

MASTER THESIS

Early repayment without early benefits

The impacts of the law on early repayment of foreign currency denominated mortgage loans at below-market exchange rates in Hungary

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January 2017

Number of characters: 148,359

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ABSTRACT

This paper examines the housing and economic impacts of the law on early repayment of foreign currency denominated mortgage loans at below-market exchange rates in Hungary. The purpose of the law was to ease the debt service burden of households with FX mortgage loans through a significant debt forgiveness. The law resulted in a vastly unequal distribution of wealth shock as wealthier households were the beneficiaries of the policy. Empirical evidence presented in other papers shows that these households tend to have lower MPC. Due to the level of data used in the Synthetic Control Method, the MPC calculated in this paper is applicable on an aggregate level. However, since the law impacted less poor households directly, an interpretation of a low MPC could be that the underlying driver of the MPC is the change in wealthier households' consumption and in their net housing wealth due to the law. I find some evidence of a depreciating Hungarian forint (against the euro) for certain periods as a result of the policy. There is no evidence found on a severe harm on the real economy measured by GDP deflator index and real GDP index.

I. INTRODUCTION

Since the turn of the 21st century many Central, Eastern and Southeastern European (CESEE) countries¹ showed the symptoms of a credit boom. However, the nature of the credit expansion was different in many aspects from what the US housing market experienced within that same period. The consequences, triggered by the spillover effects of the US financial crisis, were unavoidable and painful. The sudden uptake of foreign currency denominated loans in CESEE countries was partially due to interest rate differentials (e.g. in Hungary, prior to the crisis the nominal interest rate on Swiss franc denominated loans were at least 5 percentage points lower than on Hungarian forint loans (National Central Bank of Hungary, 2016)), relatively low standard deviation of EUR/domestic currency and CHF/domestic currency. This could have influenced households' expectations of exchange rate movements, hence, anticipating a lower exchange rate risk in the future. Furthermore, it triggered the appearance of many Western European banks that saw a great opportunity of investment in the low penetrated and financially less developed markets. The majority of lending, however, was in domestic currencies in most CESEE countries.

After the bankruptcy of Lehman Brothers, the indirect effect of the panic, uncertainty and fear of collapse of other financial institutions spread across the world and small, open economies, that are highly dependent on foreign capital, were severely hit by lack of liquidity of foreign investors. Domestic currencies in the CESEE countries depreciated sharply, resulting in an increase of total amount payable. The monthly instalment on FX loans soared, the number of distressed borrowers increased, hence, the ratio of non-performing loans (NPL) escalated. At that time, it was hard to predict for how long will the recession last and how severe it will be, and the problem of households was just one out of many others that governments faced.

To handle the crisis related to accumulated household debt, EU institutions were in favor of implementing softer measures to limit exposures, assess and monitor credit and systemic risk in addition to controlling foreign currency lending (ESRB, 2011). Until May 2011, no impactful measure was introduced but since problems concerning household debt got more and more severe,

¹ Examined CESEE countries in the region: Bulgaria, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Serbia.

Hungary took action to help out distressed debtors. The so-called "Home Protection" package allowed borrowers to pay their monthly instalment at a below-market exchange rates until end of 2014, while the accumulated amount (capital plus interest), due to the difference between spot and capped exchange rates during the transitional period, counted as a HUF-denominated loan that is required to be paid back from 2015 onward. Practically, this legislation acted as a temporary debt relief but due to strict eligibility criteria not many households could benefit from the impact of the law. The "Home Protection" package was the first in the series of legislations, and it was followed by the "National Protection Action Plan" (NPAP), which is in scope of my thesis.

I examined the effect of the fixation of the exchange rate for early repayment of foreign currency mortgage loans in Hungary (law was adopted in September 2011 and entered into force in the end of the month). The law practically allowed an early repayment of the total amount payable at a predefined exchange rate that was significantly below the spot rates in the fall of 2011. This intervention created a great turbulence and uncertainty in the markets due to the relatively low applied exchange rate (compared to the spot rates), and the implementation was less transparent. The ECB has shared its concerns, and I used that partially as a guide for my analyses to determine the effect of the intervention on the real economy, e.g. depreciation pressure on the exchange rate and two different GDP indicators. More importantly, I examined the impact on durable consumption of households and property prices. Both the length of the pre-intervention period and the length of the post-intervention period was sufficient, and I run my analyses on quarterly data. The law was greatly exclusive, since only households with more savings or higher creditworthiness could finance an early repayment. Therefore, a potential significant change in the aggregate consumption levels due to the law can either derive from the adjusted consumption of poorer households?

There are many different forces that might have influenced the magnitude of the impact of the policy on aggregate durable consumption. A household that was eligible for early repayment realized the gain from the lower applied exchange rates, while even though the net wealth was unaffected, the large one-off might have been perceived as a loss. From the perspective of a

² Unfortunately, due to lack of micro-level data separating the impacts of the law based on different household characteristics is not feasible.

household that did not participate in NPAP an additional decline in property prices and the rise in monthly instalments due to higher spot exchange rates (it will be tested whether it happened due to the law) might lowered the net worth of the household. To test the significance of the impacts on durable consumption, property prices and exchange rates, the Synthetic Control Method is used. Furthermore, the potential effect of the law is tested on GDP deflator and real GDP to assess whether the adoption of the law had significant impact on the real economy.

I find strong evidence of a decrease in durable consumption for Hungary. According to the SCM estimates the policy led to a minimum of 23.6 and maximum of 27.6 percent decrease in accumulated durable consumption during the post-intervention period. The results are robust to the use of different sets of control groups. The placebo tests also provide proof for the unique impact of the legislation. The SCM applied on property prices produces quite different results in magnitude when different control groups are used. The growth in Hungarian property prices are within the range of [-9.7,1.3] percent from 2011Q3 to 2013Q4 due to the law. The significance of the impact of the law on property prices is questionable, since some placebo studies create gaps similar in magnitude to gaps estimated for Hungary on property prices index. It could be, however, that around the same time other countries' property prices might have been impacted by new legislations on foreclosures or changes in interest rates. The MPC was calculated according to the different scenarios, and I find values of [-4.8, 4.4] percent. Due to the law the durable consumption dropped significantly, however, as the MPC shows, it was not an extreme decline as a response to net housing wealth changes. This finding is more in line with the theory that due to the law mostly wealthier households were impacted, hence, the underlying drivers of the MPC are wealthier households. Since one of the original purpose of the law was to boost the consumption, then the law should have been applied more generally not to target more affluent households only, who tend to have lower MPC. The SCM applied on exchange rate index for Hungary suggests a more volatile path for EUR/HUF after the law entered into force. Based on the results from placebo tests, there is a weak evidence of a weaker Hungarian currency for certain periods due to the impact of the policy. I find no evidence of a severe harm on the real economy measured by GDP deflator index and real GDP index.

The remainder of my thesis is organized as follows: Section II provides an overview of the mortgage loans in the CESEE region, and how the respective governments tried to ease the debt service burden on households to avoid more harmful consequences. Section III describes the assumptions regarding the underlying net housing wealth effects caused by the law, and lists the rationale behind potential outcomes. Section IV summarizes the relevant literature in addition to what has already been covered in Section II. Section V displays the methodology used for the estimations, while Section VI describes the used dataset. Section VII reveals and explains the results of the SCM. Section VIII test the robustness of the results and reveals the results of placebo tests. Section IX concludes.

II. CASE BACKGROUND

The following subsection describes the main characteristics and determinants of the strong uptake of foreign currency denominated mortgage loans in the Central, Eastern and Southeastern European (CESEE) region prior to the financial crisis. Furthermore, the last two subsections give a detailed overview of regulatory measures and mortgage loan characteristics implemented in the CESEE countries, particularly second part of Section II.II describes the policy in scope that had been announced in September 2011 in Hungary.

II.I CHARACTERISTICS OF MORTGAGE LOANS IN CESEE COUNTRIES

The barriers of free capital and labor were demolished when many of the CESEE countries entered the European Union. Even prior to the accession the economies became more open and adjusted their legal frameworks in order to prepared for the accession. The capital inflows were materialized mostly in the form of other investments where bank loans belong to. However, other Balance of Payments categories were also affected by the deregulation of the markets, such as foreign direct investments and portfolio investments. These two categories were not substantial across the whole region though. Even the rest of the economies (Bulgaria, Serbia and Romania) that did not join the European Union in 2004 had started to catch up and started to prepare for an EU accession and had grown substantially after the socialist regimes ended. Overall, the less developed CESEE economies were booming (as we know now they had been overheated in some cases) and due to the impressive GDP growth more sceptic economists and policy makers were cornered and their voices were less heard.

Banks with foreign ownership established their subsidiaries and expanded aggressively in the region to capture more market share and establish a banking culture in the transitioning countries (Table 1). Due to low labor costs and the relatively low penetration of financial products, the post-socialist countries seemed as a very attractive market to the liquid Western banks, thus many multinational companies established subsidiaries in the region. The financial institutions had direct access to foreign funds via their presence on a global level, and those funds were channeled back to the domestic markets where the subsidiaries started to operate. The bank loans provided to households were mostly denominated in EUR, CHF or sometimes in JPY (Figure 1 and Figure 2), besides the substantial amount of domestic foreign currency loans. Credit risk for banks did not seem too high in the 2000s, even though borrowers were exposed to exchange risk and foreign interest rate risk (relevant for loans with variable interest rates), there were not too many distressed borrowers during that period. As it will be detailed in Section II.III., governments and central banks reacted to the sudden uptake of FX mortgage loans differently, by (not) introducing regulatory measures that influenced borrowers' behavior.

When households face the decision on borrowing, they are required to opt for either domestic or foreign currency denominated loans. Within those categories they can either choose fixed or variable interest rate loans, assuming that they are available in the market. In the decision-making process certain factors such as interest rate differential, expected depreciation, perceived exchange risk and the relative variance of domestic short-term interest rates and the exchange rate ("fear of floating") are important determinants of households' choice (Csajbók, Hudecz, & Tamási, 2010). As Figure 5 and 6 indicate, the CHF/HUF and EUR/HUF rates seemed stable, numerically the average annual volatility of EUR/HUF and CHF/HUF during 2004Q1-2008Q3 was relatively low (.5 and .6 percent, respectively). Hence, household might have adjusted their expectation on

future volatility based on what they experienced historically. The other important component that influences households' choice between domestic and FX loans is the interest rate differential. In Hungary, prior to the crisis, the nominal interest rate on CHF loans were at least 5 percentage points lower than on Hungarian forint loans (National Central Bank of Hungary, 2016). As a starting point, this might have given an incentive to opt for a CHF loan. In general, in countries with floating exchange rate regimes, the interest rate differentials were higher prior to the crisis (in Croatia it was 5.0 percent, in Poland 5.5 percent and in Romania 6 percent vs. 1.6 percent in Bulgaria, 1.7 percent in Latvia and .6 percent in Lithuania). In countries with pegged exchange rates, the incentive that significantly triggered borrowing in foreign currencies was the higher inflation³ that reduced real interest rates. Due to the applied currency boards, the nominal exchange rate could not appreciate, hence, could not keep inflation low.

The liquidity problem that arose in the US markets followed by uncertainty and fear led to a spillover effect. The interdependencies among CESEE countries and the indirect effect of the crisis via Western countries enhanced the impact of the recession. On a cross-country level, the Vienna Initiative (from March 2009) aimed to ensure coordination and continued lending among commercial banks and other financial institutions in the region⁴ (Banai, Király, & Nagy, 2011).

The indebtedness of the households in CESEE countries was not the only factor that determined the magnitude of the recession. In Poland, as an example, households' outstanding credit increased by 445 percent from 2001Q1 to 2008Q3 (38 percent of the growth in credit is due to foreign currency denominated loans) (National Central Bank of Poland, 2016) and the Polish zloty weakened significantly, which could have resulted in low consumption and low GDP. However, the Polish nominal and real GDP growth was still positive after 2008Q3 for many consecutive quarters. The Polish economy was an exception though, as in other CESEE countries where households took foreign currency loans, the economy shrank significantly.

In Hungary, Croatia, Romania and Serbia residential borrowers faced difficulties due to increasing monthly mortgage payments due to the local currencies' depreciation (that became an

³ Massive capital inflows to the Baltic countries and Bulgaria led to higher price levels (Bakker & Gulde, 2010).

⁴ IMF provided loans to help out some of the countries in the region (e.g. Hungary).

issue in Poland as well in the aftermath of the crisis but not to such an extent as in the other three countries). In the Baltic countries and Bulgaria (countries with fixed exchange regime based on currency boards), governments decided to respond to the crisis with cutting wages and public expenditures via internal devaluation (Åslund, 2011).

In countries with pegged exchange regime (due to the impact of fiscal restrictions), loanto-value (LTV) and payment-to-income ratio for mortgage loans increased, as a consequence of the latter, the ratio of non-performing loans skyrocketed and peaked in 2010. In countries with floating regimes, a different dynamic can be noticed: the NPL ratio gradually increased in the aftermath of the crisis and had not converged to an NPL ratio level that was seen before 2008 (Figure 3).

II.II HOW TO HANDLE FOREIGN CURRENCY LOANS – HUNGARY

When the financial crisis started, it created a ripple effect and small, open economies faced a stop in inflow of capital due to the uncertainty and mistrust in the markets. Less risky options seemed more appealing, and since Swiss franc has always been considered as a last resort, during recessions the demand for such assets rises. This was extremely bad news for households that accumulated debt in CHF since domestic currencies sharply depreciated. The Hungarian Forint weakened by 18 percent between 15 September 2008 and 31 October 2008, regardless of the quick response of the Hungarian Central Bank (MNB) that increased its key policy rate by 3 percentage points to protect the domestic currency. As shown on Figure 4 the proportion of "Other"⁵ foreign currency mortgage loans reached 59 percent in 2008Q4, the increase was almost exclusively due to a stronger Swiss franc and not due to newly granted CHF loans. The average LTV ratio for mortgage loans reached 70 percent at the end of 2008 (vs. 50 percent in 2009). Due to the increased instalments on FX loans, the ratio of NPL soared and reached 8.2 percent in 2009 and 10.0 percent in 2010. First, as a temporary solution, government adopted a moratorium on evictions in 2009 but

⁵ The majority of those loans were CHF-denominated but some banks issued JPY-based mortgage loans. Due to the very low Japanese interest rates the JPY-loans seemed attractive at first sight.

since the situation of households worsened in the following years, the moratorium remained in place until July 2011 (Banai et al., 2011).

Besides the one-time increase in the base rate, the MNB invested in government bonds (HUF-denominated), introduced overnight, 3-months and 6-months EUR/HUF swaps⁶ to inject money into the economy, to boost circulation of money and to have hedging instruments available in the market (Csávás & Szabó, 2010).

Hungarian banks (not foreign owned ones) received state loans from the government via IMF loans to increase liquidity in the market. In Hungary, as well as in some other CESEE countries (Section II.III), banks unilaterally raised interest rates and/or fees, which was in fact not legitimate at the time when these changes were implemented (this unfair behavior got officially acknowledged in 2014). In 2009, banks were required to provide a "cause-and-effect" list to state the grounds of the changes. This law was made to enhance "transparent pricing" but since banks provided long and creative lists of various reasons for charging more, a Code of Conduct was made to limit the different type of reasons.

In Hungary, the interest on FX mortgage loans was either a fix rate, which also left plenty of room for banks to increase the rate despite of the "fix" feature, or an indexed rate, using 3 to 12 months EURIBOR or CHF-LIBOR as a benchmark + margin, the latter component being changeable. In most of the cases though, the reasons for raising the rates were not transparent. Consequently, borrowers not only bore the exchange rate risk but also the interest rate risk related to both benchmark rates and bank's own costs/valuations. These two elements increased monthly payments tremendously, which resulted in a growing proportion of bad loans in the banks' portfolio (Bethlendi, 2015).

Under the umbrella of "prudent lending", a stricter loan-to-value ratio (LTV) was required for FX-denominated loans from 2010. The cap on LTV was set at 80 percent for forint-denominated housing loans, at 60 percent for euro-denominated and at 45 percent for "other" FX loans (such as CHF and JPY) (Holmár, 2012). Banks were obliged to review the creditworthiness of new

⁶ These swaps were supposed to substitute the derivatives that were either not available or their price had gone up due to the crisis.

borrowers and based on a payment-to-income ratio (PTI) decide whether to grant loan to a potential customer. This regulation almost eliminated new FX loans⁷, however, later that year, foreign currency mortgage lending was banned. Under new regulation in 2010, the government tried to enrich borrowers' lives by loosening some rules on fees applicable to borrowers such as late payment interest, extension of maturity and prepayment fees (Banai et al., 2011).

A new type of tax was levied on the banking sector that accumulated substantial profit prior to the crisis, and in 2010 the government obliged banks to aid in stabilization of the budget, based on solidarity. The bank tax was supposed to last for three years until end of 2012 and the tax rate for credit institutions was originally defined as .45 percent of the value of total assets in the balance sheet reported in 2009⁸⁹ (Government of the Republic of Hungary, 2010). However, the bank tax has been extended and has been applied since its implementation to fill the gaps in the budget deficit, although the tax rate has been reduced to .24 percent in the tax year of 2016 and to .21 percent in 2017. The largest eight banks have contributed roughly with 390 million euros to the budget in 2010. The amount payable dropped significantly in 2011 (to ca. 65 million euros) when the government allowed banks to deduct 30 percent of the realized losses related to the law end of 2011 on early repayment of foreign currency loans at a fixed (below-market) exchange rate (portfolio.hu, 2012).

In 2011, the agenda of protecting borrowers continued. The right-wing party, that won the elections in 2010, promised to help out to reduce the debt service burden of households with FX mortgage loans, thus more severe actions were taken. As a first step, the "Home Protection" program was adopted in May 2011, supported both by the government and the Hungarian Banking Association (HBA)¹⁰. In relation to this legislation, the National Asset Management Ltd. (NET) was established that was owned by the government in order to purchase the property of distressed

⁷ These laws were made rather late since after 2009 both banks and households were reluctant to enter an FX loan agreement.

⁸ Some deductibles can decrease the tax base, but these items were rather minor.

⁹ Insurance companies and other financial institutions were also obliged to pay a temporary tax on their assets on average with a higher rate. Additionally, later in 2010 the rate was increased to .50% and in 2011 to .53% for credit institutions.

¹⁰ For the exhaustive list of measures covered by the "Home Protection" package please see Table 2 in Appendix B.

borrowers and let them enter a rental agreement. The moratorium on evictions meanwhile had been lifted a few months before the NET started its actual operation. The conditions of being enrolled in the property purchasing program were extremely strict¹¹. Originally the most promising part of this package was the introduction of a fixed exchange rate on FX mortgage loans that was aiming to help borrowers temporarily. Debtors could pay their monthly instalment calculated with more favorable exchange rates than spot rates until end of 2014¹². The accumulated amount (capital plus interest) due to the difference between spot and capped exchange rates during the transitional period were transferred to a forint denominated account. From 2015 the spot rate was reapplied on the outstanding amount and borrowers had to start repaying the accumulated amount along with the "regular" payment on a monthly basis (Hudecz, 2012). The package was discussed in the parliament, got adopted as Law No LXXV of 2011 and entered into force on 30 June 2011. Due to the implementation of another package called "National Protection" program in September 2011 and the modification of the previously adopted Law No LXXV in December 2011 in addition to the exceptionally strict conditions the participation rate in the "Home Protection" program remained extremely low.

