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Loan-to-Value Caps, Bank Lending, and Spillover to General-Purpose Loans

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Abstract

This paper studies the effect of the introduction of and a subsequent easing in residential credit loan-to-value (LTV) ratio caps on bank lending and borrowers' loan usage with a unique and comprehensive bank-linked individual credit data set in a large emerging economy. We first show that following the introduction of an LTV cap, banks that were previously lending at rates above the limit have reduced residential lending, as targeted by the policy. We find that banks change their balance sheet composition as a response, replacing the reduction in residential lending with higher commercial loans and general-purpose loans issued to new residential borrowers. Next we document that following the easing in the LTV ratio cap, previously constrained residential borrowers tend to take out more general-purpose credit compared to unconstrained residential borrowers, exhibiting a form of "credit spillover". This finding suggests that individuals may be purchasing more expensive/better quality homes than they otherwise could have, implying a "flight to quality" in the residential market in line with the easing in the LTV cap. These outcomes of changes in a widely used macroprudential policy suggests that LTV policies alone are successful in impacting the credit cycle and house price movements but may not necessarily impact overall indebtedness.

JEL Codes: G21, G28, E51, E58, G20
Keywords: Loan to Value Ratio, Credit Risk, Housing Loans, General-Purpose Loans, Credit Spillover

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Non-Technical Summary

In the aftermath of the global financial crisis, many governments have implemented macroprudential policies to increase the strength and resilience of their financial systems. In addition to supply-side measures like reserve requirements and counter cyclical buffers, measures curbing borrowing have also been widely employed. LTV ratio cap is chief among these measures, as it is widely used in both advanced and emerging countries alike.

This paper investigates the introduction of and an expansionary amendment to the LTV ratio cap in Turkey with the use of novel bank-linked individual credit databases that cover all the financial institutions and housing loans in the market to assess the effect of the policy on bank lending practices and additional borrowing by credit constrained individuals. The paper offers new insights through the use of a large unique database and is the first to study the effects of a loosening in LTV caps to complement the literature that has so far focused on credit cycle and housing market outcomes.

First, in a series of bank-individual-city level regressions we establish that banks that had higher levels of LTV ratios before the introduction of the policy restriction have responded to the policy by reducing their residential lending in favor of general-purpose loans to new residential customers, or to corporations. This substantiates the fact that these banks which preferred a higher exposure levels on their residential loans prior to the policy may have been left with unmet risk appetite as the LTV cap made residential loans an even safer collateralized balance sheet item. In response, these banks have switched their lending to retail or commercial loans.

In the second leg of this exercise we examine changes in lending policies following the easing in the LTV cap from 75% to 80% in 2016, and find that banks that had LTV levels close to the old limit in 2016, in other words, banks that preferred to lend at higher residential loan LTV ratios in the pre-policy period increase their residential lending as well as general-purpose loans to new residential customers. In both settings, we see a preference of these high exposure banks to increase general-purpose lending to residential loan customers, which is suggestive of “credit spillover”.

Next, treating the easing in the cap as an exogenous shock to the market, we look at how additional borrowing by constrained individuals has responded to the policy change using individual-level borrowing data that links banks and existing credit information on individuals. Employing a diff-in-diff methodology, we find that constrained borrowers after the change have on average about 5 to 6 thousand TL higher general-purpose loans, which corresponds to about half the per-capita general-purpose lending in the country at the time.

In sum, the results show that LTV cap is an effective counter-cyclical macroprudential policy, with interesting implications during an easing phase. A higher LTV ratio on residential loans is a natural and expected outcome of the increase in the LTV cap. But the results also suggest that following the policy change residential borrowers are taking out additional loans, creating a ”credit spill-over” in line with the expansionary policy phase. This may signal that, borrowers are using higher LTV ratios as an opportunity to buy better homes, indicating a ”flight to quality” in residential loans, an outcome supported by rising average prices for houses subject to residential loans in this period and aligned with the easing policy phase.

1 Introduction

The period following the financial crisis in 2008 was marked by monetary policy easing in advanced economies which, partly through a search for yield motivation by investors, eased liquidity conditions especially in emerging economies. The following rise in public debt as well as household and corporate sector indebtedness supported consumption and investment; and stimulated the real economy in the short run through the multiplier effect (IMF, 2014c). However, the rising debt and leverage ratios presented a challenge to financial stability and a tradeoff emerged between the medium to long term outlook for growth and financial stability (Huidrom et al., 2017; IMF, 2017). Supervisory authorities around the world have responded by putting a variety of prudential measures to use, ranging from active management of reserve requirements and counter cyclical buffers to more micro-founded measures on retail loans.

In this setting, policies targeting household indebtedness, working through the credit cycle or resilience building received a special focus in this period, as household leverage played a key role in the onset of the financial crisis, and continued to post high growth rates (IMF, 2017). The introduction of a cap on loan-to-value (LTV) ratio for housing loans was, and remains, chief among retail loan measures, used widely in more than 45 countries, both in advanced and emerging economies. The LTV cap on housing loans allows leveraging on a collateralized loan only up to a certain level, and in doing so it serves a triple purpose: first, the cap slows down the demand for residential loans as it limits the total amount borrowed, and has a direct cooling effect on the credit cycle (CGFS Report, 2012; Alam et al., 2019). Second, it increases the likelihood that the loan will be paid back in full at maturity, i.e. lowers the probability of default on the loan since all else equal, the smaller loan amount will be better serviced by the borrower (Gaudencio et al., 2019). Finally, as an additional potential effect, the lower leverage ratio implies a lower ex post loss given default for bank balance sheets as the collateral buffer or ”stretch” is automatically built into the loan (ESRB, 2015). The last two effects serve to increase the system’s resilience against negative shocks, a welcome development following the sub-prime crisis.

The main transmission mechanism of the policy is expected to impact the credit cycle through its effect on credit demand. With the introduction of a cap, borrowers who could only afford (or prefer to purchase) the home with leverage ratios above the cap become constrained as they have to present a share of the house value as downpayment at the time of the lending contract. This may discourage collateral constrained borrowers from purchasing a home altogether and force them out of the market for residential loans, or persuade them to buy more affordable homes. Both of these would have the desired cooling effect on credit demand. But the policy could also encourage some others to supplement their savings with non-residential

loans which can be used for the required downpayment; thus creating higher demand for general-purpose loans in the period leading up to the residential contract.

At the same time, the policy may also impact total credit supply positively, even in cases where residential loan issuance is lowered. The introduction of the LTV ratio cap may generate an unmet risk appetite in banks in two ways; first, through lower realized volume of lender-borrower matches given the cooling on credit demand as described above, and next through the utilization of the cap which makes residential lending a safer balance sheet item. The freed up funds on the retail side of the bank's balance sheet can therefore accommodate additional lending by banks. The bank may chose to approve additional loan applications by new housing loan consumers resulting in higher household leverage, or engage in new business with other applicants to whom the bank would normally not extend a line of credit to. Additionally, the bank may find that the residential loan portfolio given its higher collateral buffers no longer fulfills their risk appetite, and therefore may chose to increase lending in other (unsecured or non-retail) types of loans. On the flip side, when the LTV cap is relaxed and set at a higher level, banks and consumers are expected to respond through a reverse mechanism lowering demand for additional funds, and less risk taking in other balance sheet items.

This paper is looking at the effect of such an LTV cap policy in a large emerging economy by making use of the two incidences of exogenous policy shocks; the introduction of the cap as a restrictive policy, and the increase in the cap as an easing policy by using a comprehensive loan level bank-linked credit registry for all loans. This allows us to perform an individual-level analysis of the LTV cap expansion as a novel contribution to the literature.

In the restrictive case, we use LTV measures covering the entire population of housing loans and we perform three levels of bank lending behavior analysis. To begin with, we use the pre-introduction LTV levels of each bank to determine their exposure level to the introduction of the cap. We take each administrative city as being subject to a unique local price level, population composition, employment opportunities, preferences, infrastructure mechanism and migration shocks which are all elements that affect housing demand. So the analysis on bank-level retail lending for introduction of the policy begins with taking location to represent these common credit demand factors and contrasts lending by banks of different LTV exposure at the same location. Next, we explore whether banks with different LTV exposure levels have different corporate lending practices by performing an analysis on the same firm borrowing from banks of different exposures to control for any demand side effects. And finally, on the retail lending side, we control for other supply-side motivations and contrast the same bank's lending practices to LTV constrained or non-constrained individuals.

In the expansionary case, we make use of a detailed individual-linked data that enables us to connect each residential loan borrower's other non-residential lending and perform a quasi-experimental analysis to quantify the effects of the residential lending policy change on additional non-residential borrowing.

We find that, upon the introduction of the cap, banks' lending behavior in residential and commercial loans differ depending on the degree of exposure they have had to the new policy. We find that banks across the board reduced their lending in the period following the introduction of the cap partially due to contemporaneous changes in reserve requirement ratios.[1] However, banks that had higher levels of LTV ratios before the cap and therefore that were relatively more impacted by the introduction of the cap - i.e. exposed banks - have lower residential lending and higher commercial lending relative to unexposed banks following the new policy.

This finding highlights a unique dynamic in the lending market. The LTV cap is firstly a borrower-based measure which, by affecting demand directly or supply indirectly, could lower the amount of residential lending by the bank. Interestingly, however, the introduction of the LTV cap may generate additional funds available for lending because a lower LTV on a loan could imply a lower risk weight which then materializes as lower capital requirements (ESRB, 2015). At the same time, our analysis shows that this effect does not manifest itself as more funds available put to use for more residential lending, but instead as higher commercial lending. As such, it could have the same effect on bank balance sheets as higher capital requirements on residential loans. In this regard, our finding is in line with Auer and Ongena (2019) who find that increasing bank capital requirements specifically on residential mortgages increase commercial credit growth. Similarly, Acharya et al. (2019) also find that banks affected by housing lending limits increases risk taking in other asset types including commercial loans. To add to this point, we find that exposed banks lend more to firms with relatively lower internal ratings compared to unexposed banks. This ties up the two findings together and suggests that banks that were used to higher levels of risk exposure on their balance sheets through higher LTV residential lending find that after the introduction of the LTV cap, the lower level of risk in residential loans does not match their risk appetite, and therefore switch their balance sheet composition accordingly, in favor of corporate loans.

Next, we examine the effect of an increase in the residential LTV cap on non-residential borrowing behaviour by consumers using individual-bank linked data in a quasi-experimental setting. Contrary to the introduction phase, an increase in the LTV ratio cap should lower the

[1] A fact also corroborated by Gropp et al. (2019) who find that increasing bank capital requirements lower bank credit supply. For more on the effects of policy effects on lending and bank assets, see Hanson et al. (2011) and Aiyar et al. (2012).

number of individuals who are credit constrained due to the cap, and therefore is not expected to generate a spill-over effect from residential to non-residential borrowing. Interestingly however, average and total general-purpose borrowing by residential borrowers increased even further during this period as shown in Figure 1.

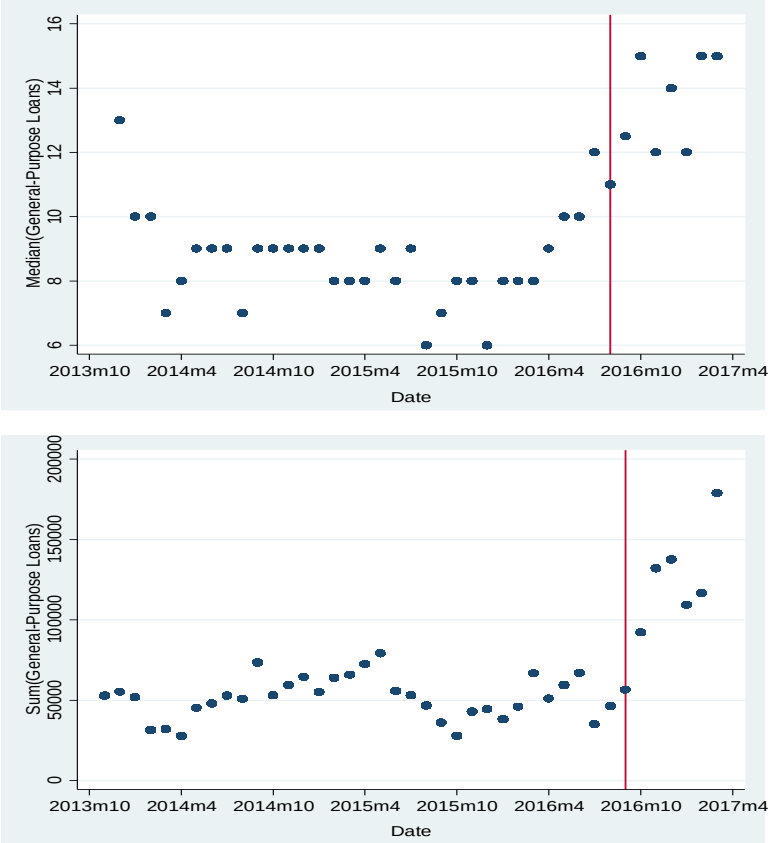

Figure 1: Median and total general-purpose loans (thousand TL) by residential borrowers. The red line represents the date of the policy shock.

The analyses show that, consumers who are constrained by the LTV cap tend to take out more general-purpose loans compared to unconstrained individuals with housing loans, exhibiting both a form of "credit spill-over" and also a potential for "flight to quality": individuals under the higher LTV cap regime do not use this as a way to reduce the amount of downpayment they would have to take out of their savings, but instead, they use it as an opportunity to borrow even higher amounts of both housing and general-purpose loans to potentially finance more expensive homes than they otherwise would have.[2] The difference in additional borrowing by constrained residential borrowers are on average 5 to 6 thousand TL more after the policy than before, an amount that is roughly equal to half the per-capita general-purpose lending. As a result, this may suggest that housing loans issued by banks have a higher effec-

[2]This finding is similar to a Sveriges Riksbank (2012) report which also states an increase in unsecured loan use following the introduction of the LTV cap.

tive LTV ratio than what the LTV ratio on the residential loan suggests. Taking into account how general-purpose loans have shorter maturities and higher interest rates, this development suggests that LTV ratio as a macroprudential policy could better serve its purpose of curbing the credit cycle as well as dampening bank balance sheet effects if coupled with policies that take total household debt into account.

Cerutti et al. (2017), Claessens (2014) and Alam et al. (2019) provide an up to date summary of the current literature on global macroprudential policies. Cerutti et al. (2017), along with Lim et al. (2011) and Kuttner and Shim (2016) provide a cross-country investigation and highlight that most macroprudential policies are linked to lower house prices and/or lower procyclical credit growth and therefore have been successful in influencing the credit cycle. Cerutti et al. (2017) further states that this effect is more pronounced during boom periods whereas, using micro-level data from Spain, Jiménez et al. (2017) state that dynamic provisioning is effective in smoothing cycles during downturns. More recently, using bank-level data from 46 countries, Morgan et al. (2019) show that LTV policies have been successful in reducing housing loans.

To complement the findings in these aggregate or bank-level data analyses, a second strand of papers use micro-level data to focus on the link between LTV caps and credit cycles or either the lender or the borrower side outcomes. Igan and Kang (2011) use survey data from Korea and document the dampening impact of LTV caps on housing market activity and prices through the expectations channel. Using loan level data from Ireland, Acharya et al. (2019) show that the LTV and LTI limits have succeeded in cooling heating housing markets, and banks have increased risk taking in corporate loans. Using micro-level data on about 27 thousand borrowers from Israel, Tzur-Ilan (2018) show that the introduction of an LTV cap is accompanied by higher interest rates and induces borrowers to buy cheaper homes away from center city in areas socioeconomically ranked lower. Conversely, van Bekkum et al. (2019) find that the LTV policy in the Netherlands leads to smaller loans overall, but not cheaper homes.

Our paper adds to the literature with novel findings on both the borrower and lender side effects of the introduction and subsequently an easing in the LTV cap policy by using a large bank-linked individual loan dataset covering a total of 6,876,150 new credits, claiming about 88% of all housing loans in the universe of credits in Turkey. We stand out from the remaining micro-level studies with our unique study of the easing in the policy and its effects on bank balance sheets. Our paper is the first in the literature to document and quantify the direct spill-over effect of a regime change in housing loans to other types of retail lending. Similar to Acharya et al. (2019), we document a shift in the assets of the banks from personal to corporate loans, and we take the results further by showing that for exposed banks, the

lending portfolio changes in favor of larger risk appetite in the composition of corporate loans. Finally, in contrast to the previous studies, we document the borrower behavior on the flipside, as the increase in the cap is associated with increased additional borrowing, suggestive of a flight to quality in home choice, as well as a spillover from residential to non-residential loans. As the Turkish intermediation sector is an open entry competitive sector and its assets amount to about 120% of the economy, the results of the macroprudential policies could set an example to many other open economies experimenting with such measures.

After the introduction of macroprudential policies following the financial crisis, concerns over the success of these policies in aiding the financial soundness of the banking sector gained importance. This paper highlights and quantifies the effect of the LTV ratio cap policy, and finds that such macroprudential policies can have additional bank balance sheet effects through higher uncollateralized lending. Previous banking and finance literature finds that LTV caps pertaining to mortgage loans create a buffer for the banking sector, make their assets more secure with room to fall back on. Claessens et al. (2013) find that policies targeting consumers help in improving the banks' balance sheets through lower individual leverage. We add to this discussion by highlighting the fact that lower leverage in housing loans does not necessarily mean lower leverage on the consumer side, as the consumer may still raise their own leverage, through higher borrowing in other -unsecured- consumer loans.

Unsecured loans carry larger risks and as a result pose a threat to financial stability, and their use is usually monitored in many countries either through lender side restrictions (such as risk weights or provisions) or borrower side limits.[3] This suggests that a measure that would limit the unsecured borrowing capacity of already indebted residential loan customers would serve a triple purpose of healthier bank balance sheets and household finances through higher debt servicing capacities as well as slower credit growth rates. Additionally, as the IMF (2014a) states, the binding power of LTV weakens with increasing house prices, which would suggest that an LTV would only slowdown, not prevent imbalances in asset prices which could lead to large scale financial imbalances.[4] Jung and Lee (2017), using district level transaction data from Korea, and Kelly et al. (2018) using loan level data from four Irish banks find that debt or loan to income measures are better at stabilizing house prices than LTV, and Jung and Lee

[3]For instance, Turkey has also implemented measures on credit card use in 2013 to promote its utilization as a means of payment, rather than credit. Credit card limits have been tied to income, and minimum monthly payments are a function of the limit, and therefore again, income. Number of payment installments allowed on purchases have also been tightly regulated. Previous examples include measures taken after the credit card crisis in Korea in 2002-2003 and Mexico in 2008 (IMF, 2014b).

[4]An increase in the house value not only causes imbalances in and of itself, but could have secondary effects through the wealth effect and the subsequent rise in borrowing against equity. As shown in Mian and Sufi (2011), borrowing against equity accounts for a sizeable share of the increase in delinquencies leading up to the global financial crisis.

(2017) add that LTV by itself can pave the way for higher loss given default. These results are in line with Kim (2014) who finds that LTV and DTI have helped steady housing market and credit expansion. Kuttner and Shim (2016) single out debt service to income ratios as the most effective non-interest rate policy in curbing housing credit growth in a panel study. We add to this by stating that such a ratio could aid in not only slowing down housing credit growth, but also non-residential, unsecured borrowing if used along with LTV caps, in line with findings in Jácome and Mitra (2015).[5]

Section 2 of the paper presents the legislative background, Section 3 introduces and discusses the data, Section 4 presents descriptive statistics and documents the distributions in additional borrowing for LTV levels, Section 5 presents and discusses the empirical strategy, Section 6 summarizes the results followed by Section 7 which concludes.

