IMPACTS OF HOUSING PRICES ON THE FINANCIAL POSITION OF HOUSEHOLDS

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This article examines the extent to which housing prices affect the balance sheets and borrowing and consumption decisions of households in the Czech Republic and indirectly also their ability to repay their debts. Empirical results were obtained by applying the Propensity Score Matching (PSM) method, which allows us to compare statistical units (households) having a different key characteristic (owner-occupied versus rented housing) and similar observed other characteristics. The article concludes that in the period of fast growth in housing prices there were differences between households not only in consumption and net savings, but also in saving structure. However, the analysis does not confirm the assumption made by many theoretical models that there is a credit channel from housing prices to GDP. On the contrary, it was found that property-owning households have statistically significantly higher net savings on average than households living in rented dwellings, even at a time of surging housing prices.

1. INTRODUCTION

Central banks regularly analyse the property market, since housing prices are significantly correlated with macroeconomic dynamics (Leamer, 2007) and financial variables. Housing price misalignment[1] implies both a greater risk to the financial stability of a country/region if the ratio of mortgage loans to total loans is high, and greater social tension. From the point of view of achieving financial stability, therefore, it is vital to study the relationship between housing prices and housing loans and the impacts on households' ability to repay those loans and on the value of the related collateral.

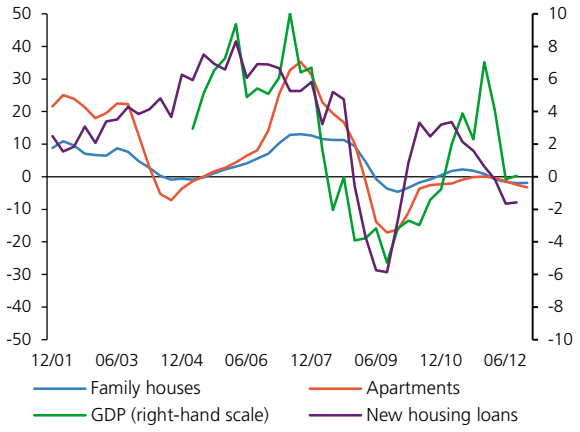
Housing prices in the Czech Republic exhibit strong cyclicality, especially so in the post-Lehman period. Apartment prices are more correlated with the business cycle than prices of family houses. The correlation between economic performance and new housing loans and between housing prices and housing loans is very close (see Chart 1).

On the aggregate level, two factors seem relevant to the interaction between the real economy, housing prices and housing loans: the wealth mechanism (a rise in housing prices implies growth in households' wealth, which, in turn, drives up their consumption) and the credit mechanism (a rise in housing prices reduces the credit constraints on a percentage of households by increasing the value of property as potential collateral).

CHART 1

CYCLICALITY OF HOUSING PRICES IN THE CZECH REPUBLIC

(year-on-year growth in %)



Source: CZSO, CNB, HB Index
Note: Transaction prices of apartments/family houses; 2011/2012 data preliminary or approximated from alternative data sources.

Different types of interaction between housing prices and the economic cycle naturally have different economic policy implications. If housing prices cause business and financial cycles,[2] it is reasonable to consider including housing prices in monetary (or, more generally, stabilisation or macro-prudential) policy decision-making. If housing prices are a mere symptom[3], there is no reason for monetary or macroprudential policy to react to them.[4] Finally, if studies asserting that housing price fluctuations are caused by

1 By misalignment we mean a situation where market prices of real estate are out of line with their hypothetical "equilibrium" value linked to the fundamental factors affecting those prices.

2 See Leamer (2007).
3 This is e.g. a case of models based on self-fulfilling expectations (see Kahn, 2008)
4 A possible exception is if the central bank has better information than private entities about future economic development.

institutional or behavioural failures are right,[5] housing prices should be the domain of, for example, institutional regulation or financial literacy policy rather than macroeconomic stabilisation policy. For this reason, it is important to analyse the cause of the observed relationship between housing prices, credit market conditions and macroeconomic dynamics. This is one of the contributions of this article.

