Borrowing Constraints in Emerging Markets

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Abstract

Most macro-finance analysis of Emerging Markets economies assume that firms' access to debt is constrained by the value of their collateral. Using credit-registry data and exploiting banking regulations from Argentina for the period 1998-2020 we show that less than 10% of firms' debt is based on asset values, with the remaining 90% based on firms' cash-flows. Exploiting Central Bank regulations over banks' capital requirements and credit policy we show argue that the most prevalent borrowing constraints restrict firms' debt interest payments as a function of firm cash flows, or "interest coverage" constraints. We construct a small open economy DSGE model and show that interest coverage constraints lead to stronger amplifications of foreign interest rates into firm's debt and output compared to the standard collateral constraints. First, this greater amplification provides a solution to the Spillover-Puzzle of US interest rates by which Emerging Market economies experience greater negative effects than Advanced Economies. Second, in terms of policy, a managed exchange rate policy is more costly in the presence of cash-flow based constraints, given their greater interest rate sensitivity, compared to the standard collateral borrowing constraint.

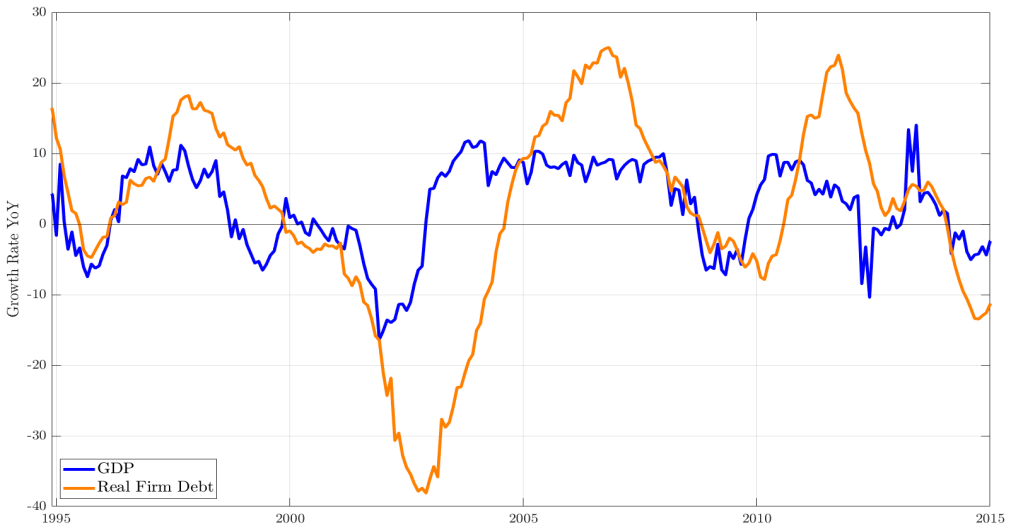
Keywords: Borrowing constraints; firm-dynamics; credit crunch; micro-to-macro; collateral constraints; foreign interest rate shocks; open economy monetary policy.

JEL codes: F34, E44, G12, G15

1 Introduction

Firms' borrowing constraints play a crucial role in international macroeconomics and finance (Kiyotaki and Moore [1997], Bernanke et al. [1999]). These borrowing constraints introduce a feedback loop between a firm's access to debt financing and economic activity, amplifying the impact of economic shocks. The great importance of these borrowing constraints leads to a crucial empirical question: What determines a firm's debt limit? The benchmark assumption in international macroeconomics is that a firm's access to debt is limited by the re-sale value of their assets, i.e., firms borrow primarily collateral-based debt (Mendoza [2010], Christiano et al. [2011]). This type of borrowing constraint is the solution to a particular limited commitment problem (Townsend [1979], Hart and Moore [1994], Bernanke et al. [1999]). However, in the presence of imperfect information and adverse selection borrowing capacity depends on a firm's cash-flow from operations (Stiglitz and Weiss [1981], Holmstrom and Tirole [1997]). In this article, we exploit the universe of firm-bank credit registry data and of corporate-loans from Argentina to empirically investigate the main determinants of firm's borrowing constraints. Furthermore, we ask what are the implications of these different borrowing constraints for the amplifications of economic shocks and for policy analysis.

Figure 1: Dynamics of GDP & Firm Debt



Note: The figure presents the dynamics of real GDP and real firm debt for the period 1995-2015 at the monthly frequency. Variables are plotted using the year-on-year growth rate.

First, we exploit the universe of firm-bank credit registry data from Argentina for the period 1998-2020 to document the central role of firm's cash-flows, not the liquidation value of collateral, in determining firm's access to bank debt. At the aggregate level, only 15% of bank debt is based on the specific value of physical or financial assets. In the finance literature, this type of debt is commonly referred as collateral-based lending, as the liquidation value of these assets are the key determinant of banks' payoffs in case of bankruptcy. This implies that 85% of aggregate bank debt is not backed by assets and is based on the value of cash flows

from firms' continuing operations, commonly referred as cash-flow based lending. We show that banks, through specific regulations imposed by the Central Bank, carry-out frequent monitoring of firms' cash-flows to assess a firm's default-risk. Additionally, we argue that Argentina's bankruptcy law provides an explicit framework for debt re-negotiation based on firm's cash-flows. At the firm level, we show that the mean and median share of cash-flow based debt is 90% and 100% respectively. Overall, the composition of bank and corporate debt suggests that the liquidation value of assets may not be the key determinant of firms' borrowing constraints in Emerging Markets.

Second, given the vast majority of cash-flow based lending, we study the form of borrowing constraints. Exploiting Central Bank regulations and hundreds of detailed corporate-loans we show a broad prevalence of interest sensitive borrowing constraints. On the one hand, borrowing constraints are set such that they cap the ratio of a firm's interest payments to its cash-flow, which the literature has denoted "*interest-coverage*" borrowing constraints (Greenwald et al. [2019]). On the other hand, a large share of firms' debt is explained by factoring, a practice through which firms can borrow based on the discounted value of their future cash-flows. The key characteristic of these borrowing constraints is their high sensitivity to interest rates, so that a 100 basis point increase leads to a reduces the borrowing capacity of a firm with a binding borrowing constraint by 5% and 20%. Additionally, we show that our data for Argentina shows a greater prevalence of interest sensitive borrowing constraints than that present in a recent literature for US firms.

Third, we build on our novel stylized facts by carrying out a structural analysis to study the implications of cash-flow based lending. We begin by introducing cash-flow based borrowing constraints into an otherwise standard Small Open Economy New Keynesian model with financial frictions. We focus our attention in studying the transmission of foreign interest rate shocks, a widely studied economic shock and key driver of business cycles in Emerging Markets (Garcia-Cicco et al. [2010], Camara [2021]). This model leads to two key novel findings: (i) "*interest-coverage*" borrowing constraints lead to orders of magnitude greater amplification in GDP and borrowing than the benchmark collateral based borrowing constraint; (ii) "*interest-coverage*" borrowing constraints lead to a greater share of the economic downturn explained by a drop in aggregate investment than the benchmark collateral based borrowing constraint, a fact emerging from a recent empirical literature (Camara et al. [2021], Camara [2021], Camara and Ramirez-Venegas [2022]).

Forth, we construct a quantitative version of our model and study three main applications. The key ingredient of this augmented model is that firms simultaneously face different borrowing constraints. We begin by showing that, in response to a foreign interest rate shock, an economy with a greater share of cash-flow based borrowing constraints, such as we show is the case for Emerging Markets, experience greater amplification than an economy which exhibits a prevalence of collateral-based borrowing constraints, such as Advanced Economies. This provides a solution to the *Spillover-puzzle*, the empirical finding that Emerging Markets experience greater spillovers from US interest rates than Advanced Economies. Second, the introduction of

simultaneous borrowing constraints leads to "*interest-coverage*" constraints being particularly binding during periods or in economies with high-interest rates. This time-varying tightness of the "*interest-coverage* borrowing constraint introduces a state-dependence in the transmission of US interest rate shocks, explaining the greater impact of US interest rates on countries with higher domestic rates and/or higher EMBI spreads (even when solely focusing on Emerging Market). Our last applications studies the importance of firms' heterogeneity in the currency of their cash-flow and of their debt. We show that, in response to a foreign interest rate shock, firms with significant streams of foreign currency cash-flow exhibit smaller negative effects than firms with only domestic currency cash-flows. At the aggregate level, the impact of foreign interest rate shocks is greater when the share of firms with foreign currency cash-flows is small.

Lastly, we study the policy implications of cash-flow based borrowing constraints. In particular, we study the benefits and costs of managed exchange rate regimes in the presence of cash-flow based and collateral-based borrowing constraints. We show that the presence of interest rate sensitive borrowing constraints increases significantly the cost of managed exchange rate regimes that rely in the domestic monetary policy rate, compared to an economy with a standard collateral-based constraint. By responding to a foreign interest rate shock with a domestic interest rate hike, the Central Bank leads to tighter interest coverage constraints, amplifying the negative effects of the original shock. We show that this amplification does not occur under the benchmark collateral-based borrowing constraint. The greater negative effects generated by the presence of "*interest-coverage*" constraints motivates the introduction of foreign exchange interventions, an experiment left for future research (Camara et al. [2021]).

Structure of the paper. Section 2 describes our credit registry data set and documents the prevalence of cash flow based lending among Argentinean firms. Section 3 exploits BCRA regulations and evidence from corporate loans and argues that the most common borrowing constraint firms face is one which relates interest payments to cash flows, commonly referred to as "interest coverage" constraint. Section 4 shows than in a simple real model of small open economy an interest coverage cash flow constraints leads to significantly greater amplification than a collateral based constraint in response to a foreign interest rate shock. Section 5 documents the "Spillover Puzzle" of US monetary policy and provides a solution exploiting differences in borrowing constraints across countries. Lastly, Section 6 concludes.

2 Prevalence of Cash-Flow Based Lending

In this section of the paper we present our first novel stylized fact, the prevalence of cash flow based lending among Argentinean firms. In Section 2.1 we describe the core definitions of asset and cash flow based lending, we explain the key financial and bankruptcy regulations in place and briefly cover our classification procedure. In Section 2.2 we report our main results. In Section 2.3 we provide supporting of our main results by studying the prevalence of cash flow based lending across firm and credit line characteristics. In Section 2.4 we compare our results

with evidence from US firms and argue that our results for Argentina may be extrapolated to other Emerging Market economies.

2.1 Collateral Based vs Cash-Flow Based Lending

The essence of collateral based versus cash flow based firm lending is debt that is issued against the liquidation value of specific (mostly physical) assets versus debt that is issued against the present and future cash-flow from the firm's continuing operations. The different types of backing of firm lending is central for credit-scoring and bank lending in practice. Furthermore, as argued by Lian and Ma [2021], we show that these backings map closely to modelling strategies by the macro-finance literature.

We follow Lian and Ma [2021] and classify collateral based and cash flow based debt contracts across four main aspects: (i) general definition, in which we exploit whether or not debt-contracts have an associated underlying asset as collateral in case of default, (ii) BCRA regulations on banks' credit policy and monitoring role, (iii) debt structure (type of credit lines) and, iv) default resolution.[1] In Appendix E.2 we describe in detail our classification procedure and provides insights and examples. We also provide evidence that allows us to generalize our results to different Emerging Market economies.

Collateral based lending:

(i) General definition: Collateral based lending debt contracts are based on the liquidation value of specific assets which include real estate, machinery, equipment, agricultural land, cattle, account receivables by large firms and even sophisticated financial assets. The banks' payoffs in case of default are driven by the liquidation value of these assets.

(ii) BCRA regulations: The central bank establishes specific regulations on these type of debt-contracts such as imposing upper bounds on how much firms can borrow according to the different types of assets which can be used as collateral (see Table 25 in Appendix E.2), suggesting guidelines on the type of assets which can serve as collateral, and requiring the registry of the asset in different government agencies. The registration of assets used as collateral serves for two distinct reasons. First, the fact these assets are associated to a specific debt-contract and that these tag is public information allows other potential creditors to assess the debtor's credit-worthiness. Second, it allows for certain asset standardization which would increase the assets value in case of default.[2] Lastly, BCRA regulations

[1] Note that the three main aspects used in this paper do not coincide directly with the aspects considered by Lian and Ma [2021]. For instance, the BCRA's "*Central de Deudores*" credit-registry data requires banks to identify which debt-contracts have an associated asset as collateral. Furthermore, exploiting the type of credit line and additional data from the credit-registry data we are able to narrow down on the type of asset associated with the debt-contract.

[2] For instance, in Appendix E.2 we show that machinery used for agriculture and fishery must be registered in detail at different sector-specific governmental agencies. This registration allows banks to better assess the

state that for the case of collateral-based lending, banks are not obliged to assess debtor's repayment capacity nor assess their probability of default using any measure of projected earnings and/or cash-flows.

(iii) Debt structure: Exploiting the different type of credit-lines, collateral based debt contracts are usually associated with credit lines specific to the purchase real estate, machinery and/or equipment, and those associated with financial leasing.[3]

(iv) Default resolution: Creditors have claims against the liquidation value of the specific asset which is associated with the collateral-based debt-contract. In case of default, creditors of collateral-based lending have the highest priority over the associated collateral.[4] However, as is the case for the bankruptcy law of the US, creditors of collateral-based debt contracts cannot seize these assets and interrupt a firms productive process, and must wait for any formal debt renegotiation process ("Concurso de acreedores" or "Proceso Preventivo de Crisis") between the firm and cash-flow based debt creditors to take place. Furthermore, creditors of collateral-based debt contracts have no formal say or vote on these debt negotiations.[5]

Cash flow based lending:

(i) General definition: cash-flow based debt contracts are based on the current and projected value of cash-flows from a firms' continuing productive and commercial operations (i.e. going-concern value Djankov et al. [2008]). Consequently, debt-contracts and any constraint on the amount borrowed is established as a function of firms' ability to generate sufficient cash-flows to pay back capital and interests. In the case of a breach in the contract and a debt renegotiation taking place, the restructured debt will reflect the adjusted cash flows of the continuing operations of the firm.

(ii) BCRA regulations: The central bank regulations clearly stipulate that debt-contracts not backed by assets must be based on debtors current and projected cash-flows.[6] Furthermore, regulations impose that banks' assessment over repayment capacity must not involve the value of any of the debtor's assets. Apart from regulations over banks' credit policy and risk-assessment, the central bank regulations impose banks with a monitoring role over debtors, requiring them to scrutinize debtors' cash-flows at a high frequency and report immediately any breach of contract or unexpected change in repayment capacity.[7] For

underlying value of assets in the case of default. We later argue that these asset standardization and registration leads to certain sectors having a greater share of collateral-based debt contracts than others.

[3]Financial leasing credit lines are debt contracts through which a bank acquires a productive asset, which has previously been selected by the tenant, and delivers it to the latter for use in exchange for a fee.

[4]See http://servicios.infoleg.gob.ar/infolegInternet/anexos/25000-29999/25379/texact.htm for the full text of the bankruptcy law of Argentina.

[5]We discuss in detail the different type of debt-renegotiation processes in

[6]In Section 3 and in Appendix E.2 we describe in detail the different set of BCRA's regulations which sharply describe the monitoring role of banks over firms performance and risk of default based on firms' cash flows.

[7]In Appendix E.1 discusses the regulations which describe banks' monitoring role over firms.

instance, any breach of a debt-contract is reported to the BCRA's "Central de Deudores" and is public information.

(iii) Debt structure: Exploiting the different type of credit-lines, cash-flow based debt contracts are usually associated with short-term credit lines, discounted documents over potential future cash-flows, un-collateralized debt and the financing of international trade transactions. As argued in Section 2.4, these type of credit lines are associated with shorter maturities than credit lines generally associated with collateral-based debt contracts. Also, corporate bonds and corporate loans (usually referred to as "Obligaciones Negociables") are also written primarily in terms of cash-flow based metrics such as ratios of interest payments to cash flows, instead of being determined by the liquidation value of assets.[8]

(iv) Default resolution: Creditors of cash flow based debt contracts have claims against the value of a firm. These creditors play a crucial role in firms debt renegotiation processes such as "Concurso de Acreedores", where they are senior creditors and vote on any restructuring plan proposed by the debtor. In case the debt renegotiation fails (either because of no agreement or the debtor not being able to meet the restructured debt payments),

Classification procedures. Our credit registry data set allows us to directly observe credit lines which have an underlying asset serving as collateral. Thus, we classify these credit lines directly as collateral based. In Section 3 and in Appendix E.2 we describe in greater detail the regulations imposed by BCRA on banks which shape collateral based lending. We classify the credit lines in our data set which do not have an asset as underlying collateral as cash flow based lending. In Section 3 and Appendixes E.2 and E.1 we describe in greater detail the BCRA regulations which define banks' lending policy as a function of firms' cash flows.

2.2 Main Results

Next, we present our first novel stylized fact: the prevalence of cash flow based lending at both the aggregate and firm level in Argentina.

Aggregate level results. Table 1 presents the results of our first novel stylized fact regarding the decomposition of debt contracts between collateral-based and cash flow based bank debt. The first column shows that only 16% of total bank debt in Argentina is collateral-based, while close to 84% of it is cash flow based. The second column shows the prevalence of cash-flow based debt is slightly greater when focusing only on firms' debt with collateral based lending explaining close to 15% of aggregate firms' debt and cash flow based lending explaining the remaining 85%.[9]

[8] In Section 3 we describe in detail the debt limits in corporate loans known as "Obligaciones Negociables".

[9] In order to differentiate between firms and professional individuals we exploit the two first digits of their tax identification number of "CUIT". The CUIT number is granted by the AFIP ("Administracin Federal de Ingresos Pblicos") and is made up of 2 digits that indicate the type, 8 digits that are the document number and a last number randomly assigned. We classify as firms observations with first two digits of the CUIT with 30 or higher.

Table 1: Composition of Argentinean Firm's Debt
Collateral vs Cash Flow Based

	Share of Debt in %			
	Total	Firms	$L \geq 100$	$L \geq 500$
Category	(1)	(2)	(3)	(4)
Collateral Based Lending	16.12%	15.24%	12.94%	8.75%
Cash Flow Based Lending	83.88%	84.76%	88.06%	91.25%

Note: This table summarizes the composition of the universe of firm-bank debt from Argentina. The data presented is for the year 2017. The choice reflects the composition by the end of our sample where we have significant complementary firm information. We avoid using data from years 2019 and 2020 so that the information is not distorted by the sovereign and financial crisis which started in March 2018 and the impact of the COVID-19 pandemic. Government loans are not accounted in either category.

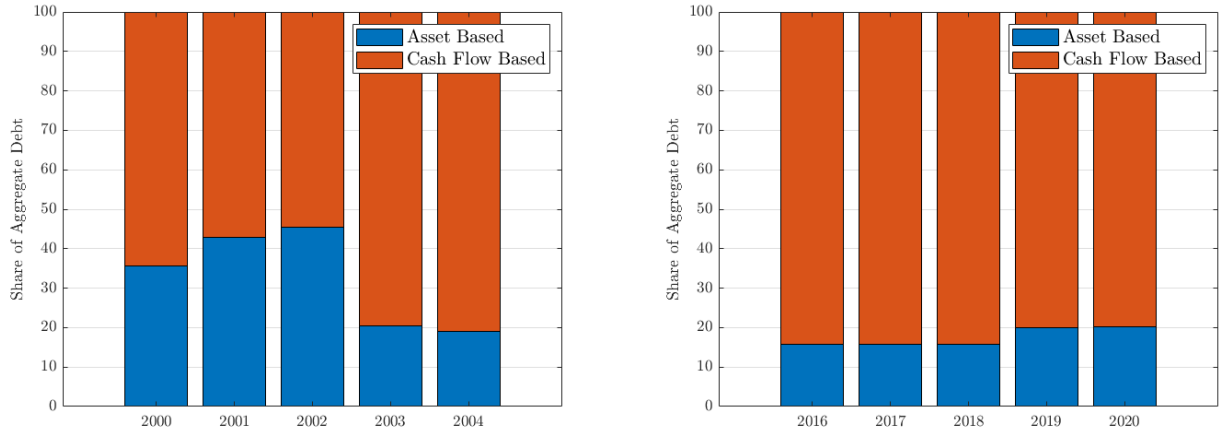
Finally, columns three and four show the decomposition of aggregate firms' debt for firms with employment levels above 100 and 500 workers respectively, with cash-flow based debt explaining between 88% and 91% of total firm debt. Consequently, by studying the aggregate composition of bank-debt it is clear that cash flow based debt explains the vast majority of total bank-debt.

Figure 2 describes the historical evolution of the decomposition of bank-debt contracts between cash flow based and collateral based lending. In particular, Figure 2a presents the decomposition around the 2002 Argentinean financial crisis, while Figure 2b presents the dynamics around the 2018 Argentinean financial crises. This event study windows around financial crisis is motivated by the empirical analysis carried out in Section 3.3. The share of cash flow based debt increased from an average close to 70% in the early 2000s to more than 80% by the end of the 2010s. This increase in the share of cash flow based debt is in line with dynamics of corporate firms in the US in the last two decades, as shown by Lian and Ma [2021] and Bianchi-Vimercati [2021].

Firm level results. Next, we turn to analyzing the prevalence of cash-flow based debt contracts at the firm level. Table 2 presents evidence on the share of firms which have cash flow based debt contracts their relative importance as a share of their total debt. The first row shows the share of firms which only have cash-flow based debt contracts. This row's first entry shows that close to 81% of private agents in our sample have 100% of their debt explained by cash-flow based debt contracts. The first row entry of Columns (2) show that 80% of firms have the totality of their debt in cash-flow based debt contracts, while Columns (3) and (4) show that this share increases to 85% and close to 88% for firms with a labor force above 100 and 500 workers, respectively. Cash-flow based debt contracts explain the vast majority of firms' debt. The second and third rows of Table 2 show that the unconditional median and mean shares of cash-flow based debt in total debt is 100% and 89% for all the observations in our sample. Columns (2) through (4) shows that the median share of cash flow based debt is 100% for all firms and even within firms with a workforce above 100 or 500, while the mean share is 89.5% for all firms and 91.6% and

Figure 2: Share of Asset & Cash Flow Based Lending

Comparison around Sovereign Default Crises



(a) Around 2002 Financial Crisis

(b) Around 2018 Financial Crisis

Note: Both figures present a decomposition of aggregate debt into cash-flow based debt (in red) and collateral based debt (in blue). Figure 2a presents the results around the 2002 financial crisis with a plus minus two year window. Figure 2b presents the results around the 2018 financial crisis with a plus minus two year window.

92.4% for firms with a workforce above 100 or above 500, respectively. Lastly, the bottom row of Table 2 shows that the mean share of cash-flow based debt for observations with a positive amount of collateral-based debt is 44%. For the case of firms, this conditional mean share is 48% for all firms, and 43% and 37% for firms with a workforce above 100 and above 500 workers, respectively.

Evidence from corporate bonds. Corporate bonds explain only a relatively small share of total financing in Argentina and have only recently gained importance in Emerging Markets (see Chang et al. [2017]). While the market for corporate loans is small (in terms of GDP and in terms of total financing) and heavily skewed toward relatively large firms, it provides publicly available documents on firms debt contracts.

We focus on corporate loans known as "Obligaciones Negociables" or ON. The ONs are fixed-income corporate loans in domestic and foreign currency listed on the Buenos Aires Stock Exchange. The issuance of these corporate bonds are carried out by investment banks in association with commercial banks which carry out the auction.[10] These corporate bonds are rated by international rating agencies, such as Fitch or Moody's, and must comply with the scrutiny of the "Comisión Nacional de Valores" (CNV) which is the Argentinean counterpart of the US' SEC.

[10]Usually these auction is carried out sequentially, with a first auction to "competitive investors", such as other investment and commercial banks, and a later auction to "non-competitive investors" which comprises all other potential investors.

Table 2: Composition of Argentinean Firm's Debt
Collateral vs Cash Flow Based

	Total	Firms	$L \geq 100$	$L \geq 500$
	(1)	(2)	(3)	(4)
I. Share of Firms with only cash flow based Debt	80.92%	79.86%	85.14%	87.85%
II. Median Share of cash flow based Debt (*unconditional*)	100%	100%	100%	100%
III. Mean Share of cash flow based Debt (*unconditional*)	89.34%	89.53%	91.58%	92.37%
IV. Mean Share of cash flow based Debt (*conditional*)	44.13%	48.02%	43.32%	37.23%

Note: This table summarizes the composition of the universe of firm-bank debt from Argentina. The data presented is for the year 2017. In the second row, the "Mean Share of cash flow based Debt (*unconditional*)" represents the average or mean share of firms' debt that is categorized as "cash flow based" debt across all firms. In the third row, the "Mean Share of cash flow based Debt (*conditional*)" represents the average or mean share of firms' debt that is categorized as "cash flow based" debt across firms which have a positive percentage of their debt as capital-based.