2 LTV Timeline

In Turkey, regulation regarding banking practices is announced and monitored by the Banking Regulation and Supervision Agency (BRSA) since 2001.[6]

Favorable credit conditions along with historically low interest rates on housing loans in 2010, resulted in housing loans growing at rates above 30%. In this setting, as a part of the movement to support prudential lending practices, and also to curb high growth rates of consumer residential lending, the BRSA has introduced an LTV cap of 75% on December 16th, 2010, effective of January 1st, 2011. Since housing loans at the time made up about half of total household lending in Turkey, the policy aided in obtaining slower credit growth in retail loans and in bending the growth trend down as seen in Figure 2 panels a and b.

As in other countries that utilize LTV ratios counter-cyclically as a dynamic policy tool, Turkey also decided to make fine-tuning arrangements on the cap following a period of slowdown in consumer credits (FSB-IMF-BIS, 2016). On September 27, 2016 effective immediately, the cap was increased to 80%. The expansionary change in the policy is contemporaneous with the recent pick up in credit growth in both housing and general-purpose loans (Figure 2).

[5]The relationship between LTV ratios and residential loan credit risk outcomes is an avenue which we leave for future research. At the same time, related to the suggestion that income related measures used together with LTV measures may be more effective in targeting credit cycles, using micro-level data from Spain, Galan and Lamas (2019) link borrower level policies and credit risk and find that measures addressing debt servicing capacities are relatively more effective. Similarly, Jones and Sirmans (2016) summarize the literature and find that debt service coverage ratios predict credit risk outcomes better than LTV ratio.

[6]The establishment of the BRSA comes after a large and disruptive liquidity and exchange rate crisis in the country. Details of the onset of the crisis and the full set of measures taken in response can be found at BRSA (2010).

The implementation of the policy differs slightly across the introduction and the amendment of the policy.[7] Since the policy was introduced two weeks prior to its implementation in 2011, those two weeks could have been subject to a policy announcement arbitrage, where individuals planning on purchasing homes would have pulled their demand to an earlier time, from 2011 to 2010 to be able to have higher/unrestricted leverage ratios on their loans. As to not cloud the analysis of the policy introduction, we exclude these two weeks between the announcement and the implementation.

In contrast, since the announcement and implementation falls on the same day on the expansionary change, the pre-post comparisons use the announcement date of September 27 as the cutoff in the analysis on the easing of the restriction.[8] The paper at hand will treat this change in policy, announced and implemented on the same day, as a quasi-experiment that will aid in assessing the other retail borrowing of constrained housing loan customers. As can be seen in Table 1 and Figure 3, the populations that borrow immediately before or after the policy change have similar distributions in personal characteristics as measures by their credit ratings, and total debt, as well as the number of creditors and average loan amount in vehicle loans, credit card debt, and to some extent in the number of general-purpose loans taken. The groups do differ in terms of loan amounts in housing and general-purpose loans which is our area of investigation.

Finally, it should be noted that the implementation of the cap is not absolute however non-compliance is punitive. It is in fact possible for banks to extend residential loans to borrowers at LTV ratios above the cap, but this extension comes at a cost for banks. If the bank were to decide to lend at an LTV ratio exceeding the cap, then the amount of leverage that exceeds the limit would be deducted from their capital in the calculation of their financial strength indicators such as capital adequacy ratios (CAR). CAR is an important balance sheet vital for banks as part of Basel accords, it is monitored diligently in Turkey by the BRSA, and should exceed a minimum target ratio set for each financial institution. In addition, CAR is also an indicator tracked by the sector and it may impact banks' external borrowing capacity on the inter-bank and international markets. As a result, banks exceed this limit for only a negligibly small share of loans in their residential loans.

One final feature of the policy framework differs from other international examples and is worth stressing. Since LTV caps are a ratio relative to the appraised value of the house, not the actual sales price, this may present a potential moral hazard problem at the time of property

[7]The 2011 introduction was announced by the BRSA via press release No.3980, and appeared in the official gazette on December 18, 2010, effective January 1, 2011. The amendment in 2016 was announced via press release No.29840 on September 27, 2016, published on the official gazette and effective starting the same day.
[8]The 4 business days remaining in September then joined together with October in the analysis.

valuation. Lending institutions (or linked appraisal companies) may have an incentive to over value the property to register a lower, or within limits LTV ratio for the residential loan (Ben-David, 2011; Akin et al., 2014; Montalvo and Raya, 2018; Bover et al., 2019).[9] Galán and Lamas (2019) link this particular practice to riskier mortgage lending. The design of the policy in Turkey where we conduct our policy analysis circumvents this potential problem by assigning the task of valuation to third parties to the housing loan transaction.[10] These third parties whose valuations are done on a basis of principals mandated by BRSA, are held accountable in their valuation by design: in the event of a loan default where the collateral is issued for sale by the bank, the bank can recourse the appraisal company, and recoup the difference between the appraised value and the resale value if the resale is significantly lower than the appraisal. Through this policy design feature, the appraisal companies do not have incentives to inflate valuations which works not only in favor of financial stability and the health of bank balance sheets, but also services to curb house price inflation.

3 Data

3.1 Bank-individual Matched Data

All consumer lending data are reported directly by banks to the BRSA (Banking Regulation and Supervision Agency) and the CBRT (Central Bank of the Republic of Turkey) at the end of the calendar month. Individuals are identified on their national identity card numbers, and banks on their EFT codes. This allows us to merge data from different months on the basis of the individual's national id number and therefore have a history of payment as well as information on their other current or past borrowing. From this dataset we extract the interest rate, capital remaining, and term conditions of each loan according to type, as well as the bank, branch and the city the loan originated in. Using the national id numbers we also add any other active consumer loans these individuals may have, with the remaining capital balance shown on these loans.

We use three novel data sets for our descriptive and empirical analyses: bank-individual-loan level data on all consumer loans of loan customers from Turkish banks, bank-individual-loan level data on all housing loans of loan customers from Turkish banks, both of which are a part of the credit registry database, and data on balance sheet and income statement information of Turkish banks. All data sets come from the CBRT, and cover the period of January 2011

[9] See Agarwal et al. (2019) for a discussion of the effects of a regulatory change on dampening the over valuation in appraisals. Galán and Lamas (2019) find that loan to price, rather than loan to value limits may work better in favor of financial stability in this regard.

[10] The valuation of collateralized property of all housing loans reported in our data set have been made by companies authorized by either the BRSA or the Capital Markets Board of Turkey.

and April 2017 on a monthly frequency.

The first data set consists of all consumer loans of households such as housing, general-purpose, vehicle and credit cards, and includes amount, type, maturity, interest rate, collateral etc. on the basis of bank, individual and loan. Second data set covers all housing loans used in Turkey. This data set includes information on the volume, appraised value of the property, origination and maturity date of loan, and the city the loan originated in.

LTV regulation has been legally followed by BRSA in Turkey since January 2011. If the bank exceeds the legal upper limits set by the BRSA, the amount that is exceeded is deducted from the bank's capital during the calculation of adequacy ratio, and the bank is penalized by this way. In other words, the bank complies with the legal upper limit in order not to face the penalty, but in some cases it can exceed the legal limits by venturing the penalty.

Although the first data set includes housing loans in detail on bank-individual-loan basis, the second data set is needed for two main reasons. i) Unlike the amount of housing loans, appraised value of the collateralized property is not included in the first data set, and therefore the LTV ratio cannot be calculated using first one only. ii) Instead of reporting all the loans linked to a national id number, banks may prefer reporting credit data under a global heading due to confidentiality. Figure 4 visualizes the cost of the confidentiality practice in terms of data coverage in housing loans with the level of housing loans from aggregated data sources and the sum of individual level housing loans obtained from first data set. However, since the second data set is based on a legislative regulation, it includes all housing loans at the loan and individual level. Therefore, we are able to track all the housing loans thanks to detailed structure of second data set, and match these with the individual's other lending.

The increase in coverage of residential lending also aids us in identifying these borrower's other lending, if the residential lending was unidentifiable. Even though the coverage in housing loans are close to the full set in the initial dataset, due to the confidentiality practice we can identify just over 10 percent of general-purpose loans at the individual level. By joining the two datasets to increase our housing loan coverage, we increase the number of individuals we identify as residential borrowers, which allows us to make full use of the non-residential loan side of the initial dataset, despite its restrictions.

3.2 Loan to Value Data

We have two different sources of LTV information. The first dataset has 100% coverage of all housing loans from January 2010 onwards at the loan level but lacks individual identifiers which prevents us from combining this information with the detailed dataset on other individual lending. Thus, this dataset is only used in our analysis at the bank-level. Our

individual-linked loan-level LTV data on the other hand is available from January 2011 to present day and contains the borrowers' national id number which allows us to link the two individual-level databases. In all our analysis we only consider valuations of appraisal companies authorized by either the BRSA or the Capital Markets Board of Turkey. As stated in Section 2 the appraisal companies are held accountable for the value they place on the residential property, on which the LTV ratio is based. All housing loans are denominated in local currency, have fixed interest rates, and even though there is no regulatory maturity limit, in practice they have maturities up to 10 years in Turkey.

As we mentioned above, although the bank-individual matched data set also includes bank-individual-loan level housing loans, some of the data is reported for various security reasons under a global heading. We go around this problem by using the information on the LTV database detailed below which allows us to see each and every housing loan issued in that calendar month. In this context, we first derive the information of individuals borrowing housing loans since January 2011 using loan-level LTV data. This data set includes the housing credit information of 2,701,161 people using 2,721,299 housing loans between January 2011 and April 2017. We then merge the first and second data sets using borrowers' national id number to derive other loans of them such as general-purpose loans, vehicle loans, credit card balances. Moreover, we also merge bank- and macro-level data sets to control the time-variant factors specific to the lender banks and the Turkish economy.

Using the appraisal reports, we calculate the LTV ratio for each residential loan at time t for each borrower i using the formula:

$$LTV_{i,t} = \frac{OriginalHousingLoan_{i,t}}{ExpertEvaluation_{i,t}}. \tag{1}$$

The distribution of loan amounts and the number of loans across different LTV levels as defined by Equation 1 are shown in Figure 5, highligting the shift from the previous LTV cap regime, to the current one.

3.3 Bank-level and Macro-level Data

Balance sheets and income statements of banks are also available from the CBRT. Our matched dataset comprises of 30 banks.[11] At the bank level, we use data on real assets size, loan to assets ratio, deposits to assets ratio, the ratio of capital and liquid assets to total assets, non-performing loans ratio and return on equity ratio, all on a monthly frequency from the CBRT. The definitions of the variables, data sources, and summary statistics are given in

[11] We do not have investment and development banks in the sample.

Table 4.

Macro-economic aggregates in Turkey may affect demand and supply of consumer loans. Hence, we need to control for the business cycles and monetary policy stance in Turkey. This will allow us to better isolate changes in LTV ratio from other changes in economic activity or monetary conditions. At the macro level, we use data on domestic interest rates, industrial production index (as an indicator of economic activity), consumer price index (CPI), all on a monthly frequency from the CBRT. The definitions of the variables, data sources, and summary statistics are given in Table 4.

4 LTV Ratios and Summary Statistics

4.1 Loan to Value Ratios

The LTV definition shown in Equation 1 looks at the actual ratio that concerns the regulation per housing loan issued to consumers. But individuals who are constrained by the LTV ratio cap may chose to borrow in other formats to top off their housing loan at a time when they need to present 20 to 25% of the house value as downpayment. Since purchasing a home is a long term investment, and requires some planning, we assume that individuals who would like to borrow for the downpayment will do so in the months leading up to the house purchase. Thus, we define a new LTV ratio called LTVpseudo in Equation 2, which takes into account the general-purpose loans issued to the consumer in the month of and the month before the house purchase to calculate the effective leverage of the housing loan under these assumptions.

$$LTVpseudo_{i,t} = \frac{OriginalHousingLoan_{i,t} + G-PLoans_{i,t} + G-PLoans_{i,t-1}}{ExpertEvaluation_{i,t}}. \qquad (2)$$

Figure 6 presents cross-plots of LTV to LTVpseudo for several important dates for new housing loans issued in these months; January 2011 when the LTV ratio cap was first introduced, September 2013 and January 2014 when other macroprudential measures were put in regulation, August 2016 to November 2016 to observe the immediate shift following the recent amendment, and April 2017 as the latest datapoint. For housing loans with no additional borrowing within the 2-month period, the LTV to LTVpseudo ratio should be one, and the loan will be presented by a dot on the 45 degree line. All other housing loans that have additional general-purpose borrowing will be placed above the 45 degree line.

As a first observation, we see that no matter which LTV ratio cap level is in place, there is a sharp concentration of consumers at and right below the cap whose LTVpseudo well exceeds

the LTV ratio. The distribution of these consumers forms almost a continuous line from the intersection of the 45 degree and LTV ratio cap lines to levels even above 100% leverage in LTVpseudo. This fact along highlights the different financial constraint faced by those at the highest level of leverage possible and others below.

The third row of graphs that show the difference between September (before the regime change) and October (after) borrowers clearly, as banks started shifting their new set of customers more towards the new limit.[12] By April 2017, borrowers have concentrated on the new cutoff level with a very high level of precision.

Two final points jump forward in terms of over-time comparison. First, the peak at the LTV cap seems to have become sharper over time, as loans concentrate on getting closer to the LTV ratio at the cap. One reason behind this shift in preferences could be due to the increasing spread between general-purpose and residential loans, as shown in Figure 7. As residential loans become relatively cheaper, consumers will want to make sure that they get as high on their LTV ratio as possible down to the fraction rather than having to resort to other means of financing with higher costs and shorter maturities. Last, we can see that at the time of the initial introduction in 2011, the implementation of the change in regulation was rather slow as there were still plenty of consumers who took out loans with actual LTV ratios above the regulated cap. In the more recent case, we see that the pick up to the expansionary change was rather fast, highlighting the asymmetries in the speed of regulatory accordance between easing and tightening policies.

4.2 Summary Statistics

2,630,800 people have used 2,984,655 housing loans during the period of January 2011 - April 2017. Table 2 shows the distribution of these residential borrowers within the last 12-month window, including the policy change date. For example, in September 2016, when the policy change took place, 43,360 people used 43,682 housing loans, and the total amount was 5.17 Billion TL and the average loan amount is 118 Thousand TL. As shown in panel 1 in Table 2, the average loan amount has increased moderately as well as the number of residential borrowers during the 12-month window. Moreover, panels 3 through 5 indicate the distribution of other loans; general-purpose loan, general-purpose loans with collateralized residential property, vehicle loans and credit cards; for people who used housing loans at least once between January 2011 and April 2017.

For example, in September 2016, 46,697 people out of 2,630,800 people using housing loans

[12] Since the regime change was announced and implemented on September 27, 2016, we have joined borrowers from the last three days of September with October borrowers in this graph.

borrowed 48,178 general-purpose loans with the average amount of 13.57 Thousand TL. Similarly, the number of people who use general-purpose loans with collateralized residential property, vehicle loans and credit cards among the housing loan borrowers registered as 2,583, 171 and 3,541 individuals, respectively. These panels mainly point out the fact that people who use housing loans actively also use other types of loans in different periods. Interestingly, as can be seen in panels 2 and 3, the average amount of general-purpose loans used by residential borrowers increased significantly after the policy change.

While Table 2 contains the distribution of other loans used by people using housing loans at least once during the analysis period, Table 3 shows other loans of these individuals that they have taken out in same month or within a short window. We use the issue date of housing loans as a benchmark, and identify the other loans granted in the same month or within the 2/4/6 month-windows as shown. We select these window brackets since there is a high probability that the general-purpose loans used in close to the date of housing loan origination will be used as payment in the acquisition of the house. This strongly implies that general-purpose loans are used to meet the downpayment of housing loans, especially by LTV cap constrained borrowers. For example, in September 2016, Table 3 panel 1 indicates that 1,365 people out of 43,360 people using housing loans have used 1,385 general-purpose loans with an average amount of 47,5 Thousand TL at the same time. We observe that 251 and 457 people used general-purpose loans one month of and the month before the house purchase. Similarly, 635 and 1,574 people used general-purpose loans 2 or 3 month of and the month before the house purchase. Panel 2 also shows that 20 people among housing loan borrowers also use a general-purpose loans with collateralized residential property in the same month.

There are three interesting points to observe in Table 3 panels 1 and 2. First, the average of general-purpose loans used in the same month as the residential loan is considerably higher than the average of general-purpose loans used in the other months. This strengthens the likelihood that the general-purpose loan used in the same month will be utilised as a down-payment for the house. Second, the average amount of the general-purpose loan used after the policy change has increased. Along with the increase in LTV cap, the increase in general-purpose loans suggests that people tend to buy more expensive houses. Third, the average amount of general-purpose loans with collateralized residential property is larger than non-collateralized general-purpose loans. Table 3 panels 3 and 4 summarize the housing loan borrowers' vehicle loans and credit card information which used in the same month or within the 2/4/6 month-windows.

Table 1 indicates the current debt of individuals using at least one housing loan between January 2011 and April 2017. For example, in September 2016, the average total debt, general-purpose loans and vehicle loans of these people is 24.4, 22.6 and 38.4 Thousand TL,

respectively. The average number of banks in which these persons are in the debt relationship is 1.46 and the average rating is 5.06. This implies that there is no significant difference in the general profiles of people before and after policy change in terms of indebtedness, average banking, credit card usage behavior and rating.

5 Empirical Strategy

5.1 Bank Retail Lending

We consider that banks that have a higher LTV ratio before the implementation of the LTV cap or the amendment to the regulation in the following years are more affected by, i.e. more exposed to, these policy changes compared to their peers. Therefore, we calculate three different exposure measures which we use in the first stage of our analysis. First, we calculate LTV_b to measure the weighted average LTV ratios of banks before the aforementioned changes in each instance of policy change. In other words, we calculate our all LTV related measures for the year of 2011 and 2016 separately, and define the following variable:

$$LTV_b = \frac{\sum_{b=1}^{B}\sum_{i=1}^{I}\sum_{t=1}^{T}(LTV_{b,i,t} * Amount_{b,i,t})}{\sum_{b=1}^{B}\sum_{i=1}^{I}\sum_{t=1}^{T} Amount_{b,i,t}} \tag{3}$$

where T takes the values of 1, 2, 4 and 6 months depending on the estimation windows used in differences-in-differences (diff-in-diff) analyses for bank b and individual i. For instance, LTV_b for the 4-month window analysis around the introduction of the LTV cap indicates the weighted average LTV ratios of banks in the four months before the introduction where the variable differs for each window and policy change analysis accordingly.

For robustness we consider two more indicators to identify the exposure of banks to the regulations. $Exposure_b$ indicates the weight of residential loans issued before the policy change that are above a certain threshold in each case which reflects the degree to which the policy change affects the banks' balance sheets. The indicator is defined in the following way:

$$Exposure_b = \frac{\sum_{b=1}^{B}\sum_{i=1}^{I}\sum_{t=1}^{T} ExposureAmount_{b,i,t}}{\sum_{b=1}^{B}\sum_{i=1}^{I}\sum_{t=1}^{T} Amount_{b,i,t}} \tag{4}$$

where T takes the value of 1, 2, 4 and 6, and the sum of $ExposureAmount_{b,i,t}$ represents the

amount of residential loans having LTV ratios higher than 75% before the date of January 1, 2011, and similarly residential loans having LTV ratios higher than 73% before the date of September 26, 2016 for the second policy change.

