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ESSAYS ON FOREIGN CURRENCY BORROWING OF HOUSEHOLDS

by

Győző Gyöngyösi

Submitted in partial fulfillment of the requirements for
the degree of Doctor of Philosophy at
Central European University

Advisor: Ádám Szeidl

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The Impact of Monetary Conditions on Bank Lending to Households

Co-authors: Steven Ongena and Ibolya Schindele

The nature of cooperation and the roles of the individual co-authors and approximate share of each co-author in the joint work: The paper was developed in cooperation with Ibolya and Steven. Ibolya and Steven invented the main question and the identification strategy of the paper. They also worked on the structure and logic of the paper. I worked on data management and programming in cooperation with Ibolya. All three co-authors contributed to the analysis of regressions and the writing of the paper.

Financial Crisis, Creditor-Debtor Conflict, and Political Extremism

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Abstract

Chapter 1

We study the impact of monetary conditions on the supply of mortgage credit by banks to households. Using a comprehensive supervisory dataset from Hungary, we first establish a "bank-lending-to-households" channel by showing that monetary conditions affect the supply of mortgage credit in volume. We then study the impact of monetary conditions on the composition of mortgage credit along its currency denomination and borrower risk. We find that expansionary domestic monetary conditions increase the supply of mortgage credit to all households in the domestic currency and to risky households in the foreign currency. Because most households are unhedged, bank lending in multiple currencies may involve additional risk taking. Changes in foreign monetary conditions affect lending in the foreign currency more than in the domestic currency, but do not trigger compositional changes in the risk exposures of the banks.

Chapter 2

This chapter studies the effect of the 2008 financial crisis on the vote share of the populist far right. We use the foreign currency borrowing of households in Hungary as a natural experiment. During the crisis the unexpected and large depreciation of the domestic currency increased the debt burden of households borrowing in foreign currencies but not of households borrowing in the local currency. We use zip code level variation in the prevalence of foreign currency borrowing of households, and show that the exposure to the depreciation significantly affected political preferences. A 10 percent unanticipated rise in indebtedness increased the vote share of the far right by 2.2 percentage points. This effect explains one third of the increase of their popularity by the 2010 election. Foreign currency debtors' naïveté, persistent extremist attitudes, local labor market shocks, and immigration do not account for this increase. We present evidence that the conflict between creditors and debtors about the resolution of the crisis is an important mechanism in the electoral success of the far right. The far right sided with debtors against creditors by advocating policies to help households with foreign currency loans.

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Chapter 3

This chapter studies how households' financial distress affected the student development. I focus on the 2008 financial crisis, I use household foreign currency credit expansion as a natural experiment in Hungary. During the crisis the exchange rate shock increased the debt burden of households borrowing in foreign currencies but not of households borrowing in the local currency. I measure exposure to the depreciation at the zip code level by using credit registry data. I use administrative student level standardized test scores at the zip code level. My identification strategy compares the development of students attending the same class but living in different zip codes. I find that a 10 percent unexpected debt shock decreases the math and reading skills by .045 standard deviation. Increased unemployment in more exposed zip codes does not explain the worse results of students.

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Chapter 1

The Impact of Monetary Conditions on Bank Lending to Households

1.1 Introduction

Although prominent academic writings have long emphasized the crucial role played by households' balance-sheets in monetary transmission, extant empirical work is scant and almost exclusively focused on the impact of monetary policy on the *demand* for mortgages by households.[1] Aladangady (2014) for example finds that expansionary monetary policy increases house prices and thus stimulates household spending and home equity-based borrowing, while Mian and Sufi (2009) further show that households are heterogeneous in their marginal propensity to borrow and spend out following a positive change in housing wealth. Di Maggio et al. (2017) find that, following expansionary monetary policy, households carrying adjustable rate mortgages (originated between 2005 and 2007 featuring an automatic reset of the interest rate after five years) accelerate debt repayment (see also Garriga et al. (2017)).

However - to the best of our knowledge - there is little or no empirical research with

[1] Bernanke and Gertler (1995) stated that „an important goal of future research should be to give the role of consumers' balance sheets in monetary policy transmission the same attention that has been paid to the balance sheets of corporations" (op. cit, page 45), while more recently Sufi (2015) surmised that "perhaps the most important effect of monetary policy on credit availability happens through the housing market" (op. cit., page 4).

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micro dataon the equally important question if and how monetary policy has an impact on the *supply* of mortgages via the bank-lending channel of monetary transmission.[2] This is surprising in the light of for example recent evidence on US household leverage prior to the financial crisis suggesting that the rapid increase in the quantity of mortgages supplied to low income (subprime) borrowers between 2002 and 2005 was an important factor in causing the financial crisis (e.g., Mian and Sufi (2014)).

To fill this gap in the literature, we investigate the impact of monetary policy on the supply by banks of mortgages to households, in volume and composition. First, we examine the potency of the bank lending channel of domestic monetary policy as pertaining to household mortgages by testing whether changes in domestic monetary conditions have a differential impact on the amount of mortgages granted by banks according to their capital ratios. Second, we investigate whether this effect is differentiated by the currency in which the mortgage is granted and whether therefore monetary conditions abroad also matter. And third, we investigate whether these effects are differentiated by borrower risk.

Hence we estimate the potency of a bank-lending channel running through the supply of mortgages granted to households and to investigate whether this effect is differentiated by mortgage currency as well as borrower risk.The interaction of the currency and risk compositional channels may worsen the impact of expansionary monetary policy on banks' risk-taking (e.g., Jiménez et al. (2014); Ioannidou et al. (2015); Dell'ariccia Giovanni et al. (2017)) when riskier households are those that are offered mortgages in the riskier foreign currency. Therefore, understanding the intertwining effects of macroeconomic policies on mortgage lending is also important from a financial stability perspective.

Hungary provides an almost ideal setting to identify the potency of a "bank-lending-to-household" channel. The comprehensive credit register at the National Bank of Hungary (Magyar Nemzeti Bank) contains granular information on all loans extended by all credit institutions operating in Hungary, including – and essential for our purposes – all mortgages granted to households. With an economic system dominated by banks, we can identify the causal impact of monetary policy on the supply of bank credit to households.

[2]Studying bank level data á la Kashyap and Stein (2000), Black et al. (2010) find that only few banks reduce mortgage lending in response to monetary contractions. Albertazzi et al. (2018) study how bank group funding conditions affect the share of new mortgages with a fixed (versus adjustable) rate but find that country level demand factors dominate such conditions.

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Our identification strategy exploits the extent of banks' foreign currency denominated lending in Hungary. When applying for a loan, households face a choice whether to borrow in domestic or foreign currency. As most households are unlikely to have an inherent currency-specific demand for credit, their currency choice is driven by differences in domestic and foreign loan conditions, their expectations on future exchange rates, and the banks' supply of foreign currency credit. We identify the effect of monetary policy on the volume and composition of the supply of mortgages by banks to households byexploiting theoretically-motivated interactions between changes in monetary conditions on the one hand and a key bank balance-sheet strength variable, i.e., the bank capital-to-total-assets ratio, on the other hand (Bernanke et al. (1996); Kashyap and Stein (2000)).[3]

In this way our identification strategy follows the most recent empirical literature assessing the effects of monetary policy on banks' supply of corporate credit. Jimenez et al. (2012) and Jiménez et al. (2014) for example explore a dataset of firms' loan applications to multiple banks and control for firm-level time-varying heterogeneity in credit demand by including firm-time fixed effects.[4] Their identification of the impact of monetary policy on the volume and composition of credit supply, respectively, rests on the differential responses (to changes in the monetary policy rate) by banks of different balance-sheet strengths.

In our most saturated specificationswe account for all household-level time-varying heterogeneity in credit demand by including individual borrower-time fixed effects (as mortgage lending is differentiated at the individual borrower-level by the loan currency). In this way we can identify supply effects from the differential responses to changes in monetary conditions by banks with different capitalization ratios by estimating á la Kashyap and Stein (2000) the coefficients of interaction terms between the monetary policy rate and bank capitalization.[5]

[3]The definition of the bank capital-to-total-assets ratio we employ closely follows the theoretical literature that attributes a prominent role to net worth in determining the ability of banks to obtain financing from their own financiers (Holmstrom and Tirole, 1997; Holmström and Tirole, 1998; Bernanke et al., 1999; Gertler and Karadi, 2011).

[4]Using fixed effects is a standard way to control for demand side heterogeneity also in other strands of the literature. Paravisini et al. (2015) for example analyze the effect of credit supply on trade and include various sets of fixed effects to account for all non-credit determinants of firms' credit demand.

[5]In sum, we will focus on the set of mortgages in various currencies granted in the same month to the same borrower by banks of varying balance-sheet strengths. Within this set of mortgages, for which the (observed and unobserved) quality of potential borrowers is constant, we study how monetary conditions affect the granting of mortgages in different currencies depending on bank capital. Consequently, what we

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As common in the literature, we account for the stance of monetary policy with changes in representative short-term interest rates. We further comprehensively account for changes in domestic GDP growth and inflation (Taylor, 1993, 2002), at all levels of interaction where the domestic interest rate is also featured.We also account for the currency compositional effect since although the Hungarian economy is not "dollarized" or "francized", many mortgages were denominated in Swiss Franc(in some sample years more than half of the mortgages was).[6]

Given these ingredients we first identify the impact of domestic monetary conditions on the supply of mortgages by local banks. We find the bank-lending-to-household channel is operational and potent, especially for mortgage granting in Hungarian Forint,the domestic currency. Specifically, we find that following a one standard deviation decrease in the domestic interest rate, lowly capitalized banks increase their mortgage credit supply by 0.1 percentage point more than highly capitalized banks. Given that the unconditional probability of granting mortgage creditin our sample is 0.92 percent, this differential impact is equivalent to a quasi-elasticity of 11 percent, representing an economically significant volume effect.

Focusing on the effect of monetary policy changes on the currency composition of loan supply, we find that when credit is granted in the domestic currency (Hungarian Forint), a one standard deviation decrease in the Forint interest rate increases the supply of mortgages by lowly capitalized banks by 0.19 percentage point more than by highly capitalized banks. When credit is granted inSwiss Franc, the same change in the Forint interest rate increases mortgage credit supply by lowly capitalized banks by 0.09 percentage point lessthan by highly capitalized banks. These numbers are economically significant, representing 20 and -10 percent of the unconditional probability of granting mortgage credit in the sample. The difference in the differential reaction of lowly and highly capitalized banks suggests that monetary policy changes trigger compositional shifts in banks' household lending decisions along the loan currency dimension.

require for the identification of supply effects is that the changes in the domestic (or foreign) interest rate do not affect borrowers' demand for domestic versus foreign currency mortgages in a way that is somehow correlated with banks' capitalization ratios.

[6]The amount of foreign cash held has traditionally been very low in Hungary. Based on survey data from the Austrian National Bank, Feige (2003) for example estimates that the fraction of total currency held as foreign currency was only 6 percent in Hungary in 2001. Hence regular households are not naturally hedged.

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Next, we investigate whether compositional changes triggered by monetary policy shocksin banks' mortgage granting are also discernible along the borrower risk dimension. We find that expansionary domestic monetary conditions increase lending – primarily by lowly capitalized banks – to all borrowers in Hungarian Forint, and to risky borrowers in Swiss Franc. Notably, our findings suggest that domestic monetary expansion stimulates bank risk-taking through enhancing lending to risky borrowers in the foreign currency.

Specifically, we find that the differencein the differential impact of a one standard deviation decrease in the interest rate on the supply of mortgages to less risky households,by low versus high capital-to-asset ratio banks, in the domestic versus the foreign currency, amounts to -36 percent of the unconditional probability of granting mortgage credit in our sample. When banks lend to risky households, this difference in the differential reaction of lowly versus highly capitalized banks to a similar change in the interest rate is -3 percent, in absolute terms a significantly smaller number. Therefore, currency compositional changes triggered by monetary policy shocks seem to be less prevalent when banks lend to risky households. This finding suggests that expansionary domestic monetary policy spurs mortgage granting to risky borrowers primarily in the foreign currency. Expansionary monetary policy may thus generate risk-taking by stimulating banks tolend to unhedged households in the foreign currency.

We also assess the impact of foreign monetary conditions on the volume and composition of domestic mortgage loan supply. We find that expansionary monetary policy in Switzerland has a differential impact on mortgage lending denominated in the domestic and foreign currencies, but differential effects on the supply of mortgages along the borrower risk dimension are not identifiable.

Our paper makes three contributions. First, our paper contributes to the literature that identifies the impact of domestic monetary policy shocks on the supply of credit (Bernanke and Blinder, 1992; Kashyap and Stein, 2000; Jimenez et al., 2012; Becker and Ivashina, 2014), by investigating the impact on the volume of mortgages granted by banks to households.[7] Our paper is the first to document thepotency of a bank-lending-to-household

[7] Matousek and Sarantis (2009); Benkovskis (2008); Kujundžić and Otašević (2013) for example assess the potency of a domestic bank lending channel in Central and Eastern European countries using bank-level or aggregate credit information while Brzoza-Brzezina et al. (2010) study the effectiveness of macroeconomic policies including monetary policy in the presence of financial dollarization.

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channel of monetary policy transmission. Second, our paper contributes to an incipient literature which investigates the international transmission of monetary policy shocks (Cetorelli and Goldberg, 2012; Cerutti and Schmieder, 2014; Morais et al., 2015), that may possibly occur along loan currency denomination (Ongena, 2015 2921). Third, our paper also contributes to the literature on the impact of the monetary policy rate on the composition of the supply of credit which has so far focused on direct credit risk taken (DellAriccia et al., 2014; Jiménez et al., 2014; Ioannidou et al., 2015) and references therein). In this paper we focus on its impact on the supply of credit along both currency denomination and household risk.[8] We find that changes in domestic monetary policy alter the composition of the granted mortgages along currency denomination and household risk and that the interplay of the two compositional channels amplifies bank risk-taking.

The rest of the paper is organized as follows. Section 1.2 describes bank lending to households in Hungary, the country's credit register, and the resultant sample. Section 1.3 discusses the identification strategy. Section 1.4 introduces the methodology and the variables. Section 1.5 contains the results assessing the potency of the bank-lending-to-household channel, both in volume and in composition. Section 1.7 concludes.

1.2 Bank Lending to Households in Hungary and Data Sources

1.2.1 Household Lending in Hungary

Hungary's transition from a centrally planned to a market economy started at the end of the 1980s, but banks did not lend all that much to households until after the turn of the millennium. Although economic transition and subsequent consolidation went hand in hand with foreign banks' entry and resulted in intense competition in the banking market, newly established foreign banks focused initially on corporate lending. Household customers were mainly served by a handful of domestic credit institutions.

[8] In this respect our paper also relates to the large empirical literature on financial dollarization that studies the determinants of banks' domestic lending in foreign currency in Latin American and transition economies (Zettelmeyer et al., 2009). This literature finds that in general the lack of macroeconomic policy credibility, inflation volatility, low institutional quality, interest rate differentials, financial market development, and foreign funding of bank credit all contribute to a high level of foreign currency bank loans in these economies (e.g., Barajas and Méndez Morales (2003); Rosenberg and Tirpák (2008); Basso et al. (2011); Neanidis and Savva (2015)).

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In 2001, the Hungarian government introduced an interest rate subsidy on housing loans, which eased households' borrowing constraints and spurred mortgage lending. Because of fiscal considerations, the program was restricted at the end of 2003, and subsequently in 2005, by tightened eligibility rules and a reduction of the interest rate subsidy. From 2004 onwards, loans denominated in foreign currencies appeared and their share increased rapidly, especially in household lending. Due to the lower interest rates, foreign currency mortgages became a substitute of state-subsidized domestic currency loans and, within a short period, developed into a major retail product. While the most popular denomination was the Swiss Franc (see Figure A.1, mortgages and consumer loans denominated in other currencies, like the Euro and the Japanese Yen, were also typical. The share of foreign currency loans in the household sector increased from 5 percent at the end of 2003 to 70 percent by the third quarter of 2008, and this ratio is 50 percent for mortgages.

Several factors contributed to the increase in the share of foreign currency loans in Hungary. On the demand side, lower interest rates, households' low awareness of exchange rate risk, borrowers' herding behavior and expectations of joining the euro-zone may all have contributed substantially to the massive spread of foreign currency loans. On the supply side, the major reason to offer foreign currency loans was banks' intense competition for new retail customers accompanied by foreign bank ownership and the consequent availability of foreign funding.

Although the Central Bank was aware of potential risks associated with banks' lending in foreign currencies (MNB, 2006), no regulatory measures were taken to curb such practices before the outburst of the financial crisis in 2008. In addition, some government measures might have even encouraged those lending practices (Banai et al., 2012).

When the financial crisis hit Hungary, the Hungarian forint suffered a major depreciation vis-à-vis the Swiss Franc losing about 30 percent of its value between September 2008 and January 2009. Swiss Franc denominated loans thus became less favorable, resulting in a pragmatic cease of Swiss Franc lending to households. Although subsequent regulatory measures curtailed lending to households in other foreign currencies too, Euro denominated mortgages continued to exist until foreign currency lending to the household sector was entirely banned in August 2010 by the government.

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1.2.2 The Household Registry of the Hungarian Credit Information System

The Household Registry of the Hungarian Central Credit Information System (KHR) contains information on all loans extended to individuals by all credit institutions in Hungary. As such this credit register contains detailed information on all mortgage-backed housing loans, which constitute our initial sample.Credit institutions in Hungary include commercial banks, branch offices of foreign banks, saving cooperatives, credit unions, specialized credit institutions, financial enterprises and other financial companies.

First, we restrict our sample to Swiss Franc and Hungarian Forint denominated mortgage-backed housing loans extended by commercial banks, branch offices of foreign banks, and saving cooperatives. The Household Registry of KHR was established in April 2012, therefore we are able to observe all loans that were outstanding at or originated after that month. We include in the sample all mortgage-backed housing loans with a minimum maturity of eight and a half years. Under this restriction, we are able to observe almost the entire population of mortgages that were originated between December 2003 and April 2012 and not repaid before April 2012. Since foreign currency lending in Hungary started in early 2004, our choice of the sample period allows us to analyze the composition of housing loan supply along the currency dimension. To keep our analysis free from the effects of the financial crisis, we choose August 2008 as the last month of the sample period. Essentially, we focus on the population of mortgage-backed housing loans of eight and a half year or longer maturity, originated between January 2004 and August 2008. As the typical mortgage has 20 years of maturity, this constraint decreases the sample size only marginally.

In addition to detailed loan and borrower characteristics, such as the date of origination, loan amount, loan maturity, borrower's date of birth and address, and whether the borrower has a guarantor, the credit register also contains information on the lender's identity and the currency denomination of the loan. Using information on loan currency, we construct a balanced individual-time-currency-level panel database with monthly frequency. To obtain our final sample, we take a 20 percent random sample from the data at the individual-level.

We match the thus organized credit register data with bank and regional characteristics. We obtain data on banks' financial statements from regulatory reports available at the National Bank of Hungary. We have information on regional characteristics including

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population,unemployment, and tax base per capita, at the settlement level of the borrowers' area of location from the T-STAR database.

We drop individuals with loans originated by multiple banks from the sample. Since the credit register contains the individual-bank relationship only at the time of the origination of the loans, for individuals with loans from multiple banks, the bank relationship will not be unambiguously defined for the months without loan origination. Since we focus on the impact of monetary conditions on banks' loan supply decisions, information on bank relationships during those months is relevant and needed for our analysis. We therefore focus on individuals whose bank relationship is unambiguously defined during the entire sample period. Individuals with single bank relationship constitute 99.1 percent of the population of individuals receiving a housing loan during the sample period, hence this choice does not affect presumably our main results.

All loan contract samples face potential borrower discouragement and loan application approval biases (e.g., Cole (1998)). Our sample may suffer from one additional selection issue. Due to the increasing monthly due payments of households and high number of defaults subsequent to the financial crisis, a large-scale debt restructuring program was initiated by the Hungarian government in November 2011. This restructuring program concerned foreign currency loans and entitled all households to repay their mortgage and home equity debt denominated in foreign currency at a preferential exchange rate, about 25 percent below the market exchange rate of that time at the expense of banks. As the gains from such an early repayment opportunity were high, many borrowers chose to participate and about 170,000 mortgage-backed housing loans were repaid at the favorable exchange rate, which accounted for 23 percent of foreign currency denominated debt. Since the debt restructuring program took place before the Household Registry was established, we are not able to observe the loans that had been originated during our sample period and repaid in 2011. In addition, such missing loans are likely to be non-random. Wealthier households were more likely to opt for early repayment and, at the same time, they might have been more likely to have borrowed from specific banks. Loans that were originated early might have also been more likely to be repaid as these loans may have been associated with lower nominal amounts. To assess how the resulting sample selection bias might affect our analysis, we estimate our regressions using a second dataset including data on early

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repayments, from three of the largest commercial banks in Hungary. The results of such robustness estimations are presented in Table **??** in the Appendix.

1.3 Identification Strategy

Does expansionary monetary policy at home and/or abroad generate changes in the volume and risk composition of the supply of mortgages by banks to households when mortgage lending takes place in domestic as well as foreign currencies? Do compositional effects along the risk and currency dimensions intertwine reinforcing the impact of loose monetary policy on risk taking? To address these questions, one needs to disentangle the impact of the changes in the interest rate on the volume and composition of mortgage credit supply from changes in the quality and volume of the demand for loans– while accounting for the impact of other key macro variables. This bank lending channel involves volume as well as compositional changes in the supply of mortgages at the bank-borrower-currency denomination level.

Given most banks may have little capital at stake, net worth has a prominent role in determining banks' capacity to borrow from their own financiers. Therefore, we identify the impact of monetary policy shocks on the volume of bank loan supply, from the differential responses of banks with different net worth characteristics as Kashyap and Stein (2000), while accounting for heterogeneity in credit demand through the use of location-time and borrower-time fixed effects as proposed by state-of-the-art methodology in the recent literature (Jimenez et al., 2012; Jiménez et al., 2014).[9]

Consistent with the above, our identification strategy consists of two crucial ingredients: (1) Interacting the change in the interest rate with bank capital, loan currency denomination, and a measure of borrower risk, while saturating the specification with borrower-time fixed effectsand locality-time-currency fixed effects to control for unobserved demand; (2) horseracing the interest rate, in its interaction with bank capital, currency denomination,

[9] As we are assessing the within-borrower credit composition (along loan currency and risk), first-stage borrower-level loan application information as traditionally used in the literature on the firm-bank-lending channel (Puri et al., 2011; Jimenez et al., 2012; Jiménez et al., 2014) would be potentially less informative for our purposes. Given that we focus on the currency denomination and risk of mortgages granted to an individual borrower in a certain month, knowing the currency requested by the borrower would be helpful. However, as far as we are aware, no credit register in the world records this type of information (Miller, 2003).

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and borrower risk, with the corresponding triple and quadruple interactions of other key macro variables, in particular GDP growth and inflation.

Next, we discuss the two afore-mentioned components of our identification strategy and our measures of credit granting in detail.

1.3.1 Saturation with Fixed Effects and Interaction Terms

Our benchmark specification focuses on the intensive margin of mortgage granting to individual borrowers in a given currency.

Borrower-Time Fixed Effects and Locality-Time-Currency Fixed Effects Expansionary monetary policy by the central bank managing one currency may spur banks into lending in this respective currency but given imperfect hedging opportunities for either the bank and/or its financiers not necessarily (or at least not to an equal degree) in other currencies.[10] In addition, expansionary monetary policy by the central bank may cause risk-shifting by increasing lending to risky households in the respective currency.

Recent evidence suggests that these testable predictions may also be consistent with demand channels. Monetary policy shocks may affect aggregate credit demand through their impact on house prices and home-equity based borrowing (Aladangady, 2014). Therefore, to suppress concurrent changes in households' creditdemand, we saturate our benchmark specifications with borrower-time fixed effects. Observed and unobserved time-varying borrower characteristics that we account for this way include the individual's income, employment status, collateral, marital status, and household characteristics. Our saturated specifications also account for the endogeneity of bank loan supply when changes in macroeconomic conditions affect banks' lending decisions indirectly, by altering borrowers' capacity to repay mortgage debt as long as changes in repayment capacity are not currency specific. In our saturated specifications, identification comes from comparing changes in lending by the same bankin the same month to the same individual in different currencies.[11] Essentially,

[10] Hungarian regulation does not require banks to hold a differential level of reserves for deposits in different currencies. Nor does foreign currency lending require banks to maintain different bank capital levels as long as the foreign currency loan position is hedged through foreign currency funding (on-balance) or through the foreign exchange swap market (off-balance sheet).

[11] Note that we need a third panel dimension for the inclusion of borrower-time fixed effects. In our data this is the currency dimension. Unlike recent research analyzing loan applications made by firms to different

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our identification relies on the assumption that household credit demand is not currency specific. On the condition thathouseholds take into account borrowing costs and potential risks associated with taking on debt, theactual currency of the granted mortgage will depend on bank's loan supply in the different currencies.

Expansionary monetary policymay also affect the level of competition in the banking industry by spurring banks' entry intonew geographical areas through an expansion of their branch networks.[12] Supply effects generated by changes in banks' market structure are, however, unrelated to monetary policy changes. We control for such effects by using locality-time fixed effects. In addition, the availability of a low interest rate foreign currency may allow banks to engage in new market segments by extending loans tohouseholds ineligible for creditin the high interest rate domestic currency. To control for such region-specific time-variation in aggregate lending in a given currency, we saturate our specifications with locality-time-currency fixed effects. Time-varying region-specific characteristics that we capture this way alsoinclude the locality level aggregate demand for loans by households rationed from creditin the domestic currency.We account for borrowers' locality at the subregion as well as the settlement (city or zip-code) level.[13]

Interaction of Interest Rate Change, Bank Capital Ratio,Currency Denomination, and Borrower Risk Given the set of fixed effects, identification of abank lending channel comes from exploiting the testable prediction that when the monetary policy rate decreases for one particular currency, banks with lower net worth will react more by lending more in this currency than banks with higher net worth. In addition to the change in the volume of lending in a specific currency, interest rate decreases may spur banks with lower net worth to engage in lending to riskier households in the respective currency. Compositional changes along the currency and risk dimensions may thus interact, reinforcing the impact of loose monetary policy on bank risk-taking. Our measure for net worth and thus the intensity of the agency conflict that besets banks own borrowing from their financiers

banks (Jimenez et al., 2012; Jiménez et al., 2014), we do not rely on the multiplicity in the borrower-bank relationship dimension.

[12]During our sample period, a significant number of foreign banks entered the Hungarian market and established new branch networks.

[13]In 2010, there were 3,152 settlements in Hungary. The average population per settlement was equal to 3,168.

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is the bank capital-to-assets ratio (Holmstrom and Tirole, 1997). The ratio is particularly meaningful in Hungary because off-balance sheet activity by banks has been almost non-existent.[14]

To identify the "currency composition channel"of monetary policy, we interact, in the spirit of Kashyap and Stein (2000), the change in the interest rate with the lagged bank capital ratio and a dummy variable indicating the currency of the mortgage loan. We expect a negative sign for the estimated coefficient on this triple interaction term: When the domestic interest rate decreases, banks with lower capital ratio are more likely to grant a mortgagein the domestic currency than in the foreign currency. To isolate the"risk-taking channel" with respect to lending in the specific currency, we create a quadruple interaction term adding borrower risk as a fourthinteracting variable. Since foreign currency loans expose borrowers to exchange rate risk, the currency compositional channel may also shift the risk composition of loan supply. If the currency and risk compositional channels reinforce one another thereby boosting bank risk taking, riskier borrowers will be more likely to receive a mortgage in the foreign currency and the coefficient of the estimated quadruple interaction term will have apositive sign.[15]

In accordance with the focus of our analysis, we cluster standard errors at the individual level.

1.3.2 Horseracing Triple and Quadruple Interaction Terms

Interest Rate Most banks are funded by short-term debt, the interest rates of which will likely respond to changes in the monetary policy rate. As in Angeloni et al. (2003), we employ the yearly change in a three-month interest rate for each currency. For Hungarian Forintmortgages, we employ the Hungarian government bond rate. For Swiss Franc lending we use the annual change in the Swiss 3-month LIBOR interest rate. Both the Hungarian and Swiss interest rates in our sample period span a full yet (across-interest-rates) distinct cycle (see Figure A.2).

[14]Total bank assets cover most of the banks' business in Hungary. Banks did not develop conduits or Structured Investment Vehicles (SIVs) and securitization was not practiced either.

[15]In a related vein, Ongena et al. (2013) provide evidence that foreign banks may engage in risky lending in domestic markets, especially when entry barriers and restrictions on non-core bank activities in domestic markets are low. At the same time, Dell'Ariccia et al. (2011) point out that lending in a foreign currency does not necessarily involve more risk-taking.

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Assuaging concerns of reverse causality (e.g., future foreign currency lending by banks may imply current domestic monetary contraction) and omitted variables (variables correlated with the stance of monetary policy that can also influence bank lending) are the comprehensive sets of borrower-time and locality-time-currency fixed effects which absorb any observed and unobserved time-varying heterogeneity across allindividualsand localities in our sample. For monetary policychanges in Switzerland omitted variable and reverse causality concerns are less likely to be of any significance.

Other Key Macro Variables Besides short-term interest rates, banks'loan supply decisions could also be affected by other key macroeconomic variables. Hence, the third component in our identification strategy is to concurrently account for the effects of changes in GDP growth and prices as the main determinants of the monetary policy rate as well as other aggregate variablesincluding changes in exchange rate, foreign direct investment, and the term structure of interest rates. To identify the currency compositional channel, we therefore horserace the tripleinteraction terms of the changes in GDP growth, pricesand other macro variables, with bank capital, currency denomination, with the equivalent tripleinteraction with the monetary policy rate. In addition, to identify the effect of monetary policy on bank risk-taking when granting mortgages in the domestic or foreign currency, we horserace the quadruple interaction terms of each respective macro variable, with bank capital, currency denomination, and borrower risk, with the quadruple interaction of the same variables and the interest rate.

Given their correlation with the monetary policy rate, the macro variables in triples and quadruples also feature as controls, to the extent that the individual-timeand locality-time-currency fixed effects did not already soak up the relevant macroeconomic variation.

1.4 Empirical Model and Variables

This Section discusses the empirical models we estimate and our dependent and independent variables.

The sample period runs from January 2004 to August 2008. The total number of observations (i.e., individual – year:month– credit in currency) equals 21,893,298 but given computing constraints the regressions in Tables A.4 to A.8 employ a 20 percent random

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sample of individuals. We thus end up with a sample of 4,378,430 observations in total.

Table A.3 presents the summary statistics. Summary statistics for banks andsubregion-sare based on the average values of the bank andsubregion characteristics over the sample period. Borrower risk characteristics are based on ex-ante informationgathered at the time the individual takes the loan as well as lending outcomeinformation obtained a number of years subsequent to loan taking. The number of banks in oursample is 141 and the number of individuals is 39,344.

1.4.1 Main Independent Variables

Short-Term Interest Rate and Other Macro Variables Our main variable of interest is the annual change in the three-month Forint interest rate that we measure by the yield on the three-month Hungarian government bond rate. The average change in the three-month Hungarian government bond rate during the sample period is -0.03 percentage points and the change varies between -5.08 percentage points and 6.98 percentage points. To proxy for monetary policy by the Swiss central bank that issues the foreign currency, we use the annual change in the Swiss three-month LIBOR interbank rate. The average change in theSwiss three-month interest rate in the sample period is 0.5 percentage point and it varies between -0.42 percentage point and 1.19 percentage point. Table A.3 presents the definitions and summary statistics of all variables used in our analysis.

We account for changes in domestic GDP growth and inflation (Taylor, 1993, 2002), including both variables at all levels of interaction where the domestic interest rate is also featured. The average GDP growth rate in Hungary during the sample period was 3.3 percent ranging between 0 percent and 5.1 percent, while average inflation was 5.7 percent, ranging between 2.3 and 9 percent.Additional macro controls are the annual change in the Hungarian Forint/Swiss Franc exchange rate, the annual change in the stock of foreign direct investment in Hungary, the annual change in the CDS rateon 5-year Hungarian sovereign bonds, and the annual change in the difference between 10-year and 1-year government bond yields.The macro variables are available monthly, except for GDP growth and the stock of foreign direct investment, which are measured quarterly. For interim months, we use the end-of-quarter GDP growth rate and currency reserve values.

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Bank Capital Ratio and Other Bank Characteristics Our key bank balance-sheet variable is the Bank Capital Ratio defined as the ratio of bank equity over total assets.[16] This ratio is a measure of the bank's ability to obtain funding from its financiers (Holmstrom and Tirole, 1997) and lend in the currency of the interest rate change ("bank balance sheet channel"). At the same time the bank capital ratio may also serve as a proxy for bank moral hazard (i.e., more "skin in the game" may deter lending in the 'other' (riskier) currency). The average bank capital ratio during the sample period is 8.39 percent.

To capture the time-variation in banks' loan supply decisions, we include a number of bank characteristics as control variables. We use the natural logarithm of total assets (Bank Total Assets) to proxy for bank size and the ratio of liquid to total assets (Bank Liquidity Ratio) to measure bank liquidity. We also include the Bank Return on Assets to measure profitability and the Bank Doubtful Loan Ratio to proxy for the current non-performance and riskiness of the bank's portfolio. We note that the individual fixed effects we include also control for the average time-invariant characteristics of the banks the individuals borrow from.

All bank balance-sheet and bank performance variables are available at monthly frequency. Their values for month t are proxied by their values at the end of month $t-1$.

Borrower Risk Measures We use the event of ex-post default to proxy for ex-ante borrower risk. Specifically, our borrower risk measure is a dummy variable that takes the value of one if the individual defaults within a six-year period after having received the mortgage. Defaults on foreign currency loans may, however, happen for reasons other than the borrower's inherent riskiness. In robustness estimations we address this issue by varying sample period and definition of the borrower risk measure.

1.4.2 Control Variables Including Fixed Effects

To control for the variation in the amount and quality of loan demand faced by the banks, we also include characteristics of the borrower's locality as well as individual and individual-

[16] Consistent with the literature, for bank subsidiaries we use local subsidiary rather than bank-group-level capital ratios (see, for example, Kashyap and Stein (2000)).

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time fixed effects in our specifications (with time referring to year:month).[17] In particular, in all regressions without locality-time-currency fixed effects, we include the Income in the Subregion measured by the logarithm of the annual tax base per number of taxpayers in the borrower's region, the Unemployment in the Subregion, measured by the proportion of unemployed within the active population of the subregion where the borrower lives, and Population in the Subregion, the logarithm of the population of the subregion where the borrower lives.

Region characteristics are available at yearly frequency. In our estimations,we use the average values of the variables over the sample period.