One of the most controversial and relatively unorthodox legislation that eventually had been implemented was the "National Protection Action Plan" (NPAP). Due to the low level of interest in the "Home Protection" package and unresolved problems of household debt, expectations arose that the government and the central bank will suggest other alternatives to ease the burden of distressed households. The government did not hesitate too much to make an alternative plan: some information about a new draft legislation was shared with the public on 9 September 2011 and on 13 September prime minister Viktor Orbán supported that proposal. According to the draft law, the total amount payable of the foreign currency mortgage loans could be repaid by the debtor at a fixed, below-market interest rate. The costs arising from exchange rate differentials would be bared by the financial institution that granted the loan. The bill triggered a harsh reaction from the

¹¹ They included income, social/family status and property value related conditions; only borrowers with payments more than 180 days late were entitled to apply and most importantly the bank had to agree on selling the property for 55%, 50% or 35% of the original value of the asset. Therefore, only a very limited circle of customers met these criteria and in the early years there were not many transactions conducted (Hudecz, 2012).

¹² 180 HUF/CHF, 250 EUR/CHF and 2 HUF/JPY were the applicable rates.

Hungarian Banking Association, politicians from the opposition and constitutional lawyers. According to these stakeholders, the draft law was unacceptable, was not in line with the constitution, threatened legal certainty and the stability of financial system of institutions, moreover it could have many unforeseen negative impacts on the macro economy. They claimed that if the law entered into force, it will be reviewed by the Constitutional Court of Hungary and by EU authorities (Hungarian Banking Association, 2011a, 2011b). The bill was submitted to ECB on 19 September without asking for an urgent procedure so that the Hungarian government could have received the opinion of ECB prior to the decision was expected to be made. On the very same day the parliament (after only three days of the submission to the legislative body) adopted the law (hereinafter 'the Law'), announced on 26 September and the Law entered into force on 29 September 2011 as an amendment to Law No CXII of 1996¹³. On 10 October 2011, the parliament voted on minor amendments¹⁴ that entered into force on 14 October (Government of the Republic of Hungary, 2011a).

Since the Law is only available in Hungarian (Government of the Republic of Hungary, 2011b) the below shortened version, which highlights the main points of the Law, was taken from the Opinion of the European Central Bank (ECB, 2011):

The draft law will amend the following legislation to establish a relief scheme for distressed borrowers in a foreign currency: (i) Law No XCIII of 1990 on duties, (ii) Law No CXVII of 1995 on personal income tax, (iii) Law No LXXXV of 1996 amending Law No XCIII of 1990 on duties and on administrative charges for certified copies of title deeds , (iv) Law No CXII of 1996 on credit institutions and financial enterprises [..], (v) Law No XXX of 1997 on mortgage credit institutions and mortgage debentures, and (vi) Law No LXXV of 2011 on the system for the forced sale of residential properties and fixing the exchange rate for repayment of foreign-currency loans.

The scheme for distressed borrowers applies to foreign currency loan agreements entered into by consumers with a State guarantee pursuant to Article 44 of Law No CXXXV of 2004 on

¹³ Amendments to Law No XCIII of 1990, Law No CXVII of 1995, Law No LXXXV of 1996, Law No XXX of 1997 and Law No LXXV of 2011 were also adopted but that had been done so to support the new legislation.

¹⁴ Due to the rapid legislation procedure certain parts of the original Law were interpreted differently among financial institutions. The amendment eliminated the loopholes and clarified ambiguous sections.

the Republic of Hungary's budget for 2005¹⁵, or a mortgage on a residential property in Hungary, and specifies the conditions for early repayment of the total amount payable by the consumer. In such cases, the financial institution which has granted the foreign currency loan, when defining the forint amount of the early repayment, must apply an exchange rate of 180 HUF/CHF for Swiss francs, 250 HUF/EUR for euro and 200 HUF/100 JPY for yen where all of the following criteria are met¹⁶:

(a) the exchange rate used at the time the financial institution extended the loan affected by early repayment was not higher than the fixed exchange rate,

(b) the financial institution has not terminated the loan agreement by the date on which the draft law takes effect,

(c) the borrower submits to the financial institution providing the foreign currency loan a written claim for early repayment by 30 December 2011,

(d) the borrower agrees, when filing a claim, to repay early any debt arising from bridge or combined account loans directly related to the foreign currency loan.

If these criteria are met, the financial institution may not refuse a claim for early repayment and is obliged to arrange for closure directed at early repayment of the contract within 60 days of a claim. The financial institution may not charge for payment of expenses and other fees or commissions defined in Law No CLXII of 2009 on credit provided to consumers for early repayment. Also, in case of foreign currency loan agreements with consumers, the financial institution may solely charge in foreign currency for costs and fees directly related to the acquisition of foreign currency resources to fulfil and support the relevant contract, including interest-type handling costs. The draft law also provides that fees and costs related to entering into contracts, correspondence, statements and certificates, visits to customers, credit monitoring, notice of termination, collateral valuation and replacement, amendments to the contract, credit repayment

¹⁵ According to this provision, the State guarantee applies to loan agreements following 31 December 2004 for residential real estate.

¹⁶ As a reference point the average CHF/HUF, EUR/HUF and JPY/HUF exchange rates a month prior to the announcement were the following: 236 HUF/CHF, 281 HUF/EUR and 263 HUF/100 JPY.

insurance services or administration of the credit agreement and associated closure of the credit account may not be charged to the consumer in foreign currency."

The "National Protection" also included measures to strengthen financial stability, e.g. establish a complete credit register, interest rates on mortgage loans were required to be linked to a reference rate (or had to be fixed rates) (MNB, 2011).

Regardless of the criticism of many different stakeholders both in Hungary and in the global media, the Law was adopted, and the HBA released another press release listing all the potential negative consequences of the Law. The HBA reached out to the Constitutional Court of Hungary to claim the Law unconstitutional and request immediate termination of the Law (Hungarian Banking Association, 2011c, 2011d). The ECB also shared its many concerns regarding the newly adopted Law and highlighted the fact that irrespective of the urgency of the matter Hungary was obliged to consult with ECB¹⁷. There were several risks that were needed to be assessed and mitigated if possible when the decision was made. It was very likely that such a policy would cause some turbulence in the markets, the extent of the impact on the different sectors and more generally on the Hungarian economy remained uncertain though. According to the arguments of ECB (2011), due to the Law, the weakening of the banking system's stability would be unavoidable and it might have spillover effects on the economy. Due to the unexpected hefty losses that the exchange rate difference causes (along with the "temporary" bank tax), banks' capital position could be adversely affected, leading to a fall in lending activity and deterioration of lending capacity of Hungarian banks with foreign subsidiaries. Due to the large presence of foreign banks in the Hungarian banking sector, the possibility of cross-border spillover effects could be high. Thanks to the increased demand for foreign currencies EUR/HUF and CHF/HUF could be under depreciation pressure and might get vastly volatile, henceforth the central bank might need to intervene to protect the domestic currency. That could lead either to higher domestic interest rate, hence costlier financing in domestic currency¹⁸, which could lower lending activity further, or to lower foreign

¹⁷ This phenomenon happened later as well when the parliament decided to convert FX loans to HUF-denominated loans (ECB, 2014).

¹⁸ A significant share of households was only able to repay their loans through loan refinancing. According to regulations in place in 2011 it was only possible through new HUF-denominated loans, which interests would be higher due to a higher base rate.

exchange reserves. Households that would not submit a claim for early repayment could be adversely effected due to increased monthly instalments, which could increase the ratio of nonperforming loans and could result in a lower disposable income. The lack of transparency and predictability of the system would certainly undermine trust and could lead to deterioration of foreign investment in addition to a potential rise in risk premia. The latter could have a negative impact on government debt. Overall, the Law could result in a lower GDP growth due to the listed potential consequences. On the positive, side if markets did not consider the policy excessively harmful then after a short time of turbulence, investors would gain trust and legitimize the policy, which could have a positive impact on risk premia, government bond yields and ratings, hence lowering the financing costs of debt. Additionally, if many borrowers decided to enter the NPAP through loan refinancing (with HUF-denominated loans) then banks providing these type of loans would gain creditworthy customers, which would affect the quality and risk of the bank's portfolio positively (ECB, 2011; Holmár, 2012; Hungarian Banking Association, 2011c; Közpolitikai Kutatások Intézete, 2011).

The government anticipated an increase in personal consumption due to the reduced and predictable debt burden. Debtors eligible for early repayment would be the wealthier households (either with savings or steady income to refinance the new borrowing). However, according to empirical studies the marginal propensity to consume is significantly higher for poorer households and households with higher leverage (A. R. Mian, Rao, & Sufi, 2013).

The debate and negotiation between the HBA and the government started once the Law was adopted. In contrast to the early criticism of the Law by HBA, the government and the HBA reached a conclusion on 15 December 2011 that allowed banks to write down 30 percent of their losses (resulting from difference in spot and fixed exchange rates used in NPAP) from the amount of annual bank tax in 2011. That reduced the unexpected losses for banks immensely and they did not challenge the Law in court. Previously adopted Law No LXXV of 2011 (a.k.a. "Home Protection") was modified: borrowers who do not have 90 days late payments can benefit from the below-market exchange rate scheme¹⁹ for 5 years but max. until June 2017 and the accumulated

¹⁹ 180 CHF/HUF and 250 EUR/HUF capped rates had not been changed compared to June 2011 but JPY/HUF got increased to 2.5 HUF/JPY (vs. 2 HUF/JPY). The amendment also claimed that if the forint weakens significantly and

amount (only capital, interest rate was calculated on capital with below-market rates and banks and the government realized the loss equally) due to the difference between spot and capped exchange rates during the transitional period will be transferred to a forint denominated account after the transitional period. Eligible borrowers were entitled to some interest rate subsidy provided by the government (Hungarian Banking Association & Government of the Republic of Hungary, 2011). The amended "Home Protection" package aided households temporarily by postponing a share of their "true" monthly instalment that increased significantly compared to ex ante crisis levels²⁰.

To prevent an excessive depreciation of the Hungarian currency and reduce Hungary's financial vulnerability, the MNB launched a new instrument in October 2011 that offered to sell EUR to HUF to counterparties to meet the increased demand for foreign currencies. Such instruments are created to alleviate the negative impact of an abrupt demand could cause in the spot market. The tenders lasted until end of February 2012 and the submitted early repayment claims were monitored by the MNB to avoid unnecessary amount purchased at the tenders (MNB, 2011).

Despite the fact that quite extended literature analyzed the outcome of the Law based on the value or volume of participants, the impact of the realized losses on the banking sector, the participation rate across different type of FX loans, source of financing the early repayment, etc., no impact studies had been made to assed the potential impact of the Law before the decision making. The reason for this was the exceptionally rapid implementation of the policy (the policy on early repayment of foreign currency denominated loans at below market rates was first officially publicly announced on 9 September 2011 and adopted on 19 September, same year).

The total value of mortgage loans (in HUF) among households was reduced by 24 percent (23.3 percent without the exchange rate impact) by the end of February 2012 due to NPAP, 92 percent of the repaid loans were CHF-denominated. The volume of total CHF, JPY and EUR-

would exceed 270 HUF/CHF, 340 HUF/EUR or 3.3HUF/JPY, the accumulated amount above those levels will be paid by the government.

²⁰ As an example average exchange rate in December 2011 was 247 HUF/CHF vs. 151 HUF/CHF in September 2008.

denominated mortgage loans dropped by 25.3 percent, 23.3 percent and 2.1 percent, respectively²¹. Financial institutions would have realized a loss of 1200 million euros but due to the law that enabled them to write 30 percent of the losses off from the additional bank tax these losses amounted to 840 million euros. Due to the exchange rate differential, banks lost about .27 CHF on every Swiss franc, .33 JPY on every Japanese yen and .18 EUR on every euro. Roughly third of the repaid loans were financed through new forint borrowings, and the average value of repaid mortgage loan was 19,000 euros (Hungarian Financial Supervisory Authority (PSZÁF), 2012). Another measure is worth mentioning is the NPL ratio that had risen quarter by quarter since the crisis (by the end of 2011 it stood at 13.7 percent), and owing to the fact that borrowers with non-performing loans could not file a claim for early repayment the NPL ratio increased by almost 3 percentage points until June 2012 according to MNB data.

Nevertheless, a significant share of borrowers benefitted from the laws detailed above, the majority of the indebted households were still struggling with the monthly payments. The following important ruling made in June 2014 was when the case of Árpád Kásler had been closed and the borrower won the case against one of the biggest banks in Hungary, OTP Bank. The case had been open since 2011 and the final decision had significant implications on the practice of unfair pricing, shifting all the exchange rate risk to borrowers and unilateral modification of contracts applied by banks during the past decade. Lenders had been applied the technique of granting the loan originally at a lower exchange rate (sell rate) and calculating the monthly payments at a higher rate (buy rate). The gap between the two was an additional premium for the bank, but according to the general ruling (16 June 2014) followed by Kásler's case, banks were not entitled to benefit from that extra margin since it was not transparent for the borrowers and no additional service was required from the banks that should have been rewarded (Curia of Hungary, 2014). Since November 2010, banks were forced by law to apply different exchange rates when crediting the account of the borrower and charging the borrower for monthly instalments. Either the MNB official rate or the bank's mid-market rate needed to be used for both (Bethlendi, 2015).

²¹ Most EUR-denominated loans were granted after 2008 and the exchange rate was higher than the threshold set by the Law. The ratio of JPY-denominated loans is minor within "Other" FX loans, thus the volume of those type of loans is marginal.

The Curia's decision gave clear guidelines on unfairness of unilateral changes that materialized in continuous rises of the interest paid on the mortgage loan; this part of the ruling was applicable to most of the mortgage loans. On top of that, some contracts had been either partially or fully terminated if borrowers were not informed adequately about the exchange rate risk when entering the loan agreement (Curia of Hungary, 2014). Due to these decisions, banks were obliged to calculate and inform each borrower to compensate for the additional costs retroactively. That was a further financial burden imposed on banks after the period of bank tax payment was extended.

As previously mentioned, the "Home Protection" package provided an aid to households whose monthly instalment had been rising since the crisis. However, that was only a temporary solution. Moreover, the NPAP was not an option for households with late payments. The NPL ratio among households was 18 percent in June 2014, according to MNB data. The government has introduced a series of legislative measures to clean banks' portfolio by eliminating all FX consumer loans (e.g. mortgage loans, financial lease contracts). The policy effective as of 1 February 2015 claimed to convert FX consumer loans at spot exchange rates on a specific date decided by the MNB. As before, to avoid market turmoil, the MNB conducted tenders to supply liquidity to banks (ECB, 2014). Due to the short window (starting from the adoption of the law in November 2014), I did not assess the impacts of the law, moreover the execution of this policy was not followed by extreme reactions of the markets even though both the law and the execution were rather rapid. Similar to the NPAP, no impact studies were conducted prior to the decision-making and Hungary did not ask for early consultation with ECB before adopting the law. Some papers, mostly concerning the timing and legal environment, have been published regarding that matter (Bethlendi, 2015; Kolozsi, Banai, & Vonnák, 2015).

II.III HOW TO HANDLE FOREIGN CURRENCY LOANS – OTHER CESEE COUNTRIES

Supervisory bodies, central banks, governments, IMF and ECB evaluated the potential negative consequences of high indebtedness of both households and corporations differently: due to the massive inflow of capital to CESEE countries, credit growth was seen as an unavoidable

component but generally there was little concern among experts who did not view rapid credit growth as a significant vulnerability (Bakker & Gulde, 2010). The Polish Financial Supervision Authority introduced "Recommendation S" in Poland in 2006 (which was later modified) to better inform customers, moreover, to first offer domestic currency loans to customers, raise risk awareness associated with foreign currency loans and require higher creditworthiness for loans offered to retail customers (Mucsi, Csortos, & Kóczián, 2015). Before the EU accession of Romania, the Romanian supervision authorities pursued to dampen credit growth, more strictly in foreign currencies by implementing a cap on debt service-to-income and on the bank's open FX position. Moreover, the authorities increased the reserve requirements on foreign currency liabilities. However, these measures were only temporary after Romania joined the EU. Also, the effectiveness of the latter policy is questionable since it rather triggered cross-border lending. Romania, Bulgaria and Croatia limited the availability/volume of foreign currency loans for a short period of time when they saw a great uptake of housing, consumer and current account loans denominated in foreign currencies²² (Steiner, 2012). This policy, similarly to other attempts that aimed to regulate lending, only inspired banks to come up with creative ways of fueling credit to CESEE countries: either loans appeared in the books of parent banks or the already existing loan portfolio was shifted to parent banks' books. Overall, based on historical data on FX loans provided to households prior to the crisis, the clear pattern is that despite of these regulatory measures EUR, CHF, JPY, USD loans remained popular and with these rather soft policy tools credit growth did not slow down (Figure 1).

After the first wave of the crisis and the sudden weakening of the Polish zloty (and also the Hungarian domestic currency) against the Swiss franc, euro denominated loans became more popular and new prudential measures were needed to reduce lending in foreign currency: Poland introduced caps on loan-to-value (LTV) and payment-to-income (PTI) ratios to disincentives foreign currency loans. The latter was included in "Recommendation T" published in 2010²³ along with advising banks to inform customers about the risk associated with FX loans. Other restrictions,

²² In Croatia and in Serbia kuna/dinar loans indexed to foreign currencies were widespread and from a statistical point of view these type of loans counted as domestic loans until 2010 in accordance with the national methodology. However, in Croatia the National Central Bank distinguished between kuna and FX loans in its statistics.

²³ In general max. ratio of 50%, borrowers with high income PTI up to 65%.

such as required higher creditworthiness of borrowers with FX loans and stricter PTI ratio for customers applying for FX loans, were included in the modification of "Recommendation S" (Mucsi et al., 2015; Steiner, 2012; World Bank, n.d.). From July 2011, there had been the possibility of repayment of FX loans by law without being charged additional fees related to repayment (Buszko & Krupa, 2015). Debt-to-income ratio threshold was also established for customers who would have borrowed in foreign currencies, furthermore banks were required to perform stress tests assuming a 30 percent depreciation of the local currency (Ratcliffe, 2014). In early 2014, a bailout of all customers with foreign currency loans did not seem feasible according to Ratcliffe (2014) since it would have been very costly and would have been unfair towards local currency borrowers since they did not benefit from the interest rate differential between zloty and CHF/EUR loans. Furthermore, due to the regulatory requirements prior to the crisis customers were well-informed about the risks of FX loans. The latter is supported by empirical data applied to eight Eastern and Southern European countries: household survey results conducted by Beckmann & Stix (2015) shows that households were indeed aware of the exchange rate risk and this knowledge and depreciation expectations of those households influenced their demand for foreign currency loans (had significantly lower demand).

One external factor, namely the ruling of cessation of the cap on EUR/CHF rate in January 2015, caused an unforeseen problem to households with CHF loans: the Swiss currency strengthened against all local currencies imposing an additional burden on the already suffering households in Poland, Croatia, Romania and Serbia. As mentioned before Hungary was not impacted by the decision of the SNB since the law that obliged banks to convert FX mortgage loans to HUF in November 2014. Poland has called on banks to reduce rates on CHF loans but in early 2015 policy makers refused to implement a Hungarian-type of loan conversion (Buckley, 2015). Due to the upcoming elections no drastic measure was taken during that year. As a result of the election in Poland, the right-wing, national-conservative party, Law and Justice (PIS) won (similar ideology as the ruling party in Hungary) and in January 2016, the newly elected president proposed a law to convert FX mortgages at a "fair" exchange rate that would be set individually²⁴. Neither

²⁴ One of the promises that the party made was to convert FX mortgage loans at historical rates.

the markets nor the banks welcomed the proposal. A few months before the draft law was published, an extra tax was levied on banks' assets that was already painful for the sector (Waldoch & Skolimowski, 2016)²⁵. According to KNF financial regulator, the costs of that legislation could reach 67bn PLN (16.17bn USD), which decreased the likelihood of making the proposal into law (Buckley, 2016). Other alternatives, such as applying a cap on instalments (that had been introduced in Hungary; would also impose some losses on banks) or extension of loans' due dates were also discussed but have not been implemented (Goclowski & Sobczak, 2016).