The credit mechanism was pioneered in Iacoviello and Neri (2010), which became the inspiration for most applied DSGE models working with a property sector. This model formalises the relationship between housing prices and macroeconomic dynamics as follows. In the first phase a rise in housing prices increases the value of property as loan collateral, leading to credit expansion. This expansion increases aggregate demand, which, in turn, fosters a temporary rise in economic activity. In the second phase, as the rise in housing prices dissipates, the value of the collateral falls and economic agents have to repay their debts and curb their spending. This, in turn, causes a downturn in economic activity. In this way, housing price shocks, which can be endogenous, create a boom-bust cycle. Housing prices can also affect the financial position of households if this credit channel operates via the income effect, with growth in housing prices increasing the value of households' financial assets and thus also their marginal propensity to consume (see Case, Quigley and Shiller, 2005).

The link between housing prices and household borrowing can be tested using household budget statistics. A quick comparison of the aggregate statistics on loans of owner-occupier households and renting households reveals a similar response of loans over the cycle, indicating that the modelling framework of Iacoviello and Neriho (2010) is not necessarily correct for, or relevant to, the situation in the Czech Republic. However, the above comparison of the aggregate statistics may not be appropriate, as the two sets of households may, for example, be heterogeneous. We therefore apply a more advanced econometric technique to the problem – Propensity Score Matching (PSM).

If the above-mentioned mechanisms of transmission of housing prices to the real economy are indeed relevant, a rise in housing prices should be accompanied by an increase in debt and or a fall in the saving rate among the types of households that own property, and conversely the debt of households living in rented dwellings should not react to housing prices.

The overall aim of this article is to use the data available for Czech households to empirically test the strength and extent of the effect of housing price movements on households' balance sheets, i.e. on their borrowing and consumption decisions, and indirectly on their ability to repay their debts. In doing so, we will investigate the relevance of the transmission mechanism between the property market and macroeconomic dynamics using the commonly used model of Iacoviello and Neri (2010). It assumes that housing prices affect the macroeconomic environment via credit expansion, with property acting as collateral. The first objective of the article is therefore to determine whether property-owning households did indeed borrow significantly more than, for example, households living in rented dwellings when housing prices were high. The second objective of the article is to investigate the relationship between housing prices and households' propensity to save. Here, we focus on testing the income effect hypothesis, according to which property-owning households have a lower propensity to save than households that live in rented accommodation when housing prices are rising, even when different income levels are taken into account.

The article is structured as follows. In Section 2 we describe the data sources used and define the variables under study. In Section 3 we use the PSM method to analyse differences in consumption and saving between households that own a house or apartment and households living in rented dwellings.

2. DATA SOURCES AND BASIC DEFINITIONS

The main data source for our empirical analysis is microeconomic information from the Household Budget Statistics (HBS) published annually by the Czech Statistical Office (CZSO).[6] The same database is also used as a source for the household stress tests published regularly in the FSR.[7] This article uses the HBS data for 2006–2011, which span at least one housing price cycle (see Chart 1).[8] The HBS

5 For example the model proposed in Piazzesi and Schneider (2008), which uses inflation illusion among economic agents to explain fluctuations in housing prices.

6 Around 3,200 households are polled for the HBS survey each year.
7 The household stress test methodology is described in another thematic article in this Report – Hlaváč, Galuščák and Jakubík (2013).
8 Namely, the surge in housing prices in 2006–2008, the subsequent fall in prices in 2009 and the continuing decline in 2010–2011. The data for the pre-2006 period, when housing prices also showed interesting dynamics, could not be used because of limited comparability of the source data.

database contains: (i) detailed information on the income and expenditure of individual households broken down by type (flow data for the given year); (ii) other socio-economic characteristics of households (e.g. age of household members, number of children, economic activity of household members, education of household members, living minimum of household); (iii) information on debt type and repayment size for various types of loans (broken down into goods repayments, house purchase loan repayments and other loan repayments);[9] (iv) information on housing type (regulated/unregulated rent, cooperative, own house/apartment, etc.). The HBS database also contains information on the locality in which the household lives/owns property (region and municipality size) and on housing type, period of construction, equipment, floor area and so on.

