BANK FOR INTERNATIONAL SETTLEMENTS

BIS Working Papers
No 876

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Monetary and Economic Department

August 2020

JEL classification: D14, E21, G21, G28.

Keywords: credit booms, household credit , payroll loans, credit card expenditure.

This paper was produced as part of the BIS Consultative Council for the Americas (CCA) research conference on "Macro models and micro data" hosted by the Central Bank of Argentina, Buenos Aires, 23–24 May 2019. BIS Working Papers are written by members of the Monetary and Economic Department of the Bank for International Settlements, and from time to time by other economists, and are published by the Bank. The papers are on subjects of topical interest and are technical in character. The views expressed in them are those of their authors and not necessarily the views of the BIS.

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ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

Government Banks, Household Debt, and Economic Downturns: The Case of Brazil

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July 24, 2020

Abstract

After the global financial crisis, government banks in Brazil boosted credit provision to households, generating a sharp increase in household debt which was followed by the most severe recession in recent Brazilian history in 2015-2016. Using a novel individual-level data set including matched credit registry and employer-employee information, we show that individuals with higher debt-to-income growth during the boom experienced lower subsequent credit card expenditure during the recession. To identify the credit-supply effect, we exploit individuals borrowing from both government-controlled and private banks. We show that, during the late stages of the boom period, government banks increased their lending more than private banks to the same individual. To study the effect of this credit supply shock on individual consumption, we exploit variation in the sector of employment of each borrower. Individuals employed by the public sector were disproportionately targeted by payroll loans offered by government banks and experienced larger decline in credit card spending during the subsequent recession.

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I Introduction

A striking pattern in advanced economies over the past 50 years has been the secular rise in household debt to GDP ratios (e.g., Jordà et al. 2016). Recent evidence shows that this pattern is not limited to advanced economies. For example, Bahadir and Gumus (2016) show that a large number of emerging economies have seen a similar rise in household debt to GDP ratios from the early 1990s to today. Furthermore, following the global financial crisis, the governments of many emerging economies have played an important role in raising debt levels of both households and firms by implementing large-scale credit expansion policies (Cong et al. 2019).

This secular rise in household debt is particularly interesting because of recent evidence that household debt booms are associated with subsequently lower economic growth (e.g., Mian et al. 2017). However, the drivers of these debt booms as well as the exact mechanism by which an increase in household debt depresses subsequent economic activity is still an open question. Most of the evidence in the existing literature is at a country or regional level. Such an approach using aggregates helps capture general equilibrium effects, but it also makes it harder to disentangle the precise channels through which a rise in household debt may lead to lower subsequent growth. The use of individual-level data can help uncover these channels.

This study focuses on Brazil, which offers a promising laboratory for two main reasons. First, Brazil experienced a large rise in household debt from 2003 to 2014, followed by its most severe recession on record (Garber et al. 2019). During the boom, there were major advancements in household debt availability, including auto loans, payroll loans, and mortgages. Furthermore, there was a large push by government banks to expand credit availability, especially during the latter part of the boom starting in 2011. Second, Brazil offers the advantage of an individual-level credit registry covering the universe of formal household credit, which has recently become available at the Central Bank of Brazil. This data set contains bank debt composition and credit card expenditures at the individual level for a representative sample of 12.8% of Brazilian borrowers between 2003 and 2016. Using borrowers' unique fiscal code we were able to match data on individual debt and credit card expenditures to data on individual characteristics – including labor income, age, education, sector and occupation – from a large employer-employee dataset covering the universe of formal workers.

This study begins by presenting a set of baseline correlations. We document that individuals with a higher increase in their debt-to-income ratio between 2011 and 2014 experienced a larger decline in credit card expenditure during the following recession. Government-controlled banks were instrumental in the aggregate increase in household debt from 2011 to 2014. These banks represent around half of the bank lending market in Brazil and are traditionally important in the implementation of government policies. In

2011, the federal government intervened in the Brazilian banking sector with the objective of expanding credit supply. The intervention included the relaxation of pre-existing macro-prudential policies, capital injections into the two largest government banks (Banco do Brasil and Caixa Economica Federal), and a campaign to reduce bank spreads following the reduction of the reference interest rate. The effect of these policies is clearly visible in macro data: in the years after 2011 retail credit from private banks stagnated while government-controlled banks started lending more aggressively.

Next, we propose an identification strategy to quantify the effect of credit supply increases by government banks on individuals' debt-to-income ratios. These effects are traditionally difficult to estimate because changes in credit supply on the lender side might be correlated with contemporaneous changes in credit demand by individuals. Building on the empirical literature on the effects of bank liquidity shocks on firm borrowing, we estimate the effect of credit supply shocks by focusing on individuals that borrow from multiple banks. This allows us to estimate a specification with individual fixed effects in first-differenced data at the bank-individual level. For identification purposes we focus on individuals that borrow from both government banks and private banks in Brazil, and then study the relative change in lending from these two types of banks once individual-level credit demand shocks are absorbed.[1] Our results show that, during the credit boom period, government banks increased their lending more than private banks to the same individual. In particular, credit relationships with government banks expanded the debt-to-income ratio of an individual by 12.8 percentage points more than credit relationships with non government-controlled banks.

Finally, we study the effect of the credit expansion by government controlled banks on individual consumption. As consumption is observed at individual level, we can no longer use individual fixed effects. Thus, we propose a different identification strategy. In particular, we exploit the fact that public sector workers tend to be the primary target of lenders offering payroll loans. Payroll loans are a type of loan that allows banks to deduct payments directly from borrowers' paycheck, making individuals with government jobs particularly attractive borrowers. Matching the credit registry with employer-employee data allows us to use variation in the employer of each borrower as a proxy for her exposure to the increase in payroll lending in the post 2011 period.

An obvious concern with this identification strategy is that public and private sector workers differ along other characteristics, which we document in our empirical analysis. To mitigate this concern we show that our results are robust to including a rich set of initial individual characteristics. These controls allow us to effectively compare borrowers with similar initial income, age, education, leverage, pre-existing relationship with government banks and living in the same location. Additionally, the employer-employee dataset

[1] 56% of individuals in our sample had credit relationships with both types of banks during the period under study.

reports the precise occupation of each borrower. This allows us to compare workers operating in different sectors but effectively performing the same job within their respective firms.

The results obtained with this identification strategy are consistent with the basic correlations in the data and the results obtained using individual fixed effects. Borrowers employed in the public sector in 2011 experienced, in the following three years, a 1.6 percentage points larger increase in their debt-to-income ratio relative to private sector workers, and this effect is largely driven by debt originated by government-controlled banks and, more specifically, by payroll loans. The magnitude is economically significant, as it corresponds to 14 percent of the average increase in debt-to-income ratio observed in our sample between 2011 and 2014. We also document that payroll lending by government banks particularly targeted public sector employees in the lowest income quintile, which experienced a 7.3 percentage points larger increase in their debt-to-income ratio with respect to private sector employees in the same income group. Next, we show that borrowers employed in the public sector in 2011 experienced a larger decline in credit card expenditure between 2014 and 2016. The magnitude of our estimates indicates that individuals with a 1 percentage point higher increase in debt-to-income ratio during the household debt boom period experienced a 1.24 percent lower change in consumption during the subsequent recession. Consistently with the heterogeneous effects discussed above, we document that public sector employees in the lowest income quintile experienced the largest decline in credit card expenditure during the recession.

These results shed new light on the risks associated with household debt booms, especially in developing countries where such booms are often promoted by government policies. The 2015-2016 recession in Brazil was characterized by a large decline in household consumption, which started in the first quarter of 2015. Our evidence shows that individuals more exposed to the credit supply expansion from government banks during the years before the recession experienced a larger decline in credit card expenditure during the following recession, indicating that household indebtedness can indeed threaten future consumption and thus the severity of economic recessions.

In this sense, our paper is related to the large literature studying the role of household debt expansions on future economic growth (see Mian and Sufi (2018) for a review). This relationship has been studied at least since the Great Depression in the US. For example, Olney (1999) shows that the drop in consumption during the early 1930s in the US was at least in part driven by the large increase in consumer debt of the late 1920s. In particular, in the 1920s the US experienced a widespread increase in the use of consumer credit, mostly in the form of installment plans to buy durable and semi-durable goods such as automobiles, which is very similar to the one occurred in Brazil from the mid-2000s (Garber et al., 2019). Olney (1999) argues that it was the combination of increased debt-to-income ratios and the punitive consequences of default to push households towards the only available alternative: reduce consumption. Similarly, Brazil introduced a set of reforms in the mid-2000s that facilitated the repossession of collateral and made default more costly for individuals.[2] There are other parallels between the two experiences suggesting that the channel at work might be similar. In particular, both Brazil in 2015-16 and the US during the Great Depression did not experience a significant surge in consumer credit defaults when the crisis hit, making lower spending the only alternative available to households.[3] We contribute to this literature by presenting – to the best of our knowledge – the first individual-level evidence on the relationship between household debt booms and future consumption from a developing country.

In addition, our paper sheds new light on the role of government in amplifying and prolonging household debt booms, a role that has become prominent in several emerging economies following the global financial crisis. In this sense, our paper is also related to the literature on the role of government – and state-owned banks in particular – in credit markets (La Porta et al., 2002). This literature has documented that lending decisions by government controlled banks often respond to political influence (Sapienza, 2004) and that their credit allocation decisions can have real effects in the local economy (Carvalho, 2014).[4] Consistently with the results presented in this paper, the role of government banks tend to become more prominent in periods before competitive elections (Cole, 2009). We contribute to this literature by documenting the role of government banks in amplifying household debt boom cycles and their effect on future economic growth.

