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Financial savings and wealth of Hungarian households after the 2008–2009 crisis

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1. Introduction

Between 2008 and 2020, the net financial wealth of Hungarian households more than tripled, expanding by around HUF 40 trillion. Households' net financial wealth relative to GDP increased by over 55 percentage points, and this rise contributed significantly to improving the economy's external balance position and thus reducing reliance on external funds. While household indebtedness increased from the early 2000s, outstanding household debt declined sharply due to repayments after the 2008–2009 financial crisis. At the same time, the ratio of households' net financial assets to GDP also expanded substantially, rising by approximately 40 percentage points in 2008–2020 (Kékesi et al., 2015).

In my research presented in this work, I focus primarily on saving processes in the period up to 2020 following the 2008–2009 crisis. There were two major aspects prompting me to choose this period. On the one hand, no comprehensive analysis has been carried out on Hungarian data in the new millennium: since 2000, Hungarian savings have not yet been presented in this manner (Árvai – Menczel, 2000). On the other hand, the crisis was followed by such a change in the saving behaviour of Hungarian households that its analysis alone would be sufficient for more research. In this dissertation, I attempt to identify the factors that, at the macro level, may have contributed to the significant growth in Hungarian households' savings following the crisis and to portfolio restructuring. In addition, I also examine which factors may determine the level and structure of the financial wealth of Hungarian households.

The importance of choosing between consumption and saving, thus the relevance of this paper is well underlined by the fact that one of the primary objectives of macroeconomics is to determine the optimal level of these two aggregates (Phelps, 1961). According to international experiences (Kóczián et al., 2015) catch-up models relying heavily on internal savings, mainly by households, proved to be successful. A high level of household financial savings can support the entry of the current account into surplus, thus ultimately reducing a country's reliance on external funds and external vulnerability.

Household savings are commonly construed as the unspent portion of income, which is invested into different financial assets by households. However, economics (and this analysis) focuses not on this category, but on net household financial savings, which already takes households' borrowing into account. The borrowing and repayment by households affects the extent of the financial assets available to households.

The dissertation is structured as follows: The second chapter summarizes the most important saving theories that define the framework of the research topic. In this section, I present not only the most important theoretical conclusions, but also the outcomes of empirical research conducted so far: in addition to studies on saving on a macro level, the chapter also deals with the outcomes of research using micro-level databases. In addition to international examples, I will also review the most important conclusions of analyses carried out so far on Hungarian data.

In the third section, with the help of descriptive analysis I examine how the savings of Hungarian households developed in the 2000s, with special emphasis on the period following the 2008–2009 crisis. I explore the underlying factors affecting Hungarian savings and discuss how the composition of households' financial assets evolved after the financial crisis, as well as the changes in the structure of the Hungarian household financial portfolio. In this chapter, I also briefly discuss the effects of the 2020 coronavirus pandemic on households' savings. In the analysis, I focus on financial savings, also using descriptive analysis and macro data to show how the significant recovery seen in the housing market since 2014 has affected households' real estate wealth. In this chapter, I provide detailed description, which factors may have contributed to the trend that households started to increase their savings held in real estate to a greater extent from 2014 onwards.

To obtain a more accurate insight into the wealth position of households, I formulate hypotheses in chapter four. To the second research question – Which are the factors that may determine the extent and composition of the gross financial wealth of Hungarian households? A relatively new micro-level database available since 2015, the Household Finance and Consumption Survey (HFCS) helped me to provide an answer.

After the 2008-2009 crisis, changed borrowing attitudes, weak consumption growth and loan repayment problems brought the issue into the forefront; aggregate data available for each sector fail to provide sufficient information to understand economic developments. Therefore, in this chapter, I make findings related to the financial assets of Hungarian households based on the results of the first comprehensive domestic survey. Additionally, I also examine the factors that influence households' portfolio allocation decisions, including the choice between risky and non-risky assets.

