CONSUMPTION SMOOTHING OR CONSUMPTION BINGING?
THE EFFECTS OF GOVERNMENT-LED CONSUMER CREDIT EXPANSION IN BRAZIL

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NBER Working Paper No. 29386
October 2021, Revised September 2022
JEL No. D12,D14,E21,E32,G21,G28,G53,O16

ABSTRACT

Brazil initiated a major credit expansion program through government banks in 2011. The program primarily targeted public sector workers, who had stable payroll, with offers of payroll-backed loans. Using individual-level administrative data on income, borrowing, and spending, we find that the program led to a large 15 percentage point rise in debt to initial income for public sector workers. We develop a new method for estimating expected income growth for workers, and show that a "consumption smoothing" motive cannot explain the rise in consumer borrowing. Instead, there is strong support for a "consumption binging" hypothesis: less financially sophisticated public sector workers borrowed more at high real interest rates of around 20%, and they ended up experiencing both higher consumption volatility and lower average consumption.

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I   INTRODUCTION

Household debt has increased substantially in recent decades, first in advanced economies and more recently in emerging markets. For example, the household credit to GDP ratio rose by an average of 1.4 percentage points annually between 1990 and 2006 in the United States leading up to the Great Recession. Since then, the annual rise in the household credit to GDP ratio has been 1.9 percentage points in emerging markets with an incredible 3.6 percentage point annual increase in China.[1] While there has been substantial empirical work on the macroeconomic implications of the rise in household debt, much less has been done on the microeconomic foundations of why household borrowing has increased.

Why do households borrow when more credit is made available? The "consumption smoothing" hypothesis views household borrowing as an effort to smooth consumption by those who anticipate stronger income growth going forward. This is the standard permanent income hypothesis with traditional exponential discounting consumers. However, there is an alternative "consumption binging" hypothesis that holds that households have behavioral biases that Ericson and Laibson (2019) collectively refer to as having *present focus* when making consumption-saving decisions. For example, they may suffer from myopia, present bias, or financial unsophistication. Whatever the underlying reason, the common prediction of this class of theories is that consumers can consumption binge; that is, they may borrow "too much" in response to a borrowing opportunity with the result that their future consumption becomes more volatile rather than smoother.

Whether actual household behavior follows the consumption smoothing versus consumption binging hypothesis is important from a policy and welfare perspective. For example, there is robust evidence that strong growth in household credit tends to be followed by a slowdown in GDP growth (see Sufi and Taylor 2021 for a review). To what extent are these patterns driven by consumption smoothing motives that fail to internalize externalities such as aggregate demand externalities? Alternatively, to what extent are these patterns driven by behavioral biases that result in consumption-binging and hence a boom-bust pattern in consumption and output? The policy implications depend on the relative strength of these two hypotheses.

It is generally difficult to separate the consumption smoothing and consumption binging hypotheses in response to a credit expansion wave. The main reason is that data requirements are quite demanding as one would need to observe borrowing, income, and consumption outcomes at the individual level, and then sort individuals along potential consumption smoothing and consumption binging tendencies. This paper makes progress on this question by analyzing the consequences of a major government credit expansion

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[1]Source: IMF global debt database. The emerging market average is weighted by GDP in PPP dollars in the base year.

program in Brazil. An analysis of government credit expansions is also important given that governments around the world have encouraged household credit growth with the goal of boosting short-term aggregate demand.[2]

The Brazilian government initiated a major consumer credit expansion effort in 2011 through the injection of new capital into the two largest government banks (Banco do Brasil and Caixa Economica Federal). In response, government banks started a major marketing campaign to promote the take up of payroll loans. These are loans that allow banks to deduct payments directly from borrowers' paychecks. As such, individuals with government jobs tend to be the primary target of such loan offers as they have the most dependable payroll stream.

Public sector workers were therefore naturally more "exposed" to the government's credit expansion program. We incorporate these features of the program in a difference-in-differences framework to study the consequences of the credit expansion program with data covering the period from 2007 to 2016. The analysis is facilitated by a new individual-level administrative data set at the Central Bank of Brazil that combines borrowing records from the credit registry, matched employer-employee worker payroll data, and credit card spending data (see Garber et al. 2019).

The effect of government policies is easily visible in aggregate data: in the years after 2011, credit from private banks stagnated, while government-owned banks started lending more aggressively. While the quantity of credit provided by government banks increased substantially, the loans were made at high interest rates that did not fall materially during the expansion. As an example, the real interest rate on payroll loans, which were an important driver of the rise in debt, averaged 20% throughout the credit expansion period.

In order to estimate the impact of this government-led credit expansion, we compare public sector workers with private sector workers conditioning on a rich set of individual characteristics, including income, age, education, location, occupation, leverage, and pre-existing relationships with banks. In a difference-in-differences framework, we then compare outcomes before and after the introduction of the government-led program across public and private sector workers.

Despite conditioning on a rich set of individual attributes, public and private sector workers may differ along unobservable characteristics. Two facts help alleviate this concern. First, private and public sector workers have similar borrowing and leverage trajectories before the introduction of the credit expansion program once we condition on the rich set of attributes mentioned above. Second, and perhaps more importantly, unconditionally public sector workers have better and more stable jobs on average. For

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[2]For example, governments have launched large-scale policies to promote access to housing credit in Malaysia, Pakistan, and China, and access to payroll loans in Brazil. These policies have been often implemented with the support of government-controlled banks.

example, in the full sample of formal workers recorded in Brazil in our baseline year 2010, public sector workers earn wages that are 68% higher and have 35% lower volatility in their annual labor income than private sector workers. The likelihood of falling out of formal labor market over the 2007-2016 period is 15% for private sector workers, but only 5% for public sector workers. As such, ceteris paribus, any unobservable impact of job stability should generate a downward bias of our estimates of credit access on consumption volatility.

Finally, we also estimate a within-individual impact of the change in government credit policy by focusing on individuals that initially borrow from both government banks and private banks, and then comparing the relative change in lending from these two types of banks. The within estimate has the advantage of completely partialling out credit demand changes at the individual level, and only estimating changes in credit that are driven by the government-led program via government banks. We find a strong within-individual effect, as the same individual starts to borrow more from government banks relative to private banks after the introduction of government program in 2011. These effects are twice as large for public sector workers than for private sectors ones.

Overall, the results show that public sector workers experienced a 15 percentage point increase in debt relative to their 2010 income from 2010 to 2014. This relative increase was almost exclusively driven by loans originated by government-owned banks, and it was concentrated in the payroll lending segment.

Why did public sector workers respond so aggressively to the credit expansion initiative? Was credit growth driven primarily by a consumption smoothing motive as traditional permanent income hypothesis postulates? Or was credit growth driven more by consumption binging motives?

If consumption smoothing were a strong motive for public sector workers borrowing, then we should naturally observe same-age workers with stronger expected income growth borrowing more aggressively. We test for this implication by constructing a new measure for expected income growth using income data on all formal sector employees in Brazil. The basic idea is that for someone in a particular age and occupation bin, their expected income growth going forward should be reflected in the *cross-sectional income slope* by age for workers in the same occupation, who are older than the age-bin under consideration. For example, consider an administrative assistant in the age bracket of 27-29 years old in 2010. His expected income growth should be correlated with the estimated slope of log wage on age for all administrative assistants that are at least 27 years old in 2010.

We estimate the cross-section income slope for each age-bin, and each of the 2,500 occupations recorded in the Brazilian employer-employee data set. We find that this measure of expected income growth is indeed strongly correlated with *actual* income growth at the individual level. A regression of average annual labor income growth between 2010 and 2014 on the cross-sectional income slope for age-occupation bin in 2010 estimates a

coefficient of 1.5 with a standard error of 0.05 for the more than 27 million formal workers in our data base. There is strong external validity support for our measure of expected income growth.

Is it the case that public sector workers with higher expected income growth are the ones who take on more payroll-backed loans? Since loans are explicitly based on payroll, and are for general consumption purposes, one would expect the consumption smoothing hypothesis to be most relevant. However, there is no support in the data that public sector workers with stronger expected income growth are more likely to increase their borrowing. In fact, the estimated coefficient even has the opposite sign with a tight standard error. The consumption smoothing hypothesis is clearly rejected in the data.

We also test for the consumption binging hypothesis. In order to test this hypothesis, the key is to come up with a measure of what type of public sector workers will be more susceptible to consumption binging. Following the influential work of Lusardi and Mitchell (2014), we focus on financial sophistication. Such a focus is warranted by a number of factors surrounding the government bank credit expansion that began in 2011. First, the programs instituted by government banks were associated with large advertising campaigns, which previous research suggests may be particularly effective in generating a take-up response among less financially sophisticated individuals (e.g., Gurun et al. 2016). Second, there was an increase in the use of bank correspondents, which raised the concerns of the regulator for their predatory practices targeting low-income, low-financially sophisticated consumers.

To measure financial sophistication at the individual level, we focus on two characteristics that are available in our data: years of education and occupation. We construct a numerical index based on keywords in the description of the occupation that capture familiarity with finance, statistics, accounting, mathematics and economics.[3] We interact this numerical index of occupational knowledge of financial concepts with years of education to obtain the final measure of financial sophistication at the individual level.

We validate this measure of financial sophistication by matching individuals in the administrative data set to a smaller survey data set in which individuals are asked a number of questions related to their financial affairs. In particular, the survey asks individuals to assess their understanding of financial concepts ("financial literacy"), and asks questions designed to capture individuals' self-control in expenditure decisions and discipline in saving decisions ("present bias"). The merged data show that our administrative measure of financial sophistication is positively correlated with survey-based measures of financial literacy and negatively correlated with survey-based measures of present bias at the individual level.

Using this measure, the results show that the rise in borrowing by public sector workers was significantly larger among workers in the lowest quintile of the financial sophistication

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[3]See also Carrell and Zinman (2014) for an occupation-based measure of financial sophistication.

distribution. The increase in the debt to income ratio from 2010 to 2014 was 5 percentage points larger for the least financially sophisticated. The timing of the relative rise in borrowing by less financially sophisticated public sector workers also corresponded to the 2011 change in policies by government banks, and there is no evidence of a pre-trend. These results suggest that consumption binging was a significant factor behind the rise in household debt to income ratio for public sector workers.

We have already mentioned that public sector workers were taking out payroll loans at a real interest rates of around 20%. Yet, workers' wage data shows that the typical real income growth of these workers was only 1%. These statistics suggest that borrowing by public sector workers should have led to lower average consumption since borrowers would be paying a very high interest rate relative to their average income growth. Since we are able to merge credit card spending data to the administrative data set, we can test if this was indeed the case.

Using credit card expenditures as a proxy for spending, we find that less financially sophisticated public sector workers experienced a significantly sharper drop in spending during the recession of 2014 to 2016. The reason for the sharp decline in consumption appears to be linked to the large relative drop in after-debt-service income, which is driven in part to the high real interest rates on the debt. Consistent with the fact that payroll loans are highly collateralized, less financially sophisticated public sector workers did not see larger delinquencies on debt during the recession.

Overall, the evidence suggests that financially unsophisticated public sector workers borrowed aggressively from government banks at high real interest rates from 2010 to 2014, which then led to a sharper drop in consumption during the recession. Were less sophisticated public sector workers made better off from the additional borrowing from 2010 to 2014? This is a difficult question to answer, but consumption patterns from 2010 to 2016 suggest that the answer is no. In particular, these individuals experienced a lower level of consumption and higher volatility of consumption over the entire business cycle of 2010 to 2016.

Related Literature

This paper is broadly related to three strands of literature. First, the paper is most closely related to the literature on understanding why consumers borrow. The consumption-saving decision is one of the most consequential economic decisions that consumers make. When should consumers borrow from external markets?

Friedman's seminal permanent income hypothesis (PIH) framework implies that if the borrowing rate is favorable enough relative to expected income growth, then consumers would want to borrow in order to smooth future consumption. This is the "consumption smoothing" motive for borrowing. We calibrate this motive with actual wage growth, unemployment risk, and interest rate for Brazil in section III to illustrate how difficult it is to justify payroll-based borrowing in our data. More generally, a large literature has

emphasized the benefits of increasing access to credit, which can allow individuals to better smooth consumption and income shocks (Townsend, 1994; Bruhn and Love, 2014), or to start entrepreneurial projects if credit-constrained (Banerjee and Duflo, 2010). Even in environments where consumer loans are expensive, studies have found that access to such loans can help borrowers mitigate financial distress (Morse, 2011), increase job retention (Karlan and Zinman, 2010), and better manage their financial situation (Zinman, 2010).

However, increased access to credit can also have negative effects on individuals' welfare. For example, in models with time-inconsistent preferences and hyperbolic discounting, individuals might borrow to increase current consumption even when this is not a welfare-improving decision in the long run (Laibson 1997, Ausubel 1991). Consistent with this idea, the literature on payday lending has shown how access to (high-interest) credit can actually exacerbate economic hardship. Melzer (2011) shows that one potential mechanism is individuals' overestimation of their ability to pay. Bertrand and Morse (2011) highlight the importance of low financial literacy in not fully understanding how interest rates and fee structures affect disposable income. Carrell and Zinman (2014) show that restricting access to payday lending improves airmen's job performance.

Similar to the settings studied by the payday lending literature, individuals in our sample operate in a high interest rate environment, in which low financial sophistication can have important real effects. Our basic finding that borrowers in Brazil are driven more by consumption binging rather than consumption smoothing motives is also very much inline with Gerard and Naritomi (2021). They find that laid off workers in Brazil tend to binge on their lump-sum severance payment instead of smoothing it out. In general, our paper is among the first to show how a large-scale national level credit expansion program largely results in increasing consumption volatility as opposed to smoothing consumption, and even at the cost of lowering average consumption. Moreover, we can directly test for the consumption smoothing motive using the expected income growth estimate from the matched employer-employee data set.