1.4.3 Empirical Model Line-Up

Next, we present ourbasic as well as complete empirical specifications for the lending channels we attempt to identify.Our dependent variable is a mortgage loan origination dummy and we estimate linear probability models with standard errors clustered at the locality (subregion or settlement) level. To estimate the effect of monetary policy on changes in the volume of credit supply, we use a collapsedpanel of individual-month level observations (excluding the loan currency dimension)and test whether interest rate changes impact the likelihood of mortgage granting (in any currency). The estimated model,i.e. model 3 in Table A.4, also serves as the basis for our more complete specifications applied to address compositional changes along the loan currency and risk dimensions:

$$\begin{aligned} MORTGAGE\ LOAN_{it} =& \alpha_i + \alpha_{jt} + \beta \Delta INTEREST\ RATE_{t-1} + \\ &+ \gamma \Delta INTEREST\ RATE_{t-1} \times BANK\ CAPITAL_{b,t-1} + \\ &+ Controls + \varepsilon_{it} \end{aligned}$$

The dependent variable, $MORTGAGE\ LOAN_{it}$, is a dummy variable that equals one if individual $i$is granted a mortgage in month t. The main independent variable is $\Delta INTEREST\ RATE_{t-1}$ which is the annual change in the (domestic) three month inter-

[17]Since all individuals in the sample have only one bank, the individual-time fixed effects also account for all observed and unobserved heterogeneity at the bank-time level, e.g., changes over time in technology and business model in each individual bank.

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est rate at $t-1$, and $BANK\ CAPITAL_{b,t-1}$ which is the capital ratio at time $t-1$ defined as the ratio of bank equity and retained earnings over total assets of bank b granting the credit to individual i. These latter two variables are discussed more at length in the next section.

We are interested in the coefficient on the interaction term of the interest rate change and bank capital, γ. The specification further loads in individual borrower and subregion-quarter fixed effects (represented by α_i and α_{jt}), and as controls includes the following sets of variables: (1) the interactions of the change in GDP and inflation, respectively, with bank capital; (2) bank capital ratio, bank size, liquidity, profitability and non-performing loans; (3) in specifications without subregion-quarter fixed effects the income, population, and unemployment in the subregion (or settlement) where the borrower lives; (4) in specifications with no time fixed effects the changes in the exchange rate, foreign direct investment, sovereign credit default swap spread and yield curve.

The complete model we use to address the currency and risk compositional channels before saturation with borrower-time fixed effects, e.g., Model (4) in Table A.7, equals (in abridged form):

$$\begin{aligned} MORTGAGE\ LOAN_{itk} =& \alpha_i + \alpha_{jtk} + \beta IN\ FX_{itk} + \gamma RISK_i \\ &+ \delta \Delta INTEREST\ RATE_{t-1} \times IN\ FX_{itk} \\ &+ \theta INTEREST\ RATE_{t-1} \times RISK_i \\ &+ \eta \Delta INTEREST\ RATE_{t-1} \times BANK\ CAPITAL_{b,t-1} \times IN\ FX_{itk} \\ &+ \kappa \Delta INTEREST\ RATE_{t-1} \times BANK\ CAPITAL_{b,t-1} \times RISK_i \\ &+ \mu \Delta INTEREST\ RATE_{t-1} \times BANK\ CAPITAL_{b,t-1} \times IN\ FX_{itk} \times RISK_i \\ &+ Controls + \varepsilon_{itk} \end{aligned}$$

The main independent variables in this second specification are $IN\ FX_{ikt}$, the abridged label for *Credit Is Granted in Foreign Currency*, which equals one if the mortgage granted to individual i in month t is in currency k which is a foreign currency, and equals zero otherwise, $RISK_i$, which is a dummy variable equal to one if individual i is a high risk borrower, and equals zero otherwise, $\Delta INTEREST\ RATE_{t-1}$, which as before is the annual change in

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the relevant three month interest rate at $t-1$, and $BANK\ CAPITAL_{b,t-1}$, which as before is the capital ratio at time $t-1$ defined as the ratio of bank equity and retained earnings over total assets of bankb granting the mortgage.

We are interested in the coefficients, i.e. β, δ, η, and μ, the coefficient on currency denomination and its double, triple and quadruple interactions with the interest rate; interest rate and bank capital; and interest rate, bank capital, and borrower risk; respectively. In addition, we are interested in the coefficients θ, γ, and κ, the coefficients on borrower risk and its interactions with the interest rate, and interest rate and bank capital, respectively. The specification further loads in individual- and locality-time-currency fixed effects (represented by α_i and α_{jtk}), and as controls we include the same sets of variables as in specification (1)).

A major concern with this empirical approach is reverse causality because adding more controls and saturating the model with fixed effects do not necessarily solve this problem. Since we control for GDP growth and inflation, which influence the short-term interest rate, along with several other macro variables, the change in interest rate is likely to capture unexpected changes in monetary policy, which could not be predicted by changes in macro variables. This fact, and the individual-time fixed make it plausible that our approach gives unbiased estimates.

In these specifications we interact the change in interest rate with the level of bank capitalization, and measure how these affect new originations. This way we follow the literature started by Kashyap and Stein (2000) who used bank level data to analyze the bank lending channel. They used the change in bank loans as a dependent variable, and regressed it on the interaction of the bank capitalization and change in monetary policy conditions. The micro data equivalent of the change in bank loans is the new originations, and that is why specify our model this way.

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1.5 Results

1.5.1 Effect of Domestic Monetary Policy on the Volume of Mortgage Loan Supply

We start analysing the effect of domestic monetary policy on banks' mortgage lending decisions by focusing on the effect of interest rate changes on the likelihood of mortgage granting either in the domestic or foreign currency. Table A.4 presents our first results. The estimations are based on a panel of individual-month level observations on borrowers granted a mortgage between January 2004 and August 2008. Since all individuals in our sample take a mortgage at least once, we essentially estimate the intensive margin of granting mortgage credit.[18]

Models 1 to 3 in Table A.4 provide a step-by-step development towards our base specification which is Model 3 and which includes all relevant interaction terms for the interest rate, GDP growth, and inflation as well as individual borrower and locality-time fixed effects. Specifically, to control for unobservable time-varying regional characteristics that might affect household borrowing, in Model 3 we include subregion-quarter fixed effects. In addition, to control for aggregate shifts in economic conditions, in Model 4, we also add month fixed effects. Finally, Model 5 uses subregion-month fixed effects.

The estimated coefficients of the domestic interest rate variable are highly significant in the first two models and have the expected negative sign suggesting that an interest rate decrease expands lending. From Model 2 onwards, we include the interaction of the interest rate with the bank capital ratio. Except from Model 2, the coefficient of this interaction term is positive and significant in all specifications suggesting that a decline in the domestic interest rate boosts credit granting more by banks with low capital-to-asset ratios than by banks with high capital-to-assets ratios. This finding is consistent with the existence of a bank-lending-to-household channel manifesting itself in the sensitivity, to monetary policy changes, of banks' mortgage loan supply, as suggested first by Bernanke and Gertler (1995) and more recently by Sufi (2015).

In Panel B of the table we calculate the economic effect of monetary policy easing for a one standard deviation change in the domestic interest rate, which is equal to 299

[18]Note that R-squares are small despite the inclusion of fixed effects in the regressions because we estimate our models using within transformation proposed by Matyas and Balázsi (2013)

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basis points in our sample. Using the parameter estimates of Model 3, we find that a lowly capitalized bank increases its mortgage credit supply by 0.1 percentage point more relative to a highly capitalized bank, in response to a monetary policy easing. Given that the unconditional probability of granting a mortgage loan in our sample is 0.92 percent, the difference in the change in banks' mortgage loan supply equals to 11 percent, which implies an economically significant impact. Our conjecture concerning the existence of a bank-lending-to-household channel is therefore confirmed by the statistical and economic significance of the result.

1.5.2 Effect of Monetary Policy on the Currency Composition of Mortgage Loan Supply

In this subsection we analyse the effect of the domestic and foreign monetary policies on the currency composition of mortgage credit supply, hence we differentiate between foreign and domestic currency denomination of the loan.

Domestic Monetary Policy Table A.2 presents our results on the effect of domestic monetary policy changes on the currency composition of mortgage loan supply, while estimations in Table A.6 also account for the effects of foreign monetary policy changes.

Model 1 in Table A.2 is our baseline specification which includes all relevant interaction terms for the interest rate, GDP growth, and inflation, as well as individual borrower fixed effects. In Model 1 we include only individual borrower fixed effects, while in Models 2 to 6 we also include locality-time-currency fixed effects to control for time-varying unobservable characteristics of the individuals' location, most importantly changes in currency-specific credit demand and bank market structure. In particular, in addition to individual fixed effects, Model 2 uses subregion-quarter-currency fixed effects, while Model 3 adds time (month) fixed effects to the specification of Model 2. Model 4 further refines our empirical approach by including subregion-month-currency fixed effects. Models 5 and 6 represent our most robust specifications that use, in addition, individual-month fixed effects to control for the time-variation in individual-specific credit demand. With regard to the inclusion of various fixed effects, we use the same structure in all subsequent tables of the paper.

All models in Table A.4 give similar results: The coefficient estimates on the interaction

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between the interest rate change and the bank capital ratio are positive and significant while the coefficient estimates on the triple interaction term of the interest rate change, bank capital ratio and loan currency denomination are negative and significant. The results thus confirm our finding in Table A.4 on the existence of a bank-lending-to-household channel and, in addition, suggest that monetary policy changes also affect the currency composition of banks' supply of mortgage credit. The large negative coefficient on the triple interaction term implies that the differential impact, of a change in the monetary policy rate, on the supply of mortgages by banks with low and high capital-to-assets ratios, is smaller when mortgages are granted in foreign currency. Expansionary monetary policy therefore increases the supply of mortgages by lowly capitalized banks to a larger extent, than by highly capitalized banks, primarily when the mortgage is granted in the domestic currency. Therefore, our results also confirm the existence, for the household sector, of a currency compositional channel of monetary policy, as first proposed, for the corporate sector by Ongena et al. (2018), and subsequently confirmed using data on cross-border lending flows by Takats and Temesvary (2017).

Panel B in Table A.2 presents the economic significance of our results on the currency compositional effect. When credit is granted in the domestic currency (Hungarian Forint), a one standard deviation decrease in the Forint interest rate increases the supply of mortgages by lowly capitalized banks by 0.19 percentage point more than by highly capitalized banks. When credit is granted in the foreign currency (Swiss Franc), the same change in the Forint interest rate increases mortgage credit supply by lowly capitalized banks by 0.09 percentage point less than by highly capitalized banks. Although small, these numbers represent economically significant effects: The semi-elasticities being 20 and -10 percent, respectively. The result shows that at times of domestic monetary policy expansion, banks – especially those with lower capital ratios – tend to tilt their supply of household credit toward loans denominated in the domestic currency, changing the currency composition of their credit supply. Foreign currency lending might thus lower the effectiveness of domestic monetary policy as banks respond to a domestic interest rate change by altering the currency composition of their credit supply.

Foreign Monetary Policy Given that banks in Hungary lend in foreign currencies, monetary policy changes by the central bank issuing the currency may also influence their

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lending behaviour. We therefore examine whether changes in the Swiss interest rate affect the amount and composition of credit supplied by banks in Hungary. We complement our previous empirical specification by including the Swiss interest rate and its relevant interaction terms with the bank capital ratio and loan currency denomination in the regressions. Table A.6 presents our results. The coefficient estimates confirm our findings on the impact of domestic monetary changes on the volume and composition of banks' mortgage loan supply. The estimated coefficients of the Swiss interest rate and its interaction terms are all significant and have opposite signs than the coefficient estimates of the domestic interest rate and its respective interaction terms implying that foreign monetary policy changes do affect the volume and composition of credit supplied by banks in Hungary. Specifically, the negative sign of the coefficient of the interaction between the interest rate change and bank capitalization suggests that a decrease in the Swiss interest rate contracts credit supply in Hungary, especially by banks with low capitalization. In addition, the positive sign of the coefficient estimate of the triple interaction term reflects that a decrease in the Swiss interest rate decreases mortgage lending by low capitalization banks, more in the domestic than in the foreign currency, i.e., we conjecture a relative expansion of credit supplied primarily by low capitalization banks in the foreign currency.

Panel B Table A.6 presents the economic significance of the results. For domestic interest rate changes, we find an economic effect similar to that implied by our earlier findings in Table A.2. With respect to foreign interest rate changes, we find that as a response to a one standard deviation (i.e., 41 basis points) decrease in the Swiss interest rate, a lowly capitalized bank decreases its supply of mortgage credit in the domestic currency by 0.26 percentage points more than a highly capitalized bank. This number equals only to 0.16 percentage points if the mortgage is offered in the foreign currency. Taking the unconditional probability of mortgage granting in the sample into account, the numbers imply an 11 percent difference in the differential reactions of lowly and highly capitalized banks across the domestic and foreign currencies.

We therefore conclude that changes in the foreign interest rate also alter the currency composition of banks' domestic credit supply: Expansionary monetary policy in Switzerland generates a relative contraction in mortgage lending in Hungary primarily in the domestic currency.

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1.5.3 Effect of Monetary Policy on the Risk Composition of Mortgage Loan Supply

In previous sections, we documented that domestic and foreign monetary policies have an impact on the volume and currency composition of the supply of mortgages by banks. In Table A.7, we further investigate whether monetary policy influences banks' risk-taking in the mortgage lending segment. We therefore complement our previous specifications by interacting the interest rate change, the bank capital ratio, the loan currency denomination, and their triple interaction term with our risk measure. To proxy for borrower risk, we use a dummy variable taking the value of one if the individual defaults within a six-year period after having received the mortgage. With regard to the use of various fixed effects, the table follows the structure of Tables A.2 and A.6.

Table A.7 confirms our previous findings on the impact of monetary policy on the volume and currency composition of mortgage loan supply: The coefficient estimates of the respective double and triple interaction terms are significant and have the same estimated signs as in our earlier, simpler specifications. Our variable of interest in the table is the quadruple interaction of the domestic interest rate, bank capital ratio, foreign currency denomination and borrower risk. Coefficient estimates on this quadruple interaction term are significantly positive in all estimations, suggesting that monetary policy changes affect the risk composition of banks' loan supply when banks lend in the foreign currency. The point estimates of the quadruple interaction term are very similar across Models 2 to 6.

To assess the economic relevance of the result, we calculate the impact of a one standard deviation change in the monetary policy rate on the difference in credit supply by lowly versus highly capitalized banks by currency denomination and riskiness, using estimates of Model 4, our main specification including both individual and subregion-month-currency fixed effects.

We find that, when mortgages are granted in the domestic currency, as a response to a one standard deviation decrease in the Hungarian interest rate, lowly capitalized banks increase their mortgage lending to non-risky borrowers by 0.20 percentage point more than highly capitalized banks. When mortgages are granted in the foreign currency, a decrease of the same magnitude in the interest rate generates 0.13 percentage point less lending, to non-risky borrowers, by lowly capitalized banks than by highly capitalized banks. Given that

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the unconditional probability of granting a mortgage is 0.92 percent, this difference across the two currencies in the differential impact of the interest rate change on the supply of mortgages to non-risky borrowers, by low versus high capital-to-asset ratio banks amounts to -36 percent (see Panel B of Table A.7). When banks lend to risky borrowers, the difference in the differential reaction of lowly versus highly capitalized banks as a response to a decrease in the interest rate is only -4 percent, a significantly smaller number.[19]

This implies that currency compositional changes triggered by monetary policy shocks are less prevalent when banks lend to riskier clients and, at the same time, suggests that expansionary domestic monetary policy may generate bank risk-taking by stimulating banks to lend to riskier clients in the "riskier" foreign currency.

In Table A.8 we also add to our specifications the foreign monetary policy rate and all its interaction terms with the relevant variables. The inclusion of the Swiss interest rate and its interaction terms reinforces our results on the risk-taking channel of domestic monetary policy. When banks lend to risky borrowers, the difference across the two currencies, in the differential reaction of lowly versus highly capitalized banks as a response to a decrease in the domestic interest rate is estimated to be 1 percent, implying a higher likelihood of granting a loan in the foreign than in the domestic currency.[20]

Similar to the results in Table V, the coefficient of the interaction between the interest rate change and bank capitalization has a negative sign suggesting that a decrease in the Swiss interest rate contracts credit supply in Hungary, especially by banks with low capitalization. Moreover, the positive sign of the coefficient estimates of the triple interaction term, in Models 2 to 6, reflects that a decrease in the Swiss interest rate decreases mortgage lending by lowly capitalized banks more in the domestic than in the foreign currency.

The coefficient estimates on the quadruple interaction term of the Swiss monetary policy rate, bank capitalization, foreign currency denomination and borrower risk are negative and highly significant, suggesting that when loans are granted to risky households the currency

[19] When banks lend to risky clients in the domestic currency, a one standard deviation decrease in the interest rate results in 0.20 percentage point larger increase in mortgage lending by lowly capitalized banks than by highly capitalized banks. When banks lend to risky clients in the foreign currency, this differential effect is not significantly smaller: its magnitude is above 0.16 percentage point.

[20] When banks lend to risky clients in the domestic currency, a one standard deviation decrease in the interest rate results in 0.065 percentage point larger increase in mortgage lending by lowly capitalized banks than by highly capitalized banks. When banks lend to risky clients in the foreign currency, the magnitude of this differential effect is 0.07 percentage point.

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compositional channel of foreign monetary policy does not prevail. Specifically, we find that when banks lend to risky households, the differential reaction of lowly versus highly capitalized banks to a one standard deviation decrease in the Swiss interest rate does not depend on the currency denomination of the loan (see Table A.8, Panel B).

1.6 Robustness: Samples and Risk of Borrowers

1.6.1 Borrower Risk Measures

Our borrower risk measure so far relied on future individual defaults within a six-year period after having received the mortgage. But as we noted before defaults on foreign currency loans may, however, happen for reasons other than the borrower's inherent riskiness.

The September 2008 exchange rate shock to the Hungarian currency for example substantially increased households' monthly payments and their probability of default (Verner and Gyöngyösi, 2017). Therefore, some households might have defaulted on their mortgage as a consequence of the exchange rate shock rather than their ex-ante riskiness.

To account for the impact of the exchange rate shock, we also estimate, in Table A.9 in the Appendix, our regressions on a sample that excludes individuals defaulting on their mortgage in the period between October 2008 and October 2009. Our results are robust to this modification of the sample.

We also present, in the Appendix, robustness estimations using a second risk measure: A dummy variable that equals one if the borrower is required to have a guarantor at the time of taking the mortgage, and zero otherwise. We build on the idea that even though having a guarantor lowers the riskiness of the loan from the bank's point of view (i.e., loans with a guarantor are reimbursed from the income stream of two individuals), that on net such loans may still remain riskier than those granted to households that are less risky to start with. Although employing a guarantor somewhat lowers loan delinquency in US data for example Jiang et al. (2013) also document in their study of 477,209 loan contracts granted to firms between 2006 and 2014 by a Spanish bank that the overuse of personal guarantees can blunt their effectiveness. Overall, Tables A.10 and A.11 in the Appendix confirm our earlier findings also for this alternative borrower risk measure, i.e., expansionary domestic monetary conditions increase the supply of mortgage credit to all

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households in the domestic currency but only to risky households in the foreign currency.

1.6.2 Sample Selection

All loan contract samples face potential borrower discouragement and loan application approval biases (e.g., Cole (1998)). Our sample may suffer from one additional selection issue. Foreign currency loans issued during our sample period may be missing from the population of loans we rely on because of the Early Repayment Program that allowed for repayment of currency denominated mortgages at a preferential exchange rate. The debt restructuring program was initiated by the Hungarian government in November 2011 because of households' increasing monthly due payments and the consequent high number of defaults. The program concerned foreign currency loans and entitled all households to repay their mortgage and home equity debt denominated in foreign currency at an exchange rate about 25 percent below the market rate of that time at the expense of banks. As the gains from such an early repayment opportunity were high, many borrowers chose to participate and about 170,000 mortgage-backed housing loans were repaid at the favorable exchange rate, which accounted for 23 percent of foreign currency denominated debt. Since the debt restructuring program took place before the Household Registry was established, we are not able to observe the loans that had been originated during our sample period and repaid in 2011. In addition, such missing loans are likely to be non-random. Wealthier households were more likely to opt for early repayment and, at the same time, they might have been more likely to have borrowed from specific banks. Loans that were originated early might have also been more likely to be repaid as these loans may have been associated with lower nominal amounts. To assess how the resulting sample selection bias might affect our analysis, we exploit a second dataset in which we can observe the participating loans as well: The data covers all mortgage loans from three of the largest commercial banks in Hungary.

Using the population of mortgages from the three-bank database, we estimate the effect of domestic monetary conditions on mortgage credit supply for the sample of all loans, and for the sample of non-participating loans. As in the credit registry data, we can only observe the non-participating loans, the latter sample corresponds to a subsample of mortgages, originated by the three banks, within our primary sample of loans.

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Table A.12 in the Appendix presents our results. Column 1 to 3 contain estimates for the sample of all loans, and column 4 to 6 for the non-participating loans only. The regressions are based on our most robust empirical specifications. Columns (1) and (4) present regressions containing individual and subregion-month-currency fixed effects. The estimations in all other columns control for the time-variation in individuals' loan demand by including individual-month fixed effects. We find that, in our most robust specifications (i.e., Columns (2) and (3)) run for the sample of all loans, the signs of the coefficient estimates on our variables of interest, are the same as in the estimations based on the credit registry dataset, indicating that this kind of sample selection does not affect our primary findings. However, as the sample uses data from three banks only, the cross-sectional variation in bank capitalization is much smaller and the magnitude of the coefficient estimates differs from that of the estimates obtained from regressions using our primary data, the credit registry. The regressions based on the non-participating loan subsample in the three-bank database (presented in Columns (4) to (6)) provide, overall, less convincing results. In the most robust specifications (Columns (5) and (6)), the coefficient estimates on the quadruple interaction terms have the expected positive sign, but their significance is below the 10 percent level.

Since the three-bank database includes the loan-to-value ratio, a classical measure of borrower risk, our estimations in Table A.12 also serve as robustness tests of the specifications based on our primary measures of borrower risk (default and guarantor requirement). Table A.12 presents the results using a continuous loan-to-value ratio as measure of risk. As discussed above, the sign and significance of the coefficient estimates on the quadruple interactions terms in Columns (2) and (3) confirm our earlier findings concerning the impact of monetary policy changes on risk composition of mortgage credit supply.

1.7 Conclusion

How do monetary conditions affect the supply of mortgage credit by banks to households? To answer this uestion we use a comprehensive supervisory dataset from Hungary.

We establish three major findings. First, we document the existence and potency of a "bank-lending-to-households" channel by showing that monetary conditions affect the supply of mortgage credit in volume. Second, we show that expansionary domestic monetary

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conditions increase the supply of mortgage credit to all households in the domestic currency but only to risky households in the foreign currency. This is a salient finding because as most households are unhedged, bank lending in multiple currencies may involve additional risk taking for banks, both in terms of currency risk and in terms of credit risk. Finally, we show that changes in foreign monetary conditions affect lending in the foreign currency more than in the domestic currency, but that such changes do not trigger corresponding compositional shifts in the credit risk exposures of the banks, though as before the currency risk incurred if left unhedged by households may still turn in credit risk for banks if the domestic currency depreciates.

In sum, domestic and foreign monetary policies alter the supply of mortgages to households in volume and in composition confirming for the first time in the literature that both bank lending and risk-taking channels are operational in residential mortgage markets as well.

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Chapter 2

Financial Crisis, Creditor-Debtor Conflict, and Political Extremism

2.1 Introduction

In the past decade there has been surge in the appeal of right-wing populist parties around the world (Rodrik, 2017). Understanding the success of these parties is important because their emergence has increased policy uncertainty and may pose a threat to pro-growth institutions such as free trade and openness. Popular explanations for the rise of populism often point to a cultural backlash against ruling elites. However, the success of populist parties after the 2008 financial crisis suggests a role for explanations based on increased economic insecurity. Financial crises tend to be followed by increased political polarization (Mian et al., 2014) and a rise in the vote share of far right populist parties (Funke et al., 2016). Yet there is limited direct evidence that financial distress affects populist far right voting, and the underlying mechanisms are not well understood.

In this paper, we examine how household financial distress ensuing from the 2008 financial crisis affected political preferences. We focus on a household foreign currency debt crisis in Hungary and measure its impact on the populist far right vote. Prior to the financial crisis, many Hungarian households borrowed heavily in foreign currency, while some borrowed in domestic currency through government-subsidized loans. The unexpected exchange rate depreciation in the crisis increased the debt burden of foreign currency borrowers but not of

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local currency borrowers. We show using zip code level data that a higher share of foreign currency loans significantly increased the vote share of the far right following the depreciation. Moreover, we present evidence that the electoral success of the far right party, which advocated aggressive debtor-friendly policies, is driven by *creditor-debtor conflict*, that is, disagreement between creditors and debtors about the resolution of the crisis.

Section 2.2 describes the foreign currency credit expansion and the political landscape in Hungary. The household lending boom started in 2000 when the government introduced a mortgage interest rate subsidy program for local currency loans. The program was cut back in 2004, fueling a phase of foreign currency lending. By 2008 more than 60 percent of household debt was denominated in Swiss franc. While the exchange rate was stable before the crisis, between September 2008 and the election held in April 2010, the domestic currency depreciated by 23 percent against the Swiss franc. This exchange rate shock increased the indebtedness of the households by 4 percent of pre-crisis GDP. Figure B.4 shows that concurrent with the deprecation, the popularity of the far right party Jobbik (Movement for a Better Hungary) surged, increasing from 2.6 percent of the vote in 2006 to 16.7 percent in 2010. The rest of the paper is devoted to establishing that this relation is causal and understanding why the debt crisis increased the demand for the populist far right.

In Section 2.3 we begin by describing our data. We build a new zip code level panel dataset combining household credit registry data, election outcomes, and data on local characteristics. We begin by using individual level survey data to compare foreign and local currency borrowers. Though the average characteristics of these two groups are similar, foreign currency borrowers have better educational attainment and higher income, but live in smaller cities. Then we move on to zip code level data. We define exposure to the exchange rate shock to be the share of foreign currency denominated household loans in September 2008, prior to the depreciation. Zip codes with lower educational attainment and higher unemployment have higher foreign currency exposure, so these are factors that we explicitly account for in our empirical analysis.

To quantify the effect of an increase in debt burdens on voting outcomes, we use a difference-in-differences framework, exploiting cross-sectional variation in households' exposure to the exchange rate shock through their debt positions. Our approach uses variation

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in the currency composition of loans and keeps per capita number of loans and pre-crisis debt-to-income fixed. The key identifying assumption is that foreign currency debt exposure is not correlated with time-varying shocks to political preferences.

We present the results in Section 2.4. We start by showing that the vote share of the far right evolved in the same way in the decade before the crisis in high and low exposure zip codes, consistent with the assumption of parallel trends. Our main finding is that the household foreign currency debt shock significantly increases the vote share of the far right in the 2010 parliamentary election, after the depreciation. This finding is robust to a wide variety of controls and is not sensitive to the choice of exposure measure. In terms of magnitudes, a 10 percentage points unanticipated debt-to-income shock raises the vote share of the far right by 2.1 percentage points between 2006 and 2010. The estimates explain 3 percentage points, or one-fifth, of the rise in the far right vote share. The effect of the crisis is persistent, as more exposed zip codes voted more for the far right in 2014 and 2018 as well.

We tackle a variety of identification concerns related to alternative explanations for the success of extremist parties. We begin by showing that unobserved extremist attitudes do not drive our results. Extremist attitudes are persistent, and the far right might have been more popular in regions where racism or anti-semitism were more prevalent historically. To rule out this explanation for the rise of the far right, we conduct a placebo test using the first secret ballot election in 1939, when far-right parties received 25 percent of the vote. We find no relation between the foreign currency share in 2008 and the vote share of the far right in 1939. A related concern is that exposed areas may have developed more xenophobic attitudes over time through immigration, but we find no evidence that a differential presence of minority and immigrant groups in exposed areas drives our results.

Further, local labor market shocks do not account for the effect of foreign currency debt exposure on the far right vote share. In particular, our results are robust to controlling for the change in the local unemployment rate, two-digit sector employment shares, and exploiting only within-labor market variation. Finally, we show that controlling for foreign currency debtors' naivete, campaign spending of parties, and the change in house price do not alter our main results.

So far we have established that higher household exposure to the exchange rate shock

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significantly increased the appeal of the populist far right. However, this causal relationship does not tell us *why* people with exposure to foreign currency debt voted for an extreme right-wing party.

In Section 2.5 we study the mechanisms through which exposure to the exchange rate shock affected political preferences. We begin by examining the creditor-debtor conflict channel. This explanation emphasizes the different views of creditors and debtors on how to resolve the crisis. As creditors might find it easier to organize themselves and influence policy, a populist party might choose to represent the debtors' interests and advocate debtor-friendly policies to win the support of distressed borrowers.

Consistent with the creditor-debtor conflict explanation, during the 2010 campaign the far right party campaigned on explicit policy proposals to mitigate the financial distress of foreign currency debtors. In particular, their platform promised payment relief and debt restructuring for borrowers with foreign currency loans. In contrast, other parties either had vague proposals, or made no mention foreign currency debtors in their campaign manifestos.

The far right's emphasis on debt relief ultimately pushed the center right (Fidesz) government to implement a large-scale debt-restructuring program in 2015. The program removed additional exchange rate risk and provided partial principal reduction for foreign currency loans. As a result, we find that the vote share of the center right party increased in 2018 in zip codes with higher foreign currency exposure.

The creditor-debtor conflict channel also has the straightforward implication that it is foreign currency debtors who voted for the far right. While we cannot link individual debt positions to voting behavior, we provide evidence consistent with this logic. In particular, we find that areas with a higher fraction of people indirectly affected by the crisis, who are not necessarily foreign-currency debtors, do not experience a stronger increase in the vote share of the far right. The increase in foreign currency debt burdens worsens local economic conditions by depressing demand, lowering local employment and thereby affecting all households. This implies that foreign currency debt exposure increases the default rate of even local currency loans. However, these indirect effects of the debt shock on the vote share of the far right are smaller and not statistically significant.

We also examine several other channels for why household financial distress, and the financial crisis more broadly, may have contributed the rise of far right. These explanations

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are prominent in the discussions of the political consequences of financial crises. We show several pieces of suggestive evidence that rising inequality and the bail-out of the banking sector do not account for the electoral success of the far right. Inequality was flat in the period around the crisis, and Hungary only had a limited bank bail-out of one major domestic bank that was fully repaid before the 2010 election.

General dissatisfaction and declining trust in establishment parties among the debtors could have also increased the appeal of the far right in more depressed regions. The declining trust channel would imply that other extremist and new parties should also benefit from the crisis. Contrary to this hypothesis, the newly founded green party did worse in more affected zip codes. Moreover, the communist far-left increased its vote share only marginally in more affected zip codes. Declining trust is also not reflected in declines in turnout or in the share of invalid votes in exposed areas. Finally, we find that trust in National Assembly did not decline differentially in more exposed regions.

Our paper is related to the economic voting literature (Fair, 1978), which analyzes how economic conditions affect political preferences. We know if little work that directly connects financial distress from high household debt and voting for extremist parties. Most closely related to our study, Stock (1984) and Eichengreen et al. (2017) relate mortgage debt, mortgage interest rates, and the threat of foreclosures to agrarian unrest and populist support in the late 19th century US. We complement these studies by exploiting a natural experiment for household financial distress and focusing on a sharp recent shift in political preferences.

We build on and contribute to a body of work that studies the effect of financial crises on populism and political extremism. Several papers analyze the effect of financial and ordinary crises on political polarization and vote share of extremist parties using country level data (Mian et al., 2014; Funke et al., 2016; Bromhead et al., 2012; Brückner and Grüner, 2010). We complement these studies as we use zip code level data, which enables us to control for time-varying country-specific shocks to political preferences, and we also examine the channels through which financial crises affect political preferences.

Our paper is related to studies analyzing broader economic conditions and voting behavior. Healy and Lenz (2014) examine how delinquency and unemployment affected the incumbent Republican Party in the 2008 presidential election. Several studies exploit re-

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gional variation to study the relation between labor market shocks and the voting behavior in the 1930s and in recent decades (King et al., 2008; Doerr et al., 2018; Jackman and Volpert, 1996; Autor et al., 2016). Finally, recent studies using survey data (Guiso et al., 2017; Geishecker and Siedler, 2011) measure how economic or job insecurity affect the popularity of populist and far-right parties. The Hungarian setting allows us to study the effect of a well-defined economic shock on the demand for populism.

Several papers examine the success of the far right in Hungary (Karácsony and Róna, 2010; Rudas, 2010). Róna (2015) gives a comprehensive review of the literature on the rise of Jobbik. Almost all of these papers reject the hypothesis that the financial crisis of 2008 explains at least partly the increasing appeal of the far right. Grajczjár and Tóth (2011) emphasizes the economic insecurity of the far-right voters, but they do not mention the foreign currency debt crisis as a reason for the success of the far right. However, unlike our study, none of these studies systematically analyzes the empirical relation between exposure to the crisis and the far right vote. As a result, we draw different conclusions.

2.2 Context

In this section we describe the Hungarian household credit boom in the 2000s, and the political landscape.

2.2.1 Household lending boom

Figure B.5a shows the household debt stock relative to GDP by currency denomination. Household indebtedness was low at the end of the 1990s, but the introduction of a mortgage subsidy program in 2000 significantly increased household borrowing in domestic currency. The subsidy program significantly eased the borrowing constraints of households, and lending picked up.

Because of the high fiscal costs of the subsidy program, at the end of 2003 the government tightened the eligibility rules and decreased the size of the interest subsidy.[1] This cutback of the subsidy program coincided with the start of the foreign currency credit expansion. Foreign currency loans were first offered by foreign banks, but later in the boom

[1] Farkas et al. (2004) review the housing market and the subsidy program between 1999 and 2003.

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domestic banks also entered the foreign currency loan segment.[2] The continued credit expansion raised household debt to 25 percent by September 2008. Concurrent with the credit expansion, the share of foreign currency debt also rose, from 5 percent in 2004 to 66 percent by September 2008. The most prevalent foreign currency denomination was Swiss franc (CHF) which accounted for 97 percent of foreign currency debt at the start of the crisis, and the rest was mainly euro and Japanese yen. Because the interest rate subsidy program applied only to mortgage loans, the share of foreign currency debt was close to half for mortgages, while most of home equity debt was denominated in foreign currencies.

Both demand and supply side factors contributed to the spread of foreign currency lending. A large interest rate differential between HUF loans at market rates and foreign currency loans was an important factor (Rosenberg and Tirpák, 2008; Csajbók et al., 2010). Perceived stability of the domestic currency (Brown et al., 2017) and expectation of euro adoption also played a crucial role (Fidrmuc et al., 2013). Moreover, banks trying to match the currency composition of their liabilities (Brown et al., 2014) and loose foreign monetary policy (Ongena et al., 2018) also contributed to the supply of foreign currency credit.

Before 2008 the Hungarian forint exchange rate was stable, but, during the crisis, the forint depreciated significantly against the Swiss franc. Figure B.5b shows the percent change in the monthly HUF/CHF and HUF/EUR exchange rates relative to January 2004. During the credit expansion phase, the forint was maintained a peg to the euro with a ± 15 band, but de facto it was a ± 5 band (Ilzetzki et al., 2017). The peg was abolished in February 2008. With the outbreak of the crisis in 2008, the Hungarian forint depreciated significantly vis-à-vis the Swiss franc. Between September 2008 and April 2010, when the election was held, the HUF/CHF exchange rate depreciated by 23 percent. The forint depreciated further against the Swiss franc during and after the eurozone crisis.