In conclusion, I summarize the most important results concluded in previous chapters and identify new possible research directions. I believe that this research will contribute to a better understanding of the factors influencing the level and structure of Hungarian savings and

help to elucidate the factors that may have led to the adjustment seen during the period after the 2008–2009 financial crisis.

2. Theoretical framework for household savings

In this chapter, I examine which factors influence household savings and wealth. To this end, I summarize the most important theories on savings. Then, based on literature review, I also present the most important results of the empirical research carried out so far: in addition to studies on savings at the macro level, the chapter also includes the results of research using micro-level databases. In addition to international examples, I also review the results of previous research carried out on Hungarian data.

The developments in Hungary in the 2000s along with many international examples have also shown that the level of household savings and wealth can play a key role in a balanced and sustainable catch up. The key role of savings stems, on the one hand, from the fact that the amount saved by households can finance investments that allow for higher potential growth and faster convergence. Typically, higher household saving rates come with higher investment rates (Feldstein – Horioka, 1980; Blanchard – Giavazzi, 2002; Prasad et al., 2007; Ganioglu – Yalçın, 2013).

Compared to foreign funds, household savings provide a more stable financing for a given country[1]. In case funds available for the economy from domestic sectors are insufficient, investments can only be made in part from foreign funds, which can cause external imbalances, furthermore, if raising funds is based on debt liabilities, the process may, for reason of indebtedness, increase the vulnerability of the economy. (Antal, 2006; Komáromi, 2007; Kóczián et al., 2016).

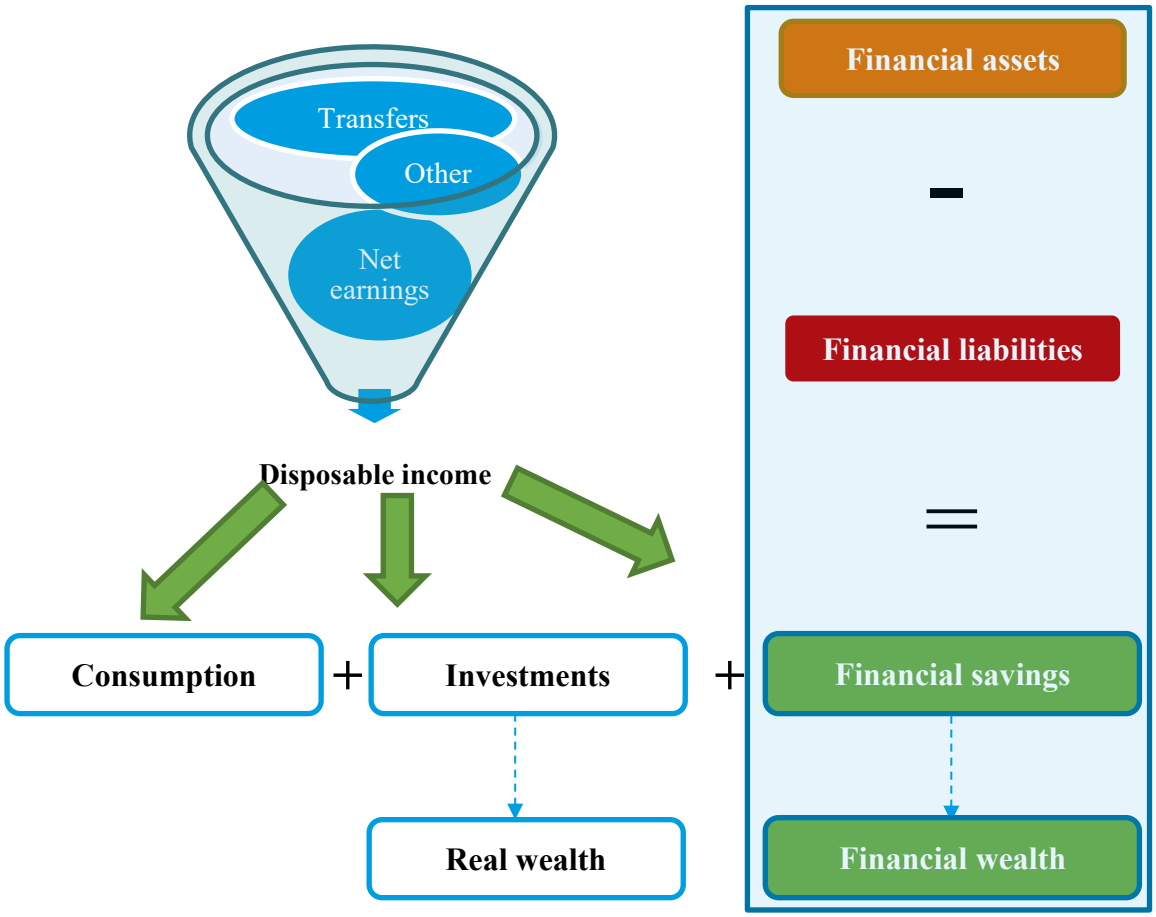
Before reviewing the factors affecting household saving, we should clarify the definitions used in the analysis. In addition to consumption, households can also use their disposable income for gross savings: accordingly, gross savings include not only net financial savings (net lending) but also investments by households.[2] (Baranyai-Csirmaz et al., 2016; 2nd equation). That is, the accumulation of non-financial assets is construed as investment, and the net accumulation of financial assets is construed as financial savings. In another approach, net financial savings mean the difference between the accumulation of financial assets and borrowing (Equation 4) – meaning, if we want to determine how much a household saves in a