The last-mentioned type of HBS information allows us to link the HBS data to the regional data on property transaction prices, published also by the CZSO. These prices are broken down by property type (apartment versus family house) and by region. For each region the prices are further broken down by municipality size. This means that for each household we can estimate the "shadow" value of the property it owns and track how price changes are reflected in its consumption and saving decisions. The price data are shown in Chart 2. Besides the general trends in housing prices they reveal increasing price differentiation across regions over time, with apartment prices in smaller municipalities rising more slowly than prices in the biggest cities. Another interesting piece of information is that although housing prices show similar trends across regions, their dynamics are not entirely homogeneous and there are frequent changes in the price rankings of individual regions.[10]

For the purposes of this article we worked with the following categories derived from the Household Budget Survey. *Consumption* contains households' expenditure on food, manufactured goods and services, excluding consumption in kind. *Gross income* comprises all money income[11] of all household members net of savings drawn, loans received and income from the sale of property and securities. *Taxes* consist mainly of income tax, property and inheritance tax and administrative and other fees. *Gross savings*[12] include new deposits, newly granted loans, purchases of securities in the given period, supplementary pension schemes and other types of insurance, private enterprise costs, property purchase expenditure and other investment in dwellings, and loan repayments. *Gross borrowings*[13] are items that reduce households assets, specifically savings drawn, various loans received, income from the sale of securities and income from the sale of movables and immovables in the given period. We then define *net savings* as *gross savings* minus *gross borrowings*[14] and *net income* as *gross income* minus *taxes* plus *gross borrowings*. Finally, we define the *saving rate* as *net savings* divided by *net income*. According to the above definitions, the following identity must hold:

$$\textit{Gross income} - \textit{Taxes} \equiv \textit{Consumption} + \textit{Net savings}$$

3. METHODS AND RESULTS

The empirical part of this article focuses on whether and how property ownership affects the following relationships: (i) the dependence of *consumption* on *net income*, (ii) the dependence of the *net saving rate* on *net income* divided by the *living minimum*, (iii) the dependence of the *gross borrowing rate* on *net income* divided by the *living minimum*.

The task of comparing households' consumption, saving and borrowing is complicated by the fact that households owning different types of property can display systematically different behaviour, influenced mainly by their position in the life cycle or to different sensitivity of expenditure and income to the business cycle and the risk of unemployment during a recession. For this reason, we apply a more

9 The HBS does not contain information on the stocks of individual types of loans, but merely provides an identifier of whether or not the household has a particular type of loan. It also gives information on the flow of loan repayments for the year and on the drawdown of new loans, from which the amount of loans taken out can be estimated only indirectly and not entirely accurately (it does not contain information on the interest rate or residual maturity of the loan).

10 For example, as regards prices in municipalities with a population of less than 2,000, Ústí nad Labem, Moravia-Silesia, Olomouc, Pardubice and Karlovy Vary have been alternating in the role of region with the lowest apartment prices.

11 i.e. income from main employment, income from self-employment, pensions and other social benefits.