The rest of the paper is organized as follows. Section II describes the matched credit registry and employer-employee dataset and presents a set of broad stylized facts on the household debt boom. Section III provides the institutional background on the role of government banks in Brazilian credit markets, with a particular focus on the late stage of the households debt boom period. Section IV describes our identification strategy to identify credit supply shocks to individuals and their effects on future consumption, and presents the main empirical results of the paper. Section V provides concluding remarks.

[2] See, for example, the 2004 reform that facilitated the repossession of cars on defaulting borrowers studied in Assunçao et al. (2013) and the 2004 new Fiduciary Law which facilitated the repossession of houses from borrowers that stop making mortgage payments. In addition, the diffusion of payroll lending implied that interest and principal payments were deducted directly from monthly salary payments.

[3] Another interesting parallel is the large use of consumer credit among public sector employees in both cases. As reported in Olney (1999): "41 percent of the 506 families of federal employees whom the BLS surveyed in 1928 bought a good on installments" (US Bureau of Labor Statistics 1929). This share was about 25 percent among the families surveyed by the BLS in a nationwide survey in 1935-36. Similarly, in this paper we will show that payroll lending by Brazilian banks targeted public sector employees in particular.

[4] On the role of government-controlled banks in Brazil see also Coelho et al. (2013), Lundberg (2011).

II Data and Stylized Facts

The main data sources for this paper are the Credit Information System of the Central Bank of Brazil and the Annual Social Information System (RAIS), which we describe in detail in what follows.

The Credit Information System – launched in 2003 — records detailed information on credit relationships between individuals and Brazilian banks.[5] The data is transmitted monthly from financial institutions to the Central Bank of Brazil, and covers all credit relationships of individuals that have a total exposure with a financial institution above a given reporting threshold.[6] In the period between 2003 and 2016, the Credit Information System contained information on around 117 million unique individuals. In an effort led by the Research Department of the Central Bank of Brazil, we extracted a random sample of 15 million individuals – 12.8% of all those ever to appear in the Credit Information System in this period – along with all their transactions recorded in the dataset.[7]

Figure I shows the number of individual borrowers reported in the Credit Information System as a whole (solid black line) and in the extracted sample (dashed black line). In the same Figure we also report the number of clients in the sample scaled by a factor of 117/15 for comparability with population totals (dashed red line).[8] As shown, there are two breaks in the time series of number of borrowers, which correspond to the two reductions in reporting threshold that occurred in 2012 and 2016. Notice that threshold reductions sensibly affect client composition. Thus, when presenting stylized facts on the composition of borrowers over time in the empirical analysis, we impose a constant (5,000 inflation-adjusted R$) threshold throughout the period under study. Changes in the reporting threshold have instead relatively small impact on aggregate household debt balance as the monetary value of the debt of marginal borrowers that enter into the system after each reduction is modest.[9] The data contains detailed information on each transaction, including type of debt, name of the lender, outstanding balance, interest rate, and maturity. For the scope of this paper we focus on outstanding balance by type of debt and type of lender.

[5]The Credit Information System is a confidential dataset of the Central Bank of Brazil. The collection and manipulation of individual loan-level data were conducted exclusively by the staff of the Central Bank of Brazil.

[6]The reporting threshold has changed over time: 5,000 BRL (around 1500 USD) in the period between January 2003 and December 2011, 1,000 BRL (about 500 USD) in the period between January 2012 and May 2016, 200 BRL (60 USD) in the period starting in June 2016.

[7]In particular, we acknowledge the participation of Sergio Mikio Koyama and Toni dos Santos in this process. The extraction of this sample – initially done for Garber et al. (2019) – is intended to facilitate the use of the Credit Information System in future research.

[8]The scaling number is population size divided by sample size, both expressed in number of individual clients across all periods.

[9]Notice that, in all the regressions presented in section IV, we restrict our attention to individual borrowers observed in the Credit Information System in the period 2011 to 2016 and we use within-individual variation. Thus, the sample used in our regressions is not affected by the change in threshold.

The Credit Information System uniquely identifies the borrower in each credit relationship using the fiscal code. This allows us to match credit relationships of each borrower with data on individual characteristics from the Annual Social Information System (RAIS). RAIS is an employer-employee dataset covering all formal workers employed in Brazil.[10] We use RAIS to extract information on individual annual labor income (SCR has limited information on income) as well as gender, age, education, sector and occupation of each borrower.

III Institutional Background: The Role of Government Banks in the Expansion of Household Indebtedness

In this section we describe the role played by government-controlled banks in the expansion of household debt in Brazil, especially in the last phase of the boom period. Government controlled banks represent around half of the bank lending market in Brazil (Coelho et al., 2011). Traditionally, the two largest federal government owned banks – Banco do Brasil and Caixa Economica Federal – are responsive to government influence and play an important role in the implementation of its policies. For example, in response to the global financial crisis and the decrease in credit provision by private lenders, both Banco do Brazil and Caixa Economica Federal lowered interest rates to stimulate credit supply in 2009.

Garber et al. (2019) explore the sources of the Brazilian household debt boom that preceded the 2015-16 recession, and highlight how – starting in 2011 – government-controlled banks began lending quite aggressively relative to private banks in the retail credit segment. The timing of this differential increase in bank lending between government controlled and private banks is consistent with Coelho et al. (2011). According to Coelho et al. (2011), in 2011 the federal government intervened in the Brazilian banking sector with the objective to expand credit supply. This intervention had several aspects, including: the relaxation of macro-prudential policies (such as the reduction of risk weights for certain loan categories and maturities), a set of large capital injections from the Brazilian National Treasury into government-controlled banks to increase their credit supply, and a campaign to reduce bank spreads following the reduction of the reference interest rate which was also led by government-controlled banks.[11]

The increase in credit supply by government banks was marketed to Brazilian households via flagship programs such as "Bompratodos" ("Good for everyone") by the Banco

[10]Employers are required by law to provide detailed worker information to the Ministry of Labor. See Decree n. 76.900, December 23^{rd} 1975. Failure to report can result in fines. RAIS is used by the Brazilian Ministry of Labor to identify workers entitled to unemployment benefits (*Seguro Desemprego*) and federal wage supplement program (*Abono Salarial*).

[11]The pressure by the federal government on major state-owned banks to lower bank spreads in an attempt to push private banks to follow was largely covered in Brazilian media at the time. See, for example, Silva Júnior (2012) and OGlobo (2012).

do Brasil and "Caixa Melhor Credito" ("Better Credit") by the Caixa Economica Federal. Both programs were launched in April 2012 with widespread advertising campaigns. The programs targeted both Brazilian households and firms offering credit at lower interest rate, longer maturities and higher credit limits. The role of government-controlled banks in expanding credit in Brazil became also an important topic in the debates between the two main presidential candidates during the 2014 electoral campaign for the presidential elections, with the incumbent Dilma Rousseff defending the government initiatives of the previous 3 years, while her opponent – Aécio Neves – arguing in favor of a smaller government role in Brazilian financial markets (Màximo, 2014). In short, Banco do Brazil and Caixa Economica Federal were key instruments of the government intervention aimed at expanding bank lending.

In what follows we use the Credit Registry data to document a set of aggregate stylized facts on bank lending by government controlled banks. We start by documenting the differential growth in bank lending between government-controlled and private banks in the post 2011 period. Next, we document the composition of this increase by type of borrowers and by type of loans.

Figure V show total outstanding debt to households for private and government-controlled banks in the period 2003-2016. Panel (a) uses all borrowers in the Credit Registry, while panel (b) focuses on borrowers used in our regression sample.[12] In both samples there is a clear shift after 2011, when credit from private banks stagnates while credit from government-controlled banks rose substantially. Garber et al. (2019) show that this increase was particularly strong in the types of credit in which public banks specialize, such as mortgages and payroll lending (*crédito consignado*).

In Figure VI, panel (a), we decompose the debt to government-controlled banks in the period 2012 to 2016 between four types of borrowers, based on the composition of their balance in the year 2011. We define as "high-exposure" individuals those that were borrowing more than 50 percent of their balance from government-controlled banks in 2011, "low-exposure" individuals those borrowing less than 50 percent of their balance from government-controlled banks in 2011, "private bank clients" those borrowing exclusively from private banks in 2011, and "no borrowing" individuals those with no outstanding debt balance with any bank in 2011. Figure VI shows a shift in composition of borrowers of government banks after 2011. In particular, the data indicates that, during the 2011 to 2014 period, the increase in household debt originated by government-controlled banks was mostly driven by individuals that were either previously borrowing from private banks or had no pre-existing banking relationship. This indicates that, in the late stage

[12]We classify banks as government controlled or private based on the the Central Bank of Brazil database of financial institutions characteristics (Unicad). Government controlled banks include those controlled by federal government and by states (e.g. Banco do Brasil, Caixa Economica Federal). Privately controlled banks include private domestic, private foreign banks, private banks with mixed control (domestic/foreign) (e.g. ITAU, Santander, HSBC).

of the household debt boom period, government-controlled banks increased credit supply mostly by extending credit to a new set of clients. Finally, in panel (b) of Figure VI, we decompose the debt to government-controlled banks in the period 2012 to 2016 between different types of loans: mortgages, auto loans, payroll lending, non-payroll lending and credit card debt. As shown, mortgage and payroll lending represent the vast majority of government-controlled banks lending to households (87 percent in 2011, 90 percent in 2016) and are the two major drivers of the increase in credit by government-controlled banks in the post 2011 period.