The large depreciation of the domestic currency was not anticipated by market participants. Data from Consensus Economics, an economic survey organization, shows that experts projected that the Hungarian forint-euro exchange rate would remain stable right before the outbreak of the crisis. Figure B.5c plots the expected percent change in the exchange rate on a 12 and 24 months horizon over time. Experts forecasted appreciation in the half year before the crisis and a minor depreciation before that.

[2] Lending in foreign currencies to households was common even before 2004, as banks offered foreign currency auto loans from 2000 onwards.

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Hungarian households were not hedged against the depreciation of the domestic currency. Several studies show that few households held any foreign currency assets.[3] Moreover, the fraction of households earning income in foreign currency was negligible before the crisis.[4]

As Hungarian households had limited income and assets in foreign currencies, the exchange rate shock significantly increased household debt burden. This quickly translated into a rising share of non-performing loans. Figure B.5d shows the share of housing loans that are at least 90 days delinquent. The figure shows the delinquency rate separately for foreign currency mortgages, subsidized domestic currency mortgages, and foreign currency home equity loans. The delinquency rate for domestic currency loans increased only slightly during this period. On the other hand, by 2014 the share of delinquent foreign currency mortgage loans was almost 20 percent, while 30 percent of home equity loans were delinquent. Strategic default cannot explain the high delinquency rate because in Hungary debt is recourse. In addition, there was no provision for personal bankruptcy prior to 2015.

Although some warned about the potential risks of foreign currency lending, no effective regulatory measures were taken to curb its growth before the crisis. The Central Bank's Report on Financial Stability (MNB, 2006) already discussed the risks and possible negative effects associated with foreign currency lending in 2006. In 2007, the Central Bank of Hungary got the banking sector to stop lending in Japanese yen, as it was considered too risky, but lending in Swiss franc and euro continued.

Prior to the election in 2010, there were no major policies targeted at foreign currency loans. The Hungarian government agreed to a 20 billion EUR IMF rescue package to cover its external financing needs, so it had limited space to intervene in domestic credit markets.

After the 2010 election, the center-right government implemented two major policies to help foreign currency debtors.[5] First, in 2011 the government launched the Early Repay-

[3]Using repeated cross-sectional survey data, Backé et al. (2007) documents that less than 10 percent of households had foreign currency holdings between 2002 and 2006, and the median positive holding was around 100 EUR. Moreover, the primary motive for holding foreign currency cash was spending abroad. Feige (2003) calculates that only 6 percent of total cash holdings were denominated in foreign currencies in 2001.

[4]Though Hungary joined the European Union in 2004, emigration to EU countries remained low. Hárs (2016) uses census data and shows that less than 2 percent of Hungarian households emigrated by 2011, and emigration accelerated only after 2010.

[5]After the outbreak of the crisis several regulatory measures were initiated, which are summarized by Banai et al. (2011). Initially, these measures were to prevent the continuation of foreign currency lending,

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ment Program (ERP), which allowed households to prepay their mortgage and home equity debt at a preferential exchange rate at the cost of the banks. The preferential exchange rate was approximately 30 percent lower than the market rate at that time.[6] There were no eligibility criteria for participation, but the program stipulated that the entire principal had to be prepaid. Approximately 170,000 loans were prepaid, constituting approximately 20 percent of outstanding foreign currency loans.

The Early Repayment Program was initiated by the far right. Róna (2015) notes that the far-right party Jobbik started collecting signatures for a petition to force banks to convert foreign currency loans into domestic currency at the exchange rate at the time of origination on September 1, 2011.[7] Under pressure from Jobbik, the center-right government responded by proposing the Early Repayment Program, which was enacted on September 19, 2011.

Second, the government initiated a settlement and a conversion program in late 2014. The settlement program required banks to compensate borrowers for charges from unilateral changes in the terms of the contracts (interest rate increases and exchange rate spreads). The compensation amounted to more than 3 percent of 2014 GDP. The conversion program converted foreign currency mortgage and home equity loans to domestic currency, and hence ended the exchange rate exposure of households.

2.2.2 Political landscape

After the transition from a one-party system to a multi-party system in 1990 there were two significant extremist right-wing parties in Hungary: the *Hungarian Justice and Life Party* (MIÉP) and the *Movement for a Better Hungary* (Jobbik). Minkenberg (2013) reviews radical right parties in Europe, and classifies Jobbik as extremist right and MIÉP as ethnocentrist right. We consider a vote as far-right if it is cast for either Jobbik or MIÉP.

We classify Fidesz, which won the elections in 1998, 2010, 2014 and 2018, as a conserva-

which culminated in the ban of foreign currency lending to households in 2010. Later policies targeted foreign currency debtors directly.

[6]The preferential exchange rates were 180HUF/CHF, and 250HUF/EUR. The market rates were 237 HUF/CHF and 284 HUF/EUR, respectively in September when the program was announced.

[7]The question on the petition was: "Do you agree that the conversion of foreign currency loans to domestic currency should happen at the exchange rate of the time of origination, and the burden of the conversion should be borne by the banking sector?"

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tive center right party. This classification is in contrast with the recent literature analyzing populism (see for example van Kessel (2015); Rodrik (2017); Inglehart and Norris (2016); Mudde and Kaltwasser (2017)). However, studies before Fidesz's 2010 electoral win did not label it as an extremist, anti-establishment party. For instance, Mudde (2007) study populism in pre-crisis Central Europe, but does not refer to Fidesz as a far-right party. Norris (2005) analyzing radical right parties mentions only MIÉP. This indicates that before 2010 most studies analyzing populist and radical parties in Hungary focused on Jobbik and MIÉP. However, Fidesz policy moved further toward right-wing populism after the 2010 election.

One the far-left end of the spectrum, the communist Workers' Party remained marginal throughout the whole post-transition period. Though represented in parliamentary elections, the Workers Party never obtained sufficient support to gain parliamentary seats. Their best result was in 1998 when they received 4.1 percent of the votes, and from 2006 onward their support remained below 1 percent.

We classify the remainder of the parties as follows. Votes for Fidesz, the Christian Democrats (KDNP), the Hungarian Democratic Forum (MDF), and the Independent Smallholders, Agrarian Workers and Civic Party (FKgP) are considered center right. The Socialist Party, Alliance of Free Democrats (SZDSZ), Together (Együtt), Conversation for Hungary (PM), and Democratic Coalition (DK) are considered as center-left parties. There is a green party, Politics Can Be Different (LMP). The aggregate vote shares for these political blocks and turn-out at parliamentary elections since 1998 are summarized in Table B.1.

2.3 Data, summary statistics, and empirical strategy

2.3.1 Data

We build a new zip code level database by combining election data, credit registry data with several other data sources. This subsection introduces the data sources.

Election data We use zip code level parliamentary election results from the National Election Office from 1998 to 2018. Though the data is available at the polling station level, the boundaries of the polling stations change over time. To address this problem we

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aggregate the data to zip code level. We assume that the zip code of the polling station is the same as voters' zip code assigned to that polling station.[8] Because of the addresses of polling stations does not contain the zip code we geocode the addresses to get the zip codes.

We use only the votes that are casted on party lists. The Hungarian election system of Hungary is a combination of a proportional and a majoritarian systems. People have two votes, and they could vote for both a candidate and a party list. The election system is tilted towards the majoritarian system, to win the election parties need to win electoral districts. This might motivate supporters of smaller parties to cast their vote strategically on larger parties.[9] To measure the political preferences we focus on votes on party lists only.

Our focus is on the 2010 election because the election system changed significantly in 2011. This change affected the relative importance of the proportional and majoritarian systems, the rules for campaigning changed, and it included the redrawing of the electoral district borders as well. Since we use zip code level data, gerrymandering does not affect our results. But some other changes might have had an impact on voters' behavior therefore we exclude 2014 and 2018 from our baseline sample.

Household Credit Registry Data Data on household debt comes from the Household Register of the Central Credit Information System (KHR). It contains the universe of household loans that were outstanding or originated later than April 2012. The previous version of KHR contained only defaulted loans, which is available from 2010. The characteristics of loans are detailed: time of origination, maturity, original amount of debt, type of loan, payment scheme, currency denomination and identity of the bank are provided and these are supplemented with monthly data on outstanding debt, amount of payment, and delinquency status. Information on debtors is limited, only the address, and year of birth

[8]There are municipalities which share the same zip code hence having information on the settlement enables use to have a more detailed partition. In the following for the sake of simplicity we will use the term zip code for municipality-zip code pairs. In larger cities the area covered by a polling stations might split across many zip codes. Since the number of voters assigned to a polling station is small, this is unlikely to affect significantly the results.

[9]There is a 5 percent floor for parties to get into the Parliament.

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is known.[10]

We reconstruct the data for the pre-2012 period using the detailed characteristics of loans and assuming annuity repayment. Since data collection started only in 2012, there is no information on the indebtedness of households for the preceding period. We reconstruct the data at the loan level using the loan characteristics. We assume annuity loans, and complement the credit registry data with bank-month-currency-loan type specific average interest rate.[11] This allows us to calculate the outstanding debt and payment for each loan in each month from origination until 2012. For more details see Appendix B.1.1.

Loans that were originated early, and loans with shorter maturity are more likely to be missing. We restrict our the baseline sample to mortgage loans and home equity loans because these products have longer maturity, and they also represent the majority of the household debt.

The Early Repayment Program (ERP) initiated by the government at the end of 2011 enabled households with foreign currency mortgage and home equity loans to repay their debts. Participating loans are missing from the credit registry as they were repaid before the start of data collection. Aggregate participation rate in the program was 23 per cent.

To mitigate the problem of missing loans stemming from ERP, we estimate participation in the program using aggregate data. We have the bank level aggregate participation rate, and we calculate the market share weighted participation.

We validate our approach by comparing the reconstructed loan level data to aggregate statistics. The loan level data matches well the aggregate statistics.

We match the election data and the credit registry data at the zip code level.

Other data sources We use several other administrative, settlement level data sources for control variables. The T-Star database contains settlement level yearly data on a wide range of characteristics, such as demographics, unemployment and income. We use Census data from 2011 which contains information on educational attainment for people above age 7, and ethnic composition of settlements. We use data on three referendums from the

[10] Detailed address (municipality and zip code) of the debtors is available for loans outstanding in June 2014. Because some loans were paid back by this time we do not have address data for all loans. If the debtor has other loan outstanding in either month we use that address information.

[11] Aggregate statistics show that more than 90 per cent of the domestic currency mortgage loans were subsidized. Because of this, for domestic currency mortgage loans we calculate subsidized interest rates.

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National Election Office. The referendums were about the accession to the European Union in 2003, about the abolishment of tuition, co-payment, and hospital daycare fee in 2008, and about immigration in 2016.

We also use several administrative firm level databases to construct employment shares of firms that could have been affected by the crisis. Our primary dataset is the Hungarian Corporate Income Tax Data which covers the universe of double book-keeping firms. It contains information on employment, firms' balance-sheet data and income statements. We match this database with a firm register data which has the address of the firm headquarters. We also merge the firm credit registry data to the balance sheet data. This combined dataset allows us to construct local employment by sector, and by foreign currency exposure of firms as well.

To complement our zip code level analysis we use an individual level survey to compare foreign currency borrowers to local currency borrowers. We rely on the Euro Survey data collected by the Oesterreichische Nationalbank (OeNB, central bank of Austria) in several Central European countries. We use the data on Hungarian individuals, and the 2007-2011 waves.

Table B.2 contains descriptive statistics on the main variables from the election data, credit registry, and control variables.

2.3.2 Measuring exposure to the depreciation

Individual level heterogeneity We use OeNB's individual level Euro survey data to examine what drives the currency choice of individuals. We compare foreign currency debtors to local currency debtors, and to the rest of the individuals with no loans. Foreign currency debtors are defined as borrowers that have some foreign currency debt. Local currency debtors are defined as borrowers that have no foreign currency loans. We pool together the waves of the survey between 2007 and 2011. Table B.3 presents the results. Column 1 shows the average characteristics of foreign currency borrowers, column 2 for local currency borrowers, column 3 for the rest of the individuals. Column 4 contains the difference between foreign currency and local currency borrowers with t statistics indicating whether the difference is significant.

We find that foreign currency debtors have better characteristics on average than local

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currency debtors. For example, they are less likely to have the lowest education, and more likely to have the highest educational attainment. The pattern is similar for income as FC debtors are more likely to be in the highest quartile of the income distribution. We also find that they are more likely to be employed. They are younger than local currency borrowers, which is consistent with the later start of foreign currency lending. Examining the saving behavior of these two groups we find that they are similar in their ability to save, and they are also similar in having foreign currency savings deposits. Results are similar if we define FC borrowers if the majority of their debt is denominated in foreign currencies. We find similar pattern when we examine individuals who plan to borrow in the near future using the 2007 and 2008 waves.[12]

2.4 Results

2.4.1 Baseline results

Parallel trend for the far right We begin by examining whether the support for the far right in zip codes with high foreign currency share and in zip codes with low foreign currency share evolved similarly before the crisis. We estimate a regression where we allow FCS to have different effect on the vote share of the far right across elections:

$$y_{it} = \alpha_i + \delta_t + \sum_{t \neq 2006} \beta_t FCS_i \times Year_t + \gamma X_{it} + \epsilon_{it} \tag{2.1}$$

The controls include zip code characteristics interacted with election year dummies, and county fixed effects interacted with election year dummies. The standard errors are clustered at the subregion level.

The vote share of the far right evolved similarly in more exposed and less exposed zip codes before the crisis. Figure B.7 plots the estimated β_t parameters, which measure the difference in far right vote share between high FCS and low FCS zip codes in election year t relative to the difference in 2006. The coefficients for the pre-crisis period are close to zero and insignificant. This indicates that there was no pre-trend in the evolution of the support of far right between more exposed and less exposed zip codes until 2006.

After the start of the crisis the vote share of the far right increases more in high FCS

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zip codes. The coefficient is close to 4 in 2010. This means that should we increase the share of foreign currency loans from zero to 100 percent the vote share of the far right would increase by 4 percentage points. The effect of foreign currency exposure is persistent on political preferences. The point estimates for 2014 and 2018 are similar in magnitude to the coefficient of 2010.

Parallel trend for other parties The identifying assumption requires that there is no pre-trend in political preferences in general, and not just in far right vote share. Though the parallel trend assumption holds for the far right vote share before 2008, it does not imply that political preferences, in particular extremist attitudes, evolved similarly. Before 2008 the far right was small, and people might have voted for other parties because of the lack of suitable far-right party. To assess the validity of the parallel trend assumption for political preferences we also examine how the vote share of other parties evolved by the exposure to the depreciation.

We first examine whether there is a pre-trend in the vote share of moderate parties. Figure B.8a and B.8b presents the results for the center-right and center-left parties, respectively. The vote shares are not related to foreign currency share in the latest elections before the start of the crisis, however, the difference between more exposed and less exposed zip codes in terms of center right and center left vote shares was different in 1998 compared to 2006 for the center-left. As these are moderate parties we do not worry about these results.

Figure B.8c plots the parameter estimates for the communist far-left Workers' Party. Though the popularity of the far left was always below the far right's, there is a declining pre-trend in their popularity. We will check in the robustness section whether higher far left vote share in 1998 explains the rise of the far right in 2010.

We also use participation in elections as a measure of political preference. Figure B.8d shows the results for turnout. We find that zip codes with higher foreign currency debt exposure tended to participate in the elections in higher numbers before the crisis though there is a declining trend.

Baseline results The baseline regression results are presented in Table B.5, which focuses on election years from 1998 to 2010. The regressions are weighted by the number of eligible

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voters in 2006, and the standard errors are clustered at the subregion level.[13] The first column shows the point estimate when only zip code and election fixed effects are included. The point estimate is 27 and highly significant. It can be interpreted as should we increase the share of foreign currency loans from zero to 100 percent the far right vote share would increase by 27 percentage point. In column 2 we add control variables and the coefficient drops to 4.6, and it is significant only at the 10 percent level. In column 3 we include county-election year fixed effects as well, and hence this regression uses only within-county variation to identify the effect of the crisis. The county-election year fixed effects control for time-varying county level unobserved shocks to political preferences by elections. For example, there could be county level unobserved labor market shocks, and unemployment could influence political preferences. The parameter estimate does not change, however, the inclusion of these fixed effects substantially reduces the standard error. The point estimate in column 3 indicates that foreign currency debt exposure of households explain one-fifth of the rise of the far right. The average foreign currency share is 66 percent, so foreign currency explains approximately 3 percentage points from the 14 percentage points, which is 21 percent. We also include subregion-year fixed effects in column 4, which approximates local labor markets (Pálóczi et al., 2016), to control for unobserved local shocks at a much finer level, and a zip code linear trend in column 5. Both of these specifications give similar result as before.

Alternative specifications Next, we show that alternative definitions of foreign currency exposure of households give similar estimates. Table B.6 summarizes the findings. Column 1 shows the point estimate when we use the share of foreign currency denominated debt instead of the number of loans. This measure captures the fraction of debt that was revalued by the crisis instead of the number affected of loans. As foreign currency loans were larger, the point estimate is smaller than before, but it is significantly positive.

In column 2, we use the per capita number of foreign currency and local currency loans as a measure. This specification can be derived from individual level regression by aggregating to zip code level.[14] This approach compares the voting behavior of foreign currency and

[13] We test whether subregion is the appropriate level for clustering using the test proposed by Ibragimov and Müller (2016) and we cannot reject this at traditional significance level.

[14] Ideally, one would measure the effect of the financial distress on political preferences using individual

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local currency borrowers to non-borrowers. As in this specification we measure the effect of adding one extra loan, we drop the debt-to-income and per capita number of loans from the set of control variables.

We find that increasing the share of FC loans significantly increases the vote share of the far right. Moreover, increasing the share of local currency loans decreases the vote share of the far right. This result might seem unintuitive first, but this specification compares the voting preferences of FC and LC borrowers to the non-borrowers. In Table B.3 we documented that borrowers are significnatly have better characteristics than non-borrowers, while FC and LC borrowers are comparable. If less educated, non-borrowers are more easily convinced by the far right than the better educated LC borrowers, then the negative LC point estimate is plausible. The difference between the FC and LC point estimates identifies the effect of the debt revaluation. This specification explains 3.5 percentage points, or 25 percent, of the rise of the far right, which is similar to the results of the main specification.

In column 3 we use the debt revaluation shock relative to the pre-crisis income as a measure of financial distress. We use unexpected change in household indebtedness as a measure of financial distress. It is not the currency denomination that matters per se for political preferences but the financial difficulties of the households triggered by the exchange rate shock. We proxy the financial problems of households by the change in indebtedness. We use only the unexpected component of the change in debt, which is due to the revaluation of the household debt because of the exchange rate shock. The effect is significantly positive, it can be interpreted as if the debt-to-income increases unexpectedly by 10 percentage points then the vote share of the far right increases by 2.1 percentage points.

In column 4 we use the foreign currency share for only the mortgage loans. Home equity

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level data:

$$y_{it} = \alpha + \beta_1 FC_i \times Post_t + \beta_2 LC_i \times Post_t + \varepsilon_{it}$$

where y_{it} is a dummy variable indicating whether individual i votes for the far right in year t. FC_i and LC_i are a dummy variables indicating whether individual has foreign currency or local currency loan, respectively. Aggregating this regression to zip code level would give

$$y_{zt} = \alpha + \beta_1 FC_z \times Post_t + \beta_2 LC_z \times Post_t + \varepsilon_{zt}$$

where the variables are zip code level averages. The dependent variable is the far right votes relative to the number of voters. This is the product of the far right vote share and the invserse of the turnout. We estimate the effect of the crisis these variables separately.

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loans were not subsidized, and hence interest rates were very high. Therefore people willing to get a home equity loan had to choose foreign currency denomination. Therefore we use variation in the currency composition of mortgage loans, where the variation comes from Column 4 shows the reduced form results. There is a drop in the number of observations, which is due to the fact that in some small zip codes there were no mortgage loans, only home equity loans. The reduced form result is significant, though its magnitude is smaller than before. The IV estimate is presented in column 5.

Since the observable characteristics of zip codes are not balanced, we show that are results are robust to a trimming procedure proposed by (Crump et al., 2009). We split our sample into two groups based on whether FCS is above average, and we treat the above-average group as treated, and the other group as control. We estimate the propensity score, p, and keep observations only if $0.1 < p < 0.9$. This way we decrease the limited overlap between the treatment and control group.

The results of the trimming procedure are presented in Table B.17. The first two column reports the point estimates of FCS for the whole and restricted samples, respectively. Column 3 and 4 show the estimates if we use above-median FCS as a measure of exposure. In both cases there is only a slight difference between the results based on different samples. This is indicative that it is not limited overlap driving our results.

2.4.2 Robustness checks

In this subsection we examine several alternative hypothesis, which might explain the rise of the far right.

Placebo test High FCS zip codes might be more likely to vote for far-right parties when the popularity of the far right increases, and this poses a threat to identification. Zip codes might be different in how responsive they are to major events that shift political preferences. For example severe recessions might increase the appeal of far-right parties in general, and some zip codes might be inherently more likely to vote for the far right during the recessions, i.e., these zip codes have „higher beta." This sensitiveness might be correlated with the share of foreign currency loans, which would bias our estimates.[15]

[15]This problem is not solved by using credit supply as instrument as banks' credit supply might also be correlated with unobserved political preferences. Banks choose the location of their branches purposefully as

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To address this endogeneity concern we use the 1939 election to conduct a placebo test when far-right parties were popular.[16] During the 1990s and early 2000s extremist parties were marginal in Hungary but they received 25 percent of the votes in 1939. As political attitudes are persistent, using this election is suitable to test whether foreign currency share is high in regions with high responsiveness to political extremism.[17]

The 1939 election was the first secret ballot in Hungary, and the government being afraid of possible far right success tried to prevent the far-right parties from runnig using various administrative measures. Some of these measures affected the incentives to run, and it could have resulted in the far right not running in many electoral districts. Figure B.3 shows the vote share of the far-right parties.

We estimate the effect of FCS using the subsample of settlements where people could have voted for a far-right party. Column 1 and 2 of Table B.7 contains the results. It shows that foreign currency share is uncorrelated with far right vote share without any control variables. Including control variables does not alter the significance of the coefficient. The third and fourth columns show the estimates we use the whole sample including settlements with no far-right party lists. The raw correlation between far right vote share and FCS is negative, suggesting that

Roma minority and immigration The presence of immigrant and minority groups in high foreign currency share zip codes might drive the popularity of the far right. Immigrants and minority groups could also increase the popularity of the far right (Halla et al., 2016). The presence of these groups might be correlated with the share of foreign currency loans, and might affect political preferences.

Though immigration is relatively small there is a sizable Roma minority, and the far right was hostile to the Roma people.[18]

they prefer locations with higher profitability. These are more likely to be cities, where political preferences might be different.

[16] For details on the election and data construction see Appendix B.1.1.

[17] Studies showing that anti-semitism has medieval origins (Voigtländer and Voth, 2012), right-wing political ideology has persistence (Cantoni et al., 2017), Nazi occupation affects political extremism today (Fontana et al., 2017), Turkish siege on Vienna affects today's political preferences (Ochsner and Roesel, 2017) or there is intergenerational correlation in extreme right wing party preferences (Avdeenko and Siedler, 2015) could make this hypothesis plausible.

[18] The common theme of the far-right manifestations were that Romani people do not work but shirk, they do not deserve transfers, they are criminals. Before the 2010 election there were a few murders

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We distinguish three major minority groups. The Roma minority, which is the largest minority group. We split the non-Roma minorities into two groups. The first group consists of local minorities that have been present in Hungary. The second group is immigrants.[19]

Controlling for the share of immigrant and minority people does not alter our main results. Results are presented in column 5 of Table B.7. In the first three columns we include these share separately, and in the fourth column jointly. The coefficient of *FC* share does not change after controlling for the presence of non-Hungarian groups, which suggests that it is not immigrants and minority groups driving our results. The coefficients of the Roma minority and other groups worth mentioning. The coefficient of the Roma is insignificant, which is in contrast with the literature analyzing the success of Jobbik. Most of these papers emphasize the anti-Roma rhetoric of the party in their success. The share of Roma is strongly correlated with pre-crisis unemployment rate, and this makes the point estimate insignificant. The point estimates of the local minority and immigrant groups are negative, indicating that their presence decreased the support for the far right. This suggests that living close to minority groups might help to know them better, which decreases prejudice in line with the model of Glaeser (2005).[20]

Since our main focus is on the 2010 election our results are exempt from the impact of the the refugee crisis because it started only in 2013.

Foreign currency debtors' naïveté Foreign currency debtors might be different from domestic currency debtors, especially in terms of naïveté. They might be more likely to choose foreign currency loans and at the same time might be easier to influence by populist far-right parties. Therefore the omitted naïveté might drive the results.

committed by the Roma, which received significant public attention. For example the lynching of a teacher in 2006, or the murder of a handball player at a bar in early 2009. Karácsony and Róna (2010) attribute the success of the far-right to these events, and to the related rhetoric of the far-right as people thought the far right to be competent to handle this issue.

[19]Local minorities include Bulgarian, Greek, Croatian, Polish, German, Armenian, Romanian, Rusyn, Serb, Slovakian, Slovenian and Ukrainian minority groups. Immigrants consists of Arabic, Chinese, Russian, Vietnamiese and other minorities.

[20]Empirical studies find mixed evidence. For example Halla et al. (2016) by using data from 1980s show that influx of immigrants increased the vote share of the far right in Austria because of concerns about the quality of the neighborhood, Ochsner and Roesel (2017) finds that right-wing voting increased in Austria in municipalities pillaged by the turks in the seventeenth century in Austria compared to non-pillaged municipalities. In contrast, Steinmayr (2016) focusing on the 2015 election shows that exposure actually reduced the vote share of the far right in Austria.

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Though individual level data indicates that foreign currency borrowers had better education and income, we run additional tests to show that it is not foreign currency debtors' naïveté that explains the rise of the far right.

We use several proxies for foreign currency debtors' naïveté. There are several possible explanations why FC debtors might be more naive. First, households borrowing in foreign currency might have lower financial literacy and this might be correlated with how susceptible they are to populist rhetorics.[21] In our baseline specification we control for education, income and unemployment which are likely to be correlated with financial literacy.

Second, lending standards could have decreased over time.[22] As later originations were more likely to be denominated in foreign currency, less creditworthy people might have been more likely to borrow in foreign currency and creditworthiness might be correlated with how easily households are persuaded by populists.

Third, there is anecdotal evidence that misselling happened during the crisis. People applying for mortgage loans might have got home equity loans instead, which was beneficial for the banks because of the higher interest rates of these loans. Because home equity loans were not subsidized, almost all of these loans were denominated in foreign currencies. If people wronged by the banks could be influenced by populists easier than local currency borrowers, then that would bias our estimates. The share of home equity loan among FC loans is not random, it is higher in zip codes with worse characteristics, for example income is lower on average in zip codes with high share of home equity loans.

We also examine how controlling for the vote share of the far-left affects our estimates. The parallel trend does not hold for these parties for the pre-crisis period, and they might be more likely to switch to another populist party, the far-right. Column 4 of Table B.7 contains the results. We use the vote share of these parties from 1998. Both of these vote shares predict higher vote share of the far right in the 2010 election, however, the point estimate of the foreign currency share is very similar as before. In column 5 we include all of these control variables at the same time. The coefficient of FCS is 0.048 and highly

[21] This would be consistent with the financial literacy literature that documents that the financial literacy of borrowers negatively correlate with default (see e.g. Gerardi et al. (2010) for the US), more financially literate borrowers tend to get credit with better terms. Financial literacy might also affect the currency choice of loans as more literate borrowers might understand the exchange rate risks associated with foreign currency loans.

[22] See Demyanyk and Van Hemert (2009); Dell'Ariccia et al. (2008) for US.

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significant.

Column 6 of Table B.7 presents the results. The point estimate of FC share decreases, but it remains highly significant. The coefficients of the control variables are also worthy of note. All of them are positive and significant, hence they contributed to the rise of far right. But because the parameter of FCS does not change after the inclusion of these control variables, this implies that the good performance of the far right in more exposed zip codes was not due to household naïveté.

Local labor market shocks Local labor market shocks could increase job insecurity, induce wage freeze or wage cut, and might result in job loss, which could influence the political preferences of people.[23] Local labor market shocks in Hungary might be correlated with exposure to the exchange rate shock, and confound our estimates.

We first directly control for the increase in unemployment after the outbreak of the crisis. The change in unemployment captures all potential shocks to employment. However, it is a bad control as the balance sheet shock could also increase unemployment (Mian and Sufi, 2014; Verner and Gyöngyösi, 2017). The results are presented in column 7. The point estimate is close to the main result.

Controlling for employment shares of group of firms that were affected by the crisis does not change the main result either. We define local labor markets at the settlement level because we previuosly controlled for subregion-election year fixed effects that capture unobserved local labor market shocks. We consider two types of shocks to the employers: sector-specific shocks, and foreign currency exposure of firms.[24] To control for these labor market shocks we include the employment share of two digit industries in 2007, and the employment share of firms with FC debt, both interacted with election year dummies. We determine local employment by using administrative balance sheet data of double book keeping firms combined with credit registry data. We determine the location of headquarters using firm register data.

[23] For example Geishecker and Siedler (2011) documents that job loss fears could foster affinity for parties at the far right. Import competition from China increases job insecurity and affects political preferences (Autor et al., 2016; Colantone and Stanig, 2017; Dippel et al., 2015).

[24] Foreign currency lending was prevalent in the corporate sector as well. Bodnár (2006, 2009) present survey results on the exchange rate exposure of corporate sector.Endresz et al. (2012) shows stylized facts on foreign currency debt in the corporate sector using credit register data. Endrész and Harasztosi (2014) shows that corporate foreign currency debt decreased investment in Hungary.

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Column 8 of Table B.7 presents the estimates when we control for the employment shares interacted with election year dummies. The coefficient of FC share increase slightly, suggesting that local labor market shocks could not explain the popularity of the far right.

House prices The results are robust to controlling for the declining house prices. Foreign currency denominated loans are more likely to default, and foreclosures might depress house prices through fire sales. Since decreasing house prices weaken the balance sheet of households, it might explain the rise of far right. In column 9 of Table B.7 we control for the change in house prices constructed in Verner and Gyöngyösi (2017), and the point estimate decreases slightly, but remains significant.

Campaign expenditures Campaigning of parties could influence political preferences. The far right might have campaigned disproportionately in regions exposed to the crisis, and that might explain their success. Though the data is not available to the public and political parties, campaigning and foreign currency exposure could be correlated as foreign currency debt exposure increased unemployment. Therefore the far right by focusing its campaign on depressed regions might explain their relative success in regions with high share of foreign currency loans.

We use data on campaign spending collected by NGOs from 2010.[25] Advertisements or campaign events of parties reported by the national news agency, *Daily Bulletin* (MTI), or spotted by activists are collected. Spending is calculated by assuming a price. They also give the location of the spending when appropriate.

We control for the per capita spending of the far right, center right and center left parties, and interact the 2010 spending with election year dummies. The results are presented in column 10 of Table B.7. The point estimate of FC share is close to the baseline estimate suggesting that disproportional campaigning in more depressed zip codes does not explain the success of the far right.

[25]The NGOs are Transparency International, K-Monitor, Atlatszo and Political Capital. They made their data available on http://kepmutatas.hu/kampanymonitor/

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2.5 Mechanisms

Financial crises can affect political preferences through several channels. Schularick et al. (2015) formulates several potential mechanisms.[26] We examine these channels in this section.

2.5.1 Creditor-Debtor Conflict

The creditor-debtor conflict explanation emphasizes the different views of the creditors and debtors about how to resolve the crisis, and the manifestation of this difference in political preferences. Debtors prefer debt relief and debt restructuring while creditors oppose these measures as these can be consequential to them during a recession (Mian et al., 2014; Frieden, 2015). Since there are fewer creditors, they could organize themselves more easily than debtors, and influence the government (OLSON, 2009). This might create a niche for populist parties that could win over debtors by advocating debtor-friendly policies.[27]

First, we look at campaign manifestos of major parties in 2010 on what they promised to foreign currency debtors. The far right had explicit promises to the foreign currency debtors: debt relief and debt restructuring (Jobbik, 2010, p. 12.).[28]

The incumbent Socialist Party was very vague about their intentions on how to help foreign currency debtors and these promises might have been regarded non-credible as they were in power until 2010 (MSZP, 2010).[29] The manifesto of the center-right Fidesz did not

[26]The hypotheses Schularick et al. (2015) formulates are rising inequality; unpopular bank bail out; government might be deemed responsible for the crisis as they could have prevented it; conflict between creditors and debtors about how to resolve the crisis and who should bear its costs; or unprecedented policies during the crisis might increase uncertainty.

[27]This mechanism is consistent with the model of Guiso et al. (2017), where populist parties promise policies to help workers with uncertain income. The policies might hurt the economy in the long run, therefore people higher economic uncertainty vote for them only. Acemoglu et al. (2013) present a model where politician use populist redistributive policies to signal that they are not captured by the elite.

[28]The promises were the following: „The eviction of troubled foreign currency borrowers should be upended immidiately for one year, and end the banks' possibility to change unilaterally the terms of the loan contracts. We will make it mandatory for loans with more than three years of maturity, without any extra condition or fees or interest rate charges, that repayment could be suspended for 6-12 months. If the foreclosure of the collateral real estate is unavoidable, then the owner should be given at least six months for selling the property. Long term solution would be low interest rate from the National Bank of Hungary, and the refinancing of the foreign currency loans by cheap domestic currency loans provided by the National Bank of Hungary. After the significant decrease of the interest rate we would incentivize the lengthening of the maturity of both domestic and foreign currency denominated loans."

[29]They promised more social housing and defending the rights of foreign currency debtors.

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contain any reference to foreign currency debtors. The newly founded green party, LMP, did not mention foreign currency debtors either.

Second, we show that indirectly affected people do not vote for the far right. The creditor-debtor conflict implies that it is the debtors who vote for the far right. While indirectly affected people, who do not have FC debt, should not support them. The household debt shock has a demand externality (Farhi and Werning, 2016). It influences all households indirectly, not just foreign currency borrowers. The revaluation of the foreign currency debt decreases disposable income and consumption. The declining aggregate demand decreases employment (Mian and Sufi, 2014). This affects all people and not just foreign currency borrowers, as they are more likely to loose their jobs.

Table B.13 presents the results. First, we show that foreign currency share predicts the change in unemployment (column 1), and the change in default rate (column 2).[30] Then we confirm that unemployment has a significant effect on the vote share of the far right. Column 3 shows that a 10 percentage points increase in unemployment is associated with 2.8 percentage points increase in the vote share of the far right. However, if we include county-election year fixed effects in column 4, the coefficient becomes insignificant.[31] In column 5, we use the change in default rate as proxy for indirectly affected people, and we find a significant impact. When we investigate further by including the default rate separately for local and foreign currency loans, we find that local currency denominated loans do not have an effect on the vote share of the far right, only foreing currency loans' default rate. These results suggest that indirectly affected households did not vote for the far right.