At large, in Poland, the NPL ratio did not show a high variance between 2009-2015 (the NPL ratio was between the range of 4.3 percent and 5.2 percent), which was due to the more prudent regulatory measures implemented prior to the crisis. The Baltic countries took the necessary policies to meet the criteria for the Eurozone accession, and households must have anticipated that either the central bank will not devalue/change the exchange rate regime or the adoption of the euro will happen in the near future since the volume of euro denominated loans was still increasing after 2008. Almost all CESEE countries experienced a rise in value of foreign currency loans – in countries with floating regimes (Croatia, Hungary, Poland, Romania and Serbia) it was mainly owing to the weakening of the domestic currencies against EUR and/or CHF.

As highlighted in the previous subsection, the timing of loan conversion is crucial in order to minimize the negative impacts and the reaction of the markets. One of the most important factor is the level of total reserves of the central bank. In Poland, the central bank's reserves had been increasing since 2009 in almost every year ("IMF Data - International Financial Statistics - At a Glance," 2016) and would have been sufficient to supply foreign currency (EUR and CHF) via tenders in order to avoid an extremely high demand for FX in the market and put a pressure on the domestic currency. Poland's central bank governor however was against the idea of loan conversion plan, he argued that the draft law could result in a banking crisis by imposing such a big burden on the sector²⁶.

²⁵ Note that Hungary also imposed such a tax on banks, though with a slightly higher rate.

²⁶ Note that central bank governor in Hungary was supporting the loan conversion and had assisted throughout the process.

Whereas conversion of CHF or FX housing loans had not been fully supported and implemented in Poland, the amendments to the Consumer Credit Act in Croatia, in a country that also faced elections in the same year as Poland did, made CHF loan conversion to euros or HRK linked to euros possible, regardless of the harsh opinion and severe warnings of ECB. The law imposed an exceptionally high burden on banks since the reference date (that was taken into account to define the exchange rate used for conversion and the interest rate on the converted loans) was set as the date of entry into the loan agreement and the full original principal amount was converted according to the entry exchange rate to recalculate the repayment schedule. Moreover, the law was applied retroactively, jeopardized the principle of legal security and forced lenders to accept the conditions if borrowers opted for the conversion (ECB, 2015b). After the legislation passed in the Croatian parliament, share prices of banks dropped significantly (Waldoch, Groendahl, & Kuzmanovic, 2015). Note that some of these foreign-owned banks are existent on the Hungarian market and had already realized substantial losses due to the introduced measures in Hungary.

Even if the original aim was to help out households that had been suffering from the strengthening of the Swiss franc (mostly after the cap had been abandoned), this type of easing was clearly disproportionate due to the unnecessary hefty losses caused to the banking sector and by letting borrowers benefit from the low interest rates and less volatile exchange rate in the beginning without bearing any risk or potential negative consequences of an open position. As the Foreign Minister of Croatia said, after the first lawsuit against Croatia had been filed, concerning the law on CHF loan conversion the law was "populist and insufficiently thought out" that triggered a strong reaction from mostly foreign-owned banks that were impacted by the decision (Croatian News Agency (HINA), 2016). Previous to the lawsuit, both ECB and the European Commission warned and asked to rethink the adopted law due to the retroactivity feature that might not comply with the Croatian legal principles and with EU regulations, and to prepare for the severe negative consequences of the law (Ilic, 2016). Prior to the conversion law, some CHF loans had been converted to local currencies with fixed interest rates in 2013 due to not transparent and unfair banking behavior: in some cases, banks increased interest rates without any rational reason, which resulted in higher monthly instalments and the conditions of CHF loans were unacceptable

according to the opinion of the Commercial court²⁷ (Buszko & Krupa, 2015; Radosavljevic, 2013; Vukic, 2013). This behavior from banks is very similar to what was seen in Hungary (as detailed in Section II.II.). When the CHF cap was abandoned in January 2015, the Croatian government decided to introduced a CHF/HRK peg for loans (6.39 HRK/CHF) for one year to avoid further negative effects of a strong Swiss currency (Financial Times, 2015). After the crisis, non-performing loans had been increased year by year and in 2014 it reached a level of 16.7 percent (vs. 4.9 percent in 2008).

The regulatory authority in Serbia mostly mirrored the Romanian policies by maximizing the debt service-to-income ratio and setting a lower rate for foreign currency loans and capping the banks' open foreign currency positions but it also obliged banks to evaluate and manage risk based on given guidelines (also in line with Basel II), e.g. different weights per item based on the riskiness of the asset in the bank's portfolio (Chailloux, Ohnsorge, & Vavra, 2010). As mentioned in Serbia (and in Croatia) domestic currency loans indexed to foreign currencies became popular. In 2010 more than 70 percent of banking assets and liabilities were denominated in foreign currencies (mainly in euros) or indexed to it. This phenomenon is quite exceptional but it is rooted in the fear of inflation, and in practice euro (previously Deutschmarks) has been used in bigger transactions. Markovic (2010) highlights the vulnerability of the financial system in such setting and urges a deeuroization (or dinarization) instead to lessen the exchange rate risk and prevent future crises.

The government (with the help of the central bank) could have incentivized dinarization by issuing government securities denominated in domestic currencies but instead it increased the ratio of euro-denominated securities by issuing euro bonds in 2011 (Ostojic & Mastilo, 2013). To serve the purpose of dinarization, NBS loosened terms and conditions on dinar denominated loans in November 2013 (Daskalovic, 2013). However, this act was not followed by a significant increase of dinar loans ²⁸.

²⁷ Banks offered CHF loans with variable interest rates and loan principal before the crisis even though those contracts were usually signed for long-term and hence the exposure to exchange risk was higher.

²⁸ The key policy rate was 8% in November 2013, which is relatively high, but a further cut would have threatened the inflation target and the dinar exchange rate.

The transmission mechanism of the independent monetary policy is relatively weak since the interest rates of FX loans and deposits are dependent on ECB (or the Swiss National Bank) and the National Bank of Serbia (NBS) has had little impact on the exchange rate resulting in a weaker domestic currency. The lack of hedging instruments worsened the situation, however, the currency mismatch per se is non-existent due to the high degree of euroization of deposits. Nevertheless, as seen in other countries, due to the continuous depreciation of the local currency, borrowers faced more difficulties in meeting monthly instalment payments, and the NPL ratio reached 22.8 percent in 2015 (from 11.3 percent in 2008) after the SNB abandoned its currency cap in January 2015. A year before the decision of SNB, the further depreciation of the dinar was dampened temporarily since the NBS shorted 1.9 billion euros and its reserves dropped below 10 billion euros, which left even less space for the central bank to intervene (Filipovic, 2015b). Even though CHF loans were not as widespread as in Poland or in Hungary ca. 29 percent of housing loans were denominated in Swiss francs. All households with CHF loans were severely hit by the exchange rate movements. However, the government had even less options to ease the burden of distressed borrowers since the government agreed on a fiscal consolidation plan with IMF (3-year loan program) that restricted any kind of drastic intervention. In order to meet the criteria in the plan and to be eligible for the IMF loan, the government cut wages by 10 percent, which caused even more problems to households (Filipovic, 2015a).

In February 2015, the NBS made a similar decision that was seen in Croatia: banks unilaterally increased the "variable indefinable elements of the interest rate", hence banks were obliged to treat the amount overcharged as early loan repayment. More importantly, they forced banks to offer borrowers a CHF loan conversion; banks could opt for a solution out of four options: either by converting loans to EUR-indexed loans, either with a 5 percent favorable exchange rate or with 1 percentage points lower interest rate, or by keeping the CHF-indexed loan but with either 1 percentage points lower interest rate or reducing the monthly instalments by 20 percent which will only be postponed and needed to be paid back at a later point²⁹ (NBS, 2015). This decision did

²⁹ First three options allowed to extend the loan repayment term by max. 5 years.

not impose an extraordinarily big burden on banks that would have threatened the profitability of the banking sector to a large extent.

The verdict was obligatory *au contraire* to the recommendation published in May 2013 that suggested banks to allow/offer households to repay future payments at a EUR/CHF rate that was originally applied minus max. 8 percent over three years. Certainly, due to the voluntary feature of the decision, this option was not commonly exercised (NBS, 2013).

Besides the preventive measures taken prior to the crisis in Romania, the first generally applied rule that had an impact on foreign currency lending was the tightening of FX lending in October 2011. It increased the down payment for all type of mortgages but required a 25 percent higher down payment for non-euro but foreign currency denominated loans to balance out the potential inability of repayment due to higher volatility of CHF/RON³⁰ (Timu & Savu, 2011). Even that time, bad loans accounted for 14.3 percent (in 2008 the NPL ratio was 2.7 percent), which foreshadowed that the situation of households (and the whole private sector) might worsen and new policies will be needed to be made. As implied some unique actions had been taken even beforehand, but those were individually decided in court.

In the fall of 2014, a few commercial banks either agreed to or were forced by the decision of the court to convert some loans granted in CHF to Romanian leu by applying the exchange rate valid when the loan agreements started³¹ (BURSA, 2014). However, partially due to the fear of a potential collapse of the banking system, no universal law was made. The reaction to the abandonment of the currency ceiling by the Swiss National Bank was to start a debate about the possible treatments to help out distressed CHF loan borrowers. The National Bank of Romania (NBR) took a *laissez-faire* approach and recommended to "let things settle down". The central bank argued that a loan conversion would cause a huge loss to banks, and would need "substantial capital infusion", since banks' solvency ratio would fall to very low level. The conversion of all foreign currency loans or a temporary cut on the interest rate on Swiss franc loans was discussed in the parliament during the first half of 2015 (Timu, 2015). Specifically, a draft law in March 2015

³⁰ Household debt is mostly denominated in RON and EUR but among non-performing loans CHF-denominated loans accounted for a proportionally higher share due to the relatively larger depreciation of RON against CHF (vs. EUR).

³¹ This was minor compared to the total value of loans.

stated that the customer would receive a 15 percent discount on the final value, whereby the state would give a financial guarantee for 50 percent of the sum (Stroe, 2015). The timing of the debate was appropriate since the key policy rate stood at a historically low level and inflation was relatively low as well, meaning that these sufficient and necessary criteria were met to discuss a potential loan conversion. In practice, the individual agreements between customers and banks continued instead (OTP Bank, 2016), and according to NBR these bilateral solutions were preferred since they did not impose a high risk of bankruptcy on the banking sector. As claimed in the Financial Stability Report in 2015, about one-third of total Swiss franc loans were successfully renegotiated, out of that, about two-third were converted into RON-denominated loans and the rest got restructured (National Bank of Romania, 2016). Several versions of the draft law on loan conversion had been under parliamentary debate but no final decision was made until October 2016. Just recently, lawmakers in the Romanian parliament opted for a loan conversion of CHFdenominated loans at below-market rates (originally the proposal covered all FX-denominated lending). The governor of NBR was not supportive of such a law due to its potential impact on the country's macroeconomic stability (Vilcu & Timu, 2016). The law could have entered into force in December 2016 but it was not promulgated by the president, also the law is under review by the Constitutional Court (Bernovici, 2016).

Due to the characteristics of the unchanged exchange rate regime in the Baltics and in Bulgaria, the monthly payments on loans had not been impacted by the strengthening of foreign currencies. Moreover, since once Estonia (2011), then Latvia (2014) and afterwards Lithuania (2015) joined the Eurozone the euro denominated loans accounted as domestic currency loans, as consequence households' positions became fully hedged, assessed risk in banks' portfolio got lowered due to a lower risk weight of domestic currency loans and low interest rates (reference rate being EURIBOR) had a favorable impact on households' instalments (if variable interest rate was applied).

As described above CESEE countries adopted vastly different techniques to dampen the negative effects of materialized exchange risk that increased the monthly payments of FX loans for households. In most countries, the implementation of laws was more drastic than what was recommended by EU institutions. Usually EU institutions (e.g. ECB, ESRB, etc.) suggested softer

measures to limit exposures, assess and monitor credit and systemic risk besides controlling foreign currency lending (ESRB, 2011). In general, however, specific recommendations or guidelines with direct impact on micro-level were not enhanced, these institutions took a more cautious and critical approach (addressed in opinions of ECB) to avoid short-term turmoil in the respective countries (ECB, 2011, 2014, 2015a, 2015b).

III. HYPOTHESIS

A housing net worth shock due to a decline in house prices, that started in 2008Q3, hits low net-worth households the hardest since they have higher debt burdens, and as A. Mian & Sufi, (2015) explains due to the leverage multiplier even a relatively small decline in house prices can lead to extreme drop in home owner's equity, hence a significant drop in net worth of indebted household. As mentioned in Section II.II the total value of mortgage loans (in HUF) among households was reduced by 24 percent in the NPAP, meaning that most households were not eligible for participating in the program. Moreover, due to their debt burden they were still more exposed to the consequences on their net worth due to the decline in house prices that continued until 2014. Additionally, as part of the "Home Protection" package the moratorium on evictions was abolished it naturally put some negative pressure on house prices. Moreover, due to the weakening of the domestic currency, which might have happened as a response to the unprecedented legislation, the HUF-value of loans increased and with the drop in house prices debtors realized higher LTV ratios. Hence, households that were not eligible for early repayment might have experienced an enhanced decline in property prices and higher monthly instalment due to the Law, therefore a further drop in their housing net worth resulting in lower consumption levels.

As already mentioned empirical evidence supports the argument that indebted and less wealthy households have higher MPC (A. R. Mian et al., 2013). The Law resulted in a vastly unequal distribution of wealth shock, as beneficiaries of the policy were households who either accumulated some savings over the years to repay the whole amount or were creditworthy to be

eligible for a bridge loan offered by banks. In other words, these were more affluent households. Their consumption of durable goods might have increased after the legislation due to the debt relief, since the difference between spot and applied capped exchange can be reckoned as a gain in net housing wealth. Additionally, after the debt had been repaid, these households were not as exposed to house price declines as before (when they had more debt). Moreover, they could have perceived the policy as an indirect aid from the government by writing down a significant share of the debt service burden, hence leading to an increase in their net worth. However, wealthier households could have also decided to cut spending if they perceived the legislation as a significant one-off, even though the net wealth is unaffected by that. Either both sides of the households' balance sheet are reduced by the same amount (mortgage is eliminated and is financed by savings) or the mortgage debt increases and decreases by the same amount due to a bridge loan to finance the repayment of the FX loan. Here, the assumption is that the conditions on the new loan are approximately the same.

The magnitude of these forces combined can be tested in Hungary as a result of the adoption of the Law, and I will test whether the Law had a significant impact on durable consumption and house prices, moreover, by modeling the path of both house prices and durable consumption I will calculate the marginal propensity to consume out of housing wealth over the post-intervention period. To the best of my knowledge there has not been any report published on an estimate of MPC out of housing wealth over the examined period.

By allowing early repayment at fixed, below-market exchange rates the Law may have had other impacts on the macro economy. The potential negative effects were detailed in Section II.II, thus to assess the validity of those concerns I employed the Synthetic Control Method to see whether the exchange rate or two GDP indicators were impacted to a significant extent due to the policy implemented. A rapid shock on exchange rates is expected but the question is whether the impact was large in magnitude and whether the Law had any impact on the exchange rate in midterm. Additionally, the SCM applied on GDP deflator and real GDP tests the hypothesis whether the impact of the Law was large enough to have a significant effect on the real economy.

I would anticipate that countries that contribute with positive and significant weights to the synthetic Hungary are the ones that share similar characteristics with Hungary. Hence, from the

first set of the donor pool countries with floating regimes, which are in fact geographically closer to Hungary than for instance the two Baltic countries. When extending the donor pool with three Scandinavian countries and the Czech Republic the intuition is that the latter would have significant weights in the synthetic unit. I would expect that further extension of the control units would not lead to significant change in the construction of the synthetic unit, however, arguably the two neighboring countries, namely Slovakia or Slovenia, or Estonia (that joined the EU in 2004) could help to reproduce the trajectory of the outcome variable during the pre-treatment period.

IV. LITERATURE REVIEW

The extended research in the field of mortgage loans in Europe has focused mostly on identifying the determinants of financial dollarization among households³². Most of the published papers rely on regression analysis by using time series or panel data until the beginning of the recession. In some countries, foreign currency loans increased gradually, while in others exponentially in the early 2000s, and results of both country-specific and region-specific researches (e.g. CESEE) have been published after the financial crisis. The impact on post socialist countries' economies (that are usually small, open economies), via the commercial banks with foreign ownerships that were represented on the global markets, was significant due to their dependence on external agents (both trading countries and corporations).

Borrowing/lending in foreign currencies is not a new phenomenon, which is not necessarily a problem per se but when financial markets are incomplete domestic investments will have currency mismatch and/or maturity mismatch. This is what Eichengreen & Hausmann (1999) calls "original sin". In CESEE countries households had some savings in foreign currencies ³³,

³² For further reference in this topic see Backé, Égert, & Walko (2007), Yesin (2013), Bakker & Gulde (2010), Ranciere et al. (2010), Brzoza-Brzezina, Chmielewski, & Niedźwiedzińska (2010), Dietrich, Knedlik, & Lindner (2011), Basso, Calvo-Gonzalez, & Jurgilas (2007), Haiss & Rainer (2012), Rosenberg & Tirpák (2009), Steiner (2012), Csajbók, Hudecz, & Tamási (2010) and Barrell, Davis, Fic, & Orazgani (2009).

³³ In the socialist era households used USD or DMK parallel to domestic currencies to export/import goods to/from Western countries, also earnings from tourism was denominated in those currencies (Bod, 2012).

consequently, they were able to hedge their foreign currency denominated loans to some extent. In other words, currency mismatch somewhat existed – however, such hedge was not possible in Swiss franc denominated loans (due to lack of income in CHF). CHF loans became vastly popular in Hungary and in Poland. In Hungary, CHF mortgage loans accounted for 2 percent of the total amount of loans (in value) in 2004 among households, and both the value and volume growth accelerated after 2004 reaching 52 percent share in 2008Q3 according to MNB data³⁴. Total mortgage loans in value doubled between 2004Q2 and 2008Q3, and the share of growth of CHF loans was 103 percent, whilst HUF-denominated housing loans decreased by 4 percent between that period. Magud (2010) argues that in an artificial model setting open economies, that are indebted in foreign currency, should opt for a floating exchange rate regime, whilst if economies are relatively closed a fixed exchange rate regime is preferable. According to Chang & Velasco (2006) both fixed and floating exchange rate regimes can occur as an equilibrium outcome, when households of a small economy choose between domestic currency and foreign currency denominated debt. What matters is the expectation of households regarding exchange rate regime, and the exchange rate regime is to be decided by the central bank. Intuitively, the expectation is indeed a key factor that influences the decision on a type of loan. However, when Hungarian households signed a loan agreement, it is very unlikely that they anticipated an option of repayment on below-market exchange rates.

Indisputably, after the financial crisis, Hungary was the first country in the CESEE region that took unorthodox legislative measures to ease the burden of distressed households. Prior to the rapidly adopted law on early repayment in September 2011, no impact studies were published by the government or any of the research institutions in Hungary, furthermore only descriptive papers exist on the results of the implemented policy that detail e.g. value of loans repaid, source of refinancing, trends in lending, changes in banks' profitability ratios due to realized losses linked to NPAP, asset distribution based on different characteristics (maturity, currency denomination, delay in payment). These are direct and straightforward outcomes of the policy (Holmár, 2012; Hudecz, 2012; MNB, 2011, 2012). However, these papers lack the assessment of the impact of the

³⁴ The MNB does not distinguish between CHF and JPY-denominated loans in its dataset but the vast majority of those loans were CHF-denominated.

legislation on indirect macroeconomic indicators such as durable consumption, property prices, risk premium, exchange rate and GDP. Some research has been done on alternative solutions to handle foreign currency lending (Berlinger & Walter, 2013).