The second strand of the literature related to our paper is the work in macro-finance that connects run up in household debt to business cycle downturns (see Mian and Sufi 2018 for a review). Consistent with historical evidence from other countries, the large rise in household debt in Brazil from 2003 to 2014 was followed by one of the most severe recessions in Brazilian history. A prominent discussion in this literature is whether debt cycles reflect changes in borrowing constraints facing rational households in the presence of aggregate demand externalities (e.g., Korinek and Simsek 2016) or behavioral factors (e.g., Bordalo et al. 2018). Our paper suggests that in the case of Brazil, borrowing and consumption patterns in response to government-led credit expansion was more due to behavioral factors than a loosening of borrowing constraints for consumption smoothing households. To the best of our knowledge, this is the first study using individual-level data to test the relationship between household debt expansion and future consumption

over a credit cycle.

The third strand of the literature related to this paper is the work on government policy in amplifying credit cycles (see e.g. La Porta et al. 2002). Governments in emerging markets have increasingly become active in promoting credit expansion since the global financial crisis, with China being the most prominent example (Cong et al., 2019). Earlier work has documented how 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] Consistent with the results presented in this paper, the role of government banks tends to become more prominent in periods before competitive elections (Cole, 2009). This study is the first to our knowledge to evaluate the effect of the government bank credit push in Brazil on household debt. It is also the first to our knowledge to test whether such programs are more likely to alleviate financial constraints or to target financially unsophisticated individuals.

The rest of the paper is organized as follows. Section II explains the government intervention in household credit markets and describes the data used in the empirical analysis. Section III proposes and calibrates a simple model of consumer behavior that is useful to separate the consumption smoothing vs consumption binging mechanisms and to guide the empirical analysis of such mechanisms. Section IV presents the identification strategy and documents the effect of exposure to higher credit availability on individual borrowing. Section V tests the model's predictions and presents the main empirical results.

II Institutional Background and Data

II.A Credit Expansion by Government Banks

Figure I shows the evolution of total household debt in Brazil between 2007 and 2016, in billions of inflation-adjusted Brazilian reals. We split total household debt between debt originated by government and private banks. Government-owned banks represent around half of the bank lending market in Brazil (Coelho et al., 2011). The two largest ones are Banco do Brasil and Caixa Economica Federal, which are controlled by the federal government.[5] Traditionally, these two banks are responsive to government influence and play an important role in the implementation of its policies. As Figure I shows, starting in 2011 credit to households originated by private banks slowed down or even contracted, while government banks' lending expanded substantially.

The timing of this differential increase in bank lending between government and private

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

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

banks coincides with the introduction of a set of interventions by the federal government in the Brazilian banking sector aimed at increasing the flow of credit in a sluggish economy, and the launch of a heavily advertised campaign by government banks to publicize this increase in credit availability. In particular, between 2011 and 2012, the Treasury Department made a set of large capital injections into government-owned banks Caixa and Banco do Brasil.[6] In the same period, while the Central Bank started increasing risk weights of long-term loans to households (loans with maturity above 60 months) due to concerns about their increase, it also maintained relatively low capital requirements for specific categories of such loans.[7] In particular, exceptions were made for car loans, mortgages, and payroll loans. In November of 2011, the Central Bank decreased the risk weights for payroll loans with maturity between 36 and 60 months, a category that encompasses about a third of payroll loans observable in our data, which likely increased the banks' ability to originate this type of loans.[8]

Following these interventions, the two largest government banks launched flagship programs to market new credit availability to Brazilian households: "Bom pra todos" ("Good for everyone") by the Banco do Brasil and "Caixa Melhor Credito" ("Better Credit") by the Caixa Economica Federal. The programs targeted both Brazilian households and firms, claiming to offer credit at better conditions than those available in the market at the time (lower interest rates, longer maturities, and higher credit limits) as well as better customer support to prospective clients. The new credit availability was publicized via widespread advertising campaigns. As shown in Figure II, data from the annual reports of the two banks show that advertising and marketing expenses doubled between 2010 and 2013, while there was not significant increase in such expenses for the three largest private banks (Itau Unibanco, Bradesco, and Santander Brazil).

In addition, there was an increase in the use of individuals working as bank correspondents – called *pastinhas* in Portuguese – that promoted and made loans to households. Bank correspondents were particularly active in the generation of payroll loans, and they received an origination fee from the lender for every new loan that they generated. This raised concerns – which were explicitly stated by the Brazilian Financial Stability Committee – about predatory practices pushing customers to take on too much debt, especially low-income customers with low financial education.[9]

These government interventions in credit markets occurred at the beginning of the

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[6]More specifically, the Brazilian government injected about 6.7Bn R\$ (approximately 3.7Bn USD) into Caixa and BNDES (the government development bank) between 2011 and 2012, while Banco do Brasil received a 8.1Bn R\$ (approximately 4Bn USD) injection in 2012.

[7]Regulation on capital requirements in Brazil establishes that banks should hold equity capital equal or higher than 11% of their risk weighted assets. See *Circular* 3360, 2007, Central Bank of Brazil.

[8]See *Circular* 3563, 2011, Central Bank of Brazil.

[9]References to the risks associated with the bank correspondent model, especially when it comes to the origination of payroll loans, can be found in the minutes of several meetings of the COMEF (the Financial Stability Committee) starting in 2011 and up to 2013. For some relevant examples, see the minutes of the COMEF meetings from September 2011 up to May 2013.

presidency of Dilma Rousseff in 2011, and lasted until the following presidential election in 2014. The role of government-owned banks in expanding credit in Brazil became an important topic in the debates between the two main presidential candidates during the 2014 electoral campaign. The incumbent president Dilma Rousseff defended the government initiatives of the previous three years, while her opponent – Aécio Neves – argued in favor of a smaller government role in Brazilian financial markets (Màximo, 2014).

It is important to recognize that the government bank credit push was not implemented through a lifting of borrowing constraints. For example, to the best of our knowledge, there was no increase in credit limits, and no loosening of restrictions on debt-to-income or loan-to-value ratios. In the language of Justiniano et al. (2019), the program was not a loosening of borrowing constraints but instead was a loosening of lending constraints. This feature is important when discussing the mechanisms responsible for the rise in household borrowing, which is done in Section III below.

II.B   DATA

The main data sources for this paper are the Credit Information System of the Central Bank of Brazil (SCR) and the Annual Social Information System of the Ministry of Labor (RAIS). The Credit Information System was launched in 2003 and records information on all credit relationships between individuals and Brazilian banks.[10] Data is transmitted monthly from financial institutions to the Central Bank, and covers all credit relationships of those individuals that have a total exposure with a financial institution above a certain reporting threshold.[11] We rely on the 12.8% random sample of Brazilian borrowers along with all their transactions created by Garber et al. (2019), to which we refer for a detailed description of the sampling procedure. Figure A.1 reports the number of individual borrowers in our sample between 2007 and 2016, scaled by sampling weights. As shown, our sample represents a population of about 17 million borrowers in 2007, which grew to almost 40 million borrowers by 2016. The Figure also reports the number of borrowers as a share of the adult population in Brazil, intended as individuals 20 years old and above.[12] As shown, access to formal credit for Brazilian households has increased substantially in the last two decades. By the end of the period under study in this paper, around a quarter of all adults in Brazil had access to formal credit.

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

[11]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. As threshold reductions can affect client composition, we impose a constant 5,000 Brazilian Real (BRL) reporting threshold throughout the 2003 to 2016 period.

[12]The number of adults is sourced from the 2000 and 2010 Brazilian Population Censi. We use a linear interpolation for years between the 2000 and the 2010 Census, and a liner projection for years post 2010.

The loan categories covered in SCR include: mortgages, car loans, payroll loans, non-payroll personal loans, current account overdrafts, credit card debt, rural loans and a residual category which we label "other loans". During the period under study, the three main loan categories in terms of share of household debt in Brazil were: mortgage loans – representing on average 32% of total household debt – followed by payroll loans and car loans, each representing about 18% of total household debt. Rural loans are another important category – with about 15% of total household debt – although they are issued in a highly regulated market mostly in the rural areas of the country and almost exclusively originated by government banks. The remaining categories, including non-payroll consumer loans, credit card debt, overdraft, and other loans together account for the remaining 17% of total household debt.

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.[13] 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.

To construct the sample of individuals used in the empirical analysis, we start from all individuals with positive borrowing as of 2010 in the 12.8% random sample extracted from the Credit Information System. This corresponds to 3,305,067 individuals. Notice that, when appropriately scaled, this number corresponds to the around 25 million borrowers observed in Brazil in the year 2010 as reported in Figure A.1. Next, we match borrowers with formal workers recorded in RAIS using their fiscal codes. We are able to match 1,888,005 individuals, or 57% of our sample of borrowers in 2010. There are two main reasons why borrowers might not appear in RAIS. First, many borrowers are retirees that do not pay into the social security system. Second, RAIS only covers formal employees, thus leaving out entrepreneurs, self-employed, informally employed or unemployed individuals. We define the 1,888,005 individuals observed both in RAIS and in the Credit Information System as our full sample of borrowers with formal jobs in 2010. Finally, we focus on individuals recorded in RAIS in 2010 and 2014 – so that we can observe the evolution of their labor income – and with credit card data available during the recession years 2014 to 2016. Once we apply these restrictions, we obtain the 763,423 individuals used in the empirical analysis.

Panel A of Table I reports summary statistics for the full sample of borrowers recorded in RAIS in 2010, and for the regression sample used in the empirical analysis. As shown, 42

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[13]Employers are required by law to provide detailed worker information to the Ministry of Labor. See Decree n. 76.900, December 23rd 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*).

percent of borrowers in our regression sample are female, and 41 percent are public sector workers. They have on average 13.2 years of education – corresponding to completed high school in Brazil – and 40.5 years of age. Their monthly labor income is about 4,000 BRL, eight times higher than the federal minimum wage in 2010. Their average debt to labor income ratio is 0.64, and their average share of borrowing from government banks is 0.23. Relative to the full sample of borrowers recorded in RAIS in 2010, the regression sample tends to capture richer, older and more educated borrowers, with lower initial debt to income ratio and a higher probability of being public sector employees. In the empirical analysis, we show that results are consistent between the two samples for the outcomes that are observable in both. In particular, we find qualitatively similar effects of exposure to the credit expansion program on debt to initial income growth in both samples, with larger magnitudes in the full sample, consistent with the fact that it better captures lower income, lower educated workers.

III Conceptual Framework

This section lays out the conceptual framework that is useful for separating consumption smoothing behavior from consumption binging. We also calibrate a model to parameters taken from Brazil to illustrate predictions for consumption smoothing versus consumption binging households. We start in section III.A by discussing potential mechanisms behind consumer borrowing. Then, in section III.B, we outline and calibrate a simple model of consumer behavior to analyze what types of households would respond the most when "treated" by a credit expansion program like the one observed in Brazil.

III.A Discussion of Potential Mechanisms

A typical explanation for a large response in borrowing during a credit expansion is that households face borrowing constraints that are loosened by the expansion itself (e.g., Gross and Souleles 2002). However, as already mentioned in Section II.A, the set of interventions by the government did not change any explicit limits on borrowing. Furthermore, a closer look at the nature of the expansion by government-owned banks in Brazil casts doubt on this borrowing constraint view.

For example, the grand majority of public sector workers do not appear to have been constrained from borrowing more via payroll loans prior to the expansion of 2011. Among individuals that had a payroll loan prior to 2011, very few were up against the constraint imposed by government policy. Brazilian law establishes that lenders are able to collateralize loans using the wages of workers paying into the social security system, as long as the total payments are no more than 30% of the borrower's income. But as Figure A.2 shows, very few individuals were near this constraint. Among the borrowers in our sample, only 5% of those with a positive balance in their payroll loan had payments of

25% or more of their monthly income. Furthermore, while the government bank credit expansion involved a major advertising push and a large relative increase in lending by government owned banks, there was no change to the limit on payroll loans as a fraction of borrower income. In short, the policy did not explicitly loosen a borrowing constraint that was prevalent in the payroll loan market.

In addition, it should be taken into account that interest rates on payroll loans remained high during the entire period of the credit expansion. Figure A.3 reports the average annual interest rate and maturity on existing loans originated by government banks and private banks between 2007 and 2016. We present these statistics separately for the four main categories of loans in our sample: payroll, car loans, mortgages and non payroll personal loans.[14] As the figure shows, after accounting for inflation (about 6% per year in this period), average interest rates for the main loan categories were extremely high in Brazil by international standards. Real interest rates on payroll loans were on average around 20% between 2011 and 2016. Furthermore, the data indicates that government banks did not sharply reduce interest rates relative to private banks during the 2011 to 2014 period as they expanded credit.

Why did public sector workers borrow substantially in response to the expansion of credit by government-owned banks, despite the fact that the borrowing was expensive and no explicit borrowing constraint was removed? We are motivated by a number of reasons to focus on financial sophistication as an important mechanism. First, the importance of financial sophistication in consumer credit settings is highlighted by the survey article of Lusardi and Mitchell (2014), who conclude that: "despite the spread of such financially complex products to the retail marketplace, including student loans, mortgages, credit cards, pension accounts, and annuities, many of these have proven to be difficult for financially unsophisticated investors to master." Over the past decade, low financial sophistication has emerged as a leading explanation for the response of individuals to a rise in credit availability.

