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Observed and expected interest rate pass-through under remarkably high market rates

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Abstract

This paper investigates the pass-through from observed and expected policy interest rates to the remarkably high lending rates in the Brazilian economy, accounting for financial-institution specific characteristics, borrower types, asymmetric adjustment and persistence in loan rates. We use a unique and non-public dataset with expected variables identified by professional forecasters and apply a fixed-effects approach to alternative specifications as robustness checks. Financial institutions correctly forecast the next target level of the policy rate and anticipate adjustments in their loan rates. There is evidence of over-proportional and positively asymmetric pass-through to loans with higher interest rate margins, implying a positive correlation between degrees of pass-through and spreads across persistent lending rates. These findings contribute to explain why loan interest rates are so high in the Brazilian economy.

Keywords Interest rate pass-through · Asymmetry · Lending rates · Monetary policy

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1 Introduction

The degrees of pass-through from the policy interest rate to lending and deposit rates unveil the transmission channel of the monetary policy to the financial sector of the economy. In an ideal scenario, changes in the policy (or base) interest rate should be completely transmitted to the market rates in a full and symmetric pass-through environment, characterizing the efficiency of the monetary policy to affect the market rates, and so the real side of the economy through the credit channel. However, in practice, this might not be the case, as the degree of interest rate pass-through might be either smaller or bigger than one, featuring an incomplete or over-proportional pass-through, respectively. In addition, the pass-through might be asymmetric, meaning that increases or decreases in the policy rate are conveyed in different proportions to the market rates. As a result, the monetary policy might not affect the market interest rates, domestic credit and economic activity as desired.

The issue is of special concern in the Brazilian economy, which historically has very high loan interest rates in both nominal and real terms. Despite the lowest level of 2% per year achieved in 2020 as a monetary policy response to stimulate the economy during the COVID-19 pandemic, market rates have remained at very high levels and not followed the downward bias in the policy interest rate. This pattern has yielded very high interest rate spreads for the banking sector. The explanations include specific features of the financial market, such as high probability of default by borrowers, market power by banks, concentration in the financial sector and poor institutional quality. These assertions, however, sound misleading as long as they only focus on the interest rate margins (or spreads) and overlook elements from the interest rate pass-through.

We argue that consistent estimates of the degree of pass-through from the observed and expected policy interest rates to different lending rates by financial institutions and borrower types might contribute to fulfil this gap. Specifically, departing from high interest rates margins, an over-proportional pass-through coupled with asymmetric behavior by financial institutions that overreact to increases and under-react to decreases in the policy interest rate, both observed and expected, might sustain the remarkably high loan interest rates in the Brazilian economy. The financial institutions might even anticipate asymmetric adjustments in their lending rates by correctly forecasting future changed in the policy rate. Thus, a complete investigation would require to consider the pass-through form both observed and expected policy interest rate.

The objective of this paper is to investigate the interest rate pass-through from the observed and expected policy rates to the remarkably high lending rates in the Brazilian economy. We estimate observed and expected degrees of pass-through by accounting for financial institution specific characteristics, asymmetric behavior and partial adjustment due to persistence in the lending rates. We use a unique and non-public dataset of loan interest rates, observed Over-Selic rate and expected Over-Selic rate identified by professional forecasters (financial institutions) covering the period

from January 2012 to April 2019 on a weekly basis, available from the Central Bank of Brazil. The sample is disaggregated by interest rates, financial institutions and loan operations for households and non-financial corporations. In addition to the static panel data estimation, we also allow for partial adjustment in the lending interest rates in a dynamic panel data environment.

We apply a fixed effects approach to panels of financial institutions and non-earmarked lending interest rates disaggregated by households and non-financial corporations. The policy interest rate is the Over-Selic rate, which is the monetary policy instrument in the inflation targeting regime adopted by the Central Bank of Brazil since June of 1999. We also use the expected Over-Selic rate identified by professional forecasters to assess whether financial institutions anticipate future changes in the policy rate when setting their loan interest rates. By doing so, they might avoid unexpected losses due to unanticipated changed in the policy rate.[1] This unique and non-public dataset with identified expectations reduces loss of information caused by aggregation of expectations by the mean or median, for instance, making the results more reliable.

Empirical studies have found asymmetric responses of lending rates (Castro and Mello 2012) and deposit rates (Chong 2010; Hannan and Berger 1991) to downward versus upward movements in policy interest rates. Liu et al. (2008) provided evidences of asymmetric responses in both rates, while Neumark and Sharpe (1992) only for deposit rates of banks in concentrated markets. These findings suggest that rigidity in the pass-through is bigger when there is stimulus for downward movements in lending rates or for upward changes in deposit rates.

Market power might affect the banks' responses to changes in the policy rate, although the effects are unclear in the pass-through literature (Kopecky and Hoose 2012). Hannan and Berger (1991) argued that banks in concentrated markets exhibit higher rigidity in deposit rates, and Holton and d'Acri (2018) found similar results for lending rates. However, while bank concentration is one of the most common indicators of market power, measures of competition are considered more relevant to assess banks' behavior (e.g., Ornelas et al. 2020; Berger et al. 2004; Cottarelli and Kourelis 1994). Cottarelli and Kourelis (1994) claimed that lack of competition increases stickiness of lending rates and simulations of a DSGE model by Hristov et al. (2014) yielded similar results under weaker competition. Holton and d'Acri (2018) are also in accordance, since large banks (proxy for banks with bigger market power) showed a lower long-run pass-through, especially for small loans (proxy for small and medium sized enterprises). On the other hand, Coelho et al. (2010) suggested that larger Brazilian banks had stronger reactions to the monetary policy than the smaller ones.

Conflicting evidences also prevail when assessing the ownership control and capital origin of the banks. Cottarelli and Kourelis (1994) considered a heterogeneous panel of 31 countries from all over the world and found that lending rates appear to be stickier in publicly owned banking systems, and privatizing would substantially increase

[1] Banerjee et al. (2013) used aggregate data for the four major Euro area economies and argued that banks anticipate short-term market rates when setting interest rates on loans and deposits, and even more so when they will have to refinance the loans that they make in the future. We found a similar result by using a loan-specific dataset with expected policy interest rate identified by professional forecasters.

flexibility of lending rates.[2] Using Brazilian data from May 2006 to March 2010, Pereira and Maia-Filho (2013) also obtained lower pass-through for public-owned government banks (GCBs) before the financial crisis, but found no evidence that private banks and GCBs adjusted their lending rates differently afterward. This behavior before the financial crisis contrasts with Coelho et al. (2010), who uncovered similar responses for both types of Brazilian banks in the period of June 2000 to December 2006. Arena et al. (2007) argued that deposit and lending rates of foreign banks are less sensitive to changes in monetary conditions during periods of financial crisis, but Coelho et al. (2010) found that both types of banks displayed similar responses for lending rates.

The combined effects of high-risk balance sheets and distress in the banking sector to a sluggish pass-through were highlighted by the financial crisis (Altavilla et al. 2020; Holton and d'Acri 2018; Von Borstel et al. 2016; Hristov et al. 2014). Such environment changed the interest rate setting strategy, making loan spreads higher in banks that incurred larger losses or shortfall in capital and liquidity buffers (Gambacorta and Mistrulli 2014; Santos 2011). Slowing down in the speed of pass-through is also associated with longer term of loans or deposits (Liu et al. 2008), repeated discount rate as a signaling device (Cottarelli and Kourelis 1994), and absence of lending relationship (Gambacorta and Mistrulli 2014). These latter elements, however, were not included in our specifications because would require some arbitrary adjustments to synchronize the data frequency, since a larger dataset is not readily available.[3]

We found convincing evidence of full pass-through from both the observed and the expected policy interest rates to the majority of lending rate types. For the overall sample, sub-samples by households and non-financial corporations and some specific lending types, the estimates indicated an over-proportional pass-through, meaning that banks increase loan interest rates more than proportional to any raise in the Over-Selic interest rate, either observed or expected. The banks' behavior is asymmetric, as downward adjustments in the lending rates are always smaller than the upward ones. The degrees of pass-through are strongly correlated with the interest rate margins, meaning that higher spreads are coupled with larger and positively asymmetric pass-through coefficients. Banks anticipate future changes in the policy rate when setting interest rates on loans, as the pass-through estimates are similar for both observed and expected rates.[4]

These findings are robust to the inclusion of other control variables and partial adjustment in a dynamic panel data environment, which additionally revealed high persistence in some loan rates. Taken together, they contribute to explain why loan interest rates are kept so high in the Brazilian economy, regardless of downward movements in the policy rate during the period. Any increase in the policy interest

[2] From the Latin American region, the panel included Colombia, Jamaica, Mexico and Venezuela, but not Brazil.

[3] See Gregor et al. (2021) for a comprehensive review of the pass-through literature.

[4] According to Schmeling et al. (2022), Cieslak (2018) and Divino and Haraguchi (2022), the financial institutions forecast ability of the policy rate depends on the knowledge of the interest rate rule followed by the Central Bank. We highlight that similar results for observed and expected interest rate pass-through indicate anticipated adjustments in the lending rates, but with room for some misalignment due to the asymmetric pass-through.

rate, either observed or expected, leads to increases at least as proportional as in highly persistent lending rates, while any stimulus to decrease in these rates is refrained by the financial institutions.

Other complementary findings also contribute to disentangle the role of the pass-through to keep the remarkably high lending rates in the Brazilian economy. First, it is important to control for the heterogeneity in the lending rates by both loan and borrower types because interest rate margins, credit risk and other specific characteristics are quite different among them. Second, financial institutions correctly forecast the next level of the policy rate and use this information to anticipate asymmetric adjustments in their lending rates, as the estimated degrees of pass-through from either the observed or the expected Over-Selic rate are very similar. Finally, there is a strong and positive correlation between the degree of pass-through and the interest rate margins across borrower types and policy rates, meaning that loan types with higher interest rate margins are coupled with larger degrees of pass-through and lower stickiness in lending rates.

Schmeling et al. (2022) showed that deviations from the conventional Taylor rule are correlated with expectation errors in the US economy. They found asymmetric short rate predictability because financial institutions correctly anticipate the direction of the changes, but most surprises were in rate cuts, not in unexpected rate hikes. Furthermore, the magnitude of the decline is more often underestimated than the size of the increase. Cieslak (2018) obtained similar results, with negative forecasting errors during and after recessions suggesting underestimation of monetary policy easing. These findings are in line with the Brazilian case, as the financial institutions predict the interest rate rule followed by the Central Bank of Brazil and correctly forecast the next target level for short horizons according to Divino and Haraguchi (2022). However, they might underestimate monetary easing and overestimate monetary tightening as captured by the asymmetric interest rate pass-through for the lending rates.[5]

The paper is organized as follows. The next section discusses the dataset and provides a summary of descriptive statistics and illustrates the several interest rate types. Section 3 outlines the empirical strategy. Section 4 reports and analyses the major findings. Section 5 describes and applies robustness tests. Resorting to the theoretical literature, it also discusses and explains the major empirical findings. Finally, Sect. 6 is dedicated to the concluding remarks.

2 Data

The dataset comprises interest rates from new credit operations (lending rates), Over-Selic interest rate[6] and expectations identified by professional forecasters (financial institutions) of the next Over-Selic target level. The sample covers the period from January 5th, 2012 to April 4th, 2019 on a weekly basis. The original dataset of loan operations contains the five-business-days weighted moving average of interest rates

[5] An alternative approach claims that the financial institutions forecasting strategy of the policy rate might rely on a pro-conservative monetary policy convention in Brazil. See Bresser-Pereira et al. (2020) for details.

[6] The Over-Selic rate is the daily average of the overnight rates of interbank loans backed by federal securities, carried out in the Special System for Settlement and Custody (the Selic System).

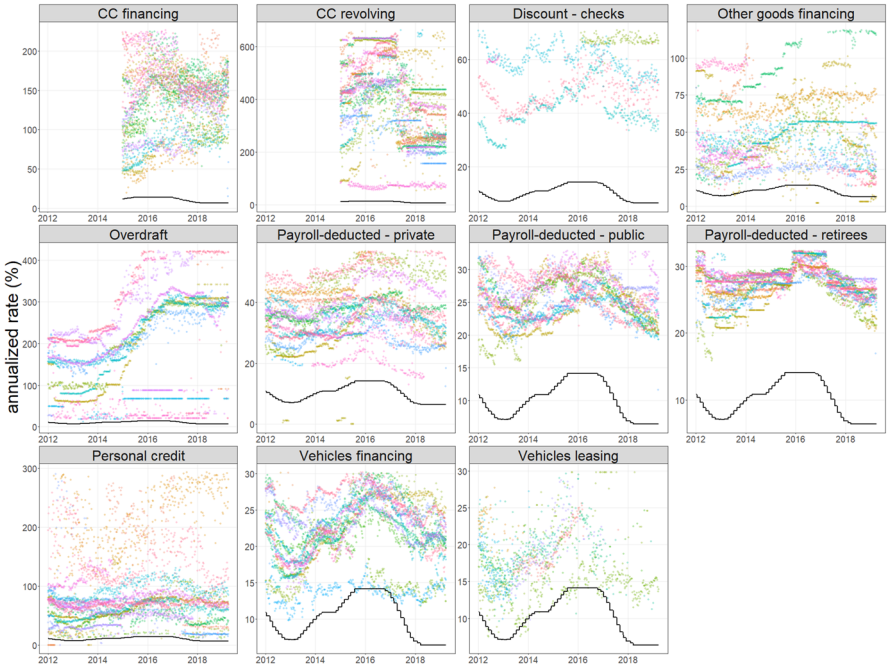

Fig. 1 Observed Over-Selic rate and household lending rates. *Notes*: The figure reports the observed Over-Selic rate (black line) and households lending rates by financial institutions and loan types (colored dots). Each color corresponds to a financial institution. CC stands for credit card. All types are fixed interest rates. (Color figure online)

by financial institutions and loan types.[7] To synchronize with the dates of the Monetary Policy Committee (Copom) meetings and capture Selic changes, we considered only observations beginning on Thursdays or the next business day in case the Thursday was a holiday. This procedure resulted in up to 378 weekly observations per financial institution and loan type, as illustrated in Figs. 1 and 2.[8]

Within this period, there were 58 Copom meetings, with an average interval of 46 days between two consecutive meetings (ranging from 35 to 63 days). Meetings always begin on Tuesday and end on Wednesday, when the Selic target is decided and publicly released. The target rate is effective from the next business day after the meeting until a new decision is made in the next meeting.

