensions of macroeconomic outcomes. Nevertheless, as we show in Table 13, results are robust and broadly unchanged when we include macroeconomic variables directly, rather than proxied by sovereign ratings.

5.4. Capital controls measures and other robustness checks

Of key importance in this paper is our measure of capital account restrictiveness. We focus on the novel data set in Schindler (2009) because unlike other indices, it allows for distinguishing between inflow and outflow controls, a dimension that is important for understanding the channel through which capital controls affect firms' credit conditions, and because it is finely gradated, providing sufficient variation to distinguish between cases with few and those with many restrictions. The novelty of the index itself, however, may raise concerns over the extent to which results are driven by measurement. Although Schindler (2009) shows that the aggregated version of this index is highly correlated with most other existing financial integration measures, we examine the issue directly by re-estimating our baseline specification (column 3 in Table 4) for a variety of alternative indices.

Specifically, we consider the measures by Quinn (1997) (updated through 2004; see IMF, 2008) (CAP100); a simply binary dummy that has been used in many capital account related studies (CAP) and which has been made available by Mody and Murshid (2005) and Chinn and Ito (2007); the index KAOPEN by Chinn and Ito (2007), which is a summary measure of CAP and other variables related to a country's financial openness; and, finally, the index INTLCAPITAL, a subcomponent of the financial reform database in Abiad et al. (2008) covering exchange rate unification and restrictions on cross-border borrowing by banks. As documented in Table 14, none of these alternative specifications alter our key findings—namely, in each case, all firms benefit from capital account liberalization (although not always significantly so), but NT firms always benefit substantially and significantly more.[24]

6. Conclusions

In this paper, we have examined a novel channel through which capital account liberalization impacts an economy. In particular, we have found a strong positive effect of capital account liberalization on firms' ability to raise funds in international credit markets. This channel operates through firms' access to foreign currency, which is necessary for issuing foreign-currency-denominated bonds. To test the importance of this channel, we exploited differences in the extent to which firms are actually constrained by capital account restrictions. In particular, we argued that firms in the tradables sector have potential access to foreign currency through their export earnings, independent of capital account restrictiveness, and are thus less constrained by such restrictions.

Using firm-level data, we found that for firms without alternative access to foreign currency, capital account restrictions have significantly larger effects than for other firms, substantially increasing their cost of, and thus reducing their access to, capital in international credit markets. Thus, our results add to the large literature on the effects of capital account liberalization by providing strong evidence for a specific, and novel channel through which the effects of capital controls may materialize. Isolating this channel using firm-level data, we find that capital account restrictions are costly for an economy, and the heterogeneous impact on different subsets of economic agents helps better understand the more mixed evidence that has emerged from the literature based on aggregate data.

At the same time, it is important to recognize that we have examined only one area where capital account restrictions may matter, that is, firms' ability and cost of issuing foreign currency debt. While this is an important area, it is only one of the many channels through which capital account restrictions may affect economic activity. Also, we have not examined the extent to which changes in corporate

[24] In other robustness analyses not reported here, we also explored the use of lagged control variables, which did not alter the findings.

credit ratings affect aggregate outcomes such as growth or investment. It is likely that the effects are large—credit ratings are important determinants of access to and cost of credit, and thus are likely to affect investment decisions and, ultimately, firms' profitability and aggregate growth outcomes.

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