We hand collected the information on all of the "Obligaciones Negociables" currently listed on "*Bolsas y Mercados Argentinos*" or BYMA. BYMA is a stock exchange that integrates and represents the main players in the Argentina's stock market. In order to address the needs of a new capital market provided for by the Law 26,831, the Buenos Aires Stock Market S.A. implemented a reorganization under the terms of Article 77 of the Income Tax Law, proceeding with the partial spin-off of its assets to create a new entity: "Bolsas y Mercados Argentinos S.A." "BYMA", resulting in this being the continuation of the activity of the Buenos Aires Stock Market S.A., with the particularity that in the constitution of the new entity the Buenos Aires Stock Exchange has been incorporated as a shareholder.

These corporate loans are mostly unsecured debt, with debt re-negotiation triggered by creditors through different clauses in the contracts. While we present in detail the different types of technical default events or triggers of contract breaches and debt re-negotiations in Section 3, Table 3 shows the aggregate composition of debt between asset and cash flow based debt. In line with the results presented above for bank debt contracts, almost the entirety of corporate debt loans are cash-flow based with only 1.27% of total debt backed by the value of an asset. This results holds when removing state owned firms from our sample (see Column (2)), and when considering only local currency denominated bonds (see Column (3) under "LC"), or when considering only dollar denominated bonds (see Column (4) under "Dollar").

The prevalence of cash-flow based over collateral-based debt has deep implications for the analysis of transmission channels and sources of amplifications of financial crises. First, the fact that physical assets, such as real estate and machinery, are not heavily used as collateral for debt-contracts suggest that amplification effects through debt-deflationary spirals à la Fisher in which borrowing constraints become tighter due to reductions in the price of collateral may not play a predominant role during episodes of financial crises as hypothesized by Mendoza [2010]. In

Table 3: Collateral vs Cash Flow Based: "*Obligaciones Negociables*"

Category	Total	Without State Owned	LC	Dollar
Collateral Based in %	1.27	1.45	0.74	4.46
Cash Flow Based in %	98.73	98.55	99.26	95.54
Total Debt Value (in millions of USD)	$63,235	$55,041	$54,265	$8,970
Share of Total ONs in %	100.00	87.04	85.82	14.18

Note: This table summarizes the composition of the corporate debt market of "*Obligaciones Negociables*". The data is sourced for the period August-2022 and reflects all listed bonds at BYMA. The second column removes the partially stated owned firm YPF S.A., which issued ONs during the government's nationalization of the company in 2014.

addition, the fact that financial assets are rarely used as collateral for firms' bank debt provides evidence that the amplification effect of financial crises through a *fire-sale* of assets such as proposed by Shleifer and Vishny [2011] and empirically studied by Duarte and Eisenbach [2021] should not play a significant role in constraining firms' access to credit. This is supported by the lack of an opaque shadow-banking sector in Emerging Markets such as Argentina.[11]

2.3 Heterogeneity across Credit Lines & Firm Characteristics

We complement our previous aggregate and firm level analysis by studying the prevalence of cash flow based lending across different types of credit lines and across different firm characteristics. We argue that these results validate our findings in Section 2.2.

Results by type of credit line. We begin by studying the relative importance of asset and cash flow based lending across the different types of credit lines in our dataset. Our credit-registry dataset presents detailed information over the different type of debt contracts firms and banks can agree to, with the characteristics of these debt contracts being specified by the Central Bank.[12]

Table 4 presents the share of cash flow based lending across the different type of credit lines for the years 2000 and 2017. The first takeaway from Table 4 is that credit lines associated with the purchase of real estate or the purchase of capital goods have the highest share of collateral based debt contracts for both the years 2000 and 2017. For instance, in the year 2017, less than 5% of "Automotive loans" where cash-flow based. This is in line with results presented by Lian and Ma [2021] for US firms. Similarly, the second takeaway from Table 4 is that credit lines which are associated with financing working capital needs, such as "Short term credit lines"

[11] For details on the study of shadow-banking in Emerging Markets see Ghosh et al. [2012] and Cozer [2015].

[12] In Section 3 we exploit the details of these regulations to proxy the borrowing constraints and debt covenants firms face.

Table 4: Cash Flow Based Debt across Credit Lines

	Share of Cash Flow Based Debt in %	
Category	2000	2017
Automotive loans	61.1	4.80
Machinery & Equipment loans	23.2	38.43
Real estate loans	8.3	43.05
Dwelling	2.3	48.40
Commercial	8.4	42.82
Credits for financial leasing	81.8	47.9
Un-collateralized or discounted documents	77.8	89.3
Short term credit lines (<30 days)	82.8	92.6
Financing of working capital for exporting	no data	96.5
Credit card debt	61.3	99.5

Note: This table presents the share of firm-bank debt which is cash flow based according to different type of debt-contracts reported by banks to the Central Bank to meet with current regulation. Data is presented for the years 2000 and 2017. The reasoning behind this choice of years is to not taint our sample with the effects of financial crises, default or severe financial repression episodes. The types of credit lines are in descending order according to the share of cash flow based contracts in the year 2017. Financial leasing is a debt contract through which a bank acquires a productive asset, which has previously been selected by the tenant, and delivers it to the latter for use in exchange for a fee. There is no data for "Financing of working capital for exporting" for the year 2000 as this type of credit line was introduced in the year 2014. We drop debt contract types which are defined as "*other loans of ...*" of different nature.

or "Un-collateralized or discounted documents" are majorly cash-flow based, for both the year 2000 and 2017.

The last takeaway from Table 4 is that the share of cash flow based lending has increased significantly during the years 2000 and 2017 across almost all types of credit lines.[13] Furthermore, the share of cash-flow based debt in credit lines associated to the purchase of real estate and or the purchase of physical capital has increased significantly, explaining close to 50% in the year 2017. This is in line with evidence presented by Greenwald [2018], which show for the US that while most of mortgage loans are collateral-based, a significant share of mortgage loans are cash flow based, i.e. related to a households and/or firms' cash-flows. Overall, this trend suggests

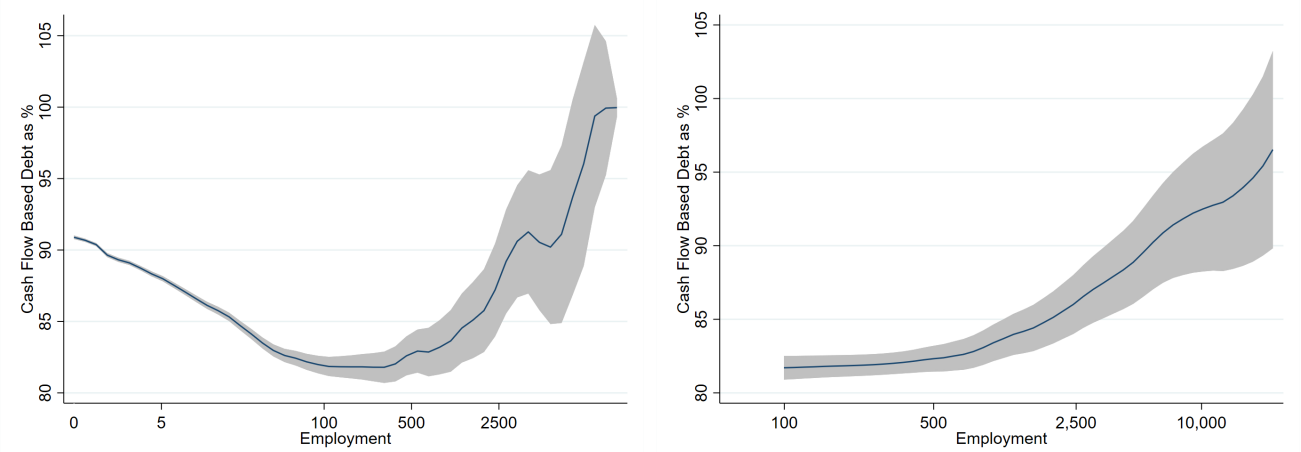
[13]The only exemption is the credit line for "Automotive loans" which saw a sharp reduction in the share of cash flow based lending from 61.1% in the year 2000 to only 4.80% in the year 2017. This increase in the prevalence of collateral based lending may be attributed to changes in the main suppliers of "Automotive loans" credit lines in the last two decades. While banks explained the vast majority of "Automotive loans" in the year 2000, after the 2001-2002 sovereign default crisis actual car manufacturers started financing and insurance companies which focused on providing financing of automotive loans. A brief description of this type of loans can be found in the following article https://www.ambito.com/economia/autos/como-comprar-un-auto-credito-prendario-la-modalidad-que-es-furor-el-mercado-automotriz-n5374828. As the article states "This type of loan is granted for the purchase of new or used vehicles, and works as follows: the good acquired from the financing, in this case a car, is "pledged" in favor of the entity that grants the loan as collateral until the loans total cancellation. During this period, the borrower is prevented from selling the vehicle until all installments are paid.

the increasing importance of cash flow based lending in Argentina.

Results by firm size. We show that the relative importance of cash-flow based debt varies across firms' size. In particular, there is a non-monotonic relationship between firms' size, measured by their workforce, and the share of cash-flow based: both relatively small and relatively large firms have the cash-flow based debt explaining the vast majority of their debt, whilst medium-sized firms exhibit a relatively lower share of cash-flow based debt.

To study the relationship between cash-based debt contracts and firms' size we fit a kernel-weighted local polynomial smoothing function, presented in Figure 3. On the left panel,

Figure 3: Relationship between Cash Flow Based Debt & Firm Size



(a) Total Sample

(b) Large Firms

Note: The red full line represents the estimated local polynomial. The grey are represents a 95% confidence interval. The panel on the right presents evidence for firms with employment levels above 100 and excludes independent contractors which are different "legal persons" than what are usually referred as firms.

Figure 3a shows the relationship between cash-flow based debt and firms' size, proxied by total employment. The figure exhibits an U shape relationship between firms' share of cash flow based lending and firms' employment. The share of cash-flow based lending is decreasing in the level of employment, peaking around 50 employees. After this peak, the level of cash flow based lending increases with the number of employees. On the right panel, Figure 3b shows the relationship between cash flow based debt and firms' size for relatively large firms.

The non-monotonic relationship between cash flow based lending and firms' employment is not surprising. Relatively smaller firms in Emerging Market economies exhibit relatively high levels of informal employment, and sell a significant share of their output in shadow markets.[14] These firms face significant challenges to access credit in the first place, and explain

[14]For a greater discussion of the relationship between firm size and informality in Argentina see Galiani and Weinschelbaum [2012] and/or Beccaría and Groisman [2015].

a relatively minor share of total employment and total bank-debt.[15,16] This has two effects on firms' borrowing patterns. Consequently, small firms borrow little from banks and when they do its mostly short-term through debt-contracts which are cash-flow based by their own nature, such as credit-card debt. Relatively larger firms have a greater share of their transactions in formal markets with the accompanied paperwork. Consequently, firms' accounting is more transparent for relatively larger firms, which facilitates both a greater access to total financing and greater amount of cash-flow based debt.

Results by firm age. Several papers have found that a firm's age is correlated with key financial indicators, such as Cloyne et al. [2018] which finds that younger firms in the US show the highest responsiveness to interest rate shocks. For the case of collateral and cash flow based lending, Lian and Ma [2021] show that relatively younger firms exhibit low to no profits and borrow primarily cash flow based. The authors argue that younger firms finance capital expenditures through collateral based lending and older firms, which have already accumulated capital, have positive streams of profits and thus can borrow backed by these cash flows.

Figure 4 presents the results for our full sample of firms for the year 2017.[17] Similar to the results for firms' size, the data suggests a U-shaped relationship between firms' age and their share of cash flow based lending.[18] While cash flow based lending is prevalent across firms of all ages, relatively younger and older firms borrow cash flow based, with medium age firms being the group which borrows relatively more collateral based.

This result may be driven by firms' life cycle in an economy with informality and underdeveloped credit markets. Relatively young firms have few to no assets to present as collateral and little access to bank debt, let alone capital markets. Consequently, firms' typically borrow through credit card debt and short term lending based on discounted documents or account receivables which act as *screening* devices. As firms mature and build larger credit records, they are able to borrow more which leads them to increase the size of their operation, both in terms of sales and capital accumulation. To carry out these capital expenditures, firms now have a higher access to collateral based lending. Relatively older firms have scarcer investment opportunities but greater flows of cash flows, which can back their borrowing of working capital.

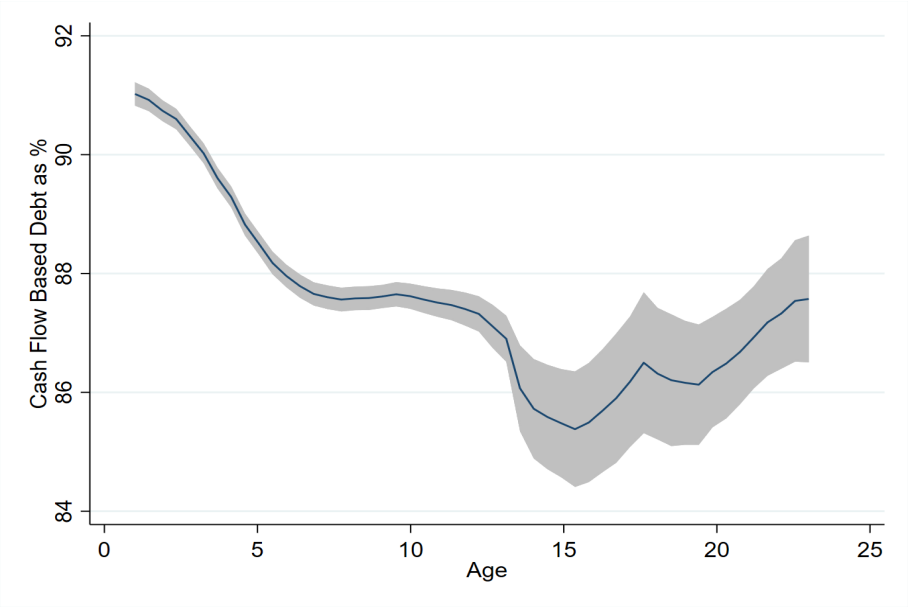
[15]For references on informality and credit access see Koeda and Dabla-Norris [2008] and/or Wellalage and Locke [2016].

[16]Firms with levels of employment above 50 employees explain above 70% of total bank debt (with firms in the top decile of employment explaining 83% of total bank-debt). Furthermore, while our dataset does not allow us to observe firms' informal employment levels, we believe that total employment is an accurate proxy of firms' size. This is due to labor informality being negatively correlated with formal employment and/or other proxy variables for firm size

[17]Our datasets does not provide an indicator of firms' age. We construct our indicator of age by establishing a proxy of firms' "*birthday*". To do so, we exploit the length of our datasets. Our international trade data goes back into the year 1994, our credit registry data goes back to 1998 and our firm level employment dataset goes up to the year 2000. We choose the year of the first observation in any of the datasets as the firm's birthday and assign them the age of 1.

[18]However, this result is not driven by firms' size as the correlation between firms' size and age is positive, but relatively week at 0.2265.

Figure 4: Relationship between Cash Flow Based Debt & Firm Age



Note: The blue full line represents the estimated local polynomial. The grey are represents a 95% confidence interval.

Results by sector of activity. Next, we turn to analyzing how cash flow based debt patterns vary across production sectors. For the case of the US, Lian and Ma [2021] show that while close to 80% of firms' debt is cash flow based, airlines and utilities companies are the exception. The authors argue that while most non-financial firms have high asset specificity, airlines and utilities companies are special cases where firms have a large amount of standardized, transferable assets (aircraft for airlines and power generators for utilities) that facilitate collateral-based lending. We test whether there are sector differences in cash flow based bank debt across production sectors in Argentina.

Table 5 shows the decomposition of total firm-bank debt for the main productive sectors of the Argentinean economy in descending order of the importance of collateral-based lending.[19] Two sectors clearly stand out with collateral-based debt contracts explaining almost half of their total debt: "Fishing" and "Transportation, storage and communications". This is not surprising as these two industries are special cases where firms have a large amount of standardized and transferable assets which facilitate collateral-based lending. The "Fishing" industry is heavily regulated (boat building permits, fishing permits, oceanic fishing permits among others) with a significant degree of over-sight by government institutions (particularly by the Ministry of Agriculture and Fishing. Besides standardized assets such as warehouses and supplies (such as nets), fishing permits are granted at the boat level with ownership transfers stipulated within regulations.[20] Similarly, firms in the "Transportation, storage and communications" sector are also intensive in standardized assets such as storage units, warehouses and automotive capital.

[19]The productive sectors arise from the Argentinean National Account classification.

[20]For additional details on the regulations, permits and transfer of permits/boats see https://www.magyp.gob.ar/sitio/areas/registro_pesca/tramites/.

Table 5: Cash Flow Based Debt across Production Sectors

Sector	Collateral Based	Cash Flow Based	Share of Total Debt
Fishing	42.6%	57.4%	0.1%
Transportation, storage and communications	40.8%	59.2%	4.0%
Construction	26.0%	74.0%	4.0%
Health and social services	25.4%	74.6%	1.2%
Education services	22.5%	77.5%	0.3%
Hotels and restaurants	21.9%	78.1%	0.7%
Real estate, business and rental activities	21.9%	78.1%	3.8%
Agriculture, livestock, hunting and forestry	21.0%	79.0%	12.7%
Wholesale, retail and repairs	14.6%	85.4%	20.7%
Manufacturing industry	10.2%	89.8%	35.4%
Utilities (Electricity, gas and water supply)	8.4%	91.6%	1.7%
Exploitation of mines and quarries	5.1%	94.9%	5.9%
Financial intermediation	4.4%	95.6%	4.6%

Note: This table summarizes the composition of the universe of firm-bank debt from Argentina according to firm's self-declared sector of activity for tax-purposes. The table presents the decomposition of total firm-bank debt to the sector. The data presented is for the year 2017. Results are robust and persistent across time. We exclude public administration, national defense and unclassified services.

Consequently, this result is in line the information presented in Table 4, which showed that the vast majority of the "Automotive loans" credit lines are backed by are assets. Lastly, it is also noteworthy and not surprising that the "Agriculture, livestock, hunting and forestry" sector exhibits a relatively higher share of collateral-based debt. As argued in Appendix E.2, collateral-based regulations are stipulated in great detail for the agricultural sector as they establish borrowing constraints as function of the price agricultural lands and/or the value of finely defined cattle.[21] Furthermore, land for agricultural and/or livestock purposes is usually a safe storage of value in Argentina maintaining its price (or even increasing) during periods of financial stress.[22] While collateral-based debt contracts explain a relatively larger share of bank debt for certain sectors, the largest sectors of the economy in terms of total bank debt exhibit significantly high levels of cash flow based debt. For instance, the "Wholesale, retail and repairs" and the "Manufacturing industry" sectors have 85.4% and 89.8% of their total debt expressed in cash-flow based contracts.

Participation in International Trade. Cash flow based debt is more prevalent for exporting firms compared to non-exporting firms even when controlling for firm size. As suggested by Lian

[21] Furthermore, Argentinean banks' have branches specific for the Agricultural sector. For instance, "*Banco Provincia de Buenos Aires*" the second largest bank in the country and largest country in the province of Buenos Aires which masses the largest part of fertile agricultural land has sector specific credit lines. For instance, credit lines are specified to the different types of crops which have different maturing cycles. For more information on the "PROCAMPO" credit lines of this bank can be observed at https://www.bancoprovincia.com.ar/agro/agro_procampo.

[22] For instance, Marchetti and Villena [2003] show that the price in US dollars of the agricultural and live stock land in Argentina increased significantly during 1980/1982 corporate and sovereign debt crisis, the 1989/1990 hyperinflation crisis, and the 2001/2002 sovereign debt crisis.

and Ma [2021], Emerging Market economies have less transparent accounting and tax systems which may difficult the emergence of debt contracts specified in terms of financial terms such as EBITDA. Exporting operations provide firms with a verifiable future revenue flow which allow firms to circumvent, at least partially, poor account quality.

The BCRA introduced in the yar 2014 the "Financing of working capital for exporting" or "Pre-financiación de exportaciones" credit line which allows firms to borrow in foreign currency. Under BCRA regulations, borrowing through this credit lines requires firms to present verifiable information of an outstanding import order by a foreign firm. Furthermore, regulations impose clear borrowing limits over this credit lines:

- The sum of total bank debt and/or other operations with financial institutions carried out by the exporting firm exporter for this type credit line must not exceed 75% of the amount (FOB value) of exports.[23,24]

Consequently, the inherent paperwork involved in exporting operations provides firms with the necessary documentation banks require to carry out risk evaluations. Overall, these regulations imply that firms can borrow up to some fraction of their present and past values of their exporting revenue.[25]

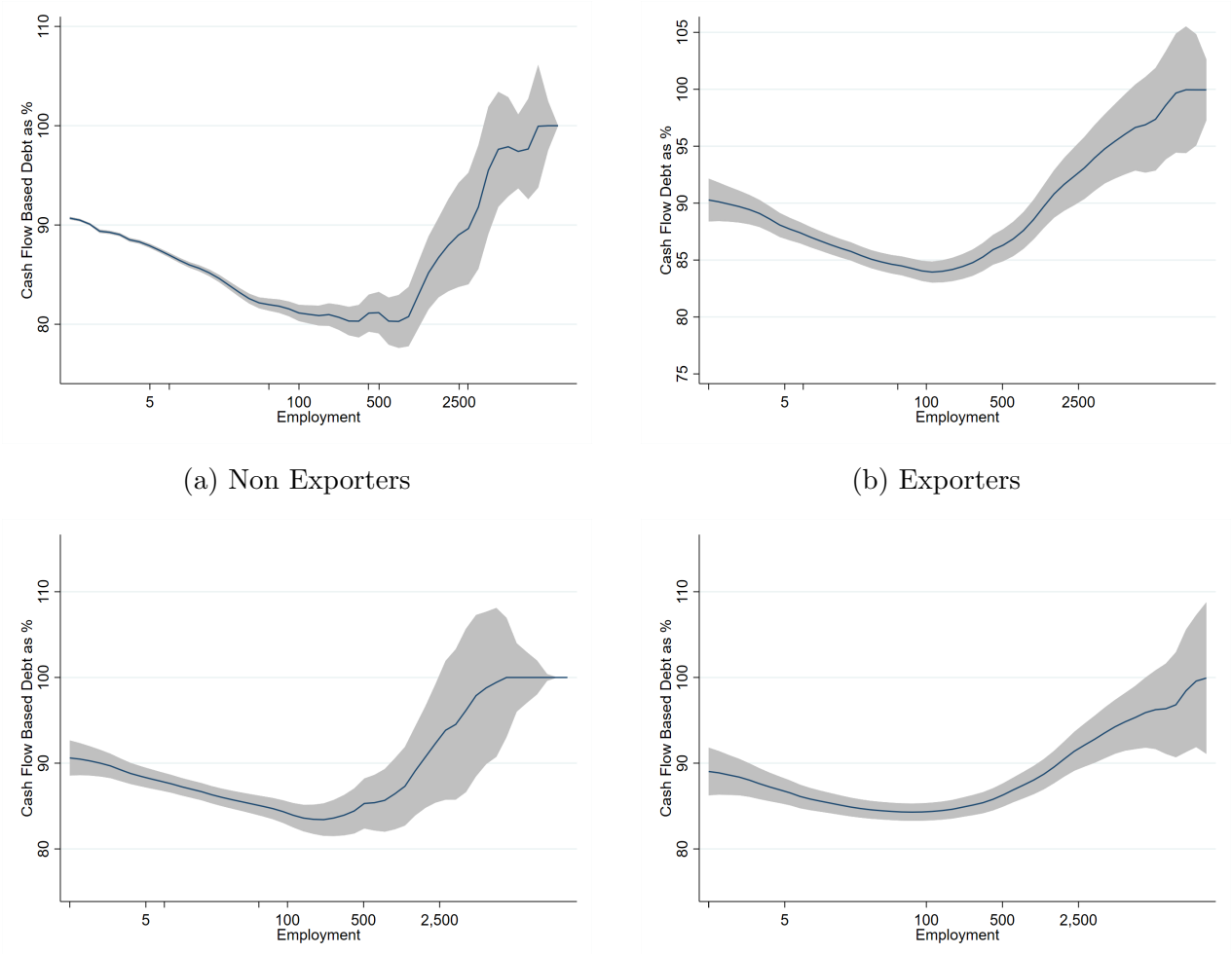
Figure 5 shows the relationship between the firms' share of cash-flow based debt for four different sub-samples: (i) the top-left panel presents the figure for non exporting firms (i.e. firms which did not exported at all during the year 2017); (ii) the top-right panel presents the figure for exporting firms (i.e. firms which did export during the year 2017); (iii) the bottom left panel presents the figure for the subset of exporting firms which are below the sector-specific median amount of exported value per firm; (iv) the bottom right panel presents the figure for the subset of exporting firms which are above the sector-specific median amount of exported value per firm. In line with the results presented in Figure 3, there is an U-shaped relationship between firms' share of cash-flow based debt and employment across all four sub-samples. By comparing the figure for non exporting firms (Figure 5a) with the figure for exporting firms (Figure 5), it is clear that the latter have a greater share of cash-flow based debt, particularly for medium levels of employment, 50 to 500 employees. The differences between exporting firms are more subtle. Figures 5c and 5d present the relationship for exporting firms below and above the sector specific median exported value. The

[23]For full details on this regulation see Section 2 of the Central Bank's "Texto ordenado de las normas sobre políticas de crédito", available at https://www.bcra.gob.ar/Pdfs/Texord/t-polcre.pdf, and Section 3.1 of BCRA's "Document A-3561", available at http://www.bcra.gov.ar/pdfs/comytexord/A3561.pdf.