Selic expectations always refer to the next Over-Selic target level. These expectations are collected daily through the "Focus Survey" carried out by Central Bank of Brazil across financial institutions and a median expectation is weekly released to the public.[9] Selic expectations are also available by financial institutions, but with one-year delay in the release and each institution anonymously identified by a non-

[7] It is available from the Open Data Portal https://opendata.bcb.gov.br/, from where we also extracted the observed and expected Over-Selic rates. Data on the Monetary Policy Committee meetings and financial institutions were obtained from Central Bank of Brazil website https://www.bcb.gov.br/en.

[8] See Appendix A for a detailed description of the loan types.

[9] Focus Survey monitors the market expectations for several economic indicators, including Selic target level and inflation rate.

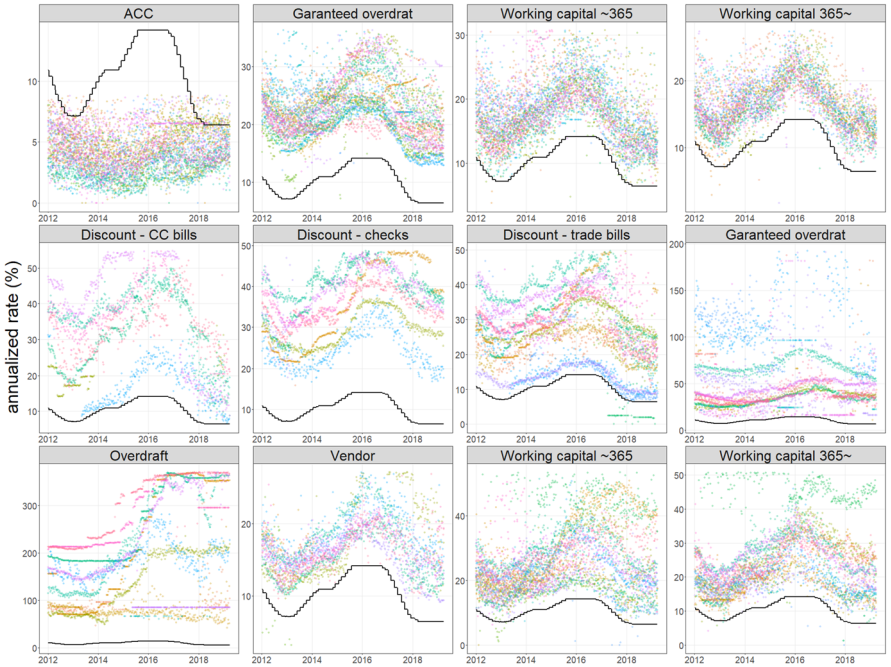

Fig. 2 Observed Over-Selic rate and non-financial corporations lending rates. *Notes*: The figure reports the observed Over-Selic rate (black line) and non-financial corporations lending rates by financial institutions and loan types (colored dots). Each color corresponds to a financial institution. ACC and CC stands for advances on exchange contracts and credit card, respectively. The types in the first row are floating interest rates, except ACC which is a foreign-currency indexed interest rate. The remaining types are fixed interest rates. (Color figure online)

public code, as illustrated in Fig. 3. For this research, the Central Bank of Brazil has kindly provided a list of the confidential codes that matches lending rates and Selic expectations by financial institutions.[10] As a result, we were able to build an accurate dataset of lending interest rates and Selic expectations both identified by financial institutions. This unique dataset reduces loss of information that would be caused by using aggregate median expectations as usually done by other studies.[11] It also allows us to estimate the pass-through from the identified Selic expectations to the loan interest rates and infer whether future changes in the Selic rate are correctly anticipated by the financial institutions and transmitted to their lending interest rates.

The financial institutions are identified by the National Register of Legal Entity (CNPJ), a public enterprise tax identification number of the financial institution that granted the loan. On the other hand, the Selic expectations are associated to a code

[10] The confidential financial institutions codes list was kindly provided by Department of Statistics (DSTAT) of the Central Bank of Brazil only for the purposes of this work.

[11] Estimates using median Selic expectations were significantly different from those with Selic expectations identified by financial institutions, especially in models with disaggregated loan operations. The higher the disaggregation in the sub-samples, the bigger the difference in the estimated pass-through coefficients between the median Selic expectations and the identified expectations by financial institutions. These results are available from the authors upon request.

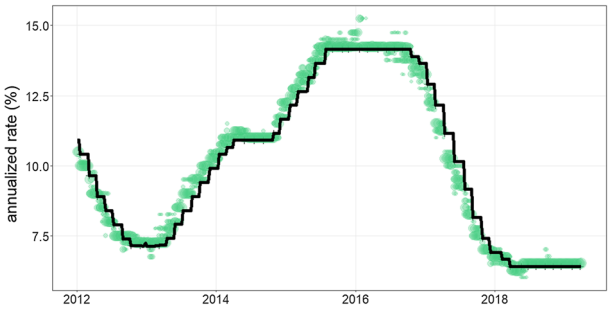

Fig. 3 Observed and expected Over-Selic rates. *Notes*: The figure presents the observed Over-Selic rate (black line) and expected Over-Selic rate (green bubbles). The size of the bubble represents the number of financial institutions that reported the same expected value in a given week. (Color figure online)

other than the CNPJ that identifies the financial institution responsible for entering the forecasts in the Focus Survey. There is a unique and confidential list from the Central Bank of Brazil matching CNPJ and Selic expectation codes by financial institution. However, CNPJ from lending rates and codes from Selic expectations hardly match one another without further information. In some cases, several financial institutions are part of the same conglomerate, where each one has its own area of experts responsible for forecasting the next target level of the Over-Selic. In many cases, the area in charge of making the forecasts has a different CNPJ than the area that grants loans to individuals and firms. The information binding these distinct CNPJ is the conglomerate. Therefore, we replaced all financial institutions' specific CNPJ by their respective conglomerate's CNPJ. In case there is no corresponding conglomerate, we considered the financial institution as a conglomerate with only one subsidiary. By doing this manipulation in the original dataset, we were able to faithfully match CNPJ and Selic expectation codes by financial institutions.

The original dataset contains Selic expectations for all dates in which financial institutions entered their initial forecast or revision of forecast in the Focus survey. Selic expectations are not restricted to the next Copom meeting and so might refer to any future meeting. In order to standardize the dataset and match the lending rates frequency, we selected the last expectations in effect on Thursdays to transform the data frequency in weekly figures. We also filtered observations to keep only expectations for the target level to be decided in the next Copom meeting. As pointed out by Coelho et al. (2010), banks costs of funds increase immediately in response to a raise in the basic interest rate, especially for short-maturity loans. The expected increase in costs that leads to raise in lending rates is better approximated by the expectations of the policy rate for the next Copom meeting than for future meetings. Expectations with horizons greater than 45 days were not considered because forecasts are more reliable as the Copom meeting approaches.

Loan operations are classified by size and capital origin of the financial institution, type of borrowers and interest rate modality. Segment S1, as defined by the Central Bank of Brazil, is composed of systemically important banks whose characteristics are a size equals to or bigger than 10% of the Brazil GDP or a relevant international activity, regardless its size. Regarding the proprietorship, a financial institution might

be either private- or public-owned and the capital origin might be either domestic or foreign. There are two types of borrowers, represented by households (HH) and non-financial corporations (NFC). Loans for NFC are categorized in 12 types, while for HH in 11 modalities. All HH types and the majority of NFC types have fixed interest rates (Fixed). For NFC, three loan types have floating interest rates (Float) and one has foreign-currency-indexed (FCI) interest rate. This later type is used as a placebo in the empirical evidence, given that there should be no pass-through from the domestic rates to the FCI rate. In order to avoid estimation biases, we trimmed outliers above the 97th percentile of each type. Descriptive statistics for the whole sample are reported in Table 1. Table 2 describes the distribution of loan operations and financial institutions by borrower and lender types.

This dataset contains more accurate information and covers an updated period when compared to other studies (Pereira and Maia-Filho 2013; Castro and Mello 2012; Coelho et al. 2010). According to the Central Bank of Brazil, in the new database of credit operations, the data coverage was extended and the operations were reclassified to meet needs for households and corporate financing.[12] Another distinguish feature is that Selic expectations are uniquely identified by financial institutions, unlike earlier information on aggregate expectations by the mean or median across financial institutions. A potential limitation, however, is that data with weekly figures of interest rates by financial institutions are only available after the year of 2012. Nonetheless, all types of loan interest rates are freely negotiated between financial institutions and borrowers, meaning that they are market rates.

3 Empirical strategy

We are interested in estimating the degree of pass-through from the observed and the expected policy rates to the loan interest rates and testing whether the estimates are over-proportional or asymmetric. To do so, we propose a panel-based approach to measure how changes in the observed and the expected Over-Selic rates might currently affect the lending interest rates. In case there is evidence of over-proportional and positively asymmetric pass-through, this might be used to account for the remarkably high lending rates in the Brazilian economy.

The fixed effects approach controls for unobserved individual heterogeneity, which is a relevant feature among financial institutions and loan types in the full sample. Panels are unbalanced because financial institutions are not obligated to report Selic expectations to the Focus survey of the Central Bank of Brazil and we trimmed outliers above the 97th percentile for each loan type.[13] The next sections report the empirical models and discuss the major results.

[12] See BCB's methodological notes in https://www.bcb.gov.br/content/statistics/methodologicalnotes_docs/financialsystemloans/notaempri.pdf and https://www.bcb.gov.br/content/statistics/methodologicalnotes_docs/financialsystemloans/notaempr201502i.pdf.

[13] As a robustness check, we also used winsorized data by setting the top 3% to the 97th percentile. The results were similar and are available from the authors upon request.

Table 1 Descriptive statistics

Type	Observations	Mean	SS	Minimum	25%	Median	75%	Maximum
Households								
CC financing	3611	137.3	42.7	15.1	103.2	145.9	166.3	226.6
CC revolving	4035	384.2	154.8	53.9	253.8	399.5	495.5	662.3
Discount-checks	1259	51.5	11.0	26.9	42.3	51.4	60.6	70.8
Other goods financing	3468	49.5	24.5	2.1	29.6	44.3	66.4	118.6
Overdraft	3732	201.9	106.0	12.7	101.4	207.6	292.5	422.3
Payroll-deducted-private	4914	36.2	8.8	0.0	29.9	35.7	41.2	56.8
Payroll-deducted-public	4630	25.4	3.2	11.6	23.0	25.4	27.8	32.8
Payroll-deducted-retirees	5184	27.4	2.5	15.9	26.1	27.6	28.9	32.3
Personal credit	4992	84.7	57.4	0.0	51.6	70.9	93.2	293.4
Vehicle financing	5190	22.0	4.4	9.8	19.3	22.4	25.3	30.2
Vehicle leasing	1408	17.7	4.1	7.5	14.7	17.2	20.3	29.8
Non-financial corporations								
ACC (FCI)	5995	4.2	1.7	0.0	2.9	4.0	5.4	8.8
Discount-CC bills	2095	31.1	12.0	6.6	20.6	32.6	40.3	54.8
Discount-checks	2834	34.6	7.8	15.8	28.6	34.9	40.6	48.6
Discount-trade bills	4542	26.3	10.1	0.0	18.9	26.4	33.8	49.6
Guaranteed overdraft	3689	51.7	32.3	9.6	31.2	39.5	62.9	192.2
Guaranteed overdraft (Float)	5542	22.4	4.8	7.2	19.2	22.0	25.1	36.3
Overdraft	3581	196.6	101.6	42.7	92.1	185.7	281.4	370.9
Vendor	2905	16.6	3.6	3.2	14.0	16.2	18.9	27.2
Working capital ∼365	4859	24.8	9.5	0.0	18.0	22.4	29.9	53.4
Working capital ∼365 (Float)	5151	17.8	4.5	3.7	14.5	17.5	20.7	30.7
Working capital 365∼	4386	23.6	8.6	0.0	17.2	21.9	28.4	50.9
Working capital 365∼ (Float)	4550	16.5	3.8	1.7	13.8	16.2	19.0	27.6
Selic								
Selic rate	378	10.1	2.8	6.4	7.2	10.2	12.9	14.2
Selic expectation	14,390	10.0	2.8	6.0	7.2	10.0	12.8	15.2