[1] The investment time horizon of households is typically short, however, historical experience in Hungary, among others, shows that in crisis situations, retail investors do not sell their government securities, and even renew maturities, as opposed to non-residents (Kicsák, 2016).

[2] Net lending computed based on national accounts (income not spent on consumption and investment) and financial accounts (differences in financial assets and liabilities) are the same in theory but may differ in practice (Baranyai-Csirmaz et al., 2016).

given period, its net borrowing must be deducted from the change in its financial assets. It follows from this definition that it is also possible to examine the gross financial savings of households, but this only shows the change in the financial assets of the sector.

Figure 1: Definition of financial saving and financial assets



Source: Author's work

If we want to examine the level of savings, it is worth using net financial savings, i.e. the ability of households to finance other sectors. This shows how much real, non-borrowed resources the household sector provides to other sectors and thus determines the proportion of investments that will be financed from domestic or foreign funds. In addition to Figure 1, relationships are shown in the following equations:

$$PDI = S_H + C_H \quad (1)$$

$$S_H = NL_H + I_H \quad (2)$$

$$NL_H = PDI - I_H - C_H \quad (3)$$

$$NL_H(NFS_H) = \Delta A - \Delta L \quad (4)$$

$$GFS_H = \Delta A \quad (5),$$

where;

PDI	=	Periodic disposable income of households
S_H	=	Gross periodic savings of households
C_H	=	Consumption of households
I_H	=	Investment
NL_H (NFS_H)	=	Net lending = net financial savings
ΔA	=	Change in financial assets (accumulation of financial assets)
ΔL	=	Change in financial resources / liabilities (borrowing)
(GFS_H)	=	Gross financial savings

The variables presented so far are flow-type variables, meaning they show how much was saved, how much was borrowed or how much was invested in a given period. Collectively, these are also called *transactions*, as these processes take place by mutual consent of the economic actors.

On top, however, there are two additional types of economic processes: revaluations and other changes in volume. Revaluations describe stock changes occurring due to changes in the prices of assets and liabilities (changes in foreign exchange rates and changes in market prices).

Other stock changes are changes that are not the result of transactions and revaluations (for example, reclassifications, loan write-offs). Typically, these are technical or special, extraordinary items, not related to normal economic activity. Therefore, I do not deal with these separately in my dissertation, only where they had a significant effect on the development of asset indicators (Baranyai-Csirmaz et al., 2016).