Indebted households' arising problems materializing in the decline of house prices (and consequently decline in the home owner's equity), drop in household expenditures, the increasing debt burdens and the orthodox or sometimes unorthodox policies aiming to solve the debt crisis are not unique phenomena in some CESEE countries. As a matter of fact, the extended research done by A. Mian & Sufi (2015) show that the root cause of the financial crisis in the US is the rise of household debt³⁵ that led to a shortfall in household spending (levered losses view), *au contraire* to the most widespread narrative (banking view), that claims that the economic malaise was due to the breakdown in the banking system (starting with the bankruptcy of Lehman Brothers). The authors prove that states/zip codes where the rise of household debt was larger and house prices fell faster, those states experienced bigger decline in spending and bigger rise in unemployment. Since households' net wealth decreased, they cut back on their expenses, which generated a spillover effect on other sectors, e.g. manufacturing and banking. Sales of businesses dropped, hence demand for credit slumped. Mian and Sufi argue that this demand driven approach should have been recognized and taken into account when policy makers decided to help out almost exclusively the important agents in the financial sector in the aftermath of the recession.

According to their research A. R. Mian et al. (2013), underwater homeowners have a higher marginal propensity to consume (MPC) than the average or median MPC across zip codes in the US (\$0.12 vs. \$0.05-\$0.07). That is a key finding since based on this empirical evidence they criticize and reject Geithner's reasoning why the government did not help out indebted households by reducing a substantial amount of mortgage principal³⁶. As a consequence, Mian and Sufi would have directed funds towards underwater homeowners and boost the economic activity by via that channel (however, they do not question the necessity of complimentary actions, e.g. stabilization

³⁵ Regarding the denominated currency of mortgage loans there is a big difference between the Hungarian and the US outstanding loans since in the US the exchange rate and the associated risk did not play any role neither as an incentive in the beginning nor as a cause of distressed mortgages.

³⁶ Geithner assumed an MPC of \$0.02 (A. Mian & Sufi, 2014), which is not supported by empirical evidence (Bostic, Gabriel, & Painter, 2009).

of the financial system, especially when the crisis hit). Such a policy would have been realized in write-downs of mortgage debt.

The notion of cram-down remained as a hypothetical response to the recent financial crisis, the former director of President Barack Obama's National Economic Council (in 2009 and 2010) was not completely fond of this approach: he argued that spending gains from mortgage debt relief might have been exceeded by the spending losses from sucking ca. trillion dollars out of the banking system, due to debt forgiveness the flow of future lending could have been inhibited (at worst car loans and credit card debt would have been affected as well) and it would have solved the problem only temporarily (Summers, 2014). He also highlighted the regulatory and time constraints of implementing such a policy. Despite of the strong case that A. Mian & Sufi (2015) made in their book, such a legislation had not been signed into law in the US. Nevertheless, either the Federal Government or particularly some states aided distressed borrowers in the form of incentivizing debt renegotiations and imposing foreclosure moratoriums (e.g. in California). These measures have been implemented in response to the foreclosure crisis: Agarwal et al., (2012) used regression analysis, specifically difference-in-difference method, on micro level data to investigate the effect of the Home Affordable Modification Program that provided intermediaries financial incentives to facilitate contract renegotiations. Synthetic Control Methodology was applied in the paper of Gabriel, Iacoviello, & Lutz (2016) to evaluate the impact of the California Foreclosure Prevention Laws.

A more drastic approach however, was not introduced in the US. That is why the Hungarian case is so unique since policy makers in Hungary, as detailed in Section II.II, were not afraid of imposing a burden on the banking sector and anticipated a higher benefit than loss on an aggregate level due to adopting laws on a relief scheme for distressed borrowers in foreign currency in two steps (2011: fixing the exchange rate for repayment of foreign currency loans, 2015: conversion of foreign exchange loans to domestic currency denominated loans). The law adopted in the fall of 2011 could be interpreted as a certain debt forgiveness, since the exchange rate that was used to repay the outstanding foreign currency debt was substantially lower than the spot rate and by law, the creditors were obliged to bear the occurring losses. Wealthier, more creditworthy households that either had sufficient savings or could reapply for a HUF-denominated loan to bridge the gap

were more likely to be eligible for filing a claim for early repayment, hence the Law created an unequal distribution of wealth shock among households. The disputes and results were described in Section II.II. Due to the applicable below-market exchange rates, households gained a substantial amount (regardless of the source of financing the repayment) when taking future monthly instalments into account – this potential impact was more articulated by the government than the potential negative effects on poorer households. Thus, the impact of the policy can serve as a natural experiment for computing MPC during the post-intervention period.

V. METHODOLOGY – SYNTHETIC CONTROL

To investigate the impact of the law in relation to protect homes and reduce the debt service burden of households with foreign currency denominated mortgage loans I applied the Synthetic Control Method (SCM) developed by Abadie & Gardeazabal (2003) and extended in Abadie, Diamond, & Hainmueller (2010). The SCM implements a data-driven control-group selection procedure for comparative case studies, thus it approximates the causal effect of a policy announcement in the country ('treated unit') affected by the intervention. A weighted average of potential control units is used to construct a synthetic control unit to approximate the most relevant characteristics of the treated unit. This methodology gives the advantage of generalizing the commonly applied difference-in-differences method by accounting for time-varying unobservable confounding factors.

In my country-level analysis I applied SCM to construct a "Synthetic Hungary" from a linear combination of different sets of control countries that best approximates the most relevant characteristics (e.g. outcome predictors and pre-intervention outcomes) of the treated country during the pre-treatment period. After the policy has been implemented ('post-intervention period') the application of the SCM models the path of "Synthetic Hungary" that represents the counterfactual situation of the treated unit in absence of the policy intervention. The causal impact of the policy is quantified by comparing the post-intervention outcomes of the treated unit, in other words the actual outcome data of Hungary, to its synthetic counterpart.

Formally, there are j = 1, ..., J + 1 countries observed for t = 1, ..., T time periods. Without loss of generality assume that only the first unit is exposed to the treatment so there are I control units (j = 2, ..., J + 1) that will be used to construct the synthetic control unit, also called as "donor pool". In this case I used four sets of control groups (the first donor pool consists of seven countries, the second consists of eleven, the third consists of nineteen and the fourth consists of twenty-five countries³⁷). The intervention or treatment is when the Law on early repayment of total amount payable of foreign currency denominated mortgage loans entered into force allowing borrowers to repay the amount at specified, below-market exchange rates. Suppose that the intervention occurred at time $T_0 + 1$ so that $t = 1, ..., T_0$ are the pre-intervention periods and t = $T_0 + 1, ..., T$ are the post-intervention periods. Two potentials outcomes are defined: Y_{it}^N refers to the outcome of unit i at time t if unit i had not been exposed to the treatment while Y_{it}^{I} refers to the outcome of unit *i* at time *t* if unit *i* had received the treatment. The casual impact of the treatment is the difference between the two potential outcomes $\alpha_{1t} = Y_{1t}^I - Y_{1t}^N$ for periods $t = T_0 + 1, ..., T$. Note that the Y_{1t}^{I} is observed $(Y_{1t}^{I} = Y_{1t})$, whilst Y_{1t}^{N} is unobserved during the post-intervention period. Therefore, the goal is to estimate the missing potential outcome with SCM to calculate $\alpha_{1t} = Y_{1t} - Y_{1t}^N.$

The SCM is developed so that the synthetic control unit resembles the treated unit in all given pre-intervention characteristics. Following (Abadie et al., 2010) suppose that Y_{1t}^N is given by the following factor model:

$$Y_{it}^{N} = \delta_{t} + \theta_{t} \mathbf{Z}_{i} + \lambda_{t} \mu_{i} + \varepsilon_{it}, \ (i = 1, \dots, J+1)$$

where δ_t is an unknown common factor and the rest of the equations is an idiosyncratic component where θ_t is a $(1 \times r)$ vector of unknown parameters, \mathbf{Z}_i is a $(r \times 1)$ vector of observed covariates that can be time-varying or time-invariant and are not affected by the treatment, in my case it consists of the pre-treatment outcome variable and the pre-treatment predictor variables, λ_t is a $(1 \times F)$ vector of unknown common factors, μ_i is an $(F \times 1)$ vector of unknown factor loadings (time-varying), and ε_{it} are unobserved transitory shocks with zero mean. Since in this

³⁷ The rationale behind the different donor pools will be discussed in Section VI.
factor model there is no restriction imposed on λ_t that it has to be constant for all *t*, the model allows the effects of confounding unobserved characteristics to vary with time. With well-defined synthetic control an unbiased estimator of Y_{1t}^N can be found³⁸.

Define a $(J \times 1)$ vector of weights $W = (\omega_2, ..., \omega_{J+1})'$ such that $\omega_j \ge 0$ for j = 2, ..., J + 1 and $\omega_2 + ... + \omega_{J+1} = 1$. Each component of W represents the assigned weight of the respective control unit and according to Abadie et al. (2010) the goal is to find the optimal weighted average of control units, W^* , so that the synthetic control unit best approximates the treated unit with regard to the outcome predictors \mathbf{Z}_i and M linear combinations of pre-intervention outcomes $\overline{Y}_i^{K_1}, ..., \overline{Y}_i^{K_M}$, where $\overline{Y}_i^K = \sum_{s=1}^{T_0} k_s Y_{is}$ and K is a $(T_0 \times 1)$ vector $K = (k_1, ..., k_{T_0})'$. The latter can be used to control for unknown common factors that vary over time (which gives an advantage compared to difference-in-differences method). By selecting W^* so that

$$\sum_{j=2}^{J+1} \omega_j^* \bar{Y}_i^{K_1} = \bar{Y}_1^{K_1} \dots \sum_{j=2}^{J+1} \omega_j^* \bar{Y}_i^{K_M} = \bar{Y}_1^{K_M}$$
(1)

and

$$\sum_{j=2}^{J+1} \omega_j^* \mathbf{Z}_j = \mathbf{Z}_1, \tag{2}$$

then $\hat{\alpha}_{1t} = Y_{1t} - \sum_{j=2}^{J+1} \omega_j^* Y_{jt}$ is an unbiased estimator for α_{1t} in periods $T_0 + 1, ..., T$. Practically, there is no set of weights that would satisfy equations (1) and (2) so a more practical approach was suggested by Abadie, Diamond, & Hainmueller (2011).

Following Abadie et al. (2010, 2011) the discrepancy between the synthetic control unit and the treated unit is minimized with an optimization algorithm. By defining a $(k \times 1)$ matrix $X_1 = (U'_1, \overline{Y}_1^{K_1}, ..., \overline{Y}_1^{K_M})'$, that captures the characteristics of the exposed unit, and a $(k \times J)$ matrix, that *j*-th row is $X_0 = (U'_j, \overline{Y}_j^{K_1}, ..., \overline{Y}_j^{K_M})'$ capturing the same characteristics of the donor pool, the distance between X_1 and X_0W , $||X_1 - X_0W||$, needs to be minimized by choosing the optimal vector W^* subject to the weight constraints. Formally, the following equation is minimized and solved for W^* :

³⁸ For further assumptions and proof see Abadie, Diamond, & Hainmueller (2010).

$$||X_1 - X_0W||_V = \sqrt{(X_1 - X_0W)'V(X_1 - X_0W)}$$

where V is defined as a $(k \times k)$ positive semi-definite matrix and the optimization algorithm chooses V such that the mean squared prediction error (MSPE) of the synthetic control estimator (the expectation of $(Y_1 - Y_0 W^*)(Y_1 - Y_0 W^*)$) is minimized over the pre-intervention period.

Inferential techniques within the synthetic control method is possible, although relatively limited due to the small number of observations in the donor pool and the relatively short time span covered by the sample. To make inference the so-called placebo tests were suggested by Abadie & Gardeazabal (2003). The technique is similar to permutation tests where a test statistic is iteratively calculated under random permutations to determine whether the unit is in the treatment or the control group (Abadie et al., 2011). The notion behind these tests is to assess the rarity and the magnitude of the intervention on the treated country, which is quantifiable by comparing the impact on the treated unit to the effect estimated for control units. The latter effect is computed by iteratively applying the SCM to control units that were not exposed to the treatment or by randomly reassigning the intervention date. In my case I conducted placebo tests by applying SCM to all countries represented in the donor pool, however I excluded countries with a poor fit for the pre-treatment period.

VI. DATA AND SAMPLE

In this section I describe the dataset that is used for the Synthetic Control Method. I have approached the Hungarian Central Statistical Office and the Hungarian Central Bank to obtain micro-level data since such dataset is not publicly available. Unfortunately, I did not receive household-level data from these institutions, as a consequence I rely on aggregate data that is used to identify the casual impact of the Law introduced in September 2011.

As a starting point four different sets of control unit groups are used in the analyses³⁹:

³⁹ The list of the countries in each control unit groups can be found in Table 4 Appendix B.

- Control Group 1 (CG1) consists of countries which had not joined the euro area until the end of the pre-treatment period and their households had a relatively large amount of outstanding foreign exchange denominated loans. In Estonia, households accumulated a substantial amount of outstanding foreign currency debt (mostly in euros), but due to the prudent fiscal policy prior to the accession to the euro zone (the country joined the euro zone in January 2011), it is excluded from CG1 (the law was adopted by Hungarian government 26 September 2011 and entered into force on 29 September 2011). As detailed in Section II.III, none of the CESEE countries had implemented such an unorthodox policy until the end of 2013, which makes them valid members of the control group. In total, seven countries are included.
- Control Group 2 (CG2) consists of countries (in addition to CG1 countries), which had not joined the euro area until the end of the pre-treatment period. Durable consumption data for many countries was missing from the Eurostat database, hence those countries are discarded from the donor pool. GDP deflator from IFS was not available for the United Kingdom. In total, eleven countries are included.
- Control Group 3 (CG3) consists of countries (in addition to CG2 countries) that have adopted the euro already prior to the end date of the pre-treatment period. For many countries, GDP deflator from IFS was missing, hence, they are not included in the sample. In total, nineteen countries are included.
- Control Group 4 (CG4) consists of countries globally (in addition to CG3 countries) that have sufficient data for the relevant variables over the examined period. Most of the countries were excluded due to either lack of property price data obtained from BIS or lack of durable consumption data from OECD or missing GDP deflator data from IFS. In total, twenty-five countries are included.

For each country the aggregate level data includes *durable consumption index* (2004Q1=100), *real GDP index* (2010=100), *GDP deflator index* (2010=100), *stock exchange index* (2010=100) and *exchange rate index* (EUR/domestic currency; 2010=100), *total amount of*

housing loans (2008Q3=100; in domestic currencies) for CG1 and for other the donor pools it is replaced by *domestic credit to private sector* (percent of GDP), *property prices index* (2010=100), *CPI index* (2010=100), *durable consumption growth prior to the crisis ("boom")* (growth from 2004Q1 to 2008Q3), *durable consumption growth after the crisis ("bust")* (growth from 2008Q3 to 2011Q2), *political stability indicator*, *1-year CDS premium* (in EUR), *3-month interbank rate* (2010=100), *control of corruption* and *IIP – other investments assets* (USD). For the outcome variables I use quarterly data and the SCM is applied on *durable consumption index, property prices index, exchange rate index, GDP deflator index* and *real GDP index*. Details on data sources, data frequency, data availability and length of period employed (both for optimization and as a predictor variable) are summarized in Table 3 in Appendix B.

Due to different data availability, the length of the pre-treatment period differs from one outcome variable to another. The policy was implemented in September 2011 (2011Q3), and following the logic outlined in Section V, 2011Q3 is the beginning the post-intervention period, which means that the pre-treatment period ends in 2011Q2. Due to the fact that I have quarterly observations, and that it is more likely that the impact of the Law is measureable rather in the short-or mid-term moreover, moreover, that some of the CESEE countries acted more actively to ease the burden of households after 2014, the post-intervention period ends in 2013Q4. In Section VII, when the results of the SCMs are described, the applied variables are listed for each analysis. The use of indices allows me to compare the estimates across countries (when placebo studies are applied), hence, the raw data extracted from different databases was converted to indices, when needed. The data was relatively fragmented, also to include as many countries as possible in the pre-defined set of control groups, the periods used for calculating and fitting the mean of predictor variables were adjusted to data availability.

By using four set of donor pools, the robustness of the results is tested but as it is mentioned in Section VIII, by changing some of the predictor variables, the robustness of the results is checked additionally. In most cases the mean of the selected predictor variables is included in the optimization algorithm, except for *other investment assets* when standard deviation is calculated over the defined period. Furthermore, *durable consumption growth during boom and bust period* are added as one value each, that needs to be taken into account in the optimization algorithm.

VII. RESULTS

In the following subsections I reveal the results of the analyses that were conducted with the SCM to estimate the impact of the legislation announced in September 2011 in Hungary that allowed borrowers to repay the total amount payable of foreign currency denominated mortgage loans at a fixed, below-market exchange rate. The SCM was employed to estimate the effect of the Law on several outcome variables such as durable consumption (index), property price index, exchange rate index and real GDP index. As detailed in the previous section four sets of control groups were used in the analyses. Hungary represents the treated country and as defined in Section VI control group 1 (CG1) consists of Bulgaria, Croatia, Latvia, Lithuania, Poland, Romania and Serbia, control group 2 (CG2) is constructed such that it includes members of CG1 and the Czech Republic, Denmark, Norway and Sweden, control group 3 (CG3) covers members of CG2 and Belgium, Cyprus, Estonia, Finland, Greece, Malta, Slovenia and Slovakia, while control group 4 (CG4) comprises Chile, Israel, Japan, Korea, Mexico and USA in addition to CG3⁴⁰.

In each subsection I list all the relevant outcome and predictor variables, more details on sources, data frequency and length of period employed can be found in Table 3 Appendix B. The numerical and graphical representation of the results follow the same logic for all outcome variables and are displayed in the Appendix. Namely, the weights of each control unit in the Synthetic Hungary and the means of covariates and outcome variables are summarized in tables including root mean squared prediction errors (RMSPE) that quantifies the pre-treatment fit of each outcome variable. As a starting point a good fit is crucial, as if the synthetic Hungary fails to match the examined outcome variable during the pre-treatment period then the estimations after the policy are not valid and the gaps cannot be explained due to the impact of the Law.

Unless specifically mentioned, the mean of the selected predictor variables is included in the optimization algorithm. Placebo tests employed are detailed in Section VIII.

⁴⁰ Donor pools are constructed as listed except for the case when property price index is the outcome variable, in that case Romania is excluded from the sample due to lack of data.

At large, the path of the different outcome variables prior to the adoption of the Law is best reproduced by Poland and the Czech Republic, also in most cases Romania, Serbia or Croatia have significant weights in the synthetic Hungary. These results are reasonable since the listed countries were at a similar stage of economic development, also they all have floating currencies, and due to that fact these economies might be exposed to similar non-country specific shocks.

VII.I SCM – DURABLE CONSUMPTION

As mentioned in Section II.II the government aspired to fulfil its promise to provide aid to distressed borrowers and expected an increase in personal consumption due to the early repayment from which creditworthy borrowers would have benefitted due to the below-market repayment scheme. The Law adopted in September 2011 can be viewed as a debt relief since the fixed exchange rate used for repayment was substantially lower than the spot rate. Hence, it could have impacted households' consumption. Particularly, durable consumption is a relevant indicator to capture certain effects in a housing market framework (A. R. Mian & Sufi, 2009; A. Mian & Sufi, 2015). In this subsection the outcome variable is *durable consumption index* (2004Q1=100) from Eurostat for CG1, CG2 and CG3, whilst for CG4 it is from OECD. The pre-treatment predictors include durable consumption index (2004Q1=100), GDP deflator index (2010=100), stock exchange index (2010=100) and exchange rate index (EUR/domestic currency; 2010=100). The pre-treatment period ranges from 2004Q1 to 2011Q2 since the Law was announced and entered into force in 2011Q3. Special predictors are also used in the SCM: total amount of housing loans (index; in domestic currencies) for CG1 and for other the donor pools it is replaced by domestic credit to private sector (percent of GDP), property prices index, CPI index, durable consumption growth prior to the crisis ("boom"), durable consumption growth after the crisis ("bust") and political stability indicator.