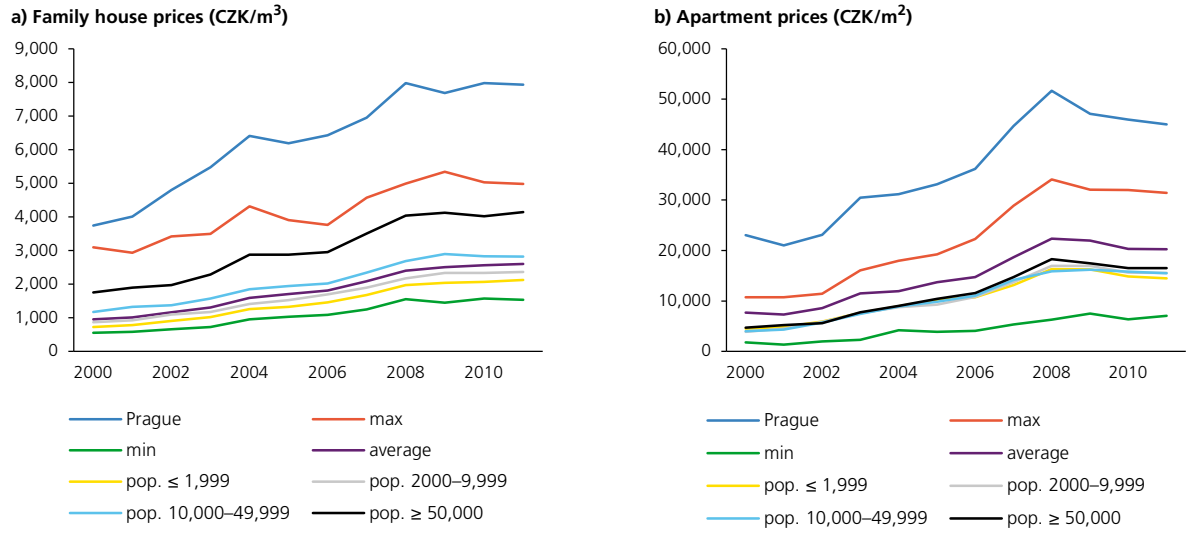
12 Gross savings and other variables (net savings, deposits, loans provided, gross borrowings, etc.) are treated in the HBS methodology as flow variables linked to the change in the stock of the variable for the given year (for example, new deposits of households are referred to as deposits in the HBS).

13 This is again a flow variable, which should rather be referred to as "gross borrowing", which often has a counterpart within gross savings.

14 Net savings are thus accompanied by a change in the stock of assets of households, although equality does not hold. However, the differences arising from the revaluation of accumulated assets, which are negligible for a large proportion of assets (e.g. deposits with banks), can be substantial in the case of immovable assets.

CHART 2

STRUCTURE OF PRICES IN THE CZECH REPUBLIC



Source: CZSO, authors' calculations
Note: Transaction prices; maximum for Czech Republic excluding Prague; likewise average prices for municipalities with a population of 50,000 or more.

sophisticated econometric technique – Propensity Score Matching (PSM) – to the problem.

The PSM method is based on comparing statistical units that have a different key characteristic (in this article the statistical units are households and the key characteristic is that they live either in a dwelling that they own or in a rented property) but similar observed characteristics in some sense. The PSM method therefore allows us to analyse the effect of the key characteristic on chosen indicators while taking into account the heterogeneity of the statistical units' observed characteristics.[15]

To better explain the PSM method, let us consider the situation where – apart from the key characteristic to be compared – the statistical units differ in only a few discrete features (e.g. education or household type). In this case, it is possible to conduct a statistically valid comparison within each group and the resulting estimate of the effect in the population will be a weighted average of the estimated effects in the individual subpopulations.

If there are many relevant features, it is clearly impossible to construct just a few homogeneous subpopulations containing a sufficient number of observations. However, Rosenbaum and Rubin (1983) proved that if certain assumptions are met, the comparison of statistical units will remain valid if it is performed on the basis of the so-called propensity score. The propensity score is a one-dimensional metric indicating the probability that the statistical unit under consideration either has or does not have the key characteristic under study. In other words, the PSM method enables us to reduce multidimensional heterogeneity into a single dimension (the propensity score) and perform a valid comparison of the statistical units under study on the basis of this one dimension.

Formally, the method is based on estimating the probability that a particular household belongs to a particular group (most frequently defined by the discrete choice method) and then matching households that have a similar probability of belonging to a particular group but in reality belong to different groups. In this way it is possible to filter out the heterogeneity in the composition of the individual groups. Econometric details on the implementation of the PSM method can be found, for example, in Caliendo and Kopeinig (2005).