[24]Regulations also specify that banks may ask/use additional verifiable information over firms' export flows of revenue in order to determine any borrowing limit. The regulation also contemplates access to foreign currency for firms which act as direct suppliers of firms which have a verifiable exporting source of foreign currency funds. These firms also must provide evidence of the regular and period exports of their direct customers. In particular, regulation specifies that firms must provide information on their export invoices for the previous 12 months.

[25]In Section 3 we come back to this point when we describe the cash flow based borrowing constraint BCRA regulations imply.

Figure 5: Cash Flow Based Debt according to Export Performance



(a) Non Exporters

(b) Exporters

(c) Exporters Below Sector's Median

(d) Exporters Above Sector's Median

Note: The blue full line represents the estimated local polynomial. The grey are represents a 95% confidence interval. Figures reflect data from the year 2017. Top-left panel presents data for non-exporting firms, top-right panel presents data for exporting firms. Bottom left and right panels present data for firms below and above the sector specific median of exported value at the firm level.

In Appendix D we present additional evidence through several regression exercises. Overall, the evidence suggests that exporting firms have a greater share of cash-flow based debt than non-exporting firms, in line with the insights provided by Figure 5. Furthermore, this relationship holds when controlling for other firm characteristics and sector fixed effects. These results present supporting evidence to the hypothesis that exporting operations, and the intrinsic paperwork involved provides firms with verifiable information about future cash flows. Consequently, exporting firms exhibit a greater share of cash-flow based debt.[26]

[26] Additionally, as we show in Appendix D, exporting firms also borrow relatively more than firms of the same employment or size. Whether this increase in total bank debt is explained by being able to provide additional verifiable information over future cash-flows, by the nature of exporting activities which are credit intensive, or by other confounding variable, it is not clear and not pursuit in the current paper.

2.4 Comparison with International Evidence

We conclude this section by comparing the results arising from our datasets of Argentinean firms with evidence from the US and other countries. First, we argue that cash flow based lending is more prevalent in Argentina than in the US and provide several probable conjectures on why this is the case. Second, we argue that our results for Argentina may be extrapolated to other Emerging Market economies.

Comparison with evidence from US firms. There is a significant and recent literature which uses firm and other micro level data to study non-financial firms' borrowing constraints in the US (see Greenwald [2018], Greenwald et al. [2019], Drechsel et al. [2019], Lian and Ma [2021], Chodorow-Reich and Falato [2022]). Thus, a straightforward questions is how do our results for Argentinean firms compare to those from the recent literature which studies US firms? We argue that cash flow based lending is more prevalent for Argentina firms than for US firms, conditional on certain caveats about data comparability.

The main limitation to carry out a comparison between our results and those from US firms arise from the differences between our datasets. On the one hand, the literature which studies the importance of cash flow based lending among US firms relies on balance sheet and supervisory data sets of syndicated loans. These datasets usually comprises relatively large and public companies. On the other hand, our credit-registry dataset contains information on firm-bank links for the universe of Argentinean firms. However, we argue that in spite of this data limitations, there is significant evidence of greater prevalence of cash flow based lending in Argentina.

Table 6 compares our results for Argentinean firms with the findings of Lian and Ma [2021] for the US non-financial corporations. At the aggregate level, the first row of Table 6

Table 6: Comparison of Cash Flow Based Lending with US Evidence

	Argentina			**US**
	BCRA - Full	BCRA - $L \geq 500$	Corp. Loans	Lian and Ma [2021]
	(1)	(2)	(3)	(4)
Aggregate Share CFB	83%	91%	94%	80%
Mean Share CFB	89%	92%	98%	85%
Firms with CFB	100%	100%	100%	62%

Note: This table summarizes the composition of the universe of firm-bank debt from Argentina. The data presented is for the year 2017. The choice reflects the composition by the end of our sample where we have significant complementary firm information. Data for the US is sourced directly from Lian and Ma [2021]. The acronym CFB represents cash flow based lending.

shows that for our full credit-registry sample (first column) cash flow based debt contracts from Argentinean firms represent around 83% of total firm-bank debt, roughly greater than that for US firms on the last column. Column (2) shows that when conditioning on firms with 500 or

more employees, a relatively more comparable sample, the share of cash flow based debt becomes significantly greater at 91% than that present for US firms. This becomes even more evident when comparing the results that arise from Argentinean corporate loans in Column (3), which exhibit a share of cash flow based lending of almost 94%.

Additionally, the second and third rows of Table 6 show that cash flow based lending are significantly more prevalent in Argentina than in the US at the firm level. The second row shows that the mean share of cash flow based lending at the firm level is significantly greater for both our samples of the credit-registry dataset and our sample of corporate loans than for US firms. Lastly, and perhaps more importantly, the third row of Table 6 shows that cash flow based lending is significantly more pervasive across Argentinean firms, with all firms in our sample providing some type of cash flow based credit line. In comparison, only 62% of US firms exhibit cash flow based lending.[27]

3 Prevalence of Interest Sensitive Borrowing Constraints

In this section, we present evidence that the standard cash flow based borrowing constraint is highly sensitive to interest rates. This constraint stipulates limits on a firm's debt payments based on measures of cash-flows. In Section 3.1 we show that BCRA regulations impose clear guidelines over both cash flow and collateral based borrowing constraints. In Section 3.2 we present supporting evidence by studying the debt covenants of hundreds of corporate loans. Section 3.2 presents evidence that violating borrowing constraints lead to significant reductions in firms' credit around the 2001-2002 sovereign default crisis.

3.1 Evidence from BCRA Regulations

We start by showing that BCRA regulations over banks shape the underlying borrowing constraints firms face. First, we show that these regulations establish detailed limits on firms' collateralized borrowing based on the different types of asset. Second, we show that BCRA regulations require banks to monitor firms and assess their risk of default based on the relationship between debt payments and cash flows.

Collateral based borrowing constraints. BCRA regulations heavily regulate collateral based lending. BCRA regulations contemplate two distinct classes of assets which can be used as collateral: "Type A" assets and "Type B" assets. On the one hand, "Type A" assets are comprised of the transfer or surety of rights with respect to financial assets, equity or other financial documents of any nature that, reliably instrumented, ensure that the bank or lending entity will be able to dispose of the funds by way of cancellation of the obligation contracted by

[27]Similarly, Lian and Ma [2021] report that among small firms on the Compustat dataset the median share of collateral based lending is 54% and the median share of cash flow–based lending is about 8%.

the client, without the need to previously require the debtor to sell the assets or repay the debt.

On the other hand, type B "preferred assets" are comprised of assets or rights over assets or commitments of third parties that, reliably instrumented, ensure that the bank or lending entity will be able to dispose of the funds by way of cancellation of the obligation contracted by the client, previously complying with the procedures established for the execution of these assets. Once again, the regulation implies that the comprised assets should efficiently liquidated in transparent and liquid markets. This type of assets comprises claims over real estate (built property land lots and construction trusts), claims over automotive vehicles and agricultural, road and industrial machinery (to the extent that they are registered in the pertinent national registry of automotive property and have a market that allows obtaining a reference value), or a fixed pledge with registration on bovine cattle; financial leasing contracts with respect to the purchase of capital goods and/or other machinery.[28] A private agent which borrows backed by these assets must present documentation which prove ownership and provide significant detail on assets. A subset of this documentation is the registration of assets, such as real estate, automotive vehicles, agricultural machinery and cattle stock under public registration entities.[29]

The Central Bank's regulation stipulates constraints on how much firms can borrow given the "preferred assets" that back debt-contracts.[30] Table 7 shows bounds as a percentage of asset values for several types of both Type "A" and Type "B" preferred assets debt-contracts. The top panel shows the bounds on Type "A" assets. How much a private agent can borrow is higher for financial assets in domestic currency than for financial assets in foreign currency. Additionally, private agents can pledge a higher fraction of more liquid assets, such as cash or central bank liabilities, than of relatively less liquid assets such as sovereign bonds and/or private equity. The bottom panel shows private agents' bounds for several Type "B" assets. Depending on the type of asset and the debtor's credit-worthiness (more on this in the next section) these debt contracts exhibit bounds between 60% and 100% of the market value of the Type "B" of preferred assets.

[28] Under financial leasing contracts for firms' purchase of capital goods and/or other machinery, the Argentinean firm finances the purchase of a productive good and keeps claims over the good while the borrowing firms makes use of it for production.

[29] For instance, real estate ownership and use must be registered in province specific registration entities. For the case of the capital city see https://www.argentina.gob.ar/justicia/propiedadinmueble. For automotive vehicles (including individual and company owned vehicles) there is a national registry which could be accessed at https://www.dnrpa.gov.ar/portal_dnrpa/. This registry also incldues agricultural machinery, see http://servicios.infoleg.gob.ar/infolegInternet/anexos/45000-49999/46096/norma.htm. Cattle stock and other agricultural assets must be declared for both registration purposes and for phytosanitary conditions/regulations. For more information on the registry of cattle stocks see https://www.argentina.gob.ar/senasa/programas-sanitarios/cadenaanimal/bovinos-y-bubalinos/bovinos-y-bubalinos-produccion-primaria/registros-y-habilitaciones/bovinos-y-bubalinos-produccion-primaria/identificacion-animal and https://www.argentina.gob.ar/senasa/programas-sanitarios/cadenaanimal/bovinos-y-bubalinos/bovinos-y-bubalinos-produccion-primaria/registros-y-habilitaciones/bovinos-y-bubalinos-produccion-primaria/identificacion-animal. For the registry of fishery machinery and equipment see https://www.argentina.gob.ar/palabras-clave/registro-de-la-pesca.

[30] These constraints on the amount firms can borrow as a function of the value of "preferred assets" are usually referred within the Central Bank's regulation as "márgenes de cobertura".

Table 7: Borrowing Limits over Collateral Based Debt

	Bound as % of Asset Value
Type "A" assets	
Cash or Highly-Liquid Domestic Currency assets	100%
Cash or Highly-Liquid Foreign Currency assets	80%
Gold	80%
Sovereign Bonds	75%
Central Bank Liabilities	100%
Private Equity Claims	70%
Type "B" assets	
Real Estate	50%-100%
Automotive vehicles & agricultural machinery	60%-75%
Road & industrial machinery	60%
Cattle stock	60%

Note: The table presents bounds on a subset of assets which are usually considered as collateral of private agents'. Consequently, the table is not exhaustive. All bounds are computed as a fraction of current market value of the assets. Asset types with bounds on the value which can back debt contracts represent heterogeneity in bounds within asset types. For instance, how much an agent can borrow backed by real estate depends on whether the property is used as living place or not, whether the property is an empty lot, a lot with construction built on it and/or an agricultural lot.

Bank debt contracts backed by collateralized assets impose the following borrowing constraint

$$B_t \leq \theta^{LEV} \times p_{k,t} k_t \tag{1}$$

where B_t^{LEV} denotes the amount of debt, $p_{k,t}k_t$ represents the value of the asset used as collateral and $\theta^{LEV} \in (0,1)$ is parameter that governs the tightness of the constraint. The borrowing constraint in Equation 1 is the standard collateral based borrowing constraint for international macroeconomic models, such as Mendoza [2010]. Under this benchmark borrowing constraint, a drop in the price of capital, $p_{k,t}$, leads to a tighter borrowing constraint, which reduces a firm's ability to accumulate capital, k_t. This drop in capital accumulation leads to an even tighter borrowing constraint, amplifying the original shock. This Fisherian deflation that reduces credit and the price and quantity of collateral assets is the key ingredient of the benchmark international macroeconomic models.

Cash flow based borrowing constraints. BCRA regulations over banks' credit policy and risk assessment shape firms' cash flow based borrowing constraints. Two BCRA regulations play a crucial part in shaping these borrowing constraints: (i) regulations over banks' monitoring role over firms performance, (ii) regulations over banks' balance sheet exposure to borrowers' risk and risk assessment. Next, we describe these two set of regulations and argue that the implied borrowing constraints are highly sensitive to the interest rates.

We start by describing the BCRA regulations that bestow on banks a monitoring role over firms' status and/or performance. Banks must update firms' status at the Central Bank of Argentina's "*Central de Deudores*" at a monthly frequency. As we described in Section 2, this implies that banks must report firms' borrowed amounts by type of credit line, whether the debt contract is in normal situation, if any stipulation in the debt contract has been violated and if so the status of the debt contract.[31]

Banks monitoring role over firms is embedded on the BCRA's regulations on banks' credit policy and debtor classification (or "*Clasificación de Deudores*").[32] The regulations stipulate that banks must re-evaluate and re-asses firms' credit status and risk of default periodically according to its total amount borrowed.[33] These bank assessments focus on firms' cash flow projections and keeping adequate debt payment to cash-flow ratios. Under normal circumstances, assessments are carried out quarterly or semi-annually depending on firms borrowing as a share of banks total lending.[34] However, banks must carry out mandatory and immediate firm re-assessments if: (i) the firm violates any condition of the original debt contract or of any debt renegotiation (such as being late on any payment for a period of time greater than 30 days), (ii) the firm's status with another bank at the BCRA's "*Central de deudores*" deteriorates to a status below the current one at the bank.[35] Consequently, firms are subject to constant monitoring and scrutiny by banks which amplify the impact of any change in firms' financing needs.

BCRA's regulation stipulate that banks must classify firm's risk of default over three main categories. The first category comprises firms which are considered under a "normal or low-risk (of default)" situation.

- "Low-risk." Firm's debt structure to cash flow relationship is *adequate*, with cash-flows being able to repay the capital and interests of its obligations with the bank.

Even more, the regulation stipulate that a debtor's situation could be classified as "low risk" if their main sector of activity is projected to report increases in cash-flows.[36] Firm's in a "low-risk"

[31] This information is easily accessible to the public and can be accessed through the following website http://www.bcra.gob.ar/BCRAyVos/Situacion_Crediticia.asp. Furthermore, this dataset provides information on whether firms have recently issued any non-sufficient-fund checks.

[32] See https://www.bcra.gob.ar/Pdfs/Texord/t-cladeu.pdf for the full text.

[33] See Section 3.2 of BCRA's "*Clasificación de Deudores*": The classification of debtors must be carried out with a frequency that takes into account their importance –considering all financing included–, and in all cases the analysis carried out must be documented.

[34] A firm's status and re-assessment must be carried out quarterly if its total borrowing is equal to or higher than 5% of the bank's net-worth or equal to or higher than 5% of the bank's total assets. If a firm's borrowing is lower than 5% of the bank's net-worth or total assets then its credit-status and re-assessment must be carried out semi-annually or twice a year.

[35] See Section 6.4 "Mandatory reconsideration of debtor classification" or "*Reconsideración obligatoria de clasificación de deudores*".

[36] Note that, in line with the results presented in Section 2, the BCRA's regulations on firms' debt capacity focus on their cash-flows and specify a classification which relates the relationship of installment payments to cash-flows. Furthermore, in Appendix E.2 we show that BCRA regulations stipulate that banks should not assess the value of a firm's assets as a proxy to repay its debt.

situation meets the following condition

$$r_t \times B_t + \vartheta_t \times B_t \leq \theta^{\text{Low Risk}} \times \pi_t \tag{2}$$

where $r_t \times B_t$ represents firm's payment of debt interests, represents the interest ,$\vartheta_t \times B_t$ represents the firm's payment of maturing debt in period t, parameter $\theta^{\text{Low Risk}} > 0$ represents the maximum ratio of debt payments to cash-flows the bank believes to be "adequate". Note that this borrowing constraint is sensitive to the interest rate, r_t. To gauge the interest sensitive of this borrowing constraint, consider an example in which the net interest rate is $r_t = 5\%$, the share of debt which matures is $\vartheta_t = 25\%$, consistent with a quarterly calibration and debt maturity equal to a year. A decrease in the interest rate from 5% to 4% increases the borrowing limit imposed by Equation 2 increases by 4%. Note that this is a direct change in the borrowing limit assuming that firms' cash flows π_t remain unchanged. In the limit case ϑ_t is equal to 1, the condition in Equation 2 imposes a debt limit as the ratio between a firm's total debt plus interest payments to cash flows.

The second category of default risk assessment comprises firms which face "medium risk of default", and/or are "reporting problems" in meeting their full debt payment obligations and/or under

- "Medium risk". The analysis of the debtor's cash flow shows that struggles meeting financial commitments, with cash flows only able to meet interest payments.

Furthermore, firms under a situation of "medium risk" of default show projections of progressive deterioration of their cash-flows and a high sensitivity to minor and foreseeable modifications of its own variables and/or of the economic environment, further weakening its payment possibilities. Firms in a situation of "medium risk" are either in technical default (as defined above), or banks project that they will in the short and foreseeable future. Firms which are not under a "normal situation" but do not fall under a situation of "medium risk" of default must meet the following borrowing condition

$$r_t \times B_t \leq \theta^{\text{Medium Risk}} \times \pi_t \tag{3}$$

where $\theta^{\text{Medium Risk}} > 0$ represents the maximum interest payment to firm's cash-flow the bank analyst believe to be adequate. The borrowing limit imposed by Equation 3 is significantly sensitive to changes in the interest rate. Firms in this situation can still re-finance their debt lines as long as they present valid information on their past, present and projected cash flows. Following the example constructed above for the case of a "low-risk" firm, a decrease in the interest rate from 5% to 4% leads to a direct decrease in the borrowing limit implied by Equation 3 of 25%.

Finally, the last category of the risk-assessment classification is comprised of firms which show a "high risk of insolvency" and/or show a "high risk of defaulting" or not meeting any debt payments

- "High-risk of insolvency (and/or default)". The analysis of the debtor's cash flow shows that it is highly unlikely that it will be able to meet all of his financial commitments. The debtor's cash of funds is manifestly insufficient, not enough to cover the payment of interest.

Moreover, firms classified into this category should, under the banks' analysis, exhibit projected cash-flows which imply that they will also have severe difficulties in "complying with possible refinancing agreements" or "debt/liability re-structuring". Firms in this situation have clearly breached their original debt contract, incurred in a technical default event and not satisfying the borrowing conditions described by either Equation 2 or Equation 3. Banks consider these loans "*irrecuperables*" or "unrecoverable" and will be written-off their balance sheets as a loss.

Banks' monitoring regulations are accompanied by macro-prudential policy regulations over banks' exposure to lending risk. In particular, banks compliance with the monitoring and informational requirements are related to BCRA regulations over banks' capital requirements over the riskiness of their credit portfolio. These regulations are described in documents "*Lineamientos para la gestión de riesgos en las entidades financieras*" or "Guidelines for risk management in financial entities" and "*Capitales mínimos de las entidades financieras*" or "Minimum capital requirements of financial institutions".[37] These BCRA regulations impose capital requirements depending on the riskiness of the assets in their credit portfolio.

Banks' capital requirements stipulated by macro-prudential policies are based on firms' relationship between interest payments and their cash flows. In particular, if a firm is categorized under the risk status "*Medium risk of default*", as described in Equation 3 the lending bank's capital requirements increase in an amount proportional in an amount equal to all of its exposure to said firm, i.e., not only the exposure to the specific debt-contract breached.[38] This increase in the bank's capital ranges from 50% to 150% depending on the bank's projection over the share of interest payments to be recovered from the firm.[39]

In summary, the BCRA imposes several regulations over banks' cash flow based credit policy and risk assessment which are based on firms' relationship between their cash flows and their interest payments. Furthermore, there is nothing in the regulations that stipulate that risk assessment should be carried out by analyzing the relationship between a firm's total debt and their cash flows. Given that firms' are able to re-finance their bank debt contracts even in a situation of "Medium risk", it is reasonable to assume that the BCRA regulations impose a debt limit of the form given by Equation 3.

Evidence from a debt contract example. We use details from an actual loan contract

[37] See https://www.bcra.gob.ar/pdfs/texord/texord_viejos/v-lingeef_19-07-01.pdf and http://www.bcra.gov.ar/Pdfs/Texord/t-capmin.pdf for the full text on this regulations.

[38] See BCRA's "Policy on minimum capital requirements of financial institutions", Section 2 on "Capital Requirements due to Credit Risk", bullet point "2.5.7."

[39] See BCRA's "Policy on minimum capital requirements of financial institutions", Section 2 on "Capital Requirements due to Credit Risk", bullet point "2.6.11.3".

application to illustrate these features.[40] In August 2015, the "Banco Industrial S.A." or BIND stipulated the following conditions as "events of technical default" or "*eventos de incumplimiento*":

1. Failing to pay any installment and/or services of interests on the debt,
2. Debtor not complying in full with any other credit or obligation towards the bank,
3. Debtor not complying in full with any other credit or obligation towards other financial situation such that it leads to a third party filing a lawsuit against the debtor,
4. Debtor refusing to supply the whatever information or allow the verification that the bank or BCRA estimate necessary,[41]
5. Or if any other circumstance occurs such that, in the bank's opinion, affects the moral or commercial solvency of the debtor.

Apart from the enumerate events, banks can declare technical default in case of significant revaluing of collateral (as argued in Section 2), or in the case of ownership transfer or events *force majeure*.[42] The first and second conditions for technical default imply that firms face a borrowing constraint in form of an "interest coverage" constraint as in Equation 3.

The last three conditions for technical default imply that the bank is continuously monitoring and evaluating a firm's commercial solvency. While this may seem like an arbitrary condition for a debt contract, it falls directly under the monitoring role the BCRA bestows on banks. In particular, BCRA's regulations on banks' credit-policy and debtor classification (or "*Clasificación de Deudores*") stipulate that banks must re-evaluate and re-asses firms' credit status and repayment capacity periodically according to its total amount borrowed.[43,44] While we describe in depth the BCRA's regulations on banks monitoring role and assessment of firms' default risk in Appendix E.1, we present below key details, relate them with the events of technical default in the example debt contract and how they translate into borrowing limits.

[40] The original and full document of the loan application can be found at https://banco.bind.com.ar/images/documentos/comex/CE003-solicitud-de-prestamo-en-moneda-extranjera-para-la-prefinanciacion-financiacion-de-exportaciones.pdf.

[41] Furthermore, the debtor must comply with any information requirement that if, carried out, would show that the data contained in the application and its annexes are inaccurate or imply that the debtor has use funds for any other destination than the one expressly consigned in the original application.

[42] These events comprise the sale, total or partial of the corporation; the merger, transformation or liquidation of the Debtor; the death or disability of the debtor (in the case of natural persons); debtor's filing for insolvency or bankruptcy or if it is requested by third parties, or is subject to any other compulsory asset or liability restructuring procedure; substantial regulatory changes that modify the fundamental market conditions under which the contract was granted.

[43] See https://www.bcra.gob.ar/Pdfs/Texord/t-cladeu.pdf for the full text.

[44] See Section 3.2 of BCRA's "*Clasificación de Deudores*": The classification of debtors must be carried out with a frequency that takes into account their importance –considering all financing included–, and in all cases the analysis carried out must be documented.

Decomposition of firm's debt according to borrowing constraints. Next, we present a decomposition of firms' debt according to borrowing constraints commonly used in macro-finance models. To this end, we build on Table 1 by classifying collateral and cash flow based lending into three different types of borrowing constraints considered by the macro-finance literature.