The results for Hungary from the SCM estimation when durable consumption is the outcome variable are presented numerically in Table 5-9 and graphically in Figure 7-14 in Appendix A. The main contributor to the synthetic unit for Hungary is Poland regardless of the set of the control units. Using CG1 Poland accounts for 60 percent, Bulgaria 31 percent and Romania

9 percent, whereas employing CG2 the latter two countries are replaced in the synthetic control by the Czech Republic that weights 42 percent and Poland's contribution is 58 percent. Including additional countries in the last two donor pools (CG3 and CG4) no major changes can be seen, although the weight of Poland in the synthetic unit is gradually decreasing and in the last SCM the Czech Republic outweighs Poland by 5 percent resulting in 34 percent weight for the Czech Republic and 29 percent for Poland. Slovakia and Norway contribute with 7-8 percent and 11 percent when employing CG3 and CG4, respectively. Non-EU countries' weights are marginal in the construction of the synthetic unit. Except for the appearance of Norway in the synthetic unit the countries and weights in Synthetic Hungary seem reasonable, the main contributor units are in general similar to Hungary in terms of macroeconomic performance since these countries joined the EU around the same time as Hungary did and might share similar characteristics (e.g. in terms of consumption) due to historical reasons⁴¹. Overall, the results are robust regardless of the donor pool applied.

The RMSPE over the pre-treatment period is between 168.5 and 250.5, hence the quarterly average RMSPE is between 5.6 and 8.4. The algorithm could not replicate the extreme spike in 2008Q4 when durable consumption levels plummeted drastically from index 195 to index 107. However, the SCM still provides a good fit: compared to the quarterly standard deviation of durable consumption index over the pre-treatment period which is 37.86 the RMSPE is 15-22 percent of the quarterly standard deviation.

During the pre-treatment period Hungary had significantly higher consumption levels and higher growth relative to the arithmetic average of the sample (all donor pools), whereas the synthetic counterpart matches the average level of durable consumption of Hungary during the pre-treatment period. Other covariates' means of the treated unit, such as GDP deflator, exchange rate index, property price index and political stability, match the means of its synthetic counterpart. However, not all predictor variables can be perfectly fitted, e.g. durable consumption growth between 2008Q3 and 2011Q2, but there is a smaller mismatch between the exposed unit's and

⁴¹ Quality of life, variety of consumer goods, supply, trade etc. in post-socialist countries were very much alike across the area due to the similar regime.

synthetic unit's stock exchange index means⁴². Nevertheless, in general, the synthetic unit for Hungary strongly resembles the actual characteristics of Hungary before the treatment. After the Law entered into force durable consumption for Hungary and Synthetic Hungary vastly diverged. In contrast to the expectation of the government consumption did not increase, instead the SCM shows that the policy led to a minimum of 23.6 and maximum of 27.6 percent decrease (in case of CG3 and CG1, respectively) in accumulated durable consumption during the post-intervention period compared to the scenario if the early repayment of FX mortgage loans at below-market exchange rates had not been made possible. On average, the decrease in durable consumption over the post-intervention period was 25.1 percent due to the Law. In addition, the implementation of the policy explains 82-96 percent of the total actual decrease during in durable consumption the post-intervention period. The results seem robust to the use of different sets of control groups. As Figure 7-14 graphs shows durable consumption dropped significantly once the Law was announced, and even compared to 2004Q1 levels actual durable consumption was only 19 percent higher in 2013Q4.

One possible interpretation is that since the beneficiaries of the policy were households with substantial savings and who tend to have a lower MPC, they immediately cut back with spending on durable goods. In other words, these households with higher amount of savings and whose debt service burden got eliminated or restructured due to a newly granted HUF-loan that financed the repayment, reduced their expenses even more than they would have done in the absence of the policy. These wealthier households that realized a substantial one-off cost due to the repayment might have started to save more instead of spending the gain from the applied below-market exchange rates that practically wrote down a significant share of their total debt burden. Additionally, in the next subsection I demonstrate the impact of the Law on property prices that might have also triggered lower consumption due to a drop in housing net worth.

⁴² The latter can be explained due to the fact that Hungary's stock exchange performed the worst over the pre-treatment period, thus subject to the weight constraints there would be no linear combination that could reach such a low level.

VII.II SCM – PROPERTY PRICE

In this subsection the outcome variable is *property price index* (2010=100) from BIS and the same predictor and special predictor variables are used in the SCM as for the one when the outcome variable is *durable consumption index*⁴³. However, due to lack of data the pre-treatment period shortened and it ranges from 2008Q1 to 2011Q2 (for CG4 the period is 2008Q2-2013Q4), also since data for Romania was only available from 2009Q1, I decided to exclude it from this sample, otherwise the pre-treatment period would have been relatively short.

Figure 15-22 plots the property price index for Hungary and its synthetic counterpart during the period 2008Q1-2013Q4. As shown in Figure 15-22 the trajectory of property price index in the Synthetic Hungary nicely follows the path of property index in Hungary over the pre-treatment period irrespective which set of control units is employed. After the treatment the path of the synthetic unit continues on its modest downward trend (CG1-CG3), meanwhile, the actual property index declined more sharply in Hungary. Thus, Hungary would have experienced a decline in property prices during the post-intervention period even in the absence of the treatment but the fall would have been more moderate. Note, that the first hypothetical value (in the absence of the policy) is already significantly higher than the realized value.

The root mean squared prediction errors range from 1.33 to 2.59 (Table 10-14), CG1 providing the best fit over the pre-treatment period. Relative to the quarterly standard deviation of property price index over the pre-treatment period (4.28) the quarterly RMSPE is maximum one-twenty-fifth (in case of the worst fit) of the quarterly standard deviation, which indicates an excellent fit.

The Synthetic Hungary consists mainly of two countries from CG1: 53 percent of Croatia and 38 percent of Poland. When using CG2 in the donor pool for constructing the synthetic unit

⁴³ Durable consumption index (2004Q1=100), GDP deflator index (2010=100), stock exchange index (2010=100) and exchange rate index (EUR/domestic currency; 2010=100); total amount of housing loans (index; in domestic currencies) for CG1 and for other the donor pools it is replaced by domestic credit to private sector (percent of GDP), property prices index, CPI index, durable consumption growth prior to the crisis ("boom"), durable consumption growth after the crisis ("boom") and political stability indicator.

the Czech Republic weights 63 percent, Poland 27 percent and Bulgaria's weights increased to 10 percent. The contribution of control units remains almost unchanged when employing CG3 instead, only major addition is Slovakia with 11 percent. Interestingly, Mexico and Bulgaria contributes to the synthetic unit with 59 percent and 30 percent, respectively⁴⁴.

By implementing the SCM and using any sets of donor pools, real Hungary and its synthetic counterpart are more alike than if the unweighted average of the control units were used during the pre-treatment period. In case of the first three control groups major deviation appears only for stock exchange index and durable consumption growth during boom years⁴⁵.

Actual property prices in Hungary dropped by 16.4 percent by 2013Q4 relative to 2008Q1, whilst property prices for the Synthetic counterpart declined by 15.3 percent, 10.3 percent and 10.5 percent over the same period when applying CG1, CG2 and CG3 as donor pool, respectively. The deviation between the actual and modelled path is more drastic if CG4 is used to construct the synthetic unit and according to the SCM the drop is only 3.9 percent in the absence of the policy over the full period.

The Hungarian property prices dropped by an additional 2.3 percent and 2.7 percent from 2011Q3 to 2013Q4 due to the Law when CG2 and CG3 is employed, while the gap between Hungary and its synthetic counterpart is 9.7 percent when countries from CG4 are chosen to model the synthetic unit's path. Since the moratorium on eviction was lifted around the time when the "Home Protection" package entered into force, hence an increase in supply of properties could have resulted in lower prices. Due to a relatively high starting point of the Synthetic Hungary in 2011Q3 and a steeper curve over the post-intervention period the SCM implies that property prices increased by 1.3 percent due to the implementation of the Law. By comparing the gap, that the treatment caused to the actual total property price growth over the post-intervention period, on

⁴⁴ Even though Mexico's property price trend does not resemble Hungary's path the elements of the *V* matrix related to the covariates are more equally distributed and the outcome variable has not the most weights to fit its path over the pre-treatment period. The interpretation and validity of the SCM is questionable when CG4 is used due to Mexico's high weight in the synthetic unit. The explanatory power of the Law would be 52 percent on average if the result of CG4 is taken into account as well.

⁴⁵ Hungary experienced one of the highest durable consumption growth from 2004Q1 to 2008Q3, thus subject to the weight constraints it is very unlikely that that special predictor value could be fitted closely.

average 19 percent of the total decline can be explained by the Law when CG1-CG3 is employed⁴⁶. The ratio is 1.59 (159 percent) when CG4 is employed, that might seem a bit unrealistic, also as noted before the majority of the weights were allocated to Mexico. The impact of the Law on the property prices is thus not as drastic as it was on durable consumption. Further robustness checks are discussed in Section VIII.

In order to calculate MPC I applied the Synthetic Control Method (SCM) to both property price index and durable consumption. According to Eurostat data durable consumption was 218.25 billion HUF in 2011Q3 in Hungary, and according to the applied SCMs the policy led to a 25.1 percent decrease in durable consumption on average (taking either CG1-CG3 or CG1-CG4 into account) over the post-intervention period. I followed the housing wealth calculation suggested by (Vadas, 2007) and collected data from the Hungarian Central Statistical Office (KSH) database on housing stock and average apartment size among homeowners in 2011. Data on a property's average price per square meter in Hungary was available on (Ingatlannet.hu, n.d.). Housing wealth in the end of 2011 was 66,420 billion HUF⁴⁷. The housing wealth change due to the additional decline in property prices is therefore 879 billion, -1,559 billion, -1,768 billion and -6,420 billion with respect to the SCMs using CG1, CG2, CG3 and CG4, respectively. As mentioned in Section II.II the measurable direct impact of the Law due to the variance between spot and applied exchange rates was 370 billion HUF (that is the loss realized by the banks), which can be viewed as a write down in households' total amount payable that increased their net wealth position (Hungarian Financial Supervisory Authority (PSZÁF), 2012). The amount repaid by a household counted as a restructuring in the household's own balance by reducing both the value of liabilities and assets, hence there was no change in the household's housing net worth. By taking the average the decrease in net housing wealth is 446 billion HUF, hence the calculated MPC out of housing wealth for Hungarian households over the examined period 12.3 percent when taking the means of the impacts from the SCMs using CG1-CG3; the average decrease in net housing wealth is 1,847 billion HUF

⁴⁶ The ratio is 1.59 (159 percent) when CG4 is employed, that might seem a bit unrealistic, also as noted before the majority of the weights were allocated to Mexico.

⁴⁷ The average price per square meter was 223,087 Ft/m² in November 2011 (September value was not published) in Hungary, average apartment size was 79 m² and there were 3,768,762 number of apartments owned by private owners in 2011.

if all the SCMs are taken into account, hence, the calculated MPC out of housing wealth for Hungarian households over the examined period 3.0 percent. The estimated MPCs are the following when it is computed for each scenario: -4.8 percent, 4.4 percent, 3.7 percent and 0.9 percent for the SCM using CG1, CG2, CG3 and CG4, respectively. Table 15 in Appendix B summarizes the presented results.

As indicated in Table 5-9 the findings on the impact of the Law on durable consumption seem robust, that is also supported by the placebo tests discussed in Section VIII. A. Mian & Sufi (2015) suggest that government should intervene to boost household spending and debt forgiveness is one policy that could trigger higher consumption from households with high MPC. However, the way how the Hungarian policy was set up resulted in an unequal distribution of wealth shock, and the policy targeted middle or upper-class households that tend to have lower MPC. Indeed, durable consumption did not increase, au contraire, it decreased and even in case of a positive net housing wealth effect of the Law (since both components - relative property price increase and gain from debt forgiveness – are positive) the calculated MPC is negative, meaning that households decided to save more. In other scenarios a higher decline in property prices offsets the gain from the debt relief, and households' net worth decreased due to the Law. The aggregate MPC is relatively low, which could be interpreted as follows: since less poor households were directly impacted by the Law through debt forgiveness, based on empirical evidence, the change in durable consumption compared to net wealth effect represents their preferences more. A lower MPC is in line with other empirical findings that wealthier households tend to have lower MPC. A microlevel data would allow me to prove whether that interpretation is indeed correct.

Since I find some evidence for a negative effect on property prices caused by the Law, which impacts both poorer and less poor households, a disaggregated dataset would have allowed me to differentiate between different households e.g. based on geographic areas, which could have resulted in a more detailed and insightful analysis and a decomposition of MPC. Unfortunately, due to the lack of such level of data the impacts were estimated only on an aggregate household level. However, since I would like to continue the research on this topic, I contacted the largest commercial banks in Hungary, that granted massive amount of foreign currency loans to households, in order to obtain micro-level data. The discussion about the level of the data, variables

needed and confidentiality issues is ongoing but with a potential support from the Central Bank of Hungary I am hoping to reach an agreement with the different stakeholders to explore the impact of the Law on a micro-level data. Moreover, by obtaining lower level data I aim to examine the effect of the mortgage loan conversion that happened in the beginning of 2015, and which meant the conversion of foreign currency denominated mortgage loans to HUF-denominated loans. The law did not create a significant turmoil on an aggregate level (when looking at GDP, CDS, consumption, investment levels) but its impacts on household sector related variables (e.g. consumption and investment) and on the housing market might differ from one type of borrower to another (based on region, age, total value of outstanding loan, etc.).

VII.III SCM – EXCHANGE RATE

In this subsection the outcome variable is EUR/domestic currency *exchange rate index* (2010=100) from Datastream and as before the same predictor variables are used in the SCM⁴⁸ but in addition to the previously used special predictors other macroeconomic indicators are included to account for not only housing market related characteristics. These covariates are *1-year CDS premium* (EUR), *3-month interbank rate* (2010=100) (excluded from CG4), *IIP – other investments assets* (USD) (only for CG1) and *control of corruption* (governance indicator). The standard deviation of *IIP – other investments assets* (USD) is to be fitted over the pre-treatment period. The pre-treatment period lasts from 2006Q3 until 2011Q2.

As seen before by implementing the SCM the synthetic unit outperforms the sample average over the pre-treatment period, since the latter would result in a worse fit than the synthetic unit. The deviation in stock exchange index means and durable consumption growth from 2004Q1 to 2008Q3 between Hungary and its synthetic counterpart is no surprise (see footnote 40 and 43). Table 16 displays the weights of each control unit in the Synthetic Hungary across all sets of control groups. In general, Hungary's trend is best reproduced by Poland regardless of the set of the donor

⁴⁸ Durable consumption index (2004Q1=100), GDP deflator index (2010=100), stock exchange index (2010=100) and exchange rate index (EUR/domestic currency; 2010=100); total amount of housing loans (index; in domestic currencies) for CG1 and for other the donor pools it is replaced by domestic credit to private sector (percent of GDP), property prices index, CPI index, durable consumption growth prior to the crisis ("boom"), durable consumption growth after the crisis ("boom") and political stability indicator.

pool, Romania, Serbia and Croatia also contributes to the construction of the Synthetic Hungary when CG1 is used in the SCM, which can be explained by the fact that these countries have floating exchange rate regimes. However, the diagonal element of *V* associated to exchange rate index is not that large (.18 if CG1 is used, .3 if CG2 is used), meaning that other variables such as durable consumption growth during bust period or GDP deflator index have also a great power predicting the exchange rate index before the policy was implemented. When employing CG2 only the Czech Republic is the new contributor (no Scandinavian country weights), which seems reasonable due to similar country characteristics.

Figure 23-30 plots the EUR/HUF exchange rate for Hungary and its synthetic counterpart during the period 2008Q1-2013Q4. As shown in Figure 23-30 the path of the outcome variable in the Synthetic Hungary closely matches the path of property index in Hungary over the pretreatment period, even the spikes are relatively well captured, irrespective which set of control units is employed. As displayed in the figures the trajectory of the synthetic unit is smoother over the post-intervention period, or numerically the standard deviation of the Synthetic Hungary is significantly lower irrespective of applied control groups (.8, 1.4, 1.3, 2.0 standard deviation vs. 3.1 in case of CG1, CG2, CG3 and CG4, respectively), hence it implies that the exchange rate got more volatile due to the Law. Figure 23-30 displays the gap between Hungary and its synthetic counterpart, and it shows that especially just after the policy was announced the Hungarian forint weakened more than it would have been in the absence of the policy. During the post-intervention period the realized EUR/HUF exchange rate index was on average 1.6-6.8 percent higher than it would have been in the absence of the Law had not been adopted.

The root mean squared prediction errors range from 6.53 to 10.48, the trajectory of the Synthetic Hungary fits Hungary's trajectory that best when using CG2 in the SCM over the pretreatment period. The quarterly RMSPE ranges from .33 to .52 which is low compared to the quarterly standard deviation of 6.1. This implies a great fit of the artificial unit over the pretreatment period.

VII.IV SCM-GDP

As detailed in Section II.II some concerns arose that the Hungarian economy might be negatively impacted due to the legislation, which might create uncertainty in the markets and as a result the level of investment might drop which might harm the GDP growth. In this subsection I used the SCM both on *GDP deflator index* (2010=100) and on *real GDP index* (2010=100) to test whether the effect of the Law was significant enough to impact the Hungarian GDP. Both outcome variables were extracted from IFS database and the pre-treatment period started in 2005Q1 and lasted until 2011Q2. As predictor variables I use the same ones that were described in Section VII.III when the estimated effects of the Law on exchange rate index was displayed.

When estimating the effect of the Law on GDP deflator index in Hungary with the SCM the synthetic unit consists of countries with floating exchange rate regimes when CG1, CG2 and CG3 are used in the algorithm (mainly Poland, Romania and Serbia, but the Czech Republic has relatively high weights when CG2 is applied). Interestingly, when CG3 and CG4 are used Greece and Slovakia have significant weights in the synthetic unit. When examining the diagonal elements of *V* it can be seen that the value associated to 1-year CDS is the largest, which can explain why Greece can appear in the synthetic unit.

Figure 31-38 plots the GDP deflator index's trajectory for Hungary and its synthetic counterpart during 2005Q1-2013Q4. At first sight some minor spikes are not completely captured with the SCM during the pre-treatment period (e.g. 2008Q1, 2008Q3, 2009Q3, 2011Q1) especially when CG1 and CG2 are used as donor pools. Due to a gradually increasing GDP deflator index the standard deviation is relatively high for actual values, hence the RMSPEs are minor compared to quarterly standard deviations over the pre-treatment period (.1 vs. 7.1 in the worst fit case, which is CG1). However, as Figure 31-38 displays the gaps between Hungary and Synthetic Hungary the magnitude of the impact of the policy on GDP deflator would have resulted in the same path in case of CG1, on average it would have performed slightly better (by .9%) if the Law had not been adopted and Synthetic Hungary consists of members of CG2. When the extended donor pools are used in the SCM then the result indicates that the Law had a minor positive impact on GDP deflator,

on average it accounts for an additional .9% and 2.0% increase compared to the case if the Law had not been adopted. Overall, based on the SCMs applied on GDP deflator index the magnitudes seem rather marginal, leading to a conclusion that the Law did not create a drastic turmoil in the market, in other words it did not have a severe spillover effect and did not caused severe harm on the real economy.

To test the hypothesis on another GDP indicator, I apply the SCM on real GDP index and I use the same predictor variables as in Section VII.III but instead of GDP deflator I include real GDP index in the covariates. Table 27-30 compares the pre-treatment characteristics of the actual Hungary with the Synthetic Hungary and with the sample average. In all four scenarios the mean of real GDP index of the synthetic unit is fairly close to the actual Hungary's average real GDP index between 2005Q1-2011Q2. There is a larger mismatch between Hungary and its synthetic counterpart regarding 3-month interbank rates, control of corruption, durable consumption and durable consumption growth during boom years (for explanation of the latter see footnote 43). Along with the relative weights assigned to these predictor variables it can be argued that neither 3-month interbank rates, nor durable consumption nor control of corruption indicator have substantial power forecasting the path of real GDP index in Hungary prior to the implementation of the Law. The last rows in Table 27-30 display the RMSPE, which is between 11.79 and 15.85, however the quarterly standard deviation of real GDP index is at least ten times higher than the quarterly RMSPE. Hence, the match over the pre-treatment period is sufficient, however, as the gaps in Figure 39-46 suggest the SCM does not provide a good fit for the early observations in the pre-treatment period.