15 The PSM method is used mainly in the medical sciences (e.g. to investigate the impact of a particular therapy) and in microeconomics (e.g. in the study of active labour market policy or the provision of support to firms in disadvantaged areas) to assess the effects of a particular treatment on a population. In such cases, the key characteristic is usually whether or not the unit under study was exposed to this treatment (therapy, unemployment training, grant) – see, for example, Gertler et al. (2011). Our article demonstrates that the PSM method has a wider application than just assessment of the effects of intervention (medical or economic).

TABLE 1

ESTIMATES USING PSM METHOD

	Indicator Unit	Consumption (absolute in CZK)	Net savings (% of net income)	Gross borrowings (% of net income)	Deposits (% of net income)	House/apartment loan repayments (% of net income)	Savings drawn (% of net income)
Rental vs. own apart., 2007	Point estimate	-20,048	-0.17	6.84	9.76	1.15	6.81
	p-value	*0.01*	*0.50*	*0.00*	*0.00*	*0.00*	*0.00*
Rental vs. own house, 2007	Point estimate	-28,239	9.24	2.36	6.33	1.07	2.41
	p-value	*0.00*	*0.00*	*0.04*	*0.00*	*0.00*	*0.02*
Rental vs. own apart., 2008	Point estimate	-16,734	1.29	4.43	6.73	1.02	5.07
	p-value	*0.05*	*0.25*	*0.02*	*0.00*	*0.00*	*0.00*
Rental vs. own house, 2008	Point estimate	-49,782	6.27	-3.46	-2.21	1.34	-3.58
	p-value	*0.00*	*0.00*	*0.01*	*0.08*	*0.00*	*0.00*

Source: CZSO, authors' calculations

We applied the PSM method to the data described in the previous section for the period 2007–2008, when housing prices in the Czech Republic recorded the strongest growth.[16] For the comparison, we only used data for households that live in dwellings for which housing prices recorded growth exceeding the 25th percentile of the growth distribution.[17] These dwellings were identified according to municipality size and region.

We performed the following two types of comparison using the PSM method: (a) households living in rented housing versus households living in their own apartment, (b) households living in rented housing versus households living in their own family house. We also experimented with households living in cooperative apartments, and we also attempted to divide households in rented housing into those which have regulated rent and those which have unregulated rent, and property-owning households into those with and those without a house purchase loan. In all cases, however, we lacked sufficient observations, so many of the results were insignificant.

The first step of the method (estimation of the propensity score) was performed using a probit model in which the explained variable was the indicator of whether the household owns a property (house or apartment). The set of explanatory variables consisted of net income, net income normalised by the living minimum, social group, number of pensioners in household (relative to number of persons), number of consumption units (weighted number of household members according to OECD methodology, where children are assigned lower weights according to their age), sex, age and education of head of household, age and education of spouse (where present), municipality type, period of construction, total floor area, number of rooms and internet access. The socio-demographic characteristics control for households' different expected income potential, and the variables relating to the amenities of the property control for the level of wealth. The inclusion of these variables means that the PSM method should yield a valid statistical comparison.

Table 1 shows the results of the point estimates of selected indicators and their statistical significance. The presented p-values were calculated using the bootstrap method. The data are interpreted as follows: for example, the figure -20,048 (column "Consumption", row "Rented vs. own apart., 2007") means that a household living in its own apartment spent CZK 20,048 less on consumption in 2007 than a comparable household living in a rented apartment. Likewise, the figure 9.24 (column "Net savings", row "Rented vs. own house, 2007") means that the net savings of households living in their own houses were 9.24 percentage points higher than those of households living in rented dwellings in the given year.

Table 1 points to some interesting results. First, during the period of rising housing prices, consumption was, *ceteris paribus*, lower in property-owning households than in renting households; this effect is statistically significant.

16 We also applied the method to the preceding period but did not identify significant differences between property-owning and non-property-owning households for that period.