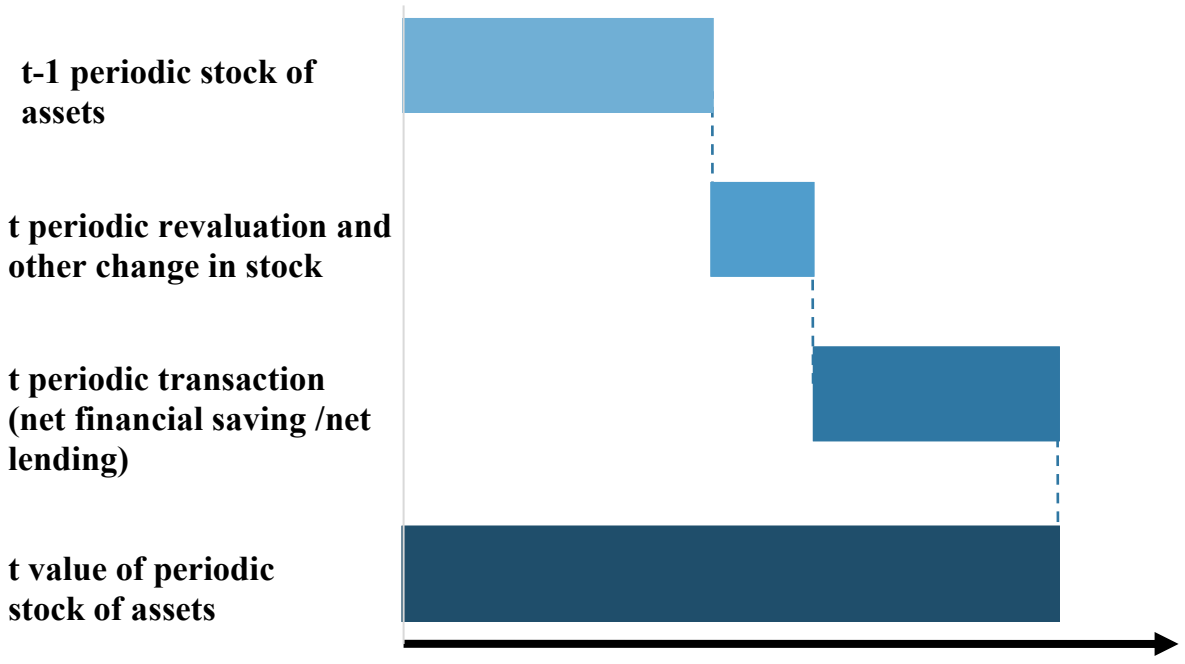
As a result of financial processes significant *stocks* may be accrued (stock type variables). Regarding household savings, *the net wealth of households* should be highlighted. Net financial wealth is derived from the difference between financial assets and the outstanding loans (Equation 4) – i.e., if we want to determine the financial wealth of a household in a given period, the stock of loans should be deducted from financial assets. With this method, we can get a "snapshot" of household wealth.

Another potential approach, if we already have stock data for an earlier period, is to use the economic processes taken place during the period to determine the stock at the end of the period. Changes in stocks over time may be the result of transactions, revaluations and other changes in volume (Figure 2). That is, if transactions (net financial savings), revaluation and other changes in volume taking place in given period are added to the stock measured at the end of the previous period, we come to the net financial assets at the end of the period.

Literature available in English uses the same term for household wealth (stock-type variable) and savings (flow-type variable). In my dissertation I tried to clearly indicate, which variable I am referring to. It is important to emphasize that one of the most important factors in net financial wealth is net financial savings, and if we want to analyse the saving behaviour of households, it is essential to examine this variable.

The empirical literature has been typically focusing on the study of the flow-type variable, net financial savings. This is well illustrated by the fact that twentieth century literature tried to explain the development of consumption mostly against savings (as can be seen in Chapter 2.1). We can also draw conclusions, however, about savings through consumption, as follows from the previous definition (Equation 3) – since savings are nothing but the unspent part of income (Equation 3).