Table 26 shows the weights allocated to different countries in the Synthetic Hungary, and as in the previous case some countries in the Synthetic unit are less intuitive. When CG1 is used as a donor pool mainly Croatia and Latvia construct the Synthetic Hungary. In *V* matrix a high value (.81) is assigned to one particular predictor variable, namely to the durable consumption growth after the crisis. Thus, this covariate is taken into account the most to minimize RMSPE. The relatively high power of this variable to predict real GDP index is robust to the extension of the donor pool. The relative weight of CESEE countries in the synthetic unit diminishes when adding new countries to the donor pool and countries like Norway, Estonia and Malta have relatively high

weights instead. It can be argued that the latter two countries shared some similar characteristics with Hungary (all three joined the EU in 2004, hence by being eligible for accession they might have been at a similar stage of economic development), however, the rationale behind Norway contributing to the Synthetic Hungary to such a large extent is rather weak.

The Synthetic Hungary line in Figure 39-46 displays the estimation of the SCMs on real GDP index if the NPAP had not been introduced in 2011Q3. As already mentioned in the beginning of the pre-treatment period the actual Hungary and synthetic Hungary lines deviate quite substantially, best fits are received when CG4, CG3 and CG1 are used (RMSPE 11.79, 13.60 and 13.81). Particularly in the first two cases the line of synthetic Hungary is above Hungary's real GDP index line for all post-intervention observations, on average the relative gap between realized and estimated values is -6.5% and -4.1% when CG4 and CG3 are used. When the donor pool consists of CG1 countries the estimates with SCM do not differ notably from the actual real GDP index values, on average the real GDP index would have been 1.9% higher during the post-intervention period if the Law had not been implemented. In general, the impact of the Law seems rather low given that the magnitude of mismatches between actual and fitted values in 2005 are similar to the magnitude of the gaps during the post-intervention period. However, between 2012Q2 and 2013Q3 the gaps are relatively larger, which might imply that there is a time lag between the date of the Law being implemented and its impact on real economy assuming that the effect was indeed due to the Law (that will be tested with placebo studies in Section VIII).

VIII. ROBUSTNESS CHECKS AND PLACEBO TESTS

The results of the SCMs described in Section VII can be interpreted as a first step of robustness checks since the path of the outcome variable over the post-intervention period was estimated with four sets of donor pools. In some cases, it was less intuitive to find a reason why a certain country appears with relatively large weight in the synthetic control unit (e.g. GDP) however, for each outcome variable the trends of the synthetic Hungary across different sets of control units were very similar. Furthermore, at large, the magnitudes of the estimated impact of

the adoption of the Law on each examined dependent variable across CG1-CG4 were alike⁴⁹. Hence, in general, the estimations seem robust to the extension of control countries.

When exchange rate index is the outcome variable the results obtained with SCM seem robust to different set of donor pools. For the purpose of further robustness checks I excluded the additional macroeconomic variables⁵⁰ when examining the impact of the Law on exchange rate index and I replaced GDP deflator with real GDP index in the list of predictor variables. As displayed in Figure 47-54 almost no change is noticeable, in other words neither the trend nor the gaps changed significantly compared to the original results, as a consequence the results presented in Section VII.III seem robust to changes in the set of covariates. The weights of Lithuania in the synthetic control unit increased by 12.5 percentage points while some countries with minor weights disappeared when CG4 is used in the SCM.

I use the inferential technique proposed by Abadie & Gardeazabal (2003) and Abadie et al. (2010), which is akin to permutation inference, where the distribution of a test statistic is calculated under random permutations of the sample units' assignments to the treated and non-treated groups. The so-called placebo tests apply the same synthetic control method to countries that did not implement such a law during the sample period. This method is suitable for a small sample size like the CESEE countries (seven units and Hungary) and for aggregate data.

In my analysis I apply the SCM to every country in the sample. The question to answer is whether the effect estimated by the SCM for Hungary is large relative to the effect estimated for a country chosen at random. Hence, if the placebo tests create gaps similar in magnitude to gaps estimated for Hungary, then the results described in Section VII do not provide significant evidence of a negative impact of the Law on the respective outcome variables in Hungary. However, if the gaps estimated for the untreated unit are significantly smaller than the gaps estimated for, then the

⁴⁹ Except for the case when property price was the outcome variable and when using CG1 the decline in property prices would have been slightly higher from 2011Q3 to 2013Q4 in the absence of the Law resulting in a positive net housing worth impact. On the other hand, when employing CG4 the effect of the Law on housing wealth was significant but negative. The concerns of taking that result into account have been described in Section VII.II.

⁵⁰ 1-year CDS premium (EUR), 3-month interbank rate (2010=100) (excluded from CG4), *IIP* – other investments assets (USD) (only for CG1) and control of corruption.

interpretation is that the analyses displayed above provide significant evidence of a negative impact of the Law on the respective outcome variables in Hungary.

As was mentioned in the beginning of Section VII a poor fit between the trajectory of Hungary and its synthetic counterpart during the pre-treatment period would not lead to a valid interpretation of the results assuming that the gaps after the treatment are due to the policy. To avoid that I exclude countries that have a RMSPE five times higher than Hungary's, therefore those countries are not shown in the figures.

First, I performed placebo studies on durable consumption index. As Figure 55-58 displays in Appendix A, regardless of the donor pool used in the SCM when running placebo tests on all eligible countries the gap line of Hungary is clearly the most unusual line, especially after 2012Q1. In conclusion, I find clear evidence for the rarity of the estimated effects in Hungary and that the impact of the Law on durable consumption was large in magnitude.

With respect to the placebo tests run on property price with SCM the results are not as robust as in the case of durable consumption. Note, that due to lack of data the pre-treatment period is relatively short and that Romania was excluded since the property price index for Romania was available only after 2009. No placebo tests are shown when CG1 is used in the SCM for Hungary since none of the countries provide a good fit during the pre-treatment period, meaning that all RMSPEs are five times higher than Hungary's RMSPE. That seems a bit odd at first sight but a closer look at the trajectories of the actual property price index shows that except for Hungary and Poland the other countries experienced more volatile property prices during the pre-treatment period which makes it harder to reproduce. Additionally, the fact that the Synthetic Hungary produced an excellent fit even the closest RMSPE, which is 17.48 for Poland, is about thirteen times higher than Hungary's RMSPE. When CG2 is applied in the SCM Denmark and Poland perform a higher negative gap than Hungary. The results for Poland (marked with dotted line) however, seem controversial since the SCM on durable consumption implies a massive positive impact due to a simulated treatment, meanwhile the property price index gap is significantly negative. The magnitude of the impact of this specific policy on property prices when CG2 or CG3 is applied is not exceptionally large. An explanation for the unusually large gaps in other countries might be that in the aftermath of the financial crisis property prices might have been impacted by new legislations on foreclosures or changes in interest rates. When using CG4 as a donor pool the gap between Hungary's actual property price index and its synthetic counterpart's estimated property price index is not exceptionally large, interestingly the estimated gap for Serbia is the largest over the post-intervention period. Overall, a few placebo tests create gaps similar in magnitude to gaps estimated for Hungary on property prices index, therefore only a weak evidence of a negative impact of the Law is found.

Next, I perform placebo studies on exchange rate index. As Figure 62-65 displays in the Appendix, it is noticeable that the spikes in the gap line of Hungary indicates a uniquely high volatility of the exchange rate, which did not happen in other countries, especially in 2011Q3 that can be interpreted as a rapid shock right after the Law was announced. When using CG3 as donor pool the gap line for Hungary is large even in magnitude once the Law was adopted, only Serbia creates a bigger deviation when the SCM is applied, however, the fit over the pre-treatment period is one of the poorest. By reapplying the SCM on all available countries in the sample Serbia's and Israel's gap line is very unusual, besides those Hungary's gap line is relatively large.

Lastly, placebo studies are conducted on both GDP deflator and real GDP index. As already implied in Section VII.IV the impact of the Law seemed rather limited, especially when GDP deflator was estimated. As Figure 66-73 indicates the gaps created with placebo tests are even larger than what the SCM estimated for Hungary over the post-intervention period when any of sets of the donor pool is used. Hence, there is no significant evidence of a negative impact of the Law on GDP deflator. The gap between Hungary's actual real GDP index and Synthetic Hungary's estimated real GDP index is only significant when all countries are used in the construction of the synthetic unit, which leads to a conclusion that there is only weak evidence of a negative effect of the Law on real GDP index. In other words, the findings imply that the Law was not significant enough to have a substantial impact on the real economy.

IX. CONCLUSION

Post socialist countries' economies experienced a significant boom during the 2000s and enjoyed the benefits of increased level of investments, increasing wages and prices along with accelerated consumption and government spending. Some economies, especially the ones with pegged exchange rate regimes, showed some signs of overheating (Bakker & Gulde, 2010). Countries that grew at a higher pace experienced higher negative growth after the crisis hit. Large current account deficits, high inflation, deterioration of competitiveness and lack of inflow of capital led to a severe recession. On the top of that one particular sector suffered more and more, namely the household sector.

Foreign currency borrowing got vastly popular among households in the CESEE countries, in most countries the ratio of euro-denominated loans was relatively high, but particularly in Hungary and in Poland Swiss franc-denominated loans outweighed EUR loans. Borrowing in foreign currency is not necessarily problematic, as we can see usually a significant share of government debt is also denominated in foreign currencies. But when the domestic currencies drastically depreciated against the euro and the Swiss franc, households' net housing wealth ceteris *paribus* decreased due to an increase of the debt burden. As a consequence, households adjusted their consumption according to their marginal propensity to consume. Based on empirical evidence indebted and poorer households have higher MPC, hence a marginal decrease in net housing worth results in a higher decrease in consumption of poor and underwater borrowers (A. R. Mian et al., 2013). An unsustainably rising debt burden eventually leads to a rise in bad loans and to an increase in number of foreclosures. The latter might impact property prices; hence, it would decrease net housing wealth even further. If a government wants to stop this vicious circle and help out distressed borrowers instead, then it should implement policies that increase the net housing wealth of households. This was the aim of the Hungarian government with the Law adopted in September 2011. The early repayment of foreign currency denominated mortgage loans at below-market exchange rates materialized in a debt forgiveness, the policy was supposed to boost household consumption. However, most of the borrowers were not eligible for filing a claim for early repayment, and these debtors were the ones with supposedly higher MPCs.

Using the Synthetic Control Method, the results on durable consumption suggest that accumulated durable consumption would have been 25 percent higher on average over 2011Q3-2013Q4 if the Law had not been implemented. Such strong evidence on a significant impact of the Law on property prices was not found, in some cases the significance is disputable. Using the results from the SCMs applied on durable consumption and property prices, the obtained MPC is relatively low. If indeed mostly wealthier households were impacted by the law, then the low MPC provides another case of empirical evidence of a relatively low MPC among wealthier households. A household-level data could prove whether that interpretation is correct. A weak evidence is found on a more depreciated Hungarian currency for certain periods due to the impact of the policy. I find no evidence of a severe harm on the real economy measured by GDP deflator index and real GDP index, hence, the concerns about a major negative impact of the Law on the macro economy is not supported by the estimations.

As detailed in Section II.III some countries are still struggling with the high ratio of nonperforming loans. Even though Hungary provided with a few examples, how the household debt issue can or cannot be managed, there is no "one size fits all" solution, all countries need to find their own way to solve the outstanding problem related to accumulated household debt denominated in foreign currencies.

BIBLIOGRAPHY

- Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program. *Journal of the American Statistical Association*, 105(490), 493–505. https://doi.org/10.1198/jasa.2009.ap08746
- Abadie, A., Diamond, A., & Hainmueller, J. (2011). Synth: An R Package for Synthetic Control Methods in Comparative Case Studies (SSRN Scholarly Paper No. ID 1958891).
 Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=1958891
- Abadie, A., & Gardeazabal, J. (2003). The Economic Costs of Conflict: A Case Study of the Basque Country. *American Economic Review*, *93*(1), 113–132.
- Agarwal, S., Amromin, G., Ben-David, I., Chomsisengphet, S., Piskorski, T., & Seru, A. (2012). *Policy Intervention in Debt Renegotiation: Evidence from the Home Affordable Modification Program* (Working Paper No. 18311). National Bureau of Economic
 Research. Retrieved from http://www.nber.org/papers/w18311
- Åslund, A. (2011). Exchange Rate Policy and the Central and East European Financial Crisis. *Eurasian Geography and Economics*, 52(3), 375–389. https://doi.org/10.2747/1539-7216.52.3.375
- Backé, P., Égert, B., & Walko, Z. (2007). Credit Growth in Central and Eastern Europe Revisited. *Focus on European Economic Integration*, (2), 69–77.

- Bakker, B. B., & Gulde, A.-M. (2010). The Credit Boom in the EU New Member States: Bad Luck or Bad Policies? (SSRN Scholarly Paper No. ID 1620249). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=1620249
- Banai, Á., Király, J., & Nagy, M. (2011). Home High Above and Home Deep Down Below-Lending in Hungary. The World Bank. Retrieved from http://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-5836
- Barrell, R., Davis, E. P., Fic, T., & Orazgani, A. (2009). Household debt and foreign currency borrowing in new member states of the EU. Retrieved from http://bura.brunel.ac.uk/handle/2438/5126
- Basso, H. S., Calvo-Gonzalez, O., & Jurgilas, M. (2007). Financial dollarization: the role of banks and interest rates (Working Paper Series No. 0748). European Central Bank. Retrieved from https://ideas.repec.org/p/ecb/ecbwps/20070748.html
- Beckmann, E., & Stix, H. (2015). Foreign currency borrowing and knowledge about exchange rate risk. *Journal of Economic Behavior & Organization*, 112, 1–16. https://doi.org/10.1016/j.jebo.2014.12.015
- Berlinger, E., & Walter, G. (2013). Unortodox javaslat a deviza- és forintalapú jelzáloghitelek rendezésére. *Hitelintézeti Szemle*, *12*(6), 469–494.
- Bernovici, A. (2016, December 12). EC's Dombrovskis: CHF loans conversion law to be carefully applied in Romania. Retrieved from http://www.romaniajournal.ro/ecsdombrovskis-chf-loans-conversion-law-to-be-carefully-applied-in-romania/
- Bethlendi, A. (2015). Egy rossz termékfejlesztésből rendszerszintű piaci kudarc A hazai lakossági deviza- jelzáloghitelezés. *Hitelintézeti Szemle*, *XIV*.(1.), 5–29.

Bod, P. Á. (2012). Lakossági devizahitelezési problémáink. *Fogyasztóvédelmi Szemle*, (1.).
 Retrieved from
 http://www.fvszemle.hu/archivum/2012_marc/gazdasag_fogyaszto/lakossagi_devizahitele

zes/

- Bostic, R., Gabriel, S., & Painter, G. (2009). Housing wealth, financial wealth, and consumption: New evidence from micro data. *Regional Science and Urban Economics*, *39*(1), 79–89. https://doi.org/10.1016/j.regsciurbeco.2008.06.002
- Brzoza-Brzezina, M., Chmielewski, T., & Niedźwiedzińska, J. (2010). Substitution between domestic and foreign currency loans in Central Europe. Do central banks matter?
 (Working Paper Series No. 1187). European Central Bank. Retrieved from https://ideas.repec.org/p/ecb/ecbwps/20101187.html
- Buckley, N. (2015, January 28). Beware Hungary's cure for the Swiss franc mortgages hangover. *Financial Times*. Retrieved from https://www.ft.com/content/b481107a-a6e9-11e4-9c4d-00144feab7de
- Buckley, N. (2016, April 14). Crunch time as Poland decides on Swiss franc mortgages. *Financial Times*. Retrieved from http://www.ft.com/cms/s/0/d3d70688-00bf-11e6-ac98-3c15a1aa2e62.html#axzz4Fh65kngT

BURSA. (2014, September 29). The conversion of loans denominated in Swiss francs - speaking of rope in the house of the man who has been hanged. Retrieved from http://www.bursa.ro/the-conversion-of-loans-denominated-in-swiss-francs-speaking-ofrope-in-the-house-of-the-man-who-...&s=print&sr=articol&id_articol=248803.html

- Buszko, M., & Krupa, D. (2015). Foreign Currency Loans in Poland and Hungary A Comparative Analysis (SSRN Scholarly Paper No. ID 2690120). Rochester, NY: Social Science Research Network. Retrieved from https://papers.ssrn.com/abstract=2690120
- Chailloux, A., Ohnsorge, F., & Vavra, D. (2010). *Euroisation in Serbia*. Retrieved from http://www.ebrd.com/downloads/research/economics/workingpapers/wp120.pdf
- Chang, R., & Velasco, A. (2006). Currency mismatches and monetary policy: A tale of two equilibria. *Journal of International Economics*, 69(1), 150–175. https://doi.org/10.1016/j.jinteco.2005.05.008
- Croatian News Agency (HINA). (2016, September 15). First suit against Croatia for CHF loan conversion filed, says FM. Retrieved from https://eblnews.com/news/croatia/first-suit-against-croatia-chf-loan-conversion-filed-says-fm-36871
- Csajbók, A., Hudecz, A., & Tamási, B. (2010). Foreign currency borrowing of households in new EU member states (Occasional Papers No. 87). Magyar Nemzeti Bank. Retrieved from https://www.mnb.hu/letoltes/op-87-1.pdf
- Csávás, C., & Szabó, R. (2010). A forint/deviza FX-swap szpredek mozgatórugói a Lehman-csőd utáni időszakban. *Hitelintézeti Szemle*, *IX*.(6.), 566–580.