Interest rates are non-weighted and in percent values. CC and ACC stand for credit card and advances on exchange contracts; FCI designates foreign-currency-indexed interest rate

Table 2 Number of observations and financial institutions by borrower and lender types

	All financial institutions				S1 financial institutions			
	Total	Public	Private	Foreign	Total	Public	Private	Foreign
Number of observations								
Total	92,552	21,279	48,528	22,745	52,002	13,893	28,335	9774
Households	42,423	9865	23,981	8577	27,978	6595	15,950	5433
Non-financial corporations	50,129	11,414	24,547	14,168	24,024	7298	12,385	4341
Number of financial institutions								
Total	57	4	34	19	30	3	20	7
Households	49	4	33	12	30	3	20	7
Non-financial corporations	32	3	17	12	11	2	7	2

S1 stands for systemically important financial institutions

3.1 Baseline specification

In order to have a comprehensive view of the interest rate pass-through, we use not only aggregate data, but also sub-samples by lending rate types and type of borrowers. This is rather relevant due to the heterogeneity in interest rate types, as illustrated in Table 1 and Figs. 1 and 2. The overall sample comprises all types except credit card revolving and advances on exchange contracts (ACC). There is a structural break in the former [14] and the funding of the latter comes from the foreign market, whose interest rate is not affected by the domestic monetary policy.[15] Sub-samples by household (HH) and non-financial corporation (NFC) loans also do not include these types. In addition to the overall sample and two sub-samples, we also estimate panels for each one of the 23 lending rate types across all financial institutions. Considering the fact that we estimate the pass-through for both observed and expected Over-Selic rates, there are 52 panels in total in the empirical analysis. The baseline model is:

$$LendingRate_{m,i,t} = \alpha + \beta BaseRate_{i,t} + C_t\delta + \varepsilon_{m,i,t} \quad (1)$$

where $LendingRate_{m,i,t}$ is the lending rate of type m and financial institution i during time t, $BaseRate_{i,t}$ is the explanatory variable (either observed or expected Over-Selic rate), C_t is a row vector of control variables, and $\varepsilon_{m,i,t}$ is the compound error term. Let's define $A \equiv \left[Inflation_t^e \quad EMBI_t\right]$, where $Inflation_t^e$ is the 12-months-ahead expected inflation rate and $EMBI_t$ is the EMBI+ Brazil index, used as a proxy for risk perception.[16] We have $C_t = A$, except for two sub-samples. First, $C_t = \left[A \quad D(CC)_t \quad BaseRate_{i,t} \times D(CC)_t\right]$ for Credit card revolving, where $D(CC)_t$ is a dummy variable for the structural change in the rules of this loan type. $D(CC)_t$ accounts for the change in level while $BaseRate_{i,t} \times D(CC)_t$ for the change in slope or in the pass-through coefficient. Second, $C_t = [A \quad Libor_t]$ for ACC, where $Libor_t$ is the US dollar Libor rate. Since ACC funding comes from the foreign market, we

[14] National Monetary Council Resolution 4549 of 2017 (http://www.bcb.gov.br/pre/normativos/busca/downloadNormativo.asp?arquivo=/Lists/Normativos/Attachments/50330/Res_4549_v1_O.pdf) states that the outstanding balance in the credit card invoice, once not completely paid at the due date, may be financed by revolving credit only until the next invoice. This measure led consumers to settle down the debt in full, to pay it in instalments, or to seek more advantageous credit sources for financing the debt. The new rule has become effective in April 3, 2017.

[15] Advances on exchange contracts is a credit type directed at foreign trade, mainly to advance funds to exporters before payment by importers. Financial institutions that offer this type of credit line obtain funds from abroad and charge interest rates indexed to credit costs in the international markets. As stated earlier, it is included as a placebo in the analysis by loan rate type because no pass-through should be observed from the domestic interest rates.

[16] We do not control for credit risk because this information is confidential and not released by loan type and financial institution. The Central Bank of Brazil computes loan ratings and borrower ratings for every new loan in the credit registry system (SCR). However, the SCR is strictly confidential and subject to specific rules and special authorization to be accessed. We only had access to monthly default rates for some loan types that did not match our weekly-basis sample. While controlling for credit risk of loan operations is relevant to explain interest rate margins (or spread), this might also be the case in the estimation of the degree of pass-through. However, the correlation between the credit risk by loan type and the Over-Selic rate (observed and expected) might not be strong enough to bias the pass-through estimates, an issue that deserves further investigation depending on data availability.

consider the US dollar Libor rate as a proxy for the foreign funding cost. We assume the one-way error component model for the compound disturbance:

$$\varepsilon_{m,i,t} = \mu_{m,i} + \gamma_t + \nu_{m,i,t} \tag{2}$$

where $\mu_{m,i}$ is the unobservable type–financial institution specific effect, γ_t is the unobservable time fixed effect, and $\nu_{m,i,t}$ is the aggregate time varying disturbance.

Coefficients α and β are scalars while δ is a column vector. The explanatory variable $BaseRate_{i,t}$ is either the Over-Selic rate ($Selic_t$) or the identified expectations of the Over-Selic rate ($Expec_{i,t}$). Sub-index i is ineffective for the observed Over-Selic rate because it varies over time but not across financial institutions. The expected Over-Selic rate, however, is identified by financial institutions (professional forecasters) and so varies in both dimensions, i and t. The coefficient of primary interest is β. We should have $\beta > 1$ for over-proportional interest rate pass-through. In case $\beta = 0$, there is no pass-through, while $0 < \beta < 1$ and $\beta = 1$ means incomplete and full pass-through, respectively.[17]

We assume that $\mu_{m,i}$ is the loan-type and financial-institution fixed effects. Hausman's and other specification tests might be used to check the alternative specifications of fixed-effects, random effects and pooled sample. We found evidence in favor of the consistent generalized least squares (GLS) estimator for the aggregate samples and 17 lending rate types. Nevertheless, instead of using different specifications, we choose to apply the fixed-effects estimator for the overall sample and all sub-samples. We prefer to lose efficiency, but get consistent estimators under eventual correlation between explanatory variables and the unobserved time-invariant component of the error term, $\mu_{m,i}$.[18]

The constraint $\sum_{m,i} \mu_{m,i} = 0$ is applied to compute the overall intercept, α, meaning that it makes the weighted average of fixed effects null. This condition equalizes the averages of the observed and fitted values, leaving the remaining fixed effects as deviations from the estimated lending rates. Additionally, under this constraint, the fixed-effects estimator, although less efficient, becomes adequate for estimating the random-effects model as well. The intercept, α, represents a constant average bank margin—or mark up, or interest rate spread—over the reference rate (e.g., Gregor et al. 2021; Banerjee et al. 2013). It is an average margin independent from the monetary policy upon the risk-free interest rate, the Over-Selic rate. It will also be computed as an expected average margin upon the expected Over-Selic rate identified by financial institutions.

We apply a robust variance-covariance matrix given by the Huber/White/sandwich estimator for within-groups, which is heteroskedasticity and serial correlation con-

[17] Kopecky and Hoose (2012) developed a dynamic adjustment cost model with imperfect competition where bank retail deposit and loan rates depend on own lagged values and on lagged, current, and expected future values of the security rate, but without providing further empirical evidence. The problem with applying this framework is that the observed Over-Selic rate varies only over time and is highly correlated with the expected rate, which changes over time and by financial institutions. This prevented us from including both observed and expected Over-Selic rates in a unique panel-data pass-through regression. The results were meaningless and are available from the authors upon request.

[18] In a robustness check, we applied the random effects specifications to all regressions and there was no significant change in the results, which are available from the authors upon request.

sistent according to Arellano (1987). Standard errors are clustered by loan types and financial institutions in the aggregate samples and by financial institutions in the subsamples.

3.2 Asymmetric pass-through

In order to test for asymmetric responses of the loan interest rates to changes in the Over-Selic rate or expected Over-Selic rate, we estimate the following model:

$$\begin{aligned} LendingRate_{m,i,t} = {} & \alpha + \beta BaseRate_{i,t} \\ & + \theta^{-}\left(BaseRate_{i,t} \times D(\Delta BaseRate < 0)_{i,t}\right) \\ & + \theta^{+}\left(BaseRate_{i,t} \times D(\Delta BaseRate > 0)_{i,t}\right) \\ & + \gamma^{-} D(\Delta BaseRate < 0)_{i,t} \\ & + \gamma^{+} D(\Delta BaseRate > 0)_{i,t} \\ & + C_t \delta + \varepsilon_{m,i,t} \end{aligned} \tag{3}$$

where $D(\Delta BaseRate < 0)_{i,t}$ and $D(\Delta BaseRate > 0)_{i,t}$ are dummy variables that assume values equal to 1 in the following cases (and zero otherwise): $D(\Delta Selic < 0)_t = 1$ for negative variation in the Selic rate, $D(\Delta Expec < 0)_{i,t} = 1$ for negative variation in the expected Selic rate, $D(\Delta Selic > 0)_t = 1$ for positive variation in the Selic rate, $D(\Delta Expec > 0)_{i,t} = 1$ for positive variation in the expected Selic rate. The compound error term, $\varepsilon_{m,i,t}$, follows the same specification described in Eq. (2). We are interested in θ^{-} and θ^{+}, which capture the differentials in the pass-through coefficient due to decreases and increases in the Selic rate or the expected Selic rate, respectively. Differentials in the level of the loan interest rates are measured by γ^{-} and γ^{+}, and are included in the model to avoid bias in the estimated asymmetry coefficients. We cannot reject the hypothesis of positively asymmetric pass-through when either $\theta^{+} > 0$, $\theta^{-} < 0$, or $\theta^{+} > 0$ and $\theta^{-} < 0$ simultaneously. In case $\theta^{+} < 0$ and $\theta^{-} > 0$, either simultaneously or independently, then there is evidence of negatively asymmetric pass-through.

4 Results

4.1 Baseline interest rate pass-through

We first estimate the baseline model for the overall sample and the HH and NFC subsamples, whose results are reported in Table 3. Confidence intervals for the coefficients of $Selic_t$ and $Expec_{i,t}$ indicate the existence of over-proportional pass-through in all panels, with similar responses in the HH and NFC loan interest rates. The confidence intervals also suggest that the pass-through from the observed and expected policy interest rates to the loan rates are analogous in all samples. A remarkable difference, however, is the interest rate margins, α, which are clearly higher for HH loans.

Table 3 Interest rate pass-through

Type	Pass-through (β)	Interest rate margin (α)	Selic
Overall (1)	1.77***	55.1***	OBS
	(1.36, 2.18)	(47.9, 62.3)	
Overall (2)	1.80***	57.0***	EXP
	(1.37, 2.23)	(49.7, 64.3)	
Households (3)	1.78***	74.3***	OBS
	(1.07, 2.50)	(63.1, 85.5)	
Households (4)	1.79***	76.2***	EXP
	(1.04, 2.54)	(64.9, 87.5)	
Non-financial corporations (5)	1.76***	38.1***	OBS
	(1.33, 2.20)	(29.1, 47.1)	
Non-financial corporations (6)	1.82***	40.0***	EXP
	(1.37, 2.27)	(30.8, 49.3)	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. 95% confidence interval in parentheses. Estimated with fixed effects. All regressions are controlled by expected inflation and EMBI. OBS indicates that the explanatory variable in the regression is Selic_t while EXP indicates that the explanatory variable is Expec_{it}

However, these apparently strong results should be interpreted with caution because of the wide heterogeneity in interest rate loan types in the overall sample as well in the HH and NFC sub-samples, as illustrated earlier. The disaggregation of the overall sample by HH and NFC sub-samples did not affect the degree of pass-through as the heterogeneity in the loan types is still high within each borrower category.

Table 4 increases the disaggregation and reports estimates by interest rate types. For HH interest rate types, there is no pass-through from both observed and expected Over-Selic only for the Credit card financing rate (panels 1 and 2). Two types—Credit card revolving rate (3 and 4) and Personal credit rate (17 and 18)—revealed significant β for the Selic rate, but not for the expected Selic rate. For all remaining interest rate types, however, there is evidence of pass-through at the 95% confidence level from both observed and expected Selic rates.

The estimated confidence intervals indicate incomplete pass-through for three types—Payroll-deducted loans to public sector employees (13 and 14), Payroll-deducted loans to retirees (15 and 16), and Vehicle financing (19 and 20)—and full pass-through for four other types—Discount of checks (5 and 6), Other goods financing (7 and 8), Payroll-deducted loans to private sector employees (11 and 12), and Personal credit (17). One type—Vehicle leasing (21 and 22)—shows incomplete pass-through from the Selic rate, but full pass-through from the expected Selic rate. An interesting result is that, for Credit card revolving (3) and Overdraft (9 and 10), there is evidence of over-proportional pass-through, similarly to the estimates for the overall, HH and NFC samples reported in Table 3. Credit card revolving and Overdraft are the most expensive credit lines and have the highest margins in the sample, suggesting that the over-proportional pass-through was not found merely by chance.