The effect of unemployment and the impact of foreign currency debt exposure are starkingly different. One potential reason for this is that laid off people receive unemployment benefit, and are eligible to other social transfers, and therefore their income is partly insured. For borrowers there are no such programs in Hungary. Debt is recourse, which allows lenders to collect what is owed for the debt even after they have taken the collateral.

[30] For more detailed results see Verner and Gyöngyösi (2017).

[31] These results are consistent with the findings of Kates et al. (2016) who examine how unemployment affected the rise of the far right in Hungary using survey data. They find that settlement level unemployment rate increases the popularity of the far right more than individual unemployment status, which is significant only at the 10 percent level. As foreign currency debt predicts unemployment, their results are suggestive evidence that the exchange rate exposure of households explains the rise of the far right.

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Second, the consumption response of these two income shocks might be starkingly different as a mortgage loan can be considered a consumption commmitment (**?**), which implies that for relatively smaller changes of income they do not reoptimize their housing consumption. Furthermore, higher leverage make people more sensitive to shocks, as debt contracts are nominal.

A large scale program designed to help foreign currency borrowers significantly increased the vote share of the center-right incumbent party. The government implemented a settlement and conversion program for foreign currency loans in 2015. Though the center right, that was in opposition before 2010, gained from the crisis in more exposed zip codes, it could further increase its appeal between 2014 and 2018. Figure B.8a shows that in zip codes with full dollarization of the debt the vote share was 13 percentage points higher than in zip codes with zero dollarization. As the incumbent won just the two-thirds of the seats in the new Parliament, the program contributed to their supermajority.

2.5.2 Alternative channels

Declining trust People might have voted for the far-right to express their discontent with the establishment and the system.[32] This would imply that it is not the policies promoted by the far-right that increased their popularity but just dissatisfaction with moderate parties. This hypothesis has several corrolaries. First, other new or extremist parties should have also benefited from the balance sheet crisis of households.

Table B.8 presents the effect of the crisis on the vote share of other parties. First we focus on moderate parties. Column 1 reports the result for the center-right parties. The center right was in opposition in 2008, and they significantly gained from the crisis. The opposite is true for the governing center-left, they lost more in highly exposed regions. These results are consistent with economic voting theory that people vote against the incumbent in recessions.

Column 3 of Table B.8 presents the estimate for the communist far left. They in fact did worse in zip codes with higher foreign currency share. Column 4 and 5 show the results for the newly founded green party. Since the party was newly founded, we identify the

[32]For example Algan et al. (2017) shows that there is a strong correlation between decline in trust and rise in populism.

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effect of the crisis from cross section. There is a negative but statistically insignificant relation between exposure and their vote share using the main control variables. As we use cross sectional data, we include vote shares of other parties in 2006 to control for persistent unobservable differences in political preferences. These additional controls make the point estimate negative, the newly founded green party received 1.3 percentage point fewer votes in fully exposed zip codes.

Column 6 examines how the crisis affected turnout.[33] The point estimate is negative suggesting that the crisis could have had a discouraging effect on voters to participate. However, Figure B.8d indicates that there is a declining trend in turnout in more exposed zip codes. Controlling for zip code linear trend makes the effect insignificant suggesting that this effect is less robust compared to the main findings. Column 7 reports the results for the share of invalid votes, for which we do not find an effect.

We use survey data from 2006 to 2010 on trust in the National Assembly to assess this possibility. The results are presented in Table B.14. Though regions with higher exposure to the crisis trust less in the Parliament even after controlling for individual characteristics, trust does not decrease in these regions, in fact, the point estimates are positive though insignificant.

We also check whether voters attributing changes in their economic circumstances to EU policies. We focus on opinions about EU membership using Eurobarometer data. We examine the answer to the question „Taking everything into consideration, would you say that Hungary benefited from being a member of the EU?" Figure B.11 plots the share of yes answers. The share of yes votes clearly deteriorated from 2006, but they started to rise from 2009. This either means that people considered the EU membership as positive, or the change of governing party might affect the opinions of people about EU membership.

These results suggest that general dissatisfaction and declining trust does not explain the rising popularity of the far right.

Inequality and redistribution Rising inequality might be an important channel in the shift of political preferences following a financial crisis (Schularick et al., 2015; Mian et al.,

[33] Charles and Stephens (2013); Burden and Wichowsky (2014) document that unemployment increases turnout. Guiso et al. (2017) emphasizes that preference to vote for a populist candidate is positively correlated with abstention, which makes it less likely for a populist to get elected.

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2014). Economic crises tend to increase inequality (Atkinson and Morelli, 2011), financial crises have redistributional consequences as they affect the poor disproportionately (Halac et al., 2004). Populist parties advocating redistributive policies might increase their support. In this subsection we analyze how inequality and redistributional preferences changed during the crisis.

First, we examine overall inequality measured by the Gini coefficient. From 2006 until 2010 there is a declining trend in the Gini coefficient, in 2011 it jumps.[34] As the popularity of the far-right started to increase in late 2008, this suggests that inequality cannot explain the rise of far right.

The importance of inequality should also be reflected in the composition of the supporters of far right. Poorer individuals tend to favor more redistribution (Alesina and Giuliano, 2009), therefore popularity of the far right should be higher among poorer people. Contrary to this hypothesis, supporters of far-right have higher income, and they are more likely to have other assets compared to voters of other parties (Rudas, 2010).

If inequality matters for the households then redistributive policies should be more popular. We compare policy positions of the far right to other moderate parties by using the Manifesto Project data, which measures the policy positions of political parties derived from a content analysis of electoral manifestos. Data is not available for the far-right in 2006, hence we could only compare the programs in 2010. The center-left and center-right parties very generous campaign promises while the far-right was much less generous indicating that it is not the general redistributive policies that increased the popularity of the far right.

We look at how the preference for redistribution is related to foreign currency share. First, we examine whether foreign currency share is correlated with preference for redistribution before the crisis. We use the results of a referendum from early 2008 to assess preferences for redistribution before the start of the crisis. The referendum was on whether to abolish university/college tuition fee, copayment and daily hospital stay fee. The results are presented in Panel A of Table B.12. Without controls, zip codes with higher foreign currency share tended to support the abolishment of these fees, however, including control variables makes the estimates insignificant. We also control for previous political

[34]There was a tax reform in 2011 when flat tax rate was introduced and tax credit was abolished. High-income individuals benefited the most from the tax reform.

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preferences as the referendum was initiated by the opposition, and parties might able to influence the constituency's preferences for redistribution. We control for political preferences by including the vote share of the center-right which initiated the referendum. We find that conditional on previous political preferences there are no differences across zip codes in preferences for redistribution. We also look at turnout in the referendum in Panel B. Participation in the referendum was lower in high foreign currency share zip codes and this result is robust to the inclusion of control variables.

We also examine survey data conducted in February 2010 and compare high foreign currency share regions and low foreign currency share regions on how people view social transfers to specific groups. The questionnaire asks to guess what fraction of the people belonging to a certain group receive social benefit and what fraction should receive the benefit. We take the difference of these, a positive number therefore indicates that more members of that group should receive social transfer. Table B.16 summarizes the results for five groups: large families, unemployed people, poor pensioners, Roma people, and disabled people. People living in high vs low foreign currency share regions guess similarly the share of people belonging to certain groups receiving transfer. However, there are differences between them on what fraction of those people should get transfers. People living in high FCS regions prefer less social transfer to all groups except for the Roma.

These results suggest that inequality is not an important channel for the rise of the populist far right.

Bank bail out Financial crises usually involve some sort of bank bail outs, which tend to be unpopular. Populist parties can exploit this by blaming the banking sector for the crisis, and the government for aiding the banking sector using the taxpayers' money.

The Hungarian banking sector is mostly owned by foreigners therefore the government did not need to inject capital into foreign banks. Though the government passed a new law in Decemebr 2008 which allowed for using the IMF rescue package money for recapitalizing domestic banks, this did not happen. Instead, two domestic banks, OTP and FHB, received EUR 1.4 billion and 0.4 billion loans with market conditions (though these were cheaper loans as they did not have to pay for the country risk), respectively, because of liquidity problems. OTP prepaid the loan in two installments in November 2009, and in March 2010, before the 2010 election. As banks were not bailed out using Hungarian taxpayers' money,

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the bail out explanation of changing political preferences is unlikely.

2.6 Conclusion

In this paper we studied the effect of the recent financial crisis on voters' political preferences using Hungarian zip code level data. We used a natural experiment from Hungary, where we exploited the prevalence of foreign currency loans. The vote share of the populist far-right increased significantly more in zip codes with higher exposure to the exchange rate depreciation. This result is consistent with the creditor-debtor conflict and we have presented evidence that other potential channels prominent in the literature do not explain our estimates.

This paper shows that debt deflation shock not only affects the real economy (Fisher, 1933; King, 1994) but it can influence political preferences as well. Though extremist parties rarely part of the government, they still can shape policy making indirectly by setting the agenda (Minkenberg, 2001) and exerting influence on the strategy of moderate parties (Guiso et al., 2017). Therefore even a moderate electoral success of populist parties can have a profound effect.

Our results indicate the 20-25 percent of the far right can be explained by the debt shock. Therefore bad economic conditions were an important factor in the rise of far right. The model of Bolton and Rosenthal (2002) shows that intervention in debt contracts decided by voting can improve efficiency. However, empirical tudies on debt relief programs suggest that though these help to restore the balance sheet of households, they do not increase consumption or investment (Giné and Kanz, 2018; Kanz, 2016), but they increase moral hazard. Hence programs targeting foreign currency borrowers could have prevented the rise of far right, they would not have been appropriate to restore aggregate demand. The program implemented in 2015 did help the incumbent party to increase its vote share, evaluating its impact on real outcomes remains for future research.

Though we use a natural experiment from Hungary, the change of political preferences in Europe after the outbreak of the crisis suggests that our results might be generalizable. Figure B.9 shows how the change in household indebtedness between 2000 and 2007 is related to the change of the vote share of far-right parties between 2004 and 2009, and 2004 and 2014. The positive relationship is suggestive that household debt might be an

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important factor in the shift towards extremist parties in the recent years, and this is not specific to the Hungarian experience.

The importance of creditor-debtor channel in the rise of the far-right suggests that the electoral success of populists is partly economic. Hence addressing the problem of increasing appeal for populist parties requires conventional economic policy measures. Redistributive policies that target indebted households might moderate the electoral success of populist parties.

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Chapter 3

Financial distress and student achievement

3.1 Introduction

Economic hardship of families might have negative consequences on the development of children of affected families. They might cut back on investment into children, which might have longlasting consequences as skills beget skills (Heckman, 2008). As economic hardship is likely to be correlated with unobserved characteristics of families, there is limited direct evidence on the relationship between economic hardship and children outcomes.

This chapter studies how the economic hardship of families affects the development of their children's cognitive skills. I use the Hungarian household foreign currency debt crisis as a natural experiment. Households could choose between subsidized domestic and foreign currency denominated loans before the crisis. During the crisis the unanticipated and large depreciation of the exchange rate increased the debt burden of households borrowing in foreign currencies but not of households borrowing in domestic currency. I use administrative household credit register data to define exposure to the exchange rate shock at the zip code level. I examine how foreign currency debt exposure affected the mathematics and reading comprehension skills of students using administrative panel data on standard based student achievement. To identify the effect of the crisis exploit that Hungary has free school choice system. I compare the development of two students attending the same class

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but living in different zip codes, and therefore experiencing the debt shock with different probability. I find that higher foreign currency share has a significant negative impact on the development on students between grade 8 and grade 10. A 10 percent increase in zip code level household debt decreased the development of both the math and reading skills by .045 standard deviation. I find that parental unemployment does not explain the negative impact of foreign currency debt exposure on student achievement, which suggests that families financial distress was an important channel in the decline of student performance.

Section 3.2 describes the Hungarian school system. There is free school choice, and commuting to school is common even for primary school students. Primary schools have an obligation to admit all local children, and there is a lottery for non-local students in case of oversubscription. Secondary schools are allowed to have own entry requirements.

In Section 3.3 I begin by introducing the National Assessment of Basic Competencies (NABC) data. The NABC measures all students' mathematics and reading comprehension skills using standardized tests in every May. Students take the tests in grade 6, grade 8, and grade 10, and they can be followed across grades. I use the waves between 2006 and 2012. Test scores are complemented with survey information on family characteristics. I match the NABC with credit register data at the zip code level.

After introducing the main databases, I present descriptive statistics. I define exposure to the exchange rate shock to be share of foreign currency loans in September 2008. I show that foreign currency borrowing of households was not random, it is negatively correlated with math and reading test scores even before the criris. Though average student performance had been already lower in more exposed zip codes, it further declined after the depreciation of the domestic currency. At the same time, I show using individual level survey that foreign currency borrowers have higher income and higher educational attainment than local currency borrowers. They are also more likely to have children than local currency borrowers.

Next, I outline my identification strategy. To measure the effect of the crisis I use a difference-in-differences method. My empirical approach compares the development of two students living in zip codes with different share of foreign currency loans, and hence experiencing the debt shock with different probability. To account for differences in school and teacher quality between students living in more exposed and less exposed zip codes I

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use class fixed effects. To control for differences in parental involvement and investment I use the rich nature of the background survey to directly control for differences in family characteristics.

Using within-school variation to identfy the effect of the crisis relies on the comparison of students attending the local school to commuting children. In primary school commuting children might have better unobservable characteristics since their parents do not choose the default, local school. The typical commuting pattern is that students living in small villages attend schools in nearby towns. As foreign currency share is higher in villages, focusing on the development of children in primary school, between grade 6 and grade 8, is likely to underestimate the effect of the crisis.

To mitigate the selection problem, I focus on the development of children in secondary school, between grade 8 and grade 10, which helps for two reasons. First, there is an entry requirement into secondary schools, which implies that classes are more homogeneous than in primary schools because students are screened. Second, there are fewer secondary schools than primary schools, therefore many students have to commmute as there is no local secondary school where they live. Both of these features of the school system suggests that the within class variation is much smaller in secondary schools than in primary schools, hence the selection problem is less severe.

Results are presented in Section 3.4. The crisis had a significant large negative impact on the development of students between grade 8 and grade 10. First, I focus on the cohort that took the first test in May 2008, before the start of the crisis. Increasing the share of foreign currency denominated loans from zero to one decreases the development of both mathematics and reading skills by .1 standard deviation. A 10 percent unanticipated debt shock decreased student achievement between 2008 and 2010 by .045 standard deviation.

To complement the empirical strategy I conduct a placebo test by comparing the development of children in more and less affected zip codes before the start of the crisis. A major concern with this identification approach is differential pre-trend. Students living in more exposed zip codes have slower development of skills even in the absence of the crisis. I find that before the crisis, foreign currency debt exposure of students was unrelated to the development of children. This indicates that it is not differential trend in student test scores that drive my results.

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The crisis decreased the performance of younger cohorts as well, who took the tests in grade 8 after the outbreak of the crisis. The exchange rate shock could have already affected the achievement of these students by grade 8. This suggests that the crisis had a continuous negative impact on the development of children.

To better understand the impact of the crisis, I analyze how the effect of foreign currency debt exposure varies with student characteristics. I split the sample into groups along various student characteristics. I find that the crisis had a significantly negative effect on boys but not on girls. Mother's education also mattered as children of mothers with secondary education suffered from the crisis while other children were not affected significantly. Splitting the sample based on previous achievement I find that the preformance of children in the third tercile of reading skills decline in more exposed zip codes.

I discuss the potential channels through which the crisis influenced student performance in Section 3.5. First, I examine whether parental employment status can explain the decline in student performance, and I find that controlling for both father's and mother's employment does not affect the main estimate. These results suggest that mental distress experienced by households borrowing in foreign currency might explain the negative effect of the crisis.

This paper connects to the literature on how economic conditions affect children's educational outcomes. Studies using educational attainment as outcome variable finds that in developed countries a recession boosts educational attainment while it has negative effect in developing countries (see for example the literature review in Ferreira and Schady (2009)). I complement these studies by using standardized test scores that measures the skills of students.

Many studies use unemployment increases as a source of shock to economic conditions, and document that parental jobb loss is an important channel in the decline of student achievement. Most of the studies use mass layoffs as an exogenous shock to unemployment, and measures its effect on GPA (Rege et al., 2011), grade retention (Stevens and Schaller, 2011), and standardized test scores (Ananat et al., 2011). I add to this literature by exploiting a large scale crisis to measure how economic hardship affect student performance.

In Hungary, Kertesi and Kezdi (2008); Kertesi et al. (2017) analyzed the effect of parental unemployment on dropping out from high school using the transition and the

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2008 financial crisis. They find a negative effect of parental unemployment. They also find that the negative effect of the crisis is mitigated in families with better socioeconomic status (Kertesi et al., 2017).

One important channel of the effect of economic conditions on parental income affectes educational attainment. Papers use exogenous shocks like increase in labor demand due to the oil boom in Norway (Løken, 2010; Løken et al., 2012), cocoa price shocks in Cote D'Ivoire (Cogneau and Jedwab, 2012), coffee price shocks in Brazil (Kruger, 2007). Using standardized test scores to measure the cognitive skills of students helps in identifying smaller effects which might not be evident when using educational attainment. Dahl and Lochner (2012) exploits nonlinear changes in earned income tax credit and uses rich survey data to measure the effect of income on student achivements. I complement this study by using data on the entire population as the earned income tax credit targets poorer households.

This paper also contributes to the literature on the negative consequences of financial crises. This branch of literature focuses on how financial crises affect real outcomes, like growth, consumption of households, or unemployment (Jordà et al., 2013; Mian et al., 2013; Mian and Sufi, 2014). These traditional measures focusing on the state of the economy might not be able to capture all important effects of a crisis. I contribute to this literature by showing that financial crisis could have negative influence on the development on children's cognitive skills. Since human capital formation is a long process, and the early years are crucial in child development. Children affected by a crisis will enter the labor market one or even two decades after the crisis took place. Therefore the potentially adverse effects might become evident only in the long run.

3.2 Context

In this section I introduce the household foreign currency credit expansion and the Hungarian school system.

3.2.1 Household credit expansion

The Hungarian household lending boom is described in detail in Section 2.2.

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3.2.2 School system

There is free school choice in Hungary, parents can choose the primary school for their children. Schools have to admit all students living in the school district if they wish to attend the local school. If there is an oversubscription then there is a lottery for non-local students but primary schools might use certain tools to screen the applicants. Families can also choose the secondary school for their children but there is entry requirement for secondary schools. These requirements are school-specific, they can entry examinations, or just a talk with the parents.

There are three type of secondary schools in Hungary: general secondary grammar schools, which prepares students to enter higher education, secondary vocational schools, which provide students with theoretical and practical qualifications. Students attending these two types of schools take a maturity exam at the end of the school and can apply for higher education. The third type is vocational school, which focuses on practical training of the students.

The primary school education is typically 8 years long, and the secondary school is typically 4 years long. However, there are some grammar schools that provide 6 or even 8 year-long program, and hence students attending these schools leave primary school after grade 6 or grade 4. These grammar schools are considered to be better than other secondary schools.

During the period I focus on, the school system was decentralized. Mostly the municipalities are the maintainers of the schools, they receive funding from the government based on the number and the composition of the students. However, this funding is usually not sufficient to run the schools, the municipalities have to provide additional funding. Varga (2000) documents this by showing that wealthier municipalities spend more on their schools.

Because of the free school choice system, commuting is common even for primary school children. Kertesi and Kézdi (2005) document using census data, that 23 percent of the children living in municipalities with only one school commute to other settlements. They also show that this commuting is positively correlated with parental education.

The compulsory schooling age was 18 until 2011 when it was reduced to 16 year. Yet, this does not affect my estimates as the oldest students are 16 in grade 10. At the same

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time this might have been an important channel later. The domestic currency depreciated continuously, and dropping out of school might have increased over time.

3.3 Data, descriptive statistics, and empirical stategy

3.3.1 Data

Student achievement data I use the Hungarian National Assessment of Basic Competencies (NABC) dataset to measure student achievement. This is a standard-based assessment of mathematics and reading comprehension skills that follows the model of the Programme for International Student Assessment (PISA). All students take the tests in every second grade from grade 6 till grade 10 in every May.[1] The data collection started in 2006. The data has a panel structure from 2008 onwards, hence the students can be followed across grades. The test score results are normalized, they have a mean of 1500, and a standard deviation of 200 in grade 6.

Beyond the test score data, the NABC contains extensive information on the socioeconomic status of the families. The students receive a background questionnaire with questions about their family, neighborhood and school. The questionnaire should be filled in together with their parents. The response rate is approximately 70 per cent.

The questionnaire also asks the address of the students at the zip code level. From 2008 onwards, this information is reported by the schools, hence it is available for all students.

The identity of the schools are known, and the classmates of the children could also be identified. The data also contains information about the schools and the establishments of the schools as the head of schools also get a questionnaire.

Credit register data I use the Hungarian credit register data for the level and currency composition of household debt. Section 2.3 provides a detailed description of the data. Similarly as in Chapter 2, I use the mortgage and home equity loans for the analysis.

[1] In the first two years, in grade 6 and in grade 10 there was a sample of students only. In grade 6 there was a random sample of 200 school establishments, in grade 10 a random sample of 30 students in each class.

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3.3.2 Cross-sectional heterogeneity in FC share

Comparison of foreign and domestic currency borrowers I also examine how similar foreign currency borrowers to local currency borrowers. Table B.3 compares FC borrowers to LC borrowers to the rest of the people using Austrian Central Bank's data. The first column presents the average characteristics of FC borrowers, the second column shows the characteristics of LC borrowers, while the third column for the non-borrowers. Column 4 contains the difference between foreign currency and local currency borrowers.

Foreign currency borrowers have better characteristics, for example they have higher income and better educational attainment.

Looking at the number of children and household size, FC borrowers are more likely to have kids compared to LC borrowers, and the size of the household is also bigger. Moreover, borrowers tend to have more kids than non-borrowers. Though there are fewer borrowers than non-borrowers, a sizeable share of children live in families with foreign currency debt.

Student level heterogeneity I define exposure to the depreciation to be share of foreign currency loans in September 2008, before the start of the crisis:

$$FCS = \frac{N_{FC}}{N_{FC} + N_{LC}}$$

where N_{FC} is the number of foreign currency denominated loans in September 2008, and N_{LC} denotes the local currency denominated loans.

In Section 2.3 we documented that the zip code level currency composition of household loans is not random. For example it is negatively related to zip code level income and educational attainment, and it is higher in villages.

In this subsection I focus on how the share of foreign currency loans is related to student characteristics. To better understand this relation, I correlate foreign currency debt exposure to student characteristics by running bivariate regressions.

Table C.1 documents that foreign currency borrowing of households is also significantly related to student performance. The average math score of children is significantly negatively related to foreign currency share, going from zero dollarization of household debt to full dollarization, the difference in math test score is 1.3 standard deviation. The negative correlation between FCS and reading is similar. The negative correlation between for-

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eign currency share and student performance is apparent even in non-standardized student achievement such as the GPA. Mothers of children living in more exposed zip codes are less educated, increasing the share of foreign currency loans from zero to one is associated with a 60 percentage points decline in the probability of tertiary education.

I also examine how the association between foreign currency debt exposure and student performance changed over time. They are strongly negatively correlated in cross-section, but now I focus on the dynamics of this relation. I analyze whether after the depreciation of the domestic currency the negative association becomes stronger. I pool together all the data for grade 6, grade 8 and grade 10 students' separately across years (hence I do not use the longitudinal nature of the data here).

I measure the performance gap between students living in more exposed and less exposed zip codes, and examine whether this gap widened after the outbreak of the crisis. I estimate the following regression using data from 2006 to 2012:

$$y_{izt} = \delta_t + \sum_{y \neq 2008} \beta_y FCS_z \times I(t = y) + \varepsilon_{izt}$$

where y_{izt} is the normalized test score of student i living in zip code z in year t, FCS_z denotes the share of foreign currency loans in zip code z, and X_{izt} is a set of control variables. The parameter δ_t is a year fixed effect. The coefficients, β_t, are the parameters of interest. They show the achievement gap between students living in zip codes with lower and higher share of foreign currency denominated loans. This gap is normalized to be zero for year 2008, hence β_t shows the achievement gap in year t relative to 2008, the last year before the crisis. I calculate robust standard errors and cluster at the class-by-year level.

Figure C.1 presents the β_t parameters for students in grade 8 both for mathematics and reading comprehension (results for other grades are in the Appendix). The coefficients for 2006 and 2007 are close to zero and they are insignificant, indicating that the gap between more and less exposed zip codes was similar to that of 2008 in the preceding years. Then, there is a declining trend in the parameters, which implies a widening gap in performance between children living in more exposed and less exposed zip codes, however, the estimates are not significant for all years. The result for mathematics shows a less clear pattern, the point estimates are not significantly different from zero in the first three years after

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the start of the crisis. By 2012, children living in zip codes where all loans were in foreign currencies had 0.4 standard deviation worse test scores than children living in zip codes with no exposure, relative to the performance gap in 2008. The pattern for grade 6 students is similar, while in grade 10 there seems to be no decline in preformance relative to 2008 (see Figure C.2 and C.3 in the Appendix).

Although these results suggest that the crisis could have affected children, students living in more exposed zip codes are apparently different, and this difference might bias the previous estimates. Unobserved student and school characteristics might be correlated with exposure. For example, students living in more exposed zip codes have lower-educated parents on average, and parental education is an important determinant of the development of children. Similarly, school quality might be lower in more exposed regions, which I take into account in my identification strategy.

3.3.3 Empirical Strategy

To measure the effect of the crisis on student achievement, I compare the development of two students, one living in a high FCS zip code to another living in a low FCS zip code. I estimate the following regression:

$$\Delta y_{iz} = \alpha + \beta FCS_z + \gamma X_{iz} + \varepsilon_{iz}$$

where Δy_{iz} is the change in test score of student i living in zip code z between year t and $t-2$, X_{iz} is a set of control variables in $t-2$. The parameter of interest is β.

The covariates X_{iz} contain zip code level measure of loan penetration and household indebtedness. The total number of affected children depends on the number of borrowers and the fraction of borrowers that have foreign currency denominated loans. Controlling for these variables implies that I compare students living in zip codes that have the same level of indebtedness and same number of borrowers, and only the currency composition of loans differs between them.

The main identification assumption is that exposure to the exchange rate shock is as good as random conditional on observables, which could be violated in two ways. First, students living in zip codes with higher share of foreign currency denominated loans attend lower quality schools. Second, parental investment into children might also be lower in

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more exposed zip codes.

School quality might be inferior in more exposed regions for several reasons. First, municipalities' school expenditure is positively related to the income of the municipality (Varga, 2000). More exposed regions are poorer, hence school inputs might also be worse in more exposed regions.[2] Second, there could be assortative matching between teachers and students as a result of free school choice (Kertesi and Kézdi, 2005). As wealthier families tend to live in cities, the average quality of teachers is better in cities as well, where the share of foreign currency loans is lower. Both of these mechanisms imply that children living in more exposed regions attend inferior quality schools.

To tackle the problem of correlation between school quality and share of foreign currency loans, I include school and class fixed effects to control for unobservable differences in school quality. This implies that I compare the development of children within the same school or class. Because of commuting, the effect of crisis can be estimated using within class variation.

To control for differences in parental investment I use information in the background survey, and include covariates that are important for child development. The control variables are parental education, gender of the student, dummy variable indicating grade retention in grade 1 to 4, a dummy variable indicating whether the student receives free textbooks, a dummy variable indicating disadvantegous family background.

Using within-school variation to estimate the effect implies that I compare students attending the local school to commuting students living in other zip codes. Commuting students might have different unobservable characteristics. For example they might have more caring parents, because they choose not to send their kids to the local school. In line with this conjecture Kertesi and Kézdi (2005) documents that primary school aged children who commute have better educated parents on average. The typical commuting pattern is that children living in small villages commute to a nearby town. As foreign currency share is higher in villages than in towns, this implies a positive correlation between family unobservable characteristics and foreign currency share. Therefore the effect of foreign currency debt exposure is overestimated.

Because of the potential unobservable characteristics of commuting children in primary

[2]The positive effect of higher educational spending is controversial but recent results suggest that it has a large effect on completed years of education, wages and adult poverty (Jackson et al., 2016).

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school, I focus on the development of students between grade 8 and grade 10 as it mitigates the commuters selection problem. Using this sample of students instead of focusing on the development of children between grade 6 and grade 8 mitigates the selection problem stemming from commuting for two reasons. First, there is an entry requirement to secondary schools, which implies that at the beginning of the secondary school the within-class variation is much smaller than the same variation in grade 6. Second, the number of secondary school is much smaller than the number of primary schools. This makes a necessasity for many students to commute as there is no local secondary school.

It is important to note that employing school fixed effects is likely to result in the underestimation of the true effect of the criris. School fixed effects are potentially bad controls as the crisis could have had an impact on school quality as well. For example school expenditure might decrease, or the crisis might influence teachers as well since they could also have foreign currency denominated loans. Declining school quality might be an important channel of the debt shock, therefore using just the within-school variation might underestimate the true effect of the crisis.

3.4 Results

Difference-in-differences I begin by presenting the main difference-in-differences results for children between grade 8 and grade 10 in Table C.2. Panel A shows the results for mathematics, and Panel B for reading. The standard errors are clustered at the grade 10 class level. Column 1 shows the relation between foreign currency share and the change in math test scores with no covariates included. FCS and both math and reading test scores are negatively correlated. In column 2, I include zip code level indebtedness control variables such as per capita number of loans, which allows me to use only the within currency variation part of the balance sheet shock. The effect of FCS decreases in absolute terms but remains significant. In column 3, I add student level control variables, which allows for that students with different characteristics might have different development of math and reading skills. In column 4 I include school fixed effect, and in column 5, I include class fixed effects. These fixed effects allow me to compare the development of students within the same school, and within the same class, respectively. The point estimates are similar as before. The point estimate in column 5 can be interpreted as going from zero dollarization

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of household loans to full dollarization would have decreased the development of math skills by approximately by 20 points, or 10 percent of the standard deviation. The results for reading comprehension show a similar pattern.

Because it is not the foreign currency denomination that matters but the debt shock, I calculate the effect of an unexpected debt shock on student achievement in column 6. The results indicate that a 10 percent unanticipated debt shock decreases student performance by 9 points, or 4.5 percent of the standard deviation.

Placebo test Omitted variable poses a major threat to identification. The main concern with the baseline identification strategy is that there could be such an omitted variable that influences the development of children, and it is also correlated with foreign currency borrowing of households. Therefore the development of children living in more exposed regions might have been slower even in the absence of the crisis.

To rule out the possibility of pre-trend, I conduct a placebo test using pre-crisis data. Though the NABC data has longitudinal structure only from 2008 onwards, the Educational Authority matched students' test scores across years for the pre-crisis period for one cohort.[3] These students were in grade 8 in 2006 and in grade 10 in 2008, hence both tests were taken before the crisis. Moreover, these are the same grades as in my main sample, hence this is directly comparable to the main results.

The results of the placebo test are presented in Table C.3, Panel A contains the estimates for mathematics and Panel B for reading. Column 1 shows the results when no covariates are included. The point estimates are close to zero and insignificant both for math and reading scores. This indicates that the development of children living in high FCS and low FCS zip codes were similar between grade 8 and grade 10. In the other columns I include control variables and the results do not change, the parameter of FC share remains insignificant for both mathematics and reading comprehension. This indicates that the development of children before the outbreak of the crisis was unrelated to the prevalence

[3]Despite the fact that Educational Authority made the matching, the match rate was only 57 percent. To better understand the sample resulted from the matching, I compare the characteristics of the matched and non-matched students in grade 8. Table **??** summarizes the results. The matched students have slightly better observables, which suggests a non-random matching. However, part of the small match rate might be because of grade retention, and grade repeaters have worse characteristics on average. Hence it is not obvious that a difference between the groups is a sign of non-random matching.

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of foreign currency loans.

Other cohorts I also examine the impact of the crisis on other cohorts. The child development literature finds that the early years are more important (see Heckman (2008) for an overview), therefore I look at how younger children are affected. Then I analyze the effect for the same age group for younger cohorts that were already affected by the crisis when they took the first test.

Despite the commuter's selection problem, I begin by measuring the effect of the crisis between grade 6 and grade 8. Results are presented in Table C.4 for students that were in grade 6 in 2008. It is indicative about the selection stemming from commuting that the point estimates of FCS are positive without individual control variables. Once I include student characteristics as covariates, I find no effect of the crisis. This result remians if I add school or class fixed effects. In the last column I drop students that attend the local school. Using only the commuting students foreign currency share still not have a significant effect, moreover the point estimates are positive.

Next, I measure the effect of foreign currency debt exposure between grade 8 and grade 10 for younger cohorts. Table C.5 presents the results for the cohort that was in grade 8 in 2009 and in grade 10 in 2011, while Table C.6 shows the estimates for the cohort that was in grade 8 in 2010 and in grade 10 in 2012. Between 2009 and 2011 I find negative point estimates, but the results are insignificant. Between 2010 and 2012 the point estimatas are significantly negative, the coefficient for mathematics is similar to the one using the sample between 2008-2010, but the point estimate on reading is 50 percent larger than between 2008 and 2010.

These younger cohorts had been already affected by the depreciation when they took the tests in grade 8. If the crisis had a negative impact on younger students as well, despite my null results then the crisis could have had a continuous negative impact on child development. Interestingly, though I can find no effect between grade 6 and grade 8 for the cohort that was in grade 6 in 2008, for the same cohort I find a large negative effect for the crisis between grade 8 and grade 10.

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3.4.1 Robustness checks

Alternative measure of foreign currency debt exposure I also check whether the results are driven by the choice of exposure measure. I use the per capita number of foreign currency and local currency loans as a measure of exposure. This measure of exposure can be derived from individual level regression aggregated to zip code level. Because this specification measures the effect of adding one foreign currency loan per capita, I drop the per capita number of loans from the control variables for this specification.

Results are reported in Table C.8. The results are not robust to this alternative measure of exposure. Foreign currency debt exposure of households does not decrease student performance. The point estimates are negative for reading, however, they are not significant. We find the local currency exposure is negatively correlated with student performance but adding control variables makes the relationship insignificant too.

Lagged dependent variable The baseline specification is a first difference regression, which is equivalent to using student fixed effects (FE). An alternative way of controlling for differences in student time-invariant characteristics is including lagged dependent variable (LDV). This is a cross-sectional regression when we use the second period performance as outcome, and include the first period performance as a control variable instead of the student fixed effect. Guryan (2001) shows analitically that the FE and LDV estimates can be used for bracketing the true effect. Hence estimating the LDV specification as well could provide additional information about the size of the effect.

Table C.9 shows the LDV estimates. These are less negative than the FE estimates, and some of them are not significantly different form zero. This implies that the effect of the crisis is between zero and 0.1 standard deviation.

3.5 Mechanism

The previous section documented the negative effect of the household balance sheet shock on student achievement. This section explores what are the channels through which the household debt shock could have influenced the cognitive skills of students.

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Unemployment Increased unemployment might explain the decline in the cognitive skills of students. A household balance sheet shock increases unemployment as affected households cut back consumption, and local firms facing a decreasing demand for their goods and services lay off some of their employees (Mian and Sufi, 2014).Therefore unemployment increased more in zip codes more exposed to the exchange rate shock. Verner and Gyöngyösi (2017) show that foreign currency debt exposure of households significantly worsened the depth of local recession. One fourth of the increase in unemployment can be attributed to foreign currency debt exposure of households.