First, we classify all collateral based lending into a standard collateral borrowing constraint as in Equation 1. This is straightforward as debt contracts are specified in terms of the liquidation value of specific assets provided as collateral by firms. This is in line with the literature which studies the micro-foundations of collateral based lending as Townsend [1979],Bernanke et al. [1999] and Jermann and Quadrini [2012].

Second, we decompose cash flow based lending into two standard borrowing constraints considered by the literature: (i) "Debt to Cash Flow" constraint, and a (ii) "Interest Coverage" constraint. As argued above, BCRA regulations stipulate a firm's risk-assessment in terms of the relationship between interest payments, not total debt, to cash flows. Given that these regulations apply to all cash flow based lending, we could classify 100% of it to an interest coverage borrowing constraint as described by Equation 3. However, as stressed in Section 2.3 that bank loans to finance working capital is associated with specific BCRA regulations which limit a firm's debt as a function of their past and present export flows. While the same capital requirement regulations apply to this credit line, the characteristics of this credit line imply a borrowing constraint closer to that of a "Debt to Cash Flow" than to an "Interest Coverage" constraint. Thus, we follow a conservative approach and classify the "Financing of working capital for exporting" and all other unclassified cash flow based lending as "Debt to Cash Flow" borrowing constraints.

Table 8 presents the results of our decomposition. The first result arising from this table

Table 8: Collateral vs. Cash Flow Lending

	BCRA - Year 2000	BCRA - Year 2017
	(1)	(2)
Collateral Based	35.5%	15.9%
Cash Flow Based	64.5%	84.1%
Debt to Cash Flow	14.9%	25.8%
Interest Coverage	49.6%	58.4%

Note: The table presents the decomposition of total firm bank debt into two categories: "Collateral Based" and "Cash Flow Based" lending. Furthermore, it decomposes the latter into two sub-categories: (i) "Debt to Cash Flow" lending, associated with a borrowing constraint of the form $B_t \leq \theta \times \pi_t$, and (ii) "Interest Coverage" lending, associated with a borrowing constraint of the form $r_t \times B_t \leq \theta \times \pi_t$ as described in Equation 3.

is that collateral borrowing constraints only explain a minor share of total firm borrowing, close to 36% in the year 2000 and less than 16% by the year 2017. This result is straightforward given

the one to one mapping between collateral based lending and collateral borrowing constraints. The second result is that the vast majority of cash flow based lending is explained by loans subject to "Interest Coverage" borrowing constraints. Even under our conservative classification strategy, close to 70% of firms' debt is subject to the interest sensitive borrowing constraints, with the remaining 30% subject to a "Debt to Cash Flow" borrowing constraint.

In summary, the BCRA's regulations described above over banks' monitoring role and risk-assessment suggest that the main borrowing constraint firms face in Argentina is a "Interest Coverage" borrowing constraint. This is, the most prevalent borrowing constraint in Argentina is one in which a firm's debt limit is determined by the relationship between its interest payments and its cash flows.

3.2 Evidence from Corporate Bonds

We provide further details over the borrowing constraints Argentinean firms face by presenting details on the episodes of technical default in the market for corporate bonds "Obligación Negociable" (described in Section 2). Alike the case of bank contracts, we present details from an actual debt contract. In April 11^{th} 2022, the firm "Empresa Distribuidora y Comercializadora Norte S.A." or EDENOR, issued a ON corporate bond at a 9.75% annual interest rate in US dollars for a total amount of US$ 120 million dollars, maturing in May 12^{th} 2025. Lenders provided the full amount upfront and had no additional commitments. The debt contract stipulates semi-annual interest payments and only one capital payment at maturity.[45]

Edenor's ON corporate debt contract specifies particular conditions under which the firm breaches the contract and is under technical default. Below we present the four key conditions for technical default

1. Non-compliance with the principal payment of any of the ON upon becoming due, either at maturity, by redemption, expiration of its term, pre-cancellation or in any other case, and such non-compliance remains in force for a period of five consecutive days;

2. Non-payment of interests when they become due, either at maturity, by redemption, expiration of their term, pre-cancellation or in any other case, and said non-compliance remains in force for a period 30 calendar days;'

3. If there had been a revocation, cancellation, rescission or suspension for more than 20 calendar days of the Edenor's concession contracts as an utility energy supplier;

4. Any failure on the part of Edenor to duly observe or comply with any of Edenor's commitments or agreements within the framework of the Trust Agreement of the ONs (except those referred to in points (a) and (b) precedents) for a period of more than 60 calendar

[45] This is the typical ON corporate bond payment profile. Weighted by debt's face value, 93% of ON's corporate bonds make only one capital payment at maturity and make interest payments either quarterly or semi-annually.

days after the date on which written notification is sent in this regard demanding that Edenor correct it, sent to Edenor by the Trustee or the holders of at least 25% of the total nominal value of the ONs;

The lack of capital payments until maturity implies that Edenor only faces the constraint implied by condition "1." only every time the ON corporate debt contract matures. Thus, Edenor regularly faces the need of sufficient cash-flows to pay interest payments to meet constraint "2.". In case Edenor loses its concession contract as an utility energy supplier (condition "3."), it is evident that it won't be able to generate the necessary cash-flows to repay any debt payments.

Edenor's ON Trust Agreement imposes a debt limit over the firm's total liabilities. This debt limit is stipulated such that the firm cannot violate, at any time, either of two conditions:

- Debt ratio index constraint: ratio between all debt obligations to the EBITDA corresponding to the last four consecutive economic quarters must not surpass 3.75.
- Interest coverage ratio index constraint: ratio between the EBITDA corresponding to the last four consecutive economic quarters to interest payments must not surpass 2.[46]

Note that the "Debt ratio index" and the "Interest coverage ratio index" imply the borrowing constraints presented in Equations 2 and 3, respectively. Violation of any of these debt-limits is considered a technical default event, accelerating the repayment of all interests and capital. In line with the evidence presented in Sections 2 and 3.1, the debt limits are stipulated in terms of the firm's cash-flow and not in terms of the liquidation value of its capital.[47] Note that these two debt limits may be violated by changes in economic and financial conditions which are not directly under the borrower's control. For instance, a decline in earnings could cause an involuntary violation of the debt limit by the firm. Declines in earnings can be caused by domestically originated shocks, such as demand shocks, or internationally originated shocks, such as exchange rate depreciations, foreign financial shocks and commodity price shocks.

Lastly, ON corporate bonds contain a key clause in which creditors can call for an "Extraordinary assembly of ON holders" or "*Asamblea extraordinaria de tenedores de ON*". These extraordinary assemblies provide creditors with the opportunity to vote over key decisions of firms' liabilities such as declaring an overall debt re-negotiation o "Concurso de Preventivo de Acreedores". Each ON bond comes with specific metrics creditors must meet to call these extraordinary assemblies and to vote over specific matters. For the case of Edenor

[46] In terms of the ON debt contract, interest payments includes not only the payment of interests on debt and the payment of any punitive interest and other additional amounts given certain conditions of technical default.

[47] The ON debt contract does imply a clause in which a technical default event is triggered if a judge declares the sale of the firms' assets to repay the debt to a third party given insufficient cash-flows. However, the clause does not imply any relationship between the firm's debt and the value of the capital. Furthermore, the lack of sufficient cash-flow to pay the debt to the third party would probably trigger any of the cash-flow based debt limits stipulated as technical default or as an actual debt limit.

- An Extraordinary Assembly may be called by the Trustee or by the Issuer of the ONs at the request of the holders of that represent at least 5% of the nominal value.
- To be able to vote at an Extraordinary Assembly, a person must be (i) the holder of one or more ON corporate bonds and must sign up three days before the registration date.
- Quorum in Extraordinary Assemblies convened to adopt any resolution will be constituted by persons who own or represent at least 60% of the total face value of the outstanding New Notes.
- Any resolution tending to modify or amend or waive the fulfillment of any provision of the ON will be validly adopted if it is approved by the majority of the persons with the right to vote present or represented at the Extraordinary Assembly.

This debt re-negotiation mechanisms embedded within ON corporate bonds implies that creditors play a recurrent monitoring role over firms. This is in line with the monitoring role banks have over firms according to BCRA's regulations. Furthermore, this debt re-negotiation mechanisms allow firms to restructure their liabilities and debt payments as a function of the dynamics of their cash-flows, allowing them to remain active.[48]

In Appendix A we build on Edenor's example by providing supporting evidence using our full sample of ON corporate bonds. We show that the vast majority of ON corporate bonds have specific technical default events specified in terms of relationships between firms' debt interest payments and their cash-flows. Furthermore, ON corporate bonds have clauses which allow creditors to step in through Extraordinary Assemblies and make decisions and vote over firms' liability decisions.

3.3 Evidence of Binding Borrowing Constraints & its Implications

This previous analysis in this section characterizes firms' borrowing constraints according to BCRA regulations and evidence from corporate bonds. A natural follow up question is whether these borrowing constraints bind, and if so, what are the implications of binding borrowing constraints. In this section, we present evidence that violations of debt covenants around the the Argentinean 2001-2002 sovereign default crisis, which we interpret as binding borrowing constraints, have significant impact on firms access to banking debt.

Evidence of covenant violations around a sovereign default crisis.

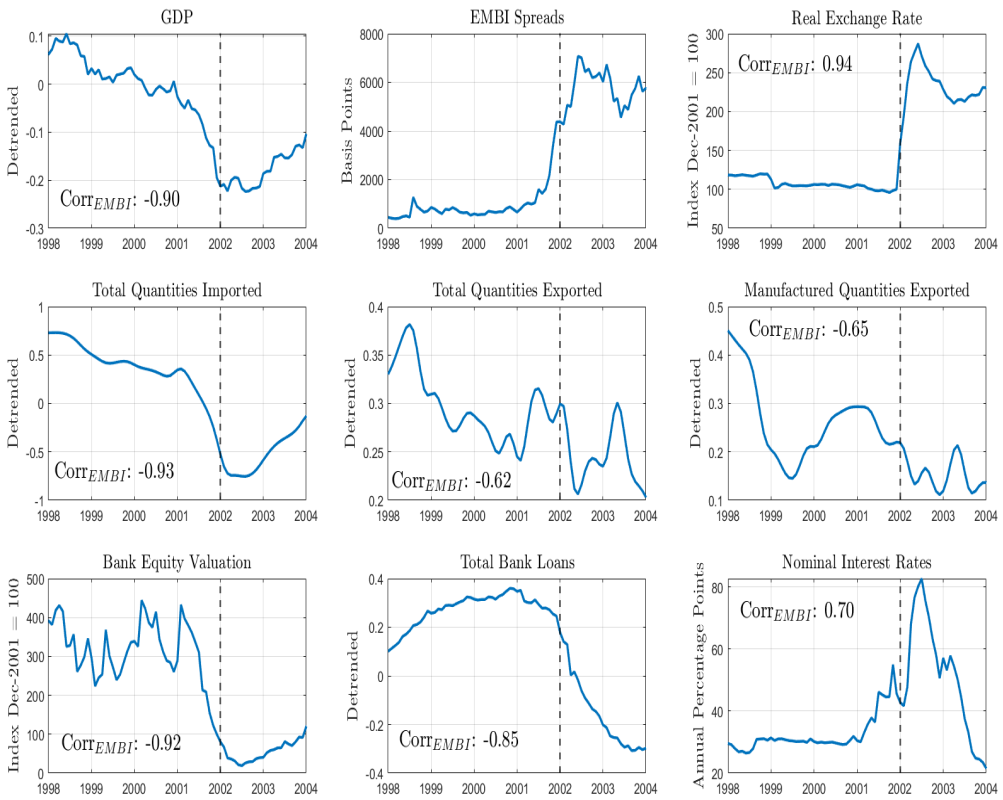
[48] A prime example of this debt re-negotiation process is the case of "Roch S.A.", a leading independent operators in the exploitation, exploration and commercialization of gas and oil in Argentina. See the company website at https://www.roch.com.ar/en/home/. On May 16^{th} 2022, the creditors called for an Extraordinary Assembly, voted in favor of an overall debt re-negotiation. See the full document over the meeting in https://ws.bolsar.info/descarga/pdf/408120.pdf. This allowed the firm to avoid default and bankruptcy and carried out a successful liability re-structuring by July 8^{th} and resume operations as usual, see https://www.iprofesional.com/negocios/366273-una-petrolera-local-logra-evitar-el-fantasma-del-default.

Binding borrowing constraints & credit supply around a sovereign default crisis. Next, that a binding borrowing constraint around Argentina's 2001/2002 sovereign debt crisis lead to a significant drop in firms' bank debt. Furthermore, we argue that this drops is quantitatively larger for firms which borrowed from banks that are relatively more exposed to the crisis.

The 1990s were a period of drastic reforms in Argentina. First, in 1991 a currency board was implemented which pegged the peso to the US dollar at \$1 peso = US\$ 1 dollar. Second, the government adopted a set of market-oriented reforms, privatizations of public enterprises, and a re-structuring of their sovereign debt as part of the Brady plan. The banking industry experienced the implementation of international regulations such as deposit insurance and Basel guidelines, and the entry of foreign institutions through mergers and privatizations. These reforms were able to tame inflation and lead to an expansion of output and credit intermediation.

Figure 6 shows the dynamics of key macroeconomic variables around the crisis. The

Figure 6: Macroeconomic & Financial Dynamics around the Sovereign Crisis

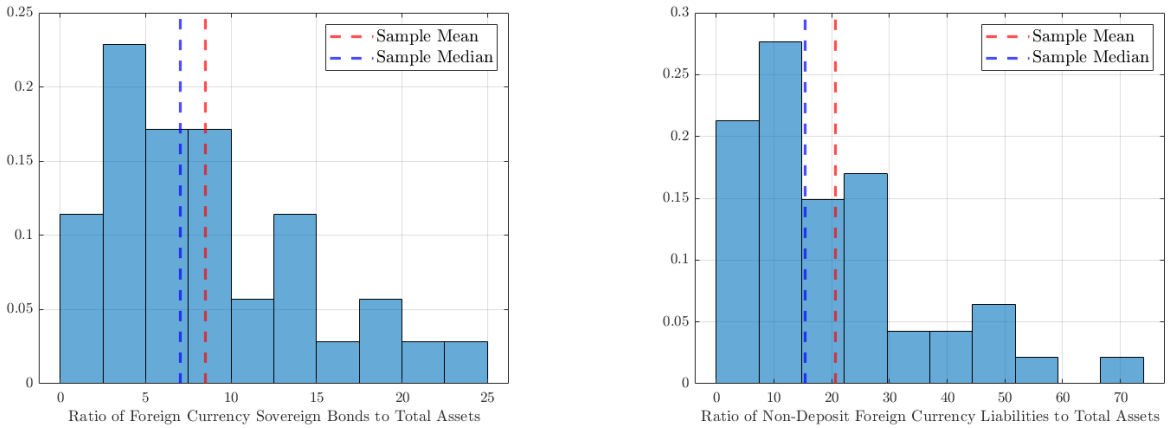


Note: There are 9 sub-figures arranged in three rows and three columns. Ordered from top to bottom and from left to right the variables are: (i) GDP, (ii) EMBI spreads, (iii) Real exchange rate with the US dollar, (iv) total quantities imported, (v) total quantities exported, (vi) manufacturing quantities exported, (vii) the mean bank equity valuation, (vii) total real bank loans, (ix) the nominal interest rate.

economy as well as the growth of private credit slowed down and the peso appreciated noticeably

late in 1998 in response to the East Asian and Brazilian crisis. Sovereign spreads increased significantly which lead to a drop in GDP close to 5% between 1999 and 2000. In March 2001, a crisis within the president's cabinet induced the first run on bank deposits, debilitating banks' health and curtailing private credit. Figure shows that the domestic banking industry exhibited a significant exposure to both sovereign risk (measured as the fraction of sovereign bonds to total assets) and to the risk of a devaluation (measured as the fraction of foreign currency liabilities to total assets). By mid 2001, spreads on government debt increased to over 1300 basis points over

Figure 7: Banking Industry Pre Crisis Exposure



(a) Exposure to Sovereign Risk

(b) Exposure to Devaluation Risk

Note: Figures are constructed using the simple average for the year 2001. The left panel presents the results for banks' exposure to sovereign risk proxied as the ratio of foreign currency sovereign bonds to total assets. The right panel presents the results for banks' exposure to a devaluation risk proxied as the ratio of non-deposit foreign currency liabilities to total assets. Each plot shows the correlation between each of the variables and the EMBI spreads.

U.S. Treasuries and bank deposits decline was greater than 10%. During the year 2001 alone, banks valuation decreased by 50%, the nominal lending interest rate to firms doubled from 30% to 60%, and total bank loans decreased by close to 15%. In order to stop the run on bank deposits the government announced a "*Corralito*" through which it froze all bank accounts on December 2001.[49] Only a small amount of cash was allowed for withdrawal on a weekly basis, and only from deposit accounts denominated in pesos.

The Argentinean economy collapsed due to the drastic reduction in bank and overall financial intermediation. The government announced the default on sovereign debt on December 26 2001 and formally abandoned the currency board on January 7, 2002. By February 2002, a dirty-float exchange rate regime was implemented which resulted in a that led to an increase in the nominal exchange rate close 250% in 2 months. Together with the new exchange rate regime, the government announced the "*Corralón*". The first part of this economic program was the announcement of a "*pesification*", i.e., the conversion of financial assets and liabilities

[49]The initial measure stated that the freeze on all bank accounts would only last 90 days.

denominated in US dollars to pesos at different rates.[50] Second, this program maintained the freeze on deposits which lasted until December 2002.

In summary, in detrended terms GDP fell close to 30% between its peak in 1998 and the 2002-2003. EMBI spreads would remain at all time high during 2003 and 2004, up until the sovereign debt re-structuring in the year 2005. Domestic financial conditions continued significantly tight post-default and devaluation as banks valuations and total loans remained significantly below pre-crisis levels.

Research designs. Our research design builds on banks' heterogeneous exposure to sovereign and devaluation risk before the crisis. The financial crisis brought a complete collapse of banks and overall financial intermediation. However, banks exposure to sovereign and foreign currency liabilities differed significantly across banks, as Figure 7 shows. For instance, Figure 7a shows that the mean ratio of sovereign bonds to total assets in the year 2001 was 8% some banks exhibited ratios above 20%. Figure 7b shows a similar heterogeneity on banks' exposure to foreign currency liabilities.

Our research designs exploits the heterogeneity in banks' exposure to the financial crisis before the sovereign default as a source exogenous variation in firms' availability of credit. Furthermore, we assess whether banks' exposure to the financial crisis affects in particular the access to credit of firms which have breached their debt contract. We test this hypothesis through regressions similar to those proposed by Chodorow-Reich and Falato [2022]

$$\begin{aligned} L_{i,b,t} = \beta_0 + \beta_1 \left[\text{Exposed Bank}_b\right] + \beta_2 \left[\text{Breached Contract}_{i,t-1,t}\right] + \\ + \beta_3 \left[\text{Exposed Bank}_b\right] \times + \left[\text{Breached Contract}_{i,t-1,t}\right] \\ + \gamma' X_{i,b,t} + \epsilon_{i,b,t} \end{aligned} \tag{4}$$

where $L_{i,b,t}$ denotes the amount of bank debt of firm i from bank b in period t, $[\text{Exposed Bank}_b]$ measures the health of bank b, $[\text{Breached Contract}_{i,t-1,t}]$ is a measure of the health of the debt contract between firm i and bank b, and $X_{i,b,t}$ includes any covariates.

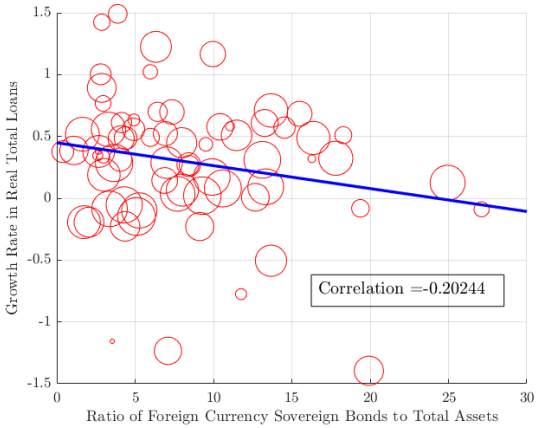
First, we show how different dimensions of banks' exposure to the financial crisis affected their aggregate loan performance and the construction of variable $[\text{Exposed Bank}_b]$. We begin by showing how banks' exposure to sovereign and devaluation risk *before* the crisis impacted their lending performance *after* the government announced the sovereign default and the end of the currency board. Figure 8 shows banks' growth rate in real lending after the *de-freezing* of deposits in late 2002 plotted against their *pre-crisis* exposure to sovereign and devaluation risk. Figures 8a and 8b show evidence that banks which exhibited a greater exposure to sovereign and devaluation risk before the crisis experienced a larger drop in their lending once banks re-opened.

We construct our indicator of banks' exposure to the financial crisis following Chodorow-

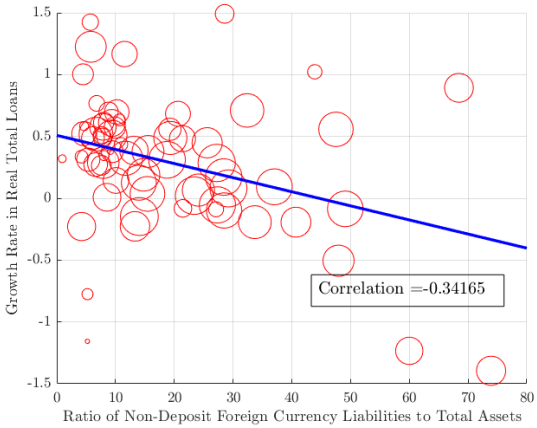
[50] All dollar denominated deposits were converted to pesos at the exchange rate of \$1.4 = US\$1. All loans to the private sector were converted at the rate of \$1 = US\$1. Sovereign bonds and public credit were converted at \$1.4 = US\$1.

Figure 8: Exposure to Financial Crisis & Post Default Lending

Bank Level Analysis



(a) Exposure to Sovereign Risk



(b) Exposure to Devaluation Risk

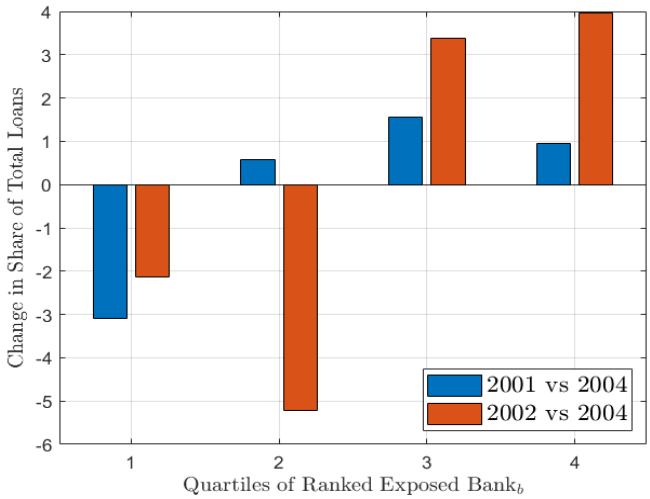
Note: On the x-axis, the indicators of exposure to sovereign risk and devaluation risk are constructed as the simple average for the year 2001. On the y-axis the growth rate of total bank level loans is constructed as $(L_{b,2004} - L_{b,2003}) \,/\, [0.5 \times (L_{b,2004} - L_{b,2003})]$.The size of the markers reflects banks' size measured as the value of their assets in the year 2001.

Reich and Falato [2022]. We combine the two indicators of banks' exposure to the financial crisis presented above, extract the first principal component and construct a rank-normalized variable as the rank of the first principal component divided by the number of banks in the sample.[51] Figure 9 shows the change in the share of aggregate bank loans across the fourth quartiles of variable Exposed Bank$_b$ between 2001 and 2004. This figure shows that relatively more exposed banks exhibited a large drop in their share of total loans while those less exposed exhibited a significant increase.

Estimating Equation 4 with ordinary least squares (OLS) raises two main concerns. First, firms that breach their debt contracts and borrow from relatively more exposed banks may differ along other dimensions from firms that breach their debt contracts and have healthier lenders. The second concern is that a firm breaching its debt contract may also correlate with other firm characteristics and bank debt may also depend on the interplay between a banks exposure to the crisis and these other characteristics.

[51] This implies that once the principal component has been recovered and predicted for each bank b, the banks are ranked according to the value of their predicted principal component with the highest value awarded the top ranking and the lowest value awarded the bottom ranking. Finally, the normalized ranking is computed as $(r_b - 1) \,/ (R - 1)$ where r_b is bank b's ranking and $R - 1$ is the total amount of observations.