Table 4 Interest rate pass-through by loan types

Households				*Non-financial corporations*			
Type	Pass-through (β)	Interest rate $margin(\alpha)$	Selic	Type	Pass-through (β)	Interest rate $margin(\alpha)$	Selic
CC financing (1)	2.44	151.8***	OBS	ACC (1)	0.00	3.4***	OBS
	(−0.53, 5.40)	(115.5, 188.2)			(−0.05, 0.06)	(2.3, 4.4)	
CC financing (2)	2.41	154.0***	EXP	ACC (2)	−0.02	3.6***	EXP
	(−0.69, 5.50)	(119.9, 188.2)			(−0.07, 0.03)	(2.5, 4.7)	
CC revolving (3)	17.07***	361.6***	OBS	Discount-CC bills (3)	2.96***	8.3	OBS
	(8.03, 26.11)	(236.1, 487.0)			(2.23, 3.69)	(−8.4, 25.0)	
CC revolving (4)	7.14*	499.1***	EXP	Discount-CC bills (4)	3.07***	11.6*	EXP
	(−0.15, 14.42)	(369.9, 628.3)			(2.21, 3.92)	(−4.2, 27.3)	
Discount-checks (5)	1.31***	42.9***	OBS	Discount-checks (5)	1.38***	31.4***	OBS
	(0.63, 1.98)	(35.4, 50.4)			(1.22, 1.54)	(25.0, 37.8)	
Discount-checks (6)	1.44***	44.5***	EXP	Discount-checks (6)	1.40***	32.8***	EXP
	(0.65, 2.24)	(37.9, 51.1)			(1.22, 1.58)	(26.5, 39.1)	
Other goods financing (7)	1.82***	51.4***	OBS	Discount-trade bills (7)	1.66***	11.2***	OBS
	(0.72, 2.91)	(36.0, 66.8)			(1.17, 2.15)	(4.5, 18.0)	
Other goods financing (8)	1.59***	52.4***	EXP	Discount-trade bills (8)	1.69***	13.0***	EXP
	(0.68, 2.50)	(38.0, 66.8)			(1.16, 2.21)	(6.5, 19.5)	
Overdraft (9)	6.34***	312.9***	OBS	Guaranteed overdraft (9)	2.34**	45.4***	OBS
	(3.18, 9.49)	(276.3, 349.4)			(0.49, 4.19)	(33.6, 57.3)	
Overdraft (10)	6.81***	321.3***	EXP	Guaranteed overdraft (10)	2.28**	47.6***	EXP
	(3.55, 10.08)	(283.2, 359.4)			(0.41, 4.14)	(36.4, 58.8)	

Table 4 continued

Households				*Non-financial corporations*			
Type	Pass-through (β)	Interest rate $margin(\alpha)$	Selic	Type	Pass-through (β)	Interest rate $margin(\alpha)$	Selic
Payroll-deducted (11)	0.85***	34.8***	OBS	Guaranteed overdraft (11)	1.00***	12.8***	OBS
- Private	(0.54, 1.16)	(32.0, 37.5)		(Float)	(0.81, 1.19)	(9.8, 15.8)	
Payroll-deducted (12)	0.86***	35.7***	EXP	Guaranteed overdraft (12)	1.03***	14.0***	EXP
- Private	(0.52, 1.19)	(32.9, 38.6)		(Float)	(0.84, 1.22)	(11.1, 16.9)	
Payroll-deducted (13)	0.65***	22.1***	OBS	Overdraft (13)	7.13***	295.1***	OBS
- Public	(0.47, 0.82)	(19.9, 24.4)			(4.24, 10.02)	(223.0, 367.1)	
Payroll-deducted (14)	0.64***	22.8***	EXP	Overdraft (14)	7.34***	303.0***	EXP
- Public	(0.45, 0.83)	(20.6, 24.9)			(4.30, 10.38)	(229.2, 376.9)	
Payroll-deducted (15)	0.59***	23.4***	OBS	Vendor (15)	0.82***	10.7***	OBS
- Retirees	(0.48, 0.70)	(22.0, 24.8)			(0.62, 1.02)	(7.4, 13.9)	
Payroll-deducted (16)	0.59***	24.1***	EXP	Vendor (16)	0.83***	11.5***	EXP
- Retirees	(0.48, 0.71)	(22.7, 25.4)			(0.61, 1.05)	(8.5, 14.5)	
Personal credit (17)	2.53**	75.4***	OBS	Working capital (17)	1.21***	17.0***	OBS
	(0.09, 4.98)	(36.8, 113.9)		~365	(0.84, 1.58)	(9.3, 24.7)	
Personal credit (18)	2.43*	77.8***	EXP	Working capital (18)	1.26***	18.4***	EXP
	(−0.25, 5.11)	(41.7, 113.9)		~365	(0.87, 1.64)	(10.9, 25.8)	
Vehicle financing (19)	0.66***	17.7***	OBS	Working capital (19)	0.90***	6.2***	OBS
	(0.49, 0.83)	(15.7, 19.7)		~365 (Float)	(0.77, 1.03)	(4.5, 8.0)	
Vehicle financing (20)	0.69***	18.4***	EXP	Working capital (20)	0.96***	7.4***	EXP
	(0.51, 0.87)	(16.4, 20.4)		~365 (Float)	(0.82, 1.11)	(5.7, 9.1)	
Vehicle leasing (21)	0.61***	13.8***	OBS	Working capital (21)	1.12***	10.6***	OBS

Table 4 continued

Households				*Non-financial corporations*			
Type	Pass-through (β)	Interest rate $margin(\alpha)$	Selic	Type	Pass-through (β)	Interest rate $margin(\alpha)$	Selic
	(0.29, 0.93)	(7.6, 19.9)		365∼	(0.77, 1.47)	(4.6, 16.6)	
Vehicle leasing (22)	0.65***	14.5***	EXP	Working capital (22)	1.20***	12.0***	EXP
	(0.28, 1.02)	(8.7, 20.3)		365∼	(0.81, 1.59)	(6.3, 17.7)	
				Working capital (23)	0.74***	5.1***	OBS
				365∼ (Float)	(0.52, 0.95)	(3.8, 6.4)	
				Working capital (24)	0.78***	6.0***	EXP
				365∼ (Float)	(0.56, 1.01)	(4.6, 7.5)	

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$. 95% confidence interval in parentheses. Estimated with fixed effects. CC is for credit cards and ACC is for advances on exchange contracts. All regressions are controlled by expected inflation and EMBI. CC revolving is also controlled by the structural change in the rules of this loan type, and ACC is also controlled by the Libor rate. OBS indicates that the explanatory variable in the regression is Selic_t, while EXP indicates that the explanatory variable is Expec_{it}

Estimated pass-through from the expected Selic rate (even-numbered panels), in general, confirms the findings from the observed Selic rate (odd-numbered panels), and the degrees of pass-through are very similar when changing between them for a given loan type. The only exception is Credit card revolving rate (3 and 4), where the pass-through for the expected Selic rate was not statistically significant at the 5% level. One possible explanation is a potential structural break resulting from the legal change in the Credit card revolving rules. This legal change was announced some months before the effective implementation, allowing for the financial institutions and borrowers to adjust behaviors in advance.

Results for NFC are even more homogeneous. Estimated pass-through coefficients are statistically significant for all types, except for Advances on exchange contracts (panels 1 and 2) as expected because it was used as a placebo.[19] There is over-proportional pass-through for the following types: Discount of credit card bills (3 and 4), Discount of checks (5 and 6), Discount of trade bills (7 and 8), and Overdraft (13 and 14). Not a coincidence, the highest interest rate margin is coupled with the highest degree of over-proportional pass-through for the Overdraft type under both observed and expected Selic rate. For the other NFC types, the pass-through is complete for both observed and expected Selic rates. The only exceptions are Working capital over 365 days and floating rate (23 and 24), which showed incomplete pass-through under the observed Selic rate.

Similarly to the HH results, the NFC types with higher loan interest rates also revealed less rigidity and over-proportional pass-through. The top five most expensive types, considering the average interest rates, also presented the highest pass-through coefficients. Among them, only for Guaranteed overdraft fixed rates (9 and 10) there is evidence of full, but not over-proportional, pass-through. Similarly to the HH types, the estimated degrees of pass-through are very similar for both observed and expected Selic rates, indicating that financial institutions successfully forecasts the next target level of the Over-Selic rate and adjust in advance their lending interest rates.

The interest rate margins, α, are positive and well dispersed across the loan types. It is not statistically significant only for Discount of credit card bills of NFC. There is a striking pattern of positive correlation between the margins and the degrees of pass-through, as reported in Fig. 4. The correlations are very strong, irrespective of the borrower category (HH or NFC) or Selic rate (observed or expected). The positive slopes of the fitted regressions illustrate that types with the highest margins also present over-proportional degrees of pass-through. While the margins in Fig. 4 might be correlated with the risk levels by loan and borrower types, the degree of pass-through is bigger for loans with higher interest rate margins. There are other factors that might affect margins, such as operating, administrative and taxing costs, but banks claim that the credit risk is a key component of the interest rate spread.[20]

[19] As explained earlier, funding for this type comes from abroad and is not related to the domestic interest rates.

[20] The Central Bank of Brazil Banking Report 2018 brings a decomposition of the average cost of outstanding loans in which delinquency—losses arising from non-payment of debts or interest and discounts granted—represented 23% of the total cost and 37% of the spread in the last three years. The report is available at https://www.bcb.gov.br/content/publications/bankingreport/BAR_2018.pdf.

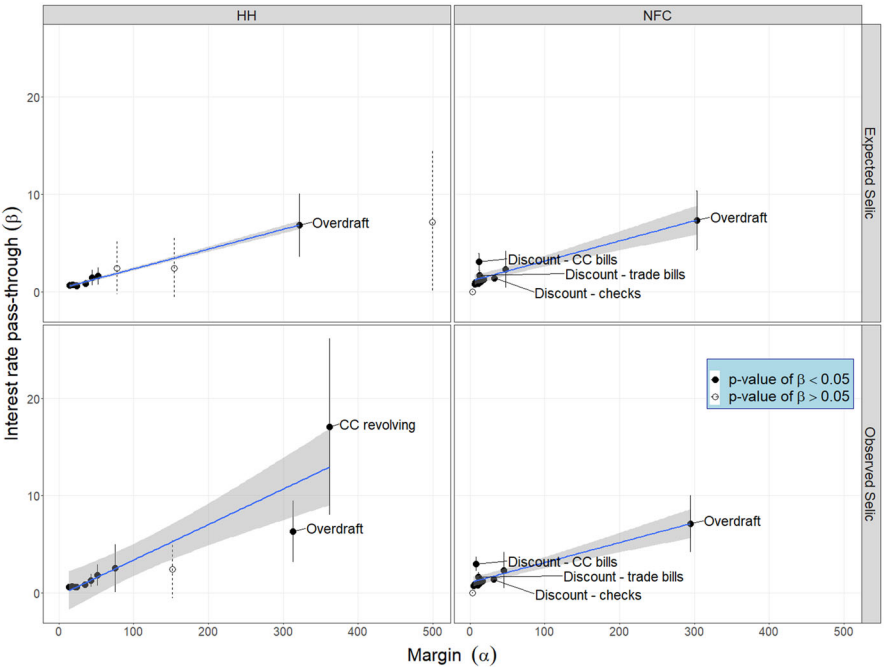

Fig. 4 Interest rate margins and degrees of pass-through for both observed and expected Selic rates. *Notes*: The figure reports the margins (α) and the degrees of pass-through (β) by type of borrower (HH and NFC) and policy rate (observed and expected Selic). Filled dots are for statistically significant β, while open dots are for non-statistically significant β. Vertical bars represent the 95% confidence interval for β. Shaded areas are the 95% confidence interval for predictions by a linear model with significant β's. Modalities with over-proportional pass-through are highlighted with their type of loans

It is worth highlighting that the heterogeneity in lending rates shall be taken into account when assessing the pass-through from the observed or expected policy rates. Loan types with higher rates and margins appear to show lower stickiness and over-proportional degrees of pass-through. The prevalence of full and over-proportional pass-through differs from previous findings by Holton and d'Acri (2018) and Hristov et al. (2014), but is in line with Coelho et al. (2010), who accounted for the concentration in the Brazilian banking system.

4.2 Asymmetric interest rate pass-through

We estimate Eq. (3) to evaluate asymmetry in the interest rate pass-through, and the results are reported in Table 5. The estimates of θ^- and θ^+ measure the asymmetric effects of changes in the observed or expected Selic rates on the degree of pass-through for distinct lending rates. They are not statistically significant for the HH sub-sample, but θ^- is negative and statistically significant for the overall sample and NFC sub-sample, meaning lower pass-through under decreases in the policy rates. On the contrary, none of the estimates for θ^+ is statistically significant. HH and NFC

Table 5 Asymmetric interest rate pass-through

Type	Pass-through (β)	Asymmetry (θ^-)	Asymmetry (θ^+)	Selic
Overall (1)	1.80***	−0.24**	−0.19	OBS
	(1.39, 2.22)	(−0.44, −0.03)	(−0.50, 0.12)	
Overall (2)	1.84***	−0.30**	−0.13	EXP
	(1.41, 2.28)	(−0.54, −0.06)	(−0.33, 0.07)	
Households (3)	1.82***	−0.22	−0.22	OBS
	(1.09, 2.54)	(−0.56, 0.13)	(−0.87, 0.43)	
Households (4)	1.83***	−0.21	−0.12	EXP
	(1.08, 2.59)	(−0.65, 0.23)	(−0.51, 0.27)	
Non-financial corporations (5)	1.80***	−0.28**	−0.13	OBS
	(1.35, 2.24)	(−0.51, −0.04)	(−0.37, 0.11)	
Non-financial corporations (6)	1.86***	−0.38***	−0.11	EXP
	(1.39, 2.33)	(−0.62, −0.15)	(−0.29, 0.08)	

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$. 95% confidence interval in parentheses. Estimated with fixed effects. All regressions are controlled by expected inflation and EMBI. OBS indicates that the explanatory variable in the regression is Selic_t while EXP indicates that the explanatory variable is Expec_{it}

sub-samples have different findings, as there are significant asymmetric effects only for the latter. To account for the heterogeneity, we disaggregate the sub-samples by loan types.