To sum up, the evidence presented in this section shows that the increase in household debt in the period 2011 to 2014 was mostly driven by an expansion of credit by government-controlled banks. This is consistent with the government campaign to expand credit supply discussed at the beginning of this section. The Credit Registry data allows us to document two additional stylized facts on the composition of credit growth from government-controlled banks in this period. First, we show that credit growth was concentrated among new clients, i.e. individuals that previously borrowed from private banks or that did not borrow at all in the formal banking sector. Second, we show that credit growth was concentrated in certain debt categories, namely mortgages and payroll loans. In what follows we discuss two specific government actions that can rationalize the stylized facts mentioned above: the Minha Casa Minha Vida program for the mortgage market and the reduction of risk weights for payroll loan.

Minha Casa Minha Vida is a large government program for affordable housing that was launched in 2009, at the beginning of the first mandate of President Dilma Rousseff. The objective of the program was to subsidize house buying for low to middle-income households. The program offers mortgages at below market rates and lump sum subsidies that depend on the monthly income of the applicant household. The program is funded by the federal government and mostly implemented by Caixa Economica Federal (CEF), one of the two largest government-controlled banks and the largest mortgage lender in Brazil. In the period between 2009 and 2014, around 2.5 million units were completed under the program.[13] Thus, Minha Casa Minha Vida could have contributed to the large increase in mortgages observed in Brazil during the 2011 to 2014 period.[14]

Another potential driver of the increase in lending by government-controlled banks is the reduction in risk weights for payroll loans.[15] In November of 2011, the Central Bank of

[13]Source: Ministry of Cities, data can be downloaded from `dados.gov.br`.

[14]Mortgages issued under Minha Casa Minha Vida are not recorded separately in the Credit Registry, thus we can not directly quantify the share of new mortgages that have been financed under this program. Additionally, the part of the program targeted to the lowest income households was not reported in the Credit Registry during the period under analysis.

[15]Capital requirements for Brazilian banks are established by the Central Bank based on a formula. In particular, the capital requirement that banks need to match is equal to 11 percent of their EPR. The EPR is a weighted sum of the loans they originate, where the weights capture the "risk" of different loan categories.

Brazil decreased the risk weights for payroll loans of certain maturities, de facto increasing banks' ability to originate this type of loans.[16] Notice that payroll lending – which allows banks to deduct payments directly from the borrower's paycheck – tend to mostly target public sector workers. This is because public sector workers are considered safer in terms of job security, and therefore of lower risk for financial institutions that collect debt service payments directly from their paycheck.[17] Thus, we expect this expansion of payroll lending from government banks in the late stage of the boom period to mostly affect public sector workers. We test this channel empirically in section IV.C.

IV Empirics

IV.A Basic Correlations in the Data

In this section we present a first set of correlations between the growth in debt-to-income ratio during the 2011-2014 period and changes in credit card expenditure during the 2015-2016 recession for the same individual.

We focus on individuals observed in both the Credit Information System and the RAIS employer-employee dataset. Therefore, the sample used in this analysis includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016. The baseline equation to be estimated is as follows:

$$\Delta \log(\text{credit card expenditure})_{i,2014-2016} = \alpha + \beta \Delta \left(\frac{debt}{income} \right)_{i,2011-2014} + \varepsilon_i \qquad (1)$$

where i indexes individuals, *debt* is total outstanding balance with the financial system, and *income* is total labor income. Outstanding balance includes all banks and it is an average across monthly observations. Credit card expenditure is the monetary value of cumulated credit card expenditure over the last year, which we use as a proxy of individual consumption. Figure III shows that quarter-to-quarter changes in aggregate credit card expenditure from the Credit Registry maps well quarter-to-quarter changes in the national household consumption index produced by the Brazilian Institute of Statistics. To control for common trends across individuals with different baseline characteristics, we augment equation (1) with a large set of fixed effects, including: micro-region of residence, quintiles of initial labor income, quintiles of age, education level, gender, sector and occupation.

[16]See *Circular* 3563 - Central Bank of Brazil.

[17]Retirees from the public pension system are also targeted since their pension income is considered stable by lenders. In December 2003 Brazil passed a new law regulating the use of payroll loans also for private sector employees and private sector social security beneficiaries. Lenders authorized by the social security administration of the Brazilian government were able to collateralize loans using the wages of workers paying into the social security system, as long as the total payments were no more than 30% of the borrower's income. Coelho et al. (2012) show that the introduction of this law led to a large increase in payroll lending and a substantial decline in interest rates.

Individual characteristics are obtained from the employer-employee dataset RAIS and observed in the baseline year 2011.[18] Standard errors are clustered at the micro-region level.

Table I reports the results of estimating equation 1. The estimated coefficient on debt-to-income growth reported in column (1) is negative and statistically significant, suggesting that individuals with a higher increase in debt as a share of their labor income during the 2011-2014 period experienced a larger decrease in consumption during the following recession. Our baseline specification in column (1) includes only micro-region and income quintiles fixed effects. In column (2) we control for all individual characteristics at baseline. As shown, the size of the point estimate remains stable and precisely estimated when comparing borrowers of the same gender, living in the same micro-region, having the same occupation in the same sector, and with a similar initial income and age. The magnitude of the coefficient in column (2) indicates that individuals with a one standard deviation larger increase in debt-to-income ratio between 2011 and 2014 (0.73) experienced a 9.5 percent lower change in credit card expenditure between 2014 and 2016 (8.8 percent of a standard deviation in credit card expenditure changes during the recession).

Figure IV reports the relationship between debt-to-income growth and future credit card expenditure sorting individuals by 50 bins of total debt-to-income growth in the 2011-2014 period. To generate this Figure we first regress both the change in log credit card expenditure in 2014-2016 and the change in total debt-to-income ratio in 2011-2014 at individual level on the set of fixed effects described above. Then we generate the predicted residuals for both variables, and plot the average change in residualized future credit card expenditure for each decile of residualized change in debt-to-income ratio. Each bin represents an equal number of individuals, while the size of the bin captures the total amount of debt of individuals in that bin.

The Figure shows that, for lower levels of debt-to-income growth, changes in leverage are correlated with slightly higher future consumption. However, when debt-to-income growth passes above a certain threshold, changes in credit card expenditure during the 2014-2016 period are monotonically decreasing with the level of debt-to-income growth in the 2011-2014 period. Notice also that this relationship appears more negative when we focus on bins that represent a smaller share of total debt. These bins tend to be populated by relative lower income borrowers among those in our sample. Overall, the results presented in Table I and Figure IV suggest that individuals that increased the most their borrowing from the formal financial system relative to their labor income experienced a larger decrease in consumption during the last recession in Brazil.

Next, in Table II, we investigate the heterogeneous effects of debt-to-income growth on consumption by type of debt. We focus on five main categories of household debt:

[18] The only exceptions are municipality in which the borrower is located and age, which were obtained from the Brazilian Internal Revenue Service.

mortgages, auto loans, payroll loans, non-payroll loans and credit card debt. As shown, all coefficients are negative and statistically significant, indicating that a larger increase in debt-to-income ratio in any of these categories is associated with lower future consumption growth during the following recession. The magnitude of the estimated coefficients differs largely across debt categories. In particular, it is larger for credit card debt, followed by non-payroll and payroll loans, car loans and mortgages. The magnitude of the correlation between changes in each type of debt and future consumption is monotonically increasing with the average interest rate charged by these different types of debt.[19] This evidence is consistent with larger increases in debt service ratio during the boom driving larger consumption decreases during the recession.

IV.B Identification Strategy using Multi-Lender Borrowers

In this section we propose an identification strategy to quantify the effect of credit supply increases by government banks on individuals' debt as a share of their income. These effects are traditionally difficult to estimate because changes in credit supply by banks tend to be correlated with contemporaneous changes in credit demand by individuals. To overcome this challenge, we build on the empirical literature studying the effects of bank liquidity shocks on firm borrowing (e.g. Khwaja and Mian (2008)), which identifies such effects by focusing on firms borrowing from multiple banks that are heterogeneously exposed to a liquidity shock. Similarly, in our setting, we focus on individuals that borrow from multiple banks that are heterogeneously exposed to government credit-expansion policies.[20]

As shown in section III, during the 2011-2014 period, government banks experienced faster growth in credit to households than private banks. This is consistent with government banks responding more promptly to a set of policies launched by the Brazilian government in 2011 to expand credit supply. Thus, in our identification strategy, we focus on individuals borrowing from at least one government bank and one private bank during the 2011-2014 period, and then study the relative change in lending from these two types of banks once individual-level credit demand shocks are absorbed via individual fixed effects.

[19] Using monthly public data on all operations recorded in the credit registry averaged across months between January 2011 and December 2016, we find an average interest rate for mortgage contracts equal to 9.5 percent, 24.0 percent for car loans, 27.0 percent for payroll loans, 95.3 percent for non-payroll personal loans, 118.2 percent for installment credit card operations and 331.7 percent for revolving credit card debt. On the other hand, this ordering is almost perfectly reversed in terms of duration, with 25.9 years on average for mortgages, 3.6 years for car loans, 5.3 years for payroll loans, 3.0 year for non-payroll personal loans and 8.7 months for credit card installment contracts. Revolving credit card lines have one month duration by definition.

[20] Our empirical approach in this section is similar to Jensen and Johannesen (2017), which study the effect of the 2007-08 financial crisis on credit supply to households using data on multi-lender individuals from Denmark. See also Chava et al. (2018) which focus on individuals with credit cards from multiple banks to study the effect of bank funding shocks on credit limits.