As parental job loss has a negative impact on student achievement (Rege et al., 2011; Stevens and Schaller, 2011), this channel might mediate the negative impact of crisis. Parents living in more exposed regions are more likely to lose their jobs. Therefore the observed decline of student performance might be explained by the increasing unemployment, rather than the financial distress of households.

I use the self-reported employment status of parents from the survey to control for parental job loss.[4] I focus on the cohort that was in grade 8 in 2008. Table C.7 presents the results. I find that controlling for father's and mother's employment status in 2010, both separately and jointly, does not affect the point estimate of FCS.

Alternative mechanisms The financial distress of families can affect children outcomes through several channels. The financial distress of households channel emphasizes the drop in diposable income. However, alternative channels might be similarly important.

Economic hardship could increase the stress levels of parents. Involuntary unemployment is documented to increase mental stress (McKee-Ryan et al., 2005; Kuhn et al., 2009). The debt shock induced financial stress of households could have similar effect on mental stress. Increased mental stress could therefore influence the way parents interact with their children, they might become less patient, less caring. Which, in turn, could affect the cognitive development of children in schools.

Parents might increase their labor supply as a result of the debt shock. To counter the drop in household disposable income, parents might take a second job. This could change

[4]The NABC questionnaire differentiates between several kinds of employment status: have permanent job, self-employed, have work regularly, have occasional works, unemployed, disabled, receive child allowance.

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both the amount and quality of time they spend with their children. Less time with children might have a detrimental effect on children outcomes.

Economic hardship might also increase the change of marital dissolution (Charles and Stephens, 2004). Divorce is documented to have negative effects on children, hence it could be an important channel for the declining student performance.

3.6 Conclusion

This chapter analyzed the impact of household financial distress on student achievement. It focused on a financial crisis, and exploited foreign currency borrowing of households as a natural experiment in Hungary. The unexpected and large depreciation of the domestic currency during the crisis increased the debt burden of households borrowing in foreign currencies but not of households borrowing in domestic currency.

I find that the math and reading skilss of children living in more exposed zip codes declined relative to children living in less exposed zip codes. A 10 percent unanticipated debt shock decreased student performance by 0.045 standard deviation. This effect is not explained by higher unemployment in more exposed zip codes. These results should be treated with care as alternative measures of exposure give insignificant estimates.

During the crisis in 2011 the compulsory schooling age was decreased from 18 to 16. Though this does not affect my estimates as the oldest students are in grade 10, the crisis potentially could have increased dropping out from school. Hence this policy could have amplified the negative effect of the crisis, especially in poorer regions.

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Appendix A

Appendix for Chapter 2

A.1 Figures

A.2 Tables

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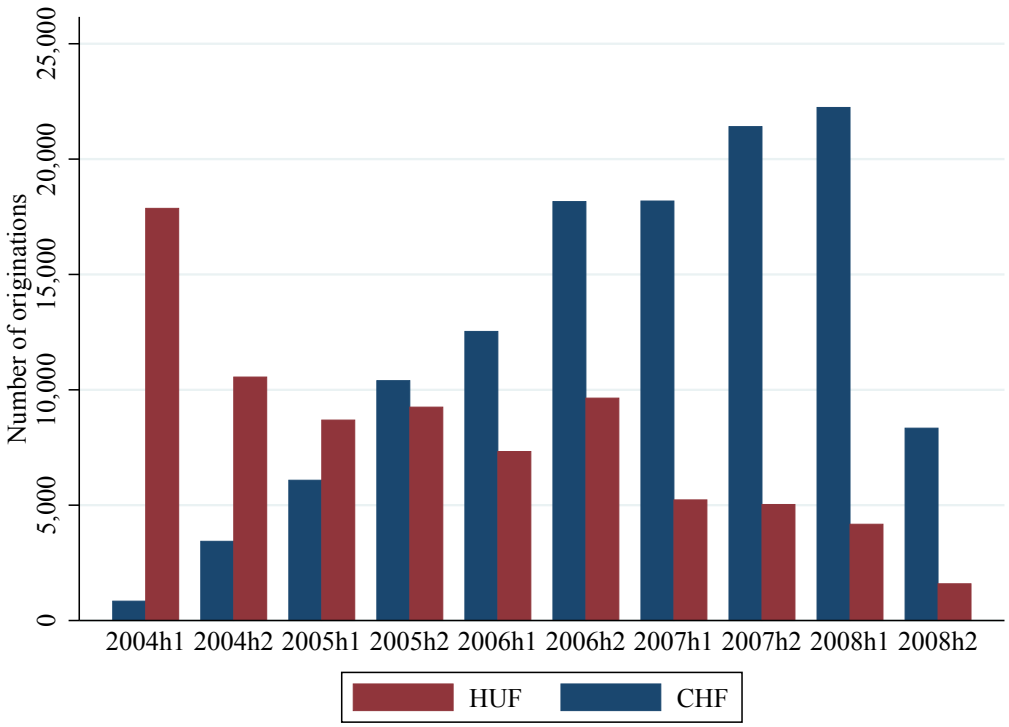
Figure A.1: Number of new mortgage originations by currency denomination



Note: This figure shows the number of new mortgage originations by currency denomination over time.

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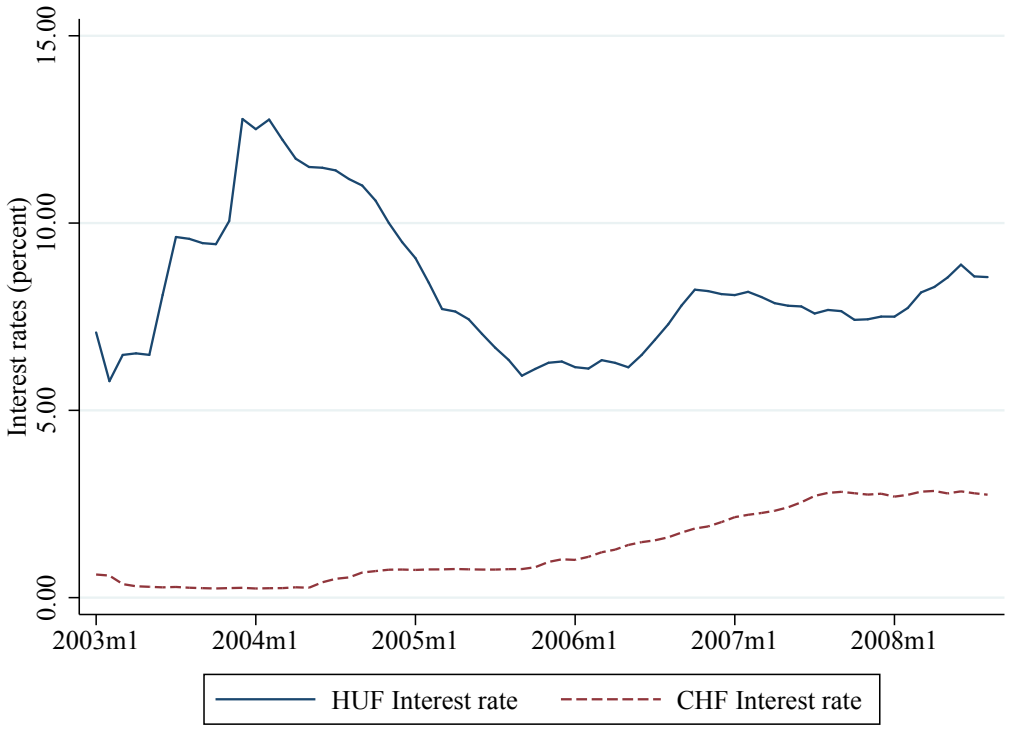
Figure A.2: Hungarian and Swiss interest rate



Note: This figure shows the evolution of the Hungarian and Swiss interest rates.

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Figure A.3: Descriptive statistics

SUMMARY STATISTICS

Variable Name	Units	Definition	Mean	Std	Min	25th Pc	Median	75th Pc	Max
Dependent variables									
Granting of $Credit_{ikt}$	0/1	=1 if borrower i receives credit in currency k in month t, conditional on having received no credit in currency k in month t-1, =0 otherwise	0,0092	0,0954	0	0	0	0	1
Independent Variables									
Macroeconomic Variables									
Δ Interest $Rate_{t-1m}$	-	Annual change in the Hungarian 3-month government bond rate in month t-1	-0,0003	0,0299	-0,0508	-0,0260	0,0030	0,0173	0,0698
Δ Interest Rate in $Switzerland_{t-1m}$	-	Annual change in the Swiss 3-month LIBOR interest rate in month t-1	0,0052	0,0041	-0,0042	0,0026	0,0049	0,0090	0,0119
Δ GDP_{t-1q}	-	Annual growth rate in Hungarian gross domestic product in quarter t-1	0,0333	0,0170	0	0,0210	0,0390	0,0470	0,0510
Δ CPI_{t-1m}	-	Annual change in the Hungarian consumer price index in month t-1	0,0572	0,0203	0,0230	0,0360	0,0645	0,0710	0,0900
Δ Exchange $Rate_{t-1m}$	-	Annual change in the HUF/CHF exchange rate in month t-1	-0,0006	0,0541	-0,1200	-0,0455	-0,0010	0,0325	0,1170
Foreign Direct $Investment_{t-1q}$	-	Annual change in the stock of Hungarian foreign direct investment in quarter t-1	-0,3558	5,6342	-12,5010	-1,8632	-0,0537	1,3669	12,2672
Δ Credit Default Swap $Spread_{t-1m}$	-	Annual change in the nominal effective exchange rate index of the Forint in month t-1	0,1017	0,3741	-0,2386	-0,1403	-0,0399	0,1871	1,4808
Δ Yield $Curve_{t-1m}$	-	Annual change in the difference between 10-year and 1-year government bond yields in month t-1	0,0010	0,0164	-0,0399	-0,0107	-0,0005	0,0158	0,0311
Bank Characteristics									
Bank Capital $Ratio_{t-1m}$	-	Ratio of bank equity to total bank assets in month t-1	0,0839	0,0458	0,0367	0,0592	0,0708	0,0934	0,4442
Bank Total $Assets_{t-1m}$	000 000 Forint	Total bank assets in month t-1	112 128	449 944	1 053	4 417	6 854	12 727	3 924 000
Log(Bank Total $Assets)_{t-1m}$	-	Natural logarithm of total bank assets in month t-1	9,21	1,55	6,95	8,38	8,82	9,44	15,15
Bank Liquidity $Ratio_{t-1m}$	-	Ratio of liquid assets to total bank assets in month t-1	0,3450	0,1355	0,0154	0,2776	0,3596	0,4211	0,7871
Bank Return On $Assets_{t-1m}$	-	Ratio of pretax profits to total bank assets in month t-1	0,0045	0,0037	-0,0214	0,0032	0,0045	0,0063	0,0162
Bank Doubtful Loan $Ratio_{t-1m}$		Bank doubtful loan ratio in month t-1	0,5657	0,0789	0,0386	0,5356	0,5773	0,6139	0,7448
Subregion Characteristics									
Log(Income in Subregion)	-	Logarithm of annual tax base per number of taxpayers in subregion (average over sample period)	7,11	0,16	6,77	6,99	7,07	7,22	7,63
Unemployment in Subregion	-	Proportion of unemployed in active population in subregion where borrower lives (average over sample period)	0,0534	0,0288	0,0091	0,0312	0,0482	0,0725	0,1428
Log(Population in Subregion)	-	Logarithm of population in subregion where borrower lives (average over sample period)	10,55	0,75	8,87	10,03	10,53	10,99	14,35
Borrower Risk Measures									
Borrower Has Guarantor	0/1	=1 if borrower is asked to name guarantor when taking loan, =0 otherwise	0,5416	0,4983	0	0	1	1	1
Borrower Defaults within 6 Years Subsequent to Taking the Loan	0/1	=1 if borrower gets into 3-month delinquency within 6 years after taking the loan, =0 otherwise	0,1407	0,3477	0	0	0	0	1

NOTE. -- The number of observations equals 21,893,298. Regressions in Tables 1-6 are run employing a 20 percent random sample. The loan origination period is January 2004 to August 2008. Summary statistics for banks and households are based on the average values of their characteristics over the origination period. The time index on each variable indicates the timing of the variable in the main regressions with t-1 indicating a one-period lag of a month (m), quarter (q) or year (y), respectively.

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A.3 Additional results

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Figure A.4: Bank lending channel

Model	(1)	(2)	(3)	(4)	(5)
Δ Interest Rate	-0.1611***	-0.1287***	-0.0491		
	(-9.14)	(-5.86)	(-1.26)		
Δ Interest Rate * Bank Capital Ratio		0.1017	0.3670***	0.2768**	0.2648**
		(0.83)	(2.94)	(2.20)	(2.10)
Δ GDP	-0.1729***	-0.2692***			
	(-16.20)	(-11.67)			
Δ GDP * Bank Capital Ratio		1.3582***	1.2144***	1.5717***	1.4296***
		(6.17)	(5.72)	(6.98)	(6.51)
Δ CPI	-0.0337***	-0.0035	-0.0539*		
	(-2.69)	(-0.16)	(-1.90)		
Δ CPI * Bank Capital Ratio		-0.2924	-0.2306	0.0640	0.1049
		(-1.43)	(-1.13)	(0.30)	(0.50)
Bank Capital Ratio		-0.0877***	-0.1134***	-0.1465***	-0.1424***
		(-4.53)	(-6.00)	(-7.39)	(-7.19)
Bank Total Assets		0.0161***	0.0111***	0.0106***	0.0111***
		(23.63)	(14.51)	(13.57)	(14.42)
Bank Liquidity Ratio		-0.0025	0.0046	0.0018	0.0025
		(-0.67)	(1.19)	(0.45)	(0.63)
Bank Return On Assets		-0.0343***	-0.0205**	0.0141	0.0168
		(-4.06)	(-2.36)	(1.12)	(1.30)
Bank Doubtful Loan Ratio		-0.0658***	-0.0738***	-0.0750***	-0.0739***
		(-24.13)	(-26.52)	(-26.71)	(-26.54)
Income in Subregion	0.0035*	-0.0082***			
	(1.76)	(-3.33)			
Population in Subregion	-0.0003	0.0012			
	(-0.27)	(1.00)			
Unemployment in Subregion	-0.0295	0.0016			
	(-1.13)	(0.06)			
Δ Credit Default Swap Spread	0.0038***	0.0028***	-0.0003		
	(7.12)	(5.14)	(-0.24)		
Δ Exchange Rate	0.0259***	0.0256***	0.0067		
	(8.00)	(7.75)	(0.78)		
Δ Yield Curve	-0.3803***	-0.3288***	0.0407		
	(-12.26)	(-10.42)	(0.81)		
Foreign Direct Investment	0.0001***	0.0001***			
	(3.21)	(5.19)			
Constant	0.0000***	0.0000***	-0.0000	-0.0000	-0.0000
	(15.62)	(9.06)	(-0.00)	(-0.01)	(-0.00)
Individual Borrower Fixed Effects	Yes	Yes	Yes	Yes	Yes
Subregion-Year:Quarter Fixed Effects	No	No	Yes	Yes	--
Subregion-Year:Month Fixed Effects	No	No	No	No	Yes
Year:Month Fixed Effects	No	No	No	Yes	--
N	2,189,215	2,189,215	2,189,215	2,189,215	2,189,215
R2	0.0008	0.0015	0.0007	0.0009	0.0007
Percentage Point Difference in Impact of a One Standard Deviation (299 bps) Decrease in Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)					
	-	*0,0279*	*0,1006*	*0,0759*	*0,0726*
Difference in Impact of a One Standard Deviation (299 bps) Decrease in Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations) as Percent of Unconditional Probability of Granting a Mortgage in Sample (= 0.92%)					
	-	*3%*	*11%*	*8%*	*8%*

NOTE. -- The table reports estimates from ordinary least squares regressions. The dependent variable in all models is Credit Granted which equals one if an individual receives a loan in given month in the domestic or foreign currency (HUF or CHF) and equals zero otherwise. All independent variables are either lagged one month or calculated over the preceding month. Timing, definition and summary statisticcs for each variable is given in Table I. The number of observations equals 4,378,430 and it is a 20 percent random sample of mortgages in the credit register data set. Coefficients are listed in the first row, t-statistics based on robust standard errors clustered at the individual level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of fixed effects is included. "No" indicates that the set of fixed effects is not included. "--" indicates that the set of fixed effects is comprised in the wider included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

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Figure A.5: Bank lending channel

in the domestic and foreign currency

Model	(1)	(2)	(3)	(4)	(5)	(6)
Δ Interest Rate	-0.0338***	-0.1360***				
	(-2.74)	(-5.66)				
Δ Interest Rate * Bank Capital Ratio	0.1921**	0.7208***	0.6746***	0.6754***		
	(2.12)	(7.38)	(6.89)	(6.87)		
Δ Interest Rate * Credit Is Granted in Foreign Currency	-0.0669***	0.2276***	0.2276***			
	(-6.24)	(9.62)	(9.62)			
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.2318**	-1.0125***	-1.0125***	-1.0267***	-1.0267***	-1.0399***
	(-2.01)	(-7.79)	(-7.79)	(-7.84)	(-5.56)	(-5.14)
Δ GDP	0.1408***					
	(11.06)					
Δ GDP * Bank Capital Ratio	-0.1872	-0.1296	0.0503	-0.0341		
	(-1.42)	(-0.98)	(0.37)	(-0.25)		
Δ GDP * Credit Granted in Foreign Currency	-0.5446***					
	(-29.31)					
Δ GDP * Bank Capital Ratio * Credit Is Granted in Foreign Currency	1.6645***	1.4103***	1.4103***	1.4327***	1.4327***	1.5748***
	(8.66)	(7.14)	(7.14)	(7.24)	(5.13)	(5.20)
Δ CPI	0.0158	0.0435**				
	(1.20)	(2.34)				
Δ CPI * Bank Capital Ratio	-0.4769***	-0.6880***	-0.5384***	-0.5368***		
	(-3.69)	(-5.12)	(-3.97)	(-3.94)		
Δ CPI * Credit Is Granted in Foreign Currency	-0.0215	-0.1292***	-0.1292***			
	(-1.14)	(-4.43)	(-4.43)			
Δ CPI * Bank Capital Ratio * Credit Is Granted in Foreign Currency	0.4810**	0.9662***	0.9662***	1.0056***	1.0056***	1.0676***
	(2.53)	(4.83)	(4.83)	(4.99)	(3.54)	(3.46)
Credit Granted in Foreign Currency	0.0269***					
	(16.75)					
Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.1257***	-0.1593***	-0.1593***	-0.1628***	-0.1628***	-0.1750***
	(-7.61)	(-9.28)	(-9.28)	(-9.42)	(-6.67)	(-6.61)
Δ Credit Default Swap Spread	0.0014***	-0.0002				
	(4.90)	(-0.33)				
Δ Exchange Rate	0.0130***	0.0031				
	(7.65)	(0.70)				
Δ Yield Curve	-0.1659***	0.0246				
	(-10.29)	(0.96)				
Foreign Direct Investment	0.0001***					
	(5.02)					
Bank Capital Ratio	0.0249**	0.0280**	0.0113	0.0152		
	(2.08)	(2.30)	(0.91)	(1.22)		
Bank Total Assets	0.0084***	0.0057***	0.0055***	0.0057***		
	(24.19)	(14.64)	(13.73)	(14.58)		
Bank Liquidity Ratio	-0.0025	0.0012	-0.0002	0.0001		
	(-1.30)	(0.62)	(-0.12)	(0.05)		
Bank Return On Assets	-0.0169***	-0.0100**	0.0082	0.0097		
	(-3.89)	(-2.24)	(1.26)	(1.47)		
Bank Doubtful Loan Ratio	-0.0329***	-0.0372***	-0.0378***	-0.0372***		
	(-23.17)	(-25.62)	(-25.80)	(-25.62)		
Income in Subregion	-0.0041***					
	(-3.28)					
Population in Subregion	0.0006					
	(0.92)					
Unemployment in Subregion	-0.0015					
	(-0.11)					
Constant	0.0000***	-0.0000	-0.0000	-0.0000	0.0000***	0.0000***
	(7.67)	(-0.00)	(-0.01)	(-0.00)	(6.40)	(2.84)
Individual Borrower Fixed Effects	Yes	Yes	Yes	Yes	--	--
Subregion-Year:Quarter-Currency Fixed Effects	No	Yes	Yes	No	--	--
Subregion-Year:Month-Currency Fixed Effects	No	No	No	Yes	Yes	--
Settlement-Year:Month-Currency Fixed Effects	No	No	No	No	No	Yes
Year:Month Fixed Effects	No	No	Yes	No	--	--
Individual Borrower-Year:Month Fixed Effects	No	No	No	No	Yes	Yes
N	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430
R2	0.0026	0.0005	0.0006	0.0005	0.0003	0.0003
Percentage Point Difference in Impact of a One Standard Deviation (299 bps) Decrease in Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint	-	*0,1976*	*0,1849*	*0,1851*	-	-
in Foreign Currency	-	*-0,0800*	*-0,0926*	*-0,0963*	-	-
Difference in Impact Between Foreign Currency and Hungarian Forint	-	*-0,2775*	*-0,2775*	*-0,2814*	*-0,2814*	*-0,2850*
Difference in Impact of a One Standard Deviation (299 bps) Decrease in Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations) as Percent of Unconditional Probability of Granting a Mortgage in Sample (= 0.92%)						
in Hungarian Forint	-	*21%*	*20%*	*20%*	-	-
in Foreign Currency	-	*-9%*	*-10%*	*-10%*	-	-
Difference in Impact Between Foreign Currency and Hungarian Forint	-	*-30%*	*-30%*	*-31%*	*-31%*	*-31%*

NOTE. -- The table reports estimates from ordinary least squares regressions. The dependent variable in all models is Credit Granted which equals one if an individual receives a loan in given month in the domestic or foreign currency (HUF or CHF) and equals zero otherwise. All independent variables are either lagged one month or calculated over the preceding month. Timing, definition and summary statisticcs for each variable is given in Table I. The number of observations equals 4,378,430 and it is a 20 percent random sample of mortgages in the credit register data set. Coefficients are listed in the first row, t-statistics based on robust standard errors clustered at the firm level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of fixed effects is included. "No" indicates that the set of fixed effects is not included. "--" indicates that the set of fixed effects is comprised in the wider included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

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Figure A.6: Domestic and foreign bank lending channel in the domestic and foreign currency

	(1)	(2)	(3)	(4)	(5)	(6)
Δ Interest Rate	-0.0409***	-0.1174***				
	(-3.12)	(-4.76)				
Δ Interest Rate * Bank Capital Ratio	0.0368	0.2200**	0.1743	0.1741		
	(0.36)	(2.07)	(1.63)	(1.62)		
Δ Interest Rate * Credit Is Granted in Foreign Currency	0.0126	0.2090***	0.2090***			
	(1.00)	(8.67)	(8.67)			
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.5974***	-0.8107***	-0.8107***	-0.8151***	-0.8151***	-0.8082***
	(-4.47)	(-5.79)	(-5.79)	(-5.77)	(-4.09)	(-3.74)
Δ Interest Rate in Switzerland	0.1399***	0.8075***				
	(2.96)	(8.47)				
Δ Interest Rate in Switzerland * Bank Capital Ratio	-4.9706***	-6.8997***	-6.9488***	-6.9169***		
	(-11.33)	(-14.28)	(-14.41)	(-14.38)		
Δ Interest Rate in Switzerland * Credit Is Granted in Swiss Franc	1.1873***	0.3881**	0.3881**			
	(18.74)	(2.24)	(2.24)			
Δ Interest Rate in Switzerland * Bank Capital Ratio * Credit Is Granted in Swiss Franc	-0.0469	2.6765***	2.6765***	2.7846***	2.7846***	3.0420***
	(-0.08)	(3.98)	(3.98)	(4.12)	(2.92)	(2.92)
Δ GDP	0.0721***					
	(5.64)					
Δ GDP * Bank Capital Ratio	-0.2722**	-0.3476***	-0.2127	-0.3066**		
	(-2.09)	(-2.64)	(-1.57)	(-2.28)		
Δ GDP * Credit Granted in Foreign Currency	-0.4121***					
	(-21.67)					
Δ GDP * Bank Capital Ratio * Credit Is Granted in Foreign Currency	1.5107***	1.5027***	1.5027***	1.5305***	1.5305***	1.6805***
	(7.85)	(7.60)	(7.60)	(7.73)	(5.48)	(5.54)
Δ CPI	-0.0216	-0.0397**				
	(-1.47)	(-2.02)				
Δ CPI * Bank Capital Ratio	0.1747	0.1880	0.3201**	0.3264**		
	(1.16)	(1.23)	(2.07)	(2.09)		
Δ CPI * Credit Is Granted in Foreign Currency	-0.0858***	-0.1050***	-0.1050***			
	(-3.91)	(-3.38)	(-3.38)			
Δ CPI * Bank Capital Ratio * Credit Is Granted in Foreign Currency	0.4688**	0.5576**	0.5576**	0.5776**	0.5776*	0.5987*
	(2.07)	(2.43)	(2.43)	(2.49)	(1.77)	(1.70)
Credit Granted in Foreign Currency	0.0204***					
	(12.53)					
Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.1239***	-0.1555***	-0.1555***	-0.1586***	-0.1586***	-0.1703***
	(-7.40)	(-9.01)	(-9.01)	(-9.13)	(-6.47)	(-6.41)
Δ Credit Default Swap Spread	0.0035***	-0.0002				
	(10.42)	(-0.33)				
Δ Exchange Rate	0.0093***	0.0085*				
	(5.42)	(1.87)				
Δ Yield Curve	-0.1838***	-0.0136				
	(-11.37)	(-0.51)				
Foreign Direct Investment	0.0001***					
	(10.09)					
Bank Capital Ratio	0.0206*	0.0334***	0.0206	0.0243*		
	(1.70)	(2.68)	(1.62)	(1.91)		
Bank Total Assets	0.0058***	0.0049***	0.0048***	0.0051***		
	(15.41)	(12.44)	(11.88)	(12.85)		
Bank Liquidity Ratio	-0.0024	-0.0010	-0.0025	-0.0021		
	(-1.23)	(-0.53)	(-1.24)	(-1.05)		
Bank Return On Assets	-0.0184***	-0.0104**	0.0101	0.0116*		
	(-4.24)	(-2.32)	(1.55)	(1.75)		
Bank Doubtful Loan Ratio	-0.0396***	-0.0418***	-0.0421***	-0.0413***		
	(-27.24)	(-28.47)	(-28.44)	(-28.21)		
Income in Micro Region	-0.0085***					
	(-6.12)					
Population in Micro Region	0.0010					
	(1.62)					
Unemployment in Micro Region	-0.0061					
	(-0.47)					
Constant	0.0000***	-0.0000	-0.0000	-0.0000	0.0000***	0.0000***
	(6.34)	(-0.00)	(-0.01)	(-0.00)	(6.35)	(2.85)
Individual Borrower Fixed Effects	Yes	Yes	Yes	Yes	--	--
Subregion-Year:Quarter-Currency Fixed Effects	No	Yes	Yes	No	--	--
Subregion-Year:Month-Currency Fixed Effects	No	No	No	Yes	Yes	--
Settlement-Year:Month-Currency Fixed Effects	No	No	No	No	No	Yes
Year:Month Fixed Effects	No	No	Yes	No	--	--
Individual Borrower-Year:Month Fixed Effects	No	No	No	No	Yes	Yes
N	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430
R2	0.0031	0.0005	0.0006	0.0005	0.0003	0.0003
Percentage Point Difference in Impact of a One Standard Deviation (299 bps) Decrease in Domestic Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint	-	*0,0603*	*0,0478*	*0,0477*	--	--
in Foreign Currency	-	*-0,1623*	*-0,1744*	*-0,1757*	--	--
Difference in Impact Between Foreign Currency and Hungarian Forint	-	*-0,2226*	*-0,2222*	*-0,2234*	*-0,2234*	*-0,2215*
Difference in Impact of a One Standard Deviation (299 bps) Decrease in Domestic Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations) as Percent of Unconditional Probability of Granting a Mortgage in Sample (= 0.92%)						
in Hungarian Forint	-	*7%*	*5%*	*5%*	--	--
in Foreign Currency	-	*-18%*	*-19%*	*-19%*	--	--
Difference in Impact Between Foreign Currency and Hungarian Forint	-	*-24%*	*-24%*	*-24%*	*-36%*	*-36%*
Percentage Point Difference in Impact of a One Standard Deviation (41 bps) Decrease in Swiss Franc Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint	-	*-0,2593*	*-0,2612*	*-0,2600*	--	--
in Foreign Currency	-	*-0,1587*	*-0,1606*	*-0,1553*	--	--
Difference in Impact Between Foreign Currency and Hungarian Forint	-	*0,1006*	*0,1006*	*0,1047*	*0,1047*	*0,1143*
Difference in Impact of a One Standard Deviation (41 bps) Decrease in Swiss Franc Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations) as Percent of Unconditional Probability of Granting a Mortgage in Sample (= 0.92%)						
in Hungarian Forint	-	*-28%*	*-28%*	*-28%*	--	--
in Foreign Currency	-	*-17%*	*-17%*	*-17%*	--	--
Difference in Impact Between Foreign Currency and Hungarian Forint	-	*11%*	*11%*	*11%*	*11%*	*12%*

NOTE. -- The table reports estimates from ordinary least squares regressions. The dependent variable in all models is Credit Granted which equals one if an individual receives a loan in given month in the domestic or foreign currency (HUF or CHF) and equals zero otherwise. Risky Borrower equals one if there are two borrowers, i.e., if there is guarantor for the loan, and equals zero otherwise. All independent variables are either lagged one month or calculated over the preceding month. Timing, definition and summary statisticcs for each variable is in Table I. The number of observations equals 4,378,430 and it is a 20 percent random sample of mortgages in the credit register data set. Coefficients are listed in the first row, t-statistics based on robust standard errors clustered at the firm level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of fixed effects is included. "No" indicates that the set of fixed effects is not included. "--" indicates that the set of fixed effects is comprised in the wider included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

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Figure A.7: Bank risk-taking channel in the domestic and the foreign currency with ex-post default as risk measure

	(1)	(2)	(3)	(4)	(5)	(6)
Δ Interest Rate	-0.0261**	-0.1302***				
	(-1.99)	(-5.33)				
Δ Interest Rate * Bank Capital Ratio	0.2256**	0.7729***	0.7211***	0.7220***		
	(2.18)	(6.99)	(6.51)	(6.49)		
Δ Interest Rate * Credit Is Granted in Foreign Currency	-0.0652***	0.2310***	0.2310***			
	(-5.49)	(9.52)	(9.52)			
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.4023***	-1.1937***	-1.1941***	-1.2077***	-1.2082***	-1.2336***
	(-3.14)	(-8.25)	(-8.25)	(-8.29)	(-5.87)	(-5.48)
Δ Interest Rate * Risky Borrower	-0.0720***	-0.0537***	-0.0577***	-0.0575***		
	(-4.24)	(-3.09)	(-3.32)	(-3.30)		
Δ Interest Rate * Bank Capital Ratio * Risky Borrower	-0.0768	-0.2137	-0.1742	-0.1736		
	(-0.42)	(-1.14)	(-0.93)	(-0.93)		
Δ Interest Rate * Credit Is Granted in Foreign Currency * Risky Borrower	0.0024	-0.0108	-0.0110	-0.0113	-0.0117	-0.0209
	(0.09)	(-0.38)	(-0.39)	(-0.40)	(-0.29)	(-0.48)
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Risky Borrower	0.9849***	1.0879***	1.0901***	1.0884***	1.0915**	1.1569**
	(3.41)	(3.57)	(3.58)	(3.56)	(2.53)	(2.45)
Individual Borrower Fixed Effects	Yes	Yes	Yes	Yes	--	--
Subregion-Year:Quarter-Currency Fixed Effects	No	Yes	Yes	No	--	--
Subregion-Year:Month-Currency Fixed Effects	No	No	No	Yes	Yes	--
Settlement-Year:Month-Currency Fixed Effects	No	No	No	No	No	Yes
Year:Month Fixed Effects	No	No	Yes	No	--	--
Individual Borrower-Year:Month Fixed Effects	No	No	No	No	Yes	Yes
N	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430
R2	0.0032	0.0010	0.0011	0.0010	0.0009	0.0010
Percentage Point Difference in Impact of a One Standard Deviation (299 bps) Decrease in Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint when Borrower is Not Risky	*0,0618*	*0,2118*	*0,1976*	*0,1979*	--	--
in Foreign Currency when Borrower is Not Risky	*-0,0484*	*-0,1153*	*-0,1296*	*-0,1331*	--	--
in Hungarian Forint when Borrower is Risky	*0,0618*	*0,2118*	*0,1976*	*0,1979*	--	--
in Foreign Currency when Borrower is Risky	*0,2215*	*0,1828*	*0,1691*	*0,1652*	--	--
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Not Risky	*-0,1103*	*-0,3272*	*-0,3273*	*-0,3310*	*-0,3312*	*-0,3381*
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Risky	*0,1597*	*-0,0290*	*-0,0285*	*-0,0327*	*-0,0320*	*-0,0210*
Difference in Impact of a One Standard Deviation (299 bps) Decrease in Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations) as Percent of Unconditional Probability of Granting a Mortgage in Sample (~ 0.93%)						
in Hungarian Forint when Borrower is Not Risky	*7%*	*23%*	*21%*	*22%*	--	--
in Foreign Currency when Borrower is Not Risky	*-5%*	*-13%*	*-14%*	*-14%*	--	--
in Hungarian Forint when Borrower is Risky	*7%*	*23%*	*21%*	*22%*	--	--
in Foreign Currency when Borrower is Risky	*24%*	*20%*	*18%*	*18%*	--	--
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Not Risky	*-12%*	*-36%*	*-36%*	*-36%*	*-36%*	*-37%*
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Risky	*17%*	*-3%*	*-3%*	*-4%*	*-3%*	*-2%*

NOTE. -- The table reports estimates from ordinary least squares regressions. The dependent variable in all models is Credit Granted which equals one if an individual receives a loan in given month in the domestic

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Figure A.8: Domestic and foreign bank risk-taking channel in the domestic and the foreign currency with ex-post default as risk measure