For the HH sub-sample, Table 6 reveals that four types—Overdraft (panels 9 and 10), Payroll-deducted loans to public sector employees (14), Payroll-deducted loans to retirees (15 and 16), and Vehicle financing (20)—show statistically significant asymmetry for either observed or expected Selic rates. For the majority of these types, decreases in policy rate are coupled with smaller degree of pass-through when compared to increases in this rate. Only Payroll-deducted loans to retirees revealed an opposite behavior. The coefficient θ^+ is negative for credit card financing, but β is not statistically significant for this type.

There is statistically significant asymmetry for five NFC types, represented by Discount of checks (panel 6), Overdraft (13 and 14), Working capital up to 365 days and floating rate (19), Discount of credit card bills (3 and 4), and Vendor (16), as reported in Table 6. For the first three, the asymmetry is positive, while for the last two it is negative. The results are inconclusive for Discount of trade bills (7 and 8), since both θ^- and θ^+ are negative and statistically significant in the observed Selic rate regression.

In summary, out of the 23 loan types, 9 revealed asymmetric interest rate pass-through for the observed, expected or both Selic rates. Among them, there is evidence of positive asymmetry for six types. The negative estimates for θ^- or positive for θ^+ imply smaller degrees of pass-through for decreases and higher for increases in the observed or expected Selic rates, respectively. These findings are in line with the argument that higher rigidity occurs for movements in interest rates that might decrease the banks' profitability (e.g., Castro and Mello 2012; Chong 2010; Liu et al. 2008;

Table 6 Asymmetric interest rate pass-through by loan types

Households					Non-financial corporations				
Type	Pass-through (β)	Asymmetry (θ^-)	Asymmetry (θ^+)	Selic	Type	Pass-through (β)	Asymmetry (θ^-)	Asymmetry (θ^+)	Selic
CC financing (1)	2.43	0.24	−9.12***	OBS	ACC (1)	0.01	−0.06**	−0.09**	OBS
	(−0.54, 5.40)	(−0.88, 1.37)	(−13.51, −4.73)			(−0.04, 0.07)	(−0.11, −0.00)	(−0.17, −0.02)	
CC financing (2)	2.40	0.03	−1.32***	EXP	ACC (2)	−0.02	−0.03	−0.04*	EXP
	(−0.72, 5.53)	(−1.55, 1.61)	(−2.22, −0.43)			(−0.07, 0.03)	(−0.08, 0.02)	(−0.08, 0.00)	
CC revolving (3)	18.20***	0.20	−11.39*	OBS	Discount-CC bills (3)	2.98***	0.00	−0.58**	OBS
	(8.82, 27.58)	(−3.80, 4.19)	(−24.89, 2.11)			(2.25, 3.71)	(−0.50, 0.50)	(−1.02, −0.13)	
CC revolving (4)	8.08**	0.16	−2.32	EXP	Discount-CC bills (4)	3.06***	−0.05	−0.44***	EXP
	(0.38, 15.77)	(−3.50, 3.83)	(−5.94, 1.30)			(2.23, 3.90)	(−0.72, 0.63)	(−0.70, −0.17)	
Discount-checks (5)	1.28***	0.09*	0.44*	OBS	Discount-checks (5)	1.38***	−0.07	−0.01	OBS
	(0.59, 1.97)	(−0.01, 0.19)	(−0.07, 0.96)			(1.23, 1.54)	(−0.19, 0.05)	(−0.33, 0.31)	
Discount-checks (6)	1.39***	0.14*	0.16	EXP	Discount-checks (6)	1.41***	−0.19**	0.04	EXP
	(0.57, 2.21)	(−0.02, 0.31)	(−0.42, 0.75)			(1.23, 1.59)	(−0.38, −0.01)	(−0.10, 0.18)	
Other goods financing (7)	1.87***	−0.66	−0.58	OBS	Discount-trade bills (7)	1.69***	−0.31**	−0.44**	OBS
	(0.74, 3.00)	(−1.54, 0.23)	(−1.63, 0.48)			(1.21, 2.18)	(−0.57, −0.05)	(−0.86, −0.02)	
Other goods financing (8)	1.67***	−1.46	−0.36	EXP	Discount-trade bills (8)	1.70***	−0.19**	−0.10	EXP
	(0.73, 2.61)	(−3.33, 0.42)	(−1.05, 0.34)			(1.17, 2.22)	(−0.38, −0.00)	(−0.29, 0.08)	
Overdraft (9)	6.22***	−0.96	5.28***	OBS	Guaranteed overdraft (9)	2.52**	−1.64*	−1.11	OBS
	(2.91, 9.53)	(−3.14, 1.22)	(2.69, 7.86)			(0.59, 4.46)	(−3.60, 0.31)	(−2.72, 0.50)	
Overdraft (10)	7.03***	−2.18*	2.61**	EXP	Guaranteed overdraft (10)	2.33**	−0.43	−0.55	EXP
	(3.74, 10.31)	(−4.51, 0.16)	(0.42, 4.80)			(0.41, 4.25)	(−1.58, 0.72)	(−1.87, 0.76)	

Table 6 continued

Households					Non-financial corporations				
Type	Pass-through (β)	Asymmetry (θ^-)	Asymmetry (θ^+)	Selic	Type	Pass-through (β)	Asymmetry (θ^-)	Asymmetry (θ^+)	Selic
Payroll-deducted (11)	0.86***	−0.06	−0.14	OBS	Guaranteed overdraft (11)	1.00***	−0.05	−0.08	OBS
- Private	(0.56, 1.17)	(−0.27, 0.15)	(−0.50, 0.22)		(Float)	(0.81, 1.20)	(−0.19, 0.10)	(−0.33, 0.16)	
Payroll-deducted (12)	0.87***	−0.07	−0.08	EXP	Guaranteed overdraft (12)	1.03***	−0.08	−0.07	EXP
- Private	(0.52, 1.21)	(−0.26, 0.12)	(−0.25, 0.08)		(Float)	(0.84, 1.23)	(−0.23, 0.07)	(−0.22, 0.08)	
Payroll-deducted (13)	0.65***	−0.08*	−0.01	OBS	Overdraft (13)	7.32***	−2.13**	1.01	OBS
- Public	(0.47, 0.83)	(−0.16, 0.00)	(−0.19, 0.16)			(4.35, 10.29)	(−3.80, −0.47)	(−1.63, 3.65)	
Payroll-deducted (14)	0.64***	−0.13***	0.03	EXP	Overdraft (14)	7.68***	−3.52***	0.31	EXP
- Public	(0.44, 0.84)	(−0.23, −0.04)	(−0.05, 0.12)			(4.63, 10.74)	(−5.09, −1.95)	(−1.74, 2.35)	
Payroll-deducted (15)	0.60***	0.00	−0.19***	OBS	Vendor (15)	0.83***	−0.06	−0.07*	OBS
- Retirees	(0.49, 0.70)	(−0.03, 0.04)	(−0.30, −0.08)			(0.64, 1.02)	(−0.25, 0.13)	(−0.13, 0.00)	
Payroll-deducted (16)	0.59***	−0.01	−0.09**	EXP	Vendor (16)	0.83***	−0.03	−0.14***	EXP
- Retirees	(0.47, 0.71)	(−0.07, 0.05)	(−0.17, −0.01)			(0.61, 1.05)	(−0.14, 0.08)	(−0.23, −0.05)	
Personal credit (17)	2.69**	−0.53	−1.90*	OBS	Working capital (17)	1.20***	0.10	0.14	OBS
	(0.30, 5.08)	(−1.74, 0.69)	(−3.96, 0.16)		∼365	(0.82, 1.57)	(−0.20, 0.40)	(−0.25, 0.53)	
Personal credit (18)	2.41*	0.84	−0.46	EXP	Working capital (18)	1.26***	−0.14	0.05	EXP
	(−0.28, 5.09)	(−0.22, 1.90)	(−1.19, 0.28)		∼365	(0.85, 1.66)	(−0.42, 0.14)	(−0.15, 0.25)	
Vehicle financing (19)	0.65***	−0.00	0.15*	OBS	Working capital (19)	0.91***	−0.13***	0.06	OBS
	(0.48, 0.83)	(−0.09, 0.08)	(−0.02, 0.33)		∼365 (Float)	(0.77, 1.04)	(−0.21, −0.05)	(−0.02, 0.14)	
Vehicle financing (20)	0.70***	−0.11***	0.01	EXP	Working capital (20)	0.97***	−0.05	0.01	EXP
	(0.51, 0.88)	(−0.19, −0.03)	(−0.08, 0.10)		∼365 (Float)	(0.82, 1.11)	(−0.17, 0.08)	(−0.09, 0.11)	
Vehicle leasing (21)	0.61***	−0.17	0.18*	OBS	Working capital (21)	1.11***	−0.03	0.16	OBS

Table 6 continued

Households					Non-financial corporations				
Type	Pass-through (β)	Asymmetry (θ^-)	Asymmetry (θ^+)	Selic	Type	Pass-through (β)	Asymmetry (θ^-)	Asymmetry (θ^+)	Selic
	(0.28, 0.93)	(−0.40, 0.07)	(−0.02, 0.38)		365∼	(0.77, 1.46)	(−0.21, 0.16)	(−0.05, 0.37)	
Vehicle leasing (22)	0.64***	0.04	0.16	EXP	Working capital (22)	1.21***	−0.16*	0.09	EXP
	(0.27, 1.00)	(−0.22, 0.30)	(−0.08, 0.39)		365∼	(0.82, 1.60)	(−0.33, 0.00)	(−0.02, 0.19)	
					Working capital (23)	0.73***	0.06	−0.06	OBS
					365∼ (Float)	(0.51, 0.95)	(−0.08, 0.19)	(−0.20, 0.08)	
					Working capital (24)	0.78***	−0.03	−0.04	EXP
					365∼ (Float)	(0.55, 1.01)	(−0.11, 0.06)	(−0.13, 0.06)	

*p<0.1; **p<0.05; ***p<0.01. 95% confidence interval in parentheses. Estimated with fixed effects. CC is for credit cards and ACC is for advances on exchange contracts. All regressions are controlled by expected inflation and EMBI. CC revolving is also controlled by the structural change in the rules of this loan type, and ACC is also controlled by the Libor rate. OBS indicates that the explanatory variable in the regression is Selic_t, while EXP indicates that the explanatory variable is Expec_{it}

Neumark and Sharpe 1992; Hannan and Berger 1991). Despite the asymmetry in some loan types, in general, the pass-through coefficients and their confidence intervals have not significantly changed relatively to the baseline estimates, confirming the previous findings.

5 Alternative specifications and robustness checks

We examine whether the degrees of pass-through for the loan interest rates reported in Sect. 4.1 are robust to alternative model specifications. First, we control for size, ownership type and capital origin of the financial institutions. Then, we allow for persistence in the loan interest rates and consider the effects of partial adjustment in a dynamic panel data environment. We also included unobserved time-specific fixed effects to account for the possibility that unobserved macroeconomic conditions would influence the evolution of both monetary policy and lending interest rates. However, they were not statistically significant and excluded from the final estimates.

5.1 Financial-institutions specific characteristics

In the previously estimated models, we accounted for macroeconomic conditions (expected inflation, sovereign risk, foreign interest rate) and a loan-specific dummy variable to control for a structural change in credit card revolving rules. However, as discussed in Sect. 1, specific characteristics of the financial institutions might potentially affect the interest rate pass-through. Size, ownership type (private or public) and capital origin (domestic or foreign) of the financial institution are some of the specific characteristics explicitly accounted for in the estimation of the following model:

$$\begin{aligned} LendingRate_{m,i,t} = {} & \alpha + \beta BaseRate_{i,t} \\ & + \sigma \left(BaseRate_{i,t} \times D(\text{non-S1})_i \right) \\ & + \psi \left(BaseRate_{i,t} \times D(\text{Public})_i \right) \\ & + \phi \left(BaseRate_{i,t} \times D(\text{Foreign})_i \right) \\ & + C_t \delta + \varepsilon_{m,i,t}, \end{aligned} \tag{4}$$

where the dummies $D(\text{non-S1})_i$, $D(\text{Public})_i$, and $D(\text{Foreign})_i$ are equal to one for non-systemically important institutions, public-owned government institutions and foreign-controlled private institutions, respectively, and equal to zero otherwise.[21] The term $\varepsilon_{m,i,t}$ follows the one-way error component model described by Eq. (2).