Our main specification is as follows:

$$\Delta \left(\frac{debt_{bi}}{income_i} \right)_{2011-2014} = \alpha_i + \lambda 1(govbank)_b + u_{bi} \tag{2}$$

The outcome variable in equation (2) is the change in lending from bank b to individual i between 2011 and 2014 as a share of labor income of individual i. To estimate this specification we first collapse the data at the bank-individual level and then take first differences between 2011 and 2014. α_i are individual fixed effects and $1(govbank)_b$ is a dummy equal to 1 if the lender is a government controlled bank. Standard errors are clustered at the micro-region level.

The results of this identification strategy are reported in Table III. We start in column (1) by estimating equation 2 with all individuals in the sample used in section IV.A and without individual fixed effects. Each observation is a bank-individual relationship, which we hereafter refer to as a loan. The estimated coefficient indicates that loans from government controlled banks experienced a 10 percentage points larger growth in the 2011-2014 period relative to loans from privately controlled banks as a share of the income of the borrower. In column (2) we augment the specification with the large set of individual characteristics used in Table I, and the estimated coefficient changes only marginally.

Next, in column (3), we estimate the same specification as in column (2) focusing exclusively on multi-lender individuals, i.e. individuals that in the 2011-2014 period borrowed from more than one bank. As can be seen by comparing the number of individuals in column (2) and (3), the vast majority (91%) of individuals in our sample were borrowing from more than one lender during the period under study. There are several potential reasons for such a wide diffusion of multi-bank borrowing among individuals in our sample. For example, formal employees in Brazil have a strong incentive to open an account in the bank used by their employer, because inter-bank transfers are still relatively expensive. Thus, employees often open new accounts when they change employer. Opening new accounts also happens if there are other bonds (like family) which require frequent bank transfers. Another reason for having multiple bank relationships is bank specialization in different credit categories: certain banks specialize in providing auto loans, others in mortgage loans, others in credit cards.

Next, in column (4), we focus on multi-lender individuals that borrow from at least one government controlled bank and one non government-controlled bank. As shown, 56% of individuals in our sample had credit relationships with both types of banks during the period under study. In this specification we include individual fixed effects, effectively absorbing any individual level shocks to credit demand. Our results show that, during the credit boom period, government banks increased their lending more than private banks to the same individual. The magnitude of the estimated coefficient indicate that credit relationships with government banks expanded debt-to-income ratio of an individual by 12.8 percentage points more than credit relationships with non government-controlled banks. Finally, in column (5) we collapse our data at the bank-type / individual level, so that each multi-lender individual appears exactly twice in this specification. The results are quantitatively and qualitatively similar to column (4).[21]

IV.C Identification Strategy using Public vs Private Sector Workers

In this section we focus on individual level outcomes, and in particular on the effect of leverage on future consumption. Since consumption is observed at individual-level, we cannot rely on the same identification strategy based on multi-lender individuals that we used in section IV.B. Instead, we need to construct an individual-level measure of exposure to the credit expansion by government-controlled banks in the post-2011 period. As discussed in section III, a significant fraction of the credit expansion by government-controlled banks occurred in the payroll loans' segment, and public sector workers tend to be the primary target of payroll loans. Thus, in this section we exploit variation in the sector of employment of the borrower as a measure of exposure to the increase in credit supply from government-controlled banks in the 2011-2014 period.

Information on the sector of employment of each borrower is obtained from the employer-employee data. We classify as public sector workers those individuals employed by the public administration, which includes personnel of local and federal government administrative bodies, judicial system, defense and law enforcement. During the period under study, public sector workers represent, on average, 21 percent of formal workers registered in our data.

The main challenge with this identification strategy is that public and private sector workers are likely to differ along several observable and unobservable characteristics. Table IV reports unconditional averages of gender, years of education, age, exposure to government banks, labor income and debt-to-income ratios for private sector and public sector workers in the baseline year 2011. As shown, we find significant differences at baseline across observable characteristics. In particular, public sector workers are 21 percent more likely to be female, have on average 0.89 more years of education, are around 5 years older and have a 19.3 percentage point higher share of borrowing from government-controlled banks. The average monthly wage of public sector workers is around 688 BRL higher (18%) than the average monthly wage of formal private sector workers, while their average debt to income ratio is significantly lower.

In our empirical analysis we control for all the individual observable characteristics reported in Table IV. In addition, we augment the estimating equation with fixed effects

[21] Although we include individual effects in the specification in column (5), notice that they do not affect the estimated parameter, since the government-controlled bank indicator is orthogonal to them by construction.

for the micro-region and the occupation of the worker. The information on occupations reported in social security data is extremely detailed, covering 2,163 occupational categories. This allows us to effectively compare workers operating in different sectors but effectively performing the same job within their firms. For example, this allows us to compare a civil engineer employed in the public sector with another civil engineer employed in the private sector, or an accountant employed in the public sector with another accountant employed in the private sector.

There are, of course, other potential confounding factors. The most relevant one for our research question is that public sector employment is likely to provide higher job security relative to the private sector. This might play an important role when studying differences in consumption during the 2015-2016 recession between these two types of workers. Notice, however, that higher stability of public sector employment should play against us finding a lower credit card expenditure for public sector workers during the recession years.

IV.C.1 Effect on debt-to-income growth during the boom period

We start by testing empirically whether public sector workers experienced faster increase in debt-to-income ratio relative to private sector workers in the 2011-2014 period using the following estimating equation:

$$\Delta \left(\frac{debt}{income} \right)_{i,2011-2014} = \alpha + \gamma 1(Public)_{i,2011} + u_i \tag{3}$$

where $1(Public)_{i,2011}$ is an indicator function that takes value 1 if individual i was employed by the government in 2011, and 0 otherwise.[22] When estimating equation (3) we include all the fixed effects and controls discussed above. The results are reported in Table V. As shown in column (1), we find a positive and significant coefficient on the dummy identifying public sector workers in 2011. The magnitude of the coefficient indicates that public sector workers experienced a 2.3 percentage points higher increase in their debt to income ratio relative to private sector workers between 2011 and 2014. This corresponds to 20 percent of the average increase in debt-to-income ratio between 2011 and 2014 across all individuals in our sample (11.8 percentage points). As shown in columns (2) and (3), this effect is exclusively driven by an increase in debt from government-controlled banks. When we decompose debt from government-controlled banks in different types of loans, we find that the change in payroll debt over income is the main driver of the differences in the change in debt to income ratios.[23] Overall, these results are consistent with an

[22]More specifically, we define this variable using the legal classification ("*natureza juridica*") of the employer of each borrower. We classify as public sector workers those employed by firms whose legal classification is "public administration".

[23]When we focus on credit originated by government controlled banks and split it into different cate-

increase in the supply of payroll lending by government-controlled banks in the 2011-2014 period which disproportionately targeted public-sector workers.

Next, we study whether the exposure of public sector workers to government banks' credit expansion differed across individuals with different initial income levels. To this end, we interact the dummy identifying public sector workers with dummies identifying quintiles in the initial distribution of labor income. Notice that our sample covers formal workers with positive borrowing from the formal financial system. The average annual labor income of borrowers in the lowest quintile is around 8,600 R$, above the income of a worker making the federal minimum wage in Brazil.[24] On the other end, the average annual labor income of borrowers in the highest quintile is approximately 100,000 R$.

The results are reported in Table VI. Column (1) shows that the effect of being a public sector employee on debt-to-income growth during the boom period is concentrated among workers in the lowest quintile of the income distribution. If low-income public sector workers experienced a 7.5 percent larger increase in debt-to-income relative to private sector workers, this difference is reduced by two-thirds (2.3 percent) when focusing on the second quintile of income, while it is muted in the upper quintiles of the income distribution. Columns (2) and (3) show that these heterogeneous effects are driven by government bank lending, and payroll lending in particular, consistent with the policies described in section III.

These heterogeneous effects can be clearly seen in Figure VII, which plots the average increase in debt-to-income growth across 50 bins of initial income, and shows them separately for public sector and private sector workers in each bin. As shown, both in the raw data and after partialling out a large set of observables, the difference in debt-to-income growth between public and private sector workers is monotonically decreasing in income and concentrated among lower income borrowers.

Figure VIII replicates this exercise by type of debt. It shows that, during the 2011-2014 period, different types of borrowers took on different types of debt. For example, the increase in credit card debt was concentrated among lower income borrowers. On the other hand, the relationship between growth in mortgage debt and income is U-shaped, with borrowers at the bottom and at the top of the income distribution experiencing relatively larger increase in mortgage debt with respect to those in the middle.[25] Finally, note that the increase in payroll lending monotonically declines with initial income of the borrower. In addition, it is the only category of debt in which the borrowing behavior of public and private sector workers is clearly different. In particular, Figure VIII (a) is

gories, we exclude auto loans as those are provided almost exclusively by private banks.

[24]In 2011, the federal minimum wage in Brazil was around 540 R$ – for an annual income of approximately 7000 R$. This number includes the 13^{th} salary that Brazilian workers receive at the end of the year.

[25]The effect at the bottom is plausibly driven by the mortgage government subsidy program described above.

consistent with the increase in the supply of payroll loans by government banks targeting almost exclusively public sector workers and, among them, those with lower initial income.