Model	(1)	(2)	(3)	(4)	(5)	(6)
Δ Interest Rate	-0.0387***	-0.1160***				
	(-2.77)	(-4.61)				
Δ Interest Rate * Bank Capital Ratio	0.0975	0.2882**	0.2382**	0.2381**		
	(0.84)	(2.39)	(1.97)	(1.96)		
Δ Interest Rate * Credit Is Granted in Foreign Currency	0.0180	0.2153***	0.2153***			
	(1.28)	(8.65)	(8.65)			
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.7724***	-0.9861***	-0.9863***	-0.9891***	-0.9889***	-0.9959***
	(-5.15)	(-6.30)	(-6.30)	(-6.26)	(-4.44)	(-4.12)
Δ Interest Rate * Risky Borrower	-0.0304	-0.0235	-0.0265	-0.0259		
	(-1.54)	(-1.17)	(-1.32)	(-1.28)		
Δ Interest Rate * Bank Capital Ratio * Risky Borrower	-0.2826	-0.3144	-0.2851	-0.2891		
	(-1.34)	(-1.46)	(-1.32)	(-1.34)		
Δ Interest Rate * Credit Is Granted in Foreign Currency * Risky Borrower	-0.0242	-0.0279	-0.0281	-0.0278	-0.0277	-0.0386
	(-0.78)	(-0.89)	(-0.90)	(-0.89)	(-0.63)	(-0.80)
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Risky Borrower	1.0230***	1.0151***	1.0164***	1.0074***	1.0059**	1.0777**
	(3.18)	(3.11)	(3.11)	(3.07)	(2.18)	(2.13)
Δ Interest Rate in Switzerland	0.0567	0.7374***				
	(1.09)	(7.55)				
Δ Interest Rate in Switzerland * Bank Capital Ratio	-4.9458***	-6.9576***	-7.0092***	-6.9793***		
	(-9.92)	(-12.84)	(-12.97)	(-12.95)		
Δ Interest Rate in Switzerland * Credit Is Granted in Foreign Currency	1.2429***	0.4360**	0.4360**			
	(17.72)	(2.47)	(2.47)			
Δ Interest Rate in Switzerland * Bank Capital Ratio * Credit Is Granted in Foreign Currency	0.3686	3.1425***	3.1425***	3.2647***	3.2647***	3.5398***
	(0.53)	(4.20)	(4.20)	(4.34)	(3.08)	(3.06)
Δ Interest Rate in Switzerland * Risky Borrower	0.6204***	0.5169***	0.5171***	0.5236***		
	(6.36)	(5.04)	(5.04)	(5.10)		
Δ Interest Rate in Switzerland * Bank Capital Ratio * Risky Borrower	-0.5992	0.1131	0.1295	0.0625		
	(-0.60)	(0.11)	(0.12)	(0.06)		
Δ Interest Rate in Switzerland * Credit Is Granted in Foreign Currency * Risky Borrower	-0.4048**	-0.3279*	-0.3279*	-0.3231*	-0.3231	-0.3539
	(-2.38)	(-1.89)	(-1.89)	(-1.86)	(-1.32)	(-1.32)
Δ Interest Rate in Switzerland * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Risky Borrower	-2.5302	-3.2327*	-3.2320*	-3.3156**	-3.3164	-3.2948
	(-1.54)	(-1.92)	(-1.92)	(-1.96)	(-1.39)	(-1.26)
Individual Borrower Fixed Effects	Yes	Yes	Yes	Yes	--	--
Subregion-Year:Quarter-Currency Fixed Effects	No	Yes	Yes	No	--	--
Subregion-Year:Month-Currency Fixed Effects	No	No	No	Yes	Yes	--
Settlement-Year:Month-Currency Fixed Effects	No	No	No	No	No	Yes
Year:Month Fixed Effects	No	No	Yes	No	--	--
Individual Borrower-Year:Month Fixed Effects	No	No	No	No	Yes	Yes
N	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430
R2	0.0037	0.0011	0.0012	0.0011	0.0010	0.0010
Percentage Point Difference in Impact of a One Standard Deviation (299 bps) Decrease in Domestic Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint when Borrower is Not Risky	--	*0,0790*	*0,0653*	*0,0653*	--	--
in Foreign Currency when Borrower is Not Risky	*-0,2117*	*-0,1918*	*-0,2050*	*-0,2058*	--	--
in Hungarian Forint when Borrower is Risky	--	*0,0790*	*0,0653*	*0,0653*	--	--
in Foreign Currency when Borrower is Risky	*0,0687*	*0,0864*	*0,0735*	*0,0703*	--	--
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Not Risky	--	*-0,2708*	*-0,2703*	*-0,2711*	*-0,2710*	*-0,2730*
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Risky	--	*0,0074*	*0,0083*	*0,0050*	*0,0047*	*0,0224*
Unconditional Probability of Granting a Mortgage in Sample (= 0.92%)						
in Hungarian Forint when Borrower is Not Risky	--	*9%*	*7%*	*7%*	-	-
in Foreign Currency when Borrower is Not Risky	*-23%*	*-21%*	*-22%*	*-22%*	-	-
in Hungarian Forint when Borrower is Risky	--	*9%*	*7%*	*7%*	-	-
in Foreign Currency when Borrower is Risky	*7%*	*9%*	*8%*	*8%*	-	-
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Not Risky	--	*-29%*	*-29%*	*-29%*	-29%	-30%
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Risky	--	1%	1%	1%	1%	2%
Percentage Point Difference in Impact of a One Standard Deviation (41 bps) Decrease in Swiss Franc Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint when Borrower is Not Risky	*-0,1859*	*-0,2615*	*-0,2634*	*-0,2623*	--	--
in Swiss Franc when Borrower is Not Risky	*-0,1859*	*-0,1434*	*-0,1453*	*-0,1396*	--	--
in Hungarian Forint when Borrower is Risky	*-0,1859*	*-0,2615*	*-0,2634*	*-0,2623*	--	--
in Swiss Franc when Borrower is Risky	*-0,1859*	*-0,2649*	*-0,2668*	*-0,2642*	--	--
Difference in Impact between Swiss Franc and Hungarian Forint, when Borrower is Not Risky	*0,0000*	*0,1181*	*0,1181*	*0,1227*	*0,1227*	*0,1330*
Difference in Impact between Swiss Franc and Hungarian Forint, when Borrower is Risky	*0,0000*	*-0,0034*	*-0,0034*	*-0,0019*	*-0,0019*	*0,0092*
Unconditional Probability of Granting a Mortgage in Sample (= 0.92%)						
in Hungarian Forint when Borrower is Not Risky	*-20%*	*-28%*	*-29%*	*-29%*	--	--
in Swiss Franc when Borrower is Not Risky	*-20%*	*-16%*	*-16%*	*-15%*	--	--
in Hungarian Forint when Borrower is Risky	*-20%*	*-28%*	*-29%*	*-29%*	--	--
in Swiss Franc when Borrower is Risky	*-20%*	*-29%*	*-29%*	*-29%*	--	--
Difference in Impact between Swiss Franc and Hungarian Forint, when Borrower is Not Risky	*0%*	*13%*	*13%*	*13%*	13%	14%
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower is Risky	*0%*	*0%*	*0%*	0%	0%	1%

NOTE. -- The table reports estimates from ordinary least squares regressions. The dependent variable in all models is Credit Granted which equals one if an individual receives a loan in given month in the domestic or

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Figure A.9: Bank risk-taking channel in the domestic and the foreign currency with ex-post default as risk measure, defaults due to 2008 exchange rate shock excluded

	(1)	(2)	(3)	(4)	(5)	(6)
Δ Interest Rate	-0.0260**	-0.1339***				
	(-1.97)	(-5.45)				
Δ Interest Rate * Bank Capital Ratio	0.2265**	0.7746***	0.7224***	0.7232***		
	(2.19)	(7.00)	(6.51)	(6.49)		
Δ Interest Rate * Credit Is Granted in Foreign Currency	-0.0652***	0.2316***	0.2316***			
	(-5.49)	(9.50)	(9.50)			
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.4023***	-1.1976***	-1.1980***	-1.2121***	-1.2129***	-1.2413***
	(-3.14)	(-8.27)	(-8.28)	(-8.31)	(-5.89)	(-5.50)
Δ Interest Rate * Risky Borrower	-0.0688***	-0.0515***	-0.0555***	-0.0554***		
	(-3.89)	(-2.84)	(-3.06)	(-3.05)		
Δ Interest Rate * Bank Capital Ratio * Risky Borrower	-0.1029	-0.2248	-0.1855	-0.1847		
	(-0.55)	(-1.16)	(-0.96)	(-0.95)		
Δ Interest Rate * Credit Is Granted in Foreign Currency * Risky Borrower	0.0047	-0.0047	-0.0049	-0.0052	-0.0057	-0.0161
	(0.17)	(-0.16)	(-0.17)	(-0.18)	(-0.14)	(-0.35)
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Risky Borrower	0.9843***	1.0428***	1.0452***	1.0417***	1.0470**	1.1157**
	(3.29)	(3.30)	(3.31)	(3.28)	(2.34)	(2.27)
Individual Borrower Fixed Effects	Yes	Yes	Yes	Yes	--	--
Subregion-Year:Quarter-Currency Fixed Effects	No	Yes	Yes	No	--	--
Subregion-Year:Month-Currency Fixed Effects	No	No	No	Yes	Yes	--
Settlement-Year:Month-Currency Fixed Effects	No	No	No	No	No	Yes
Year:Month Fixed Effects	No	No	Yes	No	--	--
Individual Borrower-Year:Month Fixed Effects	No	No	No	No	Yes	Yes
N	4,342,100	4,342,100	4,342,100	4,342,100	4,342,100	4,342,100
R2	0.0031	0.0010	0.0011	0.0010	0.0009	0.0009

NOTE. -- The table reports estimates from ordinary least squares regressions. The dependent variable in all models is Credit Granted which equals one if an individual receives a loan in given month in the

Figure A.10: Bank risk-taking channel in the domestic and the foreign currency with presence of guarantor as risk measure

Model	(1)	(2)	(3)	(4)	(5)	(6)
Δ Interest Rate	-0.0504***	-0.1530***				
	(-3.25)	(-5.88)				
Δ Interest Rate * Bank Capital Ratio	0.5016***	1.0704***	0.9536***	0.9467***		
	(3.32)	(6.72)	(5.99)	(5.94)		
Δ Interest Rate * Credit Is Granted in Foreign Currency	-0.0011	0.2886***	0.2889***			
	(-0.06)	(10.49)	(10.50)			
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.9860***	-1.6988***	-1.7012***	-1.7115***	-1.7185***	-1.7534***
	(-5.10)	(-7.91)	(-7.92)	(-7.93)	(-5.64)	(-5.36)
Δ Interest Rate * Borrower Has Guarantor	0.0042	0.0134	0.0033	0.0032		
	(0.25)	(0.77)	(0.19)	(0.18)		
Δ Interest Rate * Bank Capital Ratio * Borrower Has Guarantor	-0.3204*	-0.3859**	-0.2768	-0.2749		
	(-1.68)	(-1.97)	(-1.41)	(-1.40)		
Δ Interest Rate * Credit Is Granted in Foreign Currency * Borrower Has Guarantor	-0.1063***	-0.0990***	-0.0994***	-0.0992***	-0.1004***	-0.1057***
	(-4.80)	(-4.16)	(-4.18)	(-4.16)	(-2.98)	(-2.88)
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Borrower Has Guarantor	1.1871***	1.0729***	1.0770***	1.0717***	1.0838***	1.1416***
	(4.89)	(4.06)	(4.07)	(4.04)	(2.89)	(2.80)
Individual Borrower Fixed Effects	Yes	Yes	Yes	Yes	--	--
Subregion-Year:Quarter-Currency Fixed Effects	No	Yes	Yes	No	--	--
Subregion-Year:Month-Currency Fixed Effects	No	No	No	Yes	Yes	--
Settlement-Year:Month-Currency Fixed Effects	No	No	No	No	No	Yes
Year:Month Fixed Effects	No	No	Yes	No	--	--
Individual Borrower-Year:Month Fixed Effects	No	No	No	No	Yes	Yes
N	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430
R2	0.0030	0.0009	0.0010	0.0009	0.0008	0.0008
Percentage Point Difference in Impact of a One Standard Deviation (299 bps) Decrease in Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint when Borrower does Not Have a Guarantor	*0,1375*	*0,2934*	*0,2614*	*0,2676*	-	-
in Foreign Currency when Borrower does Not Have a Guarantor	*-0,1328*	*-0,1722*	*-0,2049*	*-0,2096*		
in Hungarian Forint when Borrower does Have a Guarantor	*0,0497*	*0,1876*	*0,1855*	*0,1841*	-	-
in Foreign Currency when Borrower does Have a Guarantor	*0,1048*	*0,0161*	*0,0144*	*0,0088*	-	-
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Not Have a Guarantor	*-0,2703*	*-0,4656*	*-0,4663*	*-0,4772*	*-0,4710*	*-0,4806*
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Have a Guarantor	*0,0551*	*-0,1716*	*-0,1711*	*-0,1754*	*-0,1740*	*-0,1677*
Probability of Granting a Mortgage in Sample (= 0.92%)						
in Hungarian Forint when Borrower does Not Have a Guarantor	*15%*	*32%*	*28%*	*29%*	-	-
in Foreign Currency when Borrower does Not Have a Guarantor	*-14%*	*-19%*	*-22%*	*-23%*		
in Hungarian Forint when Borrower does Have a Guarantor	*5%*	*20%*	*20%*	*20%*	-	-
in Foreign Currency when Borrower does Have a Guarantor	*11%*	*2%*	*2%*	*1%*	-	-
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Not Have a Guarantor	*-29%*	*-51%*	*-51%*	*-52%*	*-51%*	*-52%*
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Have a Guarantor	*6%*	*-19%*	*-19%*	*-19%*	*-19%*	*-18%*

NOTE. -- The table reports estimates from ordinary least squares regressions. The dependent variable in all models is Credit Granted which equals one if an individual receives a loan in given month in the domestic or foreign

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Figure A.11: Domestic and foreign bank risk-taking channel in the domestic and the foreign currency with presence of guarantor as risk measure

Model	(1)	(2)	(3)	(4)	(5)	(6)
Δ Interest Rate	-0.0724***	-0.1488***				
	(-4.53)	(-5.61)				
Δ Interest Rate * Bank Capital Ratio	0.4434***	0.6478***	0.5591***	0.5600***		
	(2.81)	(3.96)	(3.41)	(3.41)		
Δ Interest Rate * Credit Is Granted in Foreign Currency	0.0905***	0.2851***	0.2853***			
	(4.91)	(10.20)	(10.21)			
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-1.4030***	-1.5664***	-1.5684***	-1.5688***	-1.5757***	-1.5916***
	(-6.69)	(-7.15)	(-7.15)	(-7.12)	(-5.06)	(-4.78)
Δ Interest Rate * Borrower Has Guarantor	0.0321*	0.0376**	0.0323*	0.0331*		
	(1.71)	(1.98)	(1.70)	(1.73)		
Δ Interest Rate * Bank Capital Ratio * Borrower Has Guarantor	-0.4960**	-0.5259**	-0.4645**	-0.4715**		
	(-2.37)	(-2.46)	(-2.18)	(-2.21)		
Δ Interest Rate * Credit Is Granted in Foreign Currency * Borrower Has Guarantor	-0.1346***	-0.1319***	-0.1323***	-0.1321***	-0.1333***	-0.1389***
	(-5.23)	(-5.02)	(-5.03)	(-5.01)	(-3.57)	(-3.44)
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Borrower Has Guarantor	1.3414***	1.2579***	1.2614***	1.2560***	1.2679***	1.3291***
	(4.86)	(4.43)	(4.44)	(4.40)	(3.14)	(3.05)
Δ Interest Rate in Switzerland	-0.0056	0.7393***				
	(-0.08)	(6.73)				
Δ Interest Rate in Switzerland * Bank Capital Ratio	-5.0907***	-7.3779***	-7.2324***	-7.0433***		
	(-6.74)	(-8.99)	(-8.86)	(-8.76)		
Δ Interest Rate in Switzerland * Credit Is Granted in Foreign Currency	1.4224***	0.5759***	0.5758***			
	(14.45)	(3.01)	(3.01)			
Δ Interest Rate in Switzerland * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-0.1954	3.0002***	2.9997***	3.1157***	3.1139**	3.3072*
	(-0.19)	(2.68)	(2.68)	(2.77)	(1.97)	(1.92)
Δ Interest Rate in Switzerland * Borrower Has Guarantor	0.2878***	0.1894**	0.2209**	0.2351**		
	(3.27)	(2.05)	(2.40)	(2.57)		
Δ Interest Rate in Switzerland * Bank Capital Ratio * Borrower Has Guarantor	0.0855	0.6878	0.3957	0.2401		
	(0.09)	(0.69)	(0.40)	(0.24)		
Δ Interest Rate in Switzerland * Credit Is Granted in Foreign Currency *Borrower Has Guarantor	-0.4929***	-0.4094***	-0.4094***	-0.4083***	-0.4084**	-0.4119**
	(-3.80)	(-3.02)	(-3.02)	(-3.01)	(-2.13)	(-1.98)
Δ Interest Rate in Switzerland * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Borrower Has Guarantor	0.9242	0.1616	0.1628	0.1489	0.1530	0.2240
	(0.71)	(0.12)	(0.12)	(0.11)	(0.08)	(0.11)
Individual Borrower Fixed Effects	Yes	Yes	Yes	Yes	--	--
Subregion-Year:Quarter-Currency Fixed Effects	No	Yes	Yes	No	--	--
Subregion-Year:Month-Currency Fixed Effects	No	No	No	Yes	Yes	--
Settlement-Year:Month-Currency Fixed Effects	No	No	No	No	No	Yes
Year:Month Fixed Effects	No	No	Yes	No	--	--
Individual Borrower-Year:Month Fixed Effects	No	No	No	No	Yes	Yes
N	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430	4,378,430
R2	0.0035	0.0009	0.0010	0.0009	0.0008	0.0008
Percentage Point Difference in Impact of a One Standard Deviation (299 bps) Decrease in Domestic Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint when Borrower does Not Have a Guarantor	*0,1215*	*0,1776*	*0,1532*	*0,1535*	-	-
in Foreign Currency when Borrower does Not Have a Guarantor	*-0,2630*	*-0,2518*	*-0,2766*	*-0,2765*		
in Hungarian Forint when Borrower does Have a Guarantor	*-0,0144*	*0,0334*	*0,0259*	*0,0243*	-	-
in Foreign Currency when Borrower does Have a Guarantor	*-0,0313*	*-0,0511*	*-0,0582*	*-0,0615*	-	-
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Not Have a Guarantor	*-0,3845*	*-0,4293*	*-0,4299*	*-0,4300*	*-0,4319*	*-0,4362*
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Have a Guarantor	*-0,0169*	*-0,0846*	*-0,0841*	*-0,0857*	*-0,0844*	*-0,0719*
Probability of Granting a Mortgage in Sample (= 0.92%)						
in Hungarian Forint when Borrower does Not Have a Guarantor	*13%*	*19%*	*17%*	*17%*	-	-
in Foreign Currency when Borrower does Not Have a Guarantor	*-29%*	*-27%*	*-30%*	*-30%*	-	-
in Hungarian Forint when Borrower does Have a Guarantor	*-2%*	*4%*	*3%*	*3%*	-	-
in Foreign Currency when Borrower does Have a Guarantor	*-3%*	*-6%*	*-6%*	*-7%*	-	-
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Not Have a Guarantor	*-42%*	*-47%*	*-47%*	*-47%*	-47%	-47%
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Have a Guarantor	-2%	-9%	-9%	-9%	-9%	-8%
Percentage Point Difference in Impact of a One Standard Deviation (41 bps) Decrease in Swiss Franc Interest Rate on the Likelihood of Granting a Mortgage by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)						
in Hungarian Forint when Borrower does Not Have a Guarantor	*-0,1913*	*-0,2773*	*-0,2718*	*-0,2647*	-	-
in Foreign Currency when Borrower does Not Have a Guarantor	*-0,1913*	*-0,1645*	*-0,1591*	*-0,1476*		
in Hungarian Forint when Borrower does Have a Guarantor	*-0,1913*	*-0,2773*	*-0,2718*	*-0,2647*	-	-
in Foreign Currency when Borrower does Have a Guarantor	*-0,1987*	*-0,1645*	*-0,1591*	*-0,1476*	-	-
Difference in Impact between Swiss Franc and Hungarian Forint, when Borrower does Not Have a Guarantor	*0,0000*	*0,1128*	*0,1127*	*0,1171*	*0,1170*	*0,1243*
Difference in Impact between Swiss Franc and Hungarian Forint, when Borrower does Have a Guarantor	*-0,0073*	*0,1128*	*0,1127*	*0,1171*	*0,1150*	*0,1159*
Probability of Granting a Mortgage in Sample (= 0.92%)						
in Hungarian Forint when Borrower does Not Have a Guarantor	*-21%*	*-30%*	*-30%*	*-29%*	-	-
in Foreign Currency when Borrower does Not Have a Guarantor	*-21%*	*-18%*	*-17%*	*-16%*		
in Hungarian Forint when Borrower does Have a Guarantor	*-21%*	*-30%*	*-30%*	*-29%*	-	-
in Foreign Currency when Borrower does Have a Guarantor	*-22%*	*-18%*	*-17%*	*-16%*	-	-
Difference in Impact between Swiss Franc and Hungarian Forint, when Borrower does Not Have a Guarantor	*0%*	*12%*	*12%*	*13%*	13%	14%
Difference in Impact between Foreign Currency and Hungarian Forint, when Borrower does Have a Guarantor	*-1%*	*12%*	*12%*	13%	13%	13%

NOTE. -- The table reports estimates from ordinary least squares regressions. The dependent variable in all models is Credit Granted which equals one if an individual receives a loan in given month in the domestic or foreign currency

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Figure A.12: Bank risk-taking channel in the domestic and the foreign currency with loan-to-value as risk measure; 3 large bank database including early repayment program participants

Model	(1)	(2)	(3)	(4)	(5)	(6)
Δ Interest Rate * Bank Capital Ratio	-1.1966***			-1.4358***		
	(-8.91)			(-8.60)		
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency	0.7002**	-0.3207	-0.3385	0.9664***	0.0858	0.0806
	(2.43)	(-0.79)	(-0.82)	(2.96)	(0.18)	(0.17)
Δ Interest Rate * Risky Borrower (3)	-0.3733***			-0.3856***		
	(-23.90)			(-20.71)		
Δ Interest Rate * Bank Capital Ratio * Risky Borrower (3)	5.4871***			5.6739***		
	(23.99)			(20.67)		
Δ Interest Rate * Credit Is Granted in Foreign Currency * Risky Borrower (3)	0.1985***	0.0718*	0.0757*	0.1826***	0.0743	0.0791*
	(6.89)	(1.77)	(1.83)	(5.71)	(1.62)	(1.68)
Δ Interest Rate * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Risky Borrower (3)	-0.7312	1.2779*	1.2149*	-0.5472	1.1648	1.0870
	(-1.54)	(1.91)	(1.79)	(-1.03)	(1.53)	(1.40)
Δ GDP * Bank Capital Ratio	0.3353**			-0.1319		
	(2.20)			(-0.70)		
Δ GDP * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-7.6239***	-5.9838***	-5.8890***	-5.7059***	-4.3585***	-4.2608***
	(-11.51)	(-6.63)	(-6.44)	(-7.52)	(-4.17)	(-4.01)
Δ GDP * Risky Borrower	0.0936***			0.0531***		
	(6.55)			(3.01)		
Δ GDP * Bank Capital Ratio * Risky Borrower	-2.2921***			-1.9269***		
	(-9.43)			(-6.35)		
Δ GDP * Credit Is Granted in Foreign Currency *Risky Borrower	-0.7458***	-0.5287***	-0.5299***	-0.5686***	-0.3914***	-0.3912***
	(-9.82)	(-5.28)	(-5.22)	(-6.58)	(-3.40)	(-3.33)
Δ GDP * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Risky Borrower	-0.4358	-3.7519**	-3.7005**	-4.1153***	-6.7600***	-6.7353***
	(-0.35)	(-2.25)	(-2.19)	(-2.86)	(-3.48)	(-3.41)
Δ CPI * Bank Capital Ratio	2.2490***			2.1162***		
	(14.87)			(11.38)		
Δ CPI * Bank Capital Ratio * Credit Is Granted in Foreign Currency	-2.7888***	-0.3311	-0.3127	-2.8357***	-0.7200	-0.7132
	(-4.37)	(-0.37)	(-0.34)	(-3.98)	(-0.71)	(-0.68)
Δ CPI * Risky Borrower	0.1023***			0.0342**		
	(7.23)			(2.10)		
Δ CPI * Bank Capital Ratio * Risky Borrower	-1.4701***			-0.4654**		
	(-7.33)			(-1.97)		
Δ CPI * Credit Is Granted in Foreign Currency *Risky Borrower	-0.8652***	-0.5518***	-0.5653***	-0.7063***	-0.4406***	-0.4589***
	(-12.61)	(-5.81)	(-5.82)	(-9.43)	(-4.16)	(-4.22)
Δ CPI * Bank Capital Ratio * Credit Is Granted in Foreign Currency * Risky Borrower	12.3670***	7.3605***	7.5494***	9.9793***	5.7448***	5.9760***
	(11.27)	(4.87)	(4.88)	(8.26)	(3.39)	(3.42)
Bank Capital Ratio * Credit Is Granted in Foreign Currency	0.5790***	0.3804***	0.3754***	0.5022***	0.3350***	0.3308***
	(11.18)	(5.30)	(5.15)	(8.59)	(4.06)	(3.94)
Credit Is Granted in Foreign Currency * Risky Borrower	0.0874***	0.0619***	0.0626***	0.0714***	0.0502***	0.0510***
	(15.60)	(8.24)	(8.18)	(11.46)	(5.90)	(5.88)
Credit Is Granted in Foreign Currency * Bank Capital Ratio * Risky Borrower	-0.8550***	-0.4504***	-0.4598***	-0.5531***	-0.2208	-0.2318
	(-9.45)	(-3.69)	(-3.70)	(-5.42)	(-1.58)	(-1.62)
Bank Capital Ratio	-0.2372***			-0.2415***		
	(-23.30)			(-19.38)		
Bank Total Assets	-0.0058***			-0.0055***		
	(-21.75)			(-18.32)		
Bank Liquidity Ratio	0.0006			-0.0016		
	(0.37)			(-0.90)		
Bank Return On Assets	-0.0209***			-0.0162***		
	(-5.51)			(-3.82)		
Bank Doubtful Loan Ratio	0.0233***			0.0227***		
	(4.29)			(3.72)		
Bank Capital Ratio * Risky Borrower	0.0522***			-0.0069		
	(7.65)			(-0.82)		
Constant	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***
	(-3.71)	(-2.68)	(-2.63)	(-4.29)	(-3.08)	(-3.02)
Individual Borrower Fixed Effects	Yes	--	--	Yes	--	--
Subregion-Year:Quarter-Currency Fixed Effects	No	--	--	No	--	--
Subregion-Year:Month-Currency Fixed Effects	Yes	Yes	--	Yes	Yes	--
Settlement-Year:Month-Currency Fixed Effects	No	No	Yes	No	No	Yes
Year:Month Fixed Effects	No	--	--	No	--	--
Individual Borrower-Year:Month Fixed Effects	No	Yes	Yes	No	Yes	Yes
N	15,989,232	15,989,232	15,989,232	12,954,704	12,954,704	12,954,704
R2	0.0011	0.0009	0.0009	0.0013	0.0010	0.0010

Note: We use here the three large bank database, Risky Borrower (3) is measured by the continuous loan-to-value ratio. Column 1 to 3 presents the results when all loans are used for the estimation while column 4 to 6 shows the results when loans participating in the Early Repayment Program are dropped from the sample.

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Appendix B

Appendix for Chapter 2

B.1 Data construction

B.1.1 Credit Register data

Outstanding amount and monthly payment

The credit register database was set up in Spring 2012 and data collection started in April 2012 therefore data on outstanding debt is available only from April 2012 onwards. For the preceding period we construct it by assuming that the amortization schedule of mortgage and home equity loans in our sample follows an annuity. For ease of computation we allow for monthly changes in the interest rate. Because of large number of delinquent loans during the crisis, we calculate the annuities from origination until 2012 instead of calculating them backwards to avoid dealing with the arrears. The default rate was close to zero before the crisis therefore this approximation is plausible. We calculate the payment according to the following formula:

$$P_t^{HUF} = \frac{r(PV_t)}{1-(1+r_t)^{-N_t}} \times E_t$$

where P_t is the payment in month t, PV_t is the present value of the debt in month t, r_t is the interest rate, N is the remaining months until expiration and E_t is the monthly average exchange rate which is 1 for domestic currency loans. Given the payment in t we determine the outstanding debt in t:

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$$D_t^{HUF} = (1 + r_t)(D_{t-1}^{HUF} - P_t^{HUF})$$

This way we reconstruct the whole outstanding debt for the entire period at the loan level.

Interest rate data We use detailed interest rate data for calculating outstanding debt. The National Bank of Hungary collects monhtly average interest rate data at bank-month-currency-preiod of interest rate fixing-product-level from banks. Smaller banks or saving cooperatives might not provide interest rate data in each cell if they do not lend much in that particular segment of the market, in these cases the average interest rate across banks is used. The credit register does not contain information on the interest rate fixing therefore we use the less-than-1-year fixing interest rate, which is the most commmon one in Hungary.

The collection of interest rate data started around 2005 depending on the currency. For the preceding period we use out of sample prediction. We estimate a regression of average interest rate on a set of macro variables which are available for the 2000-2005 period as well and then do out-of-sample forecast given these variables.

Banks report only the market interest rates for the domestic currency loans and not the subsidized interest rates. As approximately 90 per cent of domestic currency mortgages were subsidized in 2008, we need to determine the amount of subsidy. The subsidy program distuinguished asset and liablity side subsidies (description of the subsidy program for the early period can be found in Farkas et al. (2004). Asset side subsidy were given to all banks while liability side subsidy was tied to mortgage bond financing. During this period only a few banks could issue mortgage bonds. The subsidy was initially linked to the mortgage bond interest rates then to government bond interest rate.

Figure B.1 compares the official aggregate debt to the aggregate calculated based on the reconstructed data by currency denomination and loan type. The two matches quite well for domestic currency loans, but are different for foreign currency loans. This is because of the Early Repayment Program. The loans participating in the program are missing from our dataset. Therefore we estimate participation in the program as a next step.

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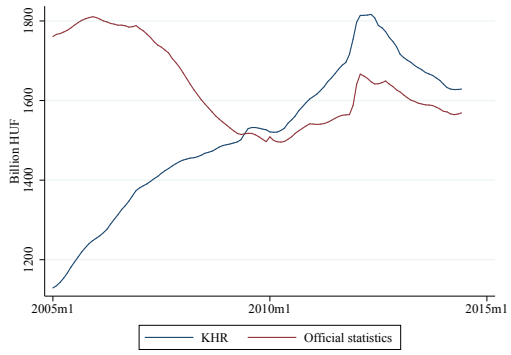
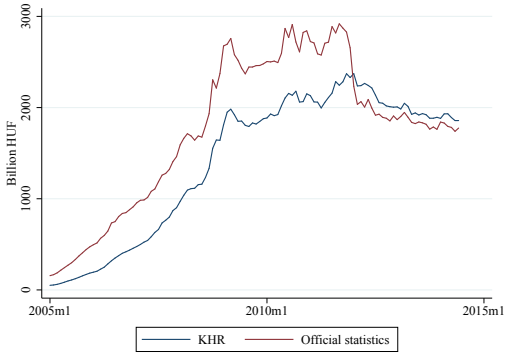
Figure B.1: Comparing KHR to official aggregate debt statistics by loan type and currency

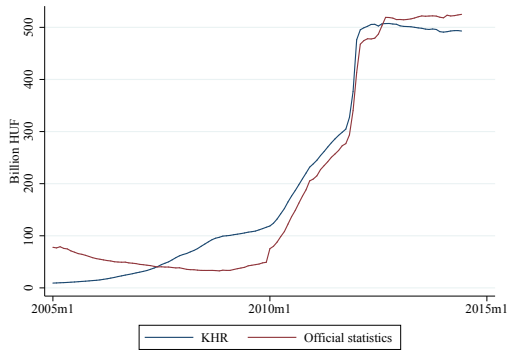
(a) Local currency mortgage



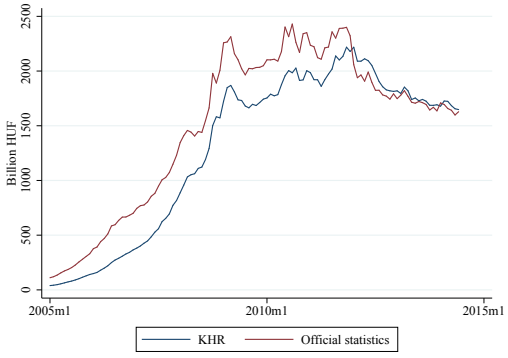
(b) Foreign currency mortgage



(c) Local currency home equity



(d) Foreign currency home equity



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Early repayment program In September 2011 the government initiated a program to aid households with foreign currency mortgage and home equity loans. The Early Repayment Program (ERP) allowed households to prepay their debt between October 2011 and February 2012 at a preferential exchange rate, which was considerably cheaper than the market exchange rate at that time. However, the program required the total prepayment of the loans. The ERP was a few months before the set up of the universal credit register therefore loans that were prepaid are missing from our dataset.

We estimate the zip code level participation rate in the program by using a loan-level monthly panel database of three large banks with market share of approximately 25 percent. The database follows loans from origination, and contains detailed characteristics of the loans and the individuals. We identify loans as being prepaid in the program if they disappear from the dataset during the program, between October 2011 and February 2012. We complement this data with aggregate statistics on participation rate collected by the National Bank. We use three different approaches to estimate the participation in the program: a parametric, a non-parametric and a refinancing approach.

The first approach estimates the participation rate as a function of zip code characteristics and after-program market share of the three banks:

$$P_{ib} = \alpha + \beta_1 X_{ib} + \varepsilon_{ib}$$

where P_{ib} is the program participation rate of borrowers in zip code i of bank b, X_{ib} is a set of variables that determines participation. These covariates are settlement income, debt originated by bank b in settlement i, total debt in settlement i, subregion fixed effect, and market share of bank b in settlement i, and their interaction terms.

Using the estimated coefficients we predict the participation rate at the zip code level for the customers of other banks. To check the validity of this approach we compare the predicted and official participation in the program at the bank level for all banks. Figure **??** shows the predicted and official participation rate.

The second approach estimate the participation using a shift-share approach:

$$P_i = \sum_b \alpha_b T P_b$$

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where α_b is the market share of bank b, TP_b is the aggregate participation rate of bank b.

The third approach uses that approximately a third of the loans prepaid by refinancing the loan. Because the credit register starts in May 2012 these new loans can be observed. We assume that all of the loans originated between October 2011 and February 2012 are used for refinancing the FC loans.

All these approaches give the participation rate, and hence the outstanding debt at the time of the program, by assuming annuity, we can calculate the outstanding debt at the start of the crisis.

Delinquency before 2010

KHR contains all loans from May 2012 and contains delinquent loans from January 2010. Information on the start date of the delinquency is available in both cases. This implies that we can only observe the last delinquency status before 2010, i.e. we cannot observe those delinquencies that started and ended before 2010 if they were followed by another delinquency spell that started before 2010. This nature of data implies that from January 2010 onwards we observe all delinquent status, however, as moving backwards in time information on delinquent status might not be known for some loans.

That implies that the observed share of delinquent loans is a lower bound of the true delinquency rate. As the share of non-performing loans was steadily increasing from October 2008, the difference between the observed and true delinquency rate is likely to be small after October 2008 while it could be larger before October 2008. If delinquency status during this period is an absorbing state, that is, if a loan become delinquent then it will not become current then the data would give the true delinquency status. Because of the significant depreciation this is a plausible assumption.