17 This is important because even in 2007 and 2008 average housing prices fell for some types of dwellings. The chosen 25th percentile of the housing price growth distribution by dwelling type corresponds to 10% growth in house prices in both 2007 and 2008, 20% growth in apartment prices in 2007 and 15% growth in apartment prices in 2008.

House-owning households have statistically significant higher net savings than households in rented housing on average.[18] These two observations directly contradict the mechanism of the effect of housing prices on macroeconomic dynamics as described in the model of Iacoviello and Neri (2010). So, if this mechanism is present in reality, it is evidently not significant.

This result is in line with studies in other countries, which also show (although there is no consensus in the literature) that growth in the consumption of property-owning households and households that use rented housing is quantitatively very similar after adjustment for household type.[19] We can therefore say that the results of microeconomic studies do not corroborate the relevance of the credit mechanism described in the introduction to this article and thus do not support the way in which many DSGE models are currently being extended. Paradoxically, this way of extending such models is popular in international institutions and some central banks.[20]

As the comparison was performed using the PSM method, these results cannot be explained by different socio-demographic compositions of owner-occupier households and households in rented dwellings. It is theoretically possible that these households differ in unobserved characteristics (such as "impatience to consume"). This may also be intuitive: more patient (thrifty) households may be more likely to be able to save money for their own housing and simultaneously have higher net savings even during a boom (such as in 2007 and 2008). If this explanation is right, it would also weaken the relevance of the credit constraint mechanism according to Iacoviello and Neri (2010). This is because impatient households should – at least in the long run – have a lower chance of owning property to use as collateral when necessary.

An alternative possible explanation for the higher savings of property-owning households is that such households are repaying housing loans and this item is part of net savings. Households living in rented dwellings usually report zero for this item. On average, the difference in loan repayments between property-owning and non-property-owning households is around 1.0–1.3% of income, i.e. less than the difference in their saving rates. In other words, higher loan repayments by property-owning households contribute to higher net savings (and lower consumption), but explain only a small fraction of the observed difference in consumption and net savings.

Second, households differ not only in consumption and net savings, but also in saving structure. The results show that property-owning households typically had higher gross borrowings, but these did not outweigh their higher gross savings (both in terms of flows in accordance with HBS terminology). This suggests that such households were changing the structure of their portfolios: on average they were drawing more on their accumulated savings, while reporting higher new (gross) deposits and not surprisingly repaying housing loans. The data show that households drawing on their existing savings were usually saving at the same time – in other words they were restructuring their portfolios.[21] This suggests different financial behaviour by property-owning households, behaviour which is hard to explain by credit constraints.

Third, one might ask what is causing the differences described above. Is it that one group of households contains "atypical" households that have savings, debts or investments of a distinctly different nature? Or is it that the distribution of savings of property-owning households has merely shifted while keeping its shape? For the net saving rate, the data clearly support the second option: the distribution of the net saving rate has a smaller dispersion in the case of property-owning households than in the case of households living in rented dwellings. Otherwise, the distributions for the two groups are similar in shape (see Chart 3).

In the case of gross borrowings (see Chart 3), deposits and savings drawn, the distributions are distinctly bimodal for both types of household: some households report relatively low values of these indicators (below 15% of their income), while others report values exceeding 25%. In the case of owner-occupier households, the latter group is relatively larger. This shows that these households were more likely to have been restructuring their portfolios in the given period (reporting a higher frequency of deposits and saving withdrawals) without getting more into debt than households living in rented dwellings. Consequently, the difference between the types of households under study is

18 The exception is the comparison of households living in rented dwellings with those living in their own apartment for 2007, where the difference in net savings is both economically insignificant (0.17% of net income) and statistically insignificant (p-statistic 0.50).