Figure 9: Change in Share of Total Loans & Exposure to the Crisis
According to Exposed Bank$_b$



Note: Figure reports the change in the share of total loan supply from banks in the four quartiles of the constructed variable Exposed Bank$_b$. The first bar or blue bar for each quartile represents the change between 2001 and 2004, while the second or red bar presents the change between between 2002 and 2004.

4 A Real Model with Cash Flow Borrowing Constraints

In this section we lay out a simple real model in which firms face the borrowing constraints presented in Section 3. The model demonstrates the key economic mechanisms at work and provides the benchmark for comparison for our extended versions of the model. In Section 5, we extend the model to allow for multiple .

4.1 Model Description

Our structural framework builds on the work of Mendoza [2010] and Garcia-Cicco et al. [2010] and introduces financial frictions following the approach of Jermann and Quadrini [2012].

Model environment. Time is discrete, indexed by t, and continues infinitely. The economy is populated by three types of agents: (i) a continuum household, (ii) a continuum of firms and (iii) a fiscal authority. The firms produces by hiring labor and accumulating capital, subject to a borrowing constraint. The households' problem is standard, it consumes, supplies labor, saves in internationally traded bonds and shares issued by the firm and receive dividend payments. The fiscal authority has a passive role, only levying lump sum taxes.

Each firm produces using a final standard good through the following production technology

$$Y_t = a_t K_{t-1}^{\alpha} M_t^{\eta} \left(X_t h_t\right)^{1-\alpha-\eta} \tag{5}$$

where Y_t represents output in period t, K_t denotes capital chosen in period $t-1$ and determined

in period t, h_t denotes hours worked in period t, M_t represents imported inputs, $\{\alpha, \eta\} \in (0,1)$ represents the capital and imported input elasticity subject to $\alpha + \eta \leq 1$, and a_t and X_t represents productivity shocks. We follow Garcia-Cicco et al. [2010] and interpret these shocks as encompassing both exogenous variations in technology and other disturbances such as terms of trade shocks.

We assume that a_t follows an auto-regressive process in logs, while X_t is a permanent shock, with its growth rate $g_t \equiv X_t/X_{t-1}$ following an auto-regressive process. These productivity processes can be characterized by the following expressions.

$$\ln a_{t+1} = \rho_a \ln a_t + \epsilon^a_{t+1}; \qquad \epsilon^a_t \sim \mathcal{N}\left(0, \sigma_a^2\right)$$
$$\ln\left(\frac{g_{t+1}}{\bar{g}}\right) = \rho_g \ln\left(\frac{g_t}{\bar{g}}\right) + \epsilon^g_{t+1}; \qquad \epsilon^g_t \sim \mathcal{N}\left(0, \sigma_g^2\right), \quad g_t \equiv \frac{X_t}{X_{t-1}}$$

where $\{\rho_a, \rho_g\} \in [0,1)$. We use uppercase letters to denote variables which in equilibrium contain a trend, and use lowercase letters to denote variables which do not contain a trend in equilibrium.

The representative firm owns and accumulate capital subject to the following law of motion

$$K_t = (1-\delta) K_{t-1} + I_t \left[1 - \frac{\phi_i}{2}\left(\frac{I_t}{I_{t-1}} - \bar{g}\right)^2\right] \tag{6}$$

where I_t is investment, δ is the depreciation rate of capital, ϕ_i is a parameter which governs the curvature of the investment adjustment cost. Note that as the economy exhibits trend growth rate, the adjustment costs of investments exhibit the deterministic component of trend productivity growth rate $\bar{g}$ inside the parenthesis. This specification of investment adjustment costs is in line with that studied in Christiano et al. [2005, 2011], and introduces a time-varying price of capital. This arises from the standard result that adjustment costs lead to variations in the value of capital inside the firm relative to its replacement value, i.e., affecting the ratio known as *Tobin's Q* (see Hayashi [1982]).

Firms use equity and debt. Debt, denoted by B_t, is preferred to equity, pecking order, because of its tax advantage. This is a standard assumption in the macro-finance literature, as in Hennessy and Whited [2005]. We assume that given an interest rate r_t, the effective interest rate firms face is

$$\tilde{R}_t = 1 + r_t (1 - \tau) \tag{7}$$

where τ represents the tax benefit. Every period, the firm must also decide on the amount of equity payouts to its shareholders, denoted by D_t. We come back to description of firm's decision over equity payouts.

In addition to the intertemporal debt, B_t, firms are subject to working capital constraint, given the vast importance of this type of financing argued in Section 2 and 3. We assume that firms must pay a fraction ϕ of the wage bill and imported intermediate inputs in

advanced and must finance it at interest rate $\tilde{R}_t$. Thus, we denote the firm's borrowing for working capital needs as

$$L_t = \phi \left(W_t h_t + p_t^M M_t \right) \tag{8}$$

where W_t is the wage rate of labor, p_t^M is the relative price of imported inputs. This working capital constraint can be rationalized through firms necessity to cover cash flow mismatches between the payments necessary to hire labor and purchase imported intermediate goods, and the realization of revenues from production. We assume that this working capital constraint is repaid within period t.

We can write the firm's flow of funds constraint as

$$Y_t + \frac{B_{t+1}}{R_t} = (1 - \phi) \left(W_t h_t + p_t^M M_t \right) + I_t + D_t + L_t \tilde{R}_t + B_t \tag{9}$$

where the left hand side represents the sources of funds, production and issue of new debt; and the right hand side represents the uses of funds, hiring labor, purchasing imported inputs, investment, payments of dividends, paying working capital and intertemporal debt.

We assume that firms face a borrowing constraint which establishes a debt limit $\bar{B}_t$. This debt limit will be endogenous in our analysis and depend on both aggregate and firm level variables. We assume that the borrowing constraint applies to both intertemporal and working capital debt and is expressed in terms of the amount lent by the firms creditors

$$\bar{B}_t \geq \frac{B_{t+1}}{1 + r_t} + \tilde{R}_t L_t \tag{10}$$

Higher debt, either inter temporal and/or for working capital, makes the borrowing constraint tighter. Given the tax advantage over debt in Equation 7, firms borrow up to its constraint in every period.

To see more clearly how changes in the borrowing constraints affect firms' financing and production decisions it is useful to think about an unexpected shock which reduces the debt limit $\bar{B}_t$. At the beginning of period t, a firm only has the obligation to repay its debt B_t issued in period $t-1$. The firm must decide how much intertemporal debt to issue, B_{t+1}, how much labor to hire and inputs to purchase, and its equity payouts D_t. If at the pre-shock starting point the firm is borrowing up to its limit in Equation 10, and the firm wishes to keep its production scale unchanged, i.e., do not reduce L_t in order to reduce which h_t or M_t, a reduction in $\bar{B}_t$ requires a reduction in the equity payout D_t. In other words, in face of a tighter borrowing constraint the firm is forced to increase its equity and reduce the amount of newly issued intertemporal borrowing. However, if the firm faces adjustment costs in its equity payouts D_t, it must reduce either hire less labor, purchase a lower amount of imported inputs, or both. Consequently, whether a tighter borrowing constraint affects a firm's production decision depends on the flexibility of firms to adjust its financial structure, i.e., the relative shares of debt and equity.

We formalize the rigidities affecting the substitution between debt and equity by following the approach of Jermann and Quadrini [2012]. This approach assumes that a firm's payout

is subject to quadratic adjustment costs which we define in detrended terms as

$$\Psi\left(d_t\right) = d_t + \psi\left(d_t - \bar{d}\right)^2 \tag{11}$$

where $\bar{d}$ is the steady state value of dividend payout deflated by technology, and $\psi \geq 0$ is a parameter that governs the adjustment costs. This adjustment costs are meant to capture managers preference over dividends smoothing, which has been documented for US firms (see Lintner [1956]), and for Emerging Markets (see Jeong [2013], Al-Malkawi et al. [2014], Al-Najjar and Kilincarslan [2017], Ahmed et al. [2020]). This preference for dividend smoothing could derive from agency problems or other financial frictions. We abstract from explicitly modelling these underlying frictions and take them as a given.

Lastly, it is useful to define a firm's cash flow as their operational profits, which we denote by π_t

$$\pi_t \equiv Y_t - \left(W_t n_t + P_t^M M_t\right) \tag{12}$$

This definition of cash-flow corresponds to the accounting definition of *EBITDA*, i.e., sales net of overhead and labor costs, but without subtracting investment, interest payments or taxes. We also study a specification of the firm's cash flow which considers the interest payments on working capital borrowing, i.e., $\tilde{\pi}_t \equiv Y_t - \left(1 - \phi + \phi\tilde{R}_t\right)\left(W_t n_t + P_t^M M_t\right)$. Our benchmark results are robust and amplified under this specification.

Borrowing constraints. Next, we describe the functional form for the debt limit $\bar{B}_t$ in Equation 10. We assume that firms are subject to a borrowing constraints on top of their working capital constraint. In line with our empirical work we consider three possible borrowing constraints: (i) a standard collateral or leverage (LEV), (ii) a cash flow to debt borrowing constraint (DC), (iii) a cash flow to interest payments or interest coverage borrowing constraint (IC). We assume that these borrowing limits are given by the following expressions

$$B_t^{LEV} \leq \theta^{LEV} p_{k,t} K_t \left(1 - \delta\right) \tag{13}$$

$$B_t^{DC} \leq \theta^{DC} \varphi\left(L\right) \pi_t \tag{14}$$

$$\tilde{r}_t B_t^{IC} \leq \theta^{IC} \varphi\left(L\right) \pi_t \tag{15}$$

where $\varphi\left(L\right)$ is a lag of operator and parameters $\theta \in \{\theta^{LEV}, \theta^{DC}, \theta^{IC}\}$ capture the exogenous tightness of these borrowing constraints. As argued in Sections 2 and 3, both the borrowing constraints implied by BCRA regulations and those implied by corporate loan debt covenants are not established in terms of the current period cash flows, but generally in terms of observable lagged cash flows in the near past.

We assume that a firm's collateral is evaluated at market value. In our current structural model, the price of capital is determined in equilibrium as the Lagrange multiplier of the firm's capital accumulation equation. Given the investment adjustment costs in Equation 6, the price of capital appreciates with an increase in investment demand and depreciates with a decrease in investment demand.

Representative firm's optimization problem. The objective function of the firm is to maximize the expected discounted stream of the dividends paid to its owners,

$$\max \mathbb{E}_0 \sum_{t=0}^{\infty} \Lambda_t \times d_t \tag{16}$$

subject to Equations 5, 6, 11, 9, 12, and one of the borrowing constraints given by Equations 13 to 15. The term Λ_t in the objective function is the firm owners' stochastic discount factor between periods 0 and t. In Appendix F.1 we present and describe the firm's optimality conditions.

Household, fiscal authority and equilibrium. The representative household maximizes the following life time utility function

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{(C_t - \zeta \omega^{-1} X_{t-1} h_t^{\omega}) - 1}{1-\sigma}$$

where β represent a discount factor, h_t represents hours worked. The household consumes and decides how much to save in risk-free bonds, B_t, and in shares of the representative firm, s_t. Given the firm's tax advantage over debt, in equilibrium firms are debtors and households save. Additionally, we do not allow foreigners to own shares of the representative firm, which leads to $s_t = 1 \; \forall$ periods t.

We assume that the fiscal authority plays a passive role. The firm runs a budget balance with only lump sum taxes over the household as a source of tax revenue. These lump sum taxes, denoted by T_t, which is the household takes as given, is used to finance the firms' tax benefit enjoyed by firms when borrowing

$$T_t = \frac{B^f}{\tilde{R}_t} - \frac{B^f}{1+r_t}$$

We assume that the economy as a whole faces a debt-elastic interest rate premium as in Schmitt-Grohé and Uribe [2003] in order to induce independence of the deterministic steady state from initial conditions. In particular, the interest rate agents in the economy face is assumed as the sum of the world interest rate $r^* > 0$ and a country premium that is a decreasing function of a detrended measure of net foreign assets, and an exogenous shock

$$r_t = r^* + \psi \left(e^{NFA_{t+1}/X_t - N\bar{F}A} - 1 \right) + e^{\mu_t - 1} - 1 \tag{17}$$

where NFA_t is given by

$$NFA_t = \left(B_t - B_t^f \right) \tag{18}$$

and $N\bar{F}A$ represents the steady state value of net foreign assets. We follow Garcia-Cicco et al. [2010] and assume that the exogenous shock term $e^{\mu_t - 1}$ is characterized by a stochastic shock which follows an auto-regressive process of order 1 given by

$$\ln \mu_{t+1} = \rho_\mu \ln \mu_t + \epsilon_t^\mu, \qquad \epsilon_t^\mu \sim \mathcal{N}\left(0, \sigma_\mu^2\right) \tag{19}$$

Calibration and solution. We parametrize our model following a two prong approach. First, there is a set of parameters which we calibrate by choosing standard values in the literature of international macroeconomics. There is a set of parameters which we calibrate to match certain aggregate moments of the Argentinean data.

We begin by presenting in Table 9 the parametrization of the set of parameters that are chosen to match the international macroeconomic literature. The capital share in production, α,

Table 9: Parametrization: Real Model
Standard Values

Parameter	Value	Details / target
ϕ_i	Investment Adjustment Cost	2 - Christiano et al. [2011]
α	Capital Elasticity	0.32 - Garcia-Cicco et al. [2010], Mendoza [2010]
η	Imported Input Elasticity	0.10 - Mendoza [2010]
δ	Capital depreciation rate	0.1255/4 - Garcia-Cicco et al. [2010]
β	Household discount factor	0.9852 - Thoenissen et al. [2014] $\rightarrow R = 6\%$
σ	Household risk aversion	2 - Garcia-Cicco et al. [2010], Mendoza [2010]
ϕ	Working capital parameter	0.25 - Mendoza [2010]
τ	Tax advantage on debt	0.35 - Argentinean Data & Thoenissen et al. [2014]
ψ	Dividend adjustment cost	0.20 - Jermann and Quadrini [2012]

Note: See Appendix F for additional details on the calibration of the model and for a full list of model parameters.

and the capital depreciation rate, δ, are sourced from Garcia-Cicco et al. [2010]. The household discount factor, β, is set to match an annual interest rate of 6%, consistent with Thoenissen et al. [2014]. We set the fraction of the wage bill and imported intermediate inputs that must be pay in advanced, $\phi_{WK} = 0.25$, in line with the estimates of Mendoza [2010] and other values in the literature. Note that this value is significantly lower than those studied by Neumeyer and Perri [2005] which choose a value of $\phi_{WK} = 1$ as their main parametrization. This parameter choice is intended to reflect the importance of working capital constraints within a broader overall borrowing constraint without overemphasizing its role as a transmission channel of economic shocks. The parameter that governs the degree of debt subsidy τ is set equal to $\tau = 0.35$ following Thoenissen et al. [2014]. Lastly, we parametrize ψ which governs the dividend adjustment cost equal to 0.2. This value is standard in the literature which study financial frictions for US firms, see Jermann and Quadrini [2012] and Drechsel et al. [2019]. This parameter value has also been used by the international macroeconomic literature which builds on Jermann and Quadrini [2012], as exemplified by Thoenissen et al. [2014], and thus we consider it a useful initial benchmark. However, we will later emphasize that this parameter plays a crucial role in determining the tightness of borrowing constraints and impact of interest rate shocks. We show that for higher values of ψ, implying greater financial frictions in Emerging Markets than for US firms, then the quantitative implications of interest coverage borrowing constraints are exacerbated.

Next, Table 10 presents the results of our set of parameters which are calibrated to

match Argentinean data. We seek to the hours worked at 20% of the households total hours, as in Garcia-Cicco et al. [2010]; a balanced net-exports to GDP ratio and a private sector credit to GDP of 35%, the average value for Argentina for the period 1993-2020.[52,53] We match these

Table 10: Parametrization: Real Model
Calibrated Values

Parameter	Value	Details / target
ζ^{LEV}	Dis-utility of Labor Lev. Const.	1.9354 - Match 20% hours worked
ζ^{DC}	Dis-utility of Labor DC Const.	1.9348 - Match 20% hours worked
ζ^{IC}	Dis-utility of Labor IC. Const.	1.9348 - Match 20% hours worked
θ^{LEV}	Tightness Leverage Const.	0.2279 - Match 35% of Credit to GDP
θ^{DC}	Tightness DC Const.	4.2261 - Match 35% of Credit to GDP
θ^{IC}	Tightness IC Const.	0.0955 - Match 35% of Credit to GDP

Note: See Appendix F for additional details on the calibration of the model and for a full list of model parameters.

aggregate moments for each of the economies with borrowing constraint from Equations 13 to 15, by choosing a set of parameters $\{\zeta, N\bar{F}A, \theta\}$. From the first panel of Table 10, it is re-assuring that the resulting parameters of the dis-utility of labor are close across economies with different borrowing constraints, and close the calibrated value of 2.24 used in Garcia-Cicco et al. [2010]. Next, it is worthy to describe the resulting values of the tightness parameters. For the leverage constraint, the parameter $\theta^{LEV} = 0.2279$ is close to the calibrated value used by Mendoza [2010] and Mendoza and Villalvazo [2020] of 0.20. Thus, we believe our benchmark parametrization allows us to carry out a quantitative comparison between the standard leverage constraint and the two cash flow based borrowing constraints. The calibrated value of $\theta^{DC} = 4.2261$ is smaller than those found by Greenwald et al. [2019], 8.613, and Drechsel et al. [2019], 4×4.6, for US firms. This is expected as the ratio of private credit to GDP in Argentina is 10 times smaller than the same ratio for the US economy. Similarly, the estimated tightness parameter for the interest coverage constraint, $\theta^{IC} = 0.0955$, is smaller than that found by by Greenwald et al. [2019], 0.154.

4.2 Impulse Response Analysis

We study the implications of cash flow based borrowing constraints under the light of a foreign interest rate shock, R_t^*. The impact of US monetary policy shock is a classic question in inter-

[52] Assuming balanced net exports to GDP is close to the observed level in the data, and in line with values assumed in the literature. For example, Garcia-Cicco et al. [2010] calibrates the model to steady state trade balance of 0.25% of GDP.

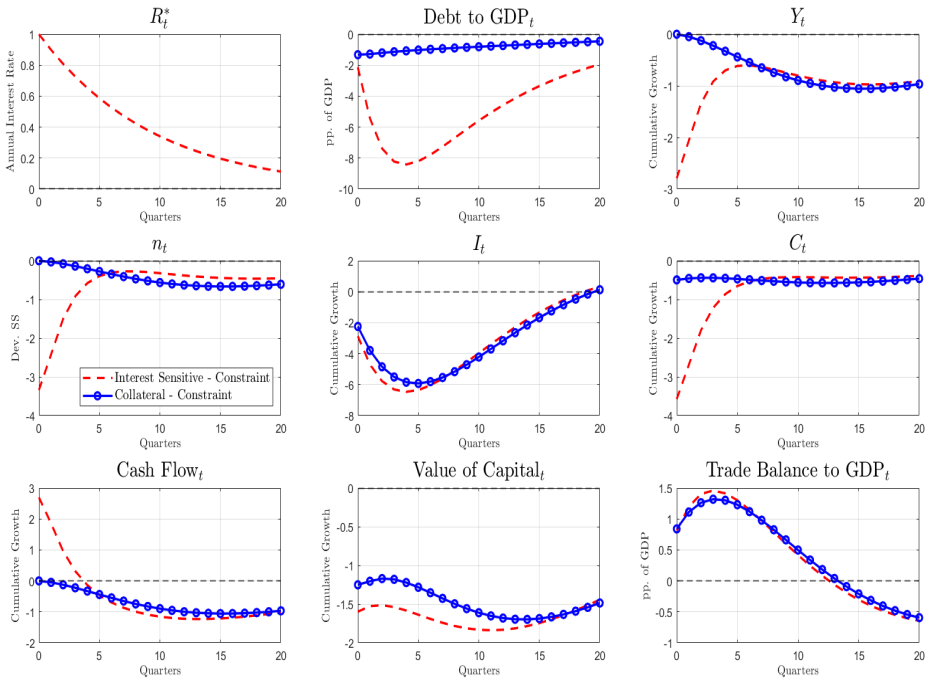
[53] The average ratio of private sector credit to GDP is sourced from the World Bank `https://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS`. We carry out robustness checks to match higher ratios of private sector credit to GDP. We find that the amplification of interest coverage constraints to leverage constraints is exacerbated for higher ratios.

national macroeconomics, going back to Fleming [1962], Mundell [1963], Dornbusch [1976] and Frenkel [1983]. Furthermore, it is still an active research topic both empirically (see Degasperi et al. [2020], Camara [2021]) and structurally (see Kalemli-Ozcan [2019], Camara et al. [2021]). We show that the introduction of interest sensitive cash flow based borrowing constraint leads to a significantly greater amplification of foreign interest rate shocks compared to the benchmark leverage constraint. Furthermore, we show that this amplification is significantly exacerbated by an increase in the magnitude of working capital constraints, ϕ, and in the frictions which govern the substitutability of debt and equity payouts, ψ.

Benchmark results. We assume that an exogenous 100 annual basis point increase in the foreign interest rate shock occurs modeled through a positive realization of ϵ_t^{μ} in Equation 19. We assume that this exogenous shock has a persistence of $\rho_{\mu} = 0.90$, which is in line with the observed path of the Federal Reserve's Federal Funds Rate after a positive interest rate shock.

Figure 10 presents the impulse responses to a foreign interest rate shock under a collateral borrowing constraint (dotted blue line) and under a interest sensitive cash flow constraint (dashed red line). The first conclusion that arises from this figure is that an economy with an

Figure 10: Collateral & Interest Sensitive Borrowing Constraints
IRF Analysis - R^* Shock



Note: The figure is comprised of 9 panels ordered in three rows and three columns. In the text we refer to each panel following a (x, y) convention, where x and y represent the row and column. Each panel presents the dynamics of an economy with a collateral borrowing constraint (blue dotted line), and an economy with a interest sensitive cash flow borrowing constraint (red dashed line).

interest sensitive borrowing constraint (IC) exhibits a significantly greater impact on real variables in response to an increase in the foreign interest rate than an economy with a collateral

borrowing constraint (Col). Panel $(1,2)$ shows that the "IC Economy" exhibits a significantly greater and more persistent drop in firms' debt than the "Col. Economy". For instance, Panel $(1,2)$ show that 4 quarters after the initial shock, the "IC Economy" exhibits a drop in Debt to GDP of 8 percentage points while the "Col Economy" exhibits a drop of only 1.5 percentage points. The overall tighter borrowing constraints under the "IC Economy" leads to a significantly greater drop in real variables. Panel $(1,3)$ shows that the "IC Economy" exhibits a 4% drop in their level of production Y_t, while the "Col Economy" only exhibits a drop of 0.2%. The impact on Y_t under both economies converges between 5 to 6 quarters after the initial shock, at the half-life of the R^* shock. In summary, a foreign interest rate shock in an "IC Economy" leads to significantly greater tightening of borrowing constraints and greater drop in production than in a "Col. Economy".

The greater drop in production in the "IC Economy" is driven by the joint effect of tighter borrowing and working capital constraints. The greater drop in firms' debt, seen in Panel $(1,2)$, leads to an abrupt drop in firms' labor demand, causing the immediate negative impact in production, seen in Panel $(1,3)$. However, Panel $(2,2)$ shows that the tighter borrowing constraint does not lead to a significantly greater drop in firms' investment under the "IC Economy" compared to the "Col. Economy". This is due to the wedge introduced into firm's optimality condition over labor demand. Thus, the interaction between tighter borrowing constraints and working capital constraints exacerbates the wedge for labor and imported input demands, negative affecting firms' production.

The second conclusion that arises from Figure 10 is that the key driver of the greater amplification of foreign interest rate shocks is the inherent interest sensitivity of our novel borrowing constraint. Panel $(3,1)$ shows the dynamics of firms' cash flow, as defined in Equation 12, where the economy under an interest sensitive borrowing constraint exhibits an initial increase in firms' cash flow. This initial increase is caused by the significant drop in real wages, triggered by firms' drop in labor demand.[54] However, given the significant and persistent drop in firms' debt, seen in Panel $(2,3)$, shows that the increase in interest rates dominates the transitory increase in firm's cash flows. Lastly, Panel $(3,2)$ shows that the dynamics of the value of capital is relatively close across the two economies. Overall, the greater drop in firms' debt is caused by the interest sensitivity of the novel borrowing constraint, which translates into tighter working capital constraints and more pronounced drop in production than under the benchmark collateral constraint.