To minimalize the problem stemming from this nature of the data I construct backwards delinquency status only until August 2008 which was the last month before the start of the crisis in Hungary. Aggregate statistics show that before this period the delinquency rate was almost flat implying that

In Spring 2012 when the switch to the universal credit register happened, the method of constructing the (within-individual) loan id changed, however, the method of constructing

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the individual identifier remained the same. To match the two datasets we use individual id along with loan characteristics such as type of loan, date of origination, date of expiry, currency, amount, start date of delinquency.

Figure B.2 compares the delinquency rate calculated from the KHR data to aggregate statistics for domestic currency mortgage and home equity, and foreign currency mortgage and home equity loans. There are differences in the definitions. First, 90-days delinquency in the KHR is defined as the loan is overdue with at least the minimum wage for at least 90 days. Second, delinquency rate in KHR is based on the number of delinquent loans while in the aggregate statistics the amount in default. The correlation of the time-series are quite good except for the domestic currency home equity loans, however, the debt stock of these loans is small because of the lack of subsidy.

Address

Detailed address (settlement and zip code) is available for loans outstanding in June 2014 and this address is that is reported by banks, therefore these are not the addresses at the time of origination. The detailed address data is provided at the loan-level and not the individual-level. Therefore one individual may have different addresses stated for different loans.

We determine the address of the individuals in the following way. At the time of the origination the creditor asks the address of the debtor therefore at the time of the origination the address is precise. However, after origination individuals may move and might have not reported their move to the bank hence their address is not updated in the database. We assume that none of the moves are reported to the banks hence all addresses correspond to the true address at the time of origination.

1939 election data

Data on the 1939 election comes from Hubai (2001) who collected settlement level election results. Between 1939 and 2010 the settlement structure changed a lot, many settlements were either merged or splitted. We use Hungarian Statistical Office's gazetteer[1] to find the successors and predecessors of settlements. We define inclusive settlements which are

[1] http://www.ksh.hu/apps/hntr.main?p_lang=EN

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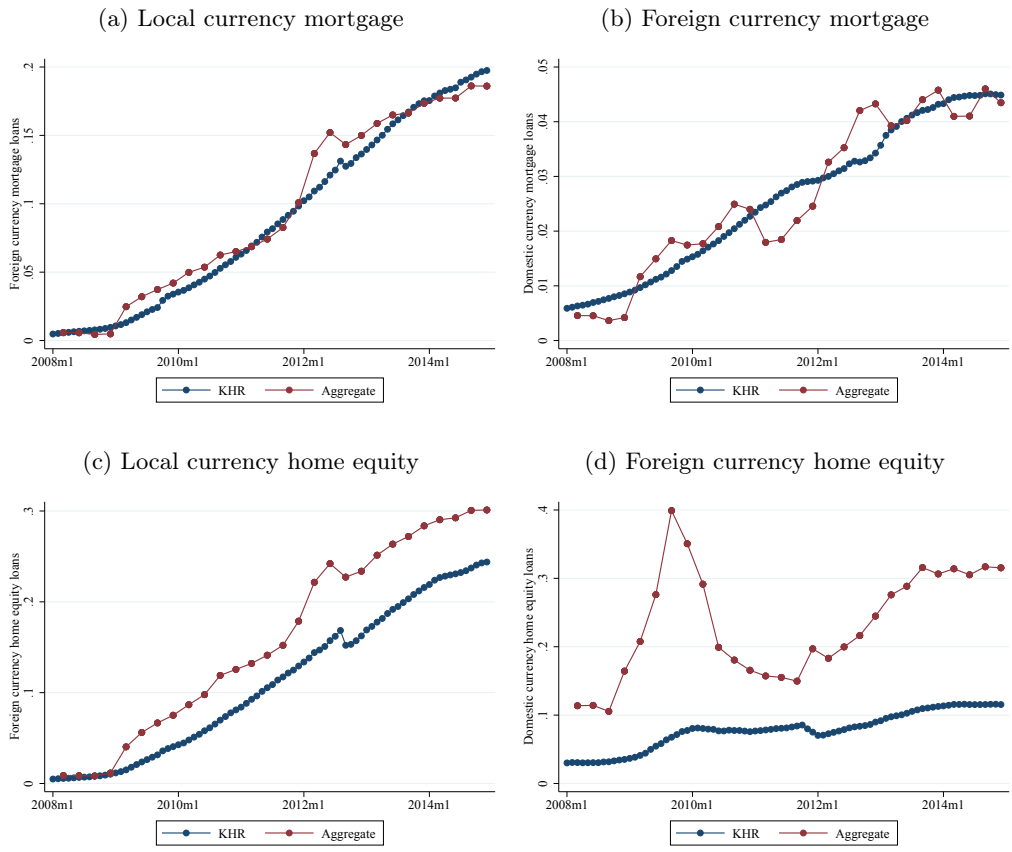
Figure B.2: Comparing KHR to official aggregate 90-day delinquency statistics by loan type and currency



Notes: In KHR data the definition of 90-day delinquency is that the debtor is in arrear with the amount at least the minimum wage for at least 90 days. Therefore loans with smaller payments is likely to have lower default rate in KHR.

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artificial settlements which enable us to match the current settlement structure to the old one. If two settlements cohered in any of the two election year then we merge those in the other election year as well. This method gives a balanced panel for the two years.

The 1939 election system was similar to today's as most of the voters had two votes, they could vote for a candidate in their electoral district and a party list. Voters living in large cities could only vote for party lists. We focus on the votes casted on party lists.

There were six far-right parties participating in the 1939 election. These were the Arrow Cross Party, National Front, United Hungarian National Socialist Party, Christian National Socialist Party, Hungarian National Socialist Agricultural Labourers' and Workers' Party and the candidates without party. Historians add the votes of these parties because they coordinated before the election by running one candidate and one party list in most electoral districts to prevent the division of their support. The Communist Party did not participate the 1939 election because it was banned.

The election law changed in 1938 which introduced secret ballot. There was not universal suffrage at this time, and the government, being afraid of the popularity of the far-right, used various measures to prevent the winning of the far-right. For example, the election law decreased the number of eligible voters, there was gerrymandering weeks before the election, a certain number of nomination were required for candidates and party lists, deposit was required for running a party list or candidate, etc. (for more details, see Pintér (2010)). This implied that in many electoral districts there were no far-right party list to vote for, and the number of party lists varied across electoral districts. Figure B.3 shows the electoral map for the far right.

The second Jew law passed before the election in 1939. This curbed the voting rights of the Jews as they were required to demonstrate with official documents that they and their ancestors had lived in Hungary since 1867. Fore example Pintér (2010) writes that a third of the Jews might have been unable to vote as a consequence, but that significantly varied across regions.

B.2 Figures

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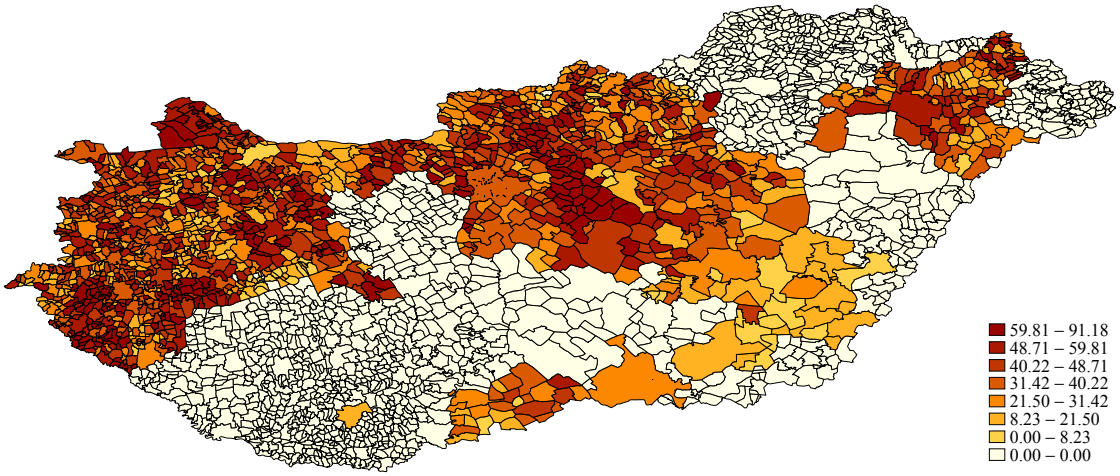
Figure B.3: Vote share of far-right parties in 1939



Note: This figure is the settlement level choropleth map showing combined vote share of six far-right parties in 1939. The shading shows the per cent of votes casted on far-right party lists. The far-right parties are Arrow Cross Party, National Front, United Hungarian National Socialist Party, Christian National Socialist Party, Hungarian National Socialist Agricultural Labourers' and Workers' Party and the candidates without party.

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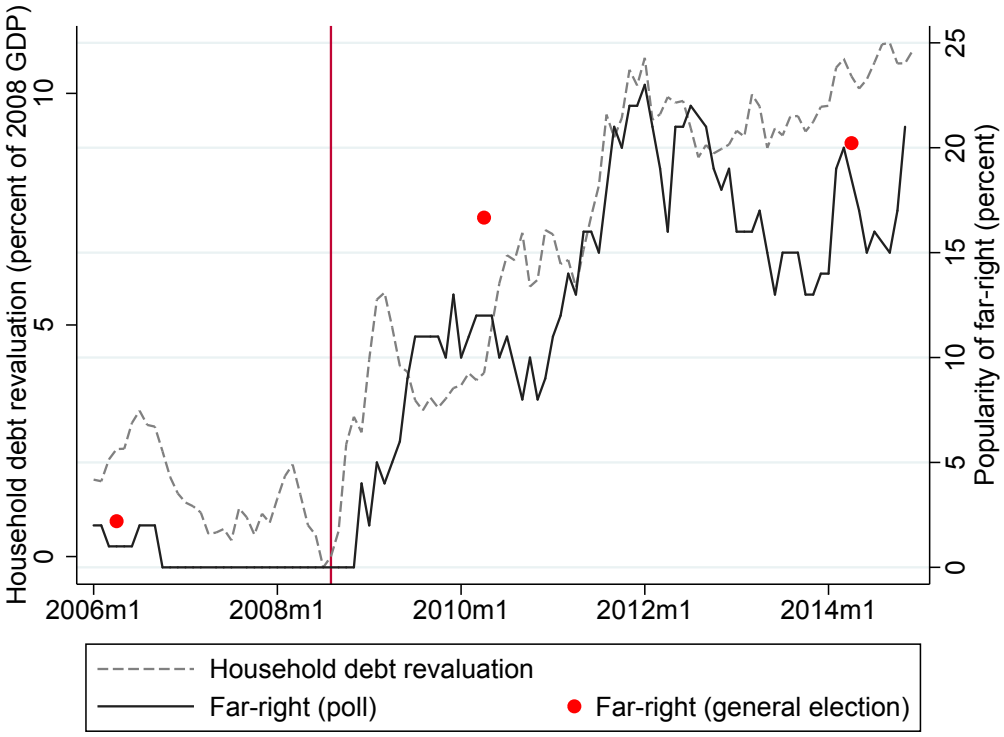
Figure B.4: Household debt revaluation and support for the far-right



Note: This figure shows the household debt revaluation (dashed line) and the popularity of far-right based on poll data (solid line) and Parliamentary election data (dots). The household debt revaluation is calculated as the household debt in September 2008 relative to the GDP in 2008, multiplied by the exchange rate change. The popularity of far-right in the poll is calculated based on the answers of individuals who have intention to vote. The vertical line represents September 2008.

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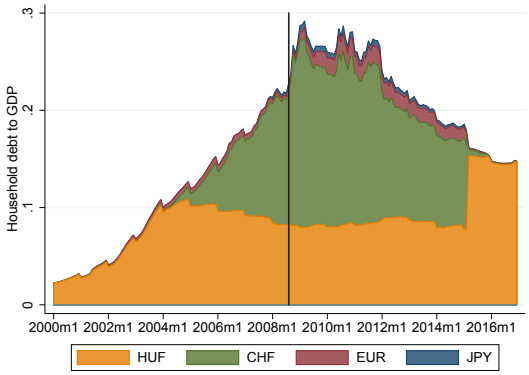
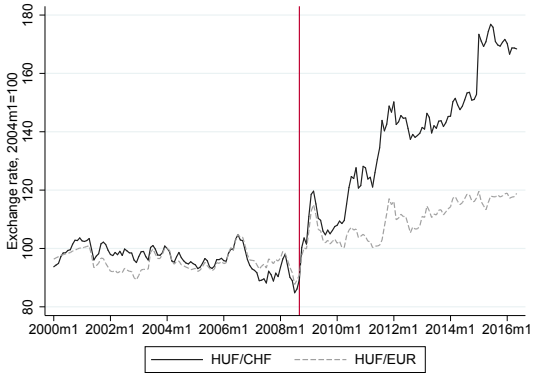
Figure B.5: Evolution of household debt and exchange rates

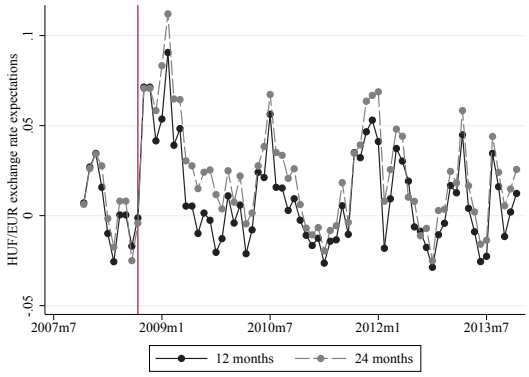
(a) Household debt



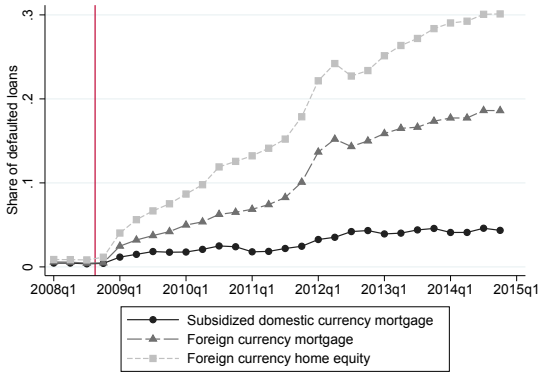
(b) Exchange rates



(c) Exchange rate expectations



(d) Default rate by currency



Notes: Figure a)
Figure b)

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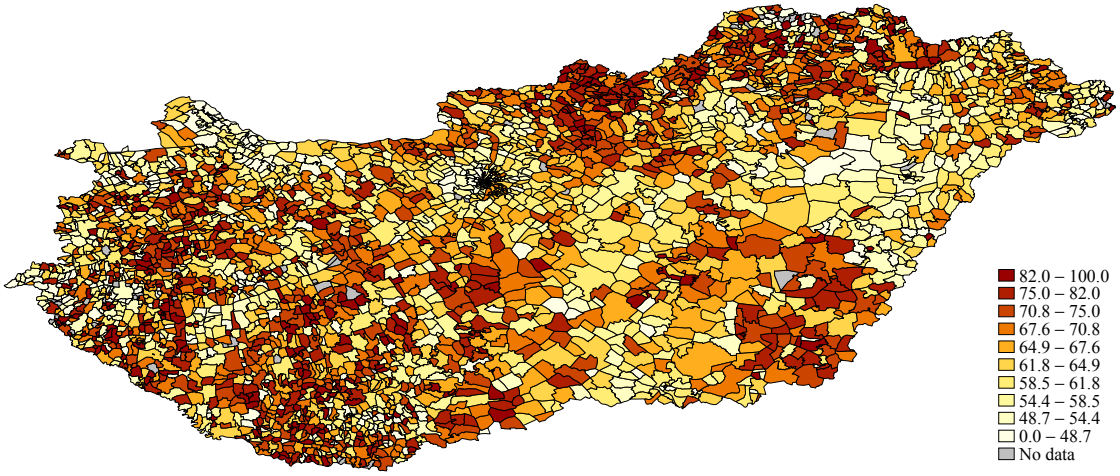
Figure B.6: Share of foreign currency loans in September 2008



Note: This figure shows the zip code level choropleth map of the share of foreign currency denominated mortgage and home equity loans in September 2008. The shading shows the deciles of the share of foreign currency denominated loans.

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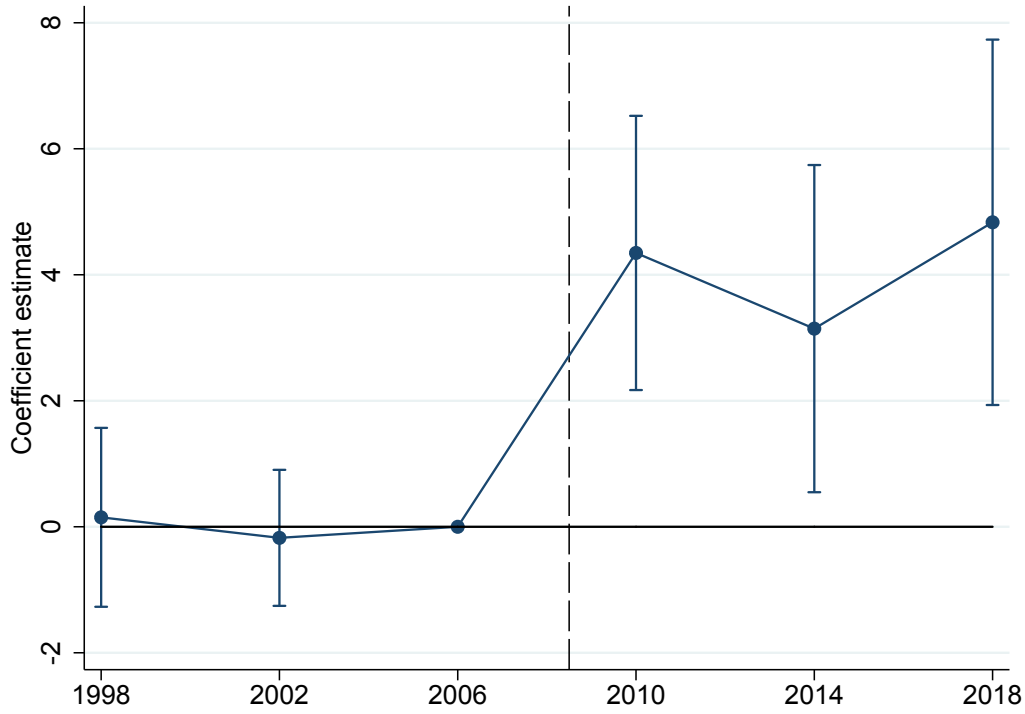
Figure B.7: Effect of foreign currency share of loans on far right vote share



Notes:

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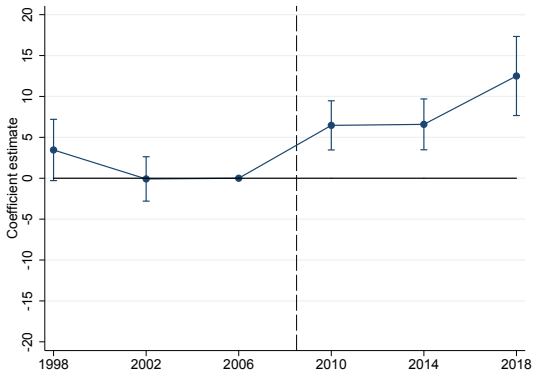
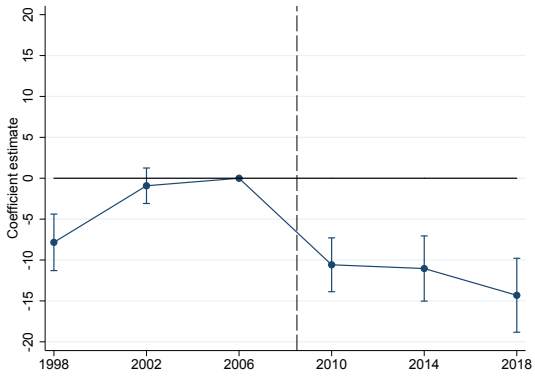
Figure B.8: Foreign currency share and vote share of other parties

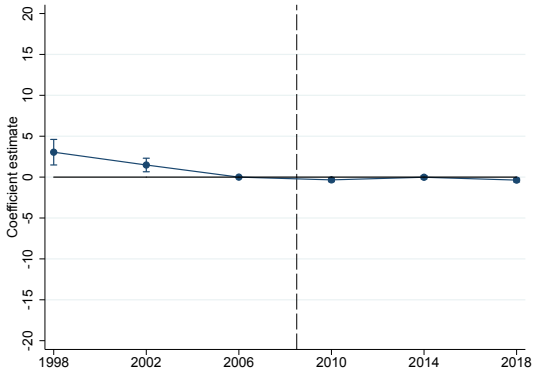
(a) Center-right



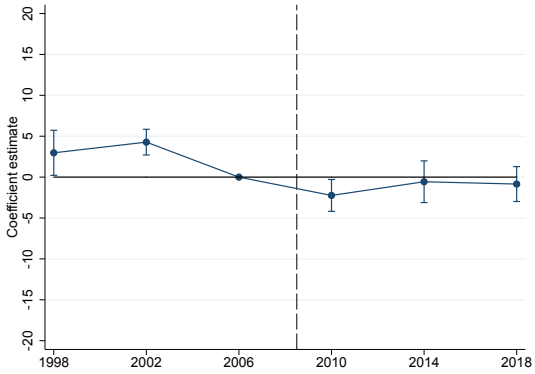
(b) Center-left



(c) Workers' Party



(d) Turnout



Notes:

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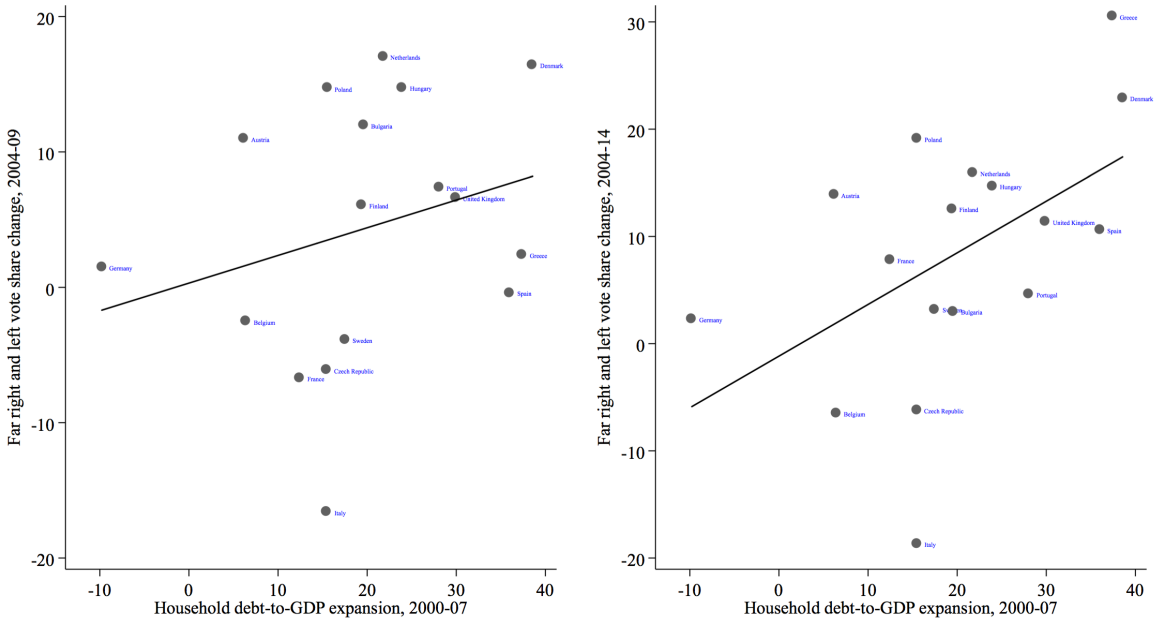
Figure B.9: Household credit boom and change in extremist vote share



Notes: Data on extremist parties comes from the Chapel Hill survey database.

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B.3 Tables

Table B.1: Election results and turnout

	Far right	Center right	Center left	Far left	Green	Turnout
1998	5.47	47.74	40.49	4.08	0.00	56.26
2002	4.37	41.82	47.62	2.16	0.00	70.53
2006	2.20	42.03	49.71	0.41	0.00	67.83
2010	16.67	52.73	19.30	0.11	7.48	64.38
2014	20.69	43.55	26.21	0.57	5.47	61.24
2018	19.80	47.36	17.95	0.28	7.31	70.22

Notes: This table shows vote shares received on party lists, and the turnout.

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Table B.2: Descriptive statistics on main variables

	Number of obs				
	count	mean	sd	p10	p90
Main variables					
FC share	3475	.63	.089	.52	.73
FC debt share	3475	.66	.094	.54	.77
FC loans per capita	3475	.057	.019	.035	.079
LC loans per capita	3475	.035	.015	.019	.05
Debt revaulation to income	3475	.087	.032	.052	.13
	count	mean	sd	p10	p90
Control variables					
Debt to income	3475	.59	.21	.36	.86
per capita number of loans, 2008	3475	.089	.03	.054	.12
Share of vocational	3475	.2	.055	.12	.26
Share of high school	3475	.27	.068	.17	.35
Share of college	3475	.15	.095	.053	.27
Log per capita income	3475	7.7	2.1	6.2	12
Log number of eligible voters, 2006	3475	9.4	1.8	6.9	12
Unemployment	3475	.073	.058	.023	.15
Share of people age 18-29	3475	.16	.014	.15	.18
Share of people age 59+	3475	.22	.033	.18	.25
	count	mean	sd	p10	p90
Dependent variables					
Vote share, far-right, 2010	3475	15	7.3	8	26
Vote share, centre-right, 2010	3475	50	13	31	65
Vote share, center-left, 2010	3475	17	6.4	8.9	26
Vote share, far-left, 2010	3475	.11	.4	0	.28
Turnout, 2010	3475	64	6.1	56	72

Notes: This table presents descriptive statistics.

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Table B.3: Balance test of foreign currency denominated loans

	FC	LC	Rest	FC-LC difference
Low education	0.13	0.20	0.28	-0.07***
	(0.33)	(0.40)	(0.45)	(-4.76)
Medium education	0.67	0.63	0.57	0.04*
	(0.47)	(0.48)	(0.50)	(2.01)
High education	0.20	0.17	0.16	0.03*
	(0.40)	(0.38)	(0.36)	(2.09)
DK / NA Income	0.18	0.14	0.19	0.04**
	(0.38)	(0.34)	(0.39)	(2.79)
Low Income	0.24	0.31	0.37	-0.07***
	(0.43)	(0.46)	(0.48)	(-4.05)
Medium Income	0.26	0.30	0.25	-0.03
	(0.44)	(0.46)	(0.43)	(-1.88)
High Income	0.32	0.26	0.19	0.07***
	(0.47)	(0.44)	(0.40)	(3.68)
Age	41.77	43.21	50.11	-1.44**
	(11.44)	(12.95)	(18.10)	(-2.93)
Have children	0.49	0.41	0.21	0.08***
	(0.50)	(0.49)	(0.40)	(3.81)
Size of Household	3.10	2.86	2.39	0.24***
	(1.22)	(1.24)	(1.23)	(4.95)
Employed	0.69	0.61	0.42	0.08***
	(0.46)	(0.49)	(0.49)	(4.46)
Retired	0.13	0.20	0.39	-0.06***
	(0.34)	(0.40)	(0.49)	(-4.16)
Self employed	0.05	0.04	0.03	0.01
	(0.22)	(0.19)	(0.17)	(1.72)
Able to save money	0.12	0.12	0.14	-0.00
	(0.32)	(0.33)	(0.35)	(-0.21)
settlement size $<$ 5,000	0.32	0.33	0.29	-0.00
	(0.47)	(0.47)	(0.46)	(-0.14)
settlement size 5,000-100,000	0.46	0.42	0.40	0.04*
	(0.50)	(0.49)	(0.49)	(2.15)
settlement size $>$ 100,000	0.22	0.26	0.31	-0.04*
	(0.41)	(0.44)	(0.46)	(-2.34)
Observations	1569	1061	5389	2630

Notes: This table shows the average characteristics of local currency borrowers, foreign currency borrowers, and the rest of the individuals.

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Table B.4: Balance test of foreign currency share of loans

	Coefficient	Standard error	N	R^2
Debt to income	-.095**	.013	3475	.052
per capita number of loans, 2008	-.24	.23	3475	.0063
Share of vocational	.59**	.047	3475	.14
Share of high school	-.38**	.044	3475	.084
Share of college	-.42**	.045	3475	.2
Log per capita income	-.011**	.0019	3475	.063
Log number of eligible voters, 2006	-.013**	.002	3475	.073
Unemployment	.42**	.067	3475	.076
Share of people age 18-29	.84**	.33	3475	.017
Share of people age 59+	.15	.21	3475	.0034
Employment share of exporters, 2007	-.068**	.015	3475	.025
Emplyoment share of manufacturing, 2007	.012	.021	3475	.00073
Employment share of firms with FC debt, 2007	.0095	.014	3475	.00033
Corporate foreign currency share of debt	-.056**	.018	2867	.023

Notes: This table shows the results of bivariate regressions where the dependent variable is foreign currency share of loans in September 2008. The regressions are weighted by the number of eligible voters in 2006. Standard errors are clustered at the subregion level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

Table B.5: Effect of foreign currency share on change of far-right vote share

	(1)	(2)	(3)	(4)	(5)
FC share×Post	27.36**	4.610+	4.537**	4.272**	4.647**
	(6.607)	(2.738)	(1.188)	(1.081)	(1.372)
Election FE	✓	✓	✓	✓	✓
Zip code FE	✓	✓	✓	✓	✓
Controls		✓	✓	✓	✓
County-election FE			✓		✓
Subregion-election FE				✓	
Linear trend					✓
R^2	0.772	0.868	0.923	0.946	0.970
Observations	13900	13896	13896	13896	13896

Notes: Regressions are weighted by number of eligible voters in 2006. Standard errors are clustered at the subregion level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.6: Robustness to alternative specifications

	(1) OLS	(2) OLS	(3) OLS	(4) RF: Mort. FC share	(5) IV: Mort. FC share
FC debt share×Post	3.211**				
	(0.879)				
FC loans per capita×Post		24.57**			
		(6.696)			
LC loans per capita×Post		-29.31**			
		(7.460)			
Debt revaluation to income×Post			21.81**		
			(7.948)		
Mortgage FC share ×Post				2.074*	
				(0.821)	
FC share×$Post$					12.74*
					(5.050)
Election FE	✓	✓	✓	✓	✓
Zip code FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
County-election FE	✓	✓	✓	✓	✓
F-statistics					1980
R^2	0.946	0.946	0.946	0.946	0.765
Observations	13900	13956	13956	13736	13732

+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.7: Effect of foreign currency share on change of far-right vote share

	Placebo 1939 vote share				Minority	Naivete	Local emp shocks		House Price	Campaig spendin
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FC share	-0.0469	0.0706	-0.245^{+}	0.0183						
	(0.104)	(0.0592)	(0.136)	(0.0327)						
FC share×Post					4.392**	3.527**	4.309**	4.700**	4.129**	4.462**
					(1.209)	(1.302)	(1.221)	(1.246)	(1.171)	(1.183)
Local minority×Post					-6.612**					
					(1.638)					
Immigrants×Post					-29.63*					
					(14.95)					
Roma minority×Post					-0.610					
					(3.738)					
Pre-crisis default×Post						15.48*				
						(7.591)				
Share of home equity, FC loans×Post						3.843**				
						(1.452)				
Far left vote share 1998×Post						0.174**				
						(0.0468)				
Δhouse price×Post									-0.0300*	
									(0.0128)	
Election FE					✓	✓	✓	✓	✓	✓
Zip code FE					✓	✓	✓	✓	✓	✓
Controls		✓		✓	✓	✓	✓	✓	✓	✓
County FE		✓		✓						
County-election FE					✓	✓	✓	✓	✓	✓
Pre-crisis default						✓				
Share of Home equity in FC						✓				
Far left vote share, 1998						✓				
Change in unemployment							✓			
Industry employment shares in 2007								✓		
Change in House price									✓	
Campaign spending										✓
R^2	0.000555	0.420	0.0114	0.729	0.924	0.925	0.923	0.925	0.924	0.924
Observations	1675	1669	2875	2868	13900	13760	13880	13060	13900	13900

Notes: Regressions are weighted by number of eligible voters in 2006. Standard errors are clustered at the subregion lev
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.8: Effect of foreign currency share on other parties' vote shares, turnout and invalid votes

	Center right	Center left	Far left	Green		Turnout	Invalid votes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FC share×Post	5.571**	-7.590**	-1.861**			-4.531**	0.0695
	(1.237)	(1.253)	(0.424)			(0.868)	(0.153)
FC share				-0.224	-1.291**		
				(0.594)	(0.464)		
Election FE	✓	✓	✓			✓	✓
Zip code FE	✓	✓	✓			✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓
County-election FE	✓	✓	✓		✓	✓	✓
County FE				✓			
Political Preferences in 2006					✓		
R^2	0.743	0.950	0.763	0.836	0.857	0.890	0.639
Observations	13900	13900	13900	3475	3475	13872	13872

Notes: Table shows the results of zip code level regression where the dependent variable is the vote share of various political parties. Controls include number of loans in 2008 per eligible number of voters, log debt in 2008 per eligible number of voters, per cpaite income in 2008, share of college educated among the 25+ year-old, log population of the municipality. Controls are interacted with years. Regressions are weighted by number of eligible voters in 2006. Standard errors are clustered at the subregion level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

Table B.9: Preferences for redistribution in June 2008

	Share of yes		Turnout	
	(1)	(2)	(3)	(4)
FC share	-0.0309*	-0.00803	-0.0711**	-0.0463*
	(0.0125)	(0.0101)	(0.0192)	(0.0184)
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Political preferences, 2006		✓		✓
R^2	0.799	0.849	0.348	0.450
Observations	3475	3475	3475	3475

Notes: This table shows the zip code level results of the June 2008 referendum. Citizens voted on whether to abolish tuition, copayment and hospital day care fee. The dependent variable is the share of yes (abolish) votes. Controls include number of loans in 2008 per eligible number of voters, log debt in 2008 per eligible number of voters, per cpaite income in 2008, share of college educated among the 25+ year-old, log population of the municipality. Regressions are weighted by number of eligible voters in 2006. Standard errors are clustered at the subregion level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.10: Effect of economic distress on change of far right vote share

	Δ Unemployment	Δ Default	Δ Far right vote share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FC share	0.0248**	0.0506**							
	(0.00533)	(0.00487)							
Δ Unemployment			28.96*	4.262		3.533	3.673	4.190	3.598
			(11.52)	(8.870)		(8.887)	(8.900)	(8.865)	(8.890)
Δ default					12.04**	11.81**			
					(3.905)	(3.956)			
Δ default rate, FC							8.798**		8.651**
							(3.049)		(3.044)
Δ default rate, LC								3.063	2.387
								(2.958)	(2.963)
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
County FE	✓	✓		✓	✓	✓	✓	✓	✓
R^2	0.217	0.229	0.433	0.685	0.686	0.686	0.686	0.685	0.687
Observations	3470	3474	3481	3481	3473	3468	3468	3468	3468

Notes: Regressions are weighted by number of eligible voters in 2006. Standard errors are clustered at the subregion level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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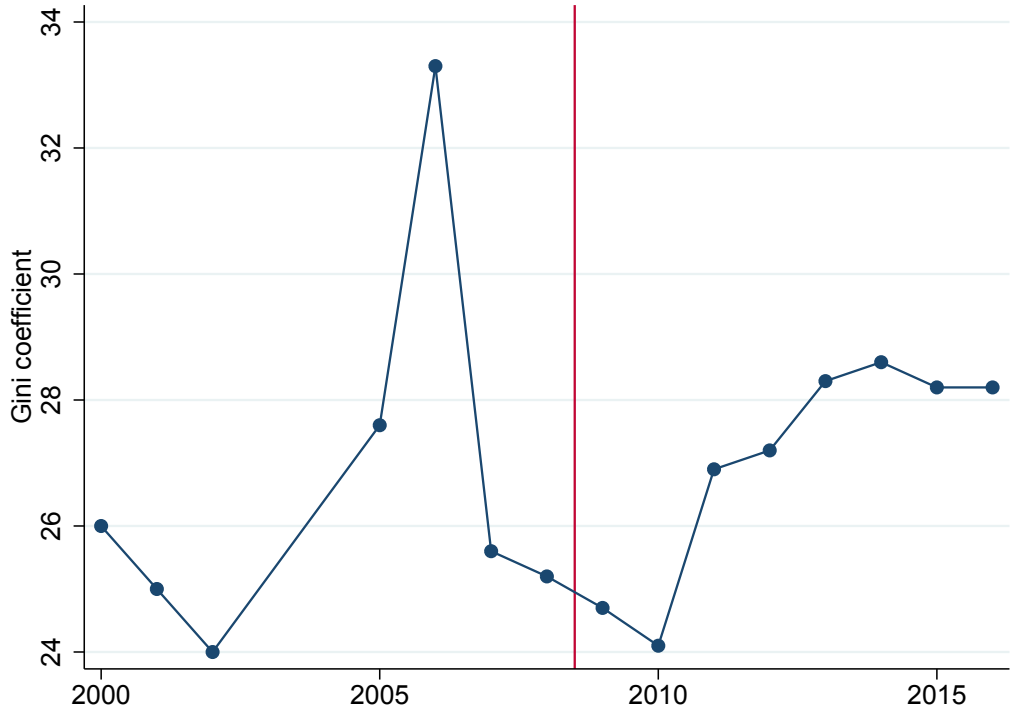
B.4 Appendix

Figure B.10: Inequality in Hungary, Gini coefficient



Note: This figure shows the Gini coefficient from Eurostat and World Bank.