IV.C.2 Effect on credit card expenditure during the recession period

In this section, we investigate whether the differential increase in debt-to-income ratio for public sector workers had an impact on their relative consumption during the subsequent recession. To this end, we estimate the following reduced form equation relating changes in credit card expenditure during the 2014-2016 period with a dummy capturing public sector workers in 2011:

$$\Delta \log(\text{credit card expenditure})_{i,2014-2016} = \alpha + \theta 1(Public)_{i,2011} + \eta_i \tag{4}$$

Table VII reports the results. The estimated coefficient θ is negative and statistically significant, indicating that public sector workers experienced, on average, a 2 percent lower change in credit card expenditure relative to private sector workers between 2014 and 2016. We include in this specification the full set of controls and fixed effects used in Table V. Under the strong assumption that this saturated model does not suffer from omitted variable bias, the results presented in Table V and VII can be used to compute the implied elasticity of consumption to debt-to-income ratio. We obtain an elasticity of -1.24, which indicates that a 1 percentage point higher increase in debt to income during the boom period corresponds to a 1.24 percent larger decline in consumption spending during the subsequent recession.[26]

Next, we investigate the heterogeneous effects by initial income levels. Table VI discussed in the previous section shows that public sector workers in the lowest income quintile experienced the largest increase in debt-to-income during the boom period, and that this increase was driven by loans originated by government controlled banks and concentrated in payroll lending. This is consistent with this category of workers being relatively more exposed to the policies aimed at increasing credit supply discussed in section III. In Table VIII we study the heterogeneous effects on credit card expenditure during the recession period. We find that public sector workers in the lowest income quintile experienced the largest decline in credit card expenditure during the recession period. The coefficients reported in column (1) indicate that, among borrowers in the lowest income quintile, public sector workers experienced a 4 percent lower change in credit card expenditure with respect to private sector workers during the recession. This difference is significantly smaller for borrowers in the other labor income quintiles (with the only exception of the highest income borrowers).

These heterogeneous effects on consumption by income can be also seen in Figure IX.

[26] This implied elasticity is obtained by dividing the estimated coefficient reported in column (2) of Table VII by the estimated coefficient reported in column (1) of Table V.

This Figure plots the average change in credit card expenditure between 2014 and 2016 across 50 income bins and separately for public and private sector workers. To sum up, the results presented in Tables VI and VIII show that the same category of borrowers – low-income public sector employees – experienced both the largest increase in debt-to-income ratio during the boom and the largest decline in consumption during the recession years.

The relative expansion of credit towards low-income borrowers during the post-2011 period suggests that banks – and government banks in particular – increased the average risk pool of their borrowers. To test this more formally, we use the internal credit-risk score reported in the credit registry for each individual. This credit score is generated by the lender and is reported in a standardized scale with 10 notches going from AA (less risk) to HH (more risk). For the purpose of our exercise, we split individuals in three groups based on their credit score in the baseline year 2011. Low-risk borrowers have credit risk scores of AA and A, medium risk borrowers have scores of B and C, while high risk borrowers have scores below D.

Using this classification we estimate equations (3) and (4) interacting our public sector dummy with dummies for medium and high risk categories, and including all the main effects of this interaction. The results are reported in Table A.1, in which we focus on two main outcomes: debt-to-income ratio during the boom period, and change in credit card expenditure during the recession. We find that credit expansion happened in a similar magnitude for low and medium risk borrowers, while high-risk borrowers experienced a significantly larger increase in their debt-to-income ratio between 2011 and 2014 with respect to low-risk borrowers. When studying the effect on credit card expenditure, we find that the negative effects on consumption are concentrated among high-risk borrowers, as shown by the negative and significant coefficient in column (2).

IV.C.3 Additional Robustness Tests

In this section we present two robustness tests of the results presented in section IV.C. One potential concern when focusing on individual credit card expenditure as a measure of consumption is that the results might be driven by banks cutting the credit limit on cards to a larger extent to those borrowers whose debt to income ratio increased the most during the 2011-2014 period. This should mechanically generate a negative correlation between increase in debt to income during the 2011-2014 period and credit card expenditure during the 2014-2016 period. Table A.2 shows (i) that borrowers with higher increases in debt-to-income ratio during the boom period experienced larger deleveraging during the recession, and (ii) that the negative relationship between debt-to-income growth and future consumption is robust to focusing exclusively on "unconstrained" borrowers, that is, borrowers with positive unused credit lines at the end of the month.[27]

Another potential concern is that public and private sector workers might have experienced a different previous evolution of wages. In particular, if wages had grown faster among public sector employees, this category might expect increases in future wages systematically larger than those of private sector workers. If those expectations were wrong, they could explain part of the relative consumption reduction during the 2015-2016 crisis. To mitigate this concern we augment our estimating equation including as controls the growth in labor income during the 2004-2011 period for each worker, as well as the interaction of this variable with the public sector worker dummy. The latter interaction should absorb any differential increase in debt driven by differences in wage growth expectations between public and private sector workers. The inclusion of such controls comes at the expense of losing 25% of the sample, as we need to restrict to individuals that have been employed in the formal sector since 2004. The estimates in Table A.3 show that our main results are robust to adding these controls.

V Concluding Remarks

In the last decades, emerging economies have experienced a significant rise in household debt to GDP ratios. This trend has been a source of concern for academics and policymakers. Recent evidence using both cross-country and within-country data has shown that household debt booms tend to be followed by lower economic growth. However, there is still scarce empirical evidence on the mechanism by which an increase in household debt depresses subsequent economic activity.

In this paper we use individual-level data from Brazil to provide evidence on the channel through which a rise in household debt may lead to lower future GDP growth. Brazil is an interesting case to study this question for several reasons. First, it experienced a household debt boom in the 2003 to 2014 period which was followed its most severe recession on record. Second, it offers detailed micro-data which allow to observe, at individual level: debt composition, labor income, and credit card expenditure along with many other individual characteristics of each borrower. Finally, and similarly to other emerging economies, the increase in household debt-to-income ratio was fueled by government intervention in the aftermath of the global financial crisis. Brazilian state-owned banks were instrumental in this intervention and increased credit supply to households starting in 2011, when credit from private banks was stagnating.

In our empirical analysis, we identify the effect of credit supply increases by government banks on individuals' debt-to-income ratios by focusing on individuals that borrow from

[27] Unused credit limits in the Credit registry refer mostly to revolving credit lines, i.e. credit card debt and checking accounts overdrafts. They are informed monthly by each bank for at the client level. In order to consider the individual as unconstrained, we require that he presents strictly positive unused credit limits in every month of the year.

both government banks and private banks and using individual fixed effects to capture demand shocks. Our results show that, during the credit boom period, government banks increased their lending significantly more than private banks to the same individual. We then document that higher debt-to-income growth at individual level during the late stages of the boom period maps into lower future consumption for the same borrower. To identify the effect on consumption at individual-level we use variation in the sector of employment of each borrower as a proxy of its exposure to the increase in lending by government-controlled banks in the post 2011 period. Borrowers employed in the public sector in 2011 experienced, in the following three years, a significantly larger increase in their debt-to-income ratio relative to private sector workers, as well as a larger decline in credit card expenditure in the 2015-2016 recession. This credit expansion as well as the decline in consumption are concentrated among the lower-income and high-risk borrowers in our sample.

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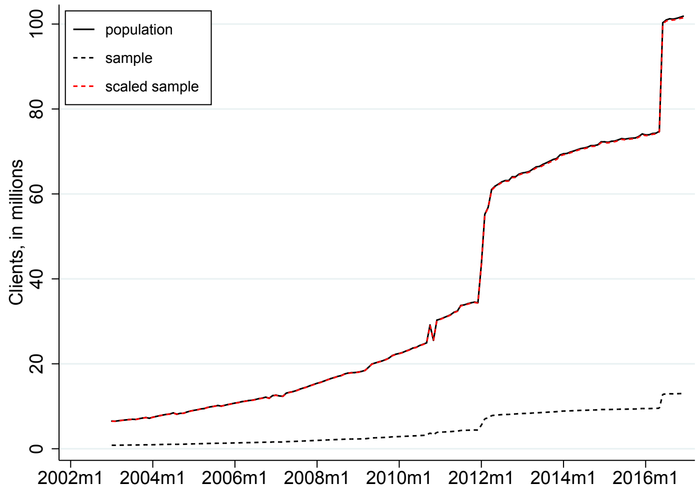
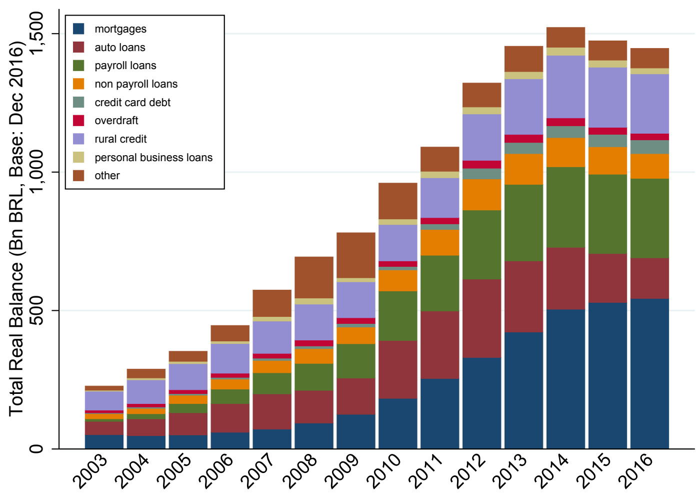
Figures and Tables