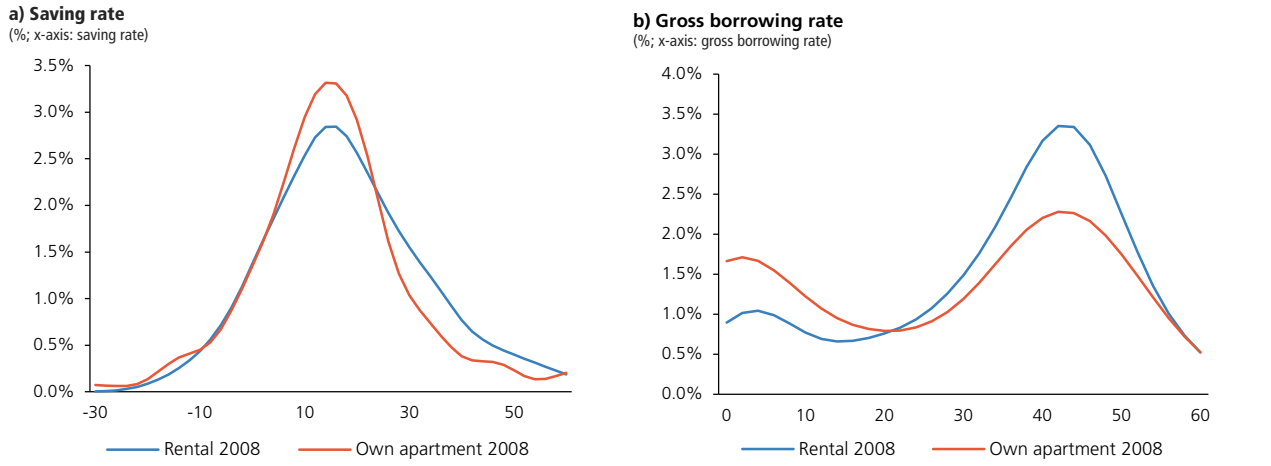
19 See, for example, Attanasio et al. (2009) and Calomiris et al. (2009).

20 See, for example, Walentin and Selin (2010), Christensen et al. (2009) and Lambertini et al. (2010).

21 The exception is 2008 in the case of house-owning households, which have lower gross borrowings and lower savings drawn than households living in rented housing.

CHART 3

EMPIRICAL DISTRIBUTION FUNCTION



Source: CZSO, authors' calculations
Note: Kernel density estimation.

due not to the presence of a significant "atypical" group of households, but rather to different consumption and investment behaviour.

Fourth, it is natural to ask whether property-owning households behaved differently when housing prices were rising compared to when they were falling. For this purpose, we calculated estimates using the PSM method for 2009 and 2010 for households that live in regions where housing prices were indeed falling. According to our results, the above differences between renting households and owner-occupier households persist even at a time of falling housing prices, although they are quantitatively smaller and statistically less significant. This may be due to a smaller number of observations[22] or to lower interest rates and rising refinancing of housing loans, which might have been reflected in lower loan repayments and therefore also in lower net savings in households owning a house or apartment.

4. CONCLUSION

This article set out to empirically test – on data available for Czech households – the strength and extent of the impact of housing price movements on the financial position of households, i.e. on their borrowing and consumption decisions, and indirectly on their ability to repay their debts. The article arrives at two statistically significant findings. The first is that consumption is, *ceteris paribus*, lower in property-owning households than in households living in rented dwellings, and also that property-owning households have higher net savings than households in rented housing. This was particularly the case in the period of rising housing prices, but differences between the two types of households persisted during the recent period of falling housing prices. This finding casts doubt on the relevance of the commonly assumed credit mechanism for explaining the observed correlation between housing prices and macroeconomic dynamics in the Czech Republic. The second conclusion is that households also restructured their portfolios differently depending on their ownership relationship to the property. This different portfolio restructuring was reflected in property-owning households on average drawing more on their existing savings but simultaneously generating more in new deposits, so that their net savings were higher. Not surprisingly, property-owning households also had higher housing loan repayments, which are also part of their savings. However, this difference explains only a small fraction of the observed difference in net savings.

22 In the case of households living in family houses prices did not fall in all the regions under review in 2009–2010, so these households were not included in the PSM estimate for those years.

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