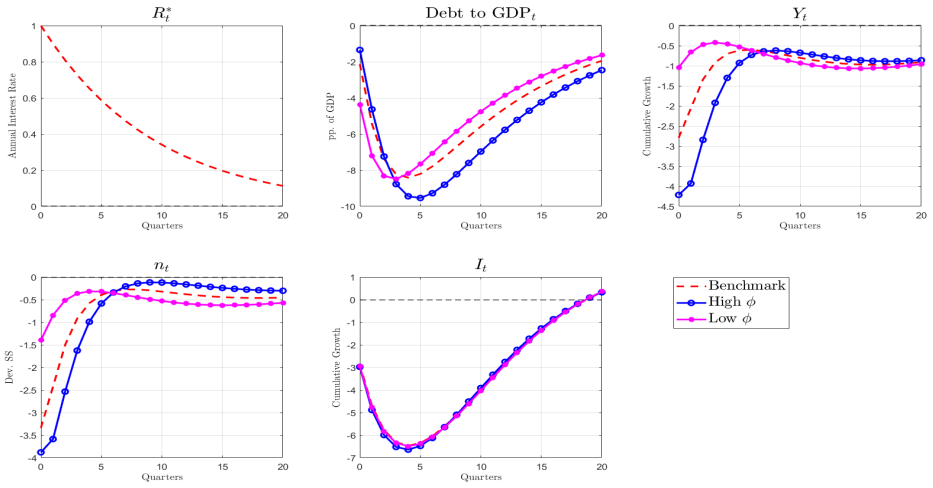
Sensitivity to working capital needs. The main transmission channel of a foreign interest rate shock R_t^* in our model is through tighter borrowing and working capital constraints. Thus, parameter ϕ which governs the importance of working capital needs plays a crucial part. Next, we test the quantitative importance of changes in the benchmark calibration of parameter ϕ.

Figure 11 shows the quantitative importance of parameter ϕ by comparing the impulse response functions of a foreign interest rate shocks for three values ϕ: (i) the benchmark value

[54] This result is caused by the lack of price and/or wage frictions.

(red dashed line), (ii) a high value of $\phi = 0.5$ (blue dotted line), (iii) a low value of $\phi = 0.05$ (magenta dotted line). The results are straightforward and intuitive as greater working capital

Figure 11: Collateral & Interest Sensitive Borrowing Constraints
Sensitivity to Working Capital ϕ



Note: The figure is comprised of 5 panels ordered in three rows and three columns. In the text we refer to each panel following a (x, y) convention, where x and y represent the row and column. Each panel presents the dynamics of an economy with interest sensitive cash flow borrowing constraints with different values of parameter ϕ. The red dashed line presents the results under the benchmark calibrated value of $\phi = 0.25$. The blue dotted line presents the results under a calibration of $\phi = 0.5$, and the dotted magenta line presents the results under a calibration of $\phi = 0.05$. For these two extreme cases with different values of ϕ, parameters θ^{IC} and ζ^{IC} are re calibrated to match the aggregate moments in Table 10.

requirements lead to tighter borrowing constraints and greater impacts on labor demand and total production. Panel $(1, 2)$ shows that the drop in the debt to GDP ratio is only significantly greater under the dynamics of a high value of ϕ. Panel $(1, 3)$ shows that doubling the working capital requirements leads to a 50% greater impact on Y_t. Similarly, almost shutting off working capital requirements with a value of $\phi = 0.05$ leads to a significantly lower impact on Y_t. The last row of Figure 11 highlights the transmission channel of foreign interest rate shocks through working capital constraints. On the one hand, Panel $(2, 1)$ shows that greater values of ϕ leads to a significantly greater impact on labor demand, n_t, as working capital requirements directly affect the wedge on firms' labor demand. On the other hand, Panel $(2, 2)$ shows that increasing the value of ϕ does not affect significantly investment dynamics which are not subject to working capital requirements.

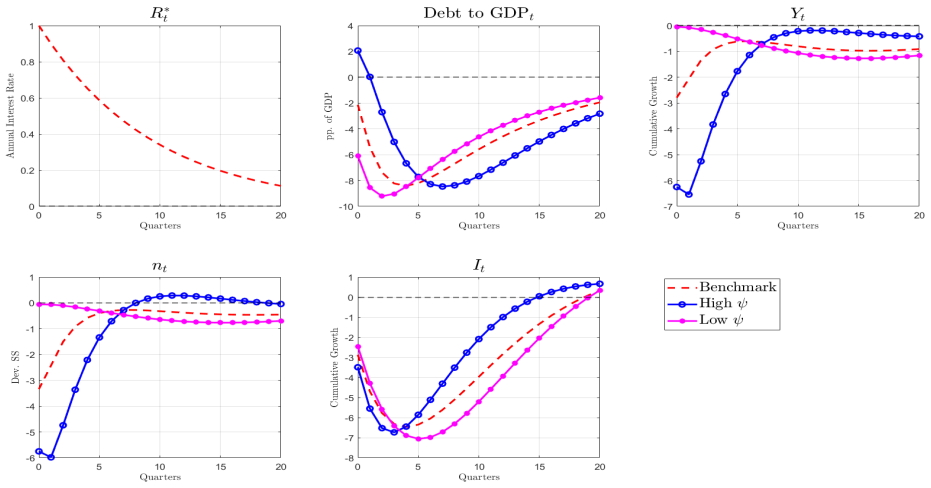
Lastly, we show that parameter ϕ plays a significantly greater role in interest sensitive than in collateral borrowing constraints.

Sensitivity to dividend adjustment costs. The frictions in adjusting dividends plays a crucial role in our model. The introduction of quadratic adjustment costs in Equation 11 causes an imperfect substitution between debt and equity, leading to tighter borrowing constraints having a real effect on firm's output. In order to gauge the quantitative importance of the

frictions in dividend payouts, we compute the impulse response functions of a foreign interest rate shock for different values of parameter ψ which governs the adjustment costs of dividends.

Figure 12 shows the quantitative importance of parameter ψ by comparing the impulse response functions of a foreign interest rate shocks for three values ψ: (i) the benchmark value (red dashed line), (ii) a high value of $\psi = 1$ (blue dotted line), (iii) a low value of $\phi = 0.005$ (magenta dotted line). Once more, results are straightforward and intuitive as greater dividend

Figure 12: Collateral & Interest Sensitive Borrowing Constraints
Sensitivity to Dividend Frictions ψ



Note: The figure is comprised of 5 panels ordered in three rows and three columns. In the text we refer to each panel following a (x, y) convention, where x and y represent the row and column. Each panel presents the dynamics of an economy with interest sensitive cash flow borrowing constraints with different values of parameter ψ. The red dashed line presents the results under the benchmark calibrated value of $\phi = 0.2$. The blue dotted line presents the results under a calibration of $\phi = 1$, and the dotted magenta line presents the results under a calibration of $\phi = 0.005$. Note that different values of parameter ψ do not affect the calibration of the model as it not affects its non-stochastic steady state.

frictions lead to an increase impact of tightening borrowing constraints over firms' input demand. Panel $(1, 2)$ shows that increasing the value of ψ leads to a greater and more persistent decrease in the ratio of debt to GDP. This greater drop in firms' debt is associated with a greater drop in production Y_t and labor demand n_t, see Panels $(1, 3)$ and $(2, 1)$ respectively. In particular, increasing the adjustment cost parameter ψ from 0.2 to 1, doubles the impact of a foreign interest rate shock on production and labor demand. Unlike an increase in working capital requirements, ϕ, an increase in the dividend adjustment costs affects investment choices as seen in Panel $(2, 2)$. While a greater value of ψ leads to a relatively larger initial impact on firms' investment after an interest rate shock, this change in parametrization also leads to a significantly faster recovery.

Sensitivity to timing of borrowing constraints. In Sections 2 and 3 we argued that both banks and corporate loans specify cash flow borrowing constraints in terms of both previous and contemporaneous measures of firms' cash flows. This fact leads us to model interest sensitive borrowing constraints . Next, we test the quantitative importance of variations in the timing of

cash flows introduced into the cash flow borrowing constraints.

5 Borrowing Constraints & the Spillover Puzzle

In this section we argue that economies which differ in their underlying borrowing constraints matter for the transmission of US interest rate shocks. We start by showing that Emerging Market economies experience significantly greater negative spillovers of US interest rate shocks than the US and other Advanced Economies, a phenomenon we denote the *Spillover Puzzle*. We do this through both panel SVAR and Local projection techniques and identifying US monetary policy shocks using the methodology introduced by Bauer and Swanson [2022]. We argue that the greater prevalence of interest sensitive cash flow based borrowing constraints in Emerging Market economies, compared to the US and other Advanced Economies, provides a solution this puzzle. We show this by augmenting our model introduced in Section 4 to allow firms to face both cash flow and collateral based borrowing constraints and calibrate it to match the data from Argentina and US firms. The greater prevalence of interest sensitive cash flow based borrowing constraints and its associated greater amplification of foreign interest rate shocks, provide a straightforward rationale for the greater impact of US interest rate shocks on Emerging Markets.

Local projection evidence of the Spillover Puzzle. The SVAR evidence presented above shows that after an identified US interest rate shock the impulse response functions of US and in other AEs' GDP is smaller in magnitude than for the panel of EM economies. We provide further evidence that stresses the greater negative spillovers of US interest rate shocks in EM economies through a local projection exercise, á la Jordà [2005].

We estimate the following econometric specification

$$\ln y_{i,t+h} = \beta_h^{MP} i_t^{\text{MP}} + \gamma_h^{INT} \mathbb{1}\left[i \neq \text{US}\right] \times i_t^{\text{MP}} + \sum_{j=1}^{J_y} \delta_i^j y_{i,t-j} + \sum_{j=1}^{J_x} \alpha_i^j x_{i,t-j} + \gamma t + \mu_i + \epsilon_{i,t} \quad (20)$$

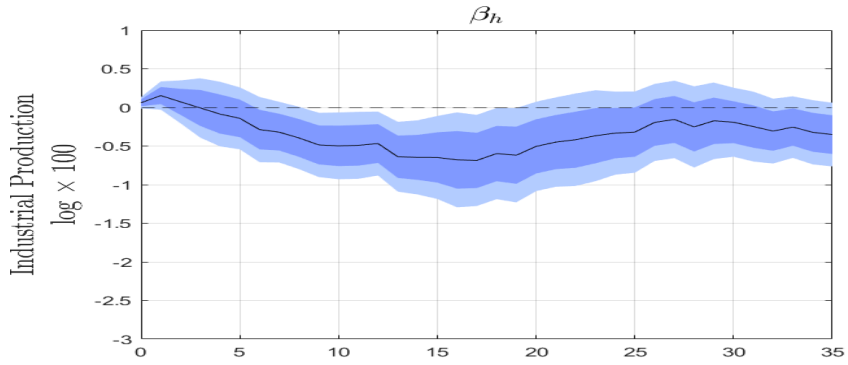
where $\ln y_{i,t+h}$ represents the log of industrial production in country i in period $t+h$, i_t^{MP} is the identified monetary policy shock, $\mathbb{1}\left[i \neq \text{US}\right]$ is an indicator variable which takes the value of 1 if country i is not the US, $y_{i,t-j}$ and $x_{i,t-j}$ are lagged values of the dependent variable and control variables from country i, the term γt represents a time trend, μ_i represents a country fixed effect, and $\epsilon_{i,t}$ is a stochastic disturbance. Constants J_y and J_x represent the number of lagged values of the dependent and control variables used in the regression, chosen to $J_y = J_x = 1$.[55],. The model is estimated at the monthly frequency, with our full sample of EM and AE economies,

[55]We select the number of lags by computing the Schwarz's Bayesian information criterion (SBIC) selection statistic for each country separately. The optimal number of lags is $J_y = J_x = 1$ for all but one country in our sample. The exception is Indonesia, for which the SBIC statistic suggest the choice of 2 lags. As a robustness check, we computed the Hannan and Quinn information criterion statistic which also suggest using one lag for the vast majority of countries in our sample.

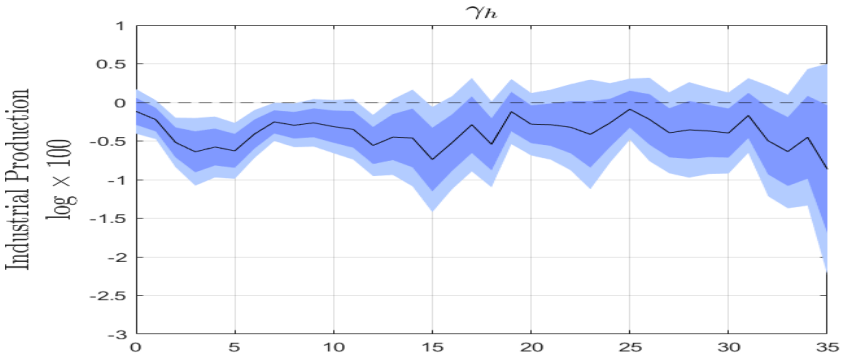
including the US economy. Standard errors are clustered at the country and time level.[56] The key parameters of interests are β_h^{MP} and β_h^{INT}. On the one hand, β_h^{MP} represents the impact of a US interest rate shock in the US economy in period h. On the other hand, $\beta_h^{MP} + \beta_h^{INT}$ represents the impact of a US interest rate shock in countries other than the US economy.

Figure 13 presents the estimates of parameters β_h and γ_h for $h = \{0, 35\}$. On the top

Figure 13: Impact of US Interest Rate Shocks
Within & Outside the US Economy



(a) Impact on US Economy - β_h^{MP}



(b) Differential Impact on the Rest of the World - γ_h^{INT}

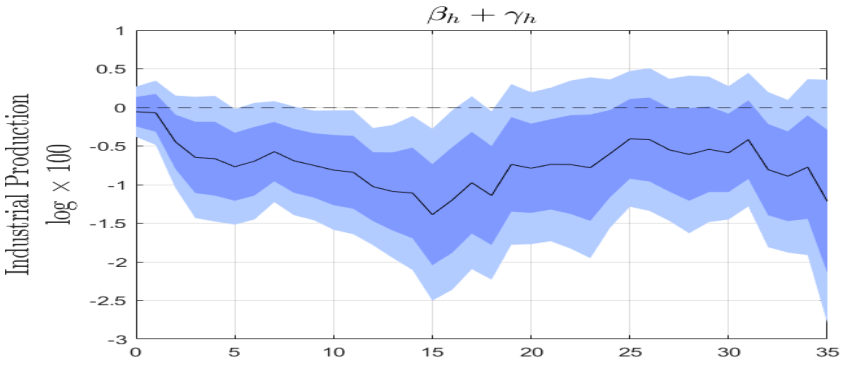
Note: The black line represents the point estimate of the parameter of interest. The dark blue are represents 68% confidence intervals. The light blue are represents 90% confidence intervals. Standard errors are clustered at the country and time dimension. Top and bottom panel present the estimates of parameters β_h and γ_h from the econometric specification in Equation 20, respectively. We normalize the scale of the graphs to match across Figures 13 and 14 to emphasize the different quantitative impact of US shocks across economies.

panel, Figure 13a shows that an one standard deviation US monetary policy shock leads to a hump-shaped impact on industrial production in the US economy. This impact is statistically different from zero 6 months after the initial shock. The impact reaches its greatest magnitude between 12 and 18 months after the initial shock around 1% below its pre shock level. Figure 13b in the bottom panel leads to two main conclusions. First, across the majority of time horizons h, the negative and significant estimate of parameter γ_h suggests that US interest rate shocks

[56] Clustering the standard errors at the time level is of key importance as the US interest rate shock occurs simultaneously for all countries in the sample.

have a significantly greater impact on industrial production outside the US than inside the US. Second, this greater impact is quantitatively larger in the first six months after the initial shock. Additionally, in the first six months the statistical significance of the estimated parameters is greater than for the rest of the time horizons. Lastly, Figure 14 exhibits the overall impact

Figure 14: Impact of US Interest Rate Shocks
Rest of the World - $\beta_h^{MP} + \gamma_h^{INT}$



Note: The black line represents the point estimate of the parameter of interest. The dark blue are represents 68% confidence intervals. The light blue are represents 90% confidence intervals. Standard errors are clustered at the country and time dimension.

of US interest rate shocks for non-US economies, computed as the sum of coefficients β_h and γ_h.[57] Overall, Figures 13 and 14 show evidence that the spillovers of US interest rate shocks are quantitatively larger outside the US economy than within the US economy.

Next, we show that outside of the US economy, the impact of US interest rate shocks is economically and statistically larger in magnitude for Emerging Market economies than for Advanced Economies. To do so, we estimate the following econometric specification

$$\ln y_{i,t+h} = \beta_h^{MP-EM} i_t^{\text{MP}} + \gamma_h^{INT-EM} \mathbb{1}\left[i = \text{EM}\right] \times i_t^{\text{MP}} + \sum_{j=1}^{J_y} \delta_i^j y_{i,t-j} + \sum_{j=1}^{J_x} \alpha_i^j x_{i,t-j} + \gamma t + \mu_i + \epsilon_{i,t} \tag{21}$$

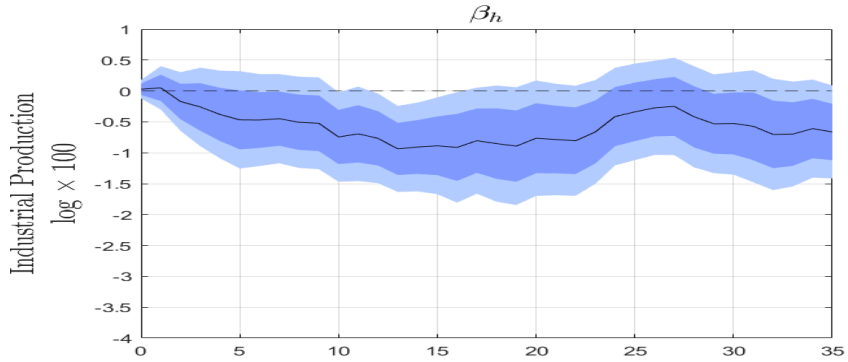
The difference with the econometric specification in Equation 20 is that the indicator function which took the value of 1 if country i was not the US economy, now takes the value of 1 if country i is an EM economy, $\mathbb{1}\left[i \neq \text{US}\right]$. We restrict our sample to countries other than the US.[58] Under this econometric specification, parameter β_h^{MP} measures the impact of a US interest rate shock in Advanced Economies in period h, while $\beta_h^{MP} + \beta_h^{INT-EM}$ represents the impact of a US interest rate shock in Emerging Market economies in period h.

Figure 15 presents the results of estimating Equation 21. On the top panel, Figure

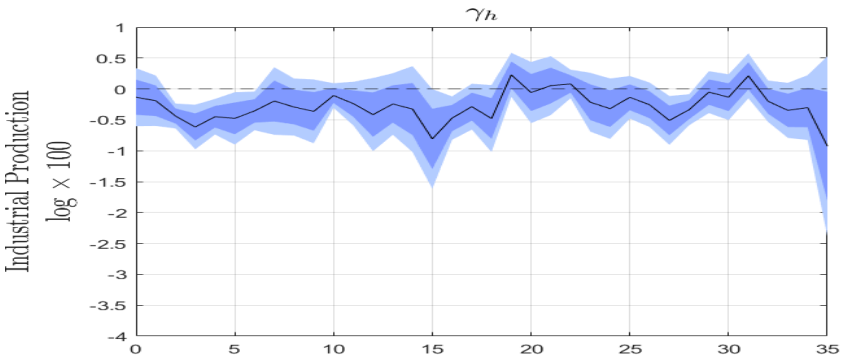
[57] We compute the standard errors of the sum of the coefficients from the variance-covariance matrix of the parameter estimates which takes into account any covariance between the estimates of these parameters.

[58] Dropping the US economy from our panel allows us to show that the results arising from estimating Equation 21 is not driven by the US economy. Including the US economy does not affect the results qualitatively or quantitatively.

Figure 15: Impact of US Interest Rate Shocks
Emerging Market & Advanced Economies



(a) Impact on Advanced Economies - β_h^{MP-EM}



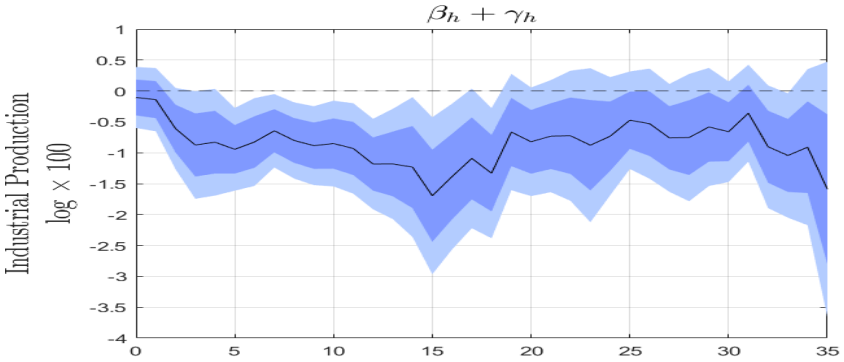
(b) Differential Impact on Emerging Market Economies - γ_h^{INT-EM}

Note: The black line represents the point estimate of the parameter of interest. The dark blue are represents 68% confidence intervals. The light blue are represents 90% confidence intervals. Standard errors are clustered at the country and time dimension. Top and bottom panel present the estimates of parameters β_h and γ_h from the econometric specification in Equation 21, respectively. We normalize the scale of the graphs to match across Figures 13 and 14 to emphasize the different quantitative impact of US shocks across economies.

15a shows that an one standard deviation US monetary policy shock leads to persistent drop in industrial production in Advanced Economies, computed as the estimate of parameter β^{MP-EM}. On the bottom panel, Figure 15b shows that a US monetary policy shock has a differential and larger impact on Emerging Market economies, compared to Advanced Economies, computed as the estimate of parameter γ_h^{INT-EM}. Similarly to the results found in Figure 13b, the evidence seems to suggest that this differential impact is larger and statistically more significant during the first months after the initial shock. Figure 16 shows the impact of US interest rate shocks on Emerging Markets, computed as the sum of the estimates of coefficients β_h^{MP-EM} and γ_h^{MP-EM}. Comparing this dynamics with those in Figure 15a, we observe that the impact of an one standard deviation US interest rate shock is twice as large in Emerging Market economies than in Advanced Economies.

In summary, the local projection regressions presented above show that US interest rate shocks have a systematic and statistically greater impact on Emerging Market economies

Figure 16: Impact of US Interest Rate Shocks
EM & AE - $\beta_h^{MP-EM} + \gamma_h^{INT-EM}$



Note: The black line represents the point estimate of the parameter of interest. The dark blue are represents 68% confidence intervals. The light blue are represents 90% confidence intervals. Standard errors are clustered at the country and time dimension.

than within the US economy and in other Advanced Economies. On the one hand, this result provides supporting evidence to the SVAR evidence presented above. On the other hand, this exercise provides evidence of the *Spillover Puzzle* through an econometric technique not yet considered by the international macroeconomics literature.

Heterogeneity in borrowing constraints as a solution to the Spillover Puzzle. We propose a novel explanation to the Spillover Puzzle as thoroughly characterized above. Specifically, we argue that differences in the prevalence of cash flow and collateral based borrowing constraints across economies provide a natural and straightforward solution. To this end, we combine the greater share of interest sensitive cash flow based lending in Emerging Markets, shown in Sections 2 and 3, with the greater amplification of foreign interest rate shocks predicted by the model presented in Section 4.

Table 11 presents the decomposition of cash flow based lending into "Debt to Cash Flow" and "Interest Coverage" constraints for both the US (leveraging on the work of Greenwald et al. [2019]) and Argentina. Results show that there is a greater prevalence of "Interest

Table 11: Cash-Flow Based Lending in Argentina & the US Countries

	US - Greenwald et al. [2019]	Argentina
Debt to Cash Flow	70%	31%
Interest Coverage	30%	69%

Coverage" constraints in Argentina compared to the US. Our results suggest that 70% of cash flow based lending in Argentina is represented by interest sensitive borrowing constraints, with the remaining 30% represented by cash flow based borrowing constraints. For the case of US firms, Greenwald et al. [2019] suggests that on average, 70% of firms' cash flow based lending is in the form of "Debt to Cash Flow" borrowing constraints, and the remaining 30% in terms of "Interest Coverage" borrowing constraints.