[21] The Central Bank of Brazil established the S1 segmentation for proportional implementation of prudential regulation to prevent any "domino effect" in the financial system. It is composed of financial institutions with the largest market shares in addition to other features, as explained in Sect. 2. The S1 institutions (Banco do Brasil, Bradesco, BTG Pactual, Caixa Econômica Federal, Itau, and Santander) accounted for 80.45% market share in outstanding credit for households and 58.24% share in outstanding credit for non-financial corporations in a universe of 172 authorized institutions, according to the Central Bank of Brazil Banking Report from 2018 (available at https://www.bcb.gov.br/content/publications/bankingreport/BAR_2018.pdf).

Since financial-institution-specific effects, such as those captured by $D(\text{non-S1})_i$, $D(\text{Public})_i$, and $D(\text{Foreign})_i$, are already accounted for in the fixed-effects component, $\mu_{m,i}$, the inclusion of level dummies has no role in the estimation. However, their interactions with the observed and expected Selic rates measure disproportional effects from different types of financial institutions in the degree of pass-through. The estimates of β are now for systemically important (S1), private and domestic financial institutions, while the coefficients σ, ψ, and ϕ captures the differentials in the degree of pass-through for non-systemically important, public-owned, and foreign-controlled financial institutions, respectively.

The results for the complete sample and sub-samples by HH and NFC lending rates are reported in Table 7. None of the interaction coefficients between the dummy variables and either the observed or expected Selic rates was statistically significant at the 5% significance level. Therefore, the previous findings were not driven by the financial-institutions specific characteristics in the overall sample and two sub-samples.

Taking into account the heterogeneity in the loan operations, the results for the HH lending rates are reported in Table 8. In general, the previous findings by HH types are also robust to the inclusion of the new dummy variables. The non-systemically important financial institutions yield a significant differential in the degree of pass-through only for Discount of checks (panels 5 and 6), Overdraft (9) and Payroll-deducted loans to retirees (15 and 16), but with no specific pattern among these types and similar effects for both observed and expected Selic rates. For Other goods financing (7 and 8), β was not statistically significant, meaning that the non-S1 institutions might have driven the estimated pass-through in the baseline specification. On the other hand, the public-owned government banks, whenever statistically significant, yielded positive differentials for the estimated degrees of pass-through, except for Credit card revolving (3 and 4) where it was negative. This was the case for Discount of checks (5 and 6), Payroll-deducted loans to retirees (15 and 16) and Vehicles leasing (21 and 22). Finally, foreign-controlled financial institutions, except for Discount of checks (panels 5 and 6) and Vehicles leasing (21 and 22), yielded positive differentials for the pass-through whenever statistically significant. This also happened with Overdraft (9), Payroll-deducted loans to public sector employees (13 and 14), and Payroll-deducted loans to retirees (15 and 16). Interesting to notice that these differentials are very similar for either the observed or expected Selic rates in the regressions, confirming that financial institutions correctly anticipated the next target level of the policy interest rate regardless of their specific characteristics.

For the NFC loan types, the results reported in Table 9 are even more stronger, in the sense that the baseline results were basically kept unchanged. The new estimates confirmed that all loan types, except Advances on exchange contracts (1 and 2), experienced a full or over-proportional pass-through in all alternative specifications. Advances on exchange contracts is the placebo and should not have any pass-through, as expected. For systemically important, private and domestic financial institutions, the over-proportional pass-through was confirmed for Discount of credit card bills (3 and 4), Discount of checks (5 and 6), Discount of trade bills (7 and 8), and Overdraft (13 and 14). For these institutions, full pass-through held in place for all remaining

Table 7 Pass-through controlling for size and ownership of the financial institutions

Type	Pass-through (β)	Size (σ)	Ownership (ψ)	Origin (ϕ)	Selic
Overall (1)	1.79***	−0.06	0.03	−0.02	OBS
	(1.12, 2.46)	(−0.68, 0.56)	(−0.79, 0.86)	(−0.74, 0.69)	
Overall (2)	1.83***	0.04	−0.20	0.01	EXP
	(1.16, 2.50)	(−0.55, 0.63)	(−0.98, 0.59)	(−0.66, 0.67)	
Households (3)	1.49***	0.43	0.14	0.55	OBS
	(0.40, 2.58)	(−0.81, 1.68)	(−1.34, 1.62)	(−0.93, 2.03)	
Households (4)	1.55***	0.47	−0.13	0.57	EXP
	(0.45, 2.66)	(−0.70, 1.65)	(−1.56, 1.30)	(−0.80, 1.94)	
Non-financial corporations (5)	2.19***	−0.54*	−0.17	−0.41	OBS
	(1.46, 2.92)	(−1.15, 0.08)	(−0.86, 0.53)	(−1.11, 0.28)	
Non-financial corporations (6)	2.22***	−0.41	−0.35	−0.39	EXP
	(1.51, 2.93)	(−0.98, 0.16)	(−0.98, 0.27)	(−1.02, 0.23)	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. 95% confidence interval in parentheses. Estimated with fixed effects. All regressions are controlled by expected inflation and EMBI. OBS indicates that the explanatory variable in the regression is Selic_t, while EXP indicates that the explanatory variable is Expec_{it}

Table 8 Pass-through for HH loans controlling for size and ownership of the financial institutions

Type	Pass-through (β)	Size (σ)	Ownership (ψ)	Origin (ϕ)	Selic
CC financing (1)	1.80	4.84	−5.59	3.30	OBS
	(−1.81, 5.40)	(−1.13, 10.81)	(−12.50, 1.31)	(−0.70, 7.29)	
CC financing (2)	1.85	4.80	−6.04*	3.01	EXP
	(−1.70, 5.41)	(−0.94, 10.54)	(−12.71, 0.64)	(−1.03, 7.06)	
CC revolving (3)	24.28***	−7.99	−16.47***	−11.85	OBS
	(13.59, 34.97)	(−19.15, 3.17)	(−28.90, −4.05)	(−32.68, 8.98)	
CC revolving (4)	15.06***	−7.57	−17.00***	−10.89	EXP
	(5.98, 24.14)	(−18.37, 3.24)	(−29.27, −4.73)	(−31.25, 9.46)	
Discount-checks (5)	1.37***	−2.10***	0.89***	−0.22***	OBS
	(1.23, 1.52)	(−2.26, −1.94)	(0.87, 0.91)	(−0.25, −0.18)	
Discount-checks (6)	1.54***	−2.11***	0.88***	−0.30***	EXP
	(1.40, 1.68)	(−2.22, −2.00)	(0.86, 0.90)	(−0.35, −0.26)	
Other goods financing (7)	1.20	2.18***	0.03	0.15	OBS
	(−0.25, 2.66)	(1.33, 3.03)	(−1.28, 1.33)	(−1.61, 1.92)	
Other goods financing (8)	1.12	2.33***	−0.46	0.09	EXP
	(−0.28, 2.52)	(1.49, 3.18)	(−1.92, 1.00)	(−1.71, 1.89)	
Overdraft (9)	7.38***	−4.67**	1.74	4.23**	OBS
	(3.49, 11.28)	(−8.96, −0.37)	(−2.69, 6.17)	(0.13, 8.33)	
Overdraft (10)	7.91***	−3.91*	0.81	3.30*	EXP
	(3.85, 11.98)	(−8.05, 0.23)	(−3.49, 5.11)	(−0.32, 6.92)	
Payroll-deducted (11)	0.80***	−0.06	0.56*	−0.46	OBS
- Private	(0.43, 1.17)	(−0.50, 0.39)	(−0.06, 1.18)	(−1.15, 0.23)	
Payroll-deducted (12)	0.78***	0.02	0.53*	−0.44	EXP
- Private	(0.43, 1.13)	(−0.41, 0.45)	(−0.05, 1.10)	(−1.12, 0.23)	

Table 8 continued

Type	Pass-through (β)	Size (σ)	Ownership (ψ)	Origin (ϕ)	Selic
Payroll-deducted (13)	0.43***	0.12	0.34	0.37***	OBS
- Public	(0.15, 0.70)	(−0.19, 0.43)	(−0.10, 0.79)	(0.16, 0.59)	
Payroll-deducted (14)	0.43***	0.11	0.32	0.37***	EXP
- Public	(0.16, 0.69)	(−0.21, 0.43)	(−0.15, 0.80)	(0.16, 0.58)	
Payroll-deducted (15)	0.41***	0.12**	0.41***	0.24***	OBS
- Retirees	(0.30, 0.52)	(0.01, 0.23)	(0.30, 0.53)	(0.11, 0.37)	
Payroll-deducted (16)	0.42***	0.12**	0.40***	0.25***	EXP
- Retirees	(0.30, 0.53)	(0.01, 0.22)	(0.27, 0.54)	(0.13, 0.36)	
Personal credit (17)	3.40	−1.64	0.39	−1.77	OBS
	(−1.43, 8.23)	(−5.91, 2.63)	(−3.88, 4.66)	(−5.65, 2.10)	
Personal credit (18)	3.24	−1.53	0.26	−1.43	EXP
	(−1.91, 8.39)	(−6.05, 2.99)	(−4.14, 4.67)	(−5.52, 2.65)	
Vehicle financing (19)	0.68***	0.05	0.06	−0.14	OBS
	(0.40, 0.95)	(−0.21, 0.30)	(−0.28, 0.39)	(−0.58, 0.30)	
Vehicle financing (20)	0.71***	0.04	0.02	−0.11	EXP
	(0.42, 0.99)	(−0.22, 0.30)	(−0.33, 0.38)	(−0.54, 0.31)	
Vehicle leasing (21)	0.85***	0.03	0.43***	−0.66***	OBS
	(0.50, 1.19)	(−0.25, 0.32)	(0.23, 0.62)	(−0.99, −0.32)	
Vehicle leasing (22)	0.90***	0.01	0.39***	−0.69***	EXP
	(0.53, 1.27)	(−0.28, 0.31)	(0.26, 0.52)	(−1.05, −0.33)	

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$. 95% confidence interval in parentheses. Estimated with fixed effects. All regressions are controlled by expected inflation and EMBI. CC revolving is also controlled by the structural change in the rules of this loan type. OBS indicates that the explanatory variable in the regression is Selic_t while EXP indicates that the explanatory variable is Expec_{it}

loan types. Overall, these findings are basically the same for either the observed or expected Over-Selic rates.

The differential for non-systemically important financial institutions is statistically significant only for Discount of credit card bills (3 and 4) and Discount of trade bills (7 and 8). The public-owned government banks differential is not significant for any of the NFC types, except Overdraft (14) in the expected Selic regression. The foreign-controlled financial institutions yielded significant differentials only for Discount of credit card bills (3 and 4) and Discount of checks (5 and 6). In all these cases, the pass-through differentials are basically the same for both the observed and expected Selic rates. Notice that, in addition of being negative, all statistically significant differentials are for types with over-proportional pass-through.

Despite some statistically significant pass-through differentials, the major findings remained unchanged. However, the negative differentials for NFC loan types indicate that over-proportional pass-through from the baseline estimates might have been driven by S1, private and domestic financial institutions. The first two characteristics are related to market power, market concentration and political interference, which might help to explain the high degrees pass-through according to the discussion in Sect. 5.3.

5.2 Persistence in the lending rates

In order to investigate how potential inertia in the lending rates might affect the interest rate pass-through, we estimate the following dynamic panel-data specification:

$$LendingRate_{m,i,t} = \rho LendingRate_{m,i,t-1} + (1-\rho)[\alpha + \beta BaseRate_{i,t} + C_t\delta] + \varepsilon_{m,i,t} \quad (5)$$

where $0 < \rho < 1$ measures the persistence in the lending rates. The other variables and parameters follow the previous definitions. In this set up, $(1-\rho)\beta$ measures the short-run pass-through while β accounts for the long-run interest rate pass-through. Thus, in the estimation of Eq. (5), we have to identify β in order to compare it with the previous static estimates.

