# Household Macroprudential Policies, Corporate Credit, and Resilience to Macro Shocks*


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This paper studies the long-run effects of macroprudential policies on the resilience of the real sector to macroeconomic shocks. We use credit registry data from Turkey, exploiting the adoption of a new macroprudential policy regime starting in 2011 and the currency depreciation of 2018 as an empirical laboratory. Higher bank exposure to household-targeting macroprudential policies is associated with a reallocation of credit toward firms, especially in local currency and to higher-rated borrowers. This reallocation is stronger for exposed banks with higher shares of FX funding, consistent with a market-discipline mechanism. Macroprudential policies are associated with greater resilience to macroeconomic shocks: firms and provinces served by banks that engage in more prudent lending following the 2011 reforms are less affected after the 2018 depreciation, exhibiting smaller relative declines in investment, electricity consumption, export growth, and firm survival. Our results suggest that macroprudential policies do not merely "lean against the wind" in the short run, but can shift bank risk-taking in ways that may bolster real-sector resilience to macroeconomic shocks in the long run.



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Macroprudential policies are central to financial stability frameworks, yet systematic evidence on their long-run real-sector implications remains scarce. A large theoretical literature motivates macroprudential policy as a tool for reducing systemic risk by constraining leverage during booms, thereby mitigating financial amplification during downturns (Lorenzoni, 2008; Jeanne and Korinek, 2019). A key prediction of these models is that macroprudential constraints should reduce the amplification of future macro shocks through balance-sheet channels (Kiyotaki and Moore, 1997; Bernanke *et al.*, 1999), yet prior empirical work has focused on short-run effects on credit growth and household leverage.[1] Less is known about whether macroprudential policies influence banks' risk-taking behaviors in ways that strengthen the real economy's ability to withstand macroeconomic shocks. This paper addresses this gap by examining the long-run implications of macroprudential policies for credit allocation and real-sector resilience, exploiting a large currency depreciation as an empirical laboratory.

We find evidence that household-focused macroprudential policies are associated with a reallocation of credit toward safer corporate borrowers, and that this shift is in turn associated with greater real-sector resilience after a subsequent macroeconomic shock. Our main results are as follows. First, we show that macroprudential policies targeting household credit are associated with a reallocation of lending away from households and toward firms at more exposed banks, accompanied by higher firm-level investment and employment in the short run. Second, this reallocation is accompanied by a shift in corporate lending toward safer borrowers and local currency loans. The pull-back from risk-taking is stronger for banks with higher shares of foreign exchange (FX) funding, consistent with a market discipline mechanism by which FX creditors are sensitive bank monitors. Third, following a sizable currency depreciation that erodes firms' debt-servicing capacity almost one decade later, provinces that are more exposed to the depreciation experience weaker economic performance—measured by electricity consumption growth, export growth, con-

[1] See, among others, Hanson *et al.* (2011); Jiménez *et al.* (2017); Altunbas *et al.* (2018); DeFusco *et al.* (2020); Ahnert *et al.* (2021); Acharya *et al.* (2022); Auer *et al.* (2022). See Cerutti *et al.* (2017) for broad cross-country evidence and Boar *et al.* (2017) and Dell'Ariccia *et al.* (2012) for surveys.

struction activity, and firm exits. However, this adverse effect is significantly attenuated in provinces served by banks that had engaged in safer lending.

Overall, our results suggest that household-targeting macroprudential policies not only achieve their intended goal of curbing household borrowing, but also encourage a reallocation of bank capital toward safer commercial lending. This broader retrenchment from risk-taking may strengthen real-sector resilience to future macroeconomic shocks. These findings are important for policy because they imply that financial stability tools do not merely "lean against the wind" in the short run, but can also shift bank risk-taking in ways that can ultimately improve the economy's ability to withstand future macroeconomic stress.

**Data and Identification.** We document these results using the household and commercial loan-level credit registers from the Central Bank of the Republic of Turkey coupled with detailed bank-, firm- and province-level data. Turkey is a dynamic emerging market where firms rely on bank financing and borrow heavily in FX, exposing the real sector to exchange-rate and balance-sheet risks. For empirical identification of the short- and long-run effects of macroprudential policies on bank lending and the real economy, we exploit two major events: (i) the adoption of a macroprudential policy regime that targets excessive household lending and leverage during a boom and (ii) a sudden and sharp currency depreciation that generates negative balance sheet effects for firms. In addition, we construct measures of bank, firm, and province-level ex-ante exposure to household macroprudential policies and, respectively, firm and province ex-ante exposure to the currency depreciation, to study the impact of macroprudential policies on the composition of bank lending portfolios, risk-taking in corporate loans, and the real sector. Our measure of bank exposure to macroprudential reforms—the household loan share—shows flat pre-reform trends in lending outcomes and banks with higher or lower exposure are similar along a range of observable characteristics that would predict lending and risk-taking decisions.

The first event we exploit is the introduction of a new macroprudential policy regime.

Starting in January 2011, Turkey adopted a macroprudential policy framework that involved both institutional and policy measures with the explicit goal of curbing excessive household credit growth and household leverage. Measures were taken to directly limit consumer lending, including higher risk weights on consumer loans and loan receivables, higher loan loss provisions, changes in limits on debt-to-income and loan-to-value (LTV) for consumer loans, and outright bans on cash advances for some credit cards. Meanwhile, no regulations were put in place to constrain commercial lending. We refer to these policies taken together as a "new macroprudential policy regime" and study their effects on the composition of bank lending portfolios, the risk profiles of their borrowers, and firm real outcomes.

The second event is a largely unanticipated and sizable Turkish lira depreciation that occurred several years after the start of the macroprudential policy reforms, in 2018:Q2 and Q3. Between end-March and end-August 2018, the Turkish lira lost a staggering 40% of its value. Given the significant FX exposure of the corporate sector—among the highest in emerging markets (IMF, 2015)—the depreciation eroded firms' debt-servicing capacity through balance-sheet currency mismatches. This event allows us to determine if firms and provinces with varying degrees of prior exposure to the macroprudential policy reforms (through their banks) were differentially able to withstand the depreciation. In doing so, the 2018 depreciation allows us to test if the macroprudential policy regime succeeded in its objective of "reducing macro-financial risks" (CBRT, 2011) and, more broadly, whether it delivered on the ultimate goal of macroprudential policy—that of increasing the resilience of the economy against future financial shocks (Borio, 2003; Hanson *et al.*, 2011).

A key ingredient to our analysis is the measure of bank ex-ante exposure to household macroprudential policies, which we take to be the share of household lending in total loans at the end of 2010, before the implementation of the new macroprudential policies (pre-reforms "bank MPP exposure"). In the cross-section of banks, the banks with higher or lower MPP exposure are similar across a wide range of characteristics. Furthermore, we measure firm exposure to the 2018 currency depreciation as the "net open FX position" ("FX position"

in short) at the end of 2017 (Fendoglu *et al.*, 2025), defined as the difference between FX loans and export revenues, normalized by total assets. We further aggregate this measure at the bank and the province levels to examine loan performance and economic outcomes as a function of the interaction between FX exposure and exposure to the macroprudential reforms. Firms and provinces with higher versus lower FX exposure are also broadly similar on observable characteristics, with the exception that FX-exposed firms tend to be older and larger, consistent with the well-documented concentration of FX borrowing among larger firms.

**Overview of Results.** We present several key results on the effects of macroprudential policies, specifically on (i) the composition of bank lending portfolios (household versus corporate), (ii) bank risk-taking decisions in corporate loans and the underlying mechanism; (iii) the real economy in the short and long run. Our empirical analysis is a difference-in-differences (DiD) approach that compares a range of bank, firm, and province-level outcomes in a symmetric window of five years around the start of the 2011 macroprudential policy regime and up to two years around the 2018 depreciation.

First, we show that tighter household-targeting macroprudential conditions are associated with a relative reduction in household loan growth and an increase in corporate loan growth by more exposed banks—those banks with a higher ex-ante household loan share. In the five years following the adoption of the new macroprudential policy regime, an increase in bank MPP exposure by one standard deviation (SD) is associated with a decline in household loan growth by about half a SD and a rise in commercial loan growth by about one quarter of a SD. These differential loan growth rates occur without a relative expansion in total lending at more exposed banks, and thus indicate a loan portfolio reallocation from household to corporate lending. Furthermore, we find no evidence of differential responses in the growth of securities portfolios and overall balance sheets.

Second, we show that starting in 2011, more exposed banks increase lending volume and

reduce interest rates on commercial loans more than less exposed banks. An increase in bank MPP exposure by one SD is associated with a rise in commercial loan growth by 8.7% and a reduction in loan rates by 2.15 ppt (the average loan rate is 15%). These results are obtained in loan-level data for multi-bank firms, by exploiting variation in lending outcomes across banks differentially exposed to macroprudential policies that lend to the same borrowing firm in a given quarter (Khwaja and Mian, 2008; Chodorow-Reich, 2014; Jiménez *et al.*, 2020). The increase in corporate credit is associated with positive real effects, with borrowing firms more exposed to MPP through their banks exhibiting higher investment rates and employment growth than other firms.[2]

Third, the reallocation of bank portfolios toward commercial loans is accompanied by a reduction in credit and exchange rate risk. Two results support this conclusion. To start with, we show that more exposed banks extend relatively more credit to ex-ante safer corporate borrowers (as proxied by internal credit risk ratings reflecting banks' private assessments of borrower default risk). In addition, more exposed banks grant larger and cheaper loans in (safer) local currency than in (riskier) foreign currency after the start of the new macroprudential policy regime. These results overall indicate that the portfolio reallocation to commercial lending—an asset class not directly targeted by the macroprudential policies—is accompanied by a broader pullback from risk-taking. We further show that this prudent lending behavior is concentrated among those banks with a higher share of FX funding, suggesting a market discipline channel by which banks more reliant on FX creditors face stronger incentives to curtail risk exposures and safeguard balance sheet health.

Finally, we turn to the long-run effects of macroprudential policies. For identification, we exploit the sharp depreciation of the Turkish lira in 2018. While Turkey's macro vul-

[2] The parallel trends assumption underlying this identification strategy is supported by placebo tests and dynamic DiD estimates showing no differential pre-trends in lending outcomes prior to 2011. Furthermore, these results are robust to controlling for concurrent macroeconomic developments—including changes in monetary policy rates, the nominal exchange rate, and reserve requirements—that could differentially affect banks with higher household loan shares. Furthermore, results are invariant to controlling for relationship banking duration, expanding the sample to include single-lender firms, and alternative approaches to clustering the standard errors.

nerabilities had already placed selling pressure on the lira in 2018:Q2, the sudden escalation of geopolitical tensions with the United States in August 2018 triggered a sharp and largely unanticipated intensification of the depreciation in 2018:Q3, which provides a source of variation in the timing and severity of the depreciation that is plausibly independent of pre-existing bank lending decisions. Our findings show that in the quarters following the depreciation, more MPP-exposed provinces experienced a smaller deterioration in economic performance after the depreciation, captured by relatively higher electricity consumption growth, higher export growth, stronger construction activity, and lower incidence of firm closures. These effects are entirely driven by, or significantly stronger in, provinces served by banks that had engaged in safer lending.

Turkey shares with many emerging markets the key characteristics that are necessary for our results: a bank-dominated financial system with limited corporate bond market development, heavy reliance on FX funding by banks that transmits global financial conditions to domestic credit (Baskaya *et al.*, 2017; Di Giovanni *et al.*, 2022), significant FX borrowing by the non-financial corporate sector generating balance-sheet currency mismatches, and a household credit boom that motivated macroprudential reforms. These features make Turkey a representative setting for studying macroprudential policies in emerging markets more broadly. At the same time, some features of our setting may be specific to Turkey, including the geopolitical tensions behind the 2018 depreciation and the severity of the 2001 banking crisis that strengthened depositors' incentives to monitor banks' risk exposures and financial health. The underlying causes of the 2018 depreciation are useful for empirical identification of the long-run effects, but the mechanism we document relies on balance-sheet currency mismatches that are common in emerging markets. Furthermore, stronger depositor monitoring incentives may amplify the market discipline channel we document, but this is also broadly applicable in any setting with significant banking system reliance on FX funding.

**Relation to the Literature.** This paper contributes to the literature on the effectiveness of macroprudential policies in reducing procyclicality of credit growth and financial crisis risk (e.g., Hanson *et al.* (2011); Freixas *et al.* (2015); Duffie (2018); Jeanne and Korinek (2019)). Recent papers show that household-focused macroprudential policies generally achieve their goals of curbing household credit and house price growth in the short term, though sometimes with unintended adverse consequences (see, among others, Aiyar *et al.* (2016); Cerutti *et al.* (2017); DeFusco *et al.* (2020); Ahnert *et al.* (2021); Acharya *et al.* (2022); Epure *et al.* (2024); and Peydró *et al.* (2026) for a review). This paper adds to this strand of literature by leveraging a significant currency depreciation several years after the start of a new macroprudential policy regime to study the real effects of these policies over a long time horizon. This approach allows us to highlight the long-term real-sector impact of macroprudential policies and to directly test if they bolster macroeconomic resilience—an area that remains understudied.

Two closely related papers include Acharya *et al.* (2022) and Epure *et al.* (2024), who examine the effects of household-focused macroprudential policies on domestic credit and the housing sector. Acharya *et al.* (2022) show that tighter loan-to-value and loan-to-income limits on mortgages in Ireland successfully cooled house price dynamics in the year following the implementation of these limits; in addition, banks increased risk exposures in non-targeted areas like corporate credit. Epure *et al.* (2024) show that while tighter macroprudential regulations reduce risky household lending, they also lead banks to reallocate some credit to real estate firms. Our paper shares with these studies a focus on bank credit reallocation driven by macroprudential regulatory arbitrage, but differs from them in two ways. First, we uncover *positive* spillovers on corporate credit by showing that tighter household-targeted macroprudential policies are associated with lending to safer (not riskier) corporate borrowers. Our results are consistent with the notion that macroprudential tightening can affect bank risk outcomes generally across banks, not just targeted exposures, and can incentivize general prudence in banks' portfolios. Additionally, we show this effect concentrated among

banks with higher FX funding—consistent with market discipline from FX creditors and depositors rather than capital or supervisory pressure (Borio, 2015; Altunbas *et al.*, 2018). Second, we present a novel analysis of real-sector resilience to subsequent macro shocks.

The paper more broadly adds to the literature that emphasizes household debt as a driver of credit boom-bust cycles (Mian *et al.*, 2017; Bahadir and Gumus, 2016; Keys *et al.*, 2014) and the importance of macroprudential policies as a tool to prevent costly crashes (Mian *et al.*, 2017; Gourinchas and Obstfeld, 2012; Schularick and Taylor, 2012). While the cross-country evidence suggests that macroeconomic policies have rarely prevented credit booms (Dell'Ariccia *et al.*, 2012), certain household-leverage regulations can reduce mortgage market buoyancy and household indebtedness (Van Bekkum *et al.*, 2024; Benetton, 2021), though sometimes at the cost of reduced credit availability for affected borrowers (DeFusco *et al.*, 2020; Peydró *et al.*, 2024). Our paper contributes by emphasizing the long-run effectiveness of macroprudential policies in an emerging market economy that is reliant on global liquidity. Thus, our findings inform the academic and policy debate by showing that macroprudential policy not only can curb household leverage, but also induce a portfolio reallocation toward commercial lending as well as more prudent lending, which subsequently is associated with greater resilience of the economy to macro shocks.

Finally, the paper speaks to the extensive literature on FX borrowing in emerging markets and the vulnerabilities this creates. A large body of work documents that unhedged FX borrowing by firms and households generating balance-sheet currency mismatches amplifies the contractionary effects of exchange rate depreciations by tightening financial constraints and depressing investment (Krugman, 1999; Eichengreen *et al.*, 2003; Céspedes *et al.*, 2004; Aguiar, 2005). Our paper contributes to this literature by showing that macroprudential policies, though targeting household credit broadly rather than FX borrowing specifically, can mitigate the real effects of currency depreciations by inducing banks to shift corporate lending toward safer, less FX-exposed borrowers.

# 1 Macroeconomic Background

In this section we describe the main macroeconomic developments following the 2001 banking crisis in Turkey and the 2008-2009 global financial crisis that set the stage for the adoption of a new macroprudential policy regime in 2011. We also review the set of policy measures at the center of our analysis, concurrent regulatory and macroeconomic developments, and the banking sector.

**Pre-2011 Macroeconomic Developments.** Turkey is a major bank-dependent emerging market economy where banks hold the majority of the country's financial assets and rely heavily on FX funding. The 2001 banking crisis marked a turning point, with financial sector reforms and fiscal discipline catalyzing a period of sustained growth throughout the 2000s. Turkey experienced significant capital inflows and financial development during this period. Banking sector loan-to-GDP ratio increased from 14% in 2003 to close to 45% in 2010 (Figure A1, panel A). Household credit increased significantly during this period, with a real annual average growth rate of more than 36% between 2004 and 2010, which consistently outpaced commercial credit growth of around 28% (Figure A1, panel B).

**Macroprudential Policy Regime Post-2011.** Credit growth accelerated after the 2008–2009 global financial crisis, a downturn to which well-capitalized and profitable Turkish banks were remarkably resilient (Yörükoğlu and Atasoy, 2010). Large-scale asset purchase programs by advanced economy central banks increased the availability of cross-border funding—a key source of financing for Turkish banks—and supported a widening current account deficit. The bank loans-to-GDP ratio rose steeply, fueled by "hot money" from abroad, particularly portfolio and short-term investments. Household credit growth continued to outpace commercial credit growth and household leverage continued to rise after the GFC. Turkey did not have a macroprudential framework before 2010.