Second, as already mentioned above, the credit push by government banks was associated with a large and sustained increase in advertising. Advertising has been shown to be a powerful determinant of credit demand in consumer credit markets (e.g., Bertrand et al. 2010). The link between advertising and financial sophistication has been studied in Gurun et al. (2016), who find that lenders that advertise more sell more expensive mortgages, and that this effect is particularly strong among less sophisticated consumers. In a survey article on financial literacy, Hastings et al. (2013) cite a number of research studies showing how advertising is often used to persuade consumers into expensive products instead of trying to inform them about the best deal.

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[14]To partially account for borrower quality, all panels in this figure are constructed conditioning on multi-bank type borrowers: that is, individuals who in a given year have a positive balance with both a government and a private bank. Using all borrowers in our sample shows similar patterns.

Third, there is evidence that the Central Bank itself was concerned with excessive credit expansion among less financially sophisticated households. In 2012, the Financial Stability Committee of the Central Bank (COMEF) recognized that the rapid increase in the share of income devoted to debt service payments among Brazilian households signaled the need for higher investments in financial education, especially for the low-income section of the Brazilian population.[15] The issue of credit expansion among less sophisticated households was also linked to the large increase in the number of bank correspondents, or *pastinhas*, described in Section II.A. Based on these concerns, in the same year, the Central Bank created a specific department dedicated to promoting financial education among the Brazilian population.

III.B A MODEL OF CONSUMER BEHAVIOR

In this section we outline a simple model of consumer behavior based on Angeletos et al. (2001). We use the model to analyze how households that are patient and have typical preferences with exponential discounting would respond when "treated" by a credit expansion program such as the government credit push in Brazil. Given their preferences, these households would want to borrow more today if doing so enables them to smooth their consumption profile over time as in the traditional permanent income hypothesis (PIH). We refer to this type as "PIH households."

We then calibrate the model to actual wage dynamics, the interest rate on saving, and the interest rate on borrowing observed in Brazil. The key insight from the calibration exercise is that, given the average real wage growth, the standard deviation of wage growth across consumers, and the large spread between borrowing and saving interest rates, very few PIH households should ever respond to the credit expansion program by borrowing more. This implies that, under typical preferences with exponential discounting, it is hard to rationalize a large increase in household borrowing.

Thus, we expand the conceptual framework by considering a second type of household. We model financially unsophisticated households as those who have a high "present focus" (PF) in the terminology used by Ericson and Laibson (2019). We justify modeling financially unsophisticated households as having high present-focus based on survey results. Hastings and Mitchell (2020) show in a survey of Chilean consumers that proxies of present bias are negatively correlated with a measure of financial literacy capturing basic understanding of math and financial concepts. Stango and Zinman (2022) show that various behavioral biases including present bias, limited attention, and limited memory, tend to be correlated with one another, and that financial literacy tends to be negatively correlated with these biases.[16] Furthermore, as discussed below, the measure of financial sophistication that we create from administrative data can be cross-checked with data

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[15]See on this the conclusions of the September 2012 COMEF meeting.

[16]See in particular row 3 of Panel A of Table 6 from their study.

from a recent survey of Brazilian households. As shown in Section V.A, individuals with a low level of financial sophistication according to our measure are less likely to meet their saving goals, less likely to be disciplined in their financial decisions, and have a harder time controlling their current expenditures.

In the model, households with high present focus want to borrow and consume more today not because of their preference for consumption smoothing, but because of their demand for consumption in the short-run even at the expense of lower subsequent consumption. We refer to this type as "PF households." When calibrating the model for PF households, we find that all households with a short run effective discount rate above a certain threshold would want to borrow and consume when exposed to the credit expansion program.

The results from this calibration exercise are useful in designing empirical tests. For example, while PIH households would be reluctant to borrow, PF households would borrow, resulting in a consumption profile that has both higher consumption volatility and lower average consumption in the long-run. In Section V, we propose two new empirical measures to identify PIH households and PF households in the data and test the empirical predictions of the model.

III.C BASIC SETUP

Consider an environment where households live for T working-age periods, and make a consumption versus saving decision each period. While working, they are employed with wage w_t that grows at an expected rate of g. Workers face labor-income risk in the form of unemployment. They receive a fraction $\chi < 1$ of their wage wage w_t when unemployed. Workers have a labor market state space, Z_t, that is a two state Markov process drawn from $\{\chi, 1\}$ with transition probability matrix P that represents the probability of workers transitioning in and out of employment.

Consumers have beta-delta preferences given by:

$$U = \max_c \left\{ u(c_t) + \beta \mathbb{E}\left[\sum_{s=1}^{T} \delta^s u(c_{t+s}) \right] \right\} \tag{1}$$

where instantaneous utility is CRRA with $u(c) = \frac{c^{1-\gamma}}{1-\gamma}$. If $\beta = 1$, the consumer behaves like the traditional exponential discounting individual, with discount factor δ. The case with $\beta < 1$ represents a consumer with present bias, who discounts current inter-temporal tradeoff at discount rate $\beta\delta$ but discounts future inter-temporal tradeoffs at δ. We assume present bias consumers are "naive" and thus do not internalize the fact that their future selves will retain present bias each period. As mentioned earlier, the higher short run discounting should be seen as encompassing all possible micro-foundations under the broader "present-focus" category as discussed in Ericson and Laibson (2019).

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There is a borrowing-lending interest rate spread in credit markets. Consumers can borrow at a rate r_d subject to a borrowing limit $b < 0$, but can only save at a rate r_a with $r_a < r_d$. Consumers maximize (1) subject to the constraints:

$$a_{t+1} = R(a)(w_t Z_t + a_t - c_t) \tag{2}$$

$$a_t \geq b * w_t Z_t \tag{3}$$

$$R(a) = 1 + r(a) = \begin{cases} 1 + r_a & a_{t+1} > 0 \\ 1 + r_d & a_{t+1} < 0 \end{cases} \tag{4}$$

$$w_t = (1+g)^t \tag{5}$$

where a_t are net assets. The timing is as follows. Consumers choose consumption and savings at the beginning of period, and receive or make payments on net asset income at the end of period. This means we can express the relevant interest rate for the Euler equation as depending on assets in $t + 1$. We assume consumers work for $T = 40$ years, starting at the age of 25 and condense retirement into a terminal period with no saving.[17]

III.D CALIBRATING THE MODEL TO BRAZILIAN CONSUMERS

We simulate the behavior of households in response to a credit expansion program of the sort rolled out in Brazil as described in section II.A. For analytical simplicity, we model the credit expansion program as increasing the borrowing limit from b to $b + \Delta b$, where $\Delta b < 0$. However, given the institutional details of the government credit expansion, it should be kept in mind that this formulation embeds, in reduced form, a range of possibilities in terms of how households perceive credit access. For example, one feature of the credit expansion program was increased expenditure on marketing and making people aware of the availability of borrowing choices or making the act of borrowing more salient. We can think of these examples as making people aware that they can borrow Δb if they wanted.

We calibrate the model to the Brazilian environment by setting parameter values to numbers shown in Table A.1. The calibration is for the average consumer in our regression sample who is fifteen years ($t = 15$) into her working life, i.e., a 40 year old consumer with meaningful working life (and income risk) ahead of them (see Table I). We consider households who are currently employed and stay employed for the next five years.[18] We set $\gamma = 2$ for an elasticity of intertemporal substitution of 0.5 that is the typical estimate in

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[17]We solve the model by backwards induction, starting with the condition that $a_{T+1} = 0$. By the FOCs, we know that the interior consumption for PIH households will be defined by $u'(\tilde{c}_t) = \delta R \mathbb{E}[u'(\tilde{c}_{t+1})]$; trivially, for PF households, it'll be $u'(c_t) = \beta(\delta R \mathbb{E}[u'(\tilde{c}_{t+1})])$. Thus, the optimal level of consumption is $\tilde{c}_t^* = \min\{(\delta R \mathbb{E}[\tilde{c}_{t+1}^{-\gamma}])^{-1/\gamma}, a + w_t z - b_t/R\}$, considering that $\tilde{c}_t \leq Ra_t + y_t - b_t$ holds at all times. Using this policy function, we can iterate backwards to find optimal consumption at each period.

[18]Conditioning on remaining employed is just for simplicity, and is not important for the results.

macro literature. The long run discount rate is $\delta = 0.987$ as in the literature (e.g. Laibson et al. 2007, and Angeletos et al. 2001). We set the average yearly real wage growth rate to 1% to match the average wage growth in Brazilian RAIS employer-employee matched data at baseline as discussed in section V.A. The average cross-sectional standard deviation of real wage growth is 2.5%. We will also explore heterogeneity in wage growth and how that might effect behavior.

Real saving (r_a) and borrowing (r_d) rates of return are 2% and 20% respectively. These are the typical rates Brazilian consumers face when making their consumption versus saving decision.[19] We normalize the current annual wage to 1 and the borrowing limit to -0.2. The matrix P is set such that probability of remaining unemployed, if unemployed last period, $p_{1,1} = 0.7$, and probability of becoming unemployed if employed last period, $p_{2,1} = 0.01$. The risk of unemployment is low as treated individuals in our sample are government employees who are unlikely to be fired. Unemployment insurance χ is set at 0.5 times employed wage.

Household type is indexed by β, with $\beta = 1$ representing the PIH households. Low β households have a high effective short run discount rate. Augenblick and Rabin (2019) estimate that 78% of individuals are present-biased with mean value β of 0.79 but a high standard deviation across individuals of 0.29. Laibson et al. (2007) and Paserman (2008) estimate β between 0.4 and 0.5. When considering the consequences of an expansion in credit supply, it is obvious that consumers with lower beta are more likely to increase their borrowing. We define the representative PF household as households with $\beta = 0.4$, which is close to the $\beta = 0.44$ estimated for naive, present-biased Brazilian consumers in Gerard and Naritomi (2021). It is only for simplicity that we collapse all households into these two types. In general, households with β closer to one will act more like the PIH household, while those with lower β will behave more like the PF household. One important note is that models of myopic consumers with very low δ could also match the patterns we see in the data; however, as in Gerard and Naritomi (2021), we rule out such cases as they would require unlikely levels of impatience from consumers.

Figure A.4 in the appendix plots the saving rate of consumers against current assets a_t. We plot the saving rate for both types of households with borrowing limit at b and then also at borrowing limit $(b + \Delta b)$. The first takeaway from saving rate schedules is that the PIH household typically has a positive saving rate while they are employed and thus would be reluctant to borrow. The reason is that the 20% real rate of borrowing in Brazil is too high relative to the 1% average real wage growth expected in Brazil. The borrowing rate

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[19]We calibrate the rate of return on savings using the average real rate on federal government bonds. Net of depository fees, the nominal rate on such bonds during the 2010-2014 period was 8.3%, and average inflation was 6.2%, for a real rate of about 2%. Note that this is an upper bound for the real saving rate in Brazil, because many households use savings accounts that pay rates very close to inflation, earning real rates of 0%. For the rate of return on borrowing, we use the average real interest rate on payroll loans, which in the period under study was about 20%.

is too high to justify foregoing future consumption for current consumption. Of course, for the small share of consumption smoothing households who may be expecting much higher wage growth, or who may be currently unemployed, we may see some borrowing. But the basic insight remains that most of the PIH households should choose not to borrow when given the opportunity.

The second takeaway from the saving rate schedules is that PF households typically have negative saving rates, with the saving rate becoming more negative if current assets are high. A natural implication is that the typical PF household is likely to have low assets in the 15th year of their working life. Such low asset PF households will respond strongly to the credit expansion program by borrowing and consuming more as the program is introduced.

Figure III plots the consumption (left panel) and borrowing (right panel) impulse response functions for the typical PIH and PF household in response to credit expansion. We show these impulse response functions for households with relatively low level of net assets at the time of program expansion. As already explained, this is likely to be the case for PF households, who are the more relevant group in this exercise. PIH households do not respond to the credit expansion program, and as such their consumption and net assets remain unchanged. On the other hand, PF households respond by borrowing more, which leads to a spike in consumption over the short-run. However, given the high interest rate on borrowing, the short-run consumption response is followed by a sharp decline in consumption as PF households pay back their high-interest debt burden. The very high cost of borrowed consumption also means that consumption in the long-run must fall, and in fact average consumption is significantly below what it would have been in the absence of the credit program. In short, the credit expansion program results in more volatile *and* lower mean consumption for PF households.

IV   The Rise in Household Debt

IV.A   Identification Strategy

What was the impact of the government-driven expansion in credit availability on individual-level debt levels? To address this question, we propose an individual-level measure of exposure to the credit expansion by government banks. In particular, we exploit the fact that the credit expansion was concentrated in certain categories of loans (payroll loans), which traditionally target specific categories of workers (public sector employees). As discussed in section II.A, payroll lending allows banks to deduct payments directly from the borrower's paycheck. Due to this feature, it traditionally targets individuals with higher job security and more stable income, such as public sector workers

and retirees.[20]

We use public sector employment as a measure of exposure to the government banks credit expansion. We extract information on the sector of employment for each borrower in the baseline year 2010 from RAIS, and 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.[21] As shown in Table I, public sector workers represent 41% of borrowers used in our regression sample. The most represented occupations include administrative assistants, secretaries, teachers, cleaning services providers, and building management and maintenance personnel.