Finally, we also define a dummy variable, $Quantile$, that indicates the top and bottom 5 banks based on their LTV ratios which we use as the final exposure measure.

In the next step, we use the following model utilizing fixed effects panel data methods to analyze the effect of two LTV policy changes on the amount of newly issued residential loans:

$$\begin{aligned} Loan_{b,i,l,t} =& \beta_0 + \beta_1 After_t + \beta_2 LTV_b + \beta_3 After * LTV_{b,t} + \zeta BankObs_{b,t-1} \\ &+ \gamma MacroObs_{t-1} + \alpha_b + \mu_l + \theta_t + \varepsilon_{b,i,l,t}. \end{aligned} \tag{5}$$

where the dependent variable $Loan_{b,i,l,t}$ is the natural logarithmic value of bank b's residential loans issued to individual i who is located in city l at time t; $After_t$ is a dummy variable taking the value 1 if the origination date of the housing loan falls on or after the policy change date of January 1, 2011 or September 27, 2016 depending on the timing of the analysis. β_1 indicates the effects of LTV regulation on banks with relatively lower LTV ratio, which we call low exposure banks. The treatment variable LTV_b is derived from Equation 3 and identifies banks that are exposed by their LTV ratio as those whose LTV ratios are close to the LTV cap. $(After * LTV)_{b,t}$ then captures the marginal effects of policy changes between high and low exposure banks.

$BankObs_{b,t-1}$ are the balance sheet ratios of bank b at time $t-1$ that may have an influence on the credit growth observed over the period of interest. Other variables we use at the bank level are real assets size, loan to assets ratio, deposit to assets ratio, the ratio of capital and liquid assets to total assets, non-performing loans ratio and return on assets ratio. These ratios of monthly frequency are obtained from the CBRT. $MacroObs_{t-1}$ are the macro indicators of the Turkish economy at time $t-1$. Moreover, we also need to control for the macroeconomic business cycles as well as the monetary policy stance in Turkey at the time of the analysis since these two factors may also play a role in the credit generation and issuance policies of banks. This will allow us to better isolate LTV regulations from other changes in economic activity or monetary conditions and incentives. At the macro level, we use data on domestic interest rates, industrial production index (as an indicator of economic activity), consumer price index (CPI), all on a monthly frequency from the CBRT again. The definitions of the variables, data sources, and summary statistics are given in Table 4. α_b stands for fixed effects for bank b; μ_l for location l and θ_t for the year t.

Although Model 5 tests the effects of policy changes on the volume of newly issued housing loans using diff-in-diff method with varying windows, separating demand and supply side effects is a crucial step to identify and trace the impact of said policies. In particular, controlling for the demand side allows us to identify supply side dynamics more clearly in order to trace the changes in lending behavior or risk appetite of banks. To overcome this hurdle, ideally we would need to identify and restrict the analysis to individuals borrowing from the same bank at the same time. However, due to the limited number of such a group of people, we saturate our model with location*month fixed effects, $\mu_{l,t}$. Adding these fixed effects, we can identify the differentiation among the low and high exposure banks that give loans to individuals located same location at the same month. This assumption relies on the fact that individuals in a particular location may share many characteristics and also are exposed to many common factors such as house price levels, preferences, trends, and population dynamics among many others, and hence are likely affected in a similar way by local and macroeconomic developments that might influence their housing loan demand. In sum, since housing markets and demand for housing are to a large extent location specific, we consider that $\mu_{l,t}$ is a good proxy to control demand side in the style of Acharya et al (2019). The estimation results obtained by Model 5 are given in Table 5.[13]

As banks that are used to having an optimal portfolio distribution with higher LTV ratios are restricted to do so in 2011, and banks that are closer to the limit introduced may signal a higher tolerance for risk compared to others in 2016, we believe that there are insights to be gained about how they respond to changes that limit, or increase their risk exposure in residential loans. In this light, we analyze the effects of LTV regulations on GPL and commercial lending behavior of banks and see if they have re-optimized the distribution of their assets due to their unmet risk appetite. In this context, we replace our dependent variable as the amount of GPL and commercial loans instead of housing loans. The estimation results are given in Tables 6 through 10.

In tables 5 through 10, we analyze the effects of LTV regulations in 2011 and 2016 on the volume and composition of loans, and use location*month fixed effects as a proxy to control demand side effects in bank-individual level datasets. In Table 8, we identify the commercial loan lending behavior of high and low exposure banks, and then investigate the compositional effects of said LTV policies. In order control the demand side more clearly, we merge our LTV dataset with the credit registry dataset that have unique firm identifiers across loans in table 9. This allows us to control demand side effects on loan issuance using firm-month fixed effects. By doing so, we focus on the differentiation among the high and low exposure

[13] Variables that have a monthly time-variation such as macro indicators of the Turkish economy will drop in this setup.

banks lending to the same firm at the same month (following the methodology of Khwaja and Mian (2008)), and use the model below:

$$\begin{aligned} Loan_{b,f,t} =& \beta_0 + \beta_1 After_t + \beta_2 LTV_b + \beta_3 After * LTV_{b,t} + \zeta BankObs_{b,t-1} \\ &+ \gamma MacroObs_{t-1} + \alpha_b + \eta_{f,t} + \varepsilon_{b,f,t}. \end{aligned} \tag{6}$$

where the dependent variable $Loan_{b,f,t}$ is the natural logarithmic value of bank b's newly issued commercial loans to firm f at time t and $\eta_{f,t}$ is the firm-month fixed effects, and enable us to control demand side of domestic commercial loans monthly. Moreover, β_3 indicates the marginal difference among the high and low exposure banks which give commercial loans to same firm at the same month. The estimation results obtained by Model 6 are given in Table 9.

To be able to determine whether potential changes in commercial lending are motivated through the risk taking channel, in the following related analysis, we utilize the internal bank ratings of firms, and examine whether high or low exposure banks differentiate their lending to relatively risky or relatively non-risky firms. Thanks to the uniqueness of dataset, we can control supply side using bank*month fixed effects and allow us to focus on use the following model:

$$\begin{aligned} Loan_{b,f,t} =& \beta_0 + \beta_1 After_t + \beta_2 LTV_b + \beta_3 Rating_{b,f,t} + \beta_4 After * LTV_{b,t} \\ &+ \beta_5 After * Rating_{b,f,t} + \beta_6 LTV * Rating_{b,f,t} + \beta_7 After * LTV * Rating_{b,f,t} \\ &+ \zeta BankObs_{b,t-1} + \gamma MacroObs_{t-1} + \alpha_{b,t} + \eta_f + \varepsilon_{b,f,t}. \end{aligned} \tag{7}$$

where $\alpha_{b,t}$ stands for bank-month fixed effects, and enables us to control monthly supply side dynamics of domestic commercial loans. Moreover, β_7 indicates the marginal difference between risky and non-risky firms borrowing from low or high exposure banks in the same month. The estimation results obtained by Model 7 are given in Table 10.

5.2 A Quasi-Experiment on Spill-Over

We take the 2016 LTV cap change as an exogenous shock to the economy, and want to investigate how this change affects non-residential borrowing of individuals with constrained LTV levels compared to unconstrained individuals. To see the effect of the policy change, we follow a diff-in-diff strategy using the individual-level matched loan and LTV data, and

estimate the following model for bank b, individual-credit i over the policy change:

$$G-PLoans_{i,b,t} = \beta_0 + \beta_1 After_t + \beta_2 LTVconst_{i,t} + \beta_3 LTVconst_{i,t} * After_t + \eta PersonObs_{i,t} + \zeta BankObs_{b,t-1} + \gamma MacroObs_{t-1} + \varepsilon_{i,b,t}. \quad (8)$$

In equation 8, $G-PLoans_{i,b,t}$ is the outcome variable of the sum of general-purpose loans that an individual takes out in the two month period including (the month of and the month immediately before) a housing loan. $After_t$ is a dummy variable taking the value 1 if the origination date of the housing loan falls on or after the policy change date of September 27, 2016. The treatment variable $LTVconst_{i,t}$ identifies individuals who are constrained by their LTV ratio as those whose LTV ratios are close to the LTV cap. For robustness we consider several different bandwidths of treatment but focus on loans with higher than 74% in the previous regime, and higher than 79% in the current regime. $LTVconst_{i,t} * After_t$ then captures the effect of the policy change on the treated. $BankObs_{b,t}$ and $MacroObs_t$ are as described above. $PersonObs_{i,t}$ includes person-level identifiers we can collect from the data, such as the individual's loan-specific rating by the bank, all other outstanding debt at the time of the housing loan, and the number of credit cards.[14]

Exogenous changes through policies that limit the amount of lending committed to mortgage borrowing can increase other household lending by the bank both due to demand and also supply factors. Equation 8 will then capture the lending response to the policy change among individuals with housing loans, and the interaction term will show us by how much general-purpose lending to home owners restricted by the cap has increased or decreased due to the change in policy.

In the data each individual appears in the month that they have taken a housing loan in with all other associated lending. We define the LTV level of the individual by taking a ratio of the original loan amount over the valuation of the home from the expert reports as specified in equation 1. We treat the LTV policy change as an exogenous shock to the financial system that will influence non-residential lending/borrowing. Since purchasing a home under an LTV cap regime requires some financial planning, we treat the general-purpose loans that the individual takes in the month of the residential loan as well as the month before as linked to the residential purchase and the LTV cap, but not after. We recognize that individuals

[14] In 2013, through a series of tightening macroprudential measures, all individuals' credit card limits have been restricted by a factor of their income, and the minimum monthly payments as a ratio of that income for cards issued after this date. However the change in regulation was not retrospectively applied to *existing* credit cards. Furthermore, new credit cards also had a further restriction in the maximum balance they could allow the consumer. This means that for individuals who use credit cards as a means of credit rather than a means of payment, a higher number of credit cards could allow for access to a larger sum in their credit card balance.

with housing loans may later on continue to take out general-purpose loans to help with monthly payments. But in this specification we rather chose to focus on the initial borrowing that individuals take in response to the LTV cap, rather than consequent financial distress or shocks.

We also recognize that the purchase of a new home may give rise to additional costs to the new owner, which may spur the need to take out a general-purpose loan regardless of whether the borrower is LTV cap constrained or not. This is why we chose to employ the diff-in-diff method as it helps us identify the *additional* lending to constrained borrowers, without having to assume that all the general-purpose lending is necessarily tied to the LTV level of the loan. By comparing the average non-residential lending to constrained borrowers versus to those who are not constrained, the method first accounts for within-period differences, and then compares this within-period difference across periods to see the effect of the policy change. As such, the within-period difference will give us how much on average the constrained borrower takes out *on top of* the borrowing by unconstrained residential borrowers.

Since the interest rate on housing loans are lower than those on general-purpose loans, and the maturities are in general longer for housing loans, we take that any rational consumer would rather take out as much as they could on their housing loan before resorting to topping the amount off with a general-purpose loan. Thus, the general-purpose loans originating at dates close to or on the date of the housing loan are not motivated by a different financial optimization dividing the loan amount between two different types of borrowing, but rather the need for funds.

Although we present results for analysis performed on 2 to 8 months-long windows around the policy change date, we focus on the 1-month window as the main specification. The longer time frame is subject to a higher degree of exposure to other policy changes, and the data including the end of the year is subject to a housing supply shock as large construction companies responded to the change in policy with aggressive sales campaigns. Thus by keeping the time frame as short as possible around the policy date, we are able to better identify its impact. All other non-individual level variables, such as bank observables or macroeconomic indicators are taken with a 2 month lag to the housing loan as ex ante variables.

As we are comparing two different periods with different consumers in their credit outcomes, it is important to establish that the groups are similar to each other so that the first period can serve as a counterfactual to the second period. As can be seen in Table 1 and Figure 3, the populations that borrow immediately before or after the policy change have similar distributions in personal characteristics as measures by their credit ratings, and total debt, number of banks they work with, as well as the number of creditors and average loan amount

in vehicle loans, credit card debt, and to some extent in the number of general-purpose loans taken. The groups do differ in terms of loan amounts in housing and general-purpose loans.

5.3 Residential Spill-over in Constrained Borrowers

In the final step, we disentangle demand and supply side effects in the GPL use of LTV constrained individuals. Therefore, we control for the supply side by adding bank-month fixed effects which allow us to determine the difference between LTV constrained and non-constrained individuals borrowing GPL loans from the same bank in the same month. To control for the supply side, we add $\alpha_{b,t}$ to the Model presented in Equation 8.

In conclusion, we investigate if the share of general-purpose lending over the value of the house is motivated by LTV ratios associated with the residential investment in the entire database. In this context, we take the share of general-purpose lending out of the total value of the residential purchase with a pooled OLS regression that covers the entire period from January 2011-April 2017 with the following specification for individual-credit *i*, for bank *b*, and time *t*:

$$\begin{aligned}\frac{G-PLoans}{HousePrice}_{i,b,t} =& \beta_0 + \beta_1 LTV_{i,t} + \beta_2 PersonObs_{i,t} + \beta_3 After_t + \beta_4 LTV_{i,t} * After_t \\ &+ \beta_5 PersonObs_{i,t} * After_t + \zeta BankObs_{b,t-1} + \gamma MacroObs_{t-1} + \varepsilon_{i,b,t}.\end{aligned} \tag{9}$$

The dependent variable $G-PLoans/HousePrice_{i,b,t}$ takes the sum of general-purpose loans within the two month bracket of the residential loan as a share of the total appraisal value of the residential purchase. The $After_t$ dummy, $PersonObs_{i,t}$, $BankObs_{b,t-1}$, and $MacroObs_{t-1}$ are the same as in the diff-in-diff specification above. The regression employs two interactions, the first one $LTV_{i,t} * After_t$ accounts for the way LTV levels affect the dependent variable differently after the policy change, and the second one $PersonObs_{i,t} * After_t$ allows for different returns to personal observables. The aim the of the regression is to see whether individuals with higher LTV do use larger sums of general-purpose loans for the entire duration of the data, and if this trend has changed significantly after the policy shock.

6 Results

6.1 Bank Residential Lending

We present the results of the effects of LTV on bank residential lending using three different indicators in Table 5. Each column in the Table controls for bank and macro observables, odd numbered columns additionally control for bank, city and year fixed effects while even numbered columns add controls on city-month in an effort to control for loan demand. The first 8 columns show the results for the LTV cap introduction phase in 2011, and the next 8 columns repeat this exercise for the LTV cap expansion phase in 2016.

The results show that following the introduction of the LTV cap in 2011, high exposure banks reduce residential lending amounts, while low exposure banks increase residential lending. After the easing in the cap in 2016, banks that are closer to the existing cap of 75% before the policy change respond more strongly to the increase in the cap as their residential loans increase more than banks that were farther away from the cap.

Both of these results are intuitive. In 2010, before the introduction of the LTV cap, or in 2016 before the change in the existing cap, banks optimized their portfolios according to a number of unique factors, their particular risk appetite being one of them. This has resulted in some banks to have an initial LTV average above the cap (in 2011) or closer to the existing cap (in 2016) than others. In 2011, as residential loans became a safe balance sheet item with the introduction of the LTV cap, banks with higher preferred LTV levels were left with unmet risk appetites. This has resulted in a reduction in the share of residential loans in their portfolios - in favor of riskier items in their balance sheets as we show in Section 6.2. Under the same reasoning, banks that had optimized their portfolios at an LTV average close to the existing cap of 75% in 2016 continued their preference for a higher level of residential loan exposure as the cap increased.

The banks that were below the 75% cap at the time of the policy introduction also seem to have re-optimized their lending practices in the new state, which we relate to a number of reasons. First of all, the very introduction of the LTV cap -whatever level the cap may stand at- may be interpreted by the banks as a signal from the regulator that the cap level represents a safe/optimal/acceptable level of risk, and therefore cause an increase in low exposure banks' LTV levels resulting in higher retail loan amounts after a re-optimization of their asset portfolio due to this signalling effect of the policy. Low exposure banks may also be responding to the larger demand they will face by a market reshuffling of individuals who would normally prefer higher LTV rates at competing (exposed) banks but can no longer have their preferences met by them.

To investigate this final point by controlling for demand side effects, we would ideally need a setting where the same individual would take out two residential loans, each from a different bank in the same month. However, consumers who take out multiple mortgages from multiple banks represent a rather limited sample in our population, let alone those doing so within the same month. As such, we try to control for demand side effects through the use of city-month fixed effects in even numbered columns in the Table. This setting allows us to compare and contrast the residential lending behavior of high and low exposure banks in the same city and month, and the results corroborate the previous findings. In 2011, high exposure banks' residential lending fell as opposed to low exposure banks' increasing residential lending for banks that gave out loans in the same month and city. In 2016, banks that gave out residential loans in the same city and month differed in terms of their responsiveness to the policy change. Banks close to the existing cap increased their lending, but banks below the limit do not show a clear trend.

6.2 Bank Lending Composition

Tables 6 to 10 examine how changes in bank residential lending translates into developments in other loan types such as general-purpose loans or commercial loans and the risk taking behavior of banks.

General-Purpose Lending Table 6 focuses on the effects of changes in 2011 and 2016 on general-purpose loan usage. Similar to Table 5, all the regressions presented include bank and macro level observables. Odd numbered columns have bank, city, and year fixed effects while even numbered columns include city-month fixed effects to control for demand in the same fashion as the results presented above. Again, the first 8 columns present results for 2011, and the second 8 repeat the analysis for 2016.

Within the 1-month window before the announcement of the introduction and after the implementation, we see that the reduction in residential loans in high exposure banks has made it possible for these banks to give out more general-purpose loans. By the reverse reasoning, the increase in residential loans for low exposure banks are coupled with a decline in general-purpose loans. Similarly, in 2016 general-purpose lending for banks close to the limit increased whereas those for banks farther away from the limit decreased. Even numbered columns controlling for demand through the use of city-month fixed effects also show that these effects are motivated by supply side developments.

The results in this table are interesting as they show that relatively higher exposed banks in the introduction phase, or banks close to the limit in the expansion periods, i.e. banks that

have increased residential lending in response to policy changes from the previous analysis were the ones that also increased general-purpose lending. But these results take their full meaning with the help of Table 7 that shows whether the changes in general-purpose loans were associated with new residential lending or not. To this end, we separated general-purpose loan users into two groups depending on whether they have also used a residential loan within two months of the general-purpose loan issuance or not. Results show that high exposure banks that have increased their general-purpose lending have done so more for residential loan users than for non-residential loan holders. While these banks have reduced their residential lending, they have allowed residential loan customers to borrow more in other types of loans. This could in essence suggest that these banks with a higher preference for risk are keeping their exposures on each loan higher than levels implied by the LTV cap.

In particular for 2016, the fact that banks that give out more residential loans also give out more general-purpose loans and they do so for residential loan customers is, at this stage, a preliminary result supporting "flight to quality" by borrowers. Further, regressions presented in even numbered columns that control for demand imply that this is a supply side motivated result, in other words, that the increase in general-purpose lending by banks is an outcome of them being high exposed banks in 2011 or banks close to the limit in 2016. Residential loan customers may want to top off their residential borrowing with additional non-residential lending independent of the type of bank they work with. But it is only the customers of banks that were either high exposed in 2011, or close to the limit in 2016, that actually get to use these additional loans.

Asset Composition It is also possible that the LTV policy may have affected not only retail loans but decisions and policies on other asset items of the bank as the bank searches for an optimal credit policy following a regulatory policy change. Table 8, constructed in similar fashion as the tables before, shows how loan issuance and risk taking in commercial loans have changed as LTV policies were introduced or amended. The analysis done on varying windows around January 2011 show that high exposure banks that experienced a decline in residential loans also are the ones that have increased their commercial lending. As would be expected, low exposure banks experience the reverse outcome.

Banks close to the limit in 2016 have lower commercial loan outcomes than those farther away from the limit, but this effect fades away as the windows get larger. The implementation of supportive credit policies along with the wider use of the Credit Guarantee Fund (CGF) during this period could have affected these results.[15] Regressions that control for demand

[15]To increase the credit access of the corporate sector, several supportive measures were put in place in the period end-2016 to mid-2017. Most of these measures targeted SME credit access through the use of low-

suggest that the results are again supply driven, and whether the banks have high exposure or not has a deterministic effect on the outcomes.

Tables 9 and 10 test these findings on credit register data which allows for a cleaner control of demand side factors through the use of firm-month fixed effects. This specification will compare credit outcomes of two banks of varying LTV exposures that lend to the same firm at the same time. Table 9 shows that firms serviced by two banks in the same month receive higher amounts from high exposed banks in 2011, but lower amounts from banks close to the limit in 2016. To investigate whether the increase in commercial lending by exposed firms in 2011 represents a shift towards a riskier balance sheet, Table 10 introduces the bank rating of the firm as a representation of risk through a triple interaction. The regressions control for supply side effects through the use of bank-month interactions and investigate if lending by the same bank in the same month differs between risky or less risky firms. The results show that riskier firm lending in 2011 by exposed banks was higher than lending towards less risky firms.

In sum, all the tables together tell a coherent story of how with the introduction of the LTV cap in 2011, banks that previously enjoyed higher levels of LTV in retail residential loans have chosen to reduce their residential lending in favor of general-purpose loans to new residential customers which increases their exposures on the residential loan, or to firms with lower internal ratings. This attests to the fact that these banks have a higher risk preference and may have been left with unmet risk appetite as the LTV cap made residential loans an even safer balance sheet item.

As for banks that had LTV levels close to the old limit in 2016, they increase their residential lending as well as general-purpose loans to new residential customers and do not engage in higher or riskier commercial lending. In both settings, we see a preference of exposed banks to increase general-purpose lending to residential loan customers, which is suggestive evidence for ”credit spill-over” and will be investigated further in the next section.

6.3 A Quasi-Experiment on Spill-Over

Results presented in Tables 11 to 16 rely on Equation 8. First, treating the LTV regime change in September 2016 as an exogenous policy shock, we present the baseline results of the diff-

interest loan facilities (TOBB, about TL5 billion), interest-free loans (KOSGEB, about TL11 billion), and the bulk of the support came from the CGF at TL250 billion. The CGF, backed by the Treasury, launched a large-scale collateral support scheme in which SMEs with insufficient collateral for a bank loan would receive a collateral guarantee from the CGF to support their credit application. Exporting firms were given 100% collateral guarantee, whereas SMEs were supported up to 90%. Risk weights on loans granted through the CGF scheme were also lowered which helped CAR valuations. For more, see Baziki and Çapacıoğlu (2020 and 2021) and the references therein.

in-diff strategy in Table 11. The first column shows results of a simple diff-in-diff and finds a positive effect of being constrained by the LTV ratio cap in the period after. The following 4 columns add individual observables which indicate that higher ratings are associated with lower general-purpose loans, however the number of credit cards and other debt do not affect general-purpose loans issued to the individual. Although our current dataset does not provide income information on the individual, a higher credit rating implies that the individual has built a reputable credit history, has taken out and paid other loans and therefore presents a low credit risk profile which are indicators correlated with higher income levels. Individuals with higher ratings therefore present a lower likelihood of being credit constrained, even when the housing loan has an LTV ratio close to the cap.

The interaction term takes on values between 5.174 and 6.040 throughout this initial exercise, which suggests that the added premium of being on the LTV ratio cap on a housing loan after the regime change increases general-purpose loans by between 5 to 6 thousand TLs compared to being on the cap before the regime change. This amount is equivalent to about half the per-capita general-purpose loan outstanding in the economy at the time as seen in Figure 7.

This result is surprising, as an easing in the macroprudential policy has not only made it possible for the individuals to be more leveraged in their residential loans, it has also encouraged constrained borrowers to take on more debt, indicative of higher monthly payments, and a higher LTVpseudo ratio linked to the associated housing loan. Under the assumption that the additional non-residential lending is used to finance the residential purchase, this also suggests that borrowers are aiming for more expensive houses than they otherwise would have. This is supported by Figure 8 which shows that the appraisal values of houses purchased after the policy change are higher than those before. The results are suggestive that the easing in the LTV cap may have encouraged a "flight to quality" in residential borrowers.[16]

The results, and the coefficient are consistent across several different specifications. Table 12 performs the same analysis on a larger sample with similar results. Table 13 shows the coefficients for the interaction term for different cutoff specifications for LTV. Lower cutoffs of 70% before and 75% after the policy change produce lower coefficients with lower significance as would be expected. As we get closer to the actual LTV caps, the results become stronger in general. The actual cap percentages have lower power, due to lower number of loans that are exactly at the cutoffs down to the decimal and therefore is not our main specification.[17] The results hold across baseline and larger samples, and specifications with

[16]This may also be a reflection of changes in the composition of borrowers. While our data does not cover background information on individuals to warrant further investigation, Tables 1, 2 and Figure 3 has already shown that the pool of borrowers before and after the regime change are comparable in terms of relevant statistics.

[17]There is a preference for loans that are whole integer multiples of thousands of TL, which is why more con-

cluster-robust errors across banks also confirm the results although at a loss of a degree of significance.

Finally Table 14 shows the results of the same exercise for larger windows of 4, 6, and 8 months and again confirms the result that being on the LTV ratio cap after the regime change increases general-purpose loan uptake compared to being on the cap before.

6.4 Residential Spill-Over in Constrained Borrowers

Tables 15 and 16 explore if LTV constrained individuals demand higher amounts of general-purpose loans by looking at the loan usage of constrained and unconstrained residential loan customers of the same bank in the same month. The identification is made possible through the use of bank-month fixed effects in the regressions and the level of being constrained is tested through varying brackets below the limits. Table 15 shows that general-purpose loan use for the month of and the month before residential loan use is higher for constrained borrowers. In even numbered columns following column 4 which control for the supply side factors, the effect is shown to be motivated by the level of constraint in LTV. In other words, LTV constrained residential loan customers use more general-purpose loans compared to unconstrained borrowers of the same bank in the same month. Additionally, the amount of general-purpose usage increases as the constraint bracket below the limit tightens, meaning as the individual's level of constraint goes up.

Table 16 repeats the analysis used in the quasi-experimental approach in Section 6.3 by controlling for the supply side and finds that the differences in general-purpose loan use between constrained and unconstrained borrowers is stemming from demand side factors. And as before, as the LTV ratio of the individual gets closer to the limit, general-purpose loan usage increases.

The results of the pooled OLS regression specified in Equation 9 shown in Table 17 show that larger levels of LTV are associated with larger shares of general-purpose loans to house value. In addition, even though the diff-in-diff specification did not attach a significant value to the number of credit cards an individual has, looking at the entire period, we see that the number of cards, which could indicate larger consumption, demand for credit and the ability to borrow, are correlated with higher non-residential debt to residential value, although this effect is smaller for the period after the policy change. The same argument follows in the coefficients for rating, which again show a different angle compared to the previous results on individual observables. As the rating for the individual improves so does their ability

sumers fall on the range between whole numbers than exact integers. Having said that we also observe a large concentration over time at 50% for LTV levels.

to borrow which translates into a higher general-purpose loan to house value ratio. The interaction variable with LTV shows that after the policy change the contribution of the LTV level to the loan to value ratio has increased, supporting the outcome in the previous analysis.

7 Conclusion

Since the onset of the global financial crisis, many regulators have introduced macroprudential policies to strengthen and preserve financial stability in their jurisdictions. In addition to supply-side measures like reserve requirements and counter cyclical buffers, measures curbing borrowing have also been widely employed. LTV ratio cap is chief among these measures, as it is widely used in both advanced and emerging countries alike. This paper investigates the introduction of and an expansionary amendment to the LTV ratio cap in Turkey, a large emerging economy, with the use of novel bank-linked individual credit databases that cover all the financial institutions and housing loans in the market. The paper offers new insights on the effect of the policy on bank lending practices and additional borrowing by credit constrained individuals through the use of a large unique database and is the first to study the effects of a loosening in LTV caps to complement the literature that has so far focused on credit cycle and housing market outcomes.

First, in a series of bank-individual-city level regressions we establish that banks that had higher levels of LTV ratios before the introduction of the policy restriction have responded to the policy by reducing their residential lending in favor of general-purpose loans to new residential customers, or to corporations. This substantiates the fact that these banks which preferred a higher risk level on their residential loans prior to the policy may have been left with unmet risk appetite as the LTV cap made residential loans an even safer collateralized balance sheet item. In response, the banks have switched their lending to unsecured retail, or relatively lower rated commercial loans. In the second leg of this exercise we examine changes in lending policies following the easing in LTV cap from 75% to 80% in 2016, and find that banks that had LTV levels close to the old limit in 2016, in other words, banks that preferred to have higher LTV ratios on residential loans in the pre-policy period increase their residential lending - which has a slightly lower collateral coverage after the easing - as well as general-purpose loans to new residential customers. In both settings, we see a preference of these high exposure, or, on-the-limit banks to increase general-purpose lending to residential loan customers, which is suggestive evidence for ”credit spill-over”.

Next, treating the easing in the cap as an exogenous shock to the market, we look at how additional borrowing by constrained individuals has responded to the policy change using individual-level borrowing data that links banks and existing credit information on individ-

uals. Employing a diff-in-diff methodology, we find that constrained borrowers after the change have on average about 5 to 6 thousand TL higher general-purpose loans, which corresponds to about half the per-capita general-purpose lending in the country at the time.

This result highlights an unforeseen consequence of easing in a macroprudential policy. A higher LTV ratio on residential loans is a natural and expected outcome of an increase in the LTV cap. But the results suggest that constrained residential borrowers are taking out additional loans following the policy change, creating a "credit spillover" in line with the expansionary policy change. This additional non-residential lending suggests higher household indebtedness relative to the residential loan and that residential borrowers could be purchasing more expensive houses than they otherwise would have, an outcome supported by rising average house prices in residential loans in this period. This may be a signal that, aligned with the easing policy phase, borrowers are using higher LTV ratios as an opportunity to buy better homes, signalling a "flight to quality" in residential loans.

From the perspective of macroprudential policy prowess, the results show that LTV policy is effective in curbing residential loan growth at its introduction. Notably, the policy also functions well on the easing end to stimulate not only residential loans, but retail loans in general. Together, our results confirm that residential LTV policies are effective countercyclical policy tools. At the same time, our findings point to the fact that the introduction of an LTV cap alone, by nature, only speaks about the leverages on residential loans and does not extend to spill overs into other types of loans. As such, to improve their efficiency and dampen the impact on bank balance sheets with a more long-term perspective, it may be favorable to couple LTV caps with measures specifying debt service ratio, or debt to income ratios.

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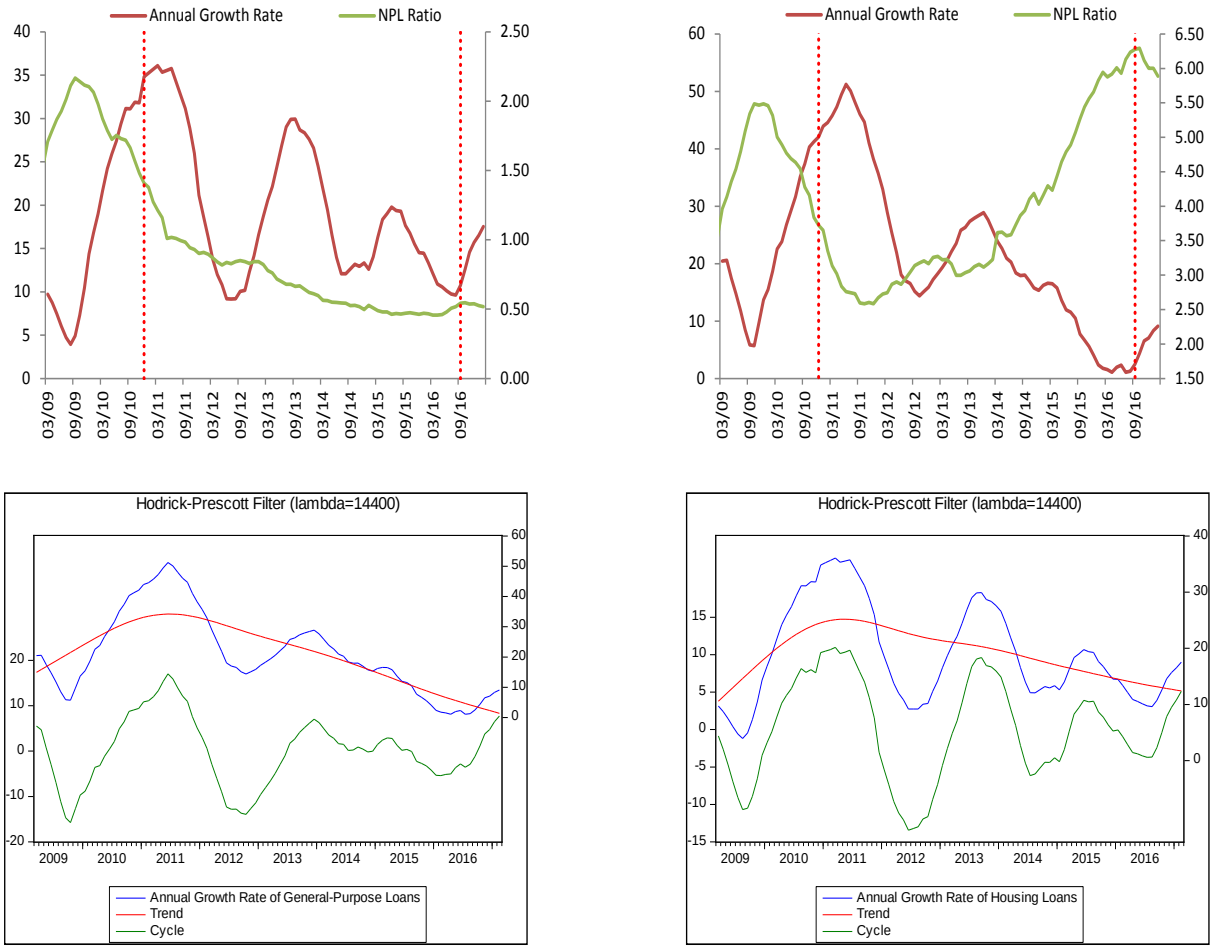

Figure 2: Housing (left panel) and general-purpose loan growth rates (Percent).

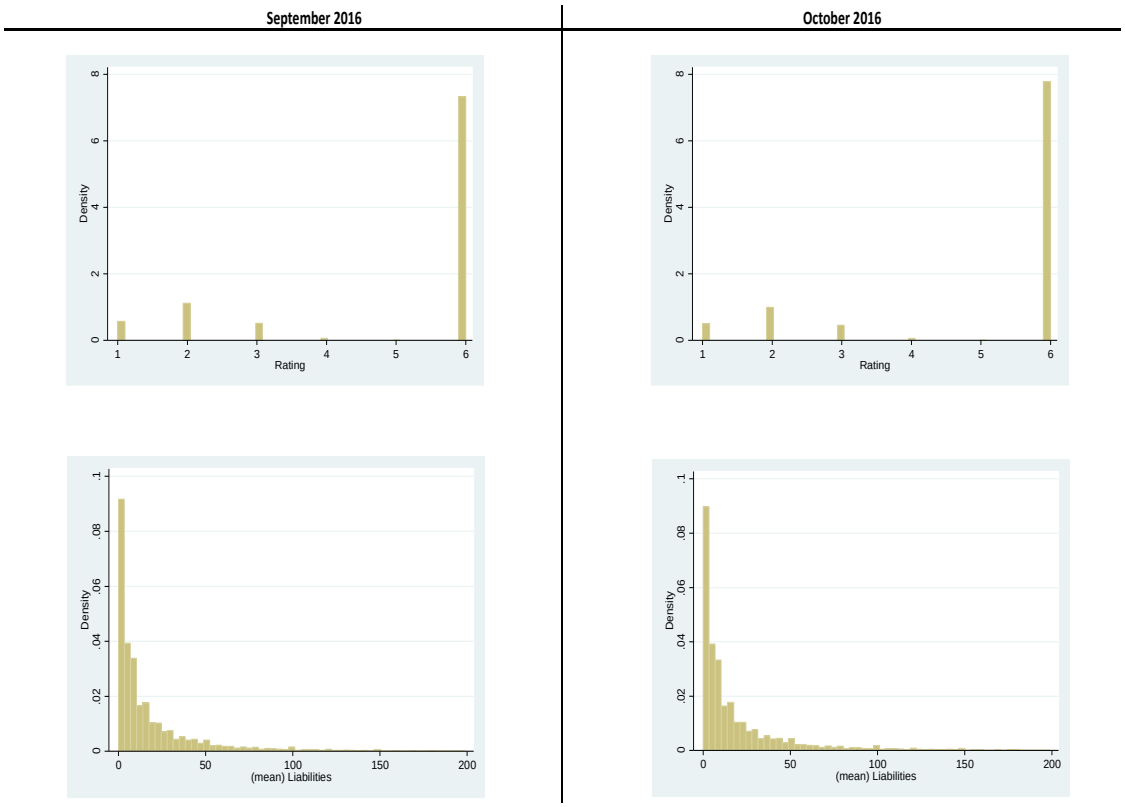

Figure 3: Distributions of ratings and liabilities of individuals before and after the policy change.

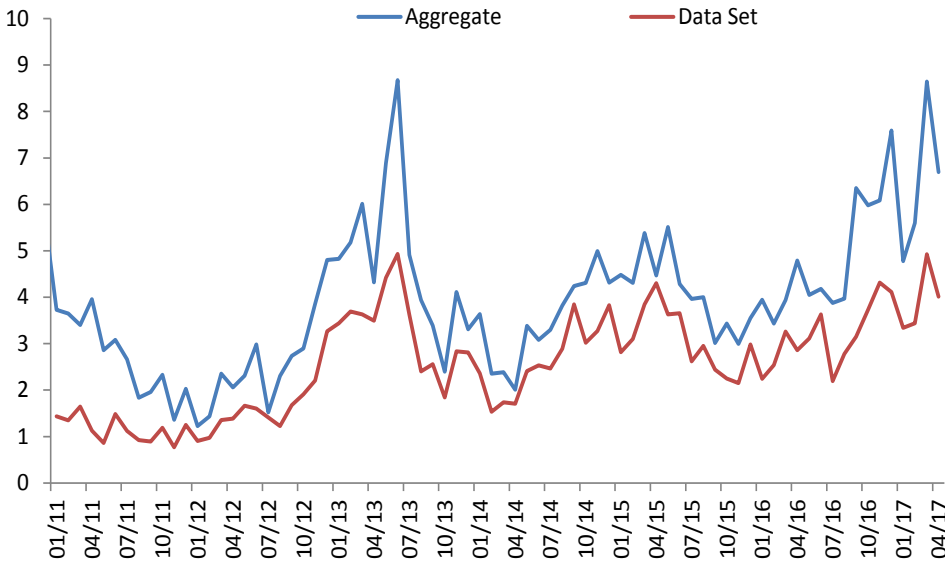

Figure 4: Data coverage in housing loans by the dataset at hand follows the aggregate data closely (flow data, Billion TL).

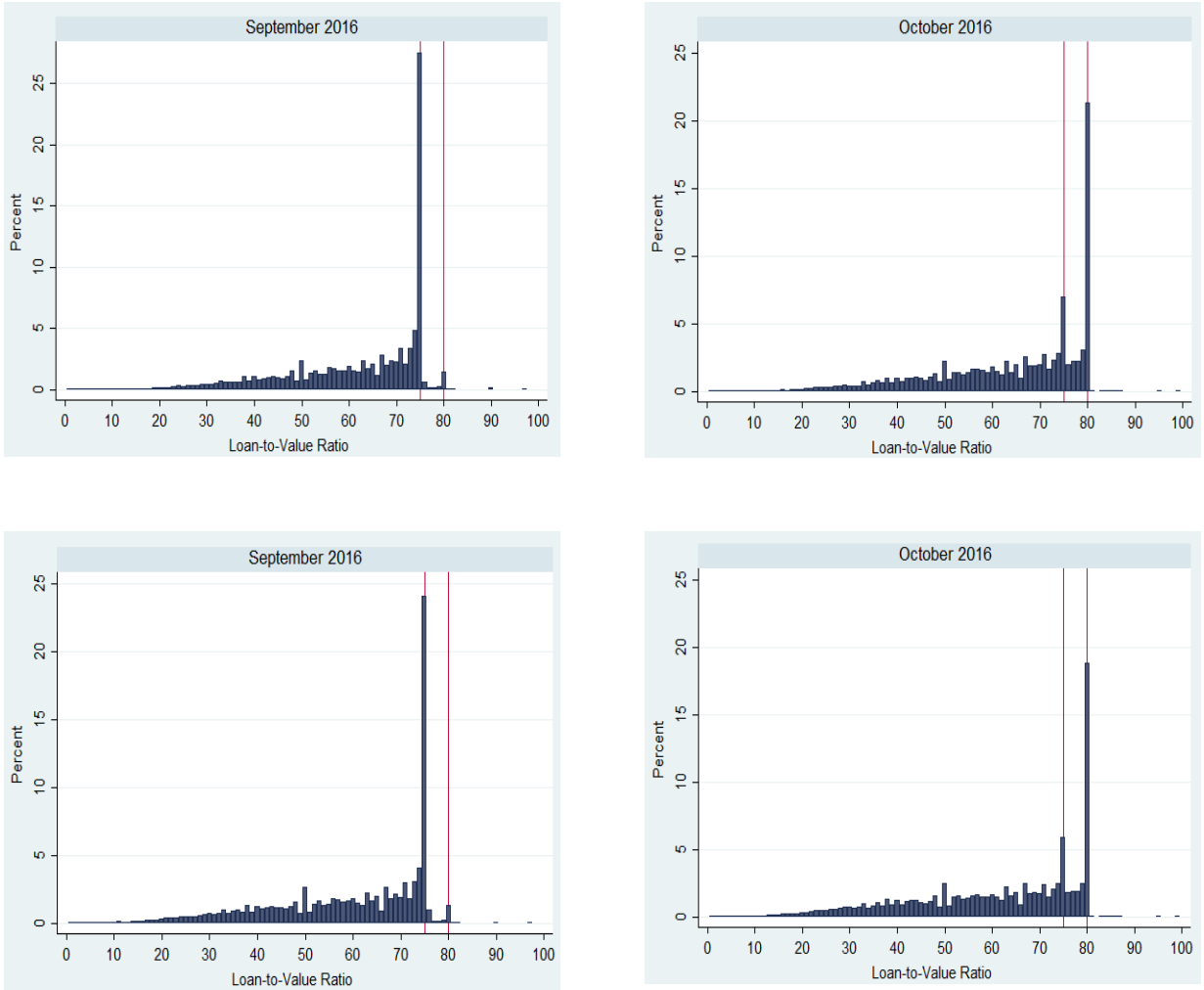

Figure 5: LTV histograms by loan amount (top panel) and the number of loans (bottom panel).

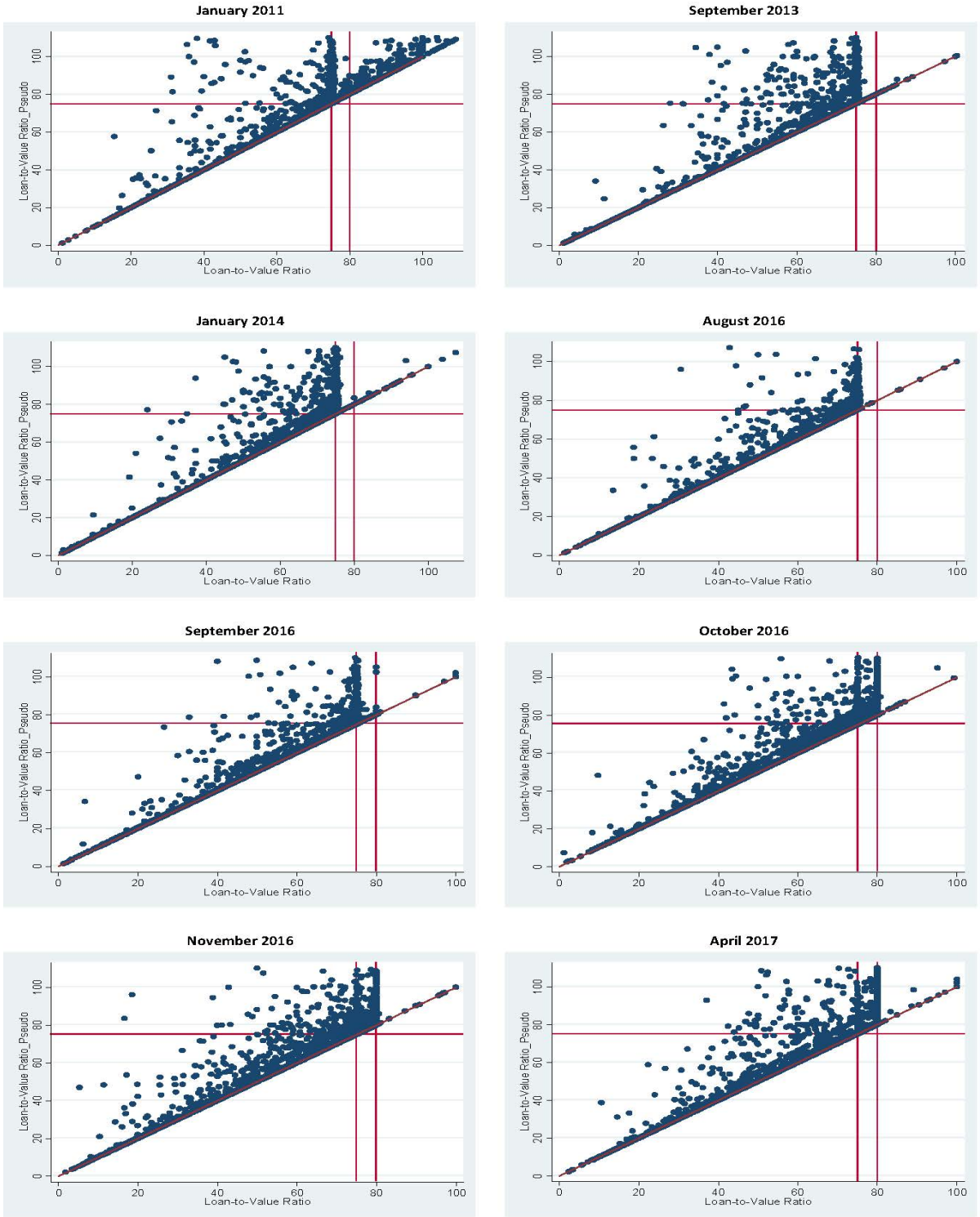

Figure 6: Mapping of individual LTV to LTVpseudo

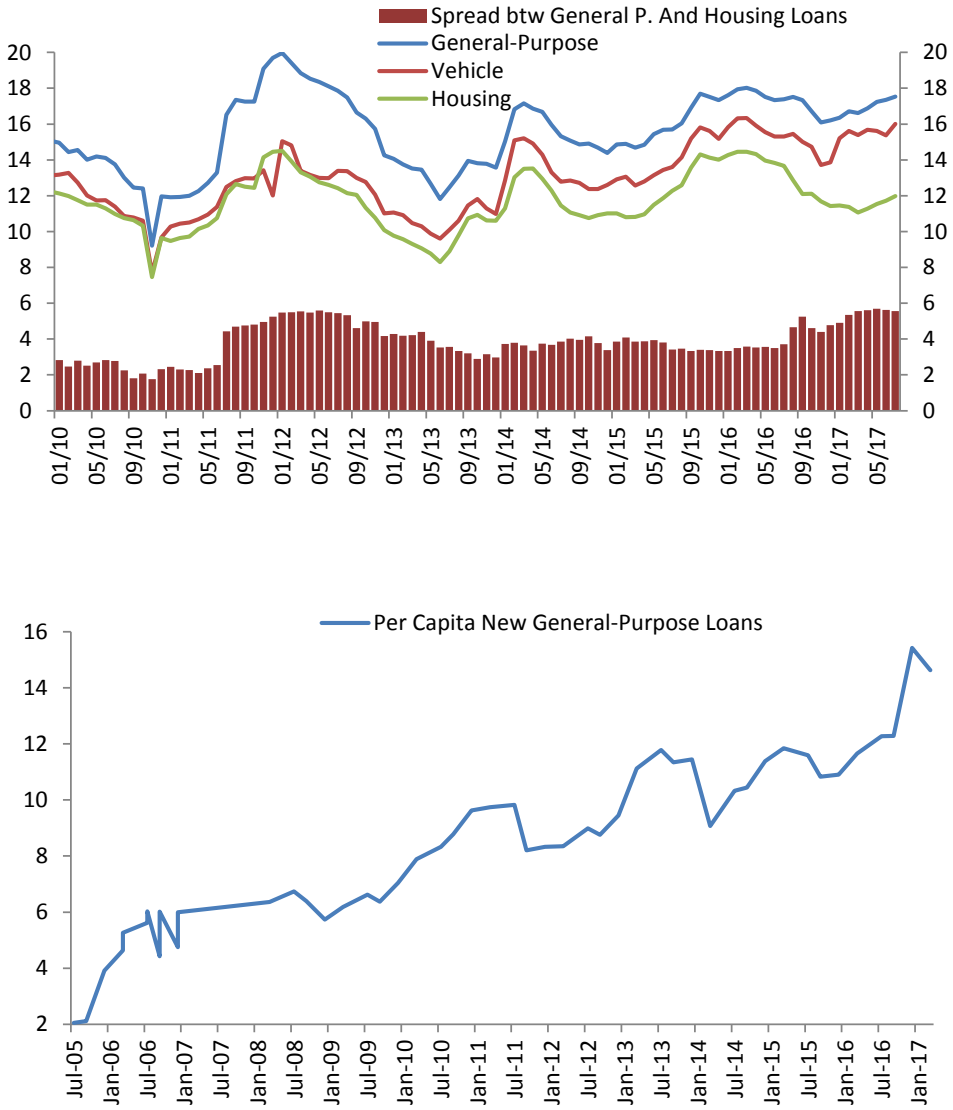

Figure 7: Interest rate spreads (top panel) and per-capita general-purpose loans (Percent, Thousand TL).

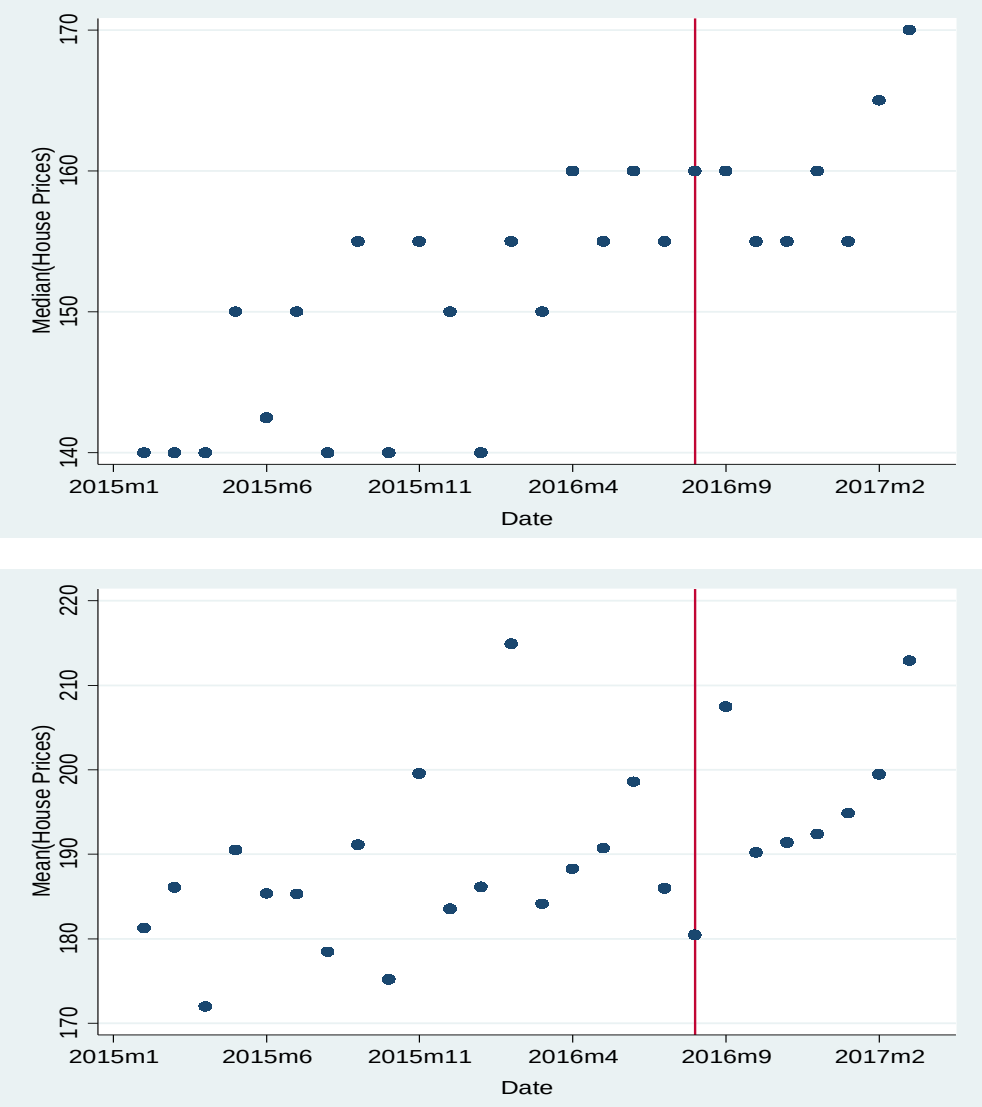

Figure 8: House prices (Thousand TL). The red line represents the date of the policy shock.

Table 1: Total debt and credit card balances of residential borrowers.

	Average Amount of Debt (Thousand TL)						# of Banks
	Total Debt	Total Debt w/o Housing Loans	General Purpose Loans	Housing Loans	Vehicle Loans	Credit Cards	
04/16	21.27	17.20	22.12	125.35	37.69	8.10	1.49
05/16	21.62	17.27	22.14	127.84	37.81	8.36	1.49
06/16	22.45	17.53	22.40	130.66	38.25	8.36	1.51
07/16	20.43	17.45	22.29	124.66	38.17	8.41	1.50
08/16	21.12	17.44	22.15	120.89	38.27	8.59	1.49
09/16	24.37	19.59	22.58	128.23	38.42	8.78	1.46
10/16	25.60	19.94	23.14	134.96	38.65	8.77	1.46
11/16	26.84	20.36	23.71	141.79	39.52	8.82	1.47
12/16	26.92	20.76	24.25	144.56	40.08	9.01	1.49
01/17	25.64	20.65	24.17	142.68	40.30	8.85	1.51
02/17	25.82	20.70	24.26	148.70	40.43	8.76	1.47
03/17	28.14	20.89	24.58	167.17	40.84	8.93	1.47

	Credit Cards				Rating
	# of Open Cards	# of Closed Cards	Balance	Average of Limit	Average of Rating of Consumers
04/16	2.39	0.18	22.59	45.04	4.98
05/16	2.21	0.17	20.79	41.86	5.02
06/16	2.10	0.15	19.66	38.55	5.21
07/16	1.80	0.04	18.29	21.07	5.06
08/16	2.15	0.15	20.37	40.31	5.91
09/16	1.89	0.14	17.79	35.89	5.06
10/16	1.77	0.13	16.33	33.34	5.18
11/16	1.81	0.12	16.99	33.38	5.23
12/16	1.78	0.12	16.69	35.79	5.40
01/17	1.94	0.14	17.97	38.15	5.92
02/17	1.79	0.14	16.44	36.32	5.20
03/17	1.62	0.12	15.34	32.40	5.27

Note: Table shows the total liabilities of residential borrowers around the policy change in thousand TLs.

Table 2: Summary Stats by Loan Type of Residential Borrowers : Total Sample

	Date	Total Loans	Average Loans	# of Credit	# of People
Housing Loans	04/16	3,838,708	114.61	33,495	33,230
	05/16	4,350,762	115.79	37,576	37,216
	06/16	4,390,482	118.07	37,184	36,844
	07/16	2,838,803	115.67	24,542	24,307
	08/16	4,238,492	113.40	37,378	37,061
	09/16	5,167,644	118.30	43,682	43,360
	10/16	6,132,442	122.43	50,089	49,671
	11/16	6,386,490	125.34	50,953	50,491
	12/16	6,328,205	126.49	50,029	49,524
	01/17	5,073,685	129.89	39,061	38,712
	02/17	5,339,186	131.04	40,745	40,304
	03/17	7,074,793	134.90	52,443	52,010
	Date	**Total Loans**	**Average Loans**	**# of Credit**	**# of People**
General Purpose Loans	04/16	541,384	14.68	36,878	35,805
	05/16	651,477	15.90	40,976	39,798
	06/16	809,272	15.22	53,167	51,423
	07/16	507,923	12.47	40,725	39,580
	08/16	651,005	13.16	49,474	47,722
	09/16	653,737	13.57	48,178	46,697
	10/16	934,059	17.74	52,651	50,694
	11/16	1,029,393	18.74	54,923	52,893
	12/16	933,085	18.96	49,209	47,279
	01/17	791,975	17.01	46,561	44,924
	02/17	756,290	17.04	44,372	43,023
	03/17	948,648	18.52	51,218	49,554
	Date	**Total Loans**	**Average Loans**	**# of Credit**	**# of People**
General Purpose Loans with Colatralized Property	04/16	71,267	35.42	2,012	1,986
	05/16	97,074	34.58	2,807	2,778
	06/16	138,528	24.59	5,634	5,536
	07/16	69,684	28.49	2,446	2,406
	08/16	81,168	23.47	3,458	3,365
	09/16	68,237	26.03	2,621	2,583
	10/16	118,123	31.41	3,761	3,694
	11/16	137,602	32.83	4,191	4,097
	12/16	109,315	28.94	3,777	3,697
	01/17	129,452	27.71	4,671	4,595
	02/17	131,668	29.34	4,488	4,416
	03/17	134,049	28.45	4,711	4,606
	Date	**Total Loans**	**Average Loans**	**# of Credit**	**# of People**
Vehicle Loans	04/16	67,330	52.40	1,285	1,274
	05/16	75,568	51.65	1,463	1,454
	06/16	86,173	53.39	1,614	1,608
	07/16	44,533	53.08	839	835
	08/16	71,956	52.68	1,366	1,359
	09/16	65,775	55.60	1,183	1,171
	10/16	75,405	54.64	1,380	1,374
	11/16	112,236	55.73	2,014	2,002
	12/16	102,606	53.78	1,908	1,899
	01/17	68,335	61.90	1,104	1,098
	02/17	61,663	59.12	1,043	1,037
	03/17	91,002	59.28	1,535	1,527
	Date	**Total Loans**	**Average Loans**	**# of Credit**	**# of People**
Credit Cards	04/16	27,271	4.47	6,099	5,148
	05/16	28,635	4.51	6,353	5,400
	06/16	27,995	4.44	6,303	5,334
	07/16	14,221	5.21	2,728	2,307
	08/16	31,010	4.68	6,620	5,552
	09/16	18,881	4.59	4,114	3,541
	10/16	20,822	4.37	4,761	4,030
	11/16	22,881	4.26	5,367	4,530
	12/16	26,868	5.05	5,324	4,504
	01/17	20,928	4.43	4,723	3,992
	02/17	18,635	4.18	4,463	3,802
	03/17	24,599	4.34	5,663	4,752

Note: The table shows the distribution of non-residential borrowing in thousand TLs by individuals who have taken out at least one residential loan between the dates January 2011-April 2017.

Table 3: Other Loans of Residential Borrowers : Expansionary Policy

General Purpose Loans (Thousand TL)

	Same Month		1 Month Before		1 Month After		2 and 3 Month Before		2 and 3 Month After	
Date	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit
04/16	44,304	1,272	4,867	190	6,661	546	7,511	329	12,291	1,006
05/16	65,253	1,760	5,616	186	4,962	437	7,131	349	13,729	1,243
06/16	68,044	1,832	4,688	171	11,955	785	13,751	541	21,185	1,903
07/16	55,473	1,055	3,106	153	5,698	567	9,543	512	15,667	1,689
08/16	48,830	1,291	5,251	209	5,653	432	13,364	608	18,485	2,056
09/16	65,801	1,385	6,013	251	6,109	457	12,692	635	13,052	1,574
10/16	88,281	1,852	10,036	336	9,264	562	17,686	675	18,334	1,357
11/16	99,374	2,232	10,949	344	13,227	657	16,419	644	22,603	1,579
12/16	101,734	2,335	9,934	293	17,251	830	17,799	613	24,697	1,599
01/17	98,759	1,807	6,846	251	10,078	660	15,350	568	26,233	1,775
02/17	74,834	1,882	8,412	323	9,749	621	6,378	264	25,950	1,809
03/17	106,362	2,475	9,835	308	9,546	599	0	0	26,599	2,030

General Purpose Loans with Collateralized Property (Thousand TL)

	Same Month		1 Month Before		1 Month After		2 and 3 Month Before		2 and 3 Month After	
Date	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit
04/16	3,764	26	244	3	835	16	278	4	1,231	45
05/16	6,304	97	419	6	432	15	49	1	1,960	76
06/16	5,936	88	390	1	2,088	40	1,040	8	2,524	82
07/16	1,730	23	30	1	379	22	186	4	1,186	72
08/16	710	18	50	1	479	20	295	5	1,120	100
09/16	1,304	20	354	3	435	6	85	3	1,038	50
10/16	2,468	36	70	1	601	18	591	7	2,680	44
11/16	7,432	43	619	6	2,647	20	400	5	1,850	75
12/16	3,372	36	113	2	4,776	30	120	3	933	46
01/17	3,061	30	2	1	450	16	3,029	9	1,098	65
02/17	3,502	45	1,278	7	956	18	50	2	2,566	67
03/17	8,708	63	659	6	1,093	15	0	0	3,012	52

Vehicle Loans (Thousand TL)

	Same Month		1 Month Before		1 Month After		2 and 3 Month Before		2 and 3 Month After	
Date	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit
04/16	962	20	346	6	886	18	1,945	27	1,573	30
05/16	773	16	646	14	1,277	20	1,163	23	3,525	55
06/16	938	15	544	11	946	15	2,030	39	2,134	39
07/16	275	6	932	10	553	8	2,219	35	1,118	22
08/16	572	12	424	7	655	15	2,344	45	2,496	41
09/16	1,447	20	552	10	437	10	2,305	30	1,172	25
10/16	1,080	22	890	15	490	9	1,870	34	2,706	44
11/16	1,226	25	1,125	17	1,905	30	4,227	64	3,386	63
12/16	1,833	37	1,583	27	2,152	37	2,921	56	4,066	68
01/17	521	11	472	8	803	18	3,524	39	2,400	45
02/17	818	17	1,631	21	821	17	1,195	18	2,071	39
03/17	1,994	22	1,306	15	1,497	29	0	0	4,166	60

Credit Cards (Thousand TL)

	Same Month		1 Month Before		1 Month After	
Date	Total Amount	# of Credit	Total Amount	# of Credit	Total Amount	# of Credit
04/16	616	280	203	29	576	221
05/16	705	349	211	39	508	149
06/16	708	357	238	40	821	223
07/16	322	124	26	8	291	114
08/16	678	286	187	28	638	164
09/16	484	184	449	59	319	83
10/16	841	228	322	43	661	147
11/16	863	241	163	38	929	211
12/16	804	241	356	54	1,110	209
01/17	620	176	348	72	626	174
02/17	1,019	256	298	36	444	114
03/17	980	340	262	53	770	169

Note: The panels within the table show each non-residential loan broken down by date of origination relative to the origination date of the residential loan for various windows around that date. This table focuses on the 12 month window around the expansionary policy change.

Table 4: The Amount of Turkish Banks' Cross-Border Borrowing during the 2008 Global Financial Crisis

Variable Names	Definition	Source	Unit	N	Mean	SD	Min.	0.25	0.50	0.75	Max.
Period	**2010M01 - 2017M03**										
Dependent Variables											
Housing Loans	The natural logarithm of the amount of the banks' housing loans	CBRT	-	689,236	11.35	0.58	11.00	11.35	11.70	6.91	15.96
General Purpose Loans	The natural logarithm of the amount of general-purpose loans issued to the non-residential borrowers	CBRT	-	325,823	6.60	2.35	5.01	6.70	8.07	0.00	12.37
General Purpose Loans	The natural logarithm of the amount of general-purpose loans issued to the home buyers in the month of and the month before the house purchase	CBRT	-	127,605	5.64	1.89	4.28	5.44	6.76	0.00	10.59
Commercial Loans	The natural logarithm of the amount of commercial loans	CBRT	-	622,855	10.09	2.39	8.53	9.94	11.59	0.00	16.55
(General Purpose Loans / House Prices)	The ratio of the amount of general-purpose loans to the appraised value of collateralized property	CBRT	Percent	102,799	13.02	16.66	0.45	2.22	7.00	17.04	74.67
Independent Variables											
Personal Observables											
LTV	Weighted average of banks' Loan-to-Value ratio	CBRT	Percent	683,400	64.23	2.80	61.72	63.69	65.64	50.40	69
LTVconst	Loan-to-Value is the amount of mortgage lien divided by the appraised value of the property	CBRT	Percent	102,799	64.70	15.85	1.03	56.82	72.31	75.00	197.50
N of CC	Total number of open credit cards consumer	CBRT	-	102,799	3.02	11.68	0.00	0.00	1.00	4.00	93.00
Other Debt	The sum of other current debts of consumer	CBRT	Thousand TL	90,005	139	227	0	70	102	152	16,219
Rating	Internal Rating of lender Turkish Bank on consumer	CBRT	Index	73,085	5.89	0.64	1.00	6.00	6.00	6.00	6.00
Bank-Specific Variables											
Total Assets	The natural logarithm of banks' total real assets	CBRT	-	689,236	13.26	0.84	12.92	13.54	13.85	8.72	14.05
Credit Ratio	Total loans divided by total assets	CBRT	Percent	689,236	60.15	8.36	59.16	62.69	64.96	32.66	76.68
Deposit Ratio	Total deposits divided by total assets	CBRT	Percent	689,236	58.95	7.33	55.05	57.07	59.94	27.30	82.21
Capital Ratio	Capital divided by total assets	CBRT	Percent	689,236	7.51	3.36	4.94	6.57	9.39	2.28	29.89
Liquidity Ratio	Selected FX liquid assets divided by total assets (Selected FX liquid assets = cash + foreign banks(free) + receivables from CBRT, interbank money market, reverse repo transactions)	CBRT	Percent	689,236	2.70	2.32	1.43	1.61	3.37	0.50	46.56
NPL Ratio	Bank non-performing loans divided by bank total loans	CBRT	Percent	689,236	3.12	1.49	1.84	2.82	3.91	0.00	10.93
ROA Ratio	Bank net profit divided by total assets	CBRT	Percent	662,802	1.74	0.56	1.41	1.77	2.00	-1.46	5.06
Turkey(TR) Macro Variables											
Δ Industrial Production	Monthly change in industrial production index growth (used instead of GDP growth due to discrepancy of frequencies)	TurkStat	Percent	689,236	5.15	5.94	1.23	4.21	9.73	-8.41	19.04
Inflation Rate	Monthly change in consumer price index	TurkStat	Percent	689,236	7.50	1.84	6.58	7.28	8.62	3.99	11.29
Δ AOFM	Monthly change in CBRT's effective policy rate	TurkStat	Percent	689,236	0.09	0.41	-0.16	-0.05	0.11	-0.35	1.44
Δ REER	Monthly change in real effective exchange rate based on consumer price index	TurkStat	Percent	689,236	-1.03	2.20	-3.08	-1.21	0.85	-5.45	3.32

Table 5: Effects of LTV Regulations on the Amount of Housing Loans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Policy	**Tightening (2011/M01)**								**Loosening (2016/M10)**							
Window:	**1-Month**		**2-Months**		**4-Months**		**6-Months**		**1-Month**		**2-Months**		**4-Months**		**6-Months**	
After	0.505***		0.527***		0.290***		0.181***		-0.742***		-0.231*		-0.164**		-0.064	
	(0.125)		(0.086)		(0.062)		(0.049)		(0.198)		(0.126)		(0.082)		(0.063)	
After*LTV	-0.785***	-0.832***	-0.829***	-0.813***	-0.449***	-0.426***	-0.274***	-0.262***	1.181***	1.187***	0.412**	0.470**	0.327**	0.352***	0.185*	0.218**
	(0.183)	(0.188)	(0.126)	(0.130)	(0.090)	(0.093)	(0.072)	(0.074)	(0.313)	(0.320)	(0.200)	(0.203)	(0.130)	(0.133)	(0.100)	(0.102)
LTV	2.811		0.074		-1.626		14.075***		5.753*		22.721***		-7.667**		-1.802	
	(4.118)		(2.045)		(2.303)		(2.631)		(2.979)		(7.567)		(3.545)		(1.469)	
Constant	2.261		4.094***		5.219***		-5.220***		0.965		-9.790**		9.475***		5.744***	
	(2.760)		(1.374)		(1.537)		(1.745)		(1.889)		(4.793)		(2.253)		(0.933)	
Obs	35,725	35,516	80,730	80,316	178,430	177,573	266,240	264,962	75,051	74,896	148,180	147,838	269,162	268,475	401,190	400,175
R-sq	0.232	0.240	0.225	0.236	0.218	0.232	0.217	0.232	0.238	0.242	0.229	0.238	0.229	0.240	0.232	0.245
After	0.012		-0.006		0.001		0.002		-0.106***		-0.016		-0.057***		-0.012	
	(0.012)		(0.008)		(0.005)		(0.004)		(0.036)		(0.025)		(0.020)		(0.017)	
After*Exposure	-0.140***	-0.144***	-0.108***	-0.101***	-0.056***	-0.049***	-0.026*	-0.027*	0.234***	0.236***	0.092*	0.106**	0.194***	0.144***	0.103***	0.150***
	(0.038)	(0.040)	(0.025)	(0.026)	(0.017)	(0.018)	(0.014)	(0.015)	(0.076)	(0.078)	(0.052)	(0.053)	(0.042)	(0.045)	(0.035)	(0.038)
Exposure	-0.016		0.082		0.102		0.287***		3.421**		3.221***		19.470**		32.965***	
	(0.173)		(0.145)		(0.084)		(0.052)		(1.627)		(1.080)		(7.867)		(4.798)	
Constant	4.140***		4.128***		4.119***		4.080***		2.980***		3.066***		-8.365		-17.565***	
	(0.026)		(0.021)		(0.011)		(0.007)		(0.777)		(0.516)		(5.279)		(3.216)	
Obs	35,717	35,508	80,722	80,308	178,416	177,559	266,227	264,949	75,051	74,896	148,113	147,771	269,024	268,337	400,993	399,978
R-sq	0.232	0.239	0.225	0.236	0.218	0.232	0.217	0.232	0.238	0.242	0.229	0.237	0.229	0.240	0.232	0.244
After	0.001		0.001		0.010		0.006		-0.026***		-0.029***		-0.010**		-0.002	
	(0.021)		(0.014)		(0.010)		(0.008)		(0.008)		(0.008)		(0.004)		(0.004)	
After*Quantile	-0.055**	-0.056**	-0.058***	-0.059***	-0.050***	-0.045***	-0.033***	-0.032***	0.039***	0.039***	0.057***	0.049***	0.068***	0.064***	0.071***	0.070***
	(0.023)	(0.024)	(0.015)	(0.015)	(0.011)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)
Quantile	0.168***	0.570**	0.188***	0.047	0.119***	-0.227*	0.098***	-0.034	-0.179***	0.169**	-1.974**	0.130**	-0.186***	0.246***	-0.190***	0.251***
	(0.032)	(0.229)	(0.021)	(0.059)	(0.014)	(0.121)	(0.012)	(0.174)	(0.019)	(0.077)	(0.801)	(0.057)	(0.017)	(0.031)	(0.016)	(0.026)
Constant	4.093***		4.096***		4.107***		4.115***		4.793***		2.062		4.786***		4.785***	
	(0.030)		(0.019)		(0.013)		(0.012)		(0.019)		(1.764)		(0.017)		(0.016)	
Obs	16,971	16,795	36,687	36,336	55,452	54,869	86,595	85,663	68,955	68,787	135,496	135,133	249,565	248,843	372,701	371,641
R-sq	0.266	0.274	0.251	0.268	0.221	0.249	0.213	0.245	0.243	0.247	0.234	0.242	0.232	0.244	0.235	0.247
Bank Observables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Observables	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Time (Year) FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
City*Month FE	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**

Note. – The table reports estimates from ordinary least squares regressions with different windows. The dependent variable is the natural logarithm of housing loans across banks, individual and location. LTV is the weighted Loan-to-Value ratio of banks. Exposure is the ratio of non conforming housing loans due to the LTV cap in the total housing loans. Quantile is a dummy variable that indicates the top and bottom 5 banks based on LTV ratios. Bank Observables include the lagged values of Bank Total Assets, Capital Ratio, Liquidity Ratio, Credit Ratio, Deposit Ratio, ROA Ratio and NPL Ratio. Macro Observables are yearly growth rate of industrial production index, inflation rate, monthly change in CBRT effective policy rate and in reel effective exchange rate. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Yes" indicates set of characteristics or fixed effects. "-" indicates set of characteristics or fixed effects is not included. "n/p" indicates set of characteristics or fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 6: Effects of LTV Regulations on the Amount of GPL

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Policy	**Tightening (2011/M01)**								**Loosening (2016/M10)**							
Window:	**1-Month**		**2-Months**		**4-Months**		**6-Months**		**1-Month**		**2-Months**		**4-Months**		**6-Months**	
After	-0.685**		-1.168***		-0.999***		-0.809***		-3.732***		-6.270***		-4.612***		-6.539***	
	(0.307)		(0.246)		(0.176)		(0.139)		(0.088)		(0.099)		(0.120)		(0.098)	
After*LTV	1.010**	1.685***	1.226***	1.875***	1.381***	1.659***	0.652***	0.940***	6.828***	6.872***	10.647***	10.739***	5.758***	5.396***	10.024***	9.554***
	(0.446)	(0.471)	(0.343)	(0.356)	(0.255)	(0.257)	(0.196)	(0.205)	(0.137)	(0.139)	(0.158)	(0.158)	(0.201)	(0.206)	(0.156)	(0.157)
LTV	8.369***	7.739***	9.338***	3.492***	7.448***	2.717***	7.557***	2.746***	-12.032***		-12.238***		-9.893***		-7.647***	
	(0.395)	(0.407)	(0.257)	(0.309)	(0.180)	(0.204)	(0.138)	(0.158)	(2.081)		(1.976)		(1.959)		(1.866)	
Constant	-6.292***		-6.901***		-5.761***		-5.791***		5.128***		9.736***		7.838***		3.997***	
	(0.273)		(0.178)		(0.124)		(0.095)		(1.319)		(1.246)		(1.240)		(1.182)	
Bank Observables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Observables	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Time (Year) FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
City*Month FE	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**
Obs	35,725	35,516	80,730	80,316	178,430	177,573	266,240	264,962	78,768	78,617	155,139	154,803	282,464	281,779	420,936	419,925
R-sq	0.344	0.399	0.319	0.372	0.250	0.319	0.246	0.316	0.999	0.999	0.997	0.997	0.978	0.980	0.974	0.978

Note. – The table reports estimates from ordinary least squares regressions with different windows. The dependent variable is the natural logarithm of general-purpose loans across banks, individual and location. LTV is the weighted Loan-to-Value ratio of banks. Bank Observables include the lagged values of Bank Total Assets, Capital Ratio, Liquidity Ratio, Credit Ratio, Deposit Ratio, ROA Ratio and NPL Ratio. Macro Observables are yearly growth rate of industrial production index, inflation rate, monthly change in CBRT effective policy rate and in reel effective exchange rate. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Yes" indicates set of characteristics or fixed effects. "-" indicates set of characteristics or fixed effects is not included. "n/p" indicates set of characteristics or fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 7: Effects of LTV Regulations on the Amount of GPL

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Policy	**Tightening (2011/M01)**								**Loosening (2016/M10)**							
Window:	**1-Month**		**2-Months**		**4-Months**		**6-Months**		**1-Month**		**2-Months**		**4-Months**		**6-Months**	
GPL of NonResidential Borrowers																
After	-0.312		-1.325***		-0.373**		-0.377***		-1.676***		-5.085***		-4.335***		-6.065***	
	(0.408)		(0.256)		(0.180)		(0.142)		(0.078)		(0.099)		(0.125)		(0.104)	
After*LTV	-0.022	1.728***	1.248***	1.884***	0.339	0.589**	-0.118	0.188	3.593***	3.633***	8.374***	8.473***	5.118***	4.694***	9.299***	8.403***
	(0.595)	(0.605)	(0.358)	(0.373)	(0.259)	(0.261)	(0.201)	(0.209)	(0.122)	(0.123)	(0.155)	(0.156)	(0.211)	(0.216)	(0.165)	(0.167)
LTV	-0.457	-0.912*	3.864***	3.641***	4.331***	4.198***	3.892***	3.758***	-11.563***		-11.732***		-5.891***		-2.450	
	(0.484)	(0.502)	(0.308)	(0.313)	(0.206)	(0.208)	(0.158)	(0.160)	(2.074)		(1.964)		(1.917)		(1.843)	
Constant	5.287***		-1.474***		-5.067***		-5.344***		4.841***		9.774***		7.300***		1.255	
	(0.572)		(0.386)		(0.249)		(0.187)		(1.315)		(1.239)		(1.213)		(1.168)	
Bank Observables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Observables	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Time (Year) FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
City*Month FE	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**
Obs	35,725	35,516	80,730	80,316	178,430	177,573	266,240	264,962	78,768	78,617	155,139	154,803	282,464	281,779	420,936	419,925
R-sq	0.355	0.406	0.316	0.367	0.255	0.322	0.247	0.316	0.999	0.999	0.997	0.997	0.976	0.978	0.971	0.975
GPL of Residential Borrowers																
After	-3.192***		-1.441***		-1.457***		-1.359***		-6.165***		-5.480***		-6.741***		-7.103***	
	(0.150)		(0.075)		(0.062)		(0.051)		(0.156)		(0.101)		(0.087)		(0.076)	
After*LTV	4.194***	4.182***	1.876***	1.833***	1.945***	1.968***	1.759***	1.854***	10.804***	10.879***	11.292***	11.404***	11.347***	11.459***	11.520***	11.595***
	(0.208)	(0.208)	(0.101)	(0.100)	(0.088)	(0.087)	(0.071)	(0.071)	(0.235)	(0.236)	(0.158)	(0.158)	(0.136)	(0.137)	(0.120)	(0.117)
LTV	0.568***	0.478***	-0.143**	-0.176***	-0.110***	-0.147***	-0.208***	-0.252***	2.984***		-0.458*		-2.571***		-4.348***	
	(0.147)	(0.143)	(0.071)	(0.068)	(0.035)	(0.032)	(0.029)	(0.027)	(0.301)		(0.260)		(0.273)		(0.256)	
Constant	-0.785***		-1.222***		-0.605***		-1.085***		-2.050***		-7.121***		0.963***		3.792***	
	(0.130)		(0.080)		(0.051)		(0.045)		(0.191)		(0.180)		(0.174)		(0.163)	
Bank Observables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Observables	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Time (Year) FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
City*Month FE	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**
Obs	35,725	35,516	80,730	80,316	178,430	177,573	266,240	264,962	78,768	78,617	155,139	154,803	282,464	281,779	420,936	419,925
R-sq	0.262	0.298	0.174	0.246	0.144	0.240	0.161	0.257	0.992	0.992	0.987	0.987	0.963	0.964	0.956	0.959

Note. – The table reports estimates from ordinary least squares regressions with different windows. The dependent variable is the natural logarithm of general-purpose loans borrowed by nonresidential and residential borrowers (consumers who borrow GPL in the month of and the month before the their house purchase). LTV is the weighted Loan-to-Value ratio of banks. Bank Observables include the lagged values of Bank Total Assets, Capital Ratio, Liquidity Ratio, Credit Ratio, Deposit Ratio, ROA Ratio and NPL Ratio. Macro Observables are yearly growth rate of industrial production index, inflation rate, monthly change in CBRT effective policy rate and in reel effective exchange rate. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Yes" indicates set of characteristics or fixed effects. "-" indicates set of characteristics or fixed effects is not included. "n/p" indicates set of characteristics or fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 8: Effects of LTV Regulations on the Amount of Commercial Loans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Policy	**Tightening (2011/M01)**								**Loosening (2016/M10)**							
Window:	**1-Month**		**2-Months**		**4-Months**		**6-Months**		**1-Month**		**2-Months**		**4-Months**		**6-Months**	
After	-4.889***		-2.308***		-1.478***		-2.301***		2.813***		1.684***		-0.035		-0.787***	
	(0.316)		(0.190)		(0.125)		(0.104)		(0.065)		(0.087)		(0.073)		(0.073)	
After*LTV	8.045***	8.796***	4.505***	4.448***	0.534***	0.659***	2.690***	1.922***	-4.648***	-4.560***	-0.341**	-0.280*	-0.142	0.125	1.244***	1.383***
	(0.476)	(0.479)	(0.276)	(0.283)	(0.180)	(0.180)	(0.148)	(0.148)	(0.103)	(0.104)	(0.145)	(0.145)	(0.115)	(0.116)	(0.116)	(0.115)
LTV	-2.504***	-2.882***	-0.370	-0.340	2.699***	2.487***	0.735***	0.604***	90.831***		86.122***		86.006***		85.853***	
	(0.390)	(0.395)	(0.270)	(0.273)	(0.165)	(0.165)	(0.134)	(0.134)	(0.509)		(0.396)		(0.444)		(0.459)	
Constant	-8.742***		-4.266***		-9.066***		-8.258***		-47.962***		-57.232***		-43.810***		-43.535***	
	(0.430)		(0.311)		(0.194)		(0.154)		(0.323)		(0.245)		(0.283)		(0.292)	
Bank Observables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Observables	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Time (Year) FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
City*Month FE	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**
Obs	33,954	33,742	77,174	76,755	170,154	169,285	253,070	251,782	78,768	78,617	155,139	154,803	282,171	281,486	376,535	375,597
R-sq	0.892	0.899	0.861	0.873	0.850	0.863	0.840	0.859	0.976	0.977	0.966	0.967	0.964	0.967	0.956	0.965

Note. – The table reports estimates from ordinary least squares regressions with different windows. The dependent variable is the natural logarithm of commercial loans across banks and locations. LTV is the weighted Loan-to-Value ratio of banks. Bank Observables include the lagged values of Bank Total Assets, Capital Ratio, Liquidity Ratio, Credit Ratio, Deposit Ratio, ROA Ratio and NPL Ratio. Macro Observables are yearly growth rate of industrial production index, inflation rate, monthly change in CBRT effective policy rate and in reel effective exchange rate. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Yes" indicates set of characteristics or fixed effects. "-" indicates set of characteristics or fixed effects is not included. "n/p" indicates set of characteristics or fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 9: Effects of LTV Regulations on the Amount of Commercial Loans (with Credit Registry Data)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Policy	**Tightening (2011/M01)**								**Loosening (2016/M10)**							
Window:	**1-Month**		**2-Months**		**4-Months**		**6-Months**		**1-Month**		**2-Months**		**4-Months**		**6-Months**	
After	-0.309***		-0.285***		-0.235***		-0.142***		-0.000		0.045***		0.037***		0.024***	
	(0.019)		(0.012)		(0.007)		(0.006)		(0.011)		(0.006)		(0.006)		(0.006)	
After*LTV	0.317***	0.140**	0.442***	0.150***	0.551***	0.135***	0.466***	0.058*	-0.042***	-0.041***	-0.049***	-0.049***	0.004	0.016	0.024***	0.029***
	(0.052)	(0.060)	(0.034)	(0.049)	(0.020)	(0.038)	(0.018)	(0.030)	(0.013)	(0.016)	(0.007)	(0.010)	(0.006)	(0.011)	(0.006)	(0.009)
LTV	-1.135***		-1.970***		-2.645***		-2.450***		-0.011	-0.028	0.026	-0.036	-0.044	0.061	-0.069	-0.154***
	(0.153)		(0.148)		(0.085)		(0.064)		(0.179)	(0.216)	(0.093)	(0.087)	(0.040)	(0.077)	(0.047)	(0.052)
Constant	4.397***		4.551***		4.653***		4.603***		4.198***		4.174***		4.245***		4.277***	
	(0.032)		(0.027)		(0.015)		(0.011)		(0.178)		(0.092)		(0.040)		(0.047)	
Bank Observables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Observables	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Time (Year) FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Firm*Month FE	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**
Obs	348,309	115,759	622,487	206,935	1,179,334	389,945	1,810,980	635,786	510,769	161,186	1,222,791	397,820	2,201,702	655,631	2,995,343	893,937
R-sq	0.798	0.682	0.738	0.679	0.689	0.682	0.661	0.676	0.849	0.742	0.782	0.739	0.741	0.744	0.717	0.740

Note. – The table reports estimates from ordinary least squares regressions with different windows. The dependent variable is the natural logarithm of commercial loans across banks and firms. LTV is the weighted Loan-to-Value ratio of banks. Bank Observables include the lagged values of Bank Total Assets, Capital Ratio, Liquidity Ratio, Credit Ratio, Deposit Ratio, ROA Ratio and NPL Ratio. Macro Observables are yearly growth rate of industrial production index, inflation rate, monthly change in CBRT effective policy rate and in reel effective exchange rate. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Yes" indicates set of characteristics or fixed effects. "-" indicates set of characteristics or fixed effects is not included. "n/p" indicates set of characteristics or fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 10: Effects of LTV Regulations on the Amount of Commercial Loans with Different Firm Types

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Policy	**Tightening (2011/M01)**								**Loosening (2016/M10)**							
Window:	**1-Month**		**2-Months**		**4-Months**		**6-Months**		**1-Month**		**2-Months**		**4-Months**		**6-Months**	
After	-0.312***		-0.152***		-0.471***		-0.285***		0.003		0.149**		-0.015	-0.174	0.006	-0.095***
	(0.029)		(0.026)		(0.015)		(0.010)		(0.019)		(0.070)		(0.027)	(0.109)	(0.009)	(0.015)
Rating	-0.026***	-0.023***	-0.036***	-0.033***	-0.043***	-0.039***	-0.044***	-0.038***	-0.006	0.007	0.016	0.015	0.003	0.003	0.000	-0.002
	(0.009)	(0.006)	(0.005)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.015)	(0.016)	(0.012)	(0.010)	(0.007)	(0.006)	(0.004)	(0.004)
LTV	-16.578***		-23.047***		1.351***		20.059***		0.317***		4.981**		4.663***		0.502***	
	(6.392)		(1.967)		(0.411)		(1.124)		(0.096)		(1.942)		(0.526)		(0.023)	
After*LTV	0.892***		1.032***		0.920***		0.722***		-0.076***		0.014		0.131***		0.064***	
	(0.098)		(0.056)		(0.037)		(0.027)		(0.028)		(0.048)		(0.025)		(0.010)	
Rating*LTV	0.118***	0.104***	0.157***	0.139***	0.185***	0.162***	0.180***	0.155***	-0.043***	-0.057***	-0.077***	-0.076***	-0.065***	-0.066***	-0.064***	-0.064***
	(0.026)	(0.019)	(0.016)	(0.013)	(0.011)	(0.010)	(0.008)	(0.007)	(0.017)	(0.017)	(0.013)	(0.010)	(0.007)	(0.006)	(0.004)	(0.004)
After*LTV*Rating	-0.059***	-0.042***	-0.080***	-0.053***	-0.089***	-0.055***	-0.080***	-0.054***	0.010**	0.007*	0.004	0.003	-0.003*	-0.003*	-0.006***	-0.005***
	(0.016)	(0.013)	(0.009)	(0.009)	(0.006)	(0.006)	(0.004)	(0.005)	(0.005)	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Constant	66.210***		53.347***		2.390***		-2.366***		4.193***		4.030***		3.849***		3.913***	
	(8.072)		(3.198)		(0.583)		(0.450)		(0.214)		(0.048)		(0.024)		(0.018)	
Bank Observables	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Macro Observables	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Bank FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time (Year) FE	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Bank*Month FE	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**
Obs	312,571	159,592	552,512	360,504	1,040,809	783,051	1,603,534	1,298,736	275,621	136,032	697,117	445,578	1,702,287	1,234,823	2,331,384	1,555,586
R-sq	0.810	0.699	0.748	0.670	0.697	0.645	0.667	0.627	0.873	0.795	0.799	0.746	0.759	0.711	0.734	0.737

Note. – The table reports estimates from ordinary least squares regressions with different windows performed on credit registry data. The dependent variable is the natural logarithm of commercial loans across banks and firms. LTV is the weighted Loan-to-Value ratio of banks. Bank Observables include the lagged values of Bank Total Assets, Capital Ratio, Liquidity Ratio, Credit Ratio, Deposit Ratio, ROA Ratio and NPL Ratio. Macro Observables are yearly growth rate of industrial production index, inflation rate, monthly change in CBRT effective policy rate and in reel effective exchange rate. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Yes" indicates set of characteristics or fixed effects. "-" indicates set of characteristics or fixed effects is not included. "n/p" indicates set of characteristics or fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 11: Differences in Differences Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
After	0.421	0.421	0.418	0.406	0.418	0.300	0.324	0.342	0.579	1.238	1.077**
	(0.467)	(0.467)	(0.467)	(0.469)	(0.475)	(0.469)	(0.443)	(0.456)	(0.498)	(1.329)	(0.489)
LTVconst	7.573***	7.573***	7.530***	7.491***	7.119***	7.423***	7.382***	7.335***	7.164***	7.354***	7.355***
	(0.687)	(0.687)	(0.688)	(0.688)	(0.736)	(0.771)	(0.751)	(0.762)	(0.771)	(0.721)	(0.721)
LTVconst*After	5.370***	5.370***	5.385***	5.419***	5.174***	5.537***	5.471***	5.490***	5.882***	6.040***	6.021***
	(1.184)	(1.184)	(1.186)	(1.187)	(1.253)	(1.327)	(1.286)	(1.279)	(1.257)	(1.195)	(1.246)
Individual Observables											
Rating=2			-5.564	-5.815	-6.182	-4.201	-3.827	-3.986	-3.026	-2.902	-2.908
			(4.632)	(4.644)	(4.816)	(6.222)	(6.290)	(6.329)	(6.289)	(6.229)	(6.235)
=3			4.100	3.884	4.245	7.077	7.634	8.012	10.190	8.984	8.987
			(9.232)	(9.213)	(9.398)	(11.898)	(11.920)	(11.901)	(11.842)	(11.971)	(11.971)
=4			-9.629	-10.680	-17.223**	-22.566**	-21.671*	-20.956**	-17.695*	-18.529*	-18.551*
			(8.161)	(8.268)	(7.579)	(10.369)	(11.101)	(10.681)	(10.110)	(10.837)	(10.953)
=5			-23.884***	-24.054***	-23.279***	-23.257***	-22.734***	-22.713***	-17.835***	-18.848***	-18.784***
			(3.657)	(3.656)	(3.896)	(4.477)	(4.307)	(4.301)	(4.588)	(4.226)	(4.305)
=6			-10.849***	-10.962***	-8.572**	-8.762*	-8.088*	-7.578*	-5.594	-6.959*	-6.978*
			(3.533)	(3.535)	(4.075)	(4.672)	(4.329)	(4.494)	(4.678)	(4.137)	(4.125)
N of CC				0.921**	-0.518	-0.193	-0.358	-0.321	-0.711	-1.036	-1.042
				(0.414)	(1.150)	(1.073)	(0.898)	(0.871)	(0.940)	(1.326)	(1.370)
Other Debt					0.173	0.178	0.178	0.178	0.179	0.180	0.180
					(0.121)	(0.126)	(0.125)	(0.125)	(0.125)	(0.126)	(0.126)
Bank Observables											
Liquidity Ratio						0.602***	0.429	0.287	-0.025	0.212	0.212
						(0.204)	(0.419)	(0.304)	(0.251)	(0.547)	(0.549)
Loan Ratio							-0.221	-0.468***	-0.818***	-0.618**	-0.618**
							(0.281)	(0.102)	(0.100)	(0.278)	(0.281)
Log Real Assets								-1.840	-4.581**	-2.415**	-2.398**
								(1.565)	(2.117)	(0.944)	(1.045)
NPL Ratio									-2.236***	-2.826**	-2.841**
									(0.468)	(1.202)	(1.311)
ROA Ratio										-6.684	-6.769
										(8.654)	(9.279)
RER											-0.166
											(1.301)
Constant	0.796***	0.796***	11.590***	11.549***	8.832**	5.337	20.000	61.135***	127.458***	96.305***	112.970
	(0.152)	(0.152)	(3.540)	(3.541)	(4.176)	(5.534)	(22.654)	(15.359)	(28.539)	(20.799)	(117.387)
Obs	49947	49947	49947	49947	49947	45476	45476	45476	45476	45476	45476
R-squared	.0056007	.0056007	.0058315	.0059169	.0100699	.0111839	.0112731	.0113914	.0121138	.012403	.012404

Note: Robust standard errors are shown in parenthesis. LTVconst marks individuals who are constrained by the LTV ratio cap, where LTV is defined according to Equation 1. The regression estimates Equation 3 on a cross-section of housing loan customers in September (before) and October (after) of 2016. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table A.1 Differences in Differences Estimates: larger sample of individuals with all types of household credit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
After	0.421	0.421	0.418	0.411	0.422	0.301	0.324	0.340	0.565	1.330	1.002**
	(0.467)	(0.467)	(0.467)	(0.469)	(0.475)	(0.469)	(0.442)	(0.456)	(0.498)	(1.283)	(0.487)
LTVconst	7.362***	7.362***	7.324***	7.278***	6.914***	7.210***	7.164***	7.112***	6.946***	7.228***	7.232***
	(0.671)	(0.671)	(0.672)	(0.672)	(0.718)	(0.751)	(0.728)	(0.742)	(0.750)	(0.707)	(0.708)
LTVconst*After	5.059***	5.059***	5.072***	5.088***	4.844***	5.187***	5.126***	5.146***	5.508***	5.703***	5.666***
	(1.153)	(1.153)	(1.154)	(1.155)	(1.223)	(1.289)	(1.249)	(1.241)	(1.219)	(1.157)	(1.202)
Individual Observables											
Rating=2			-5.199	-5.351	-5.664	-3.860	-3.523	-3.638	-2.755	-2.618	-2.631
			(4.506)	(4.513)	(4.676)	(5.972)	(6.034)	(6.064)	(6.029)	(5.971)	(5.975)
=3			3.272	3.101	3.623	5.819	6.295	6.484	8.630	7.696	7.700
			(8.814)	(8.805)	(8.974)	(11.194)	(11.206)	(11.208)	(11.151)	(11.180)	(11.182)
=4			-10.385	-11.035	-16.353**	-20.912**	-20.037**	-19.346**	-15.992*	-17.041*	-17.094*
			(7.460)	(7.527)	(6.668)	(8.707)	(9.455)	(9.039)	(8.511)	(9.218)	(9.344)
=5			-22.748***	-22.875***	-21.619***	-21.440***	-20.982***	-20.948***	-16.465***	-17.394***	-17.283***
			(3.534)	(3.534)	(3.829)	(4.426)	(4.217)	(4.222)	(4.558)	(4.180)	(4.295)
=6			-10.198***	-10.271***	-7.880**	-7.941*	-7.329*	-6.854	-5.017	-6.533	-6.577
			(3.435)	(3.436)	(3.980)	(4.545)	(4.203)	(4.372)	(4.551)	(4.025)	(4.007)
N of CC				0.519	-0.855	-0.541	-0.692	-0.665	-1.023	-1.325	-1.335
				(0.379)	(1.088)	(1.004)	(0.830)	(0.809)	(0.875)	(1.165)	(1.199)
Other Debt					0.172	0.177	0.177	0.177	0.177	0.178	0.178
					(0.119)	(0.124)	(0.124)	(0.124)	(0.124)	(0.125)	(0.125)
Bank Observables											
Liquidity Ratio						0.616***	0.458	0.327	0.038	0.295	0.295
						(0.205)	(0.417)	(0.302)	(0.251)	(0.512)	(0.512)
Loan Ratio							-0.202	-0.431***	-0.754***	-0.545**	-0.544**
							(0.278)	(0.099)	(0.097)	(0.242)	(0.243)
Log Real Assets								-1.712	-4.325**	-1.916***	-1.886**
								(1.569)	(2.115)	(0.732)	(0.804)
NPL Ratio									-2.139***	-2.851**	-2.881**
									(0.464)	(1.187)	(1.290)
ROA Ratio										-7.722	-7.887
										(8.148)	(8.719)
RER											-0.337
											(1.247)
Constant	0.796***	0.796***	10.944***	10.930***	8.205**	4.509	17.910	56.088***	118.719***	85.465***	119.462
	(0.152)	(0.152)	(3.442)	(3.443)	(4.087)	(5.428)	(22.424)	(15.439)	(28.344)	(16.810)	(117.187)
Obs	50314.000	50314.000	50311.000	50311.000	50311.000	45840.000	45840.000	45840.000	45840.000	45840.000	45840.000
R-squared	.0053326	.0053326	.0055474	.005577	.0097125	.0108292	.0109047	.0110084	.0116853	.012092	.012096

Note: Robust standard errors are shown in parenthesis. LTVconst marks individuals who are constrained by the LTV ratio cap, where LTV is defined according to Equation 1. The regression estimates Equation 3 on a cross-section of housing loan customers in September (before) and October (after) of 2016.*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 12: Differences in Differences Estimates Across Different Specifications

	(1) 70 vs 75	(2) 71 vs 76	(3) 72 vs 77	(4) 73 vs 78	(5) 74 vs 79	(6) 75 vs 80
Baseline						
After	0.318	1.143**	1.150**	1.147**	1.077**	1.028**
	(0.528)	(0.500)	(0.497)	(0.493)	(0.489)	(0.479)
LTVconstr	5.225***	5.645***	6.051***	6.617***	7.355***	11.657***
	(0.564)	(0.588)	(0.615)	(0.657)	(0.721)	(1.090)
LTVconstr*After	2.280**	4.886***	5.224***	5.346***	6.021***	3.325**
	(0.974)	(1.057)	(1.103)	(1.148)	(1.246)	(1.547)
Larger Sample						
After	0.293	0.836	0.865	0.894	0.857	0.891
	(0.648)	(0.599)	(0.592)	(0.584)	(0.575)	(0.554)
LTVconstr	3.894***	4.193***	4.571***	5.094***	5.742***	9.493***
	(0.532)	(0.539)	(0.549)	(0.571)	(0.606)	(0.849)
LTVconstr*After	1.501*	3.784***	4.030***	4.067***	4.605***	2.186*
	(0.895)	(0.886)	(0.909)	(0.928)	(0.983)	(1.175)
Baseline Clustered						
After	0.318	1.143*	1.150**	1.147**	1.077**	1.028*
	(0.466)	(0.559)	(0.546)	(0.527)	(0.504)	(0.490)
LTVconstr	5.225**	5.645**	6.051**	6.617**	7.355**	11.657**
	(2.208)	(2.356)	(2.497)	(2.676)	(2.925)	(4.479)
LTVconstr*After	2.280*	4.886*	5.224*	5.346*	6.021*	3.325
	(1.144)	(2.470)	(2.586)	(2.684)	(2.921)	(2.109)
Larger Sample Clustered						
After	0.293	0.836	0.865	0.894*	0.857*	0.891*
	(0.440)	(0.510)	(0.509)	(0.495)	(0.476)	(0.489)
LTVconstr	3.894*	4.193*	4.571*	5.094**	5.742**	9.493**
	(1.914)	(2.059)	(2.190)	(2.350)	(2.561)	(3.988)
LTVconstr*After	1.501	3.784*	4.030*	4.067*	4.605*	2.186
	(1.455)	(1.900)	(2.022)	(2.095)	(2.306)	(2.142)

Note: Robust standard errors are shown in parenthesis. LTVconst marks individuals who are constrained by the LTV ratio cap, where LTV is defined according to Equation 1. The regression estimates Equation 3 on a cross-section of housing loan customers in September (before) and October (after) of 2016 with varying constraint ranges for LTV. Column 1 shows individuals at and above 70% LTV ratio before, and 75% after the policy change, each column thereafter increases the criteria by one percentage points for both before and after. All the columns include individual and bank covariates which are not reported, Column 5 corresponds to the baseline specification, Table 11, Column (11). *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 13: Differences in Differences Estimates for various time brackets and LTV cutoffs

	(1) 70 vs 75	(2) 71 vs 76	(3) 72 vs 77	(4) 73 vs 78	(5) 74 vs 79	(6) 75 vs 80
August 2016 to November 2016						
After	0.226	1.136**	1.135**	1.127**	1.059**	0.922*
	(0.523)	(0.517)	(0.516)	(0.514)	(0.512)	(0.506)
LTVconstr	4.973***	5.325***	5.674***	6.188***	6.876***	10.508***
	-0.343	-0.358	-0.378	-0.405	-0.447	-0.67
LTVconstr*After	2.399***	3.967***	4.221***	4.315***	4.913***	2.845***
	-0.592	-0.643	-0.673	-0.706	-0.767	-0.953
Obs	92632	92632	92632	92632	92632	92632
July 2016 to December 2016						
After	0.208	1.263**	1.261**	1.250**	1.190**	1.057*
	-0.566	-0.564	-0.564	-0.563	-0.561	-0.556
LTVconstr	5.435***	5.822***	6.210***	6.766***	7.538***	11.559***
	-0.55	-0.584	-0.623	-0.676	-0.751	-1.149
LTVconstr*After	2.601***	3.774***	4.041***	4.126***	4.640***	2.217*
	-0.653	-0.702	-0.745	-0.798	-0.881	-1.251
Obs	133130	133130	133130	133130	133130	133130
June 2016 to January 2017						
After	-0.123	0.577	0.595	0.606	0.619	0.6
	-0.681	-0.664	-0.663	-0.662	-0.66	-0.657
LTVconstr	5.069***	5.438***	5.814***	6.345***	7.080***	10.967***
	-0.398	-0.422	-0.45	-0.488	-0.541	-0.833
LTVconstr*After	3.674***	4.753***	5.118***	5.321***	5.914***	3.744***
	-0.566	-0.624	-0.665	-0.712	-0.789	-1.049
Obs	177793	177793	177793	177793	177793	177793

Note: Robust standard errors are shown in parenthesis. LTVconst marks individuals who are constrained by the LTV ratio cap, where LTV is defined according to Equation 1. The regression estimates Equation 3 on a cross-section of housing loan customers in September (before) and October (after) of 2016 with varying constraint ranges for LTV. Column 1 shows individuals at and above 70% LTV ratio before, and 75% after the policy change, each column thereafter increases the criteria by one percentage points for both before and after. All the columns include individual and bank covariates which are not reported, Column 5 corresponds to the baseline specification, Table 11, Column (11).*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 14: Effects of LTV Cap on the GPL Demand of LTV Constrained Individuals (2011)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Policy	**Tightening (2011/M01)**									
Window:	**1-Months**			**2-Months**			**4-Months**		**6-Months**	
70 vs 75										
LTVconst	0.596***	0.533***	0.458**	0.215	0.473**	0.157	0.928*	0.923*	1.102***	0.711**
	(0.190)	(0.182)	(0.222)	(0.177)	(0.211)	(0.193)	(0.541)	(0.534)	(0.336)	(0.355)
Obs	8,481	8,480	7,213	7,211	15,311	15,309	35,201	35,199	54,310	54,307
71 vs 76										
LTVconst	0.698***	0.632***	0.573**	0.322*	0.610***	0.273	1.093*	1.088*	1.267***	0.857**
	(0.193)	(0.186)	(0.225)	(0.176)	(0.215)	(0.196)	(0.568)	(0.563)	(0.350)	(0.373)
Obs	8,481	8,480	7,213	7,211	15,311	15,309	35,201	35,199	54,310	54,307
72 vs 77										
LTVconst	0.759***	0.693***	0.658***	0.393**	0.701***	0.341*	1.229**	1.224**	1.390***	0.962**
	(0.198)	(0.190)	(0.231)	(0.177)	(0.220)	(0.201)	(0.604)	(0.602)	(0.373)	(0.399)
Obs	8,481	8,480	7,213	7,211	15,311	15,309	35,201	35,199	54,310	54,307
73 vs 78										
LTVconst	0.868***	0.802***	0.770***	0.496***	0.868***	0.491**	1.467**	1.463**	1.611***	1.157***
	(0.207)	(0.198)	(0.237)	(0.181)	(0.221)	(0.198)	(0.658)	(0.656)	(0.404)	(0.432)
Obs	8,481	8,480	7,213	7,211	15,311	15,309	35,201	35,199	54,310	54,307
74 vs 79										
LTVconst	1.094***	1.026***	1.044***	0.747***	1.113***	0.709***	1.734**	1.734**	1.859***	1.364***
	(0.223)	(0.213)	(0.256)	(0.189)	(0.231)	(0.202)	(0.736)	(0.734)	(0.453)	(0.484)
Obs	8,481	8,480	7,213	7,211	15,311	15,309	35,201	35,199	54,310	54,307
75 vs 80										
LTVconst	1.184***	1.122***	1.208***	0.785***	1.302***	0.744***	1.868*	1.870*	2.161***	1.464**
	(0.291)	(0.277)	(0.339)	(0.237)	(0.276)	(0.226)	(1.087)	(1.085)	(0.649)	(0.712)
Obs	8,481	8,480	7,213	7,211	15,311	15,309	35,201	35,199	54,310	54,307
Individual Observables	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Observables	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Observables	-	-	Yes	n/p	Yes	n/p	Yes	n/p	Yes	n/p
Bank FE	Yes	Yes	Yes	-	Yes	-	Yes	-	Yes	-
Time (Year) FE	Yes	Yes	Yes	-	Yes	-	Yes	-	Yes	-
Bank*Month FE	**-**	**-**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**	**-**	**Yes**

Note. – Robust standard errors are shown in parenthesis. LTVconst marks individuals who are constrained by the LTV ratio cap, where LTV is defined according to Equation 1. The regression estimates Equation 3 on a cross-section of housing loan customers in 2011.*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 15: Effects of LTV Cap on the GPL Demand of LTV Constrained Individuals (2016)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Window:	**1-Month**		**2-Months**		**4-Months**		**6-Months**	
70 vs 75								
After	-	-	-	-	-	-	-	-
LTVconst	4.460***	4.460***	4.262***	4.522***	4.699***	4.756***	4.577***	4.734***
	(0.530)	(0.530)	(0.312)	(0.332)	(0.430)	(0.399)	(0.301)	(0.286)
After*LTVconst	1.895	1.895	1.949***	2.222***	3.031***	3.631***	3.129***	3.494***
	(1.350)	(1.350)	(0.707)	(0.762)	(0.650)	(0.658)	(0.483)	(0.492)
Obs	41,292	41,292	96,417	88,448	189,119	173,609	283,896	262,691
71 vs 76								
After	-	-	-	-	-	-	-	-
LTVconst	4.483***	4.753***	4.561***	4.825***	5.069***	5.121***	4.932***	5.088***
	(0.521)	(0.558)	(0.330)	(0.350)	(0.457)	(0.427)	(0.320)	(0.305)
After*LTVconst	3.526**	3.957***	3.253***	3.672***	3.993***	4.719***	4.024***	4.479***
	(1.388)	(1.500)	(0.765)	(0.824)	(0.705)	(0.717)	(0.527)	(0.539)
Obs	45,286	41,292	96,417	88,448	189,119	173,609	283,896	262,691
72 vs 77								
After	-	-	-	-	-	-	-	-
LTVconst	4.788***	5.056***	4.886***	5.146***	5.447***	5.489***	5.282***	5.432***
	(0.551)	(0.589)	(0.351)	(0.372)	(0.488)	(0.458)	(0.341)	(0.327)
After*LTVconst	3.949***	4.408***	3.497***	3.946***	4.342***	5.110***	4.365***	4.849***
	(1.407)	(1.513)	(0.788)	(0.844)	(0.748)	(0.760)	(0.559)	(0.572)
Obs	45,286	41,292	96,417	88,448	189,119	173,609	283,896	262,691
73 vs 78								
After	-	-	-	-	-	-	-	-
LTVconst	5.184***	5.458***	5.323***	5.593***	5.678***	6.006***	5.552***	5.886***
	(0.596)	(0.634)	(0.379)	(0.401)	(0.476)	(0.499)	(0.337)	(0.355)
After*LTVconst	4.241***	4.739***	3.668***	4.135***	4.850***	5.360***	4.804***	5.126***
	(1.371)	(1.471)	(0.795)	(0.849)	(0.754)	(0.805)	(0.572)	(0.607)
Obs	45,286	41,292	96,417	88,448	189,119	173,609	283,896	262,691
74 vs 79								
After	-	-	-	-	-	-	-	-
LTVconst	5.698***	5.953***	5.938***	6.202***	6.382***	6.718***	6.253***	6.597***
	(0.658)	(0.697)	(0.422)	(0.445)	(0.534)	(0.558)	(0.377)	(0.396)
After*LTVconst	5.082***	5.646***	4.334***	4.828***	5.478***	6.009***	5.410***	5.743***
	(1.463)	(1.559)	(0.856)	(0.911)	(0.839)	(0.891)	(0.637)	(0.673)
Obs	45,286	41,292	96,417	88,448	189,119	173,609	283,896	262,691
75 vs 80								
After	-	-	-	-	-	-	-	-
LTVconst	8.752***	9.089***	9.096***	9.476***	10.056***	10.529***	9.773***	10.269***
	(0.984)	(1.039)	(0.648)	(0.679)	(0.837)	(0.875)	(0.589)	(0.619)
After*LTVconst	3.521**	4.111**	2.689***	3.140***	3.487***	3.964***	3.543***	3.782***
	(1.657)	(1.756)	(1.029)	(1.089)	(1.109)	(1.171)	(0.828)	(0.871)
Obs	45,286	41,292	96,417	88,448	189,119	173,609	283,896	262,691
Individual Observables	-	Yes	-	Yes	-	Yes	-	Yes
Bank Observables	-	n/p	-	n/p	-	n/p	-	n/p
Macro Observables	-	n/p	-	n/p	-	n/p	-	n/p
Bank FE	-	-	-	-	-	-	-	-
Time (Year) FE	-	-	-	-	-	-	-	-
Bank*Month FE	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

Note. – Robust standard errors are shown in parenthesis. LTVconst marks individuals who are constrained by the LTV ratio cap, where LTV is defined according to Equation 1. The regression estimates Equation 3 on a cross-section of housing loan customers in 2016. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 16: Pooled OLS Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
LTV	0.012***	0.012***	0.025***	0.034***	0.033***	0.034***	0.033***	0.028***	0.028***	0.029***	0.029***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Individual Observables											
N of CC		0.026***	0.053***	0.055***	0.057***	0.055***	0.057***	0.055***	0.057***	0.061***	0.062***
		(0.006)	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)
Other Debt			-0.014***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.006***
			(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Rating=2				4.854***	4.721***	4.775***	4.642***	4.834***	4.730***	4.855***	4.782***
				(0.898)	(0.959)	(0.899)	(0.958)	(0.898)	(0.959)	(0.893)	(0.954)
=3				5.007***	5.160***	4.987***	5.131***	4.990***	5.124***	5.057***	5.213***
				(1.150)	(1.221)	(1.150)	(1.221)	(1.150)	(1.221)	(1.146)	(1.216)
=4				2.031	2.038	1.967	2.042	2.003	2.095	2.145	2.254
				(2.703)	(2.845)	(2.704)	(2.854)	(2.696)	(2.845)	(2.703)	(2.848)
=5				3.567***	2.222*	3.477***	2.000	3.555***	1.854	3.574***	1.919
				(1.228)	(1.270)	(1.228)	(1.271)	(1.227)	(1.271)	(1.223)	(1.266)
=6				3.978***	3.949***	3.946***	3.886***	3.949***	3.862***	3.993***	3.926***
				(0.731)	(0.788)	(0.731)	(0.788)	(0.732)	(0.787)	(0.726)	(0.782)
Dummy								-1.368*	-0.269	-1.742**	-0.708
								(0.705)	(0.732)	(0.718)	(0.747)
Dummy*LTV								0.035***	0.026**	0.034***	0.024**
								(0.010)	(0.010)	(0.010)	(0.010)
Dummy*Other Debt										0.003***	0.004***
										(0.001)	(0.001)
Dummy*N of CC										-0.040**	-0.036**
										(0.018)	(0.018)
Bank Observables											
Total Assets$_{t-2}$					4.850***		4.567***		3.706***		3.634***
					(1.302)		(1.303)		(1.318)		(1.318)
Credit Ratio$_{t-2}$					-0.048		-0.039		-0.083**		-0.082**
					(0.039)		(0.040)		(0.042)		(0.042)
Deposit Ratio$_{t-2}$					0.045*		0.040		0.040		0.040
					(0.025)		(0.025)		(0.025)		(0.025)
Liquidity Ratio$_{t-2}$					-0.560***		-0.571***		-0.622***		-0.621***
					(0.043)		(0.044)		(0.046)		(0.046)
Capital Ratio$_{t-2}$					-0.669***		-0.741***		-0.757***		-0.762***
					(0.098)		(0.101)		(0.101)		(0.101)
NPL Ratio$_{t-2}$					0.790***		0.735***		0.523***		0.540***
					(0.180)		(0.181)		(0.187)		(0.187)
ROA Ratio$_{t-2}$					-0.226		-0.356*		-0.436**		-0.453**
					(0.203)		(0.205)		(0.205)		(0.205)
Macro Observables											
Δ Ind. Production$_{t-2}$						0.013	-0.024**		-0.013		-0.013
						(0.012)	(0.012)		(0.012)		(0.012)
Inflation Rate$_{t-2}$						-0.150***	-0.281***		-0.240***		-0.241***
						(0.055)	(0.060)		(0.060)		(0.060)
Δ BIST o/n Int. Rate$_{t-2}$						0.076	0.076		0.053		0.053
						(0.073)	(0.075)		(0.075)		(0.075)
Δ REER$_{t-2}$						-0.047**	-0.039*		-0.026		-0.026
						(0.022)	(0.023)		(0.023)		(0.023)
Constant	17.351***	17.286***	15.607***	7.976***	-46.177**	8.625***	-39.527**	8.411***	-24.379	8.411***	-23.541
	(0.369)	(0.369)	(0.473)	(0.814)	(18.473)	(0.898)	(18.542)	(0.833)	(18.915)	(0.832)	(18.917)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	102,799	102,799	90,005	73,085	70,745	73,085	70,745	73,085	70,745	73,085	70,745
R-sq	0.189	0.189	0.182	0.143	0.152	0.144	0.153	0.144	0.153	0.144	0.154

Note. – Note: The table reports estimates from ordinary least squares regressions. The dependent variable is the ratio of the amount of general-purpose loans to the appraised value of collateralized property. Sample includes the individuals who use general-purpose loans in addition to housing loans. Table 1 contains the definition of all variables and the summary statistics for each included variable. Analysis covers the period of 2011:M01 2017:M04. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Yes" indicates set of characteristics or fixed effects. "Dummy" is the dummy variable for the period of 2016:M10 2017:M04. *** Significant at 1%, ** significant at 5%, * significant at 10%.

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