Curia of Hungary. 2/2014, 2/2014 § (2014). Retrieved from http://kuria-birosag.hu/en/node/9429

- Daskalovic, D. (2013, November 8). Serbia's c-bank adopts regulation on more flexible terms for dinar-indexed loans. Retrieved February 12, 2016, from https://seenews.com/news/serbias-c-bank-adopts-regulation-on-more-flexible-terms-fordinar-indexed-loans-388506
- Dietrich, D., Knedlik, T., & Lindner, A. (2011). *Central and Eastern European Countries in the Global Financial Crisis: A Typical Twin Crisis?* (SSRN Scholarly Paper No. ID

1951616). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=1951616

ECB. (2011, November 4). Opinion of the European Central Bank of 4 November 2011 on foreign currency mortgages and residential property loan agreements (CON/2011/87).ECB. Retrieved from

https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2011_87_f_sign.pdf

- ECB. (2014, December 16). Opinion of the European Central Bank of 16 December 2014 on the conversion of foreign exchange loans (CON/2014/87). ECB. Retrieved from https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2014_87_f_sign.pdf
- ECB. (2015a, May 8). Opinion of the European Central Bank of 5 August 2015 on a draft law on specific terms of restructuring of home loans denominated in foreign currency (CON/2015/26). ECB. Retrieved from

https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2015_26_f_sign.pdf

- ECB. (2015b, September 18). Opinion of the European Central Bank of 18 September 2015 on the conversion of Swiss franc loans (CON/2015/32). ECB. Retrieved from https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2015_32_f_sign.pdf
- Eichengreen, B., & Hausmann, R. (1999). *Exchange Rates and Financial Fragility* (Working Paper No. 7418). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w7418
- ESRB. (2011). Recommendation of the European Systemic Risk Board of 21 September 2011 on lending in foreign currencies, *Recommendation ESRB/2011/1*. Retrieved from https://www.esrb.europa.eu/pub/pdf/recommendations/2011/ESRB_2011_1.en.pdf?43ef8 ba79b27b58363584ae74dce1a38

- Filipovic, G. (2015a, January 26). Serbia Won't Follow Hungary, Croatia to Ease Franc Loan Burden. Retrieved February 12, 2016, from http://www.bloomberg.com/news/articles/2015-01-26/serbia-won-t-follow-hungarycroatia-to-ease-franc-loan-burden
- Filipovic, G. (2015b, February 12). Serbia Holds Rates to Shield Dinar Before IMF Loan Approval. Retrieved from https://www.bloomberg.com/news/articles/2015-02-12/serbiaholds-rates-to-shield-dinar-before-imf-loan-approval
- Financial Times. (2015, January 23). Croatia pegs currency against Swiss franc. Retrieved from http://www.ft.com/fastft/2015/01/23/croatia-pegs-currency-against-swiss-franc/
- Gabriel, S. A., Iacoviello, M. M., & Lutz, C. (2016). A Crisis of Missed Opportunities?
 Foreclosure Costs and Mortgage Modification During the Great Recession (SSRN
 Scholarly Paper No. ID 2831830). Rochester, NY: Social Science Research Network.
 Retrieved from https://papers.ssrn.com/abstract=2831830
- Goclowski, M., & Sobczak, P. (2016, May 25). Polish president's aide calls on banks to voluntarily convert forex loans. Retrieved May 28, 2016, from http://uk.reuters.com/article/uk-poland-fxloans-conversion-idUKKCN0YG1US
- Government of the Republic of Hungary, Pub. L. No. XC, § 116, 581 T (2010). Retrieved from http://www.parlament.hu/irom39/00581/00581.pdf
- Government of the Republic of Hungary, Pub. L. No. CXXX, § 1-4, 4476 T (2011). Retrieved from http://www.parlament.hu/irom39/04144/04144.pdf
- Government of the Republic of Hungary, Pub. L. No. CXXI, § 4, 4144 T (2011). Retrieved from http://www.parlament.hu/irom39/04144/04144.pdf

- Haiss, P. R., & Rainer, W. (2012). Credit Euroization in Eastern Europe: The "Foreign Funds" Channel at Work (SSRN Scholarly Paper No. ID 2142312). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=2142312
- Holmár, K. (2012). Mérlegen a valóság, avagy a hazai devizahitelezés nyertesei és/vagy vesztesei. *Hitelintézeti Szemle, Különszám*, 33–43.
- Hudecz, A. (2012). Párhuzamos történetek. A lakossági devizahitelezés kialakulása és kezelése
 Lengyelországban, Romániában és Magyarországon. Közgazdasági Szemle (Economic
 Review Monthly of the Hungarian Academy of Sciences), LIX(4), 349–411.
- Hungarian Banking Association. (2011a, September 9). Press Release. Retrieved May 27, 2016, from http://www.bankszovetseg.hu/wp-

content/uploads/2012/09/sajtokozlemeny_MBSZ20110909_HUN.pdf

Hungarian Banking Association. (2011b, September 12). Press Release. Retrieved May 27, 2016, from http://www.bankszovetseg.hu/wp-

content/uploads/2012/09/sajtokozlemeny_20110912_bankszov.pdf

Hungarian Banking Association. (2011c, September 21). Press Release. Retrieved May 27, 2016, from http://www.bankszovetseg.hu/wp-

content/uploads/2012/09/sajtokozlemeny_MBSZ20110921_final.pdf

Hungarian Banking Association. (2011d, October 3). Press Release. Retrieved May 27, 2016, from http://www.bankszovetseg.hu/wp-

content/uploads/2012/09/sajtokozlemeny_MBSZ20111003.pdf

Hungarian Banking Association, & Government of the Republic of Hungary. (2011). *Minutes of Understanding* (Minute) (p. 10). Budapest. Retrieved from http://www.bankszovetseg.hu/wp-

content/uploads/2012/10/targyalasi_jegyzokonyv_fedlapos.pdf

- Hungarian Financial Supervisory Authority (PSZÁF). (2012). Gyorselemzés a végtörlesztésről (in Engligh: Analysis on early repayment). Hungarian Financial Supervisory Authority (PSZÁF). Retrieved from https://www.mnb.hu/letoltes/gyorselemzes-vegtorlesztes-120312j.pdf
- Ilic, I. (2016, August 7). EU asks Croatia to rethink franc loan conversion law. *Reuters*. Retrieved from http://uk.reuters.com/article/uk-croatia-loans-idUKKCN0ZO1M8
- IMF Data International Financial Statistics At a Glance. (2016). Retrieved April 26, 2016, from http://data.imf.org/default.aspx?sk=5DABAFF2-C5AD-4D27-A175-1253419C02D1
- Ingatlannet.hu. (n.d.). Ingatlan statisztikák országosan. Retrieved September 11, 2016, from http://www.ingatlannet.hu/statisztika/Magyarorsz%C3%A1g
- Kolozsi, P., Banai, Á., & Vonnák, B. (2015). A lakossági deviza-jelzáloghitelek kivezetése: időzítés és keretrendszer. *Hitelintézeti Szemle*, *XIV*.(3.), 60–87.
- Közpolitikai Kutatások Intézete. (2011). *Végtörlesztés rögzített árfolyamon* (p. 5). KKI. Retrieved from https://dkehg2m1ads8n.cloudfront.net/wpcontent/uploads/2012/11/vegtori1.pdf
- Magud, N. E. (2010). Currency mismatch, openness and exchange rate regime choice. *Journal of Macroeconomics*, *32*(1), 68–89. https://doi.org/10.1016/j.jmacro.2009.08.003
- Markovic, B. (2010, September). *Dinarization strategy in Serbia*. Speech presented at the The Financial Markets Association Serbia Annual Assembly, Zlatibor. Retrieved from http://www.bis.org/review/r101004c.pdf

- Mian, A. R., Rao, K., & Sufi, A. (2013). Household Balance Sheets, Consumption, and the Economic Slump (SSRN Scholarly Paper No. ID 1961211). Rochester, NY: Social Science Research Network. Retrieved from https://papers.ssrn.com/abstract=1961211
- Mian, A. R., & Sufi, A. (2009). House Prices, Home Equity-Based Borrowing, and the U.S. Household Leverage Crisis (Working Paper No. 15283). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w15283
- Mian, A., & Sufi, A. (2014, May 14). Why Tim Geithner is wrong on homeowner debt relief. Retrieved from https://www.washingtonpost.com/news/wonk/wp/2014/05/14/why-timgeithner-is-wrong-on-homeowner-debt-relief/
- Mian, A., & Sufi, A. (2015). House of Debt: How They (and You) Caused the Great Recession, and How We Can Prevent It from Happening Again (First Edition, Enlarged edition).
 Chicago: University Of Chicago Press.
- MNB. (2011). Jelentés a pénzügyi stabilitásról (in English: report on Financial Stability) (p. 98). Magyar Nemzeti Bank. Retrieved from https://www.mnb.hu/letoltes/jelentes-penzugyistabilitas-201111-hu.pdf
- MNB. (2012). Jelentés a pénzügyi stabilitásról (in English: report on Financial Stability) (p. 98).
 Magyar Nemzeti Bank. Retrieved from https://www.mnb.hu/letoltes/jelentes-penzugyi-stabilitas-201204-en.pdf
- Mucsi, B., Csortos, O., & Kóczián, B. (2015). A lengyel bankrendszer nemzetköziesedése és a devizahitelezés. *Financial and Economic Review*, 14(5). Retrieved from https://ideas.repec.org/a/mnb/finrev/v14y2015i5p145-155.html

National Bank of Romania. (2016). *Financial Stability Report April 2016* (New Series No. 1). NBR. Retrieved from

http://www.bnr.ro/DocumentInformation.aspx?idDocument=22037&idInfoClass=19968

- National Central Bank of Hungary. (2016). XI. Deviza-, pénz és tőkepiac. Retrieved March 10, 2016, from http://www.mnb.hu/statisztika/statisztikai-adatok-informaciok/adatok-idosorok/xi-deviza-penz-es-tokepiac
- National Central Bank of Poland. (2016, February). Narodowy Bank Polski Internet Information Service. Retrieved April 15, 2016, from

https://www.nbp.pl/homen.aspx?f = /en/statystyka/statystyka.html

- NBS. (2013, May 31). Recommendation BAN 001/13 of 31 May 2013 on Housing Loans Indexed to the Swiss Franc. NBS. Retrieved from http://www.nbs.rs/export/sites/default/internet/english/55/preporuke_20130531/Preporuka _BAN_01_eng_20130531.pdf
- NBS. (2015, February 26). NBS Renders Decision on Measures for Preserving Stability of the Financial System in the Context of Foreign Currency-Indexed Loans. Retrieved from http://www.nbs.rs/internet/english/scripts/showContent.html?id=8081&konverzija=no
- Ostojic, S., & Mastilo, Z. (2013). Effects of Unofficial Euroisation in Serbia with Regards to the Inflation and Real GDP. *Research in Applied Economics*, *5*(4), 48.
- OTP Bank. (2016, March 31). OTP Bank Romania S.A 60% of OTP Bank Romania's clients with CHF loans have accepted the conversion offers. Retrieved June 1, 2016, from https://www.otpbank.ro/en/news/60-la-suta-dintre-clientii-OTP-Bank-Romania-cucredite-in-franci-elvetieni-au-acceptat-ofertele-de-conversie-EN

portfolio.hu. (2012, December 23). A bankadó "csodálatos" evolúciója (in English: The "wonderful" evolution of the bank tax). Retrieved from

http://www.portfolio.hu/vallalatok/a_bankado_csodalatos_evolucioja.176095.html

- Radosavljevic, Z. (2013, July 4). Croatia court orders banks to replace Swiss franc loans. *Reuters*. Retrieved from http://www.reuters.com/article/croatia-banks-idUSL5N0FA1DZ20130704
- Ranciere, R., Tornell, A., Vamvakidis, A., Nocke, V., Alberola, E., & del Rio, P. (2010).
 Currency mismatch, systemic risk and growth in emerging Europe [with Discussion].
 Economic Policy, 25(64), 597–658.
- Ratcliffe, V. (2014, January 10). Poland's lessons for Hungary on forex loans. Retrieved from http://blogs.ft.com/beyond-brics/2014/01/10/polands-lessons-for-hungary-on-forex-loans/
- Rosenberg, C., & Tirpák, M. (2009). Determinants of Foreign Currency Borrowing in the New Member States of the EU. *Czech Journal of Economics and Finance (Finance a Uver)*, 59(3), 216–228.
- Steiner, K. (2012). Households' Exposure to Foreign Currency Loans in CESEE EU Member States and Croatia (SSRN Scholarly Paper No. ID 1981910). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=1981910
- Stroe, D. (2015, March 18). Romania eyes loans conversion into national currency. Retrieved from http://www.balkaneu.com/romania-eyes-loans-conversion-national-currency/
- Summers, L. (2014, June 6). Lawrence Summers on "House of Debt." Retrieved from https://www.ft.com/content/3ec604c0-ec96-11e3-8963-00144feabdc0
- Timu, A. (2015, January 30). Romanian Central Bank Urges Individual Swiss Franc Loan Measures. Retrieved February 20, 2016, from

http://www.bloomberg.com/news/articles/2015-01-30/romanian-central-bank-urgesindividual-swiss-franc-loan-measures

- Timu, A., & Savu, I. (2011, November 1). Romania Central Bank Tightens Foreign Exchange Lending Rules. Retrieved February 15, 2016, from http://www.bloomberg.com/news/articles/2011-11-01/romania-central-bank-tightensforeign-exchange-lending-rules-1-
- Vadas, G. (2007). Wealth portfolio of Hungarian households Urban legends and facts (MNB Occasional Paper No. 2007/68). Magyar Nemzeti Bank (Central Bank of Hungary).
 Retrieved from https://ideas.repec.org/p/mnb/opaper/2007-68.html
- Vilcu, I., & Timu, A. (2016, October 18). Romania Parliament Approves Law to Convert Swiss-Franc Loans. *Bloomberg.com*. Retrieved from https://www.bloomberg.com/news/articles/2016-10-18/romanian-parliament-approveslaw-to-convert-swiss-franc-loans
- Vukic, I. (2013, July 7). Croatia: Banks Slapped For Bad Behaviour To Fork Out Billions For Overcharging. Retrieved from https://inavukic.com/2013/07/07/croatia-banks-slappedfor-bad-behaviour-to-fork-out-billions-for-overcharging/
- Waldoch, M., Groendahl, B., & Kuzmanovic, J. (2015, September 18). Croatia Approves Swiss-Franc Loans Switch Over Bank Protests. *Bloomberg.com*. Retrieved from http://www.bloomberg.com/news/articles/2015-09-18/croatia-approves-swiss-franc-loanlaw-after-banks-cry-foul
- Waldoch, M., & Skolimowski, P. (2016, January 15). Polish President Proposes Loan Conversion Law at 'Fair' Rate. Retrieved April 30, 2016, from

http://www.bloomberg.com/news/articles/2016-01-15/polish-president-proposes-fxmortgage-conversion-law-banks-drop

- World Bank. (n.d.). Golden Growth (Country Benchmarks) (pp. 17–20). World Bank. Retrieved from http://siteresources.worldbank.org/ECAEXT/Resources/258598-1284061150155/7383639-1323888814015/8319788-1324485944855/benchmarks.pdf
- Yesin, P. (2013). Foreign Currency Loans and Systemic Risk in Europe (Working Paper No.

13.06). Swiss National Bank, Study Center Gerzensee. Retrieved from

https://ideas.repec.org/p/szg/worpap/1306.html

A FIGURES

Figure 1: Euroization 2000 vs. 2008 – CESEE



Euroization 2000 vs. 2008





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Figure 3: NPL ratio (2000-2015) – CESEE (+ Estonia)

Figure 4: Households mortgage loans by currency (2008-2012) – Hungary



Households mortgage loans by currency





FX/HUF exchange rate (2000=100)





Figure 6:

Notes: Source is from MNB and daily exchange rates were used to calculate annual volatility

SYNTHETIC CONTROL METHOD

Figure 7:































































































































































ROBUSTNESS CHECKS

Figure 47:































PLACEBO TESTS

Figure 55:







Durable consumption (CG2)

Figure 57:







100 50 0 -50 -100 2004Q1 2005Q1 2006Q1 2007Q1 2008Q1 2009Q1 2010Q1 2011Q1 2012Q1 2013Q1

Durable consumption (CG4)

























Figure 65:















Figure 69:















Real GDP index (CG3)




B TABLES

	BGR	HRV	HUN	LVA	LTU	POL	ROM	SRB
2000	75%	84%	67%	74%	55%	73%	47%	
2001	73%	89%	66%	65%	78%	72%	51%	13%
2002	75%	90%	85%	43%	96%	71%	53%	27%
2003	83%	91%	83%	53%	96%	72%	55%	38%
2004	82%	91%	63%	49%	91%	71%	59%	38%
2005	74%	91%	83%	58%	92%	74%	59%	66%
2006	80%	91%		63%	92%	74%	88%	79%
2007	82%	90%		64%	92%	76%	87%	76%
2008	84%	91%		66%	92%	76%	88%	75%
2009	84%	91%		69%	92%	72%	84%	74%
2010	81%	90%		69%	91%	71%	84%	74%
2011	77%	91%	86%	65%		69%	82%	74%

Table 1: Foreign ownership share (percent)

Notes: Source: EBRD

Measure	Description and purpose of measure
Exchange rate cap	Debtors of performing FX loans may apply for participation in the scheme until the end of 2011, pursuant to which they may repay their loans at preferential rates (HUF/CHF 180, HUF/EUR 250, HUF/JPY 2) during the period of the exchange rate fix lasting until the end of 2014.
Establishment of a National Asset Management	The purpose of the established company is to purchase bad loans. The former debtor can stay as a tenant in the property.
Lifting of the moratorium by the introduction of quotas	Gradual lifting of the former ban on distressed sales through increasing quotas (2 percent of residential properties are allowed to be sold in the final quarter of 2011, 3 percent per quarter in 2012, 4 percent per quarter in 2013 and 5 percent per quarter in 2014).
Resumption of lending in FX	FX loans to applicants with income exceeding 15 times the minimum wage and denominated in FX.
Encouraging residential downshifting and low cost housing	Reducing loan repayments or loan debt of the debtor's by moving into a smaller property.

Notes: "Home Protection" package. Source: MNB (2011)

Table 3: Data summary

	Source	Data frequency	Restriction	Pre-treatment period (outcome variables)	Period used for predictor variables
Durable consumption (2004Q1=100)	Eurostat (CG1, CG2, CG3) OECD (CG4)	Quarterly		2004Q1-2011Q2	2006Q3-2011Q2
Real GDP index (2010=100)	IFS FED (Mexico, Japan, USA)	Quarterly		2005Q1-2011Q2	2006Q3-2011Q2
GDP deflator index (2010=100)	IFS FED (Mexico, Japan, USA)	Quarterly		2005Q1-2011Q2	2006Q3-2011Q2
Stock exchange index (2010=100)	Datastream	Quarterly		-	2006Q3-2011Q2
Exchange rate index (2010=100)	Datastream	Quarterly		2006Q3-2011Q2	2006Q3-2011Q2
Total amount of housing loans (2008Q3=100)	Central Banks' website	Quarterly	CG1	-	2008Q3-2011Q2
Domestic credit to private sector (percent of GDP)	IMF	Annual	CG2-CG4	-	2000-2012
Property prices index (2010=100)	BIS	Quarterly		2008Q1-2011Q2 2008Q2-2011Q2 for CG4	2009Q1-2011Q2
CPI index (2010=100)	Datastream	Quarterly		-	2007Q1-2011Q2
Durable consumption growth prior to the crisis ("boom")	Eurostat (CG1, CG2, CG3) OECD (CG4)	One value		-	growth from 2004Q1 to 2008Q3
Durable consumption growth after the crisis ("bust")	Eurostat (CG1, CG2, CG3) OECD (CG4)	One value		-	growth from 2008Q3 to 2011Q2
Political stability indicator	Datastream	Annual		-	2003-2012
1-year CDS premium (in EUR)	Datastream	Quarterly		-	2009Q1-2011Q2
3-month interbank rate (2010=100)	Datastream for SK: NBS	Quarterly	CG1-CG3	-	2008Q3-2011Q2
Control of corruption	Datastream	Annual		-	2003-2012
IIP – other investments assets (USD)	Datastream	Quarterly	CG1	-	2009Q1-2011Q2

 Table 4: Set of control groups

	a a 1			
	CG1	CG2	CG3	CG4
Bulgaria	✓	✓	✓	\checkmark
Croatia	\checkmark	\checkmark	\checkmark	\checkmark
Latvia	\checkmark	\checkmark	\checkmark	\checkmark
Lithuania	\checkmark	\checkmark	\checkmark	\checkmark
Poland	\checkmark	\checkmark	\checkmark	\checkmark
Romania	\checkmark	\checkmark	\checkmark	\checkmark
Serbia	\checkmark	\checkmark	\checkmark	\checkmark
Czech				
Republic		\checkmark	\checkmark	\checkmark
Denmark		\checkmark	\checkmark	\checkmark
Norway		\checkmark	\checkmark	\checkmark
Sweden		\checkmark	\checkmark	\checkmark
Belgium			\checkmark	\checkmark
Cyprus			\checkmark	\checkmark
Estonia			\checkmark	\checkmark
Finland			\checkmark	\checkmark
Greece			\checkmark	\checkmark
Malta			\checkmark	\checkmark
Slovenia			\checkmark	\checkmark
Slovakia			\checkmark	\checkmark
Chile				\checkmark
Israel				\checkmark
Japan				\checkmark
Korea				\checkmark
Mexico				\checkmark
United States				\checkmark