Public and private sector workers in our regression sample differ along many observable characteristics, which we document in Panel B of Table I. Public sector workers are more likely to be female (22 percentage points), have on average 0.76 more years of education, are 5 years older, and have a 8 percentage point higher share of borrowing from government banks at baseline. The average monthly wage of public sector workers is around 500 BRL (14%) higher than the average monthly wage of formal private sector workers, while their average debt-to-income ratio (0.64) is similar to the one observed for private sector workers.

Although employment in the public sector is clearly not randomly assigned, there are several features of our setting that make this a plausible identification strategy to answer our research question. First, the richness of the data allows us to condition on a large set of initial individual characteristics. In our empirical analysis, we control for the individual observable characteristics discussed above and augment the estimating equation with fixed effects for the micro-region and the occupation of each worker.[22] The information on occupation reported in RAIS is extremely detailed, covering about 2,500 categories. This allows us to compare workers operating in the public sector with workers operating in the private sector that are effectively performing the same job within their firms. For example, this allows us to compare a secretary employed in a local administrative body with another secretary employed in a local private company. Second, we show that public and private sector workers within these categories display parallel trends in debt-to-income ratios before the introduction of the government credit expansion. Third, individuals selecting into public sector jobs display lower volatility in their labor income and, likely, in their consumption. As such, it is plausible that any unobservable impact of job stability should

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[20]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 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 wage. Coelho et al. (2012) show that the introduction of this law led to a large increase in payroll lending.

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

[22]The Brazilian Institute of Geography and Statistics (IBGE) defines microregions by combining geographically contiguous and economically integrated municipalities. There are 558 micro-regions in Brazil.

generate a downward bias on our estimates of credit access on consumption volatility. In section IV.C we also propose an identification strategy exploiting within-individual variation across banks lending to the same worker. This allows to capture individual-level demand shocks, and thus document a relative increase in credit supply to public sector workers by government banks during this period.

IV.B   Exposure to Credit Availability and Individual Indebtedness

To measure the degree to which public sector workers boosted borrowing in response to the rise in government bank credit availability, we estimate the following dynamic specification at the individual-level:

$$
\left(\frac{debt_{it}}{income_{i,2010}} \right) = \alpha_i + \alpha_t + \sum_{\substack{k=2007 \\ k \neq 2010}}^{2016} \beta_k 1_{t=k} Public_{i,2010} + Controls_{i,2010} \times t + u_{it} \qquad (6)
$$

where the outcome variable is the total balance of bank debt across all banking relationships of individual i normalized by the labor income of individual i in the baseline year 2010. The dummy $Public_{i,2010}$ is an indicator function that takes value 1 if individual i was a public sector worker in 2010, and 0 otherwise. Equation (6) includes individual and year fixed effects, as well as a large set of controls interacted with year fixed effects. Controls include fixed effects for age and income quintiles, education level, gender, micro-region and occupation. We also include initial debt-to-income ratio and share of initial borrowing from government banks. All controls are observed in the baseline year 2010 and interacted with year fixed effects to capture in a flexible way the effect of observable characteristics on borrowing during the period under study. Standard errors are clustered at micro-region level.

The results of estimating equation (6) are reported in Figure IV. We report separately the effect of public sector employment on individual debt balance with government banks versus private banks. As shown, we find a significant increase in borrowing from government banks for public sector workers relative to private sector workers starting in the period after 2011. On the other end, the estimated coefficients on public sector employment are close to zero and mostly not statistically significant when focusing on borrowing from private banks. These results are consistent with public sector workers being more exposed to the credit expansion program of government banks that started at the end of 2011. As shown, we find no differential trends in borrowing of public sector workers from either government banks or private banks in the four years before the intervention.

Table II reports the results of estimating a first-difference version of equation (6) as

follows:
$$\Delta \left(\frac{debt_{i,2010-2014}}{income_{i,2010}} \right) = \alpha + \gamma 1(Public)_{i,2010} + \Gamma Controls_{i,2010} + u_i \qquad (7)$$

The outcome variable in this table is the change in bank debt balance between 2010 and 2014 normalized by the 2010 labor income for individual i. We study the effect of public sector employment on total borrowing in column (1), and then we separate the effects on borrowing from government banks versus private banks in columns (2) and (3), respectively. The magnitude of the estimated coefficient in column (1) implies that public sector workers experienced a 15 percentage points higher increase in their debt-to-initial income ratio relative to private sector workers between 2010 and 2014. This corresponds to 23 percent of the average level of debt to income observed in our sample at baseline (0.65). As shown in columns (2) and (3), this effect is driven by an increase in debt from government banks.[23]

Next, we study the effect of being employed in the public sector on individual indebtedness by loan category. The results are summarized in Figure V and reported in detail in Table III. As shown in Figure V, the main driver of the differences in the change in debt-to-income across workers is the differential increase in payroll lending. Public sector workers also experience significantly higher increases in non-payroll personal loans and credit card debt, and a relative decline in car loans and mortgages with respect to private workers. However, the differences in these other loan categories are small. The results in Table III show that the differential effect of public sector employment on payroll loans is mostly driven by lending from government banks.

IV.C   WITHIN-INDIVIDUAL EFFECTS

In this section we provide additional evidence using within-individual variation. One potential concern with the results presented in section IV.B is that changes in the credit origination policy of government banks might be correlated with contemporaneous changes in credit demand by public sector workers. To investigate this concern, we build on the empirical literature studying the effects of bank liquidity shocks on firm borrowing (e.g. Khwaja and Mian 2008), and focus on individuals that borrow from multiple banks that are heterogeneously exposed to a change in credit expansion policies.[24]

We estimate the following specification:

$$\left(\frac{\Delta debt_{ib,2014-2010}}{income_{i,2010}} \right) = \alpha_i + \alpha_b + \gamma 1(Gov)_b + u_{ibt} \qquad (8)$$

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[23]Table A.2, columns (1) to (3) replicates this analysis for the full sample of borrowers observed in RAIS in 2010 described in section II.B.

[24]Our empirical approach in this section is similar to that in Jensen and Johannesen (2017), which studies 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 focuses on individuals with credit cards from multiple banks to study the effect of bank funding shocks on credit limits.

The outcome variable in equation (8) is the change in debt balance of individual i with bank b between 2010 and 2014, divided by the annual labor income of individual i in the baseline year 2010. To estimate this specification we first collapse the data at the bank-individual level. Thus, each observation is a bank-individual relationship. The variable Gov_b is a dummy equal to one for government controlled banks, and zero for private banks. Our coefficient of interest is γ, which captures the difference in borrowing from government versus private banks between 2010 and 2014 normalized by the individual's labor income. The specification includes individual fixed effects, so that the identifying variation of the coefficient of interest comes from within-individual differences in borrowing between bank types. We also include bank fixed effects to absorb any bank-specific trends in loan origination in the 2010-2014 period. Standard errors in this specification are clustered at the lender level.

Equation (8) can only be estimated for individuals borrowing from both private and government banks. Borrowing from multiple types of banks in Brazil is relatively common due to bank-level specialization in different types of loans. Around 40% of individuals in our regression sample have open balances with both government and private banks in the baseline year 2010. The results of estimating equation (8) are reported in Table IV. We start by estimating equation (8) without individual fixed effects in column (1), and then including individual fixed effects in column (2). The estimated γ is positive and statistically significant, and increases in magnitude from 0.172 to 0.186 when fully controlling for individual demand shocks. The magnitude of the coefficient in column (2) implies that, between 2010 and 2014, government controlled banks increase their lending by 18.6 percentage points more than privately controlled banks to the same individual, where the estimated coefficient should be read as a share of the initial labor income of the borrower. Finally, in column (3), we interact the government bank dummy with a dummy for public sector workers. As shown, the increase in lending by government banks relative to private banks was about twice as large for public sector workers than for private sector workers.

Overall, the results presented in this section are consistent with an increase in credit supply from government banks during the 2010-2014 period. Recall that these results are not informative about the effect of the credit expansion by government banks on the aggregate indebtedness of an individual. This is because a relative expansion of credit from government banks could have happened at the expense of credit from private banks, leaving individual indebtedness unchanged. However, taken together, the evidence in sections IV.B and IV.C point towards a credit supply increase by government banks that led to an increase in overall indebtedness of more exposed individuals.

V Exploring the Mechanism

V.A Measuring borrowing constraints and financial sophistication

To test for the underlying mechanism responsible for the rise in household borrowing, we explore cross-sectional heterogeneity across public sector workers in their borrowing response. Building on the conceptual framework proposed in Section III, we propose a way to map in the data the two types of households described in our model.

Borrowing constraints

The first type of household is a PIH household facing a binding borrowing constraint. This is a benchmark in many studies focused on the response of consumers to a rise in credit availability (e.g., Gross and Souleles 2002).[25] The permanent income hypothesis states that individuals will attempt to smooth consumption by borrowing when they are young and their future expected income is high. If lenders impose a constraint on individuals based on their current available resources, then individuals with a high ratio of future income relative to current income are more likely to face a binding constraint relative to individuals with a low ratio. If the government bank credit expansion in Brazil lifted borrowing constraints through some channel unobserved to us, we would expect individuals with higher expected income growth to see a relative rise in borrowing, after controlling for measures of current income and current consumption.[26]

We define this expected increase in future income as the *income slope* of each individual. We construct a proxy of the income slope for the individuals in our sample in three steps. First, we use data on all full-time workers employed in Brazil in the baseline year 2010. Next, for each of the 2,500 occupations recorded in RAIS, we estimate a set of linear regressions of wages on years of age. In particular, we estimate separate regressions of log average wages on years of age in which we progressively restrict our sample to older individuals based on age ventiles. To illustrate this procedure, let us take an example based on a specific occupation: administrative assistants. To estimate the income slope of individuals employed as administrative assistants that are in the first ventile of age (i.e. those aged between 18 and 20), we estimate a regression of log wage on years of age using all administrative assistants in the data. Next, when estimating the income slope of

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[25]In order to measure borrowing constraints, the existing literature has used several potential proxies including credit scores and available credit from credit cards and home equity lines (Mian and Sufi, 2011; Baker, 2018). These proxies are either not readily available in our setting or potentially problematic to interpret. In particular, the Brazilian credit registry does not contain detailed credit scores, the use of home equity lines in Brazil is extremely limited, and the previous literature has shown that credit card utilization correlates with higher frequency of financial mistakes (Jørring, 2020).

[26]The logic of this test is closest to the discussion in Zeldes (1989) and Deaton (1991). There are, of course, reasons other than liquidity constraints that would explain the dynamics of consumption, the most prominent of which is idiosyncratic income process uncertainty (e.g., Gourinchas and Parker (2002), Carroll (1997)).

administrative assistants in the second ventile of age (i.e. those aged between 21 and 22), we estimate the same regression but restricting the sample to administrative assistants aged 21 and older. We repeat this procedure for each ventile, progressively focusing on older and older workers in the data. We include in all these regressions state fixed effects, to account for differential income slopes for the same occupation in different regions of the country. In the third and last step, we loop this procedure across all 2,500 occupations recorded in RAIS, and save the estimated slopes for each occupation and age ventile. This procedure generates occupation-age ventile specific slopes that we then merge with our sample of borrowers.

Figure VI(a) summarizes the outcome of the procedure described above. In this figure, we plot the average income slope across all occupations for each age ventile, splitting workers between private sector and public sector workers. As shown, labor income slopes are the highest for younger individuals. An income slope of around 1 for individuals in their twenties implies that such individuals in Brazil can expect their annual labor income to increase by 1 percent per year in real terms for the rest of their working life. Average income slopes tend to decline over time with age as individuals reach the maximum attainable wage in their profession, and then become close to zero when workers are in their late forties and fifties. The Figure also shows how the evolution of this slope is different between public and private sector workers. Private sector workers tend to experience faster labor income growth when younger, but also a steeper decline in their slope as they get older. On the other hand, public sector workers have a lower slope when younger, which however remains relatively constant as they get older. In Figure VI(b) we plot the average slope of public sector workers along with the 25th and 75th percentiles. There is large variation in income slopes across occupations within age groups. For example, expected real income growth for public sector workers in their twenties range from 0 to about 2 percentage points per year.

We also perform an external validity test in which we study whether the estimated income slopes indeed predict future income growth. Notice that we estimate income slopes using variation across workers of different ages in 2010. Thus, testing how this measure predicts income growth after 2010 is an out of sample validation of the measure. The results are reported in Table V. We estimate to what extent income slopes computed in 2010 predict annual average income growth between 2010 and 2014. If income slopes are a good predictor of future income growth, we expect a coefficient close to 1 in these regressions. As shown, we find that income slopes are very precise predictor of future income growth for public sector workers, which have a coefficient of 0.93. For private sector workers, we find a coefficient of 1.9, which indicates that income slopes tend to under-estimate their future income growth during this period.

Financial sophistication

Next, we create an empirical proxy for individuals who are less sophisticated in terms of financial matters. The specific measure of financial sophistication that we construct is based on two individual-level characteristics that are observable in the employer-employee dataset RAIS: years of education and occupation. In particular, we use textual analysis of the description of the tasks associated with the more than 2,500 occupations contained in the RAIS data to construct an occupation-level proxy of basic knowledge of financial concepts. Following the methodology in Bustos et al. (2018) and Lagaras (2017), we proceed in three steps. First, we digitize the text containing the official description of the tasks associated with each occupation as provided by the Ministry of Labor. Second, we define a set of keywords or combination of keywords that aim at capturing the familiarity required by each occupation with basic concepts in five areas: finance, statistics, accounting, mathematics and economics.[27] Lastly, we run a text analysis that counts the occurrence of such keywords in the description of each occupation.