Figure I: Number of Individuals in Credit Information System



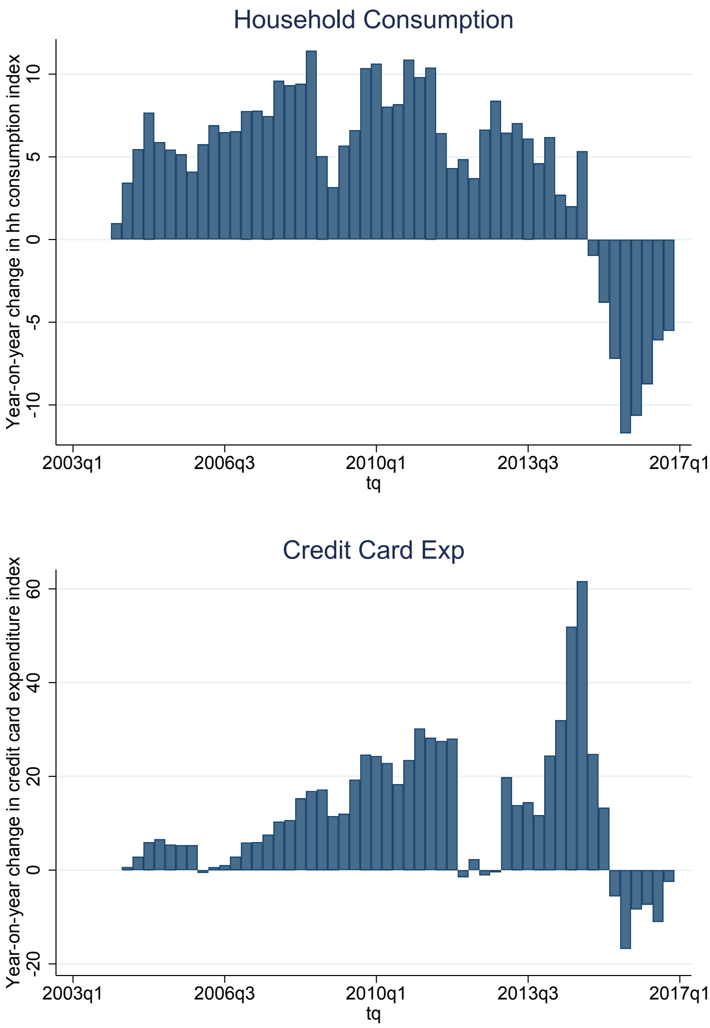
Notes: source: Garber et al. (2019). Data from the Credit Information System (SCR), Central Bank of Brazil. The sample series shows total number of individual clients by month in the 12.8% random sample of individuals extracted from SCR. The scaled sample series is obtained by multiplying total clients by month in the extracted sample by 117/15.

Figure II: Household Debt Composition 2003-2016



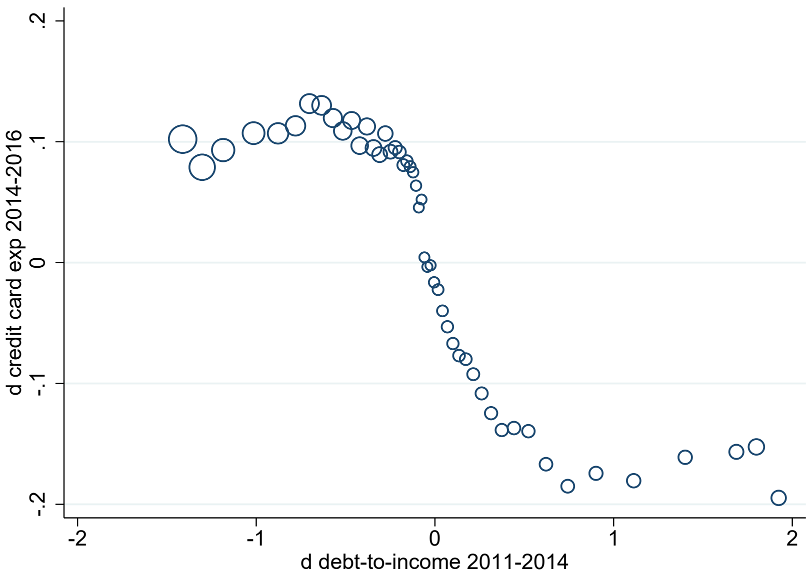
Notes: source: Garber et al. (2019). Data from the Credit Information System (SCR), Central Bank of Brazil. Aggregates are constructed starting from the 12.8% random sample of individuals extracted from SCR, and scaled to be representative of the population of individuals in SCR.

Figure III: Household Consumption Index and Credit Card Expenditure



Notes: data sourced from Brazilian Institute of Statistics and Credit Information System.

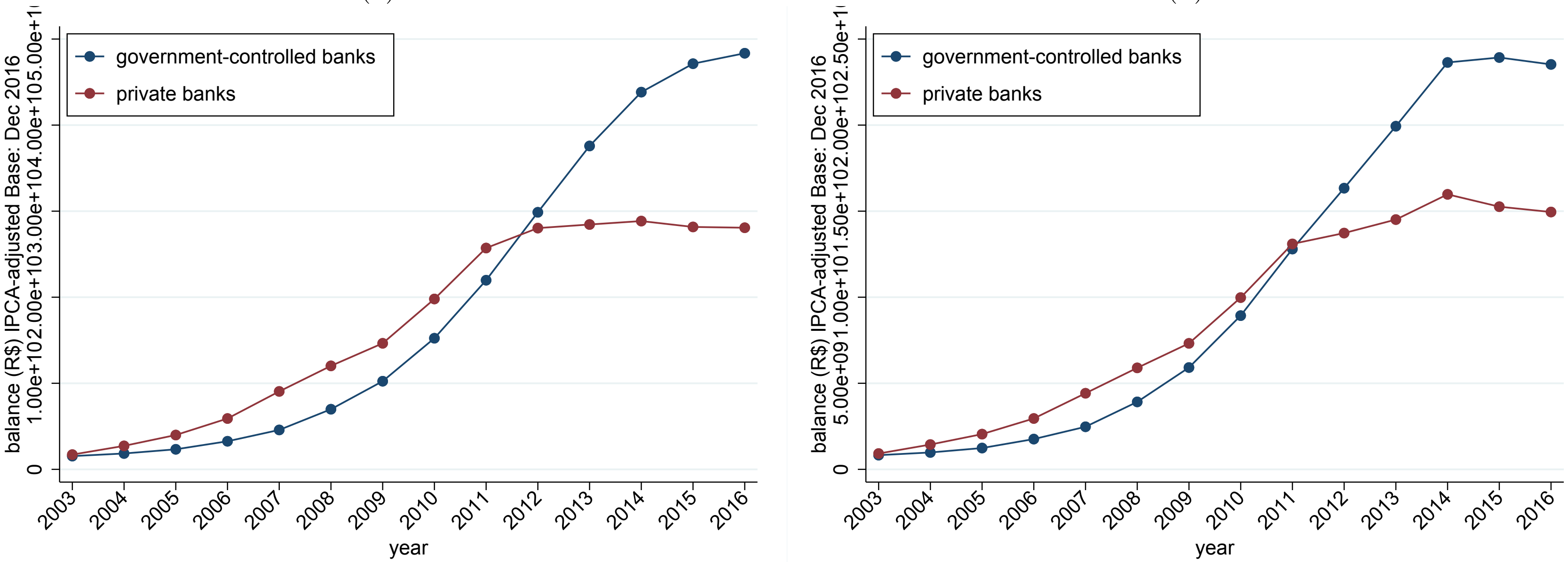
Figure IV: Household Debt to Income Ratio and Credit Card Expenditure



Notes: Intensive margin only: individuals with data on income and positive debt in 2011-2014 and with credit card expenditure in 2014-2016. Dots represent 50 population bins. Size of dot shows total debt in each bin

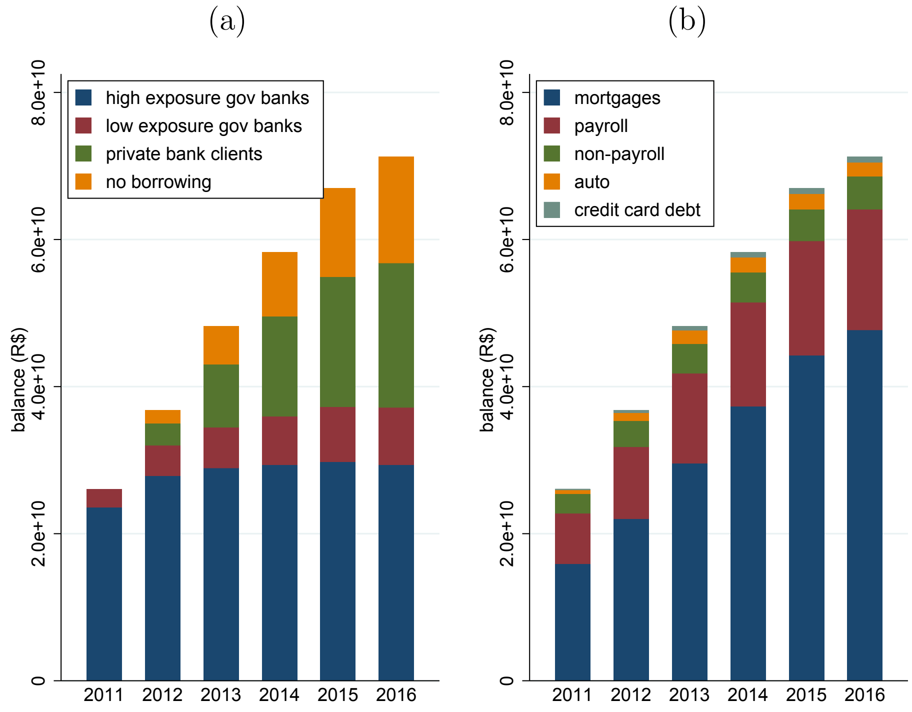
Figure V: Total Lending to Household by Bank Control

(a) (b)



Notes: Panel (a) reports total outstanding debt owed to private and government-controlled banks from 2003 to 2016 for all borrowers. Panel (b) reports the same statistics for borrowers used in the regression sample.