Figure 2: Relationship between net financial savings and net financial wealth



Source: Gerlaki et al., 2017, page 9

2.1. Theoretical framework – Literature explaining consumption

In reviewing the literature, I focus on savings (flow-type variable), as on the one hand literature also preferred to focus on the examination of net financial savings, on the other hand, one of the most important determinants of wealth is savings.

Before the Keynesian Revolution (1930s), savings meant funds for capital accumulation and economic growth. However, after Keynes's General Theory, it has become accepted that saving is detrimental to the economy as it reduces consumption as a component of demand.

Most of the saving motives are already listed by Keynes (1936), however, it is worth noting that not all of the factors apply to all households (Browning – Lusardi, 1996; Tóth – Árvai, 2001). Each theory emphasizes different factors, but in the empirical examination of savings, all factors should be considered due to the heterogeneity of households.

The first factor is the *precautionary motive*, which means that for future uncertainty of incomes, households already set up a savings reserve in advance to offset any future decline in income. According to the *life cycle motive*, household save to satisfy future individual needs from future income.

The *intertemporal substitution motive* suggests that saving occurs to take advantage of interest rate increase and devaluation. Based on the *improvement motive*, households save to increase expenditures in the future, and according to the *independence motive* with the purpose of ensuring "freedom" in their decisions (unplanned expenditures).

According to the *enterprise motive*, households stash funds aside for enterprising and speculation projects. Based on the *bequest motive*, families would like to ensure the necessary goods for the next generation. Finally, the *avarice motive* says that certain households have excessive need to save by being irrationally averse to spending.

Keynes though recognized most motives determining the savings decisions of households, he viewed savings as dependent of actual income. As a response to Keynes's theory, two (perhaps even nowadays) most important theories developed explaining the consumption-savings decisions of households: life cycle hypothesis of Modigliani (1954) and permanent income hypothesis of Friedman (1957). These theories have been considered extremely novel in given environment, with one of the common claims that the extent of savings does not depend on current income but on the size of current wealth.

To understand the evolution of savings, we should first review consumption theories. This is because the theories available in literature usually address consumption.

The factor impacting savings by the general public the most may be *permanent income*. Permanent income is understood as the average income that households assume will persist in the future. According to this hypothesis, consumption, and thus savings also depend on long-term average income, the theory focuses on smoothing consumption.

Households, to level consumption expenditures during their life cycle, may react to changes in their permanent income in the following manner: households increase their savings, when they anticipate a decrease in their permanent income and decrease them, when they expect growth in their permanent income.

At the same time, from the viewpoint how saving evolves, it is essential whether households consider the income drop to be permanent or only temporary. With a temporary increase in income, the household is aware that higher income should not be expected in the long run, so they increase savings to smooth consumption. A temporary drop in income on the other hand, will reduce savings (Berry et al., 2009).

The level of *interest rates*[3] also significantly impacts the level of savings, as the extent of consumption smoothing depends on interest rates (Árvai – Menczel, 2001; Berry et al., 2009). Households, when current interest rates are higher, increase their savings, meaning that they redeem current to future consumption (*substitution effect*). However, according to the permanent income theory, an increase in the real interest rate – due to the higher interest rate earned on savings – increases the permanent income and thus increases consumption and leaves (or decreases) savings unchanged (*income effect*). All this, however, is only true if the net saving of households is positive, so the value of its financial asset expansion exceeds the value of liabilities.

The change in interest rate through the revaluation of financial wealth may have an impact on savings (*wealth effect*). If interest rates rise, this will lead to decreasing exchange rate of financial assets through a higher discount factor, thereby reducing the financial and real wealth of households. Decreasing wealth may prompt households to increase their savings and reduce their consumption, thus the wealth effect on savings has similar consequences to the substitution effect. So, based on the wealth effect, a rise in real interest rate reduces the present

[3] Typically, the impact of short-term deposit rates on savings was examined.

value of future incomes (and the value of financial assets), leading to declining consumption and higher savings (Elmendorf, 1996).