Weight

Table 5: Durable consumption

	Weight						
	CG1	CG2	CG3	CG4			
Bulgaria	0.306	0	0	0.01			
Croatia	0	0	0	0.002			
Latvia	0	0	0	0.001			
Lithuania	0	0	0	0.096			
Poland	0.601	0.582	0.421	0.29			
Romania	0.093	0	0	0.001			
Serbia	0	0	0	0.001			
Czech Republic		0.418	0.425	0.34			
Denmark		0	0	0.003			
Norway		0	0.078	0.113			
Sweden		0	0	0			
Belgium			0	0			
Cyprus			0	0.002			
Estonia			0.001	0.004			
Finland			0	0			
Greece			0	0.003			
Malta			0	0			
Slovenia			0	0.001			
Slovakia			0.073	0.113			
Chile				0.009			
Israel				0.002			
Japan				0.001			
Korea				0.002			
Mexico				0.006			
United States				0.001			

Table 6: Durable consumption CG1

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	178.07	131.53
GDP_DEFL_INDEX10	94.87	96.30	95.76
STOCK_EXCH_INDEX10	95.76	135.47	138.91
EXCH_RATE_INDEX10	95.55	98.39	96.71
special.CREDIT_TO_HH_INDEX08Q3_OWN.2008.75.2011.5	119.69	124.19	111.67
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.56	102.41
special.CPI_INDEX10.2007.25.2011.5	94.42	96.29	97.64
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	82.73	39.86
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	5.76	-9.06
special.POLITICAL_STAB.2003.2012	0.84	0.49	0.35
RMSPE		250.50	

Table 7: Durable consumption CG2

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	176.75	119.52
GDP_DEFL_INDEX10	94.87	98.04	96.25
STOCK_EXCH_INDEX10	95.76	106.84	126.42
EXCH_RATE_INDEX10	95.55	100.71	98.83
special.CREDIT_TO_HH_INDEX08Q3_OWN.2008.75.2011.5	46.95	35.68	64.39
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	99.65	101.15
special.CPI_INDEX10.2007.25.2011.5	94.42	96.74	97.65
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	82.52	27.78
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	0.52	-15.07
special.POLITICAL_STAB.2003.2012	0.84	0.76	0.64
RMSPE		179.90	

Table 8: Durable consumption CG3

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	179.49	120.20
GDP_DEFL_INDEX10	94.87	98.13	96.57
STOCK_EXCH_INDEX10	95.76	110.42	131.87
EXCH_RATE_INDEX10	95.55	96.22	85.29
special.CREDIT_TO_HH_INDEX08Q3_OWN.2008.75.2011.5	46.95	42.06	72.49
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	99.82	100.62
special.CPI_INDEX10.2007.25.2011.5	94.42	96.94	97.57
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	90.60	30.67
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-5.57	-18.41
special.POLITICAL_STAB.2003.2012	0.84	0.83	0.74
RMSPE		168.48	

Table 9: Durable consumption CG4

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	179.23	124.79
GDP_DEFL_INDEX10	94.87	97.96	96.56
STOCK_EXCH_INDEX10	95.76	113.23	123.39
EXCH_RATE_INDEX10	95.55	93.54	90.63
special.CREDIT_TO_HH_INDEX08Q3_OWN.2008.75.2011.5	46.95	46.90	81.91
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.53	100.13
special.CPI_INDEX10.2007.25.2011.5	94.42	96.89	97.50
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	93.14	32.68
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-6.28	-10.78
special.POLITICAL_STAB.2003.2012	0.84	0.83	0.57
RMSPE		196.28	

 Table 10: Property price index

	Weight						
	CG1	CG2	CG3	CG4			
Bulgaria	0.041	0.101	0.06	0.298			
Croatia	0.531	0	0.002	0			
Latvia	0	0	0.002	0			
Lithuania	0	0	0.002	0			
Poland	0.381	0.272	0.24	0			
Romania	-	-	-	-			
Serbia	0.047	0	0.001	0			
Czech Republic		0.626	0.546	0			
Denmark		0	0.003	0			
Norway		0	0.016	0.002			
Sweden		0	0.001	0			
Belgium			0.001	0			
Cyprus			0.004	0.05			
Estonia			0.002	0			
Finland			0.001	0			
Greece			0.01	0			
Malta			0.004	0			
Slovenia			0.002	0			
Slovakia			0.105	0.059			
Chile				0			
Israel				0			
Japan				0			
Korea				0			
Mexico				0.589			
United States				0			

Table 11: Property price index CG1

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	142.41	132.59
GDP_DEFL_INDEX10	94.87	96.45	96.40
STOCK_EXCH_INDEX10	95.76	132.19	143.00
EXCH_RATE_INDEX10	95.55	99.05	97.57
special.CREDIT_TO_HH_INDEX08Q3_OWN.2008.75.2011.5	119.69	116.64	111.93
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.93	102.56
special.CPI_INDEX10.2007.25.2011.5	94.42	97.04	97.27
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	48.28	41.72
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-7.71	-9.46
special.POLITICAL_STAB.2003.2012	0.84	0.53	0.38
RMSPE		1.33	

Table 12: Property price index CG2

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	159.32	118.96
GDP_DEFL_INDEX10	94.87	98.09	96.68
STOCK_EXCH_INDEX10	95.76	119.82	127.62
EXCH_RATE_INDEX10	95.55	101.89	99.56
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	37.56	68.33
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.54	101.11
special.CPI_INDEX10.2007.25.2011.5	94.42	96.93	97.43
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	73.43	27.68
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-12.22	-15.91
special.POLITICAL_STAB.2003.2012	0.84	0.78	0.68
RMSPE		2.10	

Table 13: Property price index CG3

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	178.21	119.93
GDP_DEFL_INDEX10	94.87	98.29	96.83
STOCK_EXCH_INDEX10	95.76	120.92	132.84
EXCH_RATE_INDEX10	95.55	94.29	84.94
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	40.64	75.13
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.52	100.57
special.CPI_INDEX10.2007.25.2011.5	94.42	97.10	97.44
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	95.70	30.77
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-12.03	-19.07
special.POLITICAL_STAB.2003.2012	0.84	0.81	0.77
RMSPE		2.18	

Table 14: Property price index CG4

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	163.24	124.77
GDP_DEFL_INDEX10	94.87	95.27	96.75
STOCK_EXCH_INDEX10	95.76	131.74	123.76
EXCH_RATE_INDEX10	95.55	96.25	90.59
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	36.52	84.28
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.54	100.08
special.CPI_INDEX10.2007.25.2011.5	94.42	95.15	97.41
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	75.13	32.85
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	2.58	-10.95
special.POLITICAL_STAB.2003.2012	0.84	-0.15	0.59
RMSPE		2.59	

Table 15: MPC calculation

	CG1	CG2	CC3	CC4	AVG	AVG
Gap in Durable	COI	02	005	04	01-005	01-004
consumption						
(%)	-27.6%	-24.1%	-23.6%	-25.0%	-25.1%	-25.1%
Gap in Durable						
consumption (bn						
HUF)	-60.2bn HUF	-52.6bn HUF	-51.4bn HUF	-54.5bn HUF	-54.7bn HUF	-54.7bn HUF
Gap in Property						
price (%)	1.3%	-2.3%	-2.7%	-9.7%	-1.2%	-3.3%
Net housing						
wealth change						
due to property						
price change	879bn HUF	-1,559bn HUF	-1,768bn HUF	-6,420bn HUF	-816bn HUF	-2,217bn HUF
Net housing						
wealth change						
due to cram-	2501 11115	25 01 1 1115	25 01 1 1115	25 01 1 1115		2501 11115
down	370bn HUF	370bn HUF	370bn HUF	370bn HUF	370bn HUF	370bn HUF
Total net						
housing wealth						
change due to						
legislation	1,249bn HUF	-1,189bn HUF	-1,398bn HUF	-6,050bn HUF	-446bn HUF	-1,847bn HUF
MPC	-4.8%	4.4%	3.7%	0.9%	12.3%	3.0%

Table 16: Exchange rate index

	Weight					
	CG1	CG2	CG3	CG4		
Bulgaria	0	0	0	0		
Croatia	0.283	0	0	0		
Latvia	0	0	0	0		
Lithuania	0	0	0.201	0.209		
Poland	0.389	0.241	0.474	0.614		
Romania	0.15	0.314	0.229	0		
Serbia	0.179	0.166	0	0		
Czech Republic		0.279	0	0		
Denmark		0	0.037	0		
Norway		0	0	0		
Sweden		0	0	0		
Belgium			0	0		
Cyprus			0	0		
Estonia			0	0.017		
Finland			0	0		
Greece			0.031	0		
Malta			0	0.088		
Slovenia			0	0		
Slovakia			0.028	0.053		
Chile				0		
Israel				0		
Japan				0		
Korea				0		
Mexico				0.02		
United States				0		

Table 17: Exchange rate index CG1

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	146.55	131.53
GDP_DEFL_INDEX10	94.87	95.02	95.76
STOCK_EXCH_INDEX10	95.76	128.48	138.91
EXCH_RATE_INDEX10	95.55	95.99	96.71
special.CREDIT_TO_HH_INDEX08Q3_OWN.2008.75.2011.5	119.69	121.70	111.67
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	99.99	102.41
special.CPI_INDEX10.2007.25.2011.5	94.42	98.17	97.64
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	51.46	39.86
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-6.32	-9.06
special.POLITICAL_STAB.2003.2012	0.84	0.34	0.35
special.CDS_1Y_EUR.2009.2011.5	252.10	199.77	287.58
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	148.72	209.75
special.OTH_INV_A_USD.2009.2011.5	1420.14	1917.66	1321.70
special.CONTROL_OF_CORR.2003.2012	0.49	0.03	0.17
RMSPE		7.66	

Table 18: Exchange rate index CG2

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	146.88	119.52
GDP_DEFL_INDEX10	94.87	94.88	96.25
STOCK_EXCH_INDEX10	95.76	120.76	126.42
EXCH_RATE_INDEX10	95.55	95.88	98.83
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	32.42	64.39
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	99.94	101.15
special.CPI_INDEX10.2007.25.2011.5	94.42	98.75	97.65
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	55.52	27.78
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-10.02	-15.07
special.POLITICAL_STAB.2003.2012	0.84	0.39	0.64
special.CDS_1Y_EUR.2009.2011.5	252.10	188.17	194.98
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	136.42	188.90
special.CONTROL_OF_CORR.2003.2012	0.49	0.03	0.75
RMSPE		6.53	

Table 19: Exchange rate index CG3

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	169.13	120.20
GDP_DEFL_INDEX10	94.87	96.21	96.57
STOCK_EXCH_INDEX10	95.76	110.01	131.87
EXCH_RATE_INDEX10	95.55	95.52	85.29
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	39.29	72.49
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	101.11	100.62
special.CPI_INDEX10.2007.25.2011.5	94.42	97.00	97.57
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	71.92	30.67
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	7.24	-18.41
special.POLITICAL_STAB.2003.2012	0.84	0.58	0.74
special.CDS_1Y_EUR.2009.2011.5	252.10	204.34	179.57
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	152.97	188.57
special.CONTROL_OF_CORR.2003.2012	0.49	0.48	0.86
RMSPE		7.51	

Table 20: Exchange rate index CG4

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	184.52	124.79
GDP_DEFL_INDEX10	94.87	97.40	96.56
STOCK_EXCH_INDEX10	95.76	106.39	123.39
EXCH_RATE_INDEX10	95.55	95.56	90.63
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	41.93	81.91
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.60	100.13
special.CPI_INDEX10.2007.25.2011.5	94.42	96.25	97.50
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	87.36	32.68
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	10.80	-10.78
special.POLITICAL_STAB.2003.2012	0.84	0.71	0.57
special.CDS_1Y_EUR.2009.2011.5	252.10	145.87	152.67
special.CONTROL_OF_CORR.2003.2012	0.49	0.59	0.86
RMSPE		10.48	

Table 21: GDP deflator

	Weight					
	CG1	CG2	CG3	CG4		
Bulgaria	0	0	0	0		
Croatia	0.475	0	0	0		
Latvia	0	0	0	0		
Lithuania	0	0	0	0.019		
Poland	0.332	0.24	0.311	0		
Romania	0.149	0.182	0.127	0.204		
Serbia	0.045	0.155	0.165	0		
Czech Republic		0.375	0	0.124		
Denmark		0.049	0	0		
Norway		0	0.049	0.002		
Sweden		0	0	0.001		
Belgium			0	0		
Cyprus			0	0		
Estonia			0	0.002		
Finland			0	0.001		
Greece			0.185	0.236		
Malta			0	0.001		
Slovenia			0	0.002		
Slovakia			0.164	0.158		
Chile				0.247		
Israel				0		
Japan				0		
Korea				0		
Mexico				0		
United States				0		

Table 22: GDP deflator CG1

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	139.06	131.53
GDP_DEFL_INDEX10	94.87	95.79	95.76
STOCK_EXCH_INDEX10	95.76	127.17	138.91
EXCH_RATE_INDEX10	95.55	97.88	96.71
special.CREDIT_TO_HH_INDEX08Q3_OWN.2008.75.2011.5	119.69	115.88	111.67
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.92	102.41
special.CPI_INDEX10.2007.25.2011.5	94.42	97.54	97.64
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	44.05	39.86
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-7.53	-9.06
special.POLITICAL_STAB.2003.2012	0.84	0.48	0.35
special.CDS_1Y_EUR.2009.2011.5	252.10	193.30	287.58
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	166.96	209.75
special.OTH_INV_A_USD.2009.2011.5	1420.14	1887.58	1321.70
special.CONTROL_OF_CORR.2003.2012	0.49	0.08	0.17
RMSPE		3.81	

Table 23: GDP deflator CG2

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	146.34	119.52
GDP_DEFL_INDEX10	94.87	95.77	96.25
STOCK_EXCH_INDEX10	95.76	119.52	126.42
EXCH_RATE_INDEX10	95.55	97.49	98.83
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	40.49	64.39
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	99.80	101.15
special.CPI_INDEX10.2007.25.2011.5	94.42	98.38	97.65
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	56.49	27.78
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-12.68	-15.07
special.POLITICAL_STAB.2003.2012	0.84	0.51	0.64
special.CDS_1Y_EUR.2009.2011.5	252.10	152.91	194.98
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	139.76	188.90
special.CONTROL_OF_CORR.2003.2012	0.49	0.21	0.75
RMSPE		2.69	

Table 24: GDP deflator CG3

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	177.72	120.20
GDP_DEFL_INDEX10	94.87	95.79	96.57
STOCK_EXCH_INDEX10	95.76	137.74	131.87
EXCH_RATE_INDEX10	95.55	85.30	85.29
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	45.85	72.49
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	99.76	100.62
special.CPI_INDEX10.2007.25.2011.5	94.42	97.99	97.57
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	89.54	30.67
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-9.40	-18.41
special.POLITICAL_STAB.2003.2012	0.84	0.40	0.74
special.CDS_1Y_EUR.2009.2011.5	252.10	246.88	179.57
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	144.30	188.57
special.CONTROL_OF_CORR.2003.2012	0.49	0.18	0.86
RMSPE		2.94	

Table 25: GDP deflator CG4

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	180.37	124.79
GDP_DEFL_INDEX10	94.87	95.51	96.56
STOCK_EXCH_INDEX10	95.76	126.69	123.39
EXCH_RATE_INDEX10	95.55	89.95	90.63
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	57.35	81.91
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.52	100.13
special.CPI_INDEX10.2007.25.2011.5	94.42	97.66	97.50
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	92.94	32.68
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-6.04	-10.78
special.POLITICAL_STAB.2003.2012	0.84	0.56	0.57
special.CDS_1Y_EUR.2009.2011.5	252.10	249.20	152.67
special.CONTROL_OF_CORR.2003.2012	0.49	0.48	0.86
RMSPE		1.88	

Table 26: Real GDP index

	Weight				
	CG1	CG2	CG3	CG4	
Bulgaria	0	0	0.174	0	
Croatia	0.499	0	0	0	
Latvia	0.284	0.145	0	0.188	
Lithuania	0	0.28	0.068	0	
Poland	0.194	0.065	0.158	0.002	
Romania	0.024	0.108	0	0.042	
Serbia	0	0	0	0	
Czech Republic		0.001	0.001	0	
Denmark		0	0	0	
Norway		0.401	0.024	0	
Sweden		0	0	0	
Belgium			0	0	
Cyprus			0	0	
Estonia			0.44	0.314	
Finland			0	0	
Greece			0.132	0.052	
Malta			0.002	0.253	
Slovenia			0	0	
Slovakia			0	0	
Chile				0.149	
Israel				0	
Japan				0	
Korea				0	
Mexico				0	
United States				0	

Table 27: Real GDP index CG1

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	115.88	131.53
REAL_GDP_INDEX10	102.90	104.20	102.40
STOCK_EXCH_INDEX10	95.76	129.65	138.91
EXCH_RATE_INDEX10	95.55	99.54	96.71
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	51.47	41.62
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	103.00	102.41
special.CPI_INDEX10.2007.25.2011.5	94.42	96.98	97.64
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	18.89	39.86
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-12.17	-9.06
special.POLITICAL_STAB.2003.2012	0.84	0.58	0.35
special.CDS_1Y_EUR.2009.2011.5	252.10	272.49	287.58
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	274.96	209.75
special.OTH_INV_A_USD.2009.2011.5	1420.14	1499.07	1321.70
special.CONTROL_OF_CORR.2003.2012	0.49	0.14	0.17
RMSPE		13.81	

Table 28: Real GDP index CG2

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	114.19	119.52
REAL_GDP_INDEX10	102.90	103.16	101.59
STOCK_EXCH_INDEX10	95.76	108.73	126.42
EXCH_RATE_INDEX10	95.55	100.32	98.83
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	67.93	64.39
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	102.20	101.15
special.CPI_INDEX10.2007.25.2011.5	94.42	96.78	97.65
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	19.51	27.78
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-11.46	-15.07
special.POLITICAL_STAB.2003.2012	0.84	0.87	0.64
special.CDS_1Y_EUR.2009.2011.5	252.10	210.14	194.98
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	209.88	188.90
special.CONTROL_OF_CORR.2003.2012	0.49	1.24	0.75
RMSPE		15.85	

Table 29: Real GDP index CG3

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	121.62	120.20
REAL_GDP_INDEX10	102.90	103.83	101.44
STOCKEXCH_INDEX10	95.76	131.39	131.87
EXCH_RATE_INDEX10	95.55	99.85	85.29
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	58.43	72.49
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.63	100.62
special.CPI_INDEX10.2007.25.2011.5	94.42	96.15	97.57
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	31.64	30.67
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-11.36	-18.41
special.POLITICAL_STAB.2003.2012	0.84	0.56	0.74
special.CDS_1Y_EUR.2009.2011.5	252.10	261.82	179.57
special.INTERBANK_3M_INDEX10.2008.75.2011.5	130.35	169.64	188.57
special.CONTROL_OF_CORR.2003.2012	0.49	0.59	0.86
RMSPE		13.60	

Table 30: Real GDP index CG4

	Treated	Synthetic	Sample Mean
DUR_CONS_INDEX04	178.76	105.67	124.79
REAL_GDP_INDEX10	102.90	103.67	100.42
STOCK_EXCH_INDEX10	95.76	109.63	123.39
EXCH_RATE_INDEX10	95.55	100.86	90.63
special.DOM_CREDIT_TO_PRIV_PC_GDP.2000.25.2012.25	46.95	77.13	81.91
special.PROP_PRICES_INDEX10_BIS.2009.25.2011.5	100.50	100.65	100.13
special.CPI_INDEX10.2007.25.2011.5	94.42	97.04	97.50
special.DUR_CONS_GROWTH_PRIOR_CRISIS.2008.75	95.33	8.69	32.68
special.DUR_CONS_GROWTH_AFTER_CRISIS.2011.5	-13.22	-13.14	-10.78
special.POLITICAL_STAB.2003.2012	0.84	0.77	0.57
special.CDS_1Y_EUR.2009.2011.5	252.10	234.12	152.67
special.CONTROL_OF_CORR.2003.2012	0.49	0.75	0.86
RMSPE		11.79	