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Table B.11: Robustness to the Early Repayment Program

	(1)	(2)	(3)	(4)	(5)
ERP adjusted FC share×Post	31.85**	3.243	3.132*	3.611**	2.930+
	(9.551)	(2.640)	(1.323)	(1.214)	(1.485)
Election FE	✓	✓	✓	✓	✓
Zip code FE	✓	✓	✓	✓	✓
Controls		✓	✓	✓	✓
County-election FE			✓		✓
Subregion-election FE				✓	
Linear trend					✓
R^2	0.782	0.868	0.923	0.946	0.970
Observations	13836	13836	13836	13836	13836

Notes: Regressions are weighted by number of eligible voters in 2006. Standard errors are clustered at the subregion level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

Table B.12: Preferences for redistribution in June 2008

	Share of yes		Turnout	
	(1)	(2)	(3)	(4)
Panel A: Co-payment				
FC share	-0.0277*	-0.00463	-0.0711**	-0.0463*
	(0.0123)	(0.0102)	(0.0193)	(0.0185)
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Political preferences, 2006		✓		✓
R^2	0.774	0.832	0.348	0.450
Observations	3475	3475	3475	3475
Panel B: Hospital day care fee				
	Share of yes		Turnout	
	(1)	(2)	(3)	(4)
FC share	-0.0270*	-0.00549	-0.0715**	-0.0467*
	(0.0117)	(0.00986)	(0.0192)	(0.0184)
Controls	✓	✓	✓	✓
County FE	✓	✓	✓	✓
Political preferences, 2006		✓		✓
R^2	0.773	0.830	0.348	0.450
Observations	3475	3475	3475	3475

Notes: Regressions are weighted by number of eligible voters in 2006. Standard errors are clustered at the subregion level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.13: Effect of economic distress on change of center right vote share

	Δ Unemployment	Δ Default	Δ Far right vote share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FC share	0.0248**	0.0506**							
	(0.00533)	(0.00487)							
Δ Unemployment			-3.050	1.441		0.847	1.176	1.177	0.988
			(7.749)	(7.171)		(7.149)	(7.161)	(7.168)	(7.160)
Δ default					8.595	8.509			
					(5.213)	(5.205)			
Δ default rate, FC							3.133		2.766
							(3.816)		(3.830)
Δ default rate, LC								6.174+	5.957+
								(3.195)	(3.179)
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
County FE	✓	✓		✓	✓	✓	✓	✓	✓
R^2	0.217	0.229	0.0949	0.259	0.260	0.260	0.259	0.260	0.260
Observations	3470	3474	3481	3481	3473	3468	3468	3468	3468

Notes: Regressions are weighted by number of eligible voters in 2006. Standard errors are clustered at the subregion level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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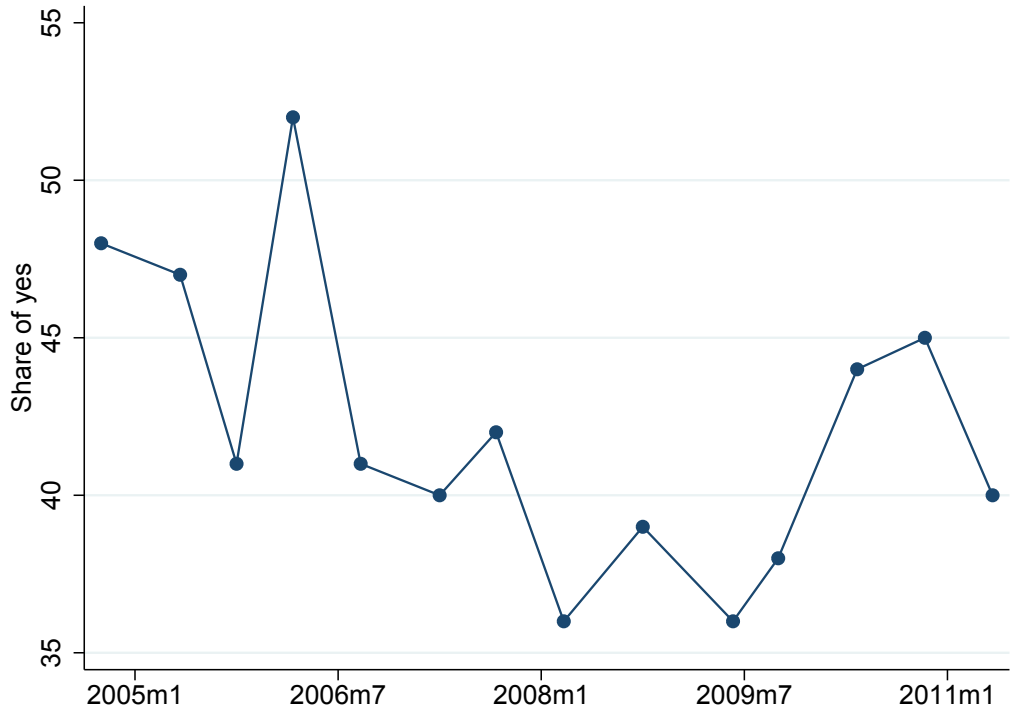
Figure B.11: Share of people saying that Hungary benefited from EU membership



Note: This figure shows the share of people who say that Hungary benefited from the membership of EU.

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Table B.14: Trust in the National Assembly

Foreign currency share	-1.108**	-1.041**	-1.083**
	(0.24)	(0.28)	(0.31)
Post	-0.746**	-0.644*	-0.642*
	(0.25)	(0.27)	(0.27)
Foreign currency share×Post	0.828*	0.682	0.678
	(0.41)	(0.44)	(0.44)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.0562	0.0755	0.0756
Observations	3076	2446	2446

Notes: This table shows the results of the effect of regional foreign currency share on the trust in the National Assembly using individual level data. Individual controls are education, employment status, gender, size of the household, income. Indebtedness controls are regional per capita number of loans and regional per capita indebtedness.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.15: Foreign currency share and xenophobia

Panel A: Hungarian from other countries			
FC share×Post	-0.191	-0.225	-0.223
	(0.18)	(0.18)	(0.18)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.00198	0.0173	0.0205
Observations	2415	2414	2414
Panel B: Chinese			
FC share×Post	0.0597	0.102	0.0733
	(0.42)	(0.42)	(0.42)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.00979	0.0424	0.0486
Observations	2335	2334	2334
Panel C: Arab			
FC share×Post	-0.218	-0.222	-0.234
	(0.36)	(0.36)	(0.36)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.00845	0.0507	0.0524
Observations	2337	2336	2336
Panel D: Romanian			
FC share×Post	-0.245	-0.193	-0.209
	(0.48)	(0.48)	(0.48)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.00243	0.0285	0.0342
Observations	2321	2320	2320
Panel E: Russian			
FC share×Post	-0.145	-0.126	-0.156
	(0.44)	(0.44)	(0.44)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.00702	0.0390	0.0550
Observations	2327	2326	2326
Panel F: Pires			
FC share×Post	0.0357	0.145	0.114
	(0.38)	(0.37)	(0.37)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.00771	0.0541	0.0619
Observations	1712	1711	1711

Notes: This table shows the results of individual-level regression where the dependent variable is whether the individual agrees with the statement that Hungary should admit people of various ethnicity. Pires is a fictious ethnicity. Individual controls include educational attainment, size of household, log income and employment status. Indebtedness controls include per capita number of loans and log per capita indebtedness. Standard error are clustered at sub-region level.

+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.16: Opinion about transfers to various groups, February 2010

	What fraction receives?			What fraction should receive?			Difference		
Panel A: Big families									
FC share	35.46^{+}	41.75^{+}	22.99	-38.73^{+}	-70.40*	-65.69*	-80.17**	-118.1**	-71.77^{+}
	(19.9)	(25.2)	(29.4)	(21.9)	(28.0)	(32.2)	(25.5)	(32.8)	(38.1)
Individual controls		✓	✓		✓	✓		✓	✓
Indebtedness controls			✓			✓			✓
R^2	0.00381	0.0979	0.101	0.00360	0.0796	0.0810	0.0122	0.0841	0.0947
Observations	834	574	574	866	606	606	799	555	555
	What fraction receives?			What fraction should receive?			Difference		
Panel B: Unemployed									
FC share	67.02**	48.47*	73.54**	18.65	-19.73	-43.73	-40.34	-58.09^{+}	-78.69*
	(18.9)	(24.2)	(28.1)	(22.3)	(28.0)	(32.0)	(26.1)	(32.1)	(37.2)
Individual controls		✓	✓		✓	✓		✓	✓
Indebtedness controls			✓			✓			✓
R^2	0.0148	0.0922	0.101	0.000819	0.105	0.119	0.00300	0.145	0.150
Observations	840	576	576	856	598	598	797	551	551
	What fraction receives?			What fraction should receive?			Difference		
Panel C: Pensioners									
FC share	10.67	-16.70	21.99	-43.38*	-79.60**	-122.7**	-62.54**	-65.45*	-118.8**
	(15.8)	(20.3)	(23.8)	(21.5)	(27.5)	(31.6)	(22.5)	(28.2)	(32.8)
Individual controls		✓	✓		✓	✓		✓	✓
Indebtedness controls			✓			✓			✓
R^2	0.000557	0.0863	0.105	0.00473	0.0731	0.0861	0.00976	0.0903	0.117
Observations	819	558	558	858	598	598	787	539	539
	What fraction receives?			What fraction should receive?			Difference		
Panel D: Roma									
FC share	-22.71	-12.21	-2.093	86.62**	99.21**	120.0**	112.4**	116.3**	136.9**
	(17.5)	(22.6)	(26.3)	(19.3)	(24.1)	(28.0)	(27.9)	(34.7)	(40.4)
Individual controls		✓	✓		✓	✓		✓	✓
Indebtedness controls			✓			✓			✓
R^2	0.00194	0.0909	0.102	0.0226	0.148	0.154	0.0193	0.155	0.168
Observations	867	596	596	871	608	608	828	571	571
	What fraction receives?			What fraction should receive?			Difference		
Panel F: Disabled									
FC share	-18.08	-38.32	-78.31**	-69.25**	-92.49**	-128.7**	-64.72**	-66.28*	-47.44
	(20.6)	(25.8)	(30.0)	(20.9)	(27.2)	(31.2)	(21.7)	(28.6)	(33.2)
Individual controls		✓	✓		✓	✓		✓	✓
Indebtedness controls			✓			✓			✓
R^2	0.000933	0.100	0.112	0.0125	0.0704	0.0846	0.0109	0.0874	0.100
Observations	828	566	566	873	607	607	804	554	554

Notes: This table shows the results of individual-level regression where the dependent variable is what fraction of the various groups receive social benefit, what fraction should receive social benefit and the difference between the two. Individual controls include educational attainment, size of household, log income and employment status. Indebtedness controls include per capita number of loans and log per capita indebtedness. Standard error are clustered at county-settlement type level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.17: Robustness check to overlap in observables

	Whole sample	$0.1 < p < 0.9$	Whole sample	$0.1 < p < 0.9$
	(1)	(2)	(3)	(4)
FC share×Post	4.355**	4.227**		
	(1.189)	(1.300)		
above median FC share×Post			0.891**	0.874**
			(0.218)	(0.225)
Election year FE	✓	✓	✓	✓
Zip code FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓
County-election FE	✓	✓	✓	✓
R^2	0.923	0.924	0.924	0.924
Observations	13900	12132	13900	12132

Notes:
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

Table B.18: Determinants of FCS

	(1) FC share	(2) FC share
Debt to income	-0.0833**	-0.0546+
	(0.0233)	(0.0312)
per capita number of loans, 2008	0.266**	0.0867
	(0.0972)	(0.119)
Share of vocational	-0.0338	0.0826
	(0.119)	(0.0928)
Share of high school	0.131+	0.0453
	(0.0759)	(0.0613)
Share of college	-0.560**	-0.530**
	(0.0706)	(0.0612)
Log per capita income	0.00386*	0.000310
	(0.00170)	(0.00315)
Log number of eligible voters, 2006	0.00190	0.00753**
	(0.00300)	(0.00270)
Unemployment	0.108	0.131+
	(0.0809)	(0.0792)
Share of people age 18-29	-0.0628	0.282*
	(0.179)	(0.140)
Share of people age 59+	0.306**	0.128+
	(0.0869)	(0.0736)
County FE		✓
R^2	0.266	0.388
Observations	3475	3475

Notes:
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Table B.19: Prejudice towards Roma minority in June 2008

	(1)	(2)	(3)
Panel A: The problems of Roma would disappear if they started to work			
Share of foreign currency loans	-1.939	-2.251	-2.721
	(1.58)	(1.68)	(1.72)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.0107	0.0719	0.0752
Observations	989	667	667
	(1)	(2)	(3)
Panel B: The Roma should receive more transfer than non-Roma			
Share of foreign currency loans	-1.686*	-1.480	-0.442
	(0.81)	(0.91)	(0.75)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.0164	0.0882	0.106
Observations	1002	673	673
	(1)	(2)	(3)
Panel C: The Roma children should have the right to be in the same class as non-Roma			
Share of foreign currency loans	-0.116	-0.234	-0.862
	(0.98)	(1.09)	(1.21)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.0000663	0.0429	0.0479
Observations	994	665	665
	(1)	(2)	(3)
Panel D: Among the Roma the traditional family values are more important than among the non-Roma			
Share of foreign currency loans	-0.563	-0.838	0.864
	(1.08)	(1.31)	(1.17)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.000975	0.0466	0.0641
Observations	894	607	607
	(1)	(2)	(3)
Panel E: The Roma has a tendency to commit crime			
Share of foreign currency loans	1.505	0.259	0.555
	(1.05)	(1.22)	(1.07)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.00631	0.0702	0.0792
Observations	963	647	647
Panel F: It is good that certain entertainment factilites do not let Roma in			
Share of foreign currency loans	-0.230	-0.808	0.355
	(1.18)	(1.49)	(1.64)
Individual controls		✓	✓
Indebtedness controls			✓
R^2	0.000131	0.0552	0.0721
Observations	944	631	631

Robust standard errors in parentheses.
+,*,** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Notes: This table shows the results of individual-level regression where the dependent variable is whether the individual agrees with the statement on a five unit scale. Individual controls include educational attainment, size of household, log income and employment status. Indebtedness controls include per capita number of loans and log per capita indebtedness. Standard error are clustered at sub-region level.
+, *, ** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively.

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Appendix C

Appendix for Chapter 3

C.1 Figures

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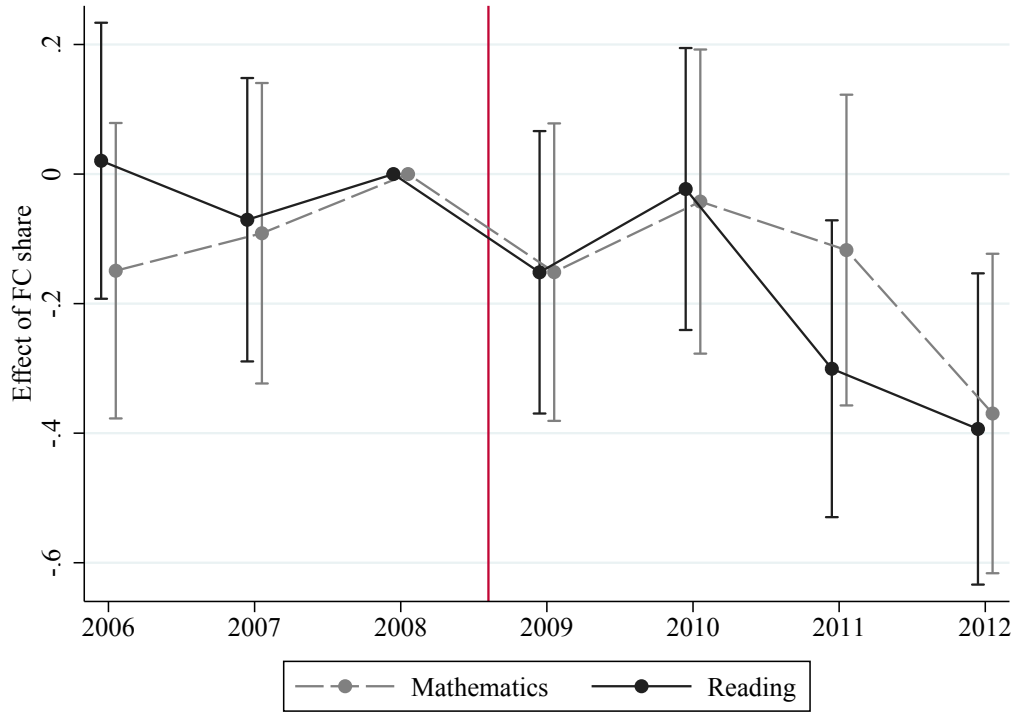
Figure C.1: The relation between foreign currency debt exposure and student performance over time in grade 8



Note: This figure shows the coefficient of the regression $y_{izt} = \delta_t + \sum_{y \neq 2008} \beta_y FCS_z \times I(t = y) + \varepsilon_{izt}$ for grade 8 students. The standard errors are clustered at the class level.

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C.2 Tables

Table C.1: Correlation between student characteristics and foreign currency share

	Coefficient	Standard error	N	R^2
Mathematics score	-1.277**	.083	91004	.013
Reading score	-1.351**	.077	90992	.015
Previous GPA	-.849**	.054	65814	.01
Grade retention in grade 1-4	.075**	.010	79922	.0011
Mother has tertiary education	-.603**	.030	79189	.017
Receive free textbooks	.455**	.033	79606	.0067
Attend local school	.619**	.041	80508	.014
Age	.128**	.030	95780	.00042

Notes: This table shows the results of bivariate student level regressions, where the outcome variable is listed in column 1, and the independent variable is the share of foreign currency loans. I use sample of students in grade 8 in 2008. The standard errors are clustered at the class level.

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Table C.2: Main results on the effect of foreign currency share between 2008-2010

	All students					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Mathematics						
FCS	-32.41**	-20.33*	-15.22+	-21.81**	-21.03*	
	(7.652)	(8.190)	(8.352)	(8.303)	(8.689)	
Debt revaluation						-91.42*
						(37.78)
R^2	0.000453	0.000977	0.0338	0.111	0.208	0.208
Observations	73915	73764	62386	53554	53554	53554
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Reading						
FCS	-24.21**	-22.83**	-16.18*	-21.20**	-19.69*	
	(7.198)	(7.755)	(7.773)	(7.731)	(8.063)	
Debt revaluation						-85.59*
						(35.06)
Loan penetration		✓	✓	✓	✓	✓
Student characteristics			✓	✓	✓	✓
School FE				✓		
Class FE					✓	✓
R^2	0.000271	0.000423	0.0126	0.0834	0.176	0.176
Observations	73922	73771	62384	53559	53559	53559

Notes: This table shows the results of student level regressions, where the dependent variable is the change in test score between grade 8 and grade 10. Standard errors are clustered at the class level.

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Table C.3: Placebo test for the pre-crisis period between 2006 and 2008

	All students				
	(1)	(2)	(3)	(4)	(5)
Panel A: Mathematics					
FC share	2.989	3.671	3.014	-6.708	-7.446
	(4.689)	(4.938)	(4.878)	(4.628)	(4.665)
R^2	0.0000199	0.000139	0.00641	0.0822	0.0882
Observations	41282	41158	38888	37241	37241
	(1)	(2)	(3)	(4)	(5)
Panel B: Reading					
FC share	-2.093	-1.161	2.471	3.849	3.164
	(4.808)	(5.012)	(4.995)	(5.054)	(5.081)
Loan penetration		✓	✓	✓	✓
Student characteristics			✓	✓	✓
School FE				✓	
Class FE					✓
R^2	0.00000843	0.0000770	0.0179	0.0834	0.0882
Observations	41296	41172	38899	37250	37250

Notes: This table presents the results of student level regressions, where the dependent variable is the change in test score between grade 8 and grade 10. Standard errors are clustered at the class level.

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Table C.4: Main results on the effect of foreign currency share between 2008-2010 for primary school students

	All students					Commuting students
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Mathematics						
FC share	26.11*	24.43*	9.728	9.585	13.05	9.964
	(10.75)	(10.82)	(10.99)	(10.71)	(9.532)	(14.32)
R^2	0.000290	0.000382	0.00458	0.231	0.358	0.374
Observations	84743	84587	63050	63050	63050	20934
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Reading						
FC share	17.96*	15.17^{+}	4.426	-0.947	-7.820	4.419
	(8.454)	(8.489)	(8.811)	(9.936)	(10.36)	(15.14)
Loan penetration		✓	✓	✓	✓	✓
Student characteristics			✓	✓	✓	✓
School FE				✓		
Class FE					✓	✓
R^2	0.000154	0.000346	0.00421	0.126	0.211	0.270
Observations	84746	84590	63061	63061	63061	20940

Notes:

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Table C.5: Main results on the effect of foreign currency share between 2009-2011

	All students				
	(1)	(2)	(3)	(4)	(5)
Panel A: Mathematics					
FCS	-31.32**	-11.10	-3.422	0.115	-3.129
	(7.801)	(8.156)	(8.587)	(8.442)	(8.796)
R^2	0.000428	0.00162	0.0151	0.0990	0.194
Observations	75737	75556	59984	51956	51956
	(1)	(2)	(3)	(4)	(5)
Panel B: Reading					
FCS	-16.06*	-9.790	-3.977	-7.366	-7.326
	(6.581)	(7.050)	(7.532)	(7.956)	(8.291)
Loan penetration		✓	✓	✓	✓
Student characteristics			✓	✓	✓
School FE				✓	
Class FE					✓
R^2	0.000118	0.000251	0.00228	0.0632	0.150
Observations	75757	75577	59993	51972	51972

Notes:

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Table C.6: Main results on the effect of foreign currency share between 2010-2012

	All students				
	(1)	(2)	(3)	(4)	(5)
Panel A: Mathematics					
FCS	-61.63**	-28.05**	-16.96^{+}	-25.04**	-20.68*
	(8.090)	(8.738)	(9.115)	(9.028)	(9.281)
R^2	0.00149	0.00448	0.0130	0.0940	0.197
Observations	74863	74674	61477	53582	53582
	(1)	(2)	(3)	(4)	(5)
Panel B: Reading					
FCS	-50.41**	-32.67**	-25.27**	-30.63**	-30.61**
	(6.753)	(7.010)	(7.346)	(7.626)	(7.957)
Loan penetration		✓	✓	✓	✓
Student characteristics			✓	✓	✓
School FE				✓	
Class FE					✓
R^2	0.00123	0.00214	0.0219	0.0720	0.155
Observations	74896	74707	61499	53598	53598

Notes:

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Table C.7: Parental employment

	All students		
	(1)	(2)	(3)
Panel A: Mathematics			
FCS	-21.40**	-23.53**	-23.96**
	(7.484)	(8.146)	(8.334)
R^2	0.201	0.211	0.214
Observations	62386	53293	50839
	(1)	(2)	(3)
Panel B: Reading			
FCS	-22.91**	-21.77**	-20.94**
	(7.271)	(7.777)	(8.035)
Zip code indebtedness	✓	✓	✓
Student characteristics	✓	✓	✓
Class FE	✓	✓	✓
Mother's employment		✓	✓
Father's employment			✓
R^2	0.174	0.178	0.180
Observations	62384	53301	50843

Notes: This table presents the results of student level regressions, where the dependent variable is the change in test score between grade 8 and grade 10. Standard errors are clustered at the class level.

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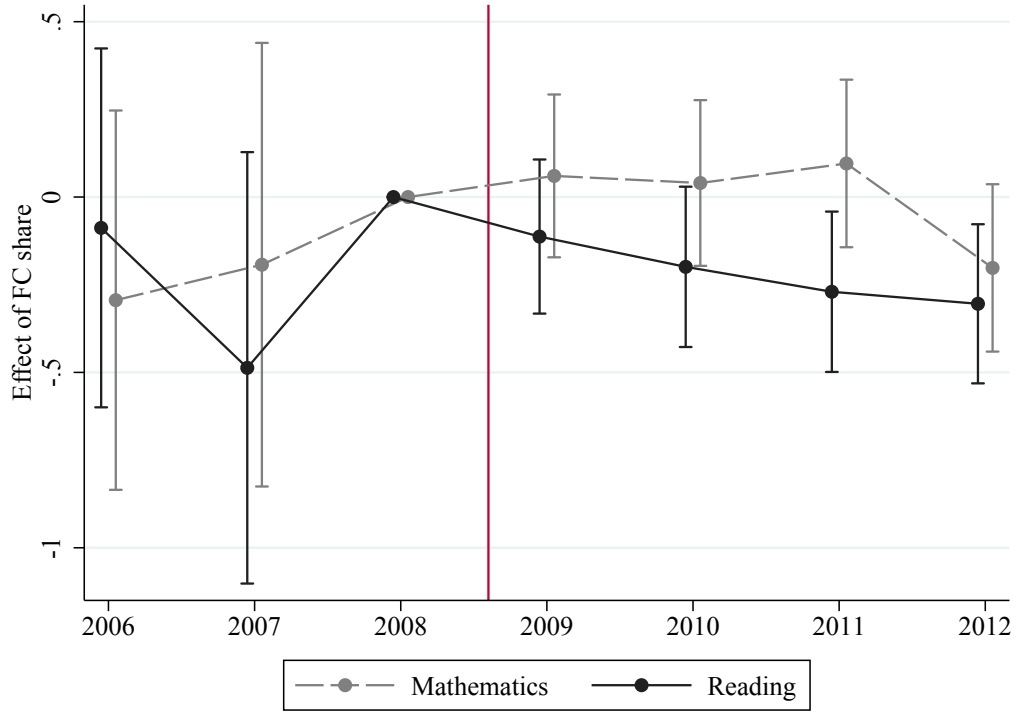
C.3 Additional results

Figure C.2: The relation between foreign currency debt exposure and student performance over time in grade 6



Note: This figure shows the coefficient of the pooled regression $y_{izt} = \delta_t + \sum_{y \neq 2008} \beta_y FCS_z \times I(t = y) + \varepsilon_{izt}$ for grade 6 students. The standard errors are clustered at the class level.

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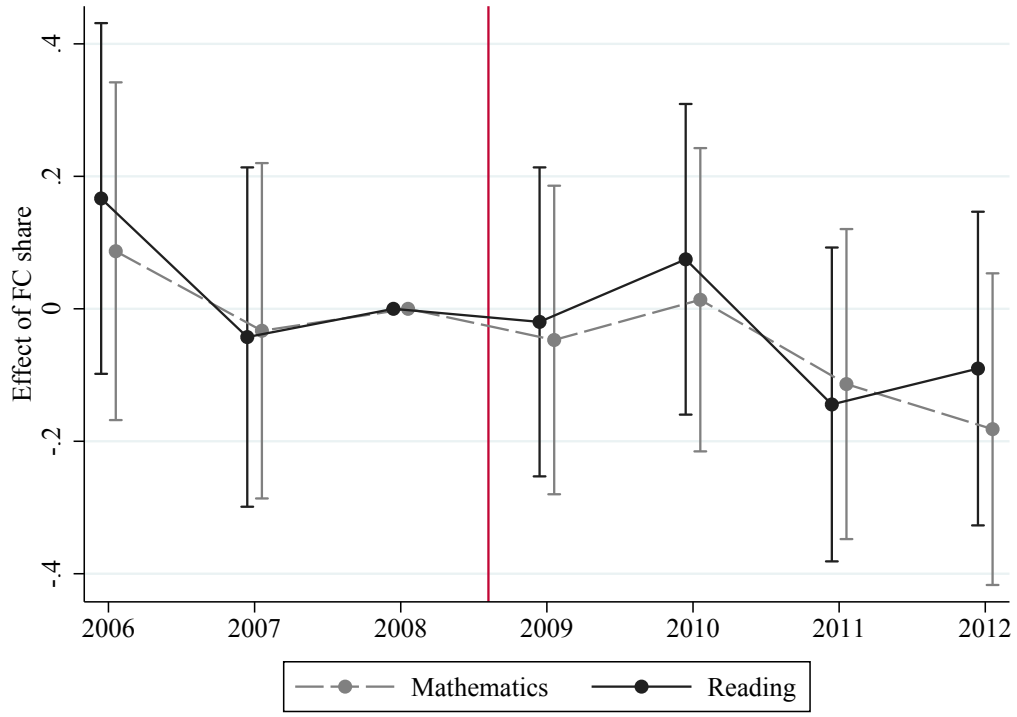
Figure C.3: The relation between foreign currency debt exposure and student performance over time in grade 10



Note: This figure shows the coefficient of the pooled regression $y_{izt} = \delta_t + \sum_{y \neq 2008} \beta_y FCS_z \times I(t = y) + \varepsilon_{izt}$ for grade 10 students. The standard errors are clustered at the class level.

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Table C.8: Robustness to alternative specification

	All students					Commuting students
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Mathematics						
FC loans per capita	52.32	52.32	-6.679	31.18	49.33	52.01
	(55.35)	(55.35)	(57.13)	(53.07)	(47.75)	(66.42)
LC loans per capita	-146.0*	-146.0*	-66.97	-1.904	-34.93	-6.085
	(62.35)	(62.35)	(63.61)	(60.28)	(54.34)	(72.28)
R^2	0.000278	0.000278	0.00455	0.231	0.358	0.374
Observations	84587	84587	63050	63050	63050	20934
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Reading						
FC loans per capita	-9.697	-9.697	-31.61	-16.47	-70.64	-58.81
	(42.48)	(42.48)	(44.02)	(49.46)	(49.76)	(68.90)
LC loans per capita	-94.10+	-94.10+	-24.95	27.02	87.19	87.72
	(49.68)	(49.68)	(50.73)	(56.73)	(57.97)	(77.20)
Loan penetration		✓	✓	✓	✓	✓
Student characteristics			✓	✓	✓	✓
School FE				✓		
Class FE					✓	✓
R^2	0.000267	0.000267	0.00420	0.126	0.211	0.270
Observations	84590	84590	63061	63061	63061	20940

Notes:

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Table C.9: Effect of foreign currency share between 2008-2010 using lagged dependent variable

	All students				
	(1)	(2)	(3)	(4)	(5)
Panel A: Mathematics					
FCS	-71.53**	-39.91**	-26.11**	-14.53+	-9.612
	(8.147)	(8.522)	(8.401)	(7.517)	(7.583)
R^2	0.576	0.578	0.610	0.661	0.713
Observations	73915	73764	62386	53554	53554
	(1)	(2)	(3)	(4)	(5)
Panel B: Reading					
FCS	-56.43**	-35.30**	-21.10**	-11.13	-4.767
	(7.924)	(8.419)	(8.027)	(7.189)	(7.145)
Loan penetration		✓	✓	✓	✓
Student characteristics			✓	✓	✓
School FE				✓	
Class FE					✓
R^2	0.605	0.606	0.627	0.681	0.732
Observations	73922	73771	62384	53559	53559

Notes:

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Table C.10: Effect of foreign currency share between 2009-2011 using lagged dependent variable

	All students				
	(1)	(2)	(3)	(4)	(5)
Panel A: Mathematics					
FCS	-88.50**	-42.64**	-22.12**	5.987	6.610
	(8.474)	(8.691)	(8.532)	(7.313)	(7.277)
R^2	0.580	0.583	0.612	0.679	0.734
Observations	75737	75556	59984	51956	51956
	(1)	(2)	(3)	(4)	(5)
Panel B: Reading					
FCS	-80.52**	-39.21**	-19.43*	2.254	3.761
	(7.535)	(7.904)	(7.737)	(6.949)	(6.970)
Loan penetration		✓	✓	✓	✓
Student characteristics			✓	✓	✓
School FE				✓	
Class FE					✓
R^2	0.597	0.600	0.626	0.683	0.734
Observations	75757	75577	59993	51972	51972

Notes:

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Table C.11: Effect of foreign currency share between 2010-2012 using lagged dependent variable

	All students				
	(1)	(2)	(3)	(4)	(5)
Panel A: Mathematics					
FCS	-61.63**	-28.05**	-16.96+	-25.04**	-20.68*
	(8.090)	(8.738)	(9.115)	(9.028)	(9.281)
R^2	0.00149	0.00448	0.0130	0.0940	0.197
Observations	74863	74674	61477	53582	53582
	(1)	(2)	(3)	(4)	(5)
Panel B: Reading					
FCS	-50.41**	-32.67**	-25.27**	-30.63**	-30.61**
	(6.753)	(7.010)	(7.346)	(7.626)	(7.957)
Loan penetration		✓	✓	✓	✓
Student characteristics			✓	✓	✓
School FE				✓	
Class FE					✓
R^2	0.00123	0.00214	0.0219	0.0720	0.155
Observations	74896	74707	61499	53598	53598

Notes:

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