Overall, economic theories fail short to provide a clear answer to the interest rate sensitivity of household consumption or savings, and there are three channels, where changes in interest rates can affect savings. Many studies found the effect of interest rates to be minor or no correlation at all between the two variables (Árvai – Menczel, 2001), which was also supported by my own literature review.

Not only the interest earned on savings will impact savings, but also the interest on loans. It is worth to deal with *borrowing*, – as it is a component of net financial savings – in more details. Borrowing can vary both due to the supply and the demand side. The literature mainly examines changes in credit demand (permanent income hypothesis, life cycle theory), but we also find examples of credit supply analysis (liquidity constraints). Due to liquidity constraints (when borrowing becomes more difficult), savings increase and consumption expenditures based on future income growth decrease. At the aforementioned liquidity constraints, the supply of credit narrows, but a possible decline in borrowing may also be triggered by a decline in credit demand.

Similarly to effects of interest rates, *economic growth* may also impact saving rate through multiple channels, in different ways. It is generally accepted that higher economic growth results in higher saving rates in the long run (Schmidt-Hebbel et al., 1996), as marginal propensity to consume decreases rapidly in parallel with rising incomes (Ferrucci – Miralles, 2007; Alves – Cardoso, 2010).

Financial deregulation is also considered an important explanatory factor in the literature, but as with the previous two factors, empirical research found opposite effects on financial deepening (Árvai – Menczel, 2001; Berry et al., 2009; Boone et al., 2001). Although the willingness to save may increase as investment opportunities expand, the liquidity constraint may decrease as financial markets deepen, making it easier for households to access credit.

Mention should also be made of the precautionary saving theory, which mainly explains the evolution of financial claims and emphasizes the role of savings as a buffer (Carroll, 2001; Murata, 2003; Berry et al., 2009). The basic idea of the theory is that due to the future uncertainty of incomes, households already form savings in advance to offset any future decline in incomes. However, if we look at these time series for many countries (based on Eurostat, 2021b), we can see that consumption typically moves along with income – this contradicts the

theories described earlier, which assume relatively stable consumption. Net saving / consumption and income move together in the long run (see, e.g., Palenzuela – Dees, 2016). The precautionary motive is to try to resolve this contradiction: according to this, a temporary surplus income reduces uncertainty and thus increases consumption.

The size of savings is also influenced by *wealth* through changes of consumption. Households increase their consumption when their financial wealth rises and restrain it when financial assets lose value. The loss of assets thus entails additional accumulation of assets.

We can observe this phenomenon not only for financial assets, but also for real assets (see interest rate sensitivity for more details). However, house price developments also influence consumption-saving decisions through two channels. On the one hand, if homeowners can borrow at the expense of increased real estate value, they can use the cash flow from borrowing for consumption. On the other hand, due to rising house prices, households wishing to buy a home either need to accumulate more savings or borrow more, thus reducing net savings. Based on empirical results, this latter effect is stronger.

The importance of demographic processes is highlighted by the *life cycle hypothesis*. The life cycle hypothesis is that individuals plan their consumption for their entire lives – so the propensity to save can vary significantly at different stages of life. To achieve a constant level of consumption, households will resort to borrowing. Borrowing is determined by the combination of income and real interest. However, based on the theory, we cannot draw clear conclusions about how changes in these two macroeconomic variables affect savings (in the case of real interest rates, for example, two opposite effects, income and substitution, must also be considered).

With regard to demography, it is also worth mentioning that societies with a higher proportion of middle-aged people or a higher life expectancy also have higher levels of savings. A common claim of the life cycle and permanent income hypotheses is that households estimate their expected income over their lifetime and, unlike Keynes, base consumption decisions in specific periods not on their current income but on this total income. That is, it seeks the answer to trade-offs between present and future consumption.

The relationship between propensity to save and the aging society is also a disputed issue. In recent decades, aging society has become a global trend, especially in more developed countries, due to higher life expectancy and declining birth rates. Thus, this phenomenon, both globally and nationally, can have a significant impact on the propensity to save: In Japan, for

example, over the past quarter century, the decline in the savings rate and the phenomenon