To curb the high levels of household credit growth and leverage, the Banking Regulation

and Supervision Agency (BRSA) announced a set of macroprudential measures targeting consumer credit in late 2010, to take effect from January 2011. We refer to these policies taken together as a "new macroprudential policy regime." The institutional framework for macroprudential policy was later formalized with the establishment of the Financial Stability Committee in June 2011 (Official Gazette, 2011), whose mandate included identifying and monitoring systemic risks and making policy recommendations.

The new macroprudential policy regime had two key features. First, and critical to our identification, no restrictions were placed on commercial credit. Second, the measures were phased-in gradually.

As seen in Table A1, which lists all relevant measures taken from 2011 until 2015, the initial policies were relatively limited in scope, consisting of new minimum LTV requirements for mortgages, higher risk weights on short-term consumer loans; and tighter minimum balance payment requirements for credit cards. Whereas the growth rate of consumer credit slowed down after the adoption of these policies, overall consumer credit balances continued to rise, with household liabilities (relative to assets) peaking at end-2013 (Kara, 2016). Given these developments, the CBRT announced a new set of measures starting from end-2013 that were both wider in scope and added more binding constraints than the previous ones did. New measures included higher risk weights and loan-loss provisioning requirements on most consumer loans, new DTI limits on credit cards, tighter requirements on minimum credit card balance payments, and an outright ban on cash advances for some credit cards. Panel A of Figure 1 depicts the cumulative number of macroprudential policies in place each quarter during 2006–2015, a period of five years before and after the adoption of these policies, highlighting the stark change in policy regime before and after 2011.

**Other Regulatory Developments.** The CBRT adjusted reserve requirement ratios after 2011 as part of its broader macroprudential toolkit, with changes affecting banks depending on their liability structure—targeting the maturity and currency composition of bank

funding. Crucially, these requirements were applied uniformly across all banks and did not distinguish between household and commercial loans. Therefore, these changes are unlikely to generate the asset-side reallocation from household to commercial lending that we document. Nevertheless, we check that our results are robust to directly controlling for a proxy of bank exposure to reserve requirement changes in our main specifications.

Beyond reserve requirements, two other regulatory developments occurred during the sample period, that are also unlikely to affect our results. Starting in 2012:Q3, Turkey formally implemented the Basel II capital adequacy framework, with reforms including enhanced calculation of risk-weighted assets under the standardized approach, strengthened disclosure requirements, and an improved supervisory process. Basel III implementation followed starting in 2014:Q1. Critical for our analysis, this framework did not differentially target household versus commercial lending, so these reforms are unlikely to generate the lending reallocation that we associate to the 2011 macroprudential policy regime.[3]

Finally, a 2009 Government decree restricted FX lending to commercial borrowers, effectively excluding households from FX-denominated credit (Official Gazette, 2009). It is possible that banks with higher household loan shares also held larger shares of FX loans to households, and that the forced reallocation of this credit after 2009 had lagged effects extending into our sample period, confounding our estimates. However, FX-denominated household loans were in practice extremely limited (less than 3% of total household loans), given that household income is predominantly in local currency. In addition, our tests indicate parallel pre-trends in commercial lending between banks with higher or lower macroprudential policy exposure before 2011—including in the two years following the 2009 decree.

**Banking Sector Characteristics.** Turkey's financial system is bank-dominated, with banks serving as the primary source of external finance for non-financial firms (Di Giovanni *et al.*, 2022; Baskaya *et al.*, 2017). Corporate bond market participation is extremely limited.

[3] As seen in panel B of Table A1, in 2008:Q1, the BRSA increased risk weights for corporate letters of guarantee and letters of credit, which, if anything, would discourage corporate lending and works against our results.

Bank funding has a significant foreign-currency component, with FX liabilities accounting for about 40% of total liabilities on average (see Table 1, panel A), reflecting Turkey's high degree of financial dollarization and reliance on international capital markets (Di Giovanni *et al.*, 2022). FX-denominated commercial loans represent approximately 35% of total loans. Banks have an average capital-to-asset ratio of 28.5% and a return on assets of 1.5%.

# 2 Empirical Approach

Here we discuss our data sources and empirical approach, focusing on the measures of bank and firm exposure to macroprudential policies and subsequent currency depreciation. We also present our workhorse empirical specification for different levels of data granularity.

## 2.1 Data: Household and Business Credit Registers

Our main data sources are the supervisory and confidential household and business credit registers, which contain detailed information on bank loan exposures to individual household and corporate borrowers, and are double-matched with bank and firm financials. These data are collected by public agencies or regulatory authorities and available through the CBRT.

The credit register data cover the universe of household and business loans granted by banks operating in Turkey. For each loan, we observe the issuing bank and the borrower, with unique identifiers that allow us to track borrowing relationships over time. We also observe comprehensive loan attributes and terms, including the outstanding loan balance, loan currency, loan type, interest rate (rarely available in credit registers), the origination and maturity dates, and collateral amount. We retain commercial loans to non-financial firms and drop loans to financial and public sector firms. For the loan-level analysis, we aggregate observations at the firm-bank-quarter level using end-of-quarter values. Loan volume at the pair level is obtained by summing up outstanding loans from a given bank to a given firm. Average interest rates (and other relevant loan characteristics) across individual loans are

weighted by loan volume. The main analysis spans the period between 2006 and 2015 and hence covers a five-year window around the start of the 2011 macroprudential policy regime.[4]

The credit registers are matched with bank and firm financial statements. Banks' monthly balance sheet and income statements are compiled by the BRSA. The regression sample includes 29 commercial banks that operate in Turkey during the period of analysis (including public, private, foreign, and Islamic banks). We drop "development and investment" banks, which do not accept deposits from the public and have a different business model and balance sheet structure from depository commercial banks, as well as failed and resolution-stage banks under the control of the Savings Deposit Insurance Fund.

Firm-level financial data are compiled by the Revenue Administration of the Ministry of Treasury and Finance. These data include balance sheets and income statements of firms, the sector of firms based on 4-digit NACE classification, and the date of incorporation, which gives us firm age. We also use the number of employees of each firm, sourced from the Social Security Institution of Turkey. The firm-level data starts in 2009 and comprises close to 200,000 firms. We complement these data with several province-level variables such as electricity consumption and firm exits via closure or liquidation for 81 administrative units ("*il*", to which we refer as provinces) and macroeconomic variables sourced from the Turkish Statistics Institute and the CBRT.

Descriptive statistics and definitions for the main variables used in the empirical analysis are reported in Table 1 and A3, respectively.

## 2.2 Bank and Firm Exposures

In this section, we analyze the effects of macroprudential policies on bank lending behavior, risk-taking, and firm outcomes. Then we extend the analysis to examine real-sector outcomes at the firm and province level after the depreciation. A key ingredient to these analyses is

[4] The CBRT credit registers have very high-quality and comprehensive data compared to other national credit registers. As a result, these data have been used extensively in academic research to examine the transmission of domestic and external shocks to the Turkish economy; see, among others, Baskaya *et al.* (2017); Fendoglu *et al.* (2019); Di Giovanni *et al.* (2022); Başkaya *et al.* (2024) and Fendoglu *et al.* (2025).

a measure of bank, firm, and province-level exposure to macroprudential policies and to the FX depreciation event, respectively, which we describe below.

**Bank Macroprudential Policy (MPP) Exposure.** All depository institutions had to comply with the new household-targeting macroprudential policies, however, the extent to which they adjusted lending and risk-taking decisions likely depended on their business model—in particular, their focus on household lending. Thus, our measure of exposure to macroprudential policies exploits heterogeneity across banks in ex-ante household lending, which we calculate relative to total loans, at the end of 2010. The household loan share is close to 24% on average and exhibits significant cross-bank variation, ranging between 1.7% at the 25th percentile and 37.8% at the 75th percentile (see Table 1). In addition, it is sticky over time within bank, with a correlation of 0.7 between the end-2006 and end-2010 values of this measure. We label this variable "bank MPP exposure."

**Covariate Balance across Bank MPP Exposure Groups.** To allay concerns that this exposure measure reflects selection on bank business models, which could lead to a bias in our results, we check its correlation with pre-2011 balance sheet attributes. In panel A of Table 2 we report median characteristics for banks with higher versus lower MPP exposure around the 75th and 50th percentiles, respectively. A t-test of equality of medians across samples indicates that we fail to reject that high- and low-exposure banks have similar characteristics for all variables when splitting around the 75th percentile (columns 1-3). When splitting around the median (columns 4-6), banks with above-median exposure tend to be larger and have lower capital ratios. These differences are modest in magnitude and, importantly, do not predict differential pre-trends in lending outcomes, as our dynamic estimates confirm. To further mitigate potential concerns that our regression results could be confounded by the effects of bank size, capitalization, or other factors, all bank- and loan-level specifications control for standard bank attributes, specifically bank size, capital, liquidity, return on assets, and FX funding ratio.

**Firm Macroprudential Policy (MPP) Exposure and Covariate Balance.** We aggregate the bank MPP exposure measure at the firm level as the average bank MPP exposure across a firm's lenders, weighted by the share of the firm's borrowing from each lender (both measured at end-2010 in the main analysis). This measure allows us to explore the effects of macroprudential policies on firm-level outcomes. Panel A of Table A5 reports the results of a standardized test of equality of means across firms with higher versus lower MPP exposure (Imbens and Rubin, 2015), using the 75th and 50th percentiles as cutoffs. As seen in columns 3 and 6, there is no evidence of systematic differences in firm characteristics—including age, balance sheet size, profitability (return on assets), leverage (equity-to-asset ratio), liquidity (cash-to-asset ratio), or revenue growth—across higher and lower MPP exposure firms. Nevertheless, we control for the above firm characteristics in all specifications.

**FX Exposure for Firms, Banks, and Provinces.** We measure firm exposure to the 2018 depreciation using a firm's "net open FX position" (Fendoglu *et al.*, 2025) defined as the difference between a firm's FX assets and FX liabilities. We approximate FX liabilities with bank FX loans (aggregated at the firm level from the business credit register) and FX assets with export revenue.[5] The "net open FX position" is thus the difference between outstanding FX loans and export revenues, normalized by total assets, and is measured at the end of 2017, before the start of the depreciation. We aggregate this measure at the bank level as the average FX exposure of a bank's borrowing firms, weighted by the loan shares of each firm (and capped at zero so that banks cannot benefit from the depreciation), to capture the ex-ante FX vulnerability of each bank's corporate lending portfolio. We further aggregate to the province level by averaging net open FX positions across firms in a given province, weighted by employment shares.

[5] Our measure is simpler than the baseline measure in Fendoglu *et al.* (2025), which focuses on short-term FX loans maturing within one year, in that we instead consider the full stock of FX liabilities. We take this approach because the depreciation occurs in Q2-Q3 of 2018 while short-term loans—observed at the end of 2017 and maturing within one year—may lead us to flag as vulnerable some firms whose loans are paid off in the first half of 2018.

**Covariate Balance for FX Exposure.** Panel B of Table A5 reports covariate balance for firms split by FX exposure. Since FX borrowing is concentrated among a subset of firms, the net open FX position is zero at both the median and 75th percentile of the distribution (Table 1), reflecting the fact that most firms in our sample have no FX loans. We therefore split firms into those with positive net open FX positions (FX-exposed firms) and those with zero exposure, and compare their observable characteristics. The two groups of firms are broadly similar, with one exception: FX-exposed firms tend to be older and larger, consistent with the well-documented pattern that FX borrowing is concentrated among larger firms (see, e.g., Alfaro *et al.*, 2019). Panel B of Table 2 shows no statistically significant differences in characteristics between banks with higher versus lower FX exposure. Finally, Table A6 shows that province-level characteristics are similarly balanced across FX exposure groups.[6]

## 2.3 Main Specifications

We examine the credit and real effects of the macroprudential policy regime, at different levels of data granularity in a standard DiD framework. Here, we present our main empirical specifications for analyses at the bank, loan, and firm (or province) level.

We start with a **bank-level analysis** that relates banks' commercial and household loan growth to banks' ex-ante MPP exposure. The specification takes the form:

$$Y_{it} = \beta_1 \text{Bank MPP Exposure}_i \times \text{Post}_t + \beta_2 \text{X}_{it-1} + \beta_3 \text{X}_{it-1} \times \text{Post}_t + \alpha_i + \gamma_t + \epsilon_{it} \qquad (1)$$

where banks are indexed by $i$ and quarters by $t$. The main dependent variables are the year-on-year growth rate of household loan balances (the sum of consumer loans, mortgages and credit cards) and commercial loan balances of bank $i$ in quarter $t$. The sample period runs between 2006:Q1 and 2015:Q4 and is split into five-year pre/post periods around 2011:Q1.

[6] Figure A4 depicts the geographic distribution of MPP exposure (panel A) and FX exposure (panel B) across the 81 provinces, highlighting the significant cross-sectional dispersion in exposure. that we exploit in the empirical analysis.

Post is a dummy variable that takes value 1 for the period following the implementation of policies (2011-2015) and 0 in the preceding period (2006-2010). Specifications include bank and quarter fixed effects ($\alpha_i$ and $\gamma_t$); these fixed effects span the time-invariant bank MPP exposure variable and Post variable, for which we cannot estimate level effects.

Bank-level controls ($X_{it-1}$) include lagged bank size (log-assets), capital ratio, liquidity ratio, return on assets, and FX funding ratio and enter the specification both in levels and interacted with Post. The coefficient of interest is $\beta_1$, which will reveal any shifts in loan allocations at banks with different MPP exposures during the Post period compared to the pre-period. We consider the growth of total assets, loans, securities, and asset quality ratios as additional outcome variables to assess whether macroprudential policies affected banks' asset allocations and credit risk more broadly. Specifications are estimated using Ordinary Least Squares, with standard errors that are double-clustered (two-way clustered) on bank and quarter.

Next, we turn to the **loan-level data** in the business credit register and analyze banks' commercial lending decisions. The empirical specification we estimate is as follows:

$$Y_{ijt} = \beta_1 \text{Bank MPP Exposure}_i \times \text{Post}_t + \beta_2 \text{X}_{it-1} + \beta_3 \text{X}_{it-1} \times \text{Post}_t + \alpha_i + \theta_{jt} + \epsilon_{ijt} \quad (2)$$

where banks are indexed by $i$, borrowing firms by $j$, and quarters by $t$. The dependent variables refer to loan volume growth and interest rate (across all loan balances): (1) the year-on-year growth rate of outstanding loans from bank $i$ to firm $j$ in quarter $t$ and (2) the average interest rate on outstanding loans from bank $i$ to firm $j$ in quarter $t$. The specifications include bank fixed effects ($\alpha_i$) and the same bank controls as in Equation 1, in levels and interaction with the Post dummy (defined as in Equation 1).[7]

Following Khwaja and Mian (2008), we restrict the sample to firms with multiple banking relationships—which account for about 30% of firms—and include firm×quarter fixed effects

[7] Note also that the regressions with loan growth as outcome variable are equivalent to including bank-firm pair fixed effects, since loan growth is defined as the change in outstanding loan balances over time within a given bank-firm pair.

($\theta_{jt}$) to control for time-varying firm-specific credit demand and other unobserved factors. The firm×quarter fixed effects will absorb common changes in lending terms driven by the macroprudential policies implemented in the Post period, including supply-driven changes. By allowing the pass-through of macroprudential policies to vary with bank exposure to macroprudential policies, the DiD term (Bank MPP Exposure$_i$ × Post$_t$) will thus capture deviations relative to the average pass-through.

These regressions are estimated with OLS and standard errors are triple clustered on bank, firm, and quarter. We cluster on bank because it represents the level of variation of the bank exposure to macroprudential policies (Bertrand *et al.*, 2004; Abadie *et al.*, 2023); we also cluster on quarter and on firm to account for serial residual correlation within quarters and firms, with the latter being particularly salient given the prevalence of firms with multiple bank-relationships in our dataset. In robustness checks, we show our results are robust to controlling for relationship banking, expanding the sample to include loans to single-lender firms, and alternative approaches to clustering the standard errors (including solely on bank).

We also explore heterogeneity in the risk profile of commercial loans by breaking down the DiD term (Bank MPP Exposure$_i$ × Post$_t$) with spline terms. For instance, we use a modified version of Equation 2 to explore the effects of macroprudential policy exposure on lending to borrowers with different risk ratings or in different currencies:

$$\begin{aligned} Y_{ijt} = &\sum_{\tau=1}^{2} \beta_\tau \left(\text{Bank MPP Exposure}_i \times \text{Post}_t\right) \times \text{Loan Risk}_{j,\tau} \\ &+ \sum_{\tau=1}^{2} \lambda^b \big(\text{Lower-level controls}\big) \times \text{Loan Risk}_{j,\tau} \\ &+ \beta_2 \text{X}_{it-1} + \beta_3 \text{X}_{it-1} \times \text{Post}_t + \alpha_i + \theta_{jt} + \epsilon_{ijt}. \end{aligned} \tag{3}$$

where Loan Risk$_{j,\tau}$ for $\tau = 1$ indicates a safer loan and $\tau = 2$ indicates a riskier loan. We measure loan risk in two ways: first, using banks' assessments of individual borrower default risk, and second, based on currency. Borrower default risk is measured by six risk categories

ranging between 1 (safest borrowers) and 4 (riskiest borrowers). We define safer loans as those to borrowers in category 1 and riskier loans as those to borrowers in categories 2-4. We drop defaulted loans (category 5).[8] Second, we measure loan risk based on FX versus local currency, with $\tau = 1$ indicating safer (Turkish lira) loans and $\tau = 2$ indicating riskier (FX, mostly USD) loans.