In the case of dynamic panels, it is well known that the fixed-effects estimator is inconsistent for typical applications in microeconomic data where there are few time periods and a large number of individuals (here, financial institutions). The estimator bias is caused by correlation between the lagged dependent variable and the unobserved specific heterogeneity. However, the current dataset does not fit this profile because it has a large number of time periods and relatively fewer individuals. Then, correlation induced by the Within transformation vanishes and the fixed-effects estimator becomes consistent according to Bond (2002). Additionally, the Least Squares Dummy Variable estimator generally has the lowest residual mean square error (RMSE) when compared to alternative methods usually applied to dynamic panels, as pointed out by Judson and Owen (1999).[22]

[22] We also applied the traditional Arellano and Bond (1991) estimator, but the coefficient of the lagged dependent variable did not lie within the bounds defined by the OLS and Within estimators, indicating that these estimates are not reliable according to Bond (2002) and Roodman (2009). Another practical issue is

Table 9 Pass-through for NFC loans controlling for size and ownership of the financial institutions

Type	Pass-through (β)	Size (σ)	Ownership (ψ)	Origin (ϕ)	Selic
ACC (1)	0.01	−0.02	−0.05	0.05	OBS
	(−0.07, 0.09)	(−0.12, 0.07)	(−0.18, 0.08)	(−0.06, 0.17)	
ACC (2)	−0.01	−0.03	−0.06	0.06	EXP
	(−0.10, 0.07)	(−0.12, 0.06)	(−0.18, 0.07)	(−0.05, 0.16)	
Discount-CC bills (3)	3.76***	−2.08***	−0.44	−1.70***	OBS
	(2.83, 4.68)	(−3.28, −0.89)	(−1.47, 0.59)	(−2.72, −0.68)	
Discount-CC bills (4)	3.92***	−2.19***	−0.59	−1.88***	EXP
	(2.81, 5.04)	(−3.52, −0.86)	(−1.75, 0.57)	(−3.04, −0.72)	
Discount-checks (5)	1.60***	−0.15	−0.27*	−0.52***	OBS
	(1.48, 1.72)	(−0.40, 0.09)	(−0.57, 0.03)	(−0.63, −0.42)	
Discount-checks (6)	1.64***	−0.15	−0.32*	−0.50***	EXP
	(1.48, 1.79)	(−0.45, 0.15)	(−0.71, 0.06)	(−0.66, −0.34)	
Discount-trade bills (7)	2.34***	−1.28***	0.28	0.09	OBS
	(1.77, 2.90)	(−1.76, −0.80)	(−0.20, 0.76)	(−0.44, 0.61)	
Discount-trade bills (8)	2.38***	−1.28***	0.14	0.12	EXP
	(1.80, 2.96)	(−1.77, −0.79)	(−0.32, 0.61)	(−0.43, 0.66)	
Guaranteed overdraft (9)	2.04**	0.70	−0.74	0.75	OBS
	(0.25, 3.84)	(−1.81, 3.21)	(−3.03, 1.56)	(−1.33, 2.83)	
Guaranteed overdraft (10)	2.07**	0.58	−0.71	0.59	EXP
	(0.23, 3.91)	(−1.80, 2.95)	(−2.85, 1.43)	(−1.38, 2.56)	

Table 9 continued

Type	Pass-through (β)	Size (σ)	Ownership (ψ)	Origin (ϕ)	Selic
Guaranteed overdraft (11)	1.04***	0.10	−0.09	−0.20	OBS
(Float)	(0.66, 1.42)	(−0.40, 0.61)	(−0.59, 0.42)	(−0.69, 0.29)	
Guaranteed overdraft (12)	1.07***	0.13	−0.12	−0.20	EXP
(Float)	(0.70, 1.43)	(−0.35, 0.60)	(−0.62, 0.38)	(−0.66, 0.26)	
Overdraft (13)	9.25***	−0.11	−3.84*	−3.73	OBS
	(5.24, 13.27)	(−4.08, 3.87)	(−7.92, 0.23)	(−8.25, 0.80)	
Overdraft (14)	9.03***	1.04	−4.45**	−3.15	EXP
	(4.84, 13.22)	(−2.94, 5.02)	(−8.40, −0.49)	(−7.77, 1.46)	
Vendor (15)	0.95***	−0.14	−0.10	−0.18	OBS
	(0.73, 1.17)	(−0.39, 0.10)	(−0.48, 0.27)	(−0.46, 0.10)	
Vendor (16)	0.96***	−0.17	−0.12	−0.14	EXP
	(0.71, 1.21)	(−0.44, 0.11)	(−0.54, 0.29)	(−0.45, 0.17)	
Working capital (17)	0.91**	0.37	0.74	−0.21	OBS
∼365	(0.15, 1.66)	(−0.35, 1.09)	(−0.46, 1.94)	(−0.78, 0.36)	
Working capital (18)	0.98**	0.38	0.60	−0.22	EXP
∼365	(0.21, 1.74)	(−0.36, 1.13)	(−0.69, 1.89)	(−0.79, 0.35)	
Working capital (19)	1.00***	−0.13	0.04	−0.07	OBS
∼365 (Float)	(0.79, 1.20)	(−0.33, 0.08)	(−0.20, 0.28)	(−0.28, 0.14)	
Working capital (20)	1.08***	−0.14	−0.00	−0.07	EXP
∼365 (Float)	(0.86, 1.29)	(−0.34, 0.07)	(−0.25, 0.24)	(−0.28, 0.14)	

Table 9 continued

Type	Pass-through (β)	Size (σ)	Ownership (ψ)	Origin (ϕ)	Selic
Working capital (21)	1.16***	−0.40	0.76*	−0.22	OBS
365∼	(0.95, 1.37)	(−0.89, 0.08)	(−0.13, 1.64)	(−0.65, 0.22)	
Working capital (22)	1.25***	−0.37	0.68	−0.24	EXP
365∼	(0.98, 1.52)	(−0.89, 0.15)	(−0.27, 1.63)	(−0.69, 0.21)	
Working capital (23)	0.79***	−0.12	0.13	−0.10	OBS
365∼ (Float)	(0.53, 1.06)	(−0.31, 0.07)	(−0.10, 0.36)	(−0.27, 0.06)	
Working capital (24)	0.85***	−0.12	0.09	−0.10	EXP
365∼ (Float)	(0.58, 1.12)	(−0.29, 0.05)	(−0.10, 0.29)	(−0.26, 0.06)	

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$. 95% confidence interval in parentheses. Estimated with fixed effects. All regressions are controlled by expected inflation and EMBI. ACC is also controlled by the Libor rate. OBS indicates that the explanatory variable in the regression is Selic_t, while EXP indicates that the explanatory variable is Expec_{it}

Table 10 Inertia in lending rates and the interest rate pass-through

Type	Persistence (ρ)	Pass-through (β)	Selic
Overall (1)	0.90***	1.54***	OBS
	(0.85, 0.95)	(0.78, 2.30)	
Overall (2)	0.90***	1.61***	EXP
	(0.85, 0.95)	(0.86, 2.36)	
Households (3)	0.90***	1.64***	OBS
	(0.85, 0.96)	(0.73, 2.56)	
Households (4)	0.90***	1.76***	EXP
	(0.85, 0.96)	(0.84, 2.68)	
Non-financial corporations (5)	0.89***	1.50**	OBS
	(0.79, 0.98)	(0.16, 2.83)	
Non-financial corporations (6)	0.89***	1.53**	EXP
	(0.79, 0.98)	(0.18, 2.88)	

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$. ρ measures the persistence in the lending rates and β corresponds to the identified long-run interest rate pass-through coefficient according to Eq. (5). 95% confidence interval in parentheses. Estimated with fixed effects. All regressions are controlled by expected inflation and EMBI. OBS indicates that the explanatory variable in the regression is Selic_t while EXP indicates that the explanatory variable is Expec_{it}

Table 10 reports the results for alternative models with persistence in lending rates. All aggregate samples revealed full pass-through with estimated coefficients slightly lower than the ones found in the static models.

Table 11 reports the estimates for the HH and NFC loan types. Basically, most of the baseline results were kept unchanged. The full pass-through is still present for the modalities that presented this result in the static models. Statistical significance of β for Discount of checks (panels 5 and 6), Vehicle financing (19 and 20) and Vehicle leasing (21 and 22) were a bit lower when compared to the estimates from Table 4. The evidence of over-proportional pass-through for Overdraft (9 and 10) was maintained. Payroll-deducted loans to public employees (13 and 14) and Payroll-deducted loans to retirees (15 and 16) revealed incomplete pass-through as in the static models.

For the NFC loans, most of the previous static findings were also held in the dynamic panel data environment, as reported in Table 11. The degree of pass-through is not statistically significant for Advances on exchange contracts (1 and 2), Discount of checks (5 and 6) and Overdraft (13 and 14). For all other loan types, the estimated values and significance levels of β were very close to the ones from the static models. However, in the dynamic environment, there is over-proportional pass-through only for Discount of credit card bill (4) when regressed against the expected Selic rate.

that a large number of time periods adds too many instrumental variables to the IV matrix and generates a dimensionality problem that requires some sort of arbitrary truncation. By using a fixed-effects estimator, we also avoid this issue.

Table 11 Inertia in lending rates and the interest rate pass-through by loan types

Households Type	Persistence (ρ)	Pass-through (β)	Selic	*Non-financial corporations* Type	Persistence (ρ)	Pass-through (β)	Selic
CC financing (1)	0.85***	2.03	OBS	ACC (1)	0.38***	0.01	OBS
	(0.78, 0.92)	(−1.01, 5.07)			(0.29, 0.47)	(−0.05, 0.07)	
CC financing (2)	0.85***	2.15	EXP	ACC (2)	0.38***	−0.02	EXP
	(0.78, 0.92)	(−1.09, 5.39)			(0.29, 0.47)	(−0.07, 0.04)	
CC revolving (3)	0.69***	20.07**	OBS	Discount-CC bills (3)	0.89***	3.05**	OBS
	(0.38, 1.00)	(4.44, 35.69)			(0.80, 0.98)	(0.69, 5.41)	
CC revolving (4)	0.70***	9.54**	EXP	Discount-CC bills (4)	0.89***	3.25***	EXP
	(0.39, 1.01)	(0.23, 18.86)			(0.82, 0.97)	(1.09, 5.41)	
Discount-checks (5)	0.73***	1.31**	OBS	Discount-checks (5)	0.90***	1.32	OBS
	(0.52, 0.94)	(0.24, 2.39)			(0.78, 1.02)	(−0.26, 2.90)	
Discount-checks (6)	0.73***	1.46**	EXP	Discount-checks (6)	0.90***	1.40*	EXP
	(0.52, 0.93)	(0.33, 2.58)			(0.79, 1.02)	(−0.15, 2.95)	
Other goods financing (7)	0.86***	1.88***	OBS	Discount-trade bills (7)	0.78***	1.62***	OBS
	(0.78, 0.94)	(0.55, 3.22)			(0.66, 0.90)	(0.83, 2.42)	
Other goods financing (8)	0.86***	1.76***	EXP	Discount-trade bills (8)	0.78***	1.72***	EXP
	(0.78, 0.94)	(0.43, 3.10)			(0.66, 0.90)	(0.83, 2.61)	

Table 11 continued

Households Type	Persistence (ρ)	Pass-through (β)	Selic	*Non-financial corporations* Type	Persistence (ρ)	Pass-through (β)	Selic
Overdraft (9)	0.92***	7.38***	OBS	Guaranteed overdraft (9)	0.36***	2.20***	OBS
	(0.86, 0.98)	(2.89, 11.87)			(0.17, 0.55)	(0.73, 3.68)	
Overdraft (10)	0.92***	7.87***	EXP	Guaranteed overdraft (10)	0.36***	2.13***	EXP
	(0.86, 0.98)	(3.09, 12.65)			(0.17, 0.55)	(0.66, 3.61)	
Payroll-deducted (11)	0.91***	0.93***	OBS	Guaranteed overdraft (11)	0.53***	0.96***	OBS
- Private	(0.87, 0.96)	(0.43, 1.43)		(Float)	(0.35, 0.71)	(0.54, 1.38)	
Payroll-deducted (12)	0.91***	0.99***	EXP	Guaranteed overdraft (12)	0.54***	1.00***	EXP
- Private	(0.87, 0.95)	(0.51, 1.46)		(Float)	(0.36, 0.72)	(0.57, 1.43)	
Payroll-deducted (13)	0.91***	0.63***	OBS	Overdraft (13)	0.91***	7.15*	OBS
- Public	(0.86, 0.96)	(0.36, 0.91)			(0.81, 1.01)	(−1.36, 15.66)	
Payroll-deducted (14)	0.91***	0.64***	EXP	Overdraft (14)	0.91***	7.30*	EXP
- Public	(0.87, 0.96)	(0.40, 0.88)			(0.81, 1.01)	(−0.97, 15.57)	
Payroll-deducted (15)	0.93***	0.47***	OBS	Vendor (15)	0.61***	0.80***	OBS
- Retirees	(0.90, 0.96)	(0.18, 0.76)			(0.39, 0.83)	(0.27, 1.33)	
Payroll-deducted (16)	0.94***	0.50***	EXP	Vendor (16)	0.62***	0.81***	EXP
- Retirees	(0.91, 0.96)	(0.21, 0.79)			(0.42, 0.83)	(0.30, 1.33)	
Personal credit (17)	0.69***	1.98**	OBS	Working capital (17)	0.31**	1.20***	OBS
	(0.61, 0.76)	(0.20, 3.77)		∼365	(0.03, 0.59)	(0.64, 1.76)	
Personal credit (18)	0.69***	1.93*	EXP	Working capital (18)	0.31**	1.23***	EXP
	(0.61, 0.76)	(−0.02, 3.88)		∼365	(0.03, 0.59)	(0.63, 1.83)	
Vehicle financing (19)	0.89***	0.52**	OBS	Working capital (19)	0.27***	0.90***	OBS
	(0.79, 0.98)	(0.05, 0.99)		∼365 (Float)	(0.16, 0.39)	(0.69, 1.10)	
Vehicle financing (20)	0.89***	0.57**	EXP	Working capital (20)	0.27***	0.96***	EXP

Table 11 continued

Households				*Non-financial corporations*			
Type	Persistence (ρ)	Pass-through (β)	Selic	Type	Persistence (ρ)	Pass-through (β)	Selic
	(0.79, 0.98)	(0.06, 1.08)		∼365 (Float)	(0.16, 0.38)	(0.75, 1.17)	
Vehicle leasing (21)	0.43***	0.61**	OBS	Working capital (21)	0.63***	1.08***	OBS
	(0.21, 0.65)	(0.01, 1.21)		365∼	(0.51, 0.75)	(0.66, 1.50)	
Vehicle leasing (22)	0.43***	0.65*	EXP	Working capital (22)	0.63***	1.16***	EXP
	(0.21, 0.66)	(−0.03, 1.32)		365∼	(0.51, 0.75)	(0.67, 1.64)	
				Working capital (23)	0.34***	0.78***	OBS
				365∼ (Float)	(0.23, 0.46)	(0.56, 1.00)	
				Working capital (24)	0.35***	0.83***	EXP
				365∼ (Float)	(0.23, 0.47)	(0.60, 1.05)	

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$. ρ measures the persistence in the lending rates and β corresponds to the identified long-run interest rate pass-through coefficient according to Eq. (5). 95% confidence interval in parentheses. Estimated with fixed effects. All regressions are controlled by expected inflation and EMBI. CC revolving is also controlled by the structural change in the rules of this loan type, and ACC is also controlled by the Libor rate. OBS indicates that the explanatory variable in the regression is Selic_t, while EXP indicates that the explanatory variable is Expec_{it}

Lending rates are highly persistent for most types, as indicated by the estimates of ρ. All R^2 coefficients are much higher than in the static models.[23] This was expected since inertia is an important component of the lending rates, increasing the explanatory power of the regressions. Overall, the major results are robust to the alternative dynamic panel data specification, despite the high persistence in most of the interest rate loan types. This finding, coupled with high interest rate margins, full (or over-proportional) and positively asymmetric pass-through contribute to explain the historically high levels of loan interest rates in the Brazilian economy. In the next section, we lay out some explanations that might help to understand the financial institutions' behavior.