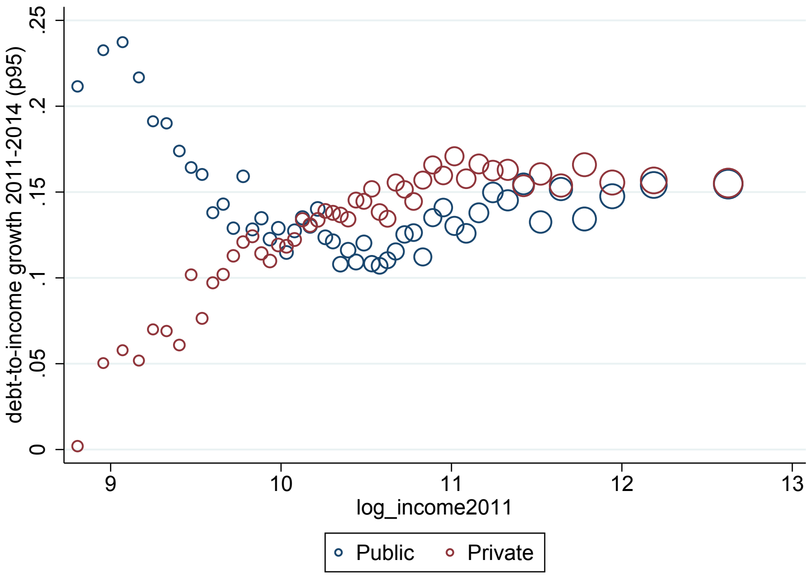
Figure VI: Total credit from Government-Controlled Banks by Type of Borrower and Type of Loans



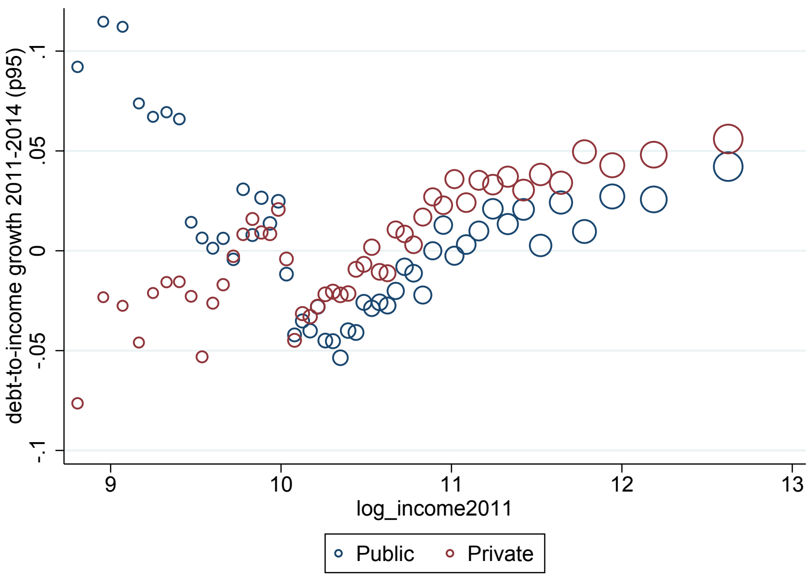
Notes: Panel (a) reports total government-controlled banks' lending decomposed by type of borrowers, based on the composition of their balance in the year 2011. Panel (b) reports total government-controlled banks' lending decomposed by type of loans.

FIGURE VII: FIRST STAGE

(a) raw data



(b) residualized

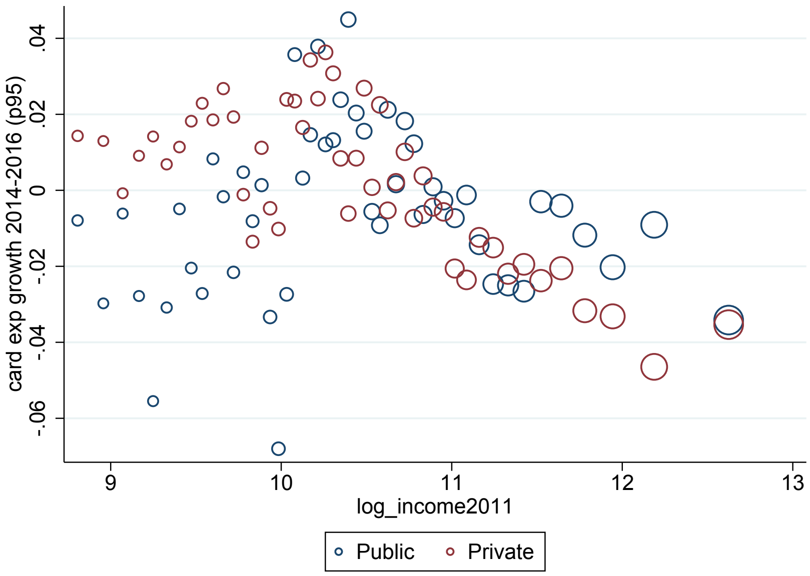


Notes: Public vs private sector workers in 2011 as measure of exposure to government sponsored credit supply increase. Dots represent 50 population bins. Size of dot shows total debt in each bin

Figure VIII: First Stage, intensive margin only, by categories of debt

Notes: Public vs private sector workers in 2011 as measure of exposure to government sponsored credit supply increase. First stage variation driven by credit supply push by gov banks in payroll loans Dots represent 50 population bins. Size of dot shows total debt in each bin

Figure IX: Reduced Form effect on Credit Card Expenditure



Notes: Public vs private sector workers in 2011 as measure of exposure to government sponsored credit supply increase. Dots represent 50 population bins. Size of dot shows total debt in each bin

Table I: Credit Card Expenditure and Debt-to-Income Ratio

outcome:	Δ log (credit card expenditure)$_{2014-2016}$	
	(1)	(2)
Δ (total debt to income)$_{2011-2014}$	-0.12802	-0.12995
	[0.00246]***	[0.00239]***
fixed effects:		
micro-region	y	y
income quintiles	y	y
age quintiles		y
education		y
gender		y
sector		y
occupation		y
Observations	981,615	981,615
R-squared	0.01484	0.01995
N clusters	558	558

Notes: The table reports the results obtained estimating equation (1) in the paper. The sample includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. Total debt includes all categories of debt recorded in the Credit Information System. Income is the total annual labor income for each individual observed in RAIS. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

Table II: Credit Card Expenditure and Debt-to-Income Ratio by Type of Debt

outcome:	Δ log (credit card expenditure)$_{2014-2016}$				
	(1)	(2)	(3)	(4)	(5)
Δ (mortgage debt to income)$_{2011-2014}$	-0.04505				
	[0.00309]***				
Δ (car debt to income)$_{2011-2014}$		-0.11062			
		[0.00460]***			
Δ (payroll debt to income)$_{2011-2014}$			-0.45286		
			[0.01623]***		
Δ (non-payroll debt to income)$_{2011-2014}$				-1.13131	
				[0.01933]***	
Δ (credit card debt to income)$_{2011-2014}$					-5.05761
					[0.11369]***
fixed effects:					
micro-region	y	y	y	y	y
income quintiles	y	y	y	y	y
age quintiles	y	y	y	y	y
education	y	y	y	y	y
gender	y	y	y	y	y
sector	y	y	y	y	y
occupation	y	y	y	y	y
Observations	981,615	981,615	981,615	981,615	981,615
R-squared	0.01261	0.01306	0.01625	0.01772	0.03248
N clusters	558	558	558	558	558

Notes: The table reports the results obtained estimating equation (1) in the paper by the main categories of debt. The sample includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. Income is the total annual labor income for each individual observed in RAIS. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

Table III: Bank-Individual Evidence using Multi-Lender Individuals

outcome	Δ (debt to income)$_{2011-2014}$				
sample of individuals:	All		Multi-lender	Multi-lender (gov and non-gov banks)	
	(1)	(2)	(3)	(4)	(5)
1(gov)	0.10698	0.10991	0.11400	0.12804	0.12520
	[0.00237]***	[0.00259]***	[0.00269]***	[0.00290]***	[0.00411]***
fixed effects:					
micro-region		y	y		
income quintiles		y	y		
age quintiles		y	y		
education		y	y		
gender		y	y		
occupation		y	y		
individual				y	y
Observations	3,674,722	3,674,722	3,584,018	2,437,862	1,108,044
R-squared	0.02183	0.02767	0.02895	0.26369	0.51321
N individuals	981,713	981,713	891,009	554,022	554,022
N clusters	558	558	558	558	558

Notes: The unit of observation in columns (1) to (4) is a bank-individual lending relationship. In column (5) the unit of observation is a bank type-individual lending relationship, where bank type can be: government-controlled bank or private bank. The sample in columns (1) and (2) includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. The sample in column (3) is restrict to multi-lender individuals. The sample in columns (4) and (5) is restricted to individuals that borrow from both government-controlled and private banks during the period 2011-2014. The variable $1(govbank)_b$ is a dummy equal to 1 if the lender is a government controlled bank. Column (4) shows the results obtained estimating equation (2) in the paper. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

Table IV: Balance Test: Private vs Public sector workers in 2011

individual characteristics (2011)	Private	Difference with Public	st.err.
1(female)	0.346	0.214	[0.01314]***
years of education	12.759	0.893	[0.10307]***
age	37.786	5.066	[0.22693]***
share of borrowing from gov banks	0.224	0.193	[0.01962]***
monthly average labor income	3,798	688	[242.84]***
debt to income ratio	0.880	-0.146	[0.03047]***