Finally, we conduct **firm- and province-level analyses** to examine the real effects of macroprudential policies and those of the depreciation. Using a firm-year dataset matched with credit register data, we estimate regressions that take the form:

$$Y_{it} = \beta_1 \text{Firm MPP Exposure}_i \times \text{Post}_t + \beta_2 \text{Z}_{it-1} + \beta_3 \text{Z}_{it-1} \times \text{Post}_t + \theta_i + \xi_{skt} + \epsilon_{it} \qquad (4)$$

where $i$ indexes firms in province $s$, industry $k$, in year $t$. The outcome variables include (1) total loan growth (based on the summation of bank loans from the credit register), (2) the investment rate (the change in fixed assets divided by lagged total assets), and (3) employment growth. Firm MPP exposure is the firm-level weighted average of the bank-level MPP exposure across all of firm's lenders, with weights given by the share of loans from each bank in the firm's total loans, measured at the end of 2010.

In this specification, firm controls ($Z_{it-1}$) include lagged firm size (log-real assets), profitability (return on assets), liquidity ratio (cash divided by assets), leverage ratio (equity divided by assets), real sales growth, and firm age (log). Regressions include firm fixed effects ($\theta_i$) and province×industry×year fixed effects ($\xi_{skt}$), which absorb common shocks to all firms in a given location and NACE-4 industry. The specification in Equation 4 is estimated using OLS with standard errors that are double clustered by firm and year.

Finally, we estimate province-level real effects around the 2018 depreciation using a specification analogous to Equation 4, where outcome variables are province-level aggregates,

[8] Bank-assessed borrower risk is monotonically related to borrower leverage: the average equity-to-asset ratio monotonically decreases from the safest category 1 borrowers (38.4%) to the riskiest category 4 borrowers (22.2%); borrowers in default (category 5) or without a rating (category 6) have an average equity-to-asset ratio of 19.5% and 28.3%, respectively.

controls are employment-weighted averages of firm-level variables, and standard errors are clustered at the province level.

# 3 Results

The results are organized in three parts. In Section 3.1, we examine the short-run bank (household and commercial) lending and real effects of the household-focused macroprudential policies implemented after 2011. In Section 3.2 we delve deeper into the risk-taking behavior of banks within the commercial lending portfolio and offer evidence on the underlying mechanisms underpinning our results. In Section 3.3, we present an analysis of the long-run effects post-2018 depreciation on firm investment and aggregate real outcomes.

## 3.1 Short-Run Effects on Lending and Real Economy

**Descriptive Evidence: Reallocation to Commercial Loans.** Estimation results in Table 3 explore the relation between banks' MPP exposure and their asset allocations based on the specification in Equation 1. This bank-level analysis is descriptive: since aggregate bank balance sheet data do not allow us to control for credit demand shifters, the estimates should be interpreted as correlations rather than causal effects. With this caveat in mind, estimates in column 1 of panel A show a negative and significant coefficient on the DiD term (Bank MPP Exposure$_i$ $\times$ Post$_t$), i.e., more exposed banks experienced relatively *lower* household loan growth after the start of the new household-targeting macroprudential policy regime. Conversely, estimates in column 2 of panel A show a positive and significant coefficient on the DiD term, indicating that more exposed banks experienced relatively *higher* commercial loan growth post-2011. Estimates in columns 1-2 indicate that an increase in bank MPP exposure by one SD is associated with a decline in household loan growth by about half a SD ($20.75 \times 2.3082/87.56 = 0.55$) and a rise in commercial loan growth by about one quarter of a SD ($20.75 \times 0.6263/54.47 = 0.24$).

These findings are consistent with the loan portfolio reallocation from panel B of Figure 1, which reveals a decline in the aggregate household loan share by about 8 ppt and an increase in the aggregate commercial loan share by about 10 ppt in the Post period. Importantly, this figure also depicts a lack of pre-existing trends in loan portfolio composition before 2011.

Columns 1-3 in panel B explore broader shifts in bank balance sheets. Estimated coefficients are statistically insignificant across specifications, suggesting that more exposed banks did not experience differential total loan, securities, or asset growth. These findings suggest that, among the outcomes we examine, the effects of the household-targeting macroprudential policy regime were concentrated in household and commercial loan growth. Thus, more exposed banks reallocated loanable funds from household to corporate borrowers more than other banks, consistent with the shift in the composition of loan portfolios at the aggregate banking sector level (panel B of Figure 1).

**Credit Registry Evidence.** Previous results suggest that bank MPP exposure is positively associated with commercial loan growth. A leading threat to a causal interpretation is the possibility that more exposed banks also experienced a simultaneous increase in the demand for credit. To address this possibility, we turn to the commercial credit registry loan-level data, where we can control for potential firm-level credit demand shifters and other unobserved firm shocks with firm×quarter fixed effects as in Equation 2. The results are reported in panel A of Table 4. Column 1 shows that more exposed banks experience significantly higher commercial loan growth after the adoption of macroprudential policies than other banks. A rise in bank MPP exposure by one SD is associated with an increase in commercial loan growth of 8.7%, obtained as $20.75 \times 0.4170/100 = 0.087$ (the average loan growth rate is 31.08%).

Estimates in column 2 show a negative and statistically significant relation between bank MPP exposure and the average loan rate. An increase in bank MPP exposure by one standard deviation is associated with a decline in commercial loan rates by 2.15 ppt,

obtained as $20.75 \times 0.1037/100 = 2.152$ (the average loan rate is 15%). With the quantity and price of commercial credit moving in opposite directions for more exposed banks, we infer that the increase in commercial credit loan growth from Table 3 and illustrated in panel B of Figure 1 more likely reflects a change in credit supply rather than credit demand.

**Firm-level Real Effects.** If higher lending from more exposed banks is offset by lower lending from less exposed banks, there would be no impact on total lending or real outcomes at the firm level. Turning to the firm-level data, we report estimates based on Equation 4 in panel B of Table 4. Estimates on the DiD term are positive and significant across specifications and reveal a positive relation between firms' MPP exposure (through their banks) and firm-level loan growth, investment rates, and employment growth. A rise in firm MPP exposure of one standard deviation is associated with an increase in the investment rate by 0.16 ppt and in employment growth by 0.65 ppt (relative to a mean investment rate of 5.1% and employment growth rate of 14.3%, see Table 1).

**Parallel Trends.** A key identifying assumption of our DiD framework is that banks with high and low MPP exposure would have followed parallel trends in lending outcomes absent the policy regime change. We provide two pieces of supporting evidence. First, Figure A3 plots dynamic DiD coefficients from a version of Equation 2, where bank MPP exposure is interacted with yearly dummies. The estimated coefficients are small and mostly insignificant during the pre-period (2006–2010), with no discernible pre-trend in either commercial loan growth or interest rates, and shift significantly after 2011 in a manner consistent with the baseline estimates in Table 4 (columns 1-2, panel A). Second, Table A10 reports placebo tests that re-estimate Equation 2 over four alternative pre-policy windows. The DiD coefficient is statistically insignificant across all placebo specifications for both outcome variables, with the exception of a marginally significant coefficient on loan growth in the 2008-versus-2009 window. Together, these results broadly support the validity of the parallel trends

assumption.[9]

**Controlling for Macro Developments and Policies.** A potential concern is that macroeconomic developments during the post-2011 period may confound our baseline estimates. As seen in Figure A2 (panels A and B), the post-2011 period was also characterized by fluctuations in inflation, growth, and interest rates. To address this concern, in Table A8 we augment the baseline specification with interactions between bank MPP exposure and three macroeconomic variables: real GDP growth (panel A), the short-term monetary policy funding rate (panel B), and the change in the nominal exchange rate (panel C). In addition, we replace the household loan share with a proxy for bank-level exposure to reserve requirement changes—the ratio of short-term deposits to total assets—in panel D. Across all four panels, the baseline DiD coefficients on household and commercial loan growth remain stable in sign, magnitude, and statistical significance relative to the baseline estimates in Table 3. Overall, these results confirm that the documented reallocation of bank lending from household to commercial credit is not explained by concurrent macroeconomic developments or changes in reserve requirements during the Post period.

**Robustness Checks.** We further test the sensitivity of our headline results to controlling for relationship banking, adding single lender loans, and alternative clustering approaches for the standard errors. Results are presented in Table A11.

In panel A, we control for the duration of the bank-firm relationship—defined as the time since the first loan origination for a given bank-firm pair (log-number of quarters). The inclusion of this control variable leaves the estimates statistically significant and nearly unchanged in magnitude compared to the baseline results. In panel B, we add the loans of single-lender firms to the sample. This test is important because our baseline sample is limited to multi-lender firms, as required by the Khwaja and Mian (2008) approach, and

[9] Dynamic DiD coefficient charts and placebo tests are not feasible for the firm-level real effects analysis because the firm-level financial data is available starting in 2009.

only 30% of firms have multiple banking relationships. As seen in Panel B, adding these loans more than doubles the sample size, but leaves our main estimates unchanged.[10]

Estimates in Panels C and D of Table A11 show that our main loan-level results—based on triple clustering on bank, firm, and quarter—are fully robust to single clustering on bank or double-clustering on bank and firm. These approaches are important to verify because they match the variation in the bank MPP exposure (our "treatment" variable) on bank; and account for the fact that most firms have multiple bank relationships and outstanding loans, which induces within-firm correlation across different loans.

## 3.2 Risk-taking in Commercial Loan Portfolio

An important question that arises from our previous results is whether banks' behavior changed following the new macroprudential policy regime by taking additional risks in their commercial lending portfolios (as in Acharya *et al.* (2022)) or, by contrast, whether they lent more prudently (Borio, 2003, 2015). In this section, we explore this question and the channels behind the documented risk-taking behavior.

Banks' risk-taking behaviors in an asset class not directly targeted by macroprudential policies are theoretically ambiguous. On the one hand, banks facing lower profitability in the targeted portfolio may want to take more risk. In our setting, more exposed banks may have to lower loan underwriting standards to grant more commercial loans. On the other hand, tighter macroprudential policies may generate pressure on capital ratios (e.g., through higher risk weights) and on bank funding costs, as investors may perceive more exposed banks as riskier. Capital and funding pressures may, in turn, lead banks to re-optimize the entire portfolio. Furthermore, it is possible that the introduction of the new macroprudential

[10] We also explored specifications that include bank×firm pair fixed effects to control for assortative matching in the bank loan market (Chodorow-Reich, 2014; Schwert, 2018) that may not be captured by the relationship duration control. The interest rate result remains negative and significant, while the loan volume result is sensitive to the combination of fixed effects included. This likely reflects the limited within-pair variation in our continuous bank MPP exposure variable: unlike the original Khwaja and Mian (2008) design, which exploited a binary bank liquidity shock, our treatment varies smoothly across banks and lacks the within-pair contrast needed to precisely identify coefficients even after absorbing pair-specific intercepts.

policy regime in 2011 signaled heightened regulatory concern for systemic risk and overall scrutiny of the banking sector, to which banks responded by reassessing all risk exposures, not just those directly targeted by the reforms.

To explore risk-taking in the commercial lending portfolio, we start by testing whether more exposed banks expanded risky lending along two dimensions: *borrower credit risk* (as measured by the banks' internal credit risk rating, based on borrower balance sheet and income characteristics, such as leverage and cash reserves) and *loan currency risk*. We turn to the specification in Equation 3, which breaks down the DiD coefficient to allow for distinct effects by borrower or loan risk. We classify borrowers in risk category 1 as safer and borrowers in risk categories 2–4 and 6 (unrated) as riskier. As shown in columns 1-2 of Table 5, commercial loan growth from more exposed banks was higher to safer borrowers than for riskier borrowers; furthermore, the difference in loan growth between the two categories is statistically significant at the 1% level. The interest rate difference between loans to safer and riskier borrowers is not statistically significant at conventional levels.

Then, we turn to loan currency risk and open up the DiD coefficient by local versus FX. Lending in foreign currencies is a major source of risk for banks in emerging markets. In Turkey, FX loans are often preferred by firms because they are cheaper and have longer maturities than local currency loans (see Gutierrez *et al.* (2023) for an explanation of this phenomenon that is rooted in depositor preferences for dollar savings). Even though Basel III and domestic regulation limits banks' net open FX positions, banks face exchange rate risks as many of their FX borrowers are unhedged. The results in columns 3-4 of Table 5 show significantly stronger effects at the 5% level for both loan growth and interest rates, indicating that more exposed banks increased loan volumes and reduced rates relatively more for (safer) Turkish lira loans than for (riskier) FX loans.[11]

[11] Additional results in Table A9 show no association between bank MPP exposure on the one hand and contemporaneous or one-year ahead asset quality, measured by the non-performing loan ratio for all loans and FX loans (columns 1-2) or the loan loss provisioning ratio (column 3), further supporting the notion that banks did not take additional risks in other parts of the lending portfolio to compensate for the loss of profitability in household lending.

**Mechanisms.** The results in Table 5 suggest more exposed banks have more prudent lending behavior in commercial lending—an asset class that was not directly targeted by the macroprudential reforms. What mechanisms could explain this effect? We examine three complementary explanations.

The first explanation refers to *market discipline* whereby banks' funding costs are determined by bank balance sheet health through an external finance premium (Bernanke, 2007). Banks with a higher share of FX funding face stronger incentives to curtail risk-taking and safeguard balance sheet health, as their FX creditors can withdraw funding in response to higher perceived bank risk. In Turkey, FX funding comes from both external wholesale creditors (such as foreign banks and institutional investors) as well as domestic FX depositors, in roughly equal proportions. While the market discipline argument typically applies to external creditors, domestic depositors can also exert significant market discipline. Turkey's severe 2001 banking crisis, during which many depositors experienced significant losses, strengthened households' incentives to monitor banks' financial health (Ungan and Caner, 2004; Starr and Yilmaz, 2007). In addition, more than 90% of FX deposits in Turkey are uninsured,[12] hence more prone to sudden withdrawal (Demiürgüç-Kunt and Huizinga, 2004; Chen *et al.*, 2024). More broadly, in highly dollarized economies, the decision to hold FX deposits reflects an informed portfolio choice about bank safety and macroeconomic risk, with changes in the currency composition of deposits themselves serving as a market discipline device (Semenova and Shapkin, 2019).

The second channel refers to *capital pressures* caused by the regulation—banks with higher MPP exposure face rising risk weights and provisioning requirements on their household books, which in turn compresses capital ratios. To protect their balance sheets, these banks may have taken a loan portfolio-wide risk optimization view and become more pru-

[12] This high share is due to the fact that deposit dollarization is greater among firms than households (excluded from deposit insurance during the period of our analysis) and FX deposits are typically higher-denomination (often above the deposit insurance coverage limit). We obtain estimates of the breakdown of total FX funding into wholesale versus depositor funding from BRSA and the breakdown of total FX deposits into insured versus uninsured deposits from the Savings Deposit Insurance Fund of Turkey (Tasarruf Mevduati Sigorta Fonu (TMSF), 2023).

dent across all lending, especially if they had lower levels of capital before the new policy regime (Borio, 2015; Altunbas *et al.*, 2018). The third channel is a *moral suasion/supervisory scrutiny* channel that manifests along the lines of private versus public bank ownership. Although there were no formal regulatory differences across these bank types in Turkey, public banks are more likely to be politically connected and, as a result, may receive less supervisory scrutiny, especially if their credit policies serve as vehicles of industrial policy (La Porta *et al.*, 2002; Sapienza, 2004; Dınç, 2005).

We test these three channels by breaking down the main DiD coefficients of interest "Bank MPP exposure×Post×Safer borrower" and "Bank MPP exposure × Post×Turkish lira loan" by bank type to determine which group of banks yields a stronger effect. Our proxies for the three channels are the pre-reform share of FX funding in total liabilities (higher/lower around the 75th percentile of FX funding share), the total capital ratio (higher/lower around the 75th percentile of capital), and private-owned vs. state-owned dummy, respectively. The specifications are otherwise unchanged.

Starting with the market-discipline channel, the results are shown in Table 6, where in three of four specifications we find significant and stronger effects for the banks with a higher FX funding share than for those with lower FX funding share. Quantitatively, the differential is sizable: the effect of MPP exposure on loan growth to safer borrowers is about 26% larger at banks with higher FX funding shares than at banks with lower shares (1.32 versus 1.05, significant at the 1% level); the corresponding differential for local currency loan growth is about 40% (0.68 versus 0.48, also significant at the 1% level). These results indicate that prudent lending behavior after 2011 is concentrated among banks more reliant on FX funding, consistent with the market discipline channel: banks facing stronger monitoring from FX creditors have greater incentives to curtail risk-taking across their entire lending portfolio, including in commercial loans not directly targeted by the macroprudential reforms. By contrast, estimates in Tables A12 and A13 show no significant differences in risk-taking between banks with higher or lower capital ratios, or private and state-owned

banks, respectively, and thus do not offer systematic support for the additional channels we considered.

## 3.3 Long-run Effects Post-2018 Depreciation

**2018 Depreciation.** Our empirical setting for studying the effects of the post-2011 macroprudential policy regime on the resilience of the economy to macro shocks is the 2018 currency depreciation. While Turkey's macroeconomic vulnerabilities—including large current account and budget deficits and high levels of FX-denominated corporate debt[13]—had already put downward pressure on the lira in 2018:Q2, with the TRY/USD rate depreciating by more than 17% between end-2017:Q4 and end-2018:Q2, the sudden escalation of geopolitical tensions between Turkey and the United States in August 2018 sharply accelerated the depreciation (see panel A of Figure 2).