Using this methodology we generate an index of familiarity with financial concepts that ranges from 1 to 6. The index is equal to 1 if no keyword is found in the description of an individual occupation. The index increases by one unit for each of the five areas described above that has related key-words found in the job description. For example, if the occupational description includes keywords related to the finance and accounting areas, the index will increase by two units. Finally, to construct the individual-level proxy of financial sophistication we interact the number of years of education with the index of familiarity with financial concepts. Since we do not observe the field of study of each individual in our data, the rationale of this interaction is to give a higher "weight" to years of education of individuals whose occupations tend to require some knowledge of basic financial concepts.

The advantage of this methodology is that it allows us to measure financial sophistication for the universe of employees in the RAIS data. The disadvantage is that it is a less precise measure of financial literacy or financial sophistication relative to survey based measures obtained by the existing literature (see, e.g., Hastings and Mitchell (2020), Stango and Zinman (2022)). However, we can cross-check our measure using a recent survey on the financial health of Brazilian households designed by the Brazilian Banks Federation (FEBRABAN) and the Central Bank. We focused on two main sections of the survey: the section evaluating financial "ability" and the section evaluating financial "behavior". Financial ability captures the ability of individuals to understand financial information that is crucial for their decisions, including their ability to search

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[27]The list of keywords include the following groups of Portuguese words: "financeir*", "estatistic*", "conta*", "matemátic*", "economi*", which are supposed to capture familiarity with tasks related to finance, statistics, accounting, mathematics and economics. The "*" indicates that we include the masculine/feminine and singular/plural versions of the same word in Portuguese.

for such information. We think of this as a proxy of financial literacy. Financial behavior captures the ability of individuals to meet their saving goals, be disciplined in their financial decisions, and to exercise self-control in their expenditure decisions. We think of this as a proxy of present focus. Each section has three questions, with a maximum score of 12 points per section.

We use data from the first two waves of the survey, which were carried out in 2020 and in 2022 on a nationally representative sample of about 5,000 individuals in each round. We were able to match 2,459 respondents which reported their fiscal code in their answers to the survey with the employer-employee dataset. This allows us to test the correlation between our measure of financial sophistication and the scores obtained by respondents in these two sections of the survey. We report these correlations in Figure VIII. Panel (a) reports the average financial ability score and the average financial sophistication of individuals in each quintile of financial sophistication, along with the regression line estimated using the underlying micro data. The financial ability score is standardized so that a unit increase in the y-axis corresponds to a standard deviation increase in the score. This implies that individuals in the lowest quintile of financial sophistication also had the lowest average financial ability score, 0.35 standard deviations below the scores for the top 2 quintiles. Similarly, Panel (b) shows that individuals in the lowest quintile of financial sophistication also recorded a 0.4 standard deviations lower score in terms of financial behavior, which implies lower self-reported discipline and lower self-control when taking savings and consumption decisions. This latter result is consistent with the finding in survey data that less financially sophisticated individuals also display higher present bias (Hastings and Mitchell 2020, Stango and Zinman 2022).

V.B Heterogeneity in Borrowing Response

In this section we test for heterogeneous effects in the borrowing response of public sector workers to the credit expansion program along the two dimensions described in the previous section: borrowing constrained and financially sophisticated. To this end, we estimate a dynamic specification similar to equation (6) in which we interact public sector employment with dummies capturing *high income slope* – our proxy for credit constraints – and *low financial sophistication*. We define individuals with high income slope as those in the top quintile of the income slope distribution at baseline, and individuals with low financial sophistication as those in the bottom quintile of the financial sophistication distribution at baseline. Our estimating equation also includes interactions of high income slope and low financial sophistication with year fixed effects, as well as the same individual level controls and fixed effects interacted with year fixed effects as in Figure IV.

The results are reported in Figure VII. We find that public sector workers with low financial sophistication experienced a larger expansion in borrowing after the 2011 government credit expansion. The estimated coefficients on the triple-interaction of public

sector workers with low financial sophistication and yearly dummies are reported in red. There is no pre-trend in the coefficients, and the timing of the relative increase in credit take up by financially unsophisticated public sector workers matches the timing of the 2011 credit expansion policies. We also find that public sector workers more likely to be financially constrained did not take up more debt after the government-led credit expansion. This is consistent with the prediction of our simple model of consumption behavior for PIH households, who – even if constrained – would not increase their borrowing when facing real interest rates as high as the ones observed in Brazil relative to their expected income growth.

Table VI reports the results of estimating a first-difference version of the specification reported in Figure VII, where the outcome variable is the change in bank debt balance between 2010 and 2014 normalized by the 2010 labor income for individual i. Column (1) shows that the effect of being a public sector employee on debt growth as a share of initial income is significantly stronger among workers with low financial sophistication. The marginal effect is large, a 5.1 percentage point larger rise in the debt as a share of initial income. In contrast, the marginal effect for public sector workers with a high income slope is negative. To the degree to which the high income slope captures individuals more likely to face a borrowing constraint, this result does not support the view that the credit expansion lifted borrowing constraints.[28]

V.C   REAL EFFECTS

In this section we study the effects of the government bank credit origination policy on consumption patterns. Our main measure of individual consumption is credit card expenditure, which is the monetary value of accumulated credit card expenditure over a year, sourced from the SCR. This measure captures expenditure on all credit cards issued by banks to an individual. One limitation of the data is that it does not contain information on the items or services purchased via credit cards. A potential concern is the limited diffusion of credit cards among the Brazilian population. The SCR data indicates that, in the post 2010 period, about 14 percent of adults and 53 percent of borrowers had a credit card. Of course, credit card penetration is increasing in the period under study, but our results are robust to conditioning on the balanced panel of individuals that used credit cards throughout.

Columns (2) to (5) in Table VI present results exploring outcomes during the 2014

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[28]Table A.2, column (4) replicates column (1) of Table VI for the full sample of borrowers observed in RAIS in 2010 described in section II.B. Table A.3 presents a robustness test of Table VI in which we include a control variable for the level of credit card expenditure in 2010 (to condition on initial consumption level), and also focuses only on the sample of individuals that are younger than 50 years old as of 2010. The latter restriction accounts for the fact that the income slope measure might become a worse predictor of future income growth for older individuals that have already accumulated most of their labor income in the past.

to 2016 recession that followed the credit expansion. Less sophisticated public sector workers borrowed the most during the boom. Column (2) shows that their after-debt-service income fell the most during the recession years. If we compare less financially sophisticated public sector workers with private sector workers, the total derivative implies a relative reduction in after-debt-service income of (3+1.2=) 4.2 percent. This is primarily due to the fact that the interest rates on the debt were quite high, as shown by the small effects on income documented in column (5).

Column (3) reports a specification with the change in the share of debt in default from 2014 to 2016 as the outcome variable. Default is measured as the share of an individual debt balance that is more than 90 days late. Public sector workers with low financial sophistication had a similar share of their balance in default relative to private sector ones. This is consistent with the high degree of collateral that the lender had for payroll loans in particular, where wage garnishment is written into the contract. The margin of adjustment for less sophisticated public sector workers during the recession was not delinquency. To summarize, public sector workers with low financial sophistication witnessed a larger decline in their after-debt-service income, and they were not more likely to discharge their debt. As column (4) shows, cutting consumption was the main margin of adjustment. The decline in consumption was substantial relative to private sector workers, with a 4.2 percentage points larger decline in credit card expenditure between 2014 and 2016.

One advantage of our setting is that it allows us to study the impact of credit expansion at the individual level on a period that encompasses both an expansion and a recession. In this last part of the analysis, we focus on the whole period 2010 to 2016. We focus on the impact of the credit expansion on individual average consumption and consumption volatility, as well as average disposable income over the entire business cycle.

The results are reported in Table VII. We find that, at the individual level, the credit expansion ultimately resulted in lower mean and higher variance of consumption over the 2010 to 2016 period. Column (1) shows that less financial sophisticated public sector employees experienced 0.27 log points lower credit card spending per year during the 2010-2016 period, which corresponds to 3.4% of the mean in our sample. This result is robust to normalizing individual spending by its average level in the pre-2010 period, as shown in column (2). Column (3) shows that, over the 2010-2016 period, less financially sophisticated public sector workers experienced 12.3% higher volatility in annual credit card expenditure relative to the mean in our sample.[29] Finally, in columns (4) and (5), we focus on after-debt-service income. We find that less financially sophisticated public sector employees had, on average, less after-debt-service income over the 2010-2016 period.

These results are consistent with the empirical predictions of the model presented in

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[29]We measure volatility with the coefficient of variation in credit card expenditure, i.e. standard deviation divided by the mean.

section III.B. In the calibration, "present-focus" households tend to respond to the credit expansion by borrowing more. Consumption of these households increases in the short run, but then experiences a sharp decline due to the high interest rate on borrowing. This lower level of consumption is persistent over time, and below what it would have been in the absence of the credit program. Consistent with this prediction, we find that households with low financial sophistication experience lower mean consumption over the whole period, as well as higher consumption volatility. These results suggest that, from an ex-post perspective, this category of workers was made worse off by the government-led credit expansion policies. It is important to emphasize, however, that this is an ex-post statement; in the absence of the recession, the borrowing from 2010 to 2014 may not have led to lower average consumption and higher consumption volatility over the whole period.

VI Concluding Remarks

In the last two decades, emerging economies have experienced a significant rise in household debt-to-GDP ratios. In many circumstances, the rise in household credit availability is an explicit goal of the government. There are many reasons why policy-makers may want to facilitate the expansion of credit availability to households. However, there is little research on the effects of government policies in emerging economies that boost credit availability, and in particular on which individuals respond the most to such policies.

In this paper, we use individual-level data from Brazil to provide evidence on an important household credit push by the government starting in 2011. We document that the credit expansion led to a large rise in household borrowing, especially among public sector employees. Which type of individuals borrowed more in response to the credit expansion? We find no evidence of the consumption smoothing hypothesis: public sector workers with higher expected income growth are not more likely to increase their borrowing. On the other hand, we find evidence consistent with the consumption binging hypothesis: the less financially sophisticated public sector workers boosted borrowing significantly in response, at the expense of lower future consumption. While it is difficult to make strong statements about the ex ante optimality of the household credit push by government banks, the evidence suggests that ex post the most exposed individuals experienced worse outcomes with regard to consumption.

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## Figure I: Government Banks and Household Debt in Brazil
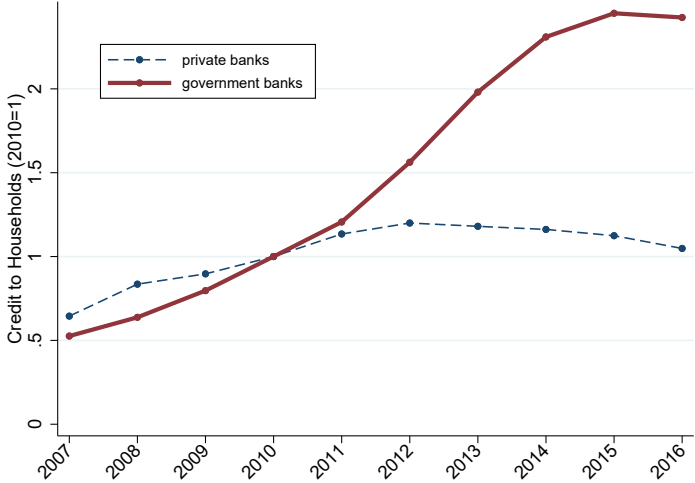
Notes: The figure reports the total outstanding balance of loans to households originated by government banks vs private banks. The data is sourced from the Credit Information System (SCR) of the Central Bank of Brazil and reported relative to the level in 2010 for each category.

Figure II: Advertising Expenditure of 5 largest Brazilian Banks
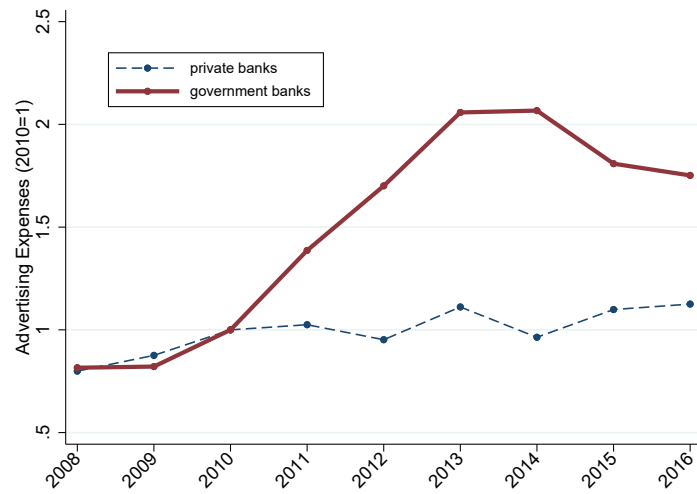
Notes: The figure reports the average annual expenditure in advertising for the 5 largest Brazilian banks by assets divided in two categories: government banks (Banco do Brasil and Caixa Economic Federal) and private banks (Itau Unibanco, Bradesco and Santander Brazil). The data is sourced from banks' annual reports and reported relative to the level in 2010 for each category. We focus on the years starting from 2008 because data on Itau Unibanco is only available starting from that year (due to the merger between Itau and Unibanco in 2008).