We allow firms to face both "Interest Coverage" and "Debt to Cash Flow" based lending simultaneously to better match the observed data. We follow the approach introduced by Drechsel et al. [2019] which establishes a firm's debt limit as a weighted average of the two constraints

$$\bar{b}_t \leq \omega b_t^{IC} + (1-\omega)\, b_t^{DC} \tag{22}$$

where $\omega \in [0,1]$ represents the relative importance of cash flow based borrowing constraints compared to collateral based constraints. Table 12 presents the calibration of the share of each

Table 12: Quantitative Exercise Argentina & US
Calibration

Parameter	Description	Argentina	US - Greenwald et al. [2019]
ω	Share of IC	0.70	0.30
θ^{IC}	Tightness θ^{IC}	0.1225	0.154
θ^{DC}	Tightness θ^{DC}	4.1437	8.613

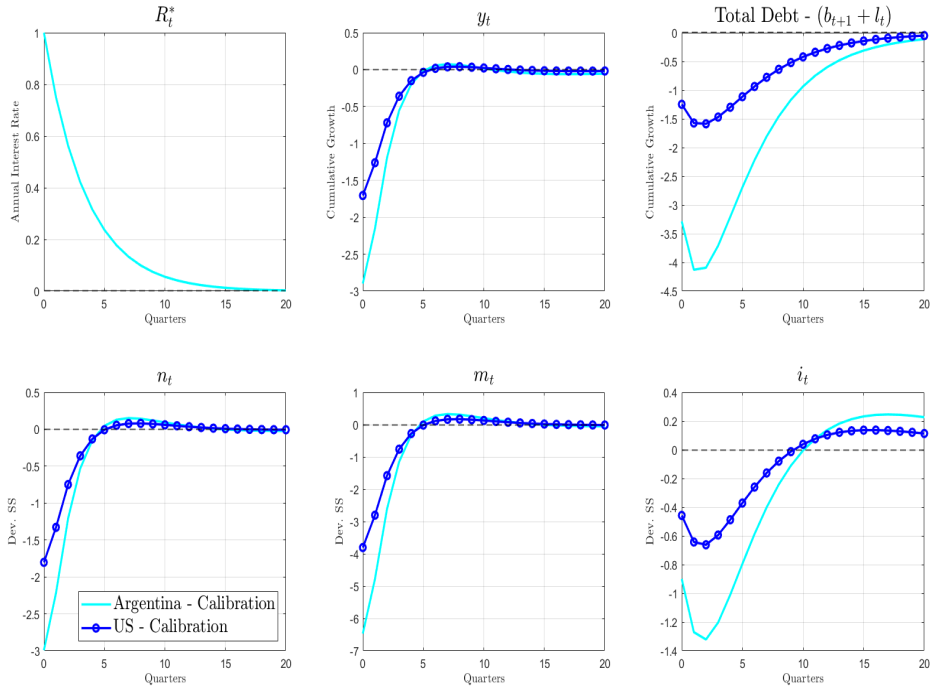
type of borrowing constraint and the tightness of each constraint for both Argentina and the US.

Figure 17 presents the impulse response functions of a foreign interest rate shock for two economies calibrated according to the parameter values in Table 12. Across variables, we observe that under this calibration, the impact on real variables is twice as large in the economy with a greater share of "Interest Coverage" borrowing constraints. This is quantitatively in line with the results arising from the local projection results presented in Figure 13. Consequently, by allowing for heterogeneity in borrowing constraints, I provide a straightforward solution to the fact that US monetary policy shocks lead to greater spillovers in Emerging Markets than within the US economy.

6 Conclusions

To be completed.

Figure 17: IRF Analysis: Argentina & US



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A Additional Data Set Description

A.1 Employment Data

In this Appendix we present additional details on our employment dataset. We start by present summary statistics about firm's employment. Argentinean firms can be constituted as independent contractors or "*Persona física*" or constituted as firms or legal independent organizations or "*Persona jurídica*". Table 13 presents details on the levels of employment per type of firm and the number of firms. While the number of independent contractors is slightly greater than the number of independent organizations, the vast majority of employment is explained by the latter.

Table 13: Employment by Type of Firm

	Employment	Number of Firms
Contractors	1,056,786	361,954
Independent Organizations	9,809,750	299,573

Note: The data presented in this table is constructed using data for the year 2017. This is in line with data used for Tables in Section 2.

Next, Table 14 presents summary statistics about the distribution of the number of employees per firm. The mean level of employment per firm is 16.43 for the full sample, 2.92 for the sample of contractors, and 32.75 for independent organizations. The distribution is highly skewed towards higher values with the median level of employment per firm being 2 for the full sample, 2 for contractors and 4 for independent organizations.

Table 14: Employment per Firm by Type of Firm

	Mean	p25	p50	p75	p90	p95
Total Sample	16.43	1	2	5	14	31
Contractors	2.92	1	2	3	6	9
Independent Organizations	32.75	1	4	11	32	67

Note: The data presented in this table is constructed using data for the year 2017. This is in line with data used for Tables in Section 2.

Next, we turn to describing the role of small, medium and large firms in explaining aggregate employment. We categorize firms by their level of employments into 7 different groups: (i) under 10 employees, (ii) between 10 and 49, (iii) between 50 and 249, (iv) between 250 and 499, (v) between 500 and 999, (vi) between 1,000 and 9,999, (vii) above 10,000. Table 15 presents data on the level of employment and the number of firms in each category. The upper panel of the table presents the results for our full sample while the bottom panel of the table presents the results excluding public administration and publicly provided education and health systems.

Table 15: Employment per Firm

Excluding Public Administration

Category	Employment	Number of Firms	Share of Employment	Share of Firms
< 10	1,361,877	561,175	12.53	84.83
$\in [10, 50)$	1,540,164	79,417	14.17	12.01
$\in [50, 250)$	1,735,432	17,387	15.97	2.63
$\in [250, 500)$	647,076	1,865	5.95	0.28
$\in [500, 1,000)$	609,212	887	5.61	0.13
$\in [1,000, 10,000)$	1,723,327	716	15.86	0.11
$\geq 10,000$	3,249,448	80	29.90	0.01
Total	**10,866,536**	**661,527**	**100**	**100**

Excluding Public Administration

Category	Employment	Number of Firms	Share of Employment	Share of Firms
< 10	1,182,386	464,599	18.74	83.44
$\in [50, 250)$	1,427,645	73,662	22.63	13.23
$\in [250, 500)$	1,578,864	15,879	25.03	2.85
$\in [500, 1,000)$	538,676	1,561	8.54	0.28
$\in [500, 1,000)$	461,180	676	7.31	0.12
$\in [1,000, 10,000)$	945,077	431	14.98	0.08
$\geq 10,000$	175,278	12	2.78	0.00
Total	**6,309,105**	**556,820**	**100**	**100**

More than half of aggregate private employment is explained by firms with less than 500 workers. However, firms with less than 500 workers explain almost 95% of all firms. This implies that a significantly small number of firms explains the top 50% of aggregate employment.

Firms' age. Our datasets do not provide direct information over a firms' age. However, we construct an indirect measure of firms' age. First, our international trade data set covers the period 1994-2019. Thus, if we observe their tax ID identifying number in 1994, we know that in year 2017 the firm is at least 23 years old. Our employment data set starts in the year 2001. If we observe a firm for the first time in our employment dataset in the year 2001, we cannot determine whether the firm was born in the year 2001 or was already alive before said year. Thus, to those firms, we can say that in the year 2017 they were at least 16 years old. This is but an imperfect measure, by no means perfect.

Table 16 presents data on mean and median employment and the number of firms by three categories of age: (i) below 5 years of age, (ii) between 5 and 9 years, (iii) above 10 years. The top panel presents information for the full sample, the middle sample presents information for independent organization firms, while the bottom panel presents information for the sample of independent organizations excluding public administration and services of health and education provided by the government. In line with literature in firm dynamics and industrial organization, such as Evans [1987] and Hansen [1992], firm size proxied by employment and firm age are positively correlated across the three samples.

Table 16: Employment per Firm by Age

Total Sample

Age in Years	Mean Employment	Median Employment	Number of Firms
Under 5	4.40	2	178,484
5 to 9	13.81	2	148,652
Above 10	44.62	3	80,595

Independent Organizations

Age in Years	Mean Employment	Median Employment	Number of Firms
Under 5	8.36	3	63,288
5 to 9	30.25	4	60,140
Above 10	88.39	7	39,294

Independent Organizations excluding Public Administration

Age in Years	Mean Employment	Median Employment	Number of Firms
Under 5	8.36	3	63,288
5 to 9	30.25	4	60,140
Above 10	88.39	7	39,294

A.2 Orbis Data

In this Appendix we present additional details on the data sourced from Orbis about Argentinean firms. This data set is accessed through the "Northwestern Library" between April 1^{st} and April 14^{th} of the year 2022.

The Orbis dataset provides additional financial data which supplements the credit-registry, firm and customs level data used in the paper. In particular, we use data for the following variables

- Total Assets
- Current Liabilities
- Non-Current Liabilities
- Net-Income
- Cash-Flows
- Sales & Cost of Producing Goods
- EBIT
- Operating Turnover

The coverage is significantly shorter than that of the rest of the datasets used across the paper. For the different variables, coverage for the period 2013-2021 we have information for a range of

100 to 600 firms. Furthermore, the coverage of reported firms is skewed towards relatively larger firms. Table 17 presents the number of firms reporting information for each of the variables

Table 17: Coverage of Orbis Data Set
Number of Firms which Report ...

Variable	2013	2014	2015	2016	2017	2018	2019	2020	2021
Assets	354	477	593	634	639	594	622	606	442
Current Liabilities	121	235	344	379	381	337	362	346	215
Non Current Liabilities	121	235	344	379	381	337	362	346	215
Cash Flow	111	101	113	126	153	156	159	155	111
EBIT	121	234	343	379	380	336	362	346	215
Net Income	356	478	596	639	645	597	628	612	445
Operating Turnover	355	473	592	1,484	1,181	12,124	619	868	445
P over L	354	476	592	635	638	593	622	606	442
Sales	120	137	170	203	235	200	209	209	143
Solvency	354	476	590	633	637	593	620	602	441

considered for our purposes.

First, we provide supporting evidence of the results presented in Section 2. In Appendix B we show that Argentina's private sector financing is primarily covered by banks. Furthermore, in Appendix B.1 we show that while Argentinean firms tend to borrow short term, show an opposite pattern, issuing debt both from banks and through corporate bonds at maturities usually greater than one year. A possible concern is that relatively larger Argentinean firms which face lower costs of issuing corporate bonds may reflect debt patterns more consistent with the patterns which arise from the US economy. Table 18 presents moments of firms' distribution of non-current liabilities over total liabilities. In line with the results presented in Section 2,

Table 18: Ratio of Non-Current Liabilities over Total Liabilities
Expressed in Percent %

	Mean	p25	Median	p75	p90
2013	31.90	11.19	27.47	47.94	67.86
2014	26.28	3.67	18.94	44.45	68.01
2015	24.08	1.61	13.17	40.03	67.61
2016	23.59	0.86	12.86	38.51	66.95
2017	25.11	1.08	15.79	43.81	68.54
2018	30.48	2.77	23.92	52.35	74.12
2019	30.55	1.47	25.04	52.75	75.19
2020	30.33	1.28	21.52	52.93	76.17
2021	33.72	3.77	30.55	56.39	77.08
Total	27.90	1.78	19.60	48.45	71.15

Note: The ratio is computed as the amount of non-current liabilities divided by the sum of current liabilities plus non-current liabilities. Results are presented as percentages over total liabilities.

the vast majority of firms' liabilities is short term or current liabilities, exhibited by the mean

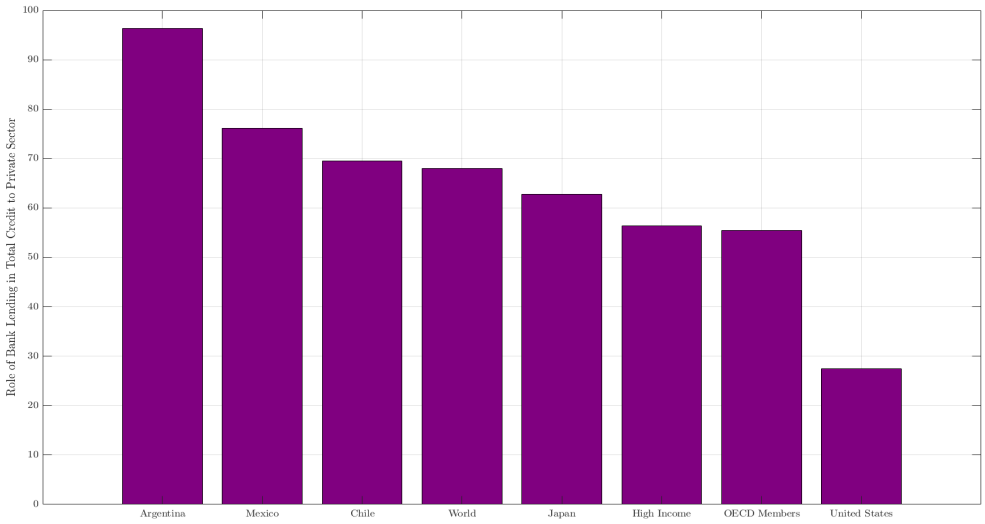
and median ratio of non-current liabilities to total liabilities being equal to 27.90% and 19.60% respectively.

B International Comparison

In this Appendix of the paper we present a comparison of the results for Argentinean firms presented above with aggregate results from other countries.

First, we present evidence of the important role of bank financing in Argentina. To do so, we compare the role of bank financing with respect to the total sources of financing of the private sector. Figure 18 presents a comparison across countries. On the first row from

Figure 18: Role of Banks in Financing the Private Sector
Selected Countries

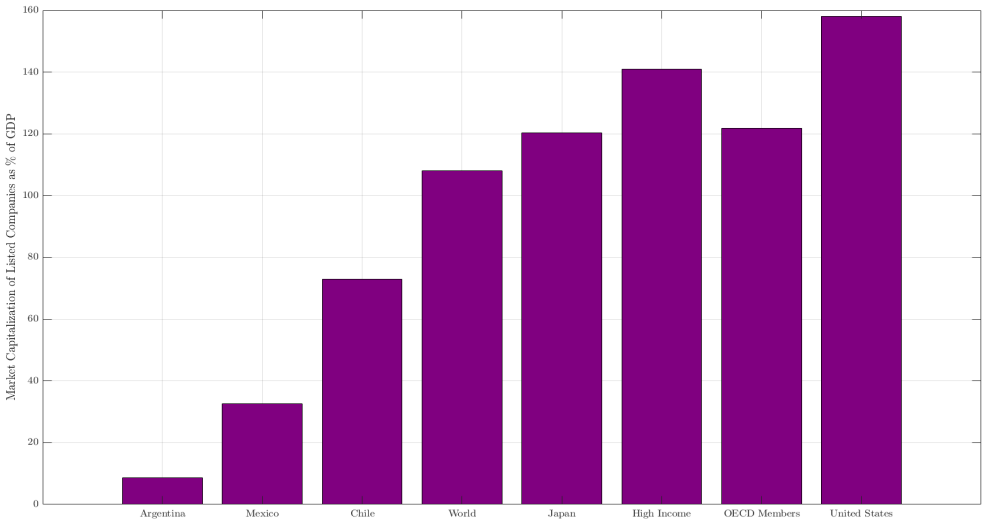


Note: The figure above presents the share of bank financing over the total private sector financing. To do so, we use data from the World Bank's. In particular, we compute the ratio of the indicator "Domestic credit to private sector by banks (% of GDP)" and the indicator "Domestic credit to private sector (% of GDP)".

the left, for the case of Argentina, banks financing explains more than 96% of total private sector financing. Naturally, Argentina is one of the countries in which banking plays the most important source of private sector financing. On the last row from the left, for the case of the US, banks only represent 25% of total financing of the private sector. Consequently, the US economy is the country in which banking financing plays the smallest role of private sector financing. Countries with similar levels of income per capita, such as Chile and Mexico, exhibit a relatively lower importance of banking in private sector financing but still high (69% and 76% respectively) at least compared to High-Income and OECD members (which exhibit an average of 56.4% 55.51% respectively).

Second, we provide an additional piece of evidence on the importance of bank financing in Argentina. To do so, we compare the "Market capitalization of listed domestic companies as a % of GDP" across countries. Publicly listed companies fund themselves through issuing equity and, in practice, have an easier/faster access to corporate bond markets. Thus, an economy which exhibits a greater market value of their listed domestic companies is more likely to have

Figure 19: Market Capitalization of Listed Domestic Companies
Selected Countries



Note: The figure above presents the "Market capitalization of listed domestic companies as a % of GDP" for a selected sample of countries. The sample choice matches that of Figure 18. Data reflect average values for the year 2019.

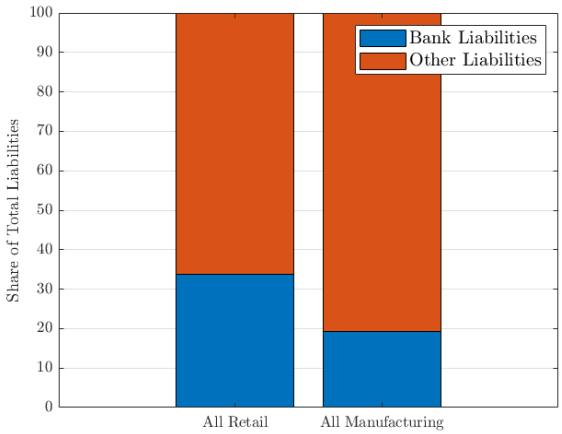
access to financing sources other than domestic banks. Figure 19 presents the results of this comparison. For the case of Argentina, the market capitalization of publicly listed companies is 8% of GDP. This is between 4 and 10 times lower than the value for Mexico and Chile, 32.58% and 72.94% respectively. The comparison is even starker for the World average of 108.12% and that of the US economy 158.12%. Thus, in line with the results presented in Figure 18, Argentinean firms rely almost exclusively in bank to cover their financing needs.

B.1 Comparison with US Firms

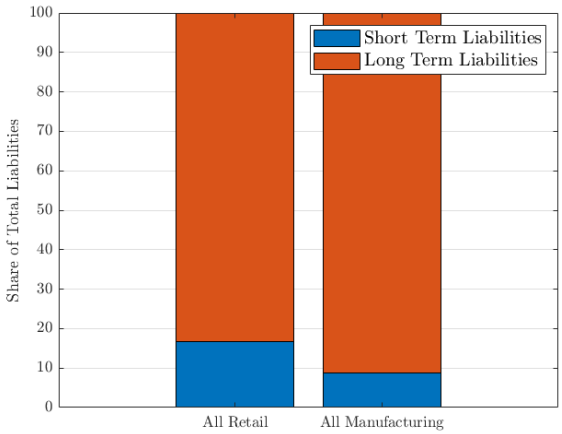
In this subsection of the Appendix, we present comparison of the firm level results for Argentina with aggregate results coming from the Quarterly Financial Report of the US Census Bureau.

First, we carry out a decomposition of US firms' debt, presented in Figure 20 On

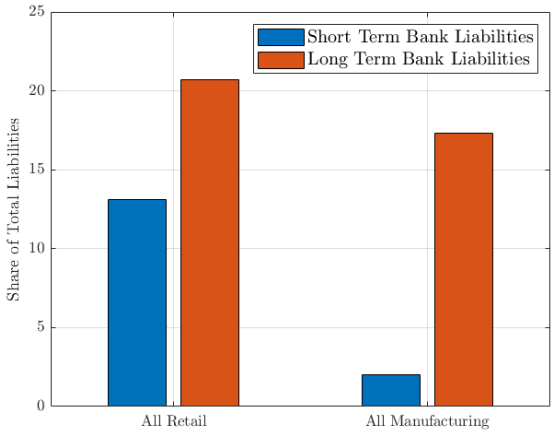
Figure 20: Composition of US Firms' Liabilities



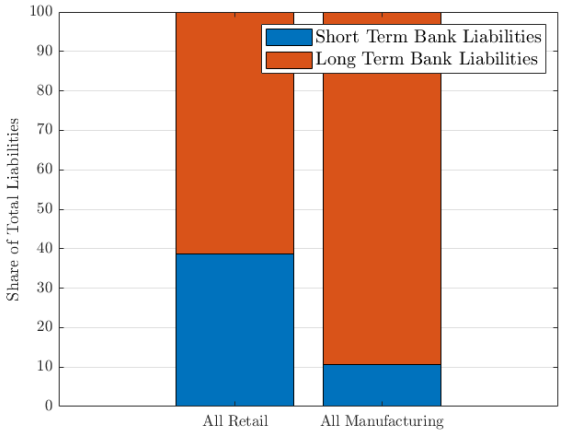
(a) Bank vs Other Debt



(b) Short vs Long Debt



(c) Short vs Long Bank Debt



(d) Short vs Long Bank Debt *Normalized*

Note: Data comes from the Quarterly Finance Report and is sourced from the St. Louis FRED dataset.

the top left panel, Figure 20a shows that US firms only source between 20% and 30% of their financing needs through bank debt for "Manufacturing" and "Retail" firms respectively. This is, the vast majority of financing needs are sourced through firms issuing commercial papers and/or corporate bonds. This in sharp contrast with the results presented for Argentinean firms, as shown in Figure 18 in Section B.

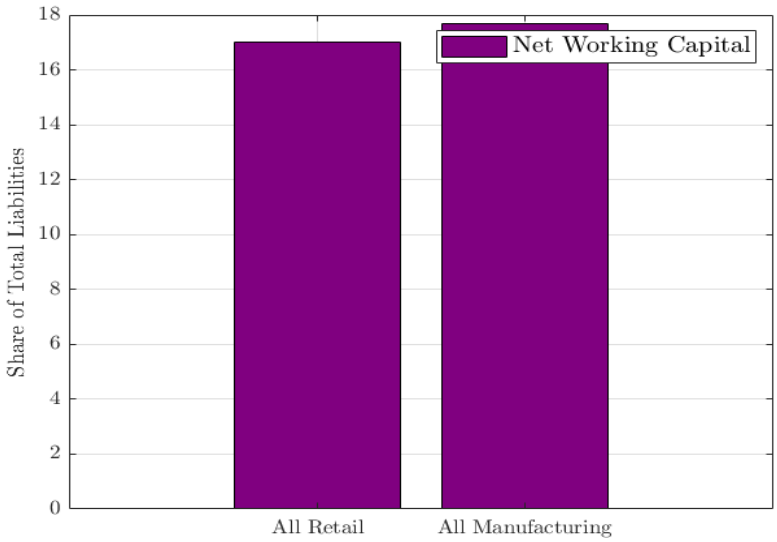
On the top right panel, Figure 20b presents the decomposition of firms' total debt into

short term and long term debt, defined as maturity lower or greater than one year. Once again, in contrast with the results for Argentina presented in Table 4 in Section 2, the vast majority of firms' debt is long term, 16.81% and 8.70% for "Retail" and "Manufacturing" firms respectively.

On the bottom panels of Figure 20, we show that even when focusing only on firms' bank debt, the vast majority of the debt is long term. Figure 20c shows the relative importance of short and long term bank debt over firms' total debt. Figure 20d shows the relative importance of short and long term debt over total firms' debt. Overall, the main message these figures convey is that firms in the US borrow from banks at a relatively long-term debt, in sharp contrast with the results presented for Argentinean firms.

Finally, Figure 21 presents the share of US firms' net working capital on their total liabilities. For both "All Retail" and "All Manufacturing" firms, the financing of working capital only explains 17% of total liabilities. Once again, this is in stark contrast with the results for

Figure 21: Importance of Net Working Capital over Total Liabilities



Argentinean firms, presented in Table 4. For the case of Argentinean firms, close to 70% of firms' liabilities are associated with working capital needs.

C Additional Stylized Facts

In this Appendix of the paper we present additional evidence which provide further evidence on the role of earning-based debt contracts presented in Section 2.

First, we show that firms, i.e. independent organizations, borrow relatively than independent contractors. To do so, we run a regression of the form

$$\%\text{ of Collateral-Based Debt}_i = \gamma \mathbb{1}\left[Firm\right]_i + \Gamma \text{Sector}_i + \epsilon_i \tag{23}$$

where % of Collateral-Based Debt$_i$ represents the share of a private agent's total debt which is collateral-based, $\mathbb{1}\left[Firm\right]_i$ is an indicator function which takes the value of 1 if the private agent is a firm and 0 otherwise, and Sector$_i$ is a dummy variable for each sector of activity, i.e., sector fixed effects. The results of estimating Equation 23 are presented in Table 19. Across specifications, firms, identified as independent organizations (excluding households and independent contractors) exhibit lower shares of collateral-based debt.