Notes: The sample includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. Data on individual characteristics refers to year 2011. Significance level: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table V: Debt-to-Income Growth in 2011-2014

outcome	Δ (total debt to income)$_{2011-2014}$						
	total	government banks	private banks	government banks			
				mortgages	payroll	non payroll	credit card debt
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I(public sector employee)$_{2011}$	0.01637	0.07252	-0.05610	0.00638	0.04858	0.0014	0.00081
	[0.00291]***	[0.00657]***	[0.00591]***	[0.00330]*	[0.00284]***	[0.00022]***	[0.00009]***
baseline controls:	y	y	y	y	y	y	y
fixed effects:							
micro-region	y	y	y	y	y	y	y
income quintiles	y	y	y	y	y	y	y
age quintiles	y	y	y	y	y	y	y
education	y	y	y	y	y	y	y
gender	y	y	y	y	y	y	y
occupation	y	y	y	y	y	y	y
Observations	981,615	981,615	981,615	981,615	981,615	981,615	981,615
R-squared	0.18906	0.06474	0.24136	0.05925	0.09608	0.02335	0.06069
N clusters	558	558	558	558	558	558	558

Notes: The table reports the results obtained estimating equation (3) in the paper. The sample includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. Total debt includes all categories of debt recorded in the Credit Information System. Income is the total annual labor income for each individual observed in RAIS. Baseline controls at individual level include: share of borrowing from government banks in 2011 and debt-to-income ratio in 2011. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

Table VI: Debt-to-Income Growth in 2011-2014 By Quintile of 2011 Labor Income

outcome	Δ (total debt to income)$_{2011-2014}$						
	total	government banks	private banks	government banks			
				mortgages	payroll	non payroll	credit card debt
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1(public sector employee)$_{2011}$	0.07143	0.10218	-0.02379	0.00463	0.06864	0.00348	0.00122
	[0.00638]***	[0.00663]***	[0.00420]***	[0.00251]*	[0.00411]***	[0.00048]***	[0.00012]***
1(public sector employee)$_{2011}$ $\times 1(incomeq = 2)$	-0.04844	-0.03621	-0.01934	-0.00459	-0.01547	-0.00134	-0.00033
	[0.00584]***	[0.00642]***	[0.00485]***	[0.00308]	[0.00212]***	[0.00033]***	[0.00007]***
1(public sector employee)$_{2011}$ $\times 1(incomeq = 3)$	-0.06805	-0.04864	-0.03045	-0.00729	-0.02238	-0.00224	-0.00042
	[0.00652]***	[0.00637]***	[0.00706]***	[0.00264]***	[0.00310]***	[0.00045]***	[0.00009]***
1(public sector employee)$_{2011}$ $\times 1(incomeq = 4)$	-0.06737	-0.03574	-0.04353	0.00482	-0.02727	-0.00285	-0.00046
	[0.00767]***	[0.00596]***	[0.00694]***	[0.00304]	[0.00269]***	[0.00050]***	[0.00010]***
1(public sector employee)$_{2011}$ $\times 1(incomeq = 5)$	-0.09252	-0.02933	-0.06816	0.01506	-0.03543	-0.00401	-0.00087
	[0.00978]***	[0.00552]***	[0.00727]***	[0.00288]***	[0.00287]***	[0.00059]***	[0.00012]***
baseline controls:	y	y	y	y	y	y	y
fixed effects:							
micro-region	y	y	y	y	y	y	y
income quintiles	y	y	y	y	y	y	y
age quintiles	y	y	y	y	y	y	y
education	y	y	y	y	y	y	y
gender	y	y	y	y	y	y	y
occupation	y	y	y	y	y	y	y
Observations	981,615	981,615	981,615	981,615	981,615	981,615	981,615
R-squared	0.18939	0.06499	0.24198	0.05940	0.09817	0.02378	0.06106
N clusters	558	558	558	558	558	558	558

Notes: The table reports the results obtained estimating an augmented version of equation (3) in the paper that includes a set of interaction terms between a dummy capturing employment in the public sector and labor income quintiles (both defined in year 2011). The sample includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. Total debt includes all categories of debt recorded in the Credit Information System. Income is the total annual labor income for each individual observed in RAIS. Baseline controls at individual level include: share of borrowing from government banks in 2011 and debt-to-income ratio in 2011. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

Table VII: Credit Card Expenditure During Recession

outcome	Δ log (credit card expenditure)$_{2014-2016}$	
	(1)	(2)
I(public sector employee)$_{2011}$	-0.01659	-0.02027
	[0.00707]**	[0.00733]***
baseline controls:		y
fixed effects:		
micro-region	y	y
income quintiles	y	y
age quintiles	y	y
education	y	y
gender	y	y
occupation	y	y
Observations	981,615	981,615
R-squared	0.01190	0.01211
N clusters	558	558

Notes: The table reports the results obtained estimating equation (4) in the paper. The sample includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. Baseline controls at individual level include: share of borrowing from government banks in 2011 and debt-to-income ratio in 2011. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

Table VIII: Credit Card Expenditure During Recession By Quintile of 2011 Labor Income

outcome	Δ log (credit card expenditure)$_{2014-2016}$	
	(1)	(2)
1(public sector employee)$_{2011}$	-0.03926	-0.04517
	[0.01158]***	[0.01173]***
1(public sector employee)$_{2011}$ $\times 1(incomeq = 2)$	0.01665	0.01927
	[0.00872]*	[0.00868]**
1(public sector employee)$_{2011}$ $\times 1(incomeq = 3)$	0.05479	0.06055
	[0.01026]***	[0.01046]***
1(public sector employee)$_{2011}$ $\times 1(incomeq = 4)$	0.03742	0.04106
	[0.01128]***	[0.01125]***
1(public sector employee)$_{2011}$ $\times 1(incomeq = 5)$	0.00879	0.00739
	[0.01243]	[0.01224]
baseline controls:		y
fixed effects:		
micro-region	y	y
income quintiles	y	y
age quintiles	y	y
education	y	y
gender	y	y
occupation	y	y
Observations	981,615	981,615
R-squared	0.01199	0.01223
N clusters	558	558

Notes: The table reports the results obtained estimating an augmented version of equation (4) in the paper that includes a set of interaction terms between a dummy capturing employment in the public sector and labor income quintiles (both defined in year 2011). The sample includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. Baseline controls at individual level include: share of borrowing from government banks in 2011 and debt-to-income ratio in 2011. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

A Appendix: Figures and Tables

Table A.1: Heterogeneous Effects by Borrower's Credit Risk

outcome	Δ (debt-to-income)$_{2011-2014}$	$\Delta \log$ (credit card exp)$_{2014-2016}$
	(1)	(2)
1(public sector employee)$_{2011}$	0.01387	-0.00155
	[0.00579]**	[0.00911]
1(public sector employee)$_{2011}$ $\times 1(risk = medium)$	0.00238	-0.00521
	[0.01009]	[0.00945]
1(public sector employee)$_{2011}$ $\times 1(risk = high)$	0.06100	-0.06244
	[0.00856]***	[0.01368]***
baseline controls	y	y
fixed effects:		
micro-region	y	y
income quintiles	y	y
age quintiles	y	y
education	y	y
gender	y	y
occupation	y	y
Observations	972,079	972,079
R-squared	0.02630	0.01216
N clusters	558	558

Notes: The sample includes all formal workers with a positive debt balance in both 2011 and 2014, and an active credit card in both 2014 and 2016 that appear in our Credit Information System-RAIS matched dataset. Baseline controls at individual level include: share of borrowing from government banks in 2011 and debt-to-income ratio in 2011. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

Table A.2: Additional Results: Robustness to Sample of Individuals with Unused Credit Limits

outcome	Δ (total debt to income)$_{2014-2016}$	Δ (total debt to income)$_{2014-2016}$	Δ log (credit card expenditure)$_{2014-2016}$
sample	all	individuals with unused credit limits	
	(1)	(2)	(3)
Δ (total debt to income)$_{2011-2014}$	-0.15128	-0.14452	-0.07056
	[0.00164]***	[0.00220]***	[0.00203]***
fixed effects:			
micro-region	y	y	y
income quintiles	y	y	y
age quintiles	y	y	y
education	y	y	y
gender	y	y	y
sector	y	y	y
occupation	y	y	y
Observations	878,123	529,587	584,434
R-squared	0.05459	0.05583	0.02275
N clusters	558	558	558

Notes: Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

Table A.3: Additional Results: Robustness to Controlling for Differential Previous Wage Growth

outcome	Δ (total debt to income)$_{2011-2014}$		Δ log (credit card expenditure)$_{2014-2016}$
	government banks	government banks payroll	
	(1)	(2)	(3)
1(public sector employee)$_{2011}$	0.07676	0.03979	-0.03708
	[0.00669]***	[0.00289]***	[0.00826]***
Δ log (income)$_{2004-2011}$	0.03736	0.00083	-0.00766
	[0.00171]***	[0.00026]***	[0.00237]***
I(public sector employee)$_{2011}$ $\times$ Δ log (income)$_{2004-2011}$	-0.00212	0.01167	0.02117
	[0.00303]	[0.00110]***	[0.00528]***
baseline controls	y	y	y
fixed effects:			
micro-region	y	y	y
income quintiles	y	y	y
age quintiles	y	y	y
education	y	y	y
gender	y	y	y
occupation	y	y	y
Observations	730,419	730,419	730,419
R-squared	0.07147	0.09489	0.01306
N clusters	558	558	558

Notes: Baseline controls at individual level include: share of borrowing from government banks in 2011 and debt-to-income ratio in 2011. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

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