5.3 Discussion

The findings of full (or over-proportional) and positively asymmetric pass-through coupled with high interest rate margins and highly persistent lending rates might be assessed by complementary explanations from the literature. One is the traditional structure-conduct-performance hypothesis arguing that market power creates an environment that affects the banks' behavior and performance in unfavorable ways from a social perspective (Berger et al. 2004). When borrowers are subjected to collusive price arrangements, banks may react differently to upward and downward movements in the policy rate. Notwithstanding this hypothesis is extensively used in studies of bank spreads, concentration, and other competition measures, it is also prominent in the interest rate pass-through literature.

Collusive behavior can occur due to the costs that borrowers incur in switching loans from a bank to another. Switching costs are one source of market power which affects bank competition. While these costs induce bank competition to enlarge customer base by capturing new clients with lower lending rates, the spreads raise to the borrowers once they are locked in (Carletti 2008). There are evidences of significant switching costs in Brazilian private banks, meaning that the longer is the duration of the relationship with the borrower, the higher is the spread (Ornelas et al. 2020). In case of collusive price arrangements, expected costs of breakdown should lead to a slowdown in pass-through (Cottarelli and Kourelis 1994; Hannan and Berger 1991), unless the interest rate change results in higher gains. Thus, lending rates would be less likely to respond to a decrease than to an increase in the policy rate, or in the expected policy rate. This asymmetric behavior by banks was successfully identified in our previous findings.

While switching costs directly affects borrowers, adjustment costs are charged on lenders. However, borrowers' behavior against changes in lending interest rates might affect the pass-through and persistence of these rates. Adjustment costs are associated to more sluggishness of the pass-through as the market become less competitive because banks are more capable of smoothing their loan adjustments over time (Kopecky and Hoose 2012). Hannan and Berger (1991) claim that negative cus-

[23] This is especially evident for the aggregate samples in Table 10, Credit card financing, Other goods financing, Personal credit, and Guaranteed overdraft (fixed rate) in Table 11. For the HH types, the estimates of ρ ranged from 0.69 to 0.94, except for Vehicle leasing, where it was 0.43. NFC rates showed lower estimated values of ρ, ranging from 0.27 to 0.91. R^2 coefficients are available from the authors upon request.

tomer's reaction (here, borrower's reaction) to unstable prices, coupled with a more negative reaction to unfavorable price changes (increases in the lending rate), imply a higher rigidity in pass-through. On the other hand, in the presence of fixed adjustment costs, the lending rates will be adjusted only if these costs are lower than the costs of keeping them unchanged (Banerjee et al. 2013; Cottarelli and Kourelis 1994). This claim is reinforced by Hofmann and Mizen (2004), who found that nonlinearities in the adjustment of retail rates to changes in base rates have arisen from menu cost models.

In our sample, where changes were relatively frequent and interest rate margins high, extra surplus by increasing lending rates could have overcome adjustment costs. The relevance of these costs depends on the demand elasticity for bank loans (Cottarelli and Kourelis 1994), but this issue is beyond the scope this study. If the gains surpass the costs of adjusting the lending rate, then banks might have incentive to a full or even over-proportional interest rate pass-through. As gains are supposed to be greater after rising lending rates, this would lead to distinct strategies of upward and downward movements in response to changes in the policy rate (or in the expected policy rate).

Adjustment costs and extra surplus might also play a central role when there is a perception that changes in money market rates (or in policy rates) would be temporary (Cottarelli and Kourelis 1994). At the beginning of our sample, throughout 2012, there was a fall in the Over-Selic rate perceived by the financial sector as inconsistent with the inflation targeting regime in place. This is the case because the Central Bank of Brazil implemented a monetary policy easing starting on August 2011 and reduced the Selic rate in the following nine Copom meetings, stopping the drop only on November of 2012. Meanwhile, the expected inflation for 2012 was above the target and increasing for 2013, which would have required the Central Bank to increase instead of reducing the policy interest rate.[24]

In the following years, the policy rate climbed once again, and expectations by financial institutions indicated that the policy rate could have reached higher levels in 2016, when it peaked in our sample (Fig. 3). There might have been some lack of confidence in the monetary authority during this period, and banks preferred not to fully pass-through movements in the Over-Selic rate to lending rates fearing sudden changes in the monetary policy conduction. This behavior might explain the high persistence in lending rates and asymmetric movements in cases where extra surplus were higher than the costs of changing lending rates.

An alternative hypothesis to the market power is the efficient structure hypothesis (e.g., Berger et al. 2004; Berger and Hannan 1989). It posits that differences in firm-specific efficiencies within markets create unequal market shares and high levels of concentration (Berger and Hannan 1989). Thus, concentration would be endogenous and, as well as performance, stem from high market share of firms that are efficient. We argue that, under this view, banks would also be efficient in adjusting lending rates after changes in the policy rate or, at least, would incur in lower adjustment costs. It might be added that over-proportional pass-through was stronger in the loan types

[24] Expected inflation ranged from 4.85% to 5.71% for 2012 and from 5.00% to 5.60% for 2013, while the inflation target was 4.5% for both years, according to Focus Survey (available at https://www3.bcb.gov.br/expectativas2/#/consultas) and the inflation targeting track record (available at https://www.bcb.gov.br/en/monetarypolicy/historicalpath).

with the highest interest rate margins. Presumably, these loan operations should have a wider interval to adjust their interest rates.

Therefore, specific elements of market power, bank concentration, lack of competition and bank efficiency should be put together to adequately assess the over-proportional and positively asymmetric pass-through to highly persistent lending rates. These striking pass-through features contribute to explain why loan interest rate are so high in Brazil. Which market imperfection will prevail to account for the banks' behavior, however, is an empirical issue that shall be tested against the data and is left for further research.

6 Conclusion

This paper investigated the interest rate pass-through from the observed and expected policy rates to the remarkably high lending interest rates in the Brazilian economy, accounting for financial institutions specific characteristics, asymmetric adjustment and persistence in the loan rates. We used a unique and non-public dataset with identified Over-Selic expectations by financial institutions, which reduces loss of information that would be caused by aggregation of expectations by the mean or median. The sample covers the period from January 2012 to April 2019, on weekly basis, with variability by loan types, financial institutions and time. In addition to the standard static specification, we also accounted for partial adjustment of the lending rates in response to changes in both observed and expected Over-Selic rates in a dynamic panel data environment.

The results provided robust evidence of full (and over-proportional) pass-through from the observed and the expected policy rates to the lending interest rates. For some loan operations, we found an asymmetric behavior by the financial institutions, as captured by smaller degrees of pass-through for decreases than for increases in the observed or expected policy rates. For the overall sample, sub-samples by households and non-financial corporations and specific loan types, there is evidence of over-proportional pass-through, meaning that increases in lending rates overpass any raise in the policy interest rate, either observed or expected. Loan types with the highest interest rate margins also revealed over-proportional degrees of pass-through. In general, the higher the interest rate margin, the bigger the degree of pass-through from both observed and expected policy rate. These findings are robust to the inclusion of other control variables, such as specific characteristics by size, ownership type and capital origin, as well as to a dynamic panel data specification. In fact, the loan interest rates are highly persistent and the long run pass-through closely resembles the short run estimates from the static models.

When addressing the pass-through, one should account for heterogeneity in the loan types, as the interest rate margins, degrees of pass-through and asymmetry might vary considerably among them. A common feature, however, is that financial institutions anticipate adjustments in their lending rates by correctly forecasting the next target level of the policy interest rate. This price-setting strategy, coupled with persistently high margins, full (or over-proportional) and positively asymmetric pass-through contribute to explain the remarkably high loan interest rates in the Brazilian economy.

The economic reasoning behind the financial institutions' behavior, however, demands complementary explanations from the specialized literature. Elements of market power, market concentration, lack of competition and other frictions should be theoretically addressed and empirically tested in an integrated environment. Expectation formation, on its turn, might be affected by forward guidance of the monetary policy, as the Central Bank communication might affect the economy even in the absence of changes in the short-term policy rate. The Brazilian case is worth investigating to check whether the effects of forward guidance are as strong as the conventional monetary policy.[25] These suggestions, however, are left for further research.

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Declarations

Conflict of interest Author J. A. Divino declares that he has no conflict of interest. Author Carlos Haraguchi declares that he has no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Appendix A: Description of the loan types

Table 12 Description of the loans modalities

Type	Description
Credit card financing	Installment loans financed by the card issuer with incidence of interest. These operations are linked to financed purchases or to refinanced credit card balances. This type includes also cash withdrawals that generate scheduled installment payments
Credit card revolving credit	Financing of the outstanding credit card balance (remaining after payment due date) or cash withdrawals that generate one payment due at next credit card bill
Other goods financing	Financing of goods, except vehicles, for consumption of households contractors
Overdraft	Revolving credit line related to checking accounts, in which limited funds are made available for customers to use discretionarily and for short periods, through withdrawals, checks, payments or bank transfers. In such transactions, the outstanding debt balance must be promptly amortized whenever there is any deposit to the checking account. This type includes situations where the negative balance exceeds the authorized overdraft limit

[25] See Ferreira (2022) for a recent empirical evidence for the US economy.

Table 12 continued

Type	Description
Payroll-deducted personal loans—to private sector employees	Credit for non-government employees, in which part of their salaries or wages is withheld by the employer in order to pay the loan installments to the lending institutions
Payroll-deducted personal loans—to public sector employees	Credit to government employees (federal, state or local; active or inactive) in which part of their wage or retirement income is withheld by the public entities in order to pay the loan installments to the lending institutions
Payroll-deducted personal loans—to retirees and pensioners	Loans to retirees or pensioners of the National Institute of Social Security (INSS), in which part of their monthly stipends is withheld by INSS in order to pay the loan installments to the lending institutions
Personal credit	Credit to individuals not bound to any specific destination and without withholding wages for the payment of loan installments (i.e., no payroll-deducted)
Vehicle financing	To consumption of households contractors. The contract must contain a lien clause, with the financed good constituting the guarantee. Funding for vehicles intended for commercial stocks are not classified in this type of credit
Vehicle leasing	Finance lease operations, where the lessor grants the lessee the use of the object of the lease (vehicles), with a purchase option at the end of the contract
Advance on exchange contracts (ACC)	Partial or total advance of funds linked to export contracts, in order to finance the production of export goods. This type includes operations of advances on delivered exchange contracts (ACE)
Discount of credit card bills	Advance of funds to non-financial corporations based on future cash flows linked to receivables from credit card bills
Discount of checks	Advance of funds to non-financial corporations based on future cash flows linked to checks
Discount of trade bills	Advance of funds to non-financial corporations based on future cash flows linked to trade bills or other receivables, except checks and credit card bills
Guaranteed overdraft accounts	Revolving credit related to bank accounts of non-financial corporations, in which limited funds are made available for customers to use, whether by running the checking account or by formally requesting to the financial institution, which may eventually seek binding guarantees from receivables, or other collaterals. This type includes situations where the negative balance exceeds the authorized overdraft limit
Vendor	Sales financing transaction where the borrowing company (seller) to finance their sales and to get immediately paid by the financial institution. The buyer commits itself to the payment schedule which will settle the transaction with the financial institution. In general, the financial institution will hold the receivables of the selling company, which undertakes the risk of the operation
Working capital up to 365 days	Short-term credit to finance operating activities of non-financial corporations, related to a specific contract that establishes deadlines, fees and guarantees. Its maturity may not exceed 365 days

Table 12 continued

Type	Description
Working capital over 365 days	Medium and long term credit to finance the operating activities of non-financial corporations, related to a specific contract that establishes deadlines, fees and guarantees. Its maturity should be above 365 days

Source: Central Bank of Brazil

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