FIGURE III: RESPONSES OF CONSUMPTION AND ASSETS FOR EMPLOYED HOUSEHOLDS WITH $a_0 = 0$
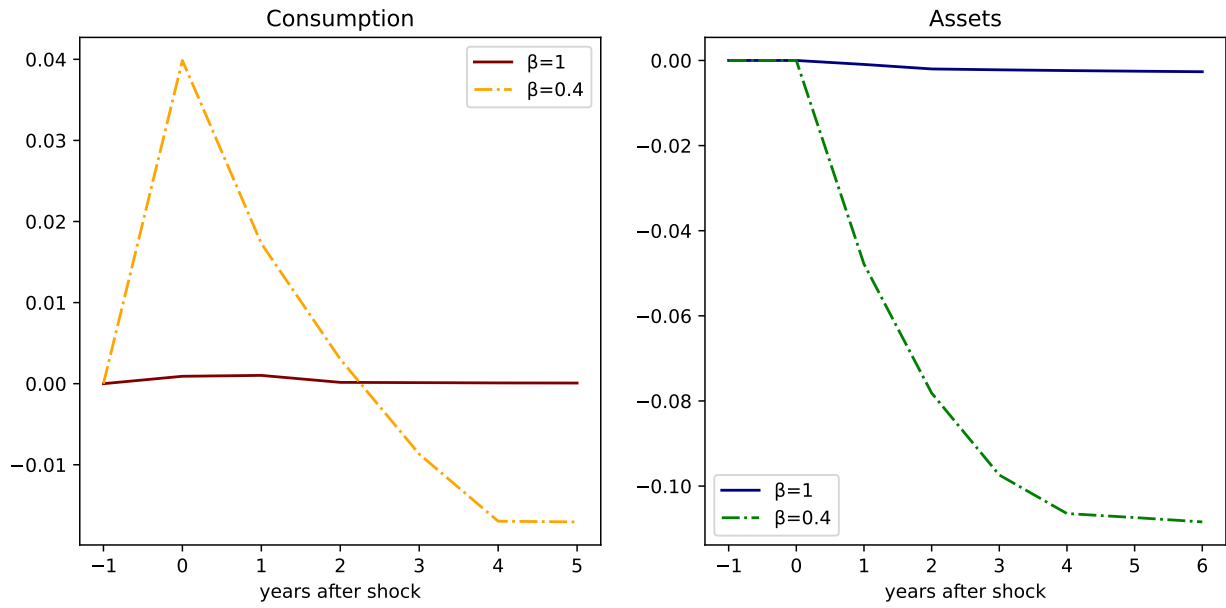
Notes: The right panel compares the impulse response function for PIH and PF consumers after a shock that relaxes borrowing constraints; the left panel shows the respective evolution on assets. The borrowing constraint goes from 0.2 to 0.3 of current salary at t = 0. At the time of the shock, the consumers are 15 years into their working life, their assets are 0, and their wages are normalized to 1. We condition on the consumer being employed for the entire period.

FIGURE IV: DYNAMIC EFFECTS OF PUBLIC SECTOR EMPLOYMENT ON
DEBT-TO-2010 INCOME RATIO
GOVERNMENT BANKS VS PRIVATE BANKS
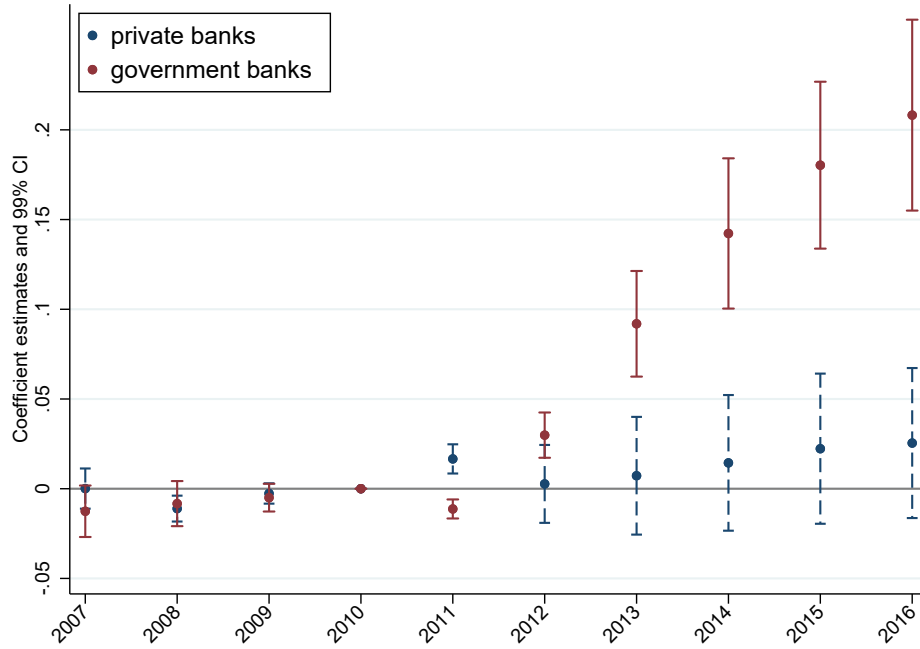
Notes: The graph reports point estimates and 99 percent confidence intervals for the coefficients β_k in equation (6). These coefficients capture the dynamic effect of public sector workers on debt divided by 2010 labor income by year, for the period between 2007 and 2016. The effects are computed relative to the excluded year 2010.

FIGURE V: PUBLIC EMPLOYMENT AND BORROWING, BY BANK AND LOAN TYPE
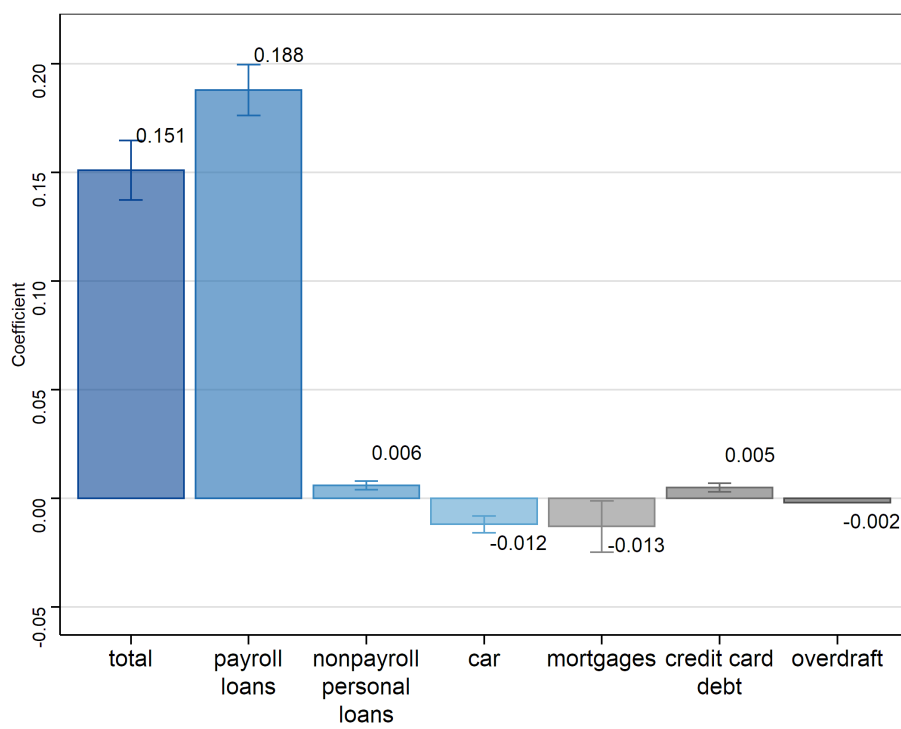
Notes: The graph reports point estimates and 95 percent confidence intervals for the estimated coefficients reported in Panel A of in Table III.

FIGURE VI: LABOR INCOME SLOPE BY WORKERS' AGE

(a) Average slope by age ventiles for private vs public workers
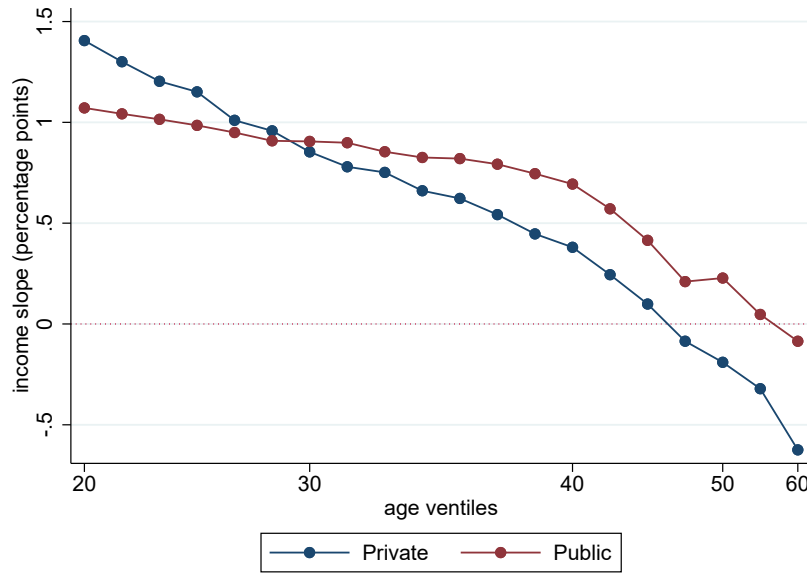
(b) Average, 25th and 75th percentile of slope by age ventiles of public workers
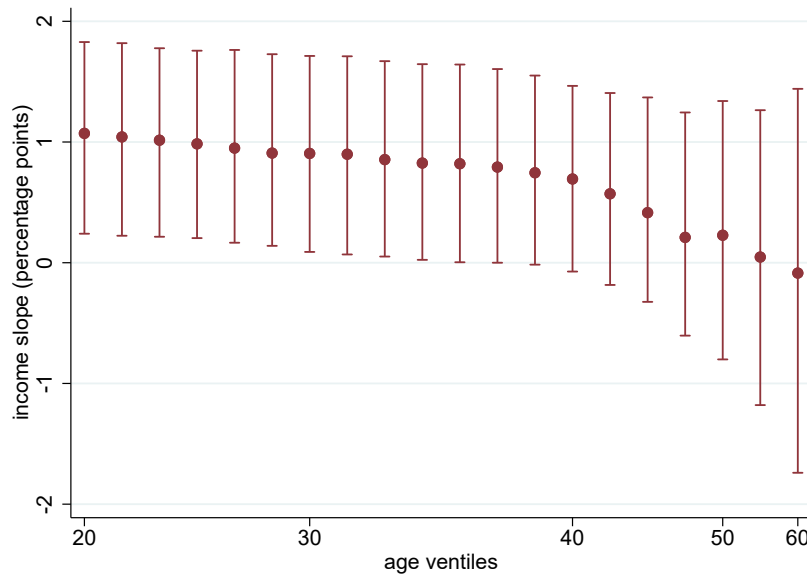
Notes: Panel (a) reports the average income slope across occupations for each age ventile for private sector workers (in blue) and public sector workers (in red). Panel (b) reports the average income slope across occupations by age ventile for public sector workers only, along with the 25th and 75th percentile of the income slope distribution.

FIGURE VII: DYNAMIC EFFECTS OF PUBLIC SECTOR EMPLOYMENT ON DEBT-TO-2010 INCOME RATIO
HETEROGENEOUS EFFECTS BY FINANCIAL SOPHISTICATION AND INCOME SLOPE
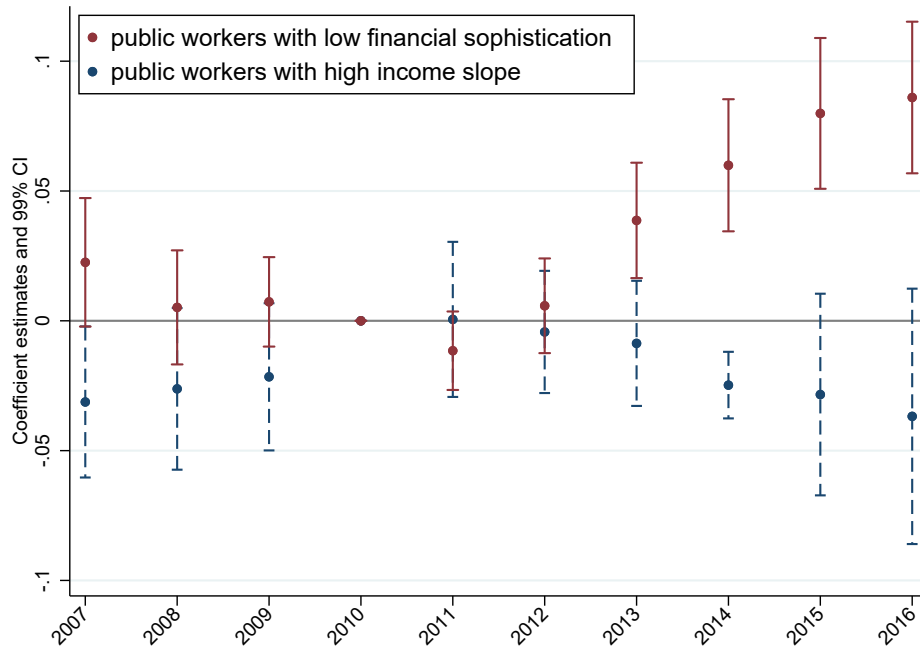
Notes: The graph reports point estimates and 99 percent confidence intervals for the coefficients on the interaction between public sector employment and dummies capturing low financial sophistication and high income slope. These coefficients capture the incremental effect on borrowing of low financial sophistication and high income slope for public sector workers in the period between 2007 and 2016. The effects are computed relative to the excluded year 2010.