Table 19: Collateral-Based Lending & Type of Firm

	Share of Debt which is Collateral-Based		
$\mathbb{1}\left[Firm\right]_i$	-0.350***	-0.306***	-1.654***
	(0.0786)	(0.0791)	(0.106)
$\ln$ Employment$_i$			2.304***
			(0.0413)
Constant	10.82***	10.80***	9.227***
	(0.0529)	(0.0528)	(0.0609)
Sector FE	No	Yes	Yes
Observations	455,675	455,675	384,139
R-squared	0.000	0.018	0.027

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Second, we study the relationship between collateral-based debt and firm size. To do so, we run a regression of the form

$$\%\text{ of Collateral-Based Debt}_i = \gamma \ln \text{Employment}_i + \Gamma \text{Sector}_i + \epsilon_i \tag{24}$$

where % of Collateral-Based Debt$_i$ represents the share of a private agent's total debt which is collateral-based, $\ln$ Employment$_i$ is represents firm i's log employment, and Sector$_i$ is a dummy variable for each sector of activity, i.e., sector fixed effects. The results of estimating Equation 24 are presented in Table 20. The first two columns show that for the full sample of firms, there is a positive relationship between firm size and collateral-based lending. However, for a sample of relatively large firms, which focus the vast majority of both total employment and

Table 20: Collateral-Based Lending & Firm Size

	Share of Debt which is Collateral-Based					
	Total Firms		$L \geq 100$		$L \geq 500$	
$\ln$ Employment$_i$	1.892***	2.489***	-1.896***	-2.469***	-4.338***	-5.627***
	(0.0346)	(0.0523)	(0.385)	(0.396)	(0.943)	(0.970)
Constant	9.113***	7.111***	28.08***	31.24***	45.79***	54.91***
	(0.0583)	(0.127)	(2.155)	(2.210)	(6.723)	(6.909)
Sector FE	No	Yes	No	Yes	No	Yes
Observations	384,139	134,790	7,237	7,237	1,259	1,259
R-squared	0.008	0.048	0.003	0.070	0.017	0.104

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

total bank-debt, there is a significant negative relationship between firm size and collateral-based debt. These results present a robustness check to the results presented in Figure 3 in Section 2 which showed an inverted U-shaped relationship between collateral-based lending and firm size.

Third, in Section 2 we argued that other papers in the literature which study the composition of firm debt for US firms emphasize the role of age in shaping debt-patterns. While our datasets do not allow us to identify a firms' age, we can construct indirect measures of a firm's age. As described in Appendix A, our datasets allow us to identify firms' unique tax identification number. Consequently, across datasets we can observe firms from 1994-2019. Across samples we can identify the first year we *observe* a firm in our samples. This approach is not perfect as it could be the case that the first year we observe a firm coincides with the first year of our dataset. Table 21 shows that more than 50% of total bank-debt is focused on firms

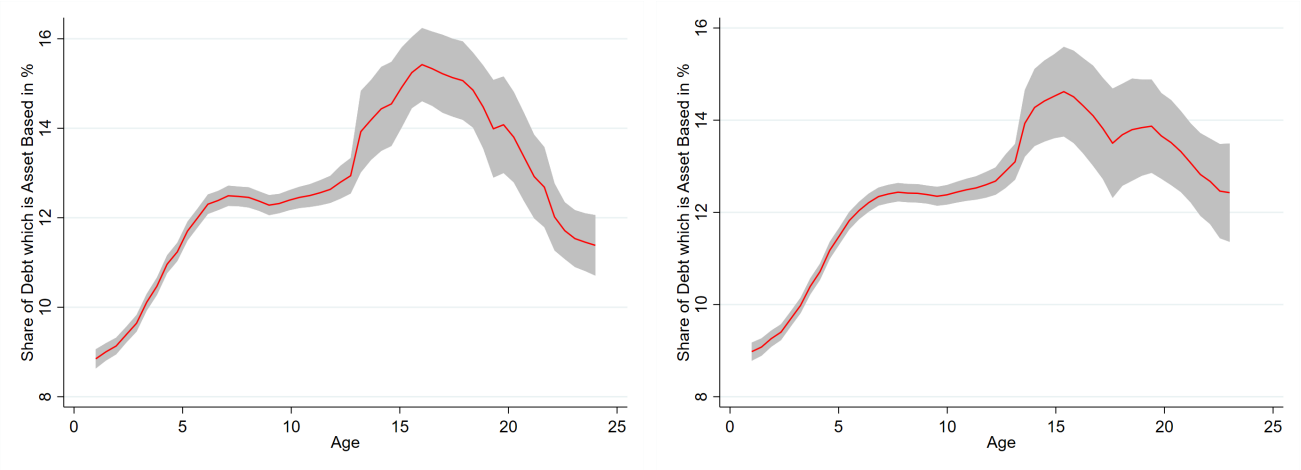
Table 21: Share of Credit by Firms' Age

Age Category	Share of Total Debt
Under 5 years	6.14%
Between 5 & 10	14.02%
Between 11 & 20	22.13%
Higher than 20	57.71%

which are older than 20 years old, with 46.27% focused on firms which are *at least* 24 years old (the highest age a firm can be in our sample given the method described above).

In order to test the relationship between firms' age and the share of collateral-based debt we fit a kernel-weighted local polynomial smoothing function, presented in Figure 22. On left panel, Figure 22a presents the fitted polynomial for the whole sample. On the right panel, Figure 22b presents the fitted polynomial for the sample of firms for which age can be computed

Figure 22: Relationship between Collateral-Based Lending & Firms' Age



(a) Total Sample

(b) Robustness Check

Note: The red full line represents the estimated local polynomial. The grey are represents a 95% confidence interval. The left panel fits the estimated local polynomial for the whole sample. The right panel fits the estimated local polynomial dropping the firms with age 17 and age 24, which are firms whose first observation coincides with the beginning of our employment and international trade datasets, respectively. The kernel-weighted local polynomial smoothing function is estimated using a Epanechnikov kernel. For the left panel we fit a polynomial of degree 0, a bandwidth of 0.95 and bandwidth for standard error calculation of 1.42. For the right panel we fit a polynomial of degree 0, a bandwidth of 1.17 and bandwidth for standard error calculation of 1.75.

outside the start of our datasets. In line with the results presented for the relationship between collateral-based debt and firm size, there is an inverted U relationship between collateral-based debt and firm age. The peak of collateral-based lending is reached around the age of 15 years old. Similarly, Lian and Ma [2021] find for US firms that the share of collateral-based lending peaks close to 15 years old.

For robustness sake, we estimate the following empirical regression

$$Y_i = \gamma \text{Age}_i + \delta \text{Age}_i^2 + \Gamma \text{Sector}_i + \epsilon_i \tag{25}$$

where Y_i represents either firm i's share of collateral-based lending or an indicator function which takes the value of 1 if the firm has any collateral-based debt and 0 otherwise. As it was the case for the empirical specifications in Equations 23 and 24, Sector_i represent sector fixed effects. Table 22 presents the results of estimating Equation 25. Across specifications and variables Y_i, the coefficient on the term Age is positive and the coefficient on the term Age^2 is negative and statistically significant.

Next, we turn to estimating how the share of collateral-based debt varies across sectors of activity. To do so, we estimate a regression of the form presented again below

$$\% \text{ of Collateral-Based Debt}_i = \sum_s^S \gamma_s \mathbb{1}\left[\text{Sector} = s\right] + \Gamma_i + \epsilon_i \tag{26}$$

Table 22: Collateral-Based Lending & Firm Age

	Share of Collateral-Based Debt		$\mathbb{1}$ [Collateral-Based Debt > 0]	
	(1)	(2)	(3)	(4)
Age	0.755***	0.636***	0.0134***	0.0114***
	(0.0322)	(0.0321)	(0.000465)	(0.000462)
Age^2	-0.0252***	-0.0230***	-7.80e-05***	-7.65e-05***
	(0.00153)	(0.00154)	(2.21e-05)	(2.21e-05)
Constant	7.976***	8.613***	0.114***	0.126***
	(0.136)	(0.136)	(0.00197)	(0.00196)
	No	Yes	No	Yes
Observations	234,708	234,708	234,708	234,708
R-squared	0.003	0.020	0.019	0.042

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

where % of Collateral-Based Debt$_i$ represents firm i's share of collateral-based debt, where $\mathbb{1}$ [Sector $= s$] is an indicator function if firm i belongs to sector s and zero otherwise, Γ_i is a vector of firm level controls (such as log employment, log total bank debt, indicator functions for exporter, importer, age and age squared).

Table 23 presents the results of estimating Equation 26. Results are broadly in line with the results presented in the main body of the paper.

Table 23: Collateral-Based Lending across Sectors
Regression Analysis

	Share of Collateral-Based Debt	
Fishing	-0.986	6.111***
	(1.790)	(1.877)
Mining	7.942***	9.600***
	(0.874)	(0.894)
Manufacturing	-2.486***	2.621***
	(0.174)	(0.187)
Electricity, gas & water	4.655***	7.527***
	(0.842)	(0.858)
Construction	-2.858***	3.307***
	(0.221)	(0.240)
Wholesale & retail	-4.221***	1.980***
	(0.139)	(0.148)
Hotels & restaurants	-7.742***	0.393*
	(0.212)	(0.228)
Transportation & communications	2.955***	8.837***
	(0.176)	(0.186)
Financial intermediation	-7.843***	-3.387***
	(0.384)	(0.396)
Real estate, business and rental activities	-7.938***	-1.565***
	(0.154)	(0.165)
Public administration	-4.898***	-0.351
	(0.707)	(1.906)
Education services	-8.718***	-0.843*
	(0.417)	(0.458)
Health & social services	-6.340***	-0.607**
	(0.212)	(0.254)
Other Services	-8.825***	0.248
	(0.198)	(0.235)
Firm Controls	No	Yes
Observations	454,640	369,924

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

D Complimentary Stylized Facts

In this Appendix, we present additional and complementary stylized facts to those presented in the main-body of the paper.

D.1 Debt-Patterns across Firms' International Trade Participation

In this Appendix we complement the results presented on firms' debt-patterns across their participation on international trade in Section 2.3. While in Section 2.3 we showed that exporting firms exhibit a greater share of cash flow based debt, we now turn to analyzing how firms' international trade participation is related to their total bank-debt. To do so, we estimate variations of the following regression

$$\ln \text{Total-Bank-Debt}_i = \beta \mathbb{1}\left[\text{Exporting-Performance}\right]_i + \alpha \mathbb{1}\left[\text{Importing-Performance}\right]_i + \Gamma_i + \epsilon_i \tag{27}$$

where $\mathbb{1}\left[\text{Exporting-Performance}\right]_i$ and $\mathbb{1}\left[\text{Importing-Performance}\right]_i$ are indicator functions of a firm's exporting and importing performance, and Γ_i is a vector of firm controls.

Table 24 presents the results of estimating different variations of Equation 27. Column (1) show that exporting firms exhibit a greater amount of total bank-debt than non-exporting firms. Column (2) shows that this result still holds when controlling for firms' employment

Table 24: Firm Bank Debt & International Trade Participation

	ln Total-Bank-Debt$_i$				
	(1)	(2)	(3)	(4)	(5)
$\mathbb{1}\left[\text{Exporter}\right]_i$	2.528***	1.384***	0.825***		
	(0.0256)	(0.0253)	(0.0273)		
$\mathbb{1}\left[\text{Importer}\right]_i$			0.988***		0.334***
			(0.0184)		(0.0704)
$\mathbb{1}\left[\text{Above Mean Exports}\right]_i$				1.128***	1.150***
				(0.106)	(0.106)
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Employment	No	Yes	Yes	Yes	Yes
Observations	370,851	370,517	370,517	7,708	7,708
R^2	0.079	0.188	0.194	0.357	0.359

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: The table presents results from estimating Equation 27 using data for the year 2017. Columns (1) through (3) use indicator variables $\mathbb{1}\left[\text{Exporter}\right]_i$ and $\mathbb{1}\left[\text{Importer}\right]_i$ which are indicator functions which takes the value of one if the firm has exported or imported in the calendar year and zero otherwise, respectively. Columns (4) and (5) use explanatory variable $\mathbb{1}\left[\text{Above Mean Exports}\right]_i$ which is an indicator function which takes the value of one if the firm's exported value is greater than the sector's mean.

level (as firm employment and other measures of firm size are positively correlated with firms' exporter status). Column (3) shows that both exporting and importing firms exhibit a greater amount of bank debt. Columns (4) shows that within exporting firms, those with exported value above the sector's mean exhibit a greater amount of bank-debt than firms below the sector's mean. Column (5) shows that this result still holds even when controlling for firms' importing status. This result is not surprising as exporting activities are intensive in credit (see Manova [2013] and Camara and Sangiácomo [2021]).

E Additional Details on BCRA Regulations

E.1 Banks' Monitoring Role over Firms

Next, we describe banks' monitoring role over firms in Argentina. As argued in Section 2.4, the banking and finance literature has found clear evidence of banks' monitoring role and informational advantage. We argue that this role is also played by banks in Argentina.

The monitoring role of banks is clearly stipulated by the Argentinean Central Bank regulations. Two distinct set of regulations address this role. First, bank must update firms' status at the Central Bank of Argentina's "*Central de Deudores*" at a monthly frequency. As we described in Section A, this implies that banks must report firms' borrowed amounts by type of credit line, whether the debt-contract is in normal situation, if any stipulation in the debt contract has been violated and if so the status of the debt contract.[59] Banks compliance with these informational requirements is part of the BCRA's macro-prudential and credit regulations which banks must report to at a monthly frequency. In particular, banks or any other financial entity under the BCRA, faces capital requirements depending on the riskiness of the assets in their balance sheet.[60] If a firm breaches its debt-contract and is categorized under "Risk status # 3 or at medium risk of default", a bank's capital requirements increase in an amount proportional in an amount equal to all of its exposure to said firm (i.e., not only the exposure to the specific debt-contract breached).[61]

Banks monitoring role over firms is also embedded on the BCRA's regulations on banks' credit-policy and debtor classification (or "*Clasificación de Deudores*").[62] The regulations stipulate that banks must re-evaluate and re-asses firms' credit status and repayment capacity periodically according to its total amount borrowed.[63] As we explain in detail in Section 2.4, these bank assessments focus on firms' cash-flow projections and keeping adequate debt-payment to cash-flow ratios. Under normal circumstances, assessments are carried out quarterly or semi-annually depending on firms borrowing as a share of banks total lending.[64] However, banks must carry out mandatory and immediate firm re-assessments if: (i) the firm violates any condition of the original debt contract or of any debt renegotiation (such as being late on any payment

[59] This information is easily accessible to the public and can be accessed through the following website http://www.bcra.gob.ar/BCRAyVos/Situacion_Crediticia.asp. Furthermore, this dataset provides information on whether firms have recently issued any non-sufficient-fund checks.

[60] See http://www.bcra.gov.ar/Pdfs/Texord/t-capmin.pdf

[61] See BCRA's "Policy on minimum capital requirements of financial institutions", Section 2 on "Capital Requirements due to Credit Risk", bullet point 2.5.7.

[62] See https://www.bcra.gob.ar/Pdfs/Texord/t-cladeu.pdf for the full text.

[63] See Section 3.2 of BCRA's "*Clasificación de Deudores*": The classification of debtors must be carried out with a frequency that takes into account their importance –considering all financing included–, and in all cases the analysis carried out must be documented.

[64] A firm's status and re-assessment must be carried out quarterly if its total borrowing is equal to or higher than 5% of the bank's net-worth or equal to or higher than 5% of the bank's total assets. If a firm's borrowing is lower than 5% of the bank's net-worth or total assets then its credit-status and re-assessment must be carried out semi-annually or twice a year.

for a period of time greater than 30 days), (ii) the firm's status with another bank at the BCRA's "*Central de deudores*" deteriorates to a status below the current one at the bank.[65] Consequently, firms are subject to constant monitoring and scrutiny by banks which amplify the impact of any change in firms' financing needs.

Next, the document presents with detailed guidelines on how to classify a debtor according to its risk of default. We produce below the sections of the document which provide key insights on the role of firms' cash flows on determining a debtor's riskiness and or financial situation.

- Section 6.2 "Debtors' classification criterion". In this section of the document, the regulation states that the basic evaluation criterion of a debtor's repayment capacity must be based on the estimated financial flow and, only secondly, based on the liquidation value of the client's assets, given that the debt-financing must respond to the client's true needs. Furthermore, debt-financing should be carried out under amortization conditions in accordance with the real possibilities of repayment that its activity and its cash flow may allow. For the case of debt-contracts in foreign currency, the regulation states that debtors should be able to reflect a regular and predictable cash-flow in foreign currency.

- Section 6.5.1 "Classification of a debtor as *normal* or low-risk." In this section of the document, regulation state that a debtor's financial situation should be classified as *normal* or low risk if debt structure to cash flow relationship is *adequate*, with cash-flows being able to repay the capital and interests of its obligations with the bank. Even more, the regulation stipulate that a debtor's situation could be classified as *normal* or low-risk if their main sector of activity is projected to report increases in cash-flows.

- Section 6.5.3 "Classification of a debtor as *reporting problems*." In this section of the document the regulations state that a debtor's financial situation should be classified as "reporting problems" if the analysis of the debtor's cash flow shows that it has problems meeting all of its financial commitments and that, if not corrected, these problems could result in a loss for the financial institution and/or bank. The debtor presents an illiquid financial situation and a level of cash flow that does not allow it to meet the payment of the entire capital and interest on debts, being able to cover only the latter. The debtor shows low cash flows and the projection of its cash flows show a progressive deterioration and a high sensitivity to minor and foreseeable modifications of its own variables and/or of the economic environment, further weakening its payment possibilities.

- Section 6.5.4 "Classification of a debtor as *high-risk* of insolvency and/or default." In this section of the document the regulations state that a debtor's financial situation should be classified as "high-risk of insolvency and/or default". The analysis of the debtor's cash flow shows that it is highly unlikely that it will be able to meet all of his financial commitments. The debtor's cash of funds is manifestly insufficient, not enough to cover the payment of

[65] See Section 6.4 "Mandatory reconsideration of debtor classification" or "*Reconsideración obligatoria de clasificación de deudores*".

interest, and it is feasible to presume that it will also have difficulties in complying with possible refinancing agreements.

- Section 6.5.5 "Classification of a debtor as irrecoverable." In this section of the document the regulations state that a debtor's financial situation should be classified as "irrecoverable". Debts included in this category are considered noncollectable. While these assets might have some recovery value under a certain set of future circumstances, their *uncollectibility* is evident at the time of analysis. Particularly, the debtor's cash flow is not enough to cover production costs.

E.2 Identification of Cash Flow Based and Collateral Based Contracts

The Argentinean Central Bank's "*Central de Deudores*" datasets described in Section A reports whether firms' debt-contracts are backed by "Preferred assets or collaterals" ("*Garantías Preferidas*") or not.[66] BCRA regulations contemplate two distinct classes of assets which can be considered as collateral: "Type A" assets and "Type B" assets. On the one hand, "Type A" assets are comprised of the transfer or surety of rights with respect to financial assets, equity or other financial documents of any nature that, reliably instrumented, ensure that the bank or lending entity will be able to dispose of the funds by way of cancellation of the obligation contracted by the client, without the need to previously require the debtor to sell the assets or repay the debt. This implies that these assets liquidation depends on solvent third parties or on the existence of sufficiently liquid markets in which the aforementioned assets, securities or documents, or the effects they represent, can be directly liquidated and/or settled.[67] This asset-classification comprises a diverse type of assets such as cash or highly liquid assets in *pesos* (domestic currency) or several other foreign currencies (taking into account the evolution of their spot market price), gold (taking into account the evolution of its market price), financial securities such as Argentina's sovereign bonds, Central Bank's interest bearing liabilities and private equity securities.

On the other hand, type B "preferred assets" are comprised of assets or rights over assets or commitments of third parties that, reliably instrumented, ensure that the bank or lending entity will be able to dispose of the funds by way of cancellation of the obligation contracted by the client, previously complying with the procedures established for the execution of these assets. Once again, the regulation implies that the comprised assets should efficiently liquidated in transparent and liquid markets. This type of assets comprises claims over real estate (built property land lots and construction trusts), claims over automotive vehicles and agricultural,

[66] Additional details on Argentinean Central Banks' regulation of collateral-based debt-contracts can be found at https://www.bcra.gob.ar/Pdfs/Texord/t-garant.pdf.

[67] Note that this does not imply that the assets or securities' expiration dates coincides with the expiration of the loan or with the committed periodic payments or that the proceeds be applied to the cancellation of the debt or transferred directly to the entity for that purpose.

road and industrial machinery (to the extent that they are registered in the pertinent national registry of automotive property and have a market that allows obtaining a reference value), or a fixed pledge with registration on bovine cattle; financial leasing contracts with respect to the purchase of capital goods and/or other machinery.[68] A private agent which borrows backed by these assets must present documentation which prove ownership and provide significant detail on assets. A subset of this documentation is the registration of assets, such as real estate, automotive vehicles, agricultural machinery and cattle stock under public registration entities.[69]

The Central Bank's regulation stipulates constraints on how much firms can borrow given the "preferred assets" that back debt-contracts.[70] Table 25 shows bounds as a percentage of asset values for several types of both Type "A" and Type "B" preferred assets debt-contracts. The top panel shows the bounds on Type "A" assets. How much a private agent can borrow is higher for financial assets in domestic currency than for financial assets in foreign currency. Additionally, private agents can pledge a higher fraction of more liquid assets, such as cash or central bank liabilities, than of relatively less liquid assets such as sovereign bonds and/or private equity. The bottom panel shows private agents' bounds for several Type "B" assets. Depending on the type of asset and the debtor's credit-worthiness (more on this in the next section) these debt contracts exhibit bounds between 60% and 100% of the market value of the Type "B" of preferred assets.

[68] Under financial leasing contracts for firms' purchase of capital goods and/or other machinery, the Argentinean firm finances the purchase of a productive good and keeps claims over the good while the borrowing firms makes use of it for production.

[69] For instance, real estate ownership and use must be registered in province specific registration entities. For the case of the capital city see https://www.argentina.gob.ar/justicia/propiedadinmueble. For automotive vehicles (including individual and company owned vehicles) there is a national registry which could be accessed at https://www.dnrpa.gov.ar/portal_dnrpa/. This registry also incldues agricultural machinery, see http://servicios.infoleg.gob.ar/infolegInternet/anexos/45000-49999/46096/norma.htm. Cattle stock and other agricultural assets must be declared for both registration purposes and for phytosanitary conditions/regulations. For more information on the registry of cattle stocks see https://www.argentina.gob.ar/senasa/programas-sanitarios/cadenaanimal/bovinos-y-bubalinos/bovinos-y-bubalinos-produccion-primaria/registros-y-habilitaciones/bovinos-y-bubalinos-produccion-primaria/identificacion-animal and https://www.argentina.gob.ar/senasa/programas-sanitarios/cadenaanimal/bovinos-y-bubalinos/bovinos-y-bubalinos-produccion-primaria/registros-y-habilitaciones/bovinos-y-bubalinos-produccion-primaria/identificacion-animal. For the registry of fishery machinery and equipment see https://www.argentina.gob.ar/palabras-clave/registro-de-la-pesca.

[70] These constraints on the amount firms can borrow as a function of the value of "preferred assets" are usually referred within the Central Bank's regulation as "márgenes de cobertura".

Table 25: Collateral-Based Bank Debt
Bounds and Borrowing Limits

	Bound as % of Asset Value
Preferred Type "A" assets	
Cash or Highly-Liquid Domestic Currency assets	100%
Cash or Highly-Liquid Foreign Currency assets	80%
Gold	80%
Sovereign Bonds	75%
Central Bank Liabilities	100%
Private Equity Claims	70%
Preferred Type "B" assets	
Real Estate	50%-100%
Automotive vehicles & agricultural machinery	60%-75%
Road & industrial machinery	60%
Cattle stock	60%

Note: The table presents bounds on a subset of assets which are usually considered as collateral of private agents'. Consequently, the table is not exhaustive. All bounds are computed as a fraction of current market value of the assets. Asset types with bounds on the value which can back debt contracts represent heterogeneity in bounds within asset types. For instance, how much an agent can borrow backed by real estate depends on whether the property is used as living place or not, whether the property is an empty lot, a lot with construction built on it and/or an agricultural lot.

F Additional Details on Section 4 Model

F.1 Additional Details on RBC Model

F.2 Additional Details on New Keynesian Model

G Additional Details on Empirical Model

G.1 SVAR Model Details

G.2 Local Projection Model Details