The key identifying assumption is that the timing and magnitude of the August 2018 acceleration were unanticipated by banks. This assumption is supported by the timeline of events in Table A14, which shows that the August 10 tariff announcement followed a sequence of escalating but unpredictable geopolitical events that happened over a short period of time. Specifically, on Friday, August 10, 2018, President Trump announced a doubling of tariffs on Turkish steel and aluminum and stated that the US's "relations with Turkey were not good," triggering a new wave of lira selling, with daily depreciation of 9.1%. On Monday, August 13, the TRY/USD rate hit an all-time high of 7.2 in overnight trading. The CBRT intervened with emergency liquidity measures that stabilized the lira at around 6.90, corresponding to 13.7% depreciation in a single day. The total depreciation between end-March and end-August 2018 was close to 40%. We treat 2018:Q2 as a ramp-up quarter during which the initial depreciation began and exclude it from our estimation window. Our Post period thus begins in 2018:Q3, by when the depreciation had fully materialized following the geopolitical

[13] At the time of the depreciation, Turkey had a high level of FX-denominated corporate debt (corporate FX debt-to-GDP ratio of nearly 35% (IIF, 2018) and FX share of corporate loans exceeding 50% at the end of 2017), ranking among the emerging markets most vulnerable to a sudden reversal of capital flows and making it an ideal setting for testing the long-run effects of macroprudential policies.

events.

Panel B of Figure 2 shows that the 2018 depreciation was followed by a marked deterioration in loan performance, as seen in the evolution of the share of watch-list loans (showing signs of credit deterioration and subject to heightened supervisory scrutiny but not yet non-performing).[14] With FX loans accounting for more than half of total corporate loans, the credit deterioration strained bank balance sheets and tightened credit conditions (Fendoglu *et al.*, 2025). Next, we provide evidence on the effects of the depreciation on banks, firms, and provinces, and subsequently test for the resilience of these sectors to the depreciation depending on their prior exposure to macroprudential policy reforms.

**Banking Sector Resilience to 2018 Depreciation.** We start by testing the effects of the 2018 depreciation on the banking sector in a DiD framework with a six-quarter window (we drop the data for 2018:Q2 and set 2018:Q3 as the first post-period quarter). The measure of bank exposure to the depreciation is the end-2017 average of the borrowers' FX position, weighted by their loan shares with the bank (as defined in Section 2.2).

The results, reported in columns 1-2 of Table 7, show that banks with higher ex-ante FX loan exposure report higher watch-list loan ratios than other banks in the quarters following the depreciation. The estimate in column 1 indicates that a one SD increase in bank FX exposure is associated with a rise in the watch-list loan share of 0.08 ppt after the depreciation (relative to a mean of 8.1%). This is a modest effect that likely reflects the short six-quarter window around the depreciation: the transmission from exchange rate depreciation to observable loan delinquency requires firms to exhaust liquidity buffers, miss payments, and trigger banks' internal classification processes, all of which take time.[15] When we open up the DiD term "Bank FX exposure×Post" by banks' prior MPP exposure (column

[14] We measure loan performance using the share of watch-list loans (in total gross loans) on bank balance sheets as opposed to the non-performing loan ratio because this classification requires the loan to be non-performing for at least 90 days and we examine short windows of six quarters around the depreciation which may not allow sufficient time for delinquent loans to be reclassified.

[15] Consistent with this interpretation, Fendoglu *et al.* (2025) document that the deterioration in bank asset quality following the 2018 depreciation was gradual and continued well beyond our sample window.

2), we find that this effect is driven by the banks with lower ex-ante MPP exposure. These results suggest that while the depreciation increased delinquencies on average at more FX-exposed banks, those banks with prior safer lending fared better than less exposed banks.

These results are consistent with Fendoglu *et al.* (2019), who use Turkish credit registry data to show that the 2018 depreciation induced a sudden stop-like contraction in bank credit, with negative effects on the real economy. The paper documents that banks with higher FX loan exposures had worse asset quality and subsequently tightened lending terms across multiple margins (loan volumes, interest rates, maturities and collateral requirements).[16] Our results additionally show that those FX-vulnerable banks that had been more exposed to the prior macroprudential policy reforms did not experience a rise in delinquent loans thanks to their relatively prudent commercial lending behavior after 2011.

**Real Economy Resilience to 2018 Depreciation.** Next, we test the effect of the depreciation on the real sector. First we establish that the depreciation was associated with worsening real outcomes at the province level. Second, we determine if the post-depreciation differential performance of banks that we documented above translates into differential performance in the real sector. That is, we test how the baseline effect of the depreciation varies across provinces with their prior MPP exposure (above versus below median).

Table 8 reports the estimation results for province-level outcomes. Here, we examine four measures of economic activity in data at different granularity levels: industrial electricity growth (at the province-year level); export growth (at the province-destination country-quarter level, where we include destination-country×quarter fixed effects to absorb time-varying demand from individual foreign markets); construction activity (log number of construction permits at the province-quarter level); and the change in firm exits (at the province-firm type-quarter level, for three firm types: companies, cooperatives, and sole proprietorships). Columns 1 and 3 estimate the full-sample effect, while columns 2 and 4 break

[16] In addition, their research documents sizable macroeconomic effects of the depreciation, with FX-indebted firms creating adverse spillovers not only on banks through the credit channel mentioned above, but also on other customer and supplier firms through firm-to-firm production networks.

down the main DiD coefficient by prior MPP exposure around the 75th percentile.[17]

The results indicate that provinces with higher FX exposure experience worse real outcomes than other provinces, across all outcomes considered. Coefficient estimates in columns 1 and 3 indicate that a one SD increase in province-level FX exposure is associated with a 3.2 ppt decline in industrial electricity consumption growth, a 2.8 ppt decline in export growth, 6.7% fewer construction permits, and a rise in firm exits of 0.016 ppt relative to a near-zero mean. All these effects are statistically significant and entirely driven by provinces with lower prior MPP exposure, with no significant effects in provinces served by banks with higher MPP exposure (columns 2 and 4). All these province-level are robust to dropping Istanbul from the regression sample (see Table A15), which accounts for an outsized share of economic activity and FX-exposed firms.

Overall, these results suggest that macroprudential policies can have positive long-run effects on the economy by bolstering its resilience to macroeconomic stress. While FX-exposed provinces experienced deterioration in real activity following the depreciation, the adverse effects tend to be concentrated in provinces served by banks that had engaged in riskier lending before the 2011 reforms. By contrast, provinces served by banks that adopted more prudent lending practices after 2011 appear largely shielded from the real costs of the depreciation. This heterogeneity in real-sector resilience underscores the long-lasting benefits of macroprudential policies for safeguarding the economy from macroeconomic shocks.

# 4 Conclusion

Macroprudential policies have become part of the standard financial stability toolkit, yet whether they generate changes in bank risk-taking that strengthen the economy's resilience to future macroeconomic shocks remains an open question. In this paper, we exploit a new macroprudential policy regime adopted in Turkey in 2011 and a sizable currency depreciation

[17] The aggregate province-level data have less variation than the firm-level data (the coefficient of variation for the FX exposure is 5% for provinces compared to 15% for firms), and thus require a higher cutoff to discriminate between provinces depending on their MPP exposure.

in 2018 to examine the long-run real-sector implications of macroprudential policies.

Using two credit registries and extensive bank, firm, and province-level data, we find that household-targeting macroprudential policies are associated with a larger decline in household loan growth at more exposed banks, consistent with the policy's intended goal. At the same time, more exposed banks extend larger and cheaper loans—both to lower-risk borrowers and in local currency—than other banks, and this shift toward safer corporate lending is suggestive of a market discipline mechanism whereby banks with a higher share of FX funding face stronger incentives to curtail risk-taking. Turning to the long run, we find that more FX-exposed provinces experience weaker economic performance after the depreciation—including slower industrial electricity growth, lower export growth, reduced construction activity, and higher firm exit rates. However, these adverse effects are insignificant in provinces served by safer banks. Taken together, these results trace the full chain from bank lending reallocation to real-sector resilience several years later.

Our findings also raise an important question about the welfare implications of macroprudential policies. The reallocation of credit away from household borrowers that we document may have come at a cost to households that faced tighter borrowing conditions or lost access to credit (see, e.g., Peydró *et al.* (2024)). In addition, the shift toward safer corporate borrowers we document could coincide with credit rationing for some borrowers: while safer borrowers receive more credit, riskier borrowers may receive less. A comprehensive welfare assessment of macroprudential policies—accounting for both the resilience benefits and potential distributional costs—remains a promising avenue for future research.

Overall, our results suggest that macroprudential policies can deliver significant long-run financial stability benefits that extend beyond their immediate goal of curbing household credit, by being associated with a broader retrenchment from risk-taking and greater real-sector resilience to future macro shocks. Our findings imply that financial stability tools do not merely "lean against the wind" in the short run. Rather, they can shift bank risk-taking in ways that improve the economy's ability to withstand macroeconomic stress, suggest-

ing that the long-run benefits of macroprudential regulation may be larger than short-run evaluations would imply.

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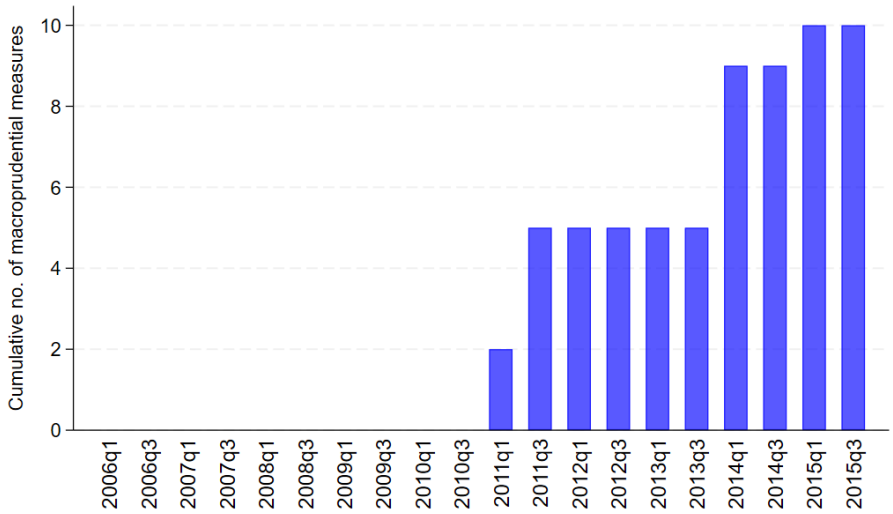
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# A Figures and Tables

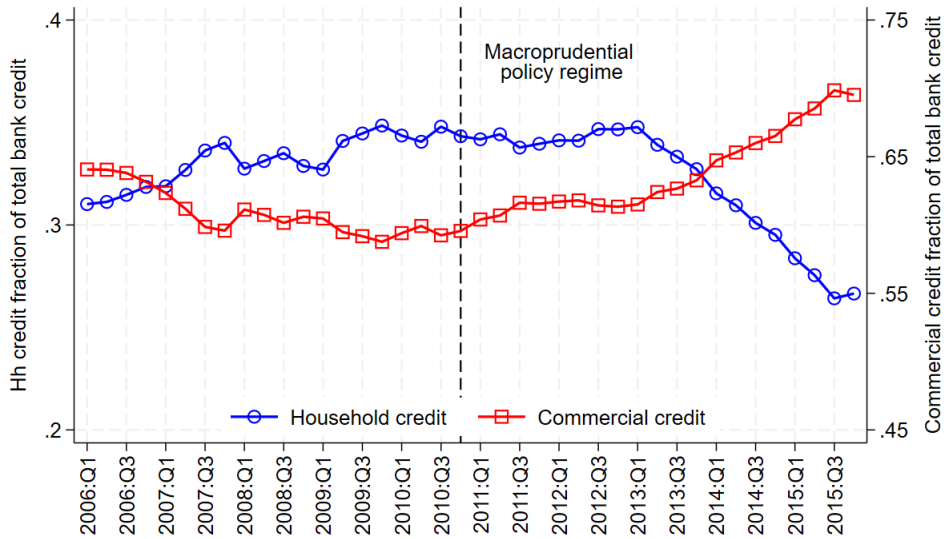
## Figure 1: Macroprudential policies and composition of bank credit, 2006–2015

This figure shows the cumulative number of household-focused macroprudential measures during 2006:Q1-2015:Q4 (panel A) and the share of commercial and household loans in total loans in the banking sector, aggregated from loan-level credit register data (panel B). Source: Authors' calculations using data from the Central Bank of the Republic of Turkey (CBRT).

**A. Macroprudential policies**



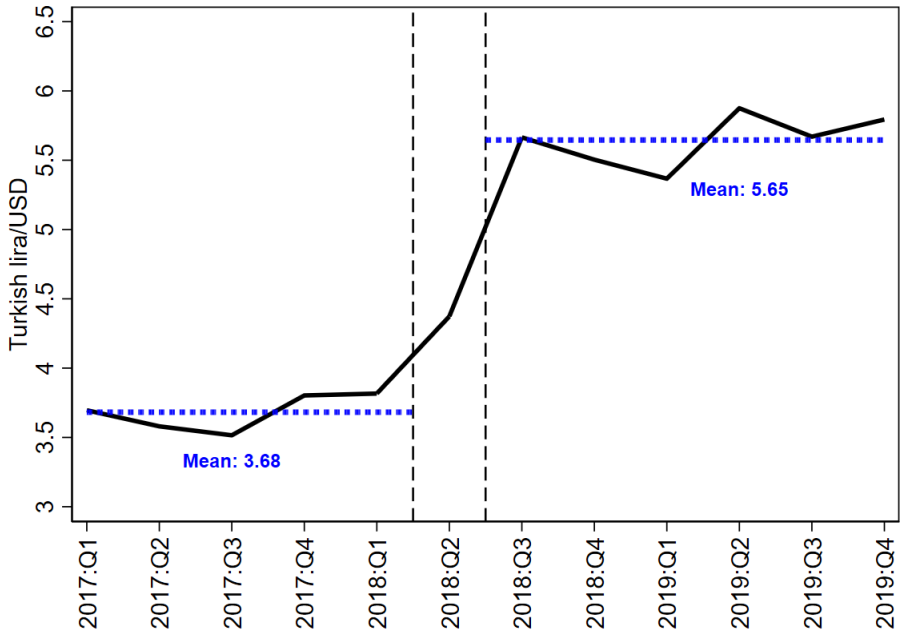

**B. Composition of bank lending portfolios**



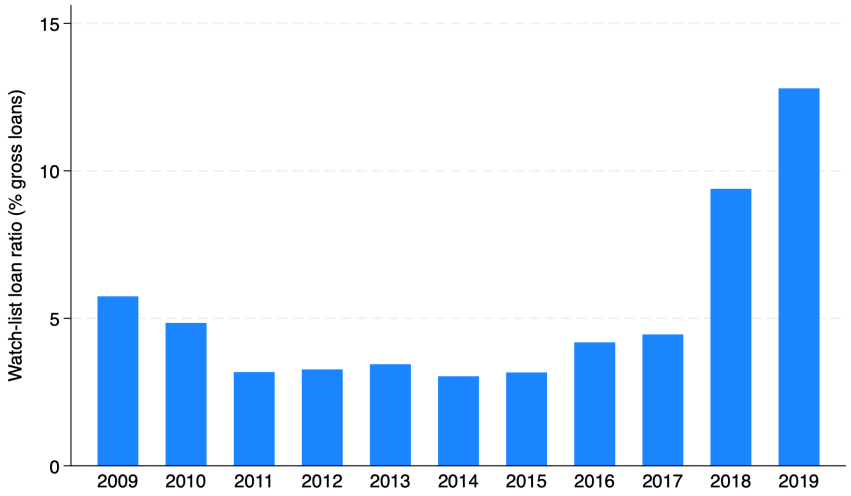
## Figure 2: Exchange rate and asset quality around 2018 depreciation

This figure shows the Turkish lira (TRY) to USD nominal average exchange rate (panel A) and banking sector asset quality (panel B). Asset quality is measured using the share of watch-list loans (in total commercial loans), which refer to the loans showing signs of credit deterioration and are subject to heightened supervisory scrutiny, but are not yet non-performing. Source: Authors' calculations using data from Organization for Economic Co-operation and Development, Currency Conversions: US Dollar Exchange Rate: Average of Daily Rates: National Currency: USD for Turkey [CCUSMA02TRM618N], retrieved from FRED, Federal Reserve Bank of St. Louis (panel A) and the Central Bank of the Republic of Turkey (CBRT) (panel B).

### A. TRY/USD exchange rate, 2017–2019




### B. Watch-list loan ratio, 2009–2019



## Table 1: Selected descriptive statistics: Baseline analysis

The table presents descriptive statistics for regression variables. Sample period is 2006:Q1 to 2015:Q4. Bank- and loan-level variables are at a quarterly frequency, firm-level variables are at an annual frequency. Loan growth rates are year-on-year percentage changes for each quarter and investment rate is defined as the difference in fixed assets divided by lagged total assets. Loan growth rates, interest rates, and firm variables, except employment, are winsorized at 1%.

| | Obs. | Mean | Std. Dev. | P25 | Median | P75 |
|---|---|---|---|---|---|---|
| **(A) Bank-level variables** | | | | | | |
| Bank MPP exposure (%) | 1,226 | 23.97 | 20.75 | 1.719 | 25.60 | 37.81 |
| Commercial loan growth (%) | 1,226 | 21.45 | 54.47 | 3.133 | 15.09 | 29.08 |
| Household loan growth (%) | 1,166 | 25.45 | 87.56 | -3.591 | 14.15 | 31.91 |
| Total loan growth | 1,235 | 20.64 | 47.43 | 3.94 | 14.60 | 27.88 |
| Total securities growth | 1,238 | 24.17 | 125.1 | -16.45 | 0.17 | 27.15 |
| Total asset growth | 1,243 | 13.72 | 34.49 | -0.85 | 9.95 | 21.56 |
| Total assets (log) | 1,226 | 15.79 | 2.125 | 14.24 | 15.86 | 17.60 |
| Liquidity ratio (%) | 1,226 | 21.97 | 18.03 | 11.50 | 14.73 | 22.57 |
| Return on assets (%) | 1,226 | 1.477 | 1.881 | 0.800 | 1.524 | 2.297 |
| FX funding ratio (%) | 1,226 | 40.62 | 15.44 | 32.84 | 39.31 | 47.14 |
| Capital ratio (%) | 1,226 | 28.51 | 41.58 | 14.41 | 16.55 | 22.79 |
| **(B) Loan-level variables** | | | | | | |
| Commercial loan growth (%) | 8,117,704 | 31.08 | 143.2 | -34.15 | -7.662 | 34.03 |
| Interest rate (%) | 14,601,910 | 14.95 | 9.871 | 10 | 13.56 | 18 |
| Safer borrower (0/1) | 7,011,758 | 0.049 | 0.216 | 0 | 0 | 0 |
| **(C) Firm-level variables** | | | | | | |
| Total loan growth (%) | 445,729 | 75.51 | 268.6 | -29.32 | 5.965 | 66.95 |
| Total assets (log) | 614,110 | 14.29 | 1.585 | 13.24 | 14.19 | 15.24 |
| Employment | 611,221 | 40.17 | 242.6 | 4 | 10 | 26 |
| Employment growth (%) | 609,966 | 14.32 | 59.94 | -8.33 | 0.00 | 21.43 |
| Investment rate | 614,110 | 5.136 | 18.19 | -0.756 | 0.289 | 5.227 |
| Age (years) | 614,110 | 13.54 | 8.206 | 7 | 13 | 18 |
| Sales growth (%) | 614,110 | 39.07 | 197.5 | -16.25 | 4.650 | 31.17 |
| Leverage ratio (%) | 614,110 | 32.60 | 37.12 | 15.49 | 30.87 | 53.03 |
| Liquidity ratio (%) | 614,110 | 9.630 | 17.72 | 0.703 | 3.645 | 13.84 |
| Return on assets (%) | 614,110 | 1.072 | 15.49 | 0.336 | 1.838 | 4.960 |
| MPP exposure (%) | 614,110 | 32.15 | 8.992 | 27.66 | 32.66 | 35.75 |
| **(D) Province-level variables** | | | | | | |
| Industrial electricity consumption growth | 322 | 0.015 | 0.243 | -0.069 | 0.024 | 0.104 |
| Export growth (YoY) | 56,318 | 0.107 | 1.128 | -0.387 | 0.081 | 0.591 |
| No. construction permits | 972 | 112.249 | 208.193 | 19.500 | 46.833 | 114.333 |
| No. construction permits (log) | 972 | 3.899 | 1.269 | 3.020 | 3.868 | 4.748 |
| $\Delta$ Firm exits (YoY, '00s) | 2,673 | 0.007 | 0.267 | -0.030 | 0.000 | 0.030 |
| FX exposure | 81 | 1.653 | 2.157 | 0.393 | 0.933 | 1.982 |
| MPP exposure | 81 | 32.876 | 1.668 | 32.031 | 32.808 | 33.724 |

## Table 2: Balance of covariates by bank exposure to macroprudential policies and depreciation

This table shows a diagnostic test of bank selection based on observable characteristics to macroprudential policies (panel A) and the currency depreciation (panel B) for the N=29 commercial banks in the regression sample. In panel A, bank exposure to macroprudential policies (Bank MPP exposure) is measured at the end of the pre-period, in 2010:Q4. In panel B, bank FX exposure is defined as the weighted sum of FX exposure of the banks' borrowing firms, with weights given by the end-2017 loan shares of each firm and is truncated at zero. Firm FX exposure is defined as FX loans minus export revenues divided by total assets, measured at end-2017, truncated at zero. Columns 1-2 and 4-5 report sample medians for bank characteristics measured at end-2010 (pre-MPP reforms, panel A) or end-2018:Q1 (pre-depreciation, panel B). Columns 3 and 6 reports the p-value of a t-test of equality of medians. Columns 1-3 split the banks into higher versus lower-exposure bank around the 75th percentile of the distribution; columns 4-6 split the banks into higher versus lower-exposure bank around the sample median. Significance: *** 1%, **5%, *10%.

| | **High exposure cutoff > p75** | | | **High exposure cutoff > p50** | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | *(A) Bank exposure to macroprudential policies (Bank MPP exposure)* | | | | | |
| | **High exp. bank** | **Low exp. bank** | **p-value (1)=(2)** | **High exp. bank** | **Low exp. bank** | **p-value (4)=(5)** |
| Total assets (log) | 16.666 | 15.294 | 0.590 | 17.139 | 14.592 | 0.000*** |
| Liquidity ratio (%) | 10.150 | 10.531 | 0.742 | 9.975 | 15.102 | 0.356 |
| Return on assets (%) | 1.482 | 1.712 | 0.231 | 1.791 | 1.340 | 0.573 |
| FX funding ratio (%) | 35.571 | 33.533 | 0.159 | 34.784 | 33.054 | 0.573 |
| Capital ratio (%) | 16.680 | 19.145 | 0.742 | 16.680 | 22.520 | 0.096* |
| NPL ratio (%) | 4.217 | 4.111 | 0.742 | 3.713 | 4.459 | 0.356 |
| LLR ratio (%) | 2.966 | 2.826 | 0.663 | 2.966 | 2.505 | 0.705 |
| No. of banks | N=7 | N=22 | | N=15 | N=14 | |
| | *(B) Bank exposure to the depreciation (Bank FX exposure)* | | | | | |
| | **High exp. bank** | **Low exp. bank** | **p-value (1)=(2)** | **High exp. bank** | **Low exp. bank** | **p-value (4)=(5)** |
| Total assets (log) | 16.813 | 16.575 | 0.590 | 17.671 | 15.961 | 0.016** |
| Liquidity ratio (%) | 19.072 | 16.513 | 0.590 | 15.891 | 16.733 | 0.573 |
| Return on assets (%) | 0.852 | 1.455 | 0.231 | 1.331 | 1.268 | 0.858 |
| FX funding ratio (%) | 51.400 | 48.473 | 0.023** | 51.290 | 43.214 | 0.016** |
| Capital ratio (%) | 15.366 | 17.069 | 0.231 | 16.595 | 17.289 | 0.191 |
| NPL ratio (%) | 3.955 | 3.249 | 0.590 | 3.704 | 3.045 | 0.858 |
| LLR ratio (%) | 2.068 | 2.414 | 0.742 | 2.104 | 2.483 | 0.573 |
| No. of banks | N=7 | N=22 | | N=14 | N=15 | |

## Table 3: Banks' reallocation from household to commercial lending

The table reports DiD estimation results corresponding to Equation 1. The data are at the bank-quarter level for the period between 2006:Q1 and 2015:Q4. The dependent variables are year-on-year growth rates of household loans, commercial loans, total loans, total securities, and total assets. Bank MPP exposure is defined as 2010:Q4 share of household loans in total loans. Post dummy takes the value 1 for the period after the adoption of macroprudential policies (2011:Q1-2015:Q4) and 0 in the period before their adoption (2006:Q1-2010:Q4). All regressions include lagged bank controls (log total assets, return on assets, FX funding ratio, capital ratio, liquidity ratio) in levels and interaction with the Post dummy (coefficients not shown). Standard errors are double clustered at the bank and quarter levels. Significance: *** 1%, **5%, *10%.

| | **A. Reallocation from Household to Commercial Loans** | |
|---|---|---|
| Dependent variable: | (1) **Household Loan Growth** | (2) **Commercial Loan Growth** |
| Bank MPP exposure×Post | -2.3082*** | 0.6263** |
| | (0.6527) | (0.2620) |
| Observations | 1,166 | 1,226 |
| R-squared | 0.2473 | 0.2265 |
| Bank controls×Post | Y | Y |
| Bank FE | Y | Y |
| Quarter FE | Y | Y |

| | **B. Effects on Overall Balance Sheet and Main Components** | | |
|---|---|---|---|
| Dependent variable: | (1) **Total Loan Growth** | (2) **Total Securities Growth** | (3) **Total Asset Growth** |
| Bank MPP exposure×Post | 0.2883 | -0.2671 | 0.1615 |
| | (0.2205) | (0.7342) | (0.1913) |
| Observations | 1,235 | 1,238 | 1,243 |
| R-squared | 0.2564 | 0.1726 | 0.2870 |
| Bank controls×Post | Y | Y | Y |
| Bank FE | Y | Y | Y |
| Quarter FE | Y | Y | Y |

## Table 4: Banks' commercial lending and real effects

The table reports DiD estimation results corresponding to Equation 2 in panel A (commercial lending results) and Equation 4 in panel B (real effects results). In panel A, the data are at the bank-firm-quarter level over 2006:Q1 and 2015:Q4. The dependent variables are year-on-year loan growth rate (column 1) and the interest rate (column 2). Bank MPP exposure is defined as 2010:Q4 share of household loans in total loans. Post dummy takes the value 1 during 2011:Q1-2015:Q4 and 0 during 2006:Q1-2010:Q4. Regressions include lagged bank controls (log total assets, return on assets, FX funding ratio, capital ratio, liquidity ratio) in levels and interaction with the Post dummy (coefficients not shown). In panel B, the data are at the firm level over 2009–2015. The dependent variables are total loan growth, investment rate (the change in fixed assets divided by lagged total assets), and employment growth. Firm MPP exposure is defined as the weighted average of macroprudential exposure across the firm's lenders measured in 2010:Q4, with weights given by the loan shares of each bank in total firm's debt. Post dummy takes the value 1 during 2011:Q1-2015:Q4 and 0 during 2009:Q1-2010:Q4 in panel A and 1 in 2009–2010 and 0 in 2011-2015 in panel B. Regressions include firm age and lagged controls (log total assets, return on assets, liquidity ratio, leverage ratio, sales growth) in level and interaction with Post (coefficients not shown). Firm industry is 4-digit NACE classification. Standard errors are triple clustered at the bank, firm, quarter level (panel A) and double-clustered at the firm and year level (panel B). Significance: *** 1%, **5%, *10%.

| | **A. Commercial Lending Effects (loan-level)** | |
|---|---|---|
| | (1) | (2) |
| Dependent variable: | **Loan Growth** | **Interest Rate** |
| Bank MPP exposure×Post | 0.4170*** | -0.1037*** |
| | (0.1452) | (0.0278) |
| Observations | 8,117,704 | 14,601,910 |
| R-squared | 0.3782 | 0.6589 |
| Bank controls×Post | Y | Y |
| Bank FE | Y | Y |
| Firm×Quarter FE | Y | Y |

| | **B. Real Effects (firm-level)** | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Dependent variable: | **Total Loan Growth** | **Investment Rate** | **Employment Growth** |
| Firm MPP exposure through banks×Post | 3.5729*** | 0.0178** | 0.0723** |
| | (0.1619) | (0.0055) | (0.0205) |
| Observations | 445,729 | 614,110 | 609,966 |
| R-squared | 0.2947 | 0.3780 | 0.2996 |
| Firm controls×Post | Y | Y | Y |
| Firm FE | Y | Y | Y |
| Province×Industry×Year FE | Y | Y | Y |

## Table 5: Bank risk-taking in commercial lending: Baseline results

The table reports DiD estimation results corresponding to Equation 3 by level of borrower ex-ante risk. The data are at the bank-firm-quarter level (columns 1-2) and at the bank-firm-currency-quarter level (columns 3-4) for the period between 2006:Q1 and 2015:Q4. The dependent variables are year-on-year commercial loan growth rate (columns 1, 3) and average loan interest rate (columns 2, 4). In columns 1-2, the DiD term "Bank MPP exposure×Post" is broken down by high versus low borrower risk, where "safer borrower" is a dummy variable that takes value 1 for borrowers in the lowest risk category (1) and 0 for borrowers in the higher risk categories (2, 3, and 4). The dummy variable "riskier borower" takes value 1 for borrowers in risk categories 2-4 and 0 for those in risk category 1. Borrowers in default (category 5) are excluded. In columns 3-4, the DiD term "Bank MPP exposure×Post" is broken down by local currency (Turkish lira) loans versus FX loans. All relevant double and triple interaction terms are included, but coefficients not shown. All other specification details (including variable definitions and controls) are as in columns 1-2 of panel A of Table 4. Standard errors are triple clustered at the bank, firm, quarter level. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Loan Growth** | (2) **Interest Rate** | (3) **Loan Growth** | (4) **Interest Rate** |
|---|---|---|---|---|
| Bank MPP exposure×Post×Safer borrower [1] | 0.9134*** | -0.1120*** | | |
| | (0.1797) | (0.0370) | | |
| Bank MPP exposure×Post×Riskier borrower [2] | 0.3482** | -0.0800*** | | |
| | (0.1433) | (0.0271) | | |
| Bank MPP exposure×Post×Turkish lira loan [3] | | | 0.4601*** | -0.1077*** |
| | | | (0.1528) | (0.0282) |
| Bank MPP exposure×Post×FX loan [4] | | | 0.1386 | -0.0522* |
| | | | (0.1438) | (0.0295) |
| pvalue t-test: $H_a$: [1]>[2] | 0.0045 | 0.1998 | | |
| pvalue t-test: $H_a$: [3]>[4] | | | 0.0441 | 0.0287 |
| Observations | 7,011,758 | 13,712,283 | 8,395,094 | 15,294,533 |
| R-squared | 0.3733 | 0.6503 | 0.3733 | 0.3626 |
| Bank controls×Post | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y |
| Firm×Quarter FE | Y | Y | Y | Y |

## Table 6: Bank risk-taking in commercial lending: The market discipline channel

The table reports DiD estimation results corresponding to Equation 3 by level of loan risk, further broken down high versus low bank share of FX funding. The data are at the bank-firm-quarter level (columns 1-2) and at the bank-firm-currency-quarter level (columns 3-4) for the period between 2006:Q1 and 2015:Q4. The dependent variables are year-on-year commercial loan growth rate (columns 1, 3) and average loan interest rate (columns 2, 4). Across columns, the DiD terms "Bank MPP exposure×Post×Safer borrower" and "Bank MPP exposure×Post×Turkish lira loan" are broken down by high versus low bank share of FX funding around the 75th percentile of the cross-sectional distribution (at end-2010). All relevant double and triple interaction terms are included, but coefficients not shown. All other specification details (including variable definitions and controls) are as in Table 5. Standard errors are triple clustered at the bank, firm, quarter level. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Loan Growth** | (2) **Interest Rate** | (3) **Loan Growth** | (4) **Interest Rate** |
|---|---|---|---|---|
| Bank MPP exposure×Post×Safer borrower×... | | | | |
| ... × Higher FX funding share [1] | 1.3227*** | -0.1462*** | | |
| | (0.2251) | (0.0415) | | |
| ... × Lower FX funding share [2] | 1.0500*** | -0.1308*** | | |
| | (0.1903) | (0.0411) | | |
| Bank MPP exposure×Post×Turkish lira loan×... | | | | |
| ... × Higher FX funding share [3] | | | 0.6750*** | -0.1075*** |
| | | | (0.1739) | (0.0378) |
| ... × Lower FX funding share [4] | | | 0.4822*** | -0.1155*** |
| | | | (0.1465) | (0.0290) |
| pvalue t-test: $H_a$: [1]>[2] | 0.0059 | 0.0447 | | |
| pvalue t-test: $H_a$: [3]>[4] | | | 0.0058 | 0.3540 |
| Observations | 7,011,758 | 13,712,283 | 8,395,094 | 15,294,533 |
| R-squared | 0.3732 | 0.6499 | 0.3608 | 0.6675 |
| Bank controls×Post | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y |
| Firm×Quarter FE | Y | Y | Y | Y |

## Table 7: Bank asset quality after 2018 depreciation

The table reports DiD estimation results on bank asset quality after the FX depreciation event. The dependent variable is the share of watch-list loans relative to total gross loans (where watch-list loans are defined as loans that show signs of credit deterioration and are subject to heightened supervisory scrutiny, but are not yet non-performing) and the data are at the bank-quarter level. Bank FX exposure is defined as the average FX exposure of borrowing firms, weighted by bank-firm debt shares at end-2017. Post dummy takes the value 1 for the six-quarter period after the depreciation (2018:Q3-2019:Q4) and 0 in the six-quarter period before the shock (2016:Q4-2018:Q1), with the ramp-up quarter (2018:Q2) dropped. Lower/higher MPP exposure is defined as a dummy taking value one for banks with end-2010 MPP exposure above/below the 75th percentile. Regressions include lagged bank controls (log total assets, return on assets, capital ratio, liquidity ratio) in levels and interaction with the Post dummy (coefficients not shown). Standard errors are double clustered at the bank and quarter level. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) | (2) |
|---|---|---|
| | **Bank's loan performance (watch-list loan share)** | |
| | *Bank-quarter* | |
| FX exposure×Post | 0.1406* | |
| | (0.0725) | |
| FX exposure×Post×Lower MPP exposure | | 0.2048** |
| | | (0.0667) |
| FX exposure×Post×Higher MPP exposure | | -0.2552 |
| | | (0.3053) |
| Observations | 347 | 347 |
| R-squared | 0.8095 | 0.8174 |
| Bank controls×Post | Y | Y |
| Bank FE | Y | Y |
| Quarter FE | Y | Y |

## Table 8: Macro Resilience: Province-level real effects after 2018 depreciation

The table reports DiD estimation results for a regression of province-level real outcomes after the FX depreciation event. The outcome variables are the yearly growth rate of industrial electricity consumption (panel A), the year-on-year (log-difference) export growth (panel B), number of construction permits (log) (panel C), and the year-on-year change in firm exits (panel D). The data are at the province-year level in panel A, province-export country-quarter level in panel B, province-quarter level in panel C, and province-firm type-quarter level in panel D (where firm types are companies, cooperatives, and sole proprietorship). In panel A the sample period is 2016-2019 (Post dummy takes value 1 in 2018-2019 and 0 during 2016–2017); in panels C-D, the period of analysis is 2016:Q4–2019:Q4 and the Post dummy takes the value 1 for the six-quarter period after the depreciation (2018:Q3-2019:Q4) and 0 in the six-quarter period before the depreciation (2016:Q4-2018:Q1), with the ramp-up quarter (2018:Q2) dropped. All specifications include province-level controls measured at end-2017 and obtained by averaging firm characteristics at the province level (including return on assets, liquidity ratio, leverage ratio, sales growth, and the fraction of firms with less than five employees), weighted by firm size (given by employment), in interaction with Post. Lower/higher MPP exposure is based on the 75th percentile of the cross-sectional distribution at end-2010. The standard errors are clustered at the province level. Significance: *** 1%, **5%, *10%.

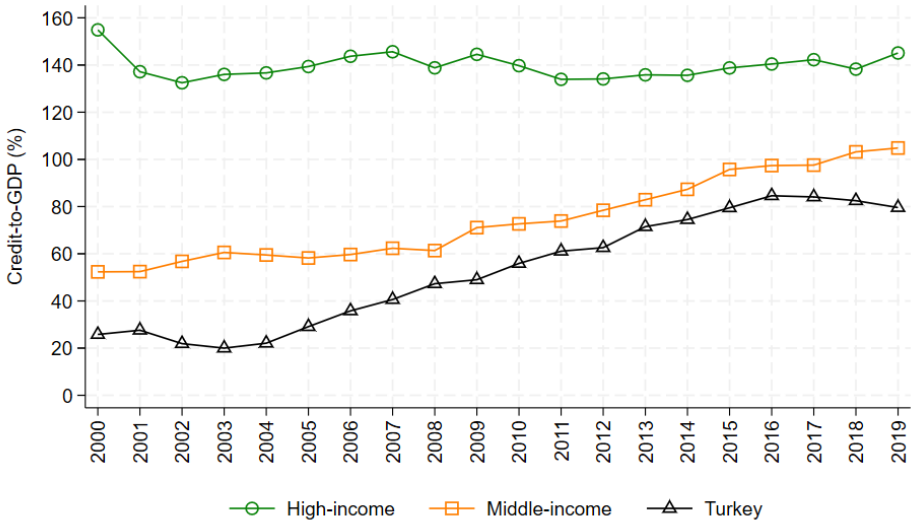
| Dependent variable: | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **(A) Industrial electricity consumption growth** *Province-year* | | **(B) Export growth (yoy)** *Province-country-quarter* | |
| FX shock exposure×Post | -0.0148* | | -0.0128*** | |
| | (0.0086) | | (0.0039) | |
| FX shock exposure×Post×Low MPP exposure | | -0.0162* | | -0.0130*** |
| | | (0.0090) | | (0.0041) |
| FX shock exposure×Post×High MPP exposure | | -0.0138 | | -0.0380 |
| | | (0.0377) | | (0.0229) |
| Observations | 322 | 322 | 56,318 | 56,318 |
| R-squared | 0.3317 | 0.3324 | 0.0595 | 0.0595 |
| Province-level controls×Post | Y | Y | Y | Y |
| Province FE, Year FE | Y | Y | Y | Y |
| Destination country×Quarter FE | - | - | Y | Y |
| | **(C) No. construction permits (log)** *Province-quarter* | | **(D) Δ Firm exits (yoy)** *Province-firm type-quarter* | |
| FX shock exposure×Post | -0.0309** | | 0.0073** | |
| | (0.0128) | | (0.0033) | |
| FX shock exposure×Post×Low MPP exposure | | -0.0303** | | 0.0076** |
| | | (0.0128) | | (0.0035) |
| FX shock exposure×Post×High MPP exposure | | -0.0454 | | -0.0003 |
| | | (0.0453) | | (0.0060) |
| Observations | 972 | 972 | 2,673 | 2,673 |
| R-squared | 0.9202 | 0.9210 | 0.1201 | 0.1202 |
| Province-level controls×Post | Y | Y | Y | Y |
| Province FE, Quarter FE | Y | Y | Y | Y |
| Firm-type FE | - | - | Y | Y |

# Internet Appendix for "Household Macroprudential Policies, Corporate Credit, and Macro Shocks"

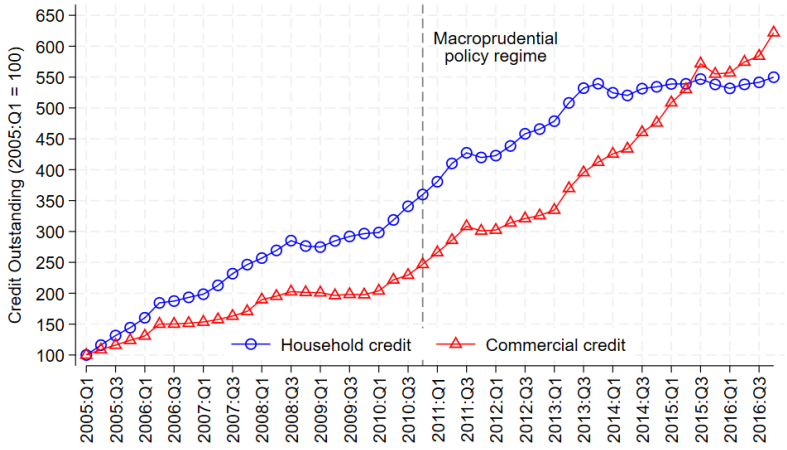
## Figure A1: Evolution of credit aggregates

Panel A depicts the average credit-to-GDP ratio by country income group (middle-income countries and high-income countries) versus the credit-to-GDP ratio for Turkey over 2000-2019. Panel B shows total outstanding household and corporate credit over 2016:Q1–2019:Q4, expressed in real terms and normalized to 100 in 2005:Q1. Sources: World Bank's World Development Indicators (WDI), Bank for International Settlements credit-to-GDP gaps dataset, and CBRT.

### A. Credit-to-GDP ratio



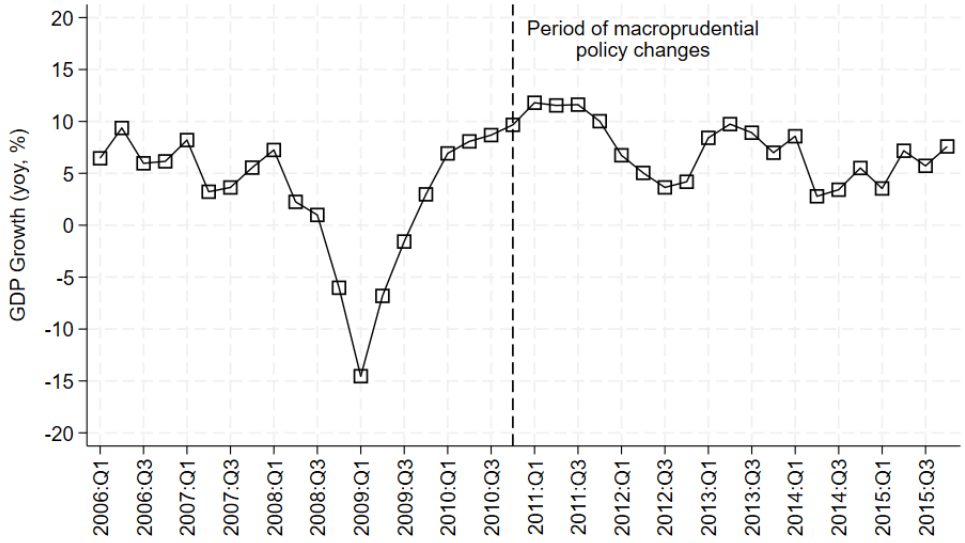

### B. Household vs. commercial credit outstanding



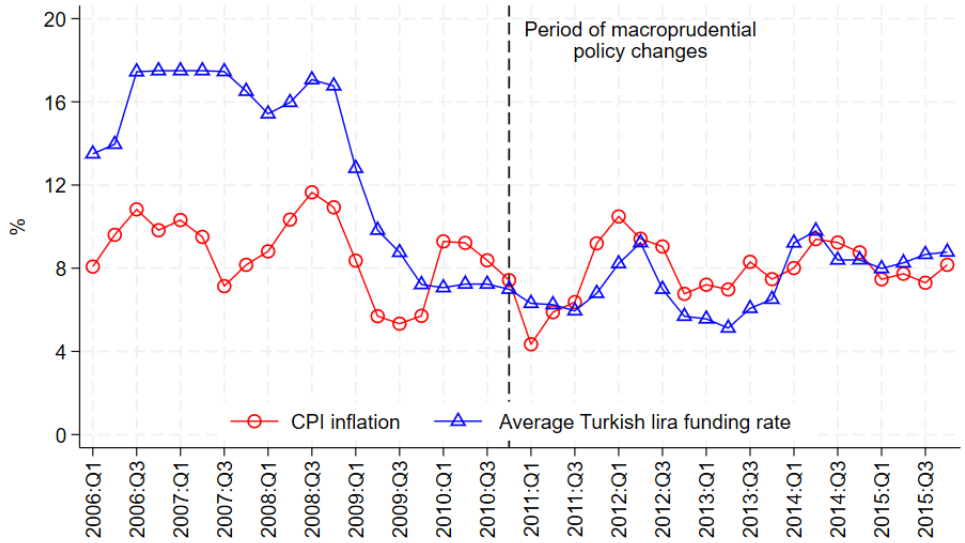
## Figure A2: GDP growth, inflation, and monetary policy

This figure plots macroeconomic developments over the period between 2005:Q1 and 2016:Q4. Panel A shows the year-on-year nominal GDP growth. Panel B shows the CPI inflation rate and the average Turkish lira funding rate (defined as the volume-weighted average of the CBRT's Turkish lira funding rates across various instruments like repos), a key indicator of monetary policy. Sources: Authors' calculations using data from the Central Bank of the Republic of Turkey (CBRT).

### A. GDP growth

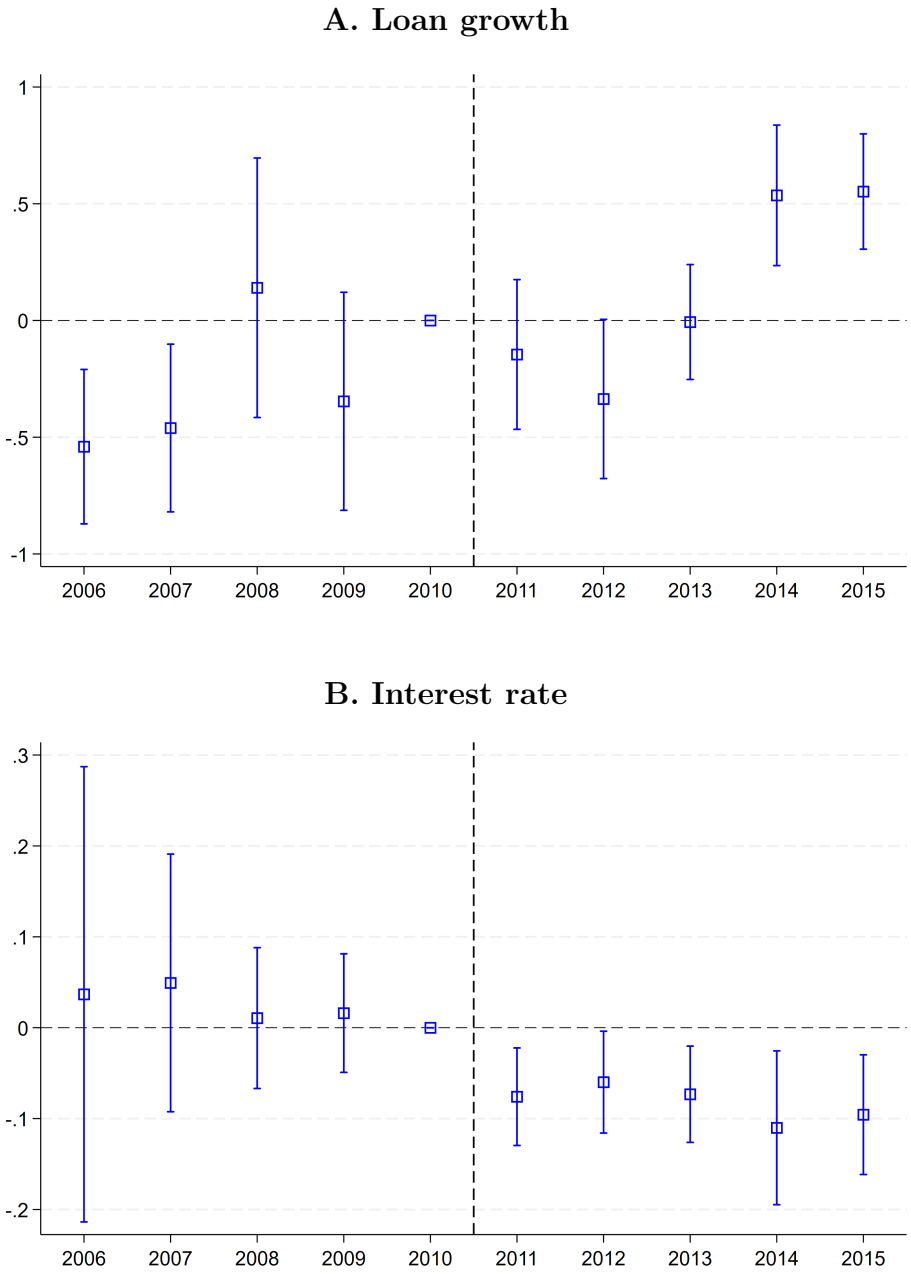



### B. Inflation rate and monetary policy stance



## Figure A3: Dynamic DiD coefficient charts for commercial lending regressions

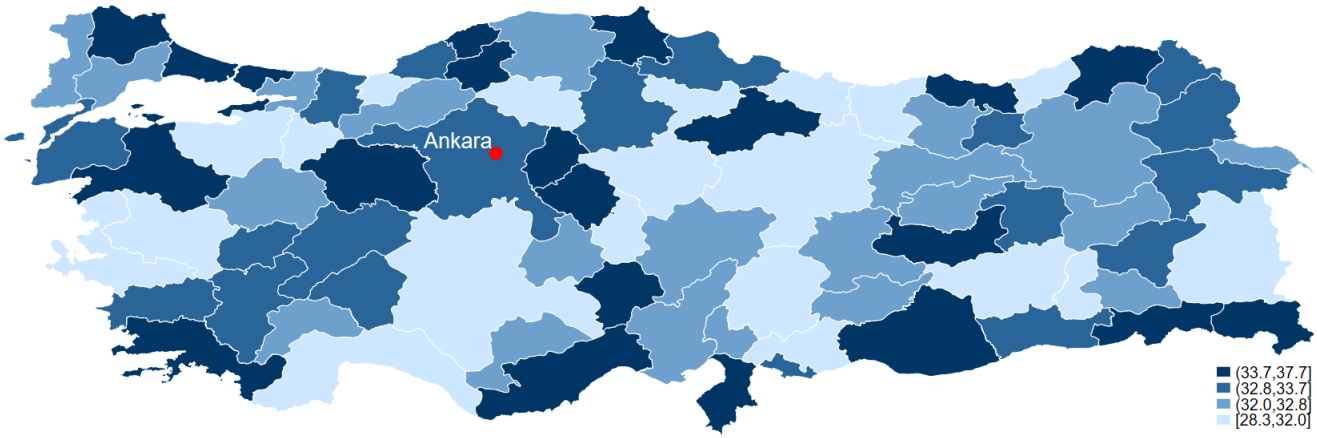
This figure shows the estimated marginal effects of bank exposure to macroprudential policy on commercial loan growth (panel A) and loan interest rates (panel B) during 2006–2015. The charts plot the estimated DiD coefficients and the associated 95% confidence levels of the dynamic variant of the specifications in Table 4 with interaction effects between bank exposure to macroprudential policies and yearly dummies (columns 1, 2 in panel A). Standard errors are triple clustered at the bank, firm, and quarter level. Sources: Authors' calculations.



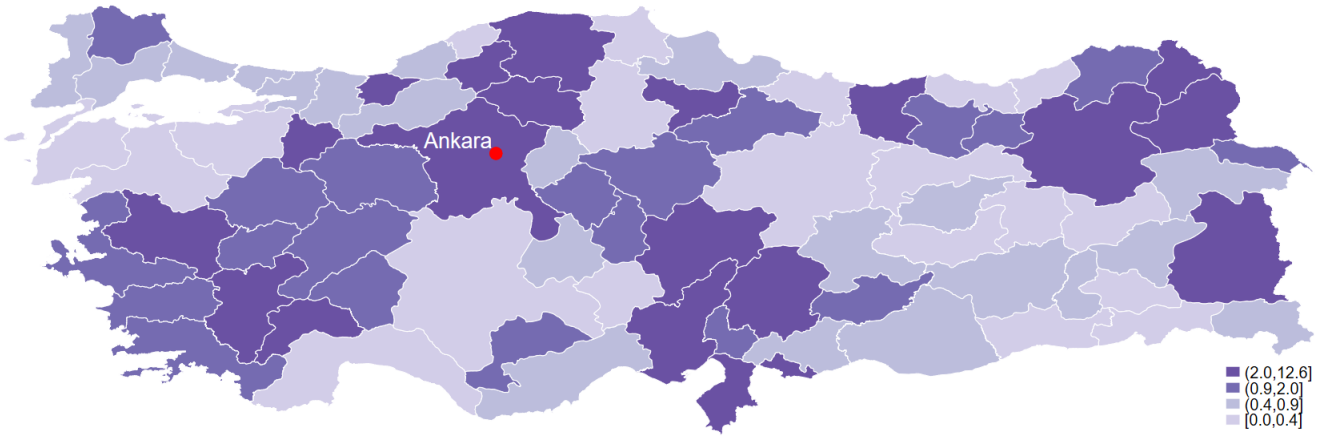
## Figure A4: Province-level MPP and FX exposure

This figure depicts maps showing the variation in MPP exposure (at end-2010) and FX exposure (at end-2017), respectively, across 81 provinces ("*il*"). Darker colors represent higher exposure. Sources: Authors' calculations.

### A. MPP exposure




### B. FX exposure



## Table A1: Macroprudential policy measures, 2011–2015

The table reports the list of macroprudential policy measures implemented during 2005:Q1–2015:Q4. Panel A includes the household-targeting measures and panel B includes measures adopted as part of aligment to the Basel II prudential framework, and other relevant prudential measures. The dummy variable "Policy change" takes value 1 for a tightening and -1 for an easing. Sources: CBRT, Cerutti *et al.* (2017), and references therein.

| Date | Macroprudential policy measure | Policy change | Policy type |
|---|---|---|---|
| **A. Household-targeting macroprudential policies** | | | |
| 2011Q1 | Introduction of maximum loan-to-value (LTV) ratio of 75% on housing loans. | 1 | Household |
| 2011Q1 | Minimum balance payment rate requirements for credit cards increased (with gradual phase-in over 2011–2013). | 1 | Household |
| 2011Q2 | Risk-weight on consumers loans with 1-2 year maturity increased from 100% to 150%, 200% if maturity $>$ 2 years. | 1 | Household |
| 2011Q2 | Cardholders who pay less than 50% of the statement balance more than 3 instances per calendar year prohibited from utilizing credit card cash advances. | 1 | Household |
| 2011Q2 | Increased general loan loss provisions on consumer loans, excluding housing and auto loans. | 1 | Household |
| 2013Q4 | Risk weights for all credit cards and car loans increased. | 1 | Household |
| 2013Q4 | Cardholders who pay less than 50% of the statement balance more than 3 instances in a calendar year prohibited from usnig credit card cash advances; and cardholders who pay miss 3 consecutive payments prohibited from using the credit card altogether. | 1 | Household |
| 2013Q4 | Debt to income (DTI) restrictions on credit cards (total credit card limit across all cards cannot exceed 4 times the borrower income). | 1 | Household |
| 2014Q1 | Increae in minimum balance payment rate requirements for credit cards (gradual phase-in over 2014–2015). | 1 | Household |
| 2015Q1 | Increase in risk-weights on banks' consumer loan receivables (150% risk-weight for those with 1-2 year remaining maturity; and 200% for those with +2 year remaining maturity), excluding housing loans, certain loans to retirees, and credit card loans. | 1 | Household |
| **B. Basel II adoption and other prudential policies** | | | |
| 2007Q2 | Changes in capital adequacy regulation, including new requirement for banks to hold additional capital for operational risks. | 1 | Basel |
| 2008Q1 | Reduction in credit conversion rates of all (consumer and corporate) credit card limit liabilities and limit liabilities for deposit accounts with overdraft facilities from 50% to 20%. | -1 | Other |
| 2008Q1 | Increase in risk-weight for installment (consumer or corporate) credit card receivables. | 1 | Other |
| 2008Q1 | Increase in risk-weight for corporate letters of gurantee and letters of credit. | 1 | Basel |
| 2012Q2 | Adoption of Basel II, II.5 regulations, starting Jul 2012. | 1 | Basel |
| 2014Q1 | Adoption of Basel III. | 1 | Basel |

## Table A2: Selected descriptive statistics: Additional analyses

The table presents descriptive statistics for the variables used in additional analyses and robustness checks. Sample period is 2006:Q1 to 2015:Q4. Bank- and loan-level variables are at a quarterly frequency, firm-level variables are at an annual frequency. Province-level variables in panel D are measured at end-2017 and are used as controls in baseline Table 8.

| | Obs. | Mean | Std. Dev. | P25 | Median | P75 |
|---|---|---|---|---|---|---|
| **A. Bank-level variables** | | | | | | |
| Bank FX exposure (%) | 347 | 10.588 | 9.238 | 0 | 11.538 | 16.914 |
| Short term deposits/assets (%) | | | | | | |
| Watch-list loan share (%) | 347 | 8.708 | 6.951 | 3.191 | 7.618 | 13.76 |
| NPL ratio (%) | 1,226 | 7.356 | 16.72 | 2.018 | 3.365 | 5.486 |
| LLR ratio (%) | 1,194 | 4.483 | 9.601 | 1.495 | 2.404 | 4.061 |
| **B. Loan-level variables** | | | | | | |
| Relationship duration (# quarters, log) | 8,117,704 | 2.508 | 0.571 | 2.079 | 2.485 | 2.944 |
| Total assets (log) | 813,784 | 14.05 | 1.797 | 13.03 | 14.01 | 15.10 |
| **C. Macro variables** | | | | | | |
| GDP growth (%) | 40 | 5.235 | 5.203 | 3.483 | 6.303 | 8.497 |
| Monetary policy rate | 40 | 10.30 | 4.328 | 6.991 | 8.534 | 14.69 |
| Exchange rate (% change) | 40 | 8.136 | 13.760 | -2.001 | 6.987 | 15.130 |
| **D. Province-level variables** | | | | | | |
| Share small firms (< 5 emp.) | 81 | 0.570 | 0.047 | 0.538 | 0.568 | 0.602 |
| Leverage ratio (%) | 81 | 28.123 | 6.826 | 24.051 | 27.695 | 30.807 |
| Liquidity ratio (%) | 81 | 8.073 | 3.020 | 5.677 | 8.178 | 9.724 |
| Return on assets (%) | 81 | 2.260 | 2.117 | 1.046 | 2.158 | 2.939 |
| Sales growth (%) | 81 | 59.933 | 35.405 | 38.607 | 52.271 | 78.009 |
| Firm age (years) | 81 | 15.948 | 4.111 | 12.911 | 15.363 | 17.980 |

## Table A3: Variable definitions and sources

The table presents variable definitions and sources for all the variables used in the empirical analysis. In Panel C, all firm-level variables are at book values. Ministry of Treasury and Finance is abbreviated as MTF. Turkish Statistics Institute is abbreviated as TURKSTAT.

| Variable | Definition | Source |
|---|---|---|
| **(A) Bank-level variables** | | |
| Bank MPP exposure | The ratio of household loans (consumer loans, consumer credit cards, mortgages) to total loans, both aggregated from loan-level-data, measured at end-2010. | Own calculations |
| Total assets | Logarithm of total assets. | BRSA, CBRT |
| FX loan dummy | Dummy variable taking value 1 for firms with at least one FX outstanding loan. | BRSA, CBRT |
| Liquidity ratio | The ratio of liquid assets (cash+receivables from Central Bank, money market and banks plus required reserves) to total assets. | BRSA, CBRT |
| Return on assets | Cumulative net income of the trailing 4 quarters divided by the avg. total assets of the trailing 4 quarters. | BRSA, CBRT |
| FX funding ratio | The ratio of foreign currency non-equity funding to total assets. | BRSA, CBRT |
| Capital ratio | The ratio of equity to risk-weighted assets. | BRSA, CBRT |
| Commercial loan growth | YoY growth rate of commercial loans. | Own calculations |
| Household loan growth | YoY growth rate of household loans. | Own calculations |
| Total loan growth | YoY growth rate of total loans. | Own calculations |
| Total asset growth | YoY growth rate of total assets. | Own calculations |
| Total securities growth | YoY growth rate of total securities. | Own calculations |
| Watch-list loan ratio | The ratio of watch-list loans with credit classification 2 in the credit registry and under close supervisory monitoring to total gross loans. | Own calculations |
| NPL ratio | The ratio of nonperforming loans to total gross loans, both aggregated from loan-level-data. | Own calculations |
| LLR ratio | The ratio of provision for nonperforming loans to total gross loans. | BRSA, CBRT |
| Bank FX exposure | Weighted sum of FX exposure of the banks' borrowing firms, with weights given by the loan shares of each firm, measured at end-2017 and truncated at zero. | Own calculations |
| **(B) Business credit register variables (loan-level)** | | |
| Loan growth | YoY growth rate of loan volume for each bank-firm pair in a given quarter. | Own calculations |

*(Continued on next page)*

*(Continued from previous page)*

| Variable | Definition | Source |
|---|---|---|
| Interest rate | Loan-volume weighted average interest rate for each firm-bank pair in a given quarter. | Own calculations |
| Firm risk | Internal risk rating on a scale of 1 to 6 where higher values indicate higher risk (5 is for defaulted borrowers and 6 is for unrated borrowers). | BRSA, CBRT |
| Safer/riskier firm | Safer firms are firms with internal risk rating=1. Riskier firms have internal risk rating=2, 3, or 4. Borrowers in default (rating=5) are excluded. | Own calculations |
| **(C) Firm-level variables** | | |
| Firm MPP exposure | Weighted sum of bank MPP exposure across a firm's lenders, where weights are the share of loans from each lender in firm's total loans, measured at end-2010 or 2018:Q2 in the main MPP analysis and FX shock analysis, respectively. | Own calculations |
| Firm FX exposure | FX loans minus export revenues divided by total assets, measured at end-2017, truncated at zero. | Own calculations |
| Total loan growth | Annual percentage growth rate of total loans aggregated from loan-level-data. | Own calculations |
| Total assets | Logarithm of total assets. | MTF, CBRT |
| Investment rate | Change in fixed assets divided by lagged total assets. | MTF, CBRT |
| Employment growth | Annual percentage growth rate of number of employees. | MTF, CBRT |
| Firm age (years) | Logarithm of 1+firm age in years. | MTF, CBRT |
| Sales growth | Annual percentage growth rate of net sales. | MTF, CBRT |
| Leverage ratio | The ratio of equity to total assets. | MTF, CBRT |
| Liquidity ratio | The ratio of cash and cash equivalents plus marketable securities to total assets. | MTF, CBRT |
| Return on assets | The ratio of net profit to total assets. | MTF, CBRT |
| **(E) Province-level variables** | | |
| Industrial electricity consumption growth | Yearly growth rate of industrial electricity consumption at the province level. | TURKSTAT |
| Export growth | YoY export growth (log-difference) in quarterly province-export destination country data, for 168 countries. | TURKSTAT |
| Construction permits | Number of construction permits by the number of buildings (log) at the province-quarter level. | TURKSTAT |
| Firm exits | Year-on-year difference in the number of firm exits (closures and liquidations) at the province-quarter level. | TURKSTAT |
| FX exposure | Weighted sum of FX exposure of firms located in a province, where weights are the end-2017 employment shares of each firm. | Own calculations |

*(Continued on next page)*

*(Continued from previous page)*

| Variable | Definition | Source |
|---|---|---|
| MPP exposure | Weighted sum of MPP exposure of banks located in a province, where weights are the end-2010 loan shares of each bank. | Own calculations |

## Table A5: Balance of covariates by firms' MPP exposure

This table shows a diagnostic test of firm selection based on observable characteristics to macroprudential policies. Firm exposure to macroprudential policies (Firm MPP exposure) is the weighted sum of bank MPP exposure across a firm's lenders, where weights are the end-2010 share of loans from each lender in firm's total loans. Columns 1-2 and 4-5 report sample averages for firm characteristics measured at end-2017 (pre-depreciation). Columns 4 and 6 report the normalized differences between each pair of averages (the difference between the two averages, normalized by the square root of the sum of the corresponding variances). Imbens and Rubin (2015) propose that two variables have "similar" means when the absolute value of the normalized difference is less than 0.25. Firms are split into high versus low-exposure firm around the 75th percentile of the distribution. Significance: * indicates that the absolute value of the normalized difference is larger than 0.3 and thus that the averages across the two groups are statistically "different."

| | **High exposure cutoff > p75** | | | **High exposure cutoff > p50** | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | *Firm exposure to macroprudential policies (Firm MPP exposure)* | | | | | |
| | **High exp. firm** | **Low exp. firm** | **normalized diff.: (2)-(1)** | **High exp. firm** | **Low exp. firm** | **normalized diff.: (5)-(4)** |
| Firm size (log-assets) | 13.890 | 14.179 | 0.189 | 14.044 | 14.168 | 0.081 |
| Employment (# employees) | 33.652 | 34.288 | 0.003 | 36.788 | 31.521 | -0.027 |
| Return on assets (%) | 2.883 | 2.825 | -0.005 | 3.030 | 2.652 | -0.030 |
| Leverage ratio (%) | 36.591 | 36.399 | -0.006 | 36.742 | 36.157 | -0.018 |
| Liquidity ratio (%) | 10.734 | 10.592 | -0.008 | 11.038 | 10.225 | -0.044 |
| Sales growth (%) | 68.532 | 67.346 | -0.005 | 65.726 | 69.524 | 0.015 |
| Firm age (years) | 11.154 | 11.404 | 0.031 | 11.286 | 11.395 | 0.014 |
| No. of Firms | N=25,136 | N=75,411 | | N=49,799 | N=50,748 | |

## Table A6: Balance of covariates by provinces' MPP and FX exposure

This table shows a diagnostic test of province selection based on observable characteristics to macroprudential policies (panel A) and the currency depreciation (panel B) for the $N = 81$ provinces in the regression sample. In panel A, province exposure to macroprudential policies (Province MPP exposure) is the weighted sum of PP exposure of banks located in a province, where weights are the end-2010 share of loans from each bank in province's total loans. In panel B, province FX exposure is the weighted sum of FX exposure of the firms located in a province, where weights are the end-2017 employment shares of each firm. Columns 1-2 and 4-5 report sample averages for province characteristics measured at end-2017 (pre-depreciation). Columns 4 and 6 report the p-value of a two-sided t-test of equality of means. Panel A splits the provinces into high versus low-exposure provinces around the 75th percentile of the distribution; panel B splits the provinces around the sample median. Significance: *** 1%, **5%, *10%.

| | **High exposure cutoff > p75** | | | **High exposure cutoff > p50** | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | *(A) Province exposure to macroprudential policies (Province MPP exposure)* | | | | | |
| | **High exp. province** | **Low exp. firm** | **p-value (1)=(2)** | **High exp. province** | **Low exp. province** | **p-value (4)=(5)** |
| Share small firms (< 5 emp.) | 0.577 | 0.568 | 0.458 | 0.573 | 0.568 | 0.613 |
| Return on assets (%) | 2.529 | 2.172 | 0.515 | 2.240 | 2.280 | 0.933 |
| Leverage ratio (%) | 27.914 | 28.192 | 0.876 | 27.412 | 28.817 | 0.358 |
| Liquidity ratio (%) | 8.062 | 8.077 | 0.985 | 7.792 | 8.348 | 0.411 |
| Sales growth (%) | 71.779 | 56.049 | 0.085* | 59.603 | 60.255 | 0.935 |
| Firm age (years) | 14.857 | 16.306 | 0.173 | 15.029 | 16.845 | 0.046** |
| No. of Provinces | N=20 | N=61 | | N=40 | N=41 | |
| | *(B) Province exposure to the depreciation (Province FX exposure)* | | | | | |
| | **High exp. province** | **Low exp. firm** | **p-value (1)=(2)** | **High exp. province** | **Low exp. province** | **p-value (4)=(5)** |
| Share small firms (< 5 emp.) | 0.566 | 0.572 | 0.635 | 0.558 | 0.583 | 0.015** |
| Return on assets (%) | 2.090 | 2.316 | 0.682 | 1.961 | 2.552 | 0.212 |
| Leverage ratio (%) | 27.526 | 28.319 | 0.655 | 27.890 | 28.350 | 0.764 |
| Liquidity ratio (%) | 7.838 | 8.150 | 0.691 | 7.627 | 8.509 | 0.190 |
| Sales growth (%) | 60.542 | 59.733 | 0.930 | 56.300 | 63.478 | 0.365 |
| Firm age (years) | 16.360 | 15.813 | 0.608 | 15.543 | 16.343 | 0.384 |
| No. of Provinces | N=20 | N=61 | | N=40 | N=41 | |

## Table A7: Bank loan portfolio reallocation from household to commercial lending: Full estimation results

The table reports DiD estimation results corresponding to Equation 1 and Table 3 with full set of coefficient estimates. The data are at the bank-quarter level for the period between 2006:Q1 and 2015:Q4. All variable definitions as in Table 3. Standard errors are double clustered at the bank and quarter levels. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Household Loan Gr.** | (2) **Commercial Loan Gr.** | (3) **Total Loan Growth** | (4) **Asset Growth** | (5) **Securities Growth** |
|---|---|---|---|---|---|
| Bank MPP exposure×Post | -2.3082*** | 0.6263** | 0.2883 | 0.1615 | -0.2671 |
| | (0.6527) | (0.2620) | (0.2205) | (0.1913) | (0.7342) |
| Bank size (log-assets) | -11.4835 | 9.9730 | 13.3854 | 31.1785*** | 6.8183 |
| | (24.8260) | (14.0788) | (9.4007) | (8.4299) | (15.5023) |
| Liquidity ratio | -0.0584 | -0.1258 | 0.0419 | -0.4848*** | -1.2061** |
| | (0.5018) | (0.3323) | (0.2247) | (0.1557) | (0.5651) |
| Return on assets (ROA) | -6.9310 | 1.7052 | 1.5064* | 2.4056** | -1.4324 |
| | (6.4074) | (1.0868) | (0.8811) | (0.8962) | (1.9931) |
| FX funding ratio | -0.2668 | 0.3959 | 0.8114** | 0.1861 | -0.4614 |
| | (0.3734) | (0.3231) | (0.3660) | (0.2251) | (0.7505) |
| Capital ratio | 0.7969 | 0.0285 | 0.0246 | -0.0356 | -0.5094*** |
| | (0.7473) | (0.0747) | (0.0637) | (0.0569) | (0.0934) |
| Bank MPP exposure×Size | 12.3280*** | -3.6922 | -2.0794 | 1.3034 | 2.3647 |
| | (4.2462) | (3.4057) | (1.6795) | (1.8649) | (7.1282) |
| Bank MPP exposure×Liquidity ratio | -0.2184 | -0.0501 | 0.2278 | -0.0221 | 0.3344 |
| | (0.8325) | (0.6234) | (0.5755) | (0.2443) | (0.6914) |
| Bank MPP exposure×ROA | 5.0776 | -11.8155* | -5.6580 | -0.8018 | 13.2009 |
| | (8.7554) | (6.3505) | (3.7928) | (1.9409) | (8.2723) |
| Bank MPP exposure×FX funding ratio | 0.9700** | -0.2992 | -0.4532 | 0.3153 | 0.1978 |
| | (0.4720) | (0.7392) | (0.5142) | (0.3205) | (0.8397) |
| Bank MPP exposure×Capital ratio | -0.5405 | -0.2090 | -0.3598 | 0.3446** | -0.5124 |
| | (0.8310) | (0.4470) | (0.4258) | (0.1649) | (0.4151) |
| Observations | 1,166 | 1,226 | 1,235 | 1,243 | 1,238 |
| R-squared | 0.2473 | 0.2265 | 0.2564 | 0.2870 | 0.1726 |
| Bank controls×Post | Y | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y | Y |
| Quarter FE | Y | Y | Y | Y | Y |

## Table A8: Bank loan portfolio reallocation from household to commercial lending: Robustness to controlling for GDP growth, interest rates, exchange rates, and reserve requirements

The table reports DiD estimation results corresponding to Equation 1 and Table 3 where we additionally control for the interaction of the bank MPP exposure with macroeconomic variables—real GDP growth, monetary policy (short-term funding rate, taken to be the average interest rates on CBRT funding across instruments used to meet market liquidity needs), and the change in the nominal exchange rate (panels A-C) as well as a proxy of bank exposure to changes in reserve requirements taken to be the ratio of short-term deposits to total assets (panel D). The data are at the bank-quarter level for the period between 2006:Q1 and 2015:Q4. All other variable definitions as in Table 3. Standard errors are double clustered at the bank and quarter levels. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Household Loan Growth** | (2) **Commercial Loan Growth** | (3) **Household Loan Growth** | (4) **Commercial Loan Growth** |
|---|---|---|---|---|
| | **(A) Control for GDP Growth** | | **(B) Control for Monetary Policy** | |
| Bank MPP exposure×Post | -1.6414*** | 0.6059* | -2.1779*** | 0.8510*** |
| | (0.4792) | (0.3166) | (0.6484) | (0.3078) |
| Bank MPP exposure×GDP growth | -0.1314** | 0.0100 | | |
| | (0.0600) | (0.0240) | | |
| Bank MPP exposure×Funding rate | | | 0.0296 | 0.0381 |
| | | | (0.0692) | (0.0337) |
| Observations | 1,166 | 1,226 | 1,166 | 1,226 |
| R-squared | 0.2922 | 0.2379 | 0.2606 | 0.2367 |
| | **(C) Control for Exchange Rate** | | **(D) Reserve Requirements** | |
| Bank MPP exposure×Post | -2.3626*** | 0.5039* | -0.8927 | 0.6468*** |
| | (0.6681) | (0.2779) | (0.5480) | (0.1449) |
| Bank MPP exposure×Exchange rate | 0.0083 | 0.0404* | | |
| | (0.0177) | (0.0220) | | |
| Bank Short-term deposits/Assets×Post | | | 60.4363 | 1.5114 |
| | | | (37.1925) | (11.0970) |
| Observations | 1,166 | 1,226 | 812 | 818 |
| R-squared | 0.2652 | 0.2361 | 0.3641 | 0.4657 |
| Bank controls×Post | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y |
| Quarter FE | Y | Y | Y | Y |

## Table A9: Bank asset quality and loan loss provisioning in the short run

The table reports results for DiD estimations that link bank asset quality to MPP exposure (Equation 1). The data are at the bank-quarter level. The dependent variables are contemporaneous and 1-year forward averages (over t+1 to t+4) of the non-performing loan ratio and the loan loss reserve ratio. Bank MPP exposure is defined as 2010:Q4 share of household loans in total loans. Post dummy takes the value 1 for the period after the adoption of macroprudential policies (2011:Q1-2015:Q4) and 0 in the period before their adoption (2006:Q1-2010:Q4). All regressions include lagged bank controls (log total assets, return on assets, FX funding ratio, capital ratio, liquidity ratio) in interaction with the Post dummy (coefficients not shown). Standard errors double-clustered at the bank and quarter level are. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Non-Performing Loan Ratio** | (2) **Non-Performing Loan Ratio** | (3) **Loan Loss Reserves** |
|---|---|---|---|
| | **All loans** | **FX loans** | **All loans** |
| | **(A) Contemporaneous** | | |
| Bank MPP exposure×Post | -0.0579 | -0.0380 | 0.0164 |
| | (0.0487) | (0.0457) | (0.0532) |
| Observations | 1,222 | 1,190 | 1,203 |
| R-squared | 0.9208 | 0.6292 | 0.5260 |
| | **(B) One-year ahead (t+1, t+4)** | | |
| Bank MPP exposure×Post | -0.0901* | -0.0591 | -0.0003 |
| | (0.0518) | (0.0419) | (0.0439) |
| Observations | 1,221 | 1,196 | 1,201 |
| R-squared | 0.8979 | 0.5203 | 0.5687 |
| Bank controls×Post | Y | Y | Y |
| Bank FE | Y | Y | Y |
| Quarter FE | Y | Y | Y |

## Table A10: Bank commercial lending: Placebo tests

The table reports placebo tests for the DiD estimation results corresponding to Equation 2 in panel A (commercial lending results) of Table 4. These estimations are conducted by shifting the sample period back by a few years relative to our baseline analysis and comparing lending outcomes over 2007-2008 versus 2009-2010 (panel A), 2006 versus 2007 (panel B), 2008 versus 2009 (panel C), and 2009 versus 2010 (panel D). All other specifications and variables as in panel A of of Table 4. Standard errors in panels A-B are triple clustered at the bank, firm, quarter level. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Loan Growth** | (2) **Interest Rate** | (3) **Loan Growth** | (4) **Interest Rate** |
|---|---|---|---|---|
| | **(A) 2007-2008 vs 2009-2010** | | **(B) 2006 vs 2007** | |
| Bank MPP exposure×Post | -0.1802 | -0.0433 | 0.3979 | -0.1076 |
| | (0.2868) | (0.0388) | (0.2632) | (0.0889) |
| Observations | 1,275,722 | 3,006,700 | 208,255 | 723,497 |
| R-squared | 0.4162 | 0.6791 | 0.4187 | 0.6533 |
| | **(C) 2008 vs. 2009** | | **(D) 2009 vs 2010** | |
| Bank MPP exposure×Post | -0.8700* | 0.0032 | 0.6953 | 0.0358 |
| | (0.3871) | (0.0327) | (0.4764) | (0.0244) |
| Observations | 627,352 | 1,616,123 | 967,121 | 1,834,214 |
| R-squared | 0.4197 | 0.6652 | 0.4143 | 0.7183 |
| Bank controls×Post | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y |
| Firm×Quarter FE | Y | Y | Y | Y |

## Table A11: Banks' commercial lending: Robustness tests

The table reports robustness tests for the DiD estimation results corresponding to Equation 2 in panel A (commercial lending results) of Table 4. Panel A includes an additional control for bank-firm relationship banking, proxied by the relationship duration (number of years since the first loan is observed for each bank-firm pair in the sample). Panel B adds single-lender firms to the regression sample and replaces the Firm×Quarter fixed effects with Province×Industry×Quarter fixed effects. Panel C and D explore the robustness of the main commercial lending results to alternative approaches to clustering the standard errors either on bank (panel C) or on bank and firm (Panel D). All other specifications and variables as in panel A of of Table 4. Standard errors in panels A-B are triple clustered at the bank, firm, quarter level. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Loan Growth** | (2) **Interest Rate** | (3) **Loan Growth** | (4) **Interest Rate** |
|---|---|---|---|---|
| | **(A) Control for relationship banking** | | **(B) Add single-lender firms** | |
| Bank MPP exposure×Post | 0.4209*** | -0.1037*** | 0.3422* | -0.1101** |
| | (0.1434) | (0.0279) | (0.1711) | (0.0506) |
| Observations | 8,117,704 | 14,601,910 | 18,851,606 | 29,445,763 |
| R-squared | 0.3787 | 0.6589 | 0.0295 | 0.3768 |
| Bank controls×Post | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y |
| Relationship duration | Y | Y | - | - |
| Firm×Quarter FE | Y | Y | - | - |
| Province×Industry×Quarter FE | - | - | Y | Y |
| | **(C) Cluster on bank** | | **(D) Double cluster on bank and firm** | |
| Bank MPP exposure×Post | 0.4170*** | -0.1037*** | 0.4170*** | -0.1037*** |
| | (0.1466) | (0.0335) | (0.1181) | (0.0270) |
| Observations | 8,117,704 | 14,601,910 | 8,117,704 | 14,601,910 |
| R-squared | 0.3782 | 0.6589 | 0.3782 | 0.6589 |
| Bank controls×Post | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y |
| Firm×Quarter FE | Y | Y | Y | Y |

## Table A12: Bank risk-taking in commercial lending: Bank capital channel

The table reports DiD estimation results corresponding the specifications in Table 5 where the DiD terms "Bank MPP exposure×Post×Safer borrower" and "Bank MPP exposure×Post×Turkish lira loan" are broken down by high versus low capital ratio around the 75th percentile of the cross-sectional distribution (at end-2017). All relevant double and triple interaction terms are included, but coefficients not shown. Standard errors are triple clustered at the bank, firm, quarter level. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Loan Growth** | (2) **Interest Rate** | (3) **Loan Growth** | (4) **Interest Rate** |
|---|---|---|---|---|
| Bank MPP exposure×Post×Safer borrower×... | | | | |
| ... × Higher capital ratio [1] | 0.8712*** | -0.1147** | | |
| | (0.2201) | (0.0433) | | |
| ... × Lower capital ratio [2] | 0.8520*** | -0.1265** | | |
| | (0.2714) | (0.0488) | | |
| Bank MPP exposure×Post×Turkish lira loan×... | | | | |
| ... × Higher capital ratio [3] | | | 0.4177** | -0.1160*** |
| | | | (0.1688) | (0.0341) |
| ... × Lower capital ratio [4] | | | 0.4834*** | -0.0439 |
| | | | (0.1750) | (0.0390) |
| pvalue t-test: $H_a$: [1]>[2] | 0.4200 | 0.2320 | | |
| pvalue t-test: $H_a$: [3]>[4] | | | 0.2560 | 0.0019 |
| Observations | 7,011,758 | 13,712,283 | 8,395,094 | 15,294,533 |
| R-squared | 0.3731 | 0.6495 | 0.3607 | 0.6680 |
| Bank controls×Post | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y |
| Firm×Quarter FE | Y | Y | Y | Y |

## Table A13: Banks' commercial lending: Supervisory intensity channel

The table reports DiD estimation results corresponding the specifications in Table 5 where the DiD terms "Bank MPP exposure×Post×Safer borrower" and "Bank MPP exposure×Post×Turkish lira loan" are broken down by bank ownership: privately-owned versus state-owned banks. All relevant double and triple interaction terms are included, but coefficients not shown. Standard errors are triple clustered at the bank, firm, quarter level. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) **Loan Growth** | (2) **Interest Rate** | (3) **Loan Growth** | (4) **Interest Rate** |
|---|---|---|---|---|
| Bank MPP exposure×Post×Safer borrower×... | | | | |
| ... × Private-owned bank [1] | 0.9237*** | -0.1114*** | | |
| | (0.1791) | (0.0372) | | |
| ... × State-owned bank [2] | 1.1350*** | -0.1011** | | |
| | (0.2238) | (0.0396) | | |
| Bank MPP exposure×Post×Turkish lira loan×... | | | | |
| ... × Private-owned bank [3] | | | 0.4572*** | -0.1082*** |
| | | | (0.1488) | (0.0276) |
| ... × State-owned bank [4] | | | 0.5795** | -0.0943* |
| | | | (0.2302) | (0.0477) |
| pvalue t-test: $H_a$: [1]>[2] | 0.0163 | 0.2315 | | |
| pvalue t-test: $H_a$: [3]>[4] | | | 0.1640 | 0.3325 |
| Observations | 7,011,758 | 13,712,283 | 8,395,094 | 15,294,533 |
| R-squared | 0.3733 | 0.6503 | 0.3608 | 0.6679 |
| Bank controls×Post | Y | Y | Y | Y |
| Bank FE | Y | Y | Y | Y |
| Firm×Quarter FE | Y | Y | Y | Y |

## Table A14: Timeline of Key Events During the 2018 Turkish Lira Depreciation

This table reports a chronological timeline of key geopolitical and market events during the 2018 Turkish lira depreciation. The August 10, 2018 tariff announcement (in boldface) marks the start of the sharp acceleration in the Turkish lira depreciation that defines the Post period in our empirical analysis.

| Date | Event |
|---|---|
| March 30, 2018 | USD/TRY rate closes Q1:2018 at 3.95. |
| April 16, 2018 | First court hearing of Pastor Andrew Brunson, arrested in the aftermath of the 2016 coup attempt for alleged links to outlawed organizations. |
| April 18, 2018 | President Trump denounces the trial of Pastor Brunson; the Assistant Secretary of State states the U.S. is consulting Congress about "possible measures" if Brunson is not released. |
| May 1, 2018 | S&P downgrades Turkey's FX sovereign credit rating from BB to BB−, citing macroeconomic imbalances and deterioration in Turkey's external, inflation, and fiscal outlook. Strong depreciation follows. |
| May 15, 2018 | President Erdogan states his intention to take a more active role in economic decision-making and reiterates his stance against high interest rates. Several days of strong depreciation ensue. |
| May 21, 2018 | Fitch publishes commentary arguing that presidential rhetoric raises the possibility of less predictable economic policy, highlighting Turkey's vulnerability from its large external financing requirement. |
| May 22, 2018 | Early sell-off in TRY accelerated by stop-loss selling; USD/TRY hits 4.93 intraday (more than 5% daily loss). CBRT holds emergency meeting and raises its late liquidity window lending rate by 300 bps, stabilizing the lira. |
| June 29, 2018 | USD/TRY closes 2018:Q2 at 4.61, corresponding to more than 15% depreciation since end-Q1. |
| July 13, 2018 | Fitch downgrades Turkey's long-term FX Issuer Default Rating from BB+ to BB, citing widening current account deficit, challenging external financing environment, rising inflation, and deteriorating economic policy credibility. |
| July 26, 2018 | President Trump tweets that the U.S. would "impose large sanctions on Turkey" unless Pastor Brunson is released immediately. |
| August 1, 2018 | U.S. announces sanctions on two Turkish cabinet members for their roles in the arrest and detention of Pastor Brunson. |
| August 10, 2018 | **President Trump announces the doubling of tariffs on Turkish steel and aluminum and states that the US's relations with Turkey "are not good."** A new wave of lira selling begins, resulting in 9.1% depreciation day-over-day. |
| August 13, 2018 | Lira selling intensifies; USD/TRY hits an all-time high of 7.2 in overnight trading. In response, CBRT pledges to provide "all the liquidity the banks need," lowers reserve requirements, and announces additional liquidity measures, stabilizing the lira at close to 6.90 (13.7% depreciation day-over-day). |

## Table A15: Robustness of province-level real effects to dropping Istanbul

The table reports DiD estimation results corresponding the specifications in Table 8 with the only difference that the sample omits Istanbul. All variables and sample specifications are the same as in Table 8. The standard errors are clustered at the province level. Significance: *** 1%, **5%, *10%.

| Dependent variable: | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **(A) Industrial electricity consumption growth** *Province-year* | | **(B) Export growth (yoy)** *Province-country-quarter* | |
| FX shock exposure×Post | -0.0148* | | -0.0125*** | |
| | (0.0086) | | (0.0039) | |
| FX shock exposure×Post×Low MPP exposure | | -0.0162* | | -0.0126*** |
| | | (0.0090) | | (0.0041) |
| FX shock exposure×Post×High MPP exposure | | -0.0138 | | -0.0379* |
| | | (0.0377) | | (0.0227) |
| Observations | 320 | 320 | 54,299 | 54,299 |
| R-squared | 0.3315 | 0.3323 | 0.0596 | 0.0597 |
| Province-level controls×Post | Y | Y | Y | Y |
| Province FE, Year FE | Y | Y | Y | Y |
| Destination country×Quarter FE | - | - | Y | Y |
| | **(C) No. construction permits (log)** *Province-quarter* | | **(D) Δ Firm exits (yoy)** *Province-firm type-quarter* | |
| FX shock exposure×Post | -0.0298** | | 0.0064* | |
| | (0.0127) | | (0.0033) | |
| FX shock exposure×Post×Low MPP exposure | | -0.0291** | | 0.0067* |
| | | (0.0127) | | (0.0034) |
| FX shock exposure×Post×High MPP exposure | | -0.0460 | | 0.0002 |
| | | (0.0456) | | (0.0060) |
| Observations | 960 | 960 | 2,640 | 2,640 |
| R-squared | 0.9168 | 0.9168 | 0.1108 | 0.1109 |
| Province-level controls×Post | Y | Y | Y | Y |
| Province FE, Quarter FE | Y | Y | Y | Y |
| Firm-type FE | - | - | Y | Y |