FIGURE VIII: FINANCIAL SOPHISTICATION, FINANCIAL LITERACY, AND PRESENT BIAS

(a) Financial ability score

(b) Financial behavior score
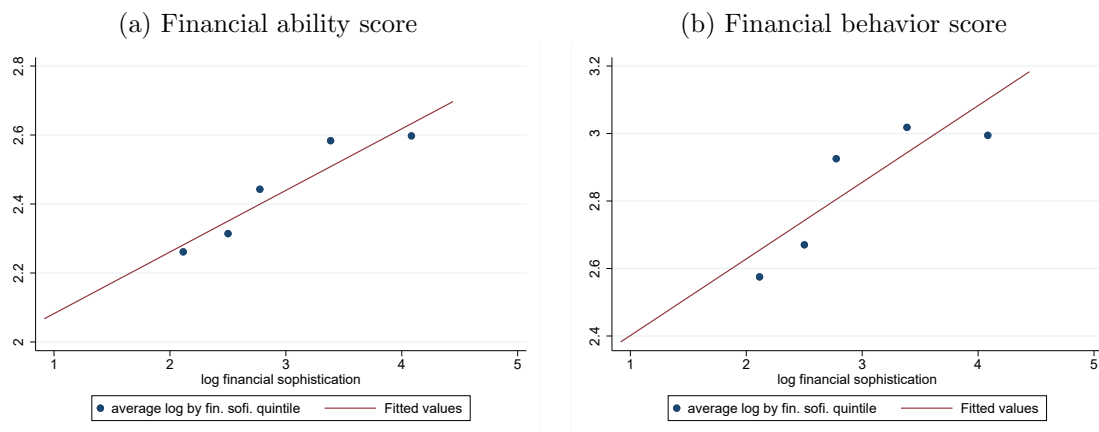
Notes: The figure reports the correlation between our measure of financial sophistication (in logs) and the financial ability score (panel a) and financial behavior score (panel b) at individual level captured by the 2020 and 2022 FEBRABAN surveys on financial health of Brazilian households. A higher financial ability score captures higher financial literacy. A higher financial behavior score captures lower present bias. We report the average financial ability and financial behavior scores for each quintile of financial sophistication, along with the regression line estimated using the underlying micro data. Both scores are standardized so that a unit increase in the y-axis corresponds to a standard deviation increase.

TABLE I: SUMMARY STATISTICS

Panel A: Summary statistics of regression sample vs full sample

Baseline characteristics	Regression sample (N=763,423)			Full sample (N=1,888,005)	
	Mean	St.dev		Mean	St.dev
Gender (=1 if female)	0.42	0.49		0.39	0.49
Education (years)	13.24	3.03		12.10	3.28
Age	40.55	10.30		38.52	11.08
Monthly Wage (BRL)	3,970	4,596		2,676	3,071
log (yearly labor income)	10.33	0.93		9.93	0.96
Public employment	0.41	0.49		0.32	0.47
Total debt to labor income	0.64	0.65		0.71	0.77
Share of borrowing from government banks	0.23	0.41		0.27	0.41
Δ (total debt)$_{2010-2014}$ /income$_{2010}$					
all	0.66	1.18		0.36	1.18
government banks	0.42	0.87		0.30	0.75
private banks	0.20	0.60		0.05	0.66

Panel B: Comparing Private vs Public sector workers

Baseline characteristics	Regression sample (N=763,423)				Full sample (N=1,888,005)			
	Private (N=453,567)	Public (N=309,856)	Diff	St.err.	Private (N=1,274,479)	Public (N=613,526)	Diff	St.err.
Gender (=1 if female)	0.33	0.55	0.22	[0.01]***	0.31	0.55	0.24	[0.00]***
Education (years)	12.93	13.69	0.76	[0.11]***	11.77	12.79	1.02	[0.01]***
Age	38.52	43.52	5.00	[0.23]***	36.39	42.95	6.55	[0.02]***
Monthly Wage (BRL)	3,758	4,281	523	[252]**	2,453	3,140	687	[5.03]***
log (yearly labor income)	10.25	10.46	0.22	[0.05]***	9.80	10.21	0.41	[0.00]***
Total debt to labor income	0.64	0.63	-0.01	[0.02]	0.73	0.66	-0.06	[0.00]***
Share of borrowing from government banks	0.19	0.28	0.08	[0.01]***	0.20	0.42	0.23	[0.00]***

Notes: The full sample includes all borrowers in the 12.8% credit registry random sample that are also formally employed at the end of 2010 and thus recorded in RAIS. The regression sample restricts the full sample by focusing on individuals recorded in RAIS consistently between 2010 and 2014 and that have credit card data available during the recession years 2014 to 2016. Data on individual characteristics refers to the year 2010. Changes in total debt as a share of initial labor income are winsorized at the 5% in each tail. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

outcome	Δ (total debt)$_{2010-2014}$ /income$_{2010}$		
	total	government banks	private banks
	(1)	(2)	(3)
1(public sector employee)$_{2010}$	0.151	0.177	-0.020
	[0.007]***	[0.017]***	[0.014]
individual 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	763,423	763,423	763,423
R-squared	0.081	0.063	0.126
N clusters	558	558	558

Notes: The table reports the results obtained estimating equation (7) in the paper. 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. Individual controls include: share of borrowing from government banks in 2010 and debt-to-income ratio in 2010. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

TABLE III: INDIVIDUAL-LEVEL EFFECTS: BORROWING DURING BOOM YEARS 2010-2014
BY CATEGORY OF DEBT AND TYPE OF BANK

Panel A: All banks — $\Delta \text{(total debt)}_{2010-2014} / \text{income}_{2010}$

	total	payroll loans	non payroll personal loans	car loans	mortgages	credit card debt	overdraft
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1(public sector employee)$_{2010}$	0.151 [0.007]***	0.188 [0.006]***	0.006 [0.001]***	-0.012 [0.002]***	-0.013 [0.006]**	0.005 [0.001]***	-0.002 [0.000]***
R-squared	0.081	0.210	0.032	0.035	0.055	0.099	0.026

Panel B: Government banks — $\Delta \text{(debt from government banks)}_{2010-2014} / \text{income}_{2010}$

	total	payroll loans	non payroll personal loans	car loans	mortgages	credit card debt	overdraft
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1(public sector employee)$_{2010}$	0.177 [0.017]***	0.141 [0.009]***	0.009 [0.001]***		-0.007 [0.006]	0.002 [0.000]***	0.000 [0.000]***
R-squared	0.063	0.195	0.063		0.050	0.071	0.024

Panel C: Private banks — $\Delta \text{(debt from private banks)}_{2010-2014} / \text{income}_{2010}$

	total	payroll loans	non payroll personal loans	car loans	mortgages	credit card debt	overdraft
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1(public sector employee)$_{2010}$	-0.020 [0.014]	0.036 [0.006]***	-0.003 [0.001]***	-0.014 [0.002]***		0.003 [0.001]***	-0.002 [0.000]***
R-squared	0.126	0.096	0.020	0.038		0.100	0.031

Notes: Observations (in all specifications): 763,423. Number of clusters (in all specifications): 558. All specifications include the same individual controls and fixed effects as in Table II. The table reports the results obtained estimating equation (7) in the paper. 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. Individual controls include: share of borrowing from government banks in 2010 and debt-to-income ratio in 2010. Missing coefficients for car loans in Panel B and for mortgages in Panel C are due to bank specialization in these segments: car loans are mostly issued by private banks, mortgages are mostly issued by government banks. Standard errors clustered at micro-region level reported in brackets. Significance level: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

	Δ (total debt)$_{ib,2010-2014}$ / income$_{i,2010}$		
	(1)	(2)	(3)
1(Gov)	0.172	0.186	0.101
	[0.028]***	[0.025]***	[0.017]***
1(Gov) $\times$ 1(public sector employee)$_{2010}$			0.131
			[0.032]***
individual fe	no	y	y
Observations	1,931,211	1,931,211	1,931,211
R-squared	0.031	0.219	0.223
N individuals	315,683	315,683	315,683
N clusters	1,578	1,578	1,578

Notes: The unit of observation is a bank-individual lending relationship. The sample includes all multi-bank type individuals, i.e. individuals with a positive balance with both government controlled and private banks in the baseline year 2010. The variable 1(Gov) is a dummy equal to 1 if the lender is a government controlled bank. Standard errors are clustered at bank-level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

TABLE V: DO INCOME SLOPES PREDICT FUTURE LABOR INCOME GROWTH?

outcome	Yearly Avg Labor Income Growth 2010-2014		
sample	all workers	public sector	private sector
	(1)	(2)	(3)
Labor income slope using 2010 data	1.512***	0.929***	1.903***
	(0.048)	(0.050)	(0.041)
Municipality fixed effects	y	y	y
Observations	27,365,472	6,079,528	21,285,928
R-squared	0.013	0.047	0.014

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

TABLE VI: HETEROGENEITY BY INITIAL FINANCIAL SOPHISTICATION AND INCOME SLOPE

outcome	Boom period 2010-14	Recession period 2014-16			
	Δ (total debt)$_{2010-2014}$ /income$_{2010}$ (1)	Δ after-debt-service income (2)	Δ (Share Balance in default) (3)	Δ log (credit card expenditure) (4)	Δ log (income) (5)
1(public sector employee)$_{2010}$ $\times LowSophi_{2010}$	0.051 [0.011]***	-0.012 [0.006]**	0.000 [0.000]	-0.042 [0.010]***	-0.007 [0.004]*
1(public sector employee)$_{2010}$ $\times HighSlope_{2010}$	-0.056 [0.009]***	0.022 [0.004]***	-0.000 [0.000]***	-0.002 [0.006]	0.017 [0.003]***
1(public sector employee)$_{2010}$	0.170 [0.008]***	-0.030 [0.004]***	-0.000 [0.000]*	-0.013 [0.008]	-0.001 [0.004]
$LowFinSophi_{2010}$	0.025 [0.019]	-0.016 [0.009]*	-0.001 [0.000]***	0.008 [0.015]	0.004 [0.005]
$HighSlope_{2010}$	0.066 [0.008]***	-0.007 [0.003]**	-0.000 [0.000]**	0.007 [0.005]	0.002 [0.002]
individual controls	y	y	y	y	y
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
occupation	y	y	y	y	y
Observations	763,423	684,884	763,423	763,423	685,052
R-squared	0.081	0.017	0.025	0.013	0.041
N clusters	558	558	558	558	558

Notes: Individual controls include: share of borrowing from government banks in 2010 and debt-to-income ratio in 2010. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

TABLE VII: CONSUMPTION MEAN, CONSUMPTION VOLATILITY, AND AFTER-DEBT-SERVICE INCOME BOOM AND RECESSION YEARS 2010-2016

outcomes	credit card expenditure			after-debt-service income	
	average	avg normalized by pre-2010	coeff of variation	average	avg normalized by pre-2010
	(1)	(2)	(3)	(4)	(5)
1(public sector employee)$_{2010}$ $\times LowFinSophi_{2010}$	-0.271 [0.020]***	-0.018 [0.004]***	0.016 [0.001]***	-0.051 [0.008]***	-0.047 [0.013]***
1(public sector employee)$_{2010}$ $\times HighSlope_{2010}$	0.100 [0.010]***	-0.003 [0.002]	-0.003 [0.001]***	0.011 [0.007]	0.001 [0.012]
1(public sector employee)$_{2010}$	-0.153 [0.025]***	0.015 [0.004]***	0.010 [0.001]***	0.001 [0.015]	0.010 [0.021]
$LowFinSophi_{2010}$	0.063 [0.017]***	-0.000 [0.006]	-0.003 [0.001]**	0.026 [0.011]**	0.029 [0.020]
$HighSlope_{2010}$	-0.031 [0.006]***	0.003 [0.002]*	0.001 [0.000]**	-0.007 [0.003]**	-0.004 [0.006]
baseline controls	y	y	y	y	y
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
occupation	y	y	y	y	y
Observations	763,405	436,844	763,405	763,275	761,217
R-squared	0.301	0.023	0.080	0.202	0.023
N clusters	558	557	558	558	558
Mean Outcome	7.94	1.21	0.13	0.57	0.75
beta $\times$ mean outcome	-3.4%	-1.5%	12.3%	-9.0%	-6.3%

Notes: Individual controls include: share of borrowing from government banks in 2010 and debt-to-income ratio in 2010. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .

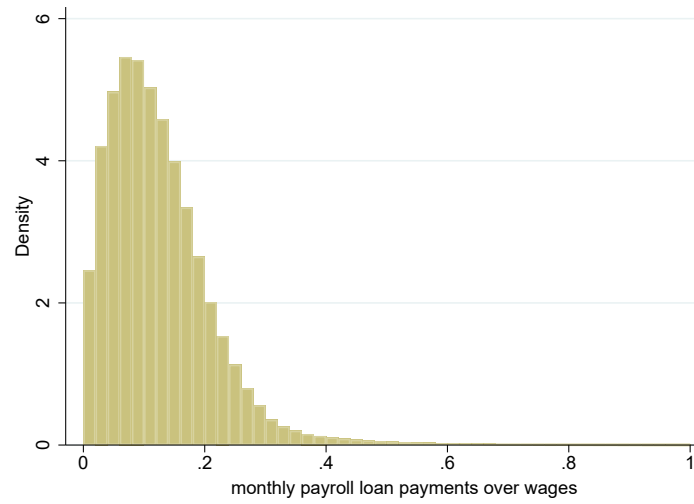# A   Appendix: Figures and Tables

Figure A.1: Number of Borrowers in SCR, 2007-2016
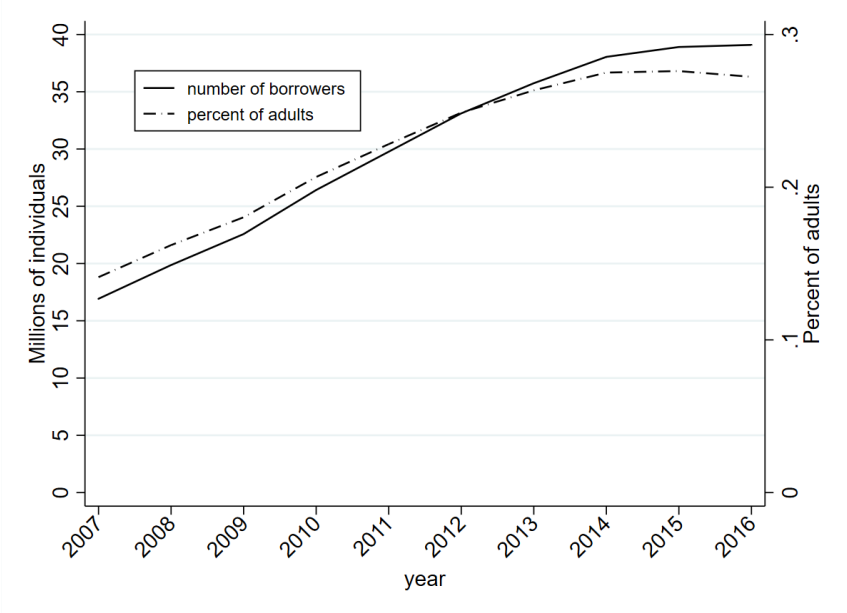
Notes: Data from the Credit Information System (SCR), Central Bank of Brazil, and Population Census.

Notes: Figure shows the distribution of the ratio of debt servicing payments for payroll loans over wages. Payroll loans payments are sourced from SCR, wage are sourced from RAIS. Data refers to the year 2011.

(a) payroll loans

interest rate

maturity

(b) non-payroll loans

interest rate

maturity

(c) auto loans

interest rate

maturity

(d) mortgages

interest rate
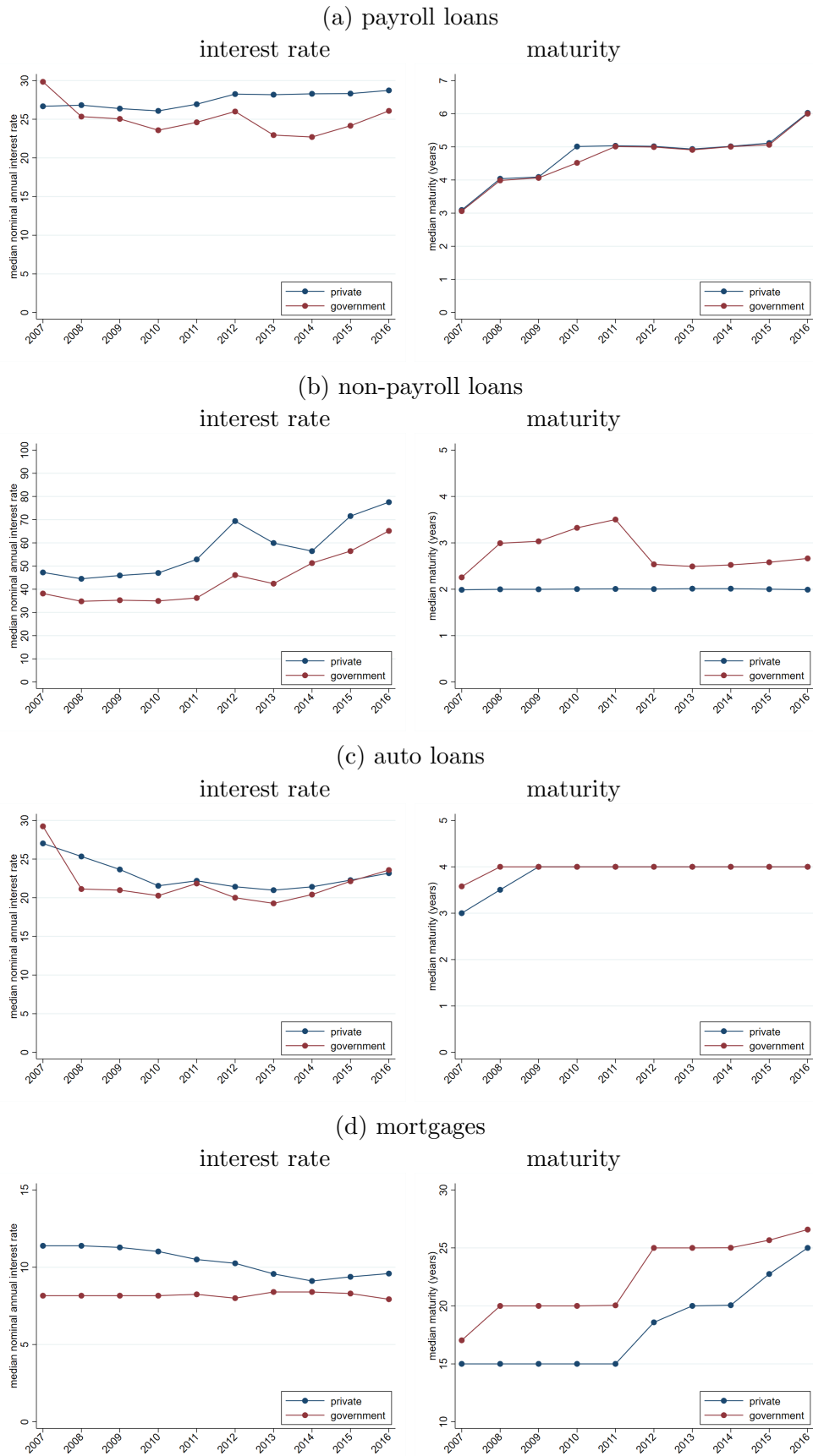
maturity

Notes: The figure reports the median interest rate (in percentage points) and maturity (in years) for loans outstanding in each year. The sample restricted to multi-bank borrowers. 3

FIGURE A.4: SAVING POLICY FUNCTIONS FOR DIFFERENT LEVELS OF β
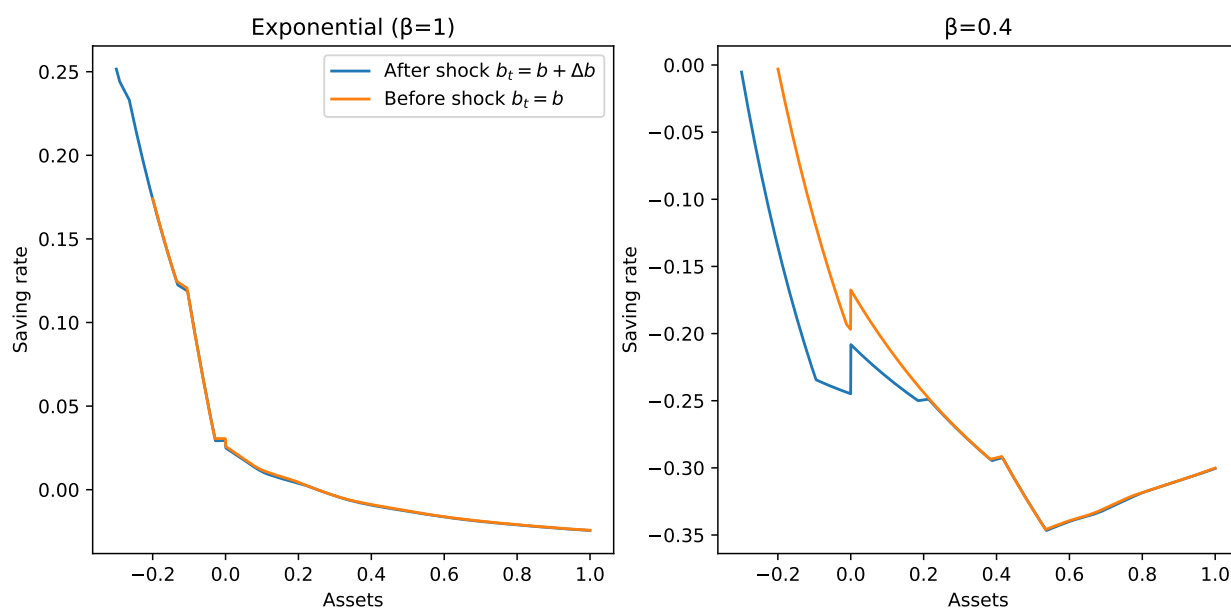
Notes: The panels compare the change in savings policy of households as a function of their assets after a borrowing constraint shock. The left panel represents PIH consumers, while the right panel represents PF consumers. The shock consists of the borrowing constraint going from 0.2 to 0.3 of current salary. We condition on the consumer being currently employed. At the time of the shock, the consumers are 15 years into their working life and their wages are normalized to 1.

Parameter	T	δ	γ	χ	$p_{1,1}$	$p_{2,1}$	g	r_a	r_d	b	Δb
Value	40	0.987	2	0.5	0.7	0.01	0.01	0.02	0.2	-0.2	-0.1

Notes: The table displays the value of the parameters used in the theoretical model. T is the total working life in years, while δ and γ is the degree of impatience and IES of consumers, respectively. χ is the share of usual income a household gets while unemployed. $p_{1,1}$ and $p_{2,1}$ are, respectively, the probability of remaining unemployed if unemployed last period, and the probability of becoming unemployed if employed last period. g, r_a, and r_b are the growth rate of wages, the interest rate on assets, and the interest rate on debt. b is the initial borrowing constraint (as share of current income), and Δb is the size of the borrowing constraint shock.

TABLE A.2: INDIVIDUAL-LEVEL EFFECTS: DEBT-TO-INCOME DURING BOOM
ROBUSTNESS TO USING FULL SAMPLE OF BORROWERS OBSERVED IN RAIS IN 2010

outcome	Δ (total debt)$_{2010-2014}$ /income$_{2010}$			
	total (1)	government banks (2)	private banks (3)	total (4)
I(public sector employee)$_{2010}$	0.208 [0.011]***	0.189 [0.013]***	0.012 [0.019]	0.207 [0.007]***
I(public sector employee)$_{2010}$ $\times LowSophi_{2010}$				0.074 [0.009]***
I(public sector employee)$_{2010}$ $\times HighSlope_{2010}$				-0.098 [0.027]***
$LowFinSophi_{2010}$				-0.002 [0.014]
$HighSlope_{2010}$				0.162 [0.010]***
individual controls	y	y	y	y
fixed effects:				
micro-region	y	y	y	y
income quintiles	y	y	y	y
age quintiles	y	y	y	y
education	y	y	y	y
gender	y	y	y	y
occupation	y	y	y	y
Observations	1,867,205	1,867,205	1,867,205	1,867,205
R-squared	0.073	0.043	0.128	0.074
N clusters	558	558	558	558

Notes: Individual controls include: share of borrowing from government banks and debt-to-income ratio, both observed in 2010. Standard errors clustered at micro-region level reported in brackets. Significance level: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

TABLE A.3: INDIVIDUAL-LEVEL EFFECTS: DEBT-TO-INCOME DURING BOOM
HETEROGENEITY BY FINANCIAL SOPHISTICATION VS BORROWING CONSTRAINTS
ROBUSTNESS TO CONTROLLING FOR INITIAL CONSUMPTION AND SAMPLE OF BORROWERS < 50 YEARS OF AGE

outcome	Boom period 2010-14	Recession period 2014-16			
	Δ (total debt)$_{2010-2014}$ /income$_{2010}$ (1)	Δ after-debt-service income (2)	Δ (Share Balance in default) (3)	Δ log (credit card expenditure) (4)	Δ log (income) (5)
1(public sector employee)$_{2010}$ $\times LowFinSophi_{2010}$	0.051 [0.017]***	-0.020 [0.010]**	0.000 [0.000]	-0.042 [0.019]**	-0.007 [0.005]
1(public sector employee)$_{2010}$ $\times HighSlope_{2010}$	-0.075 [0.013]***	0.019 [0.006]***	0.000 [0.000]	0.009 [0.011]	0.009 [0.004]**
1(public sector employee)$_{2010}$	0.192 [0.018]***	-0.031 [0.006]***	-0.001 [0.000]***	-0.025 [0.010]**	0.002 [0.004]
$LowFinSophi_{2010}$	-0.020 [0.035]	-0.033 [0.016]**	-0.001 [0.001]**	0.022 [0.029]	-0.003 [0.008]
$HighSlope_{2010}$	0.070 [0.009]***	-0.002 [0.004]	-0.000 [0.000]	-0.002 [0.008]	0.006 [0.003]*
log credit card expenditure$_{2010}$	0.010 [0.001]***	0.004 [0.001]***	-0.000 [0.000]***	-0.022 [0.001]***	0.001 [0.000]**
individual controls	y	y	y	y	y
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
occupation	y	y	y	y	y
Observations	296,083	272,475	296,083	296,083	272,513
R-squared	0.075	0.027	0.028	0.018	0.048
N clusters	557	557	557	557	557

Notes: The sample is restricted to borrowers with less than 50 years of age and with data on credit card expenditure in the baseline year 2010. Individual controls include: share of borrowing from government banks and debt-to-income ratio, both observed in 2010. Standard errors clustered at micro-region level reported in brackets. Significance level: *** p<0.01, ** p<0.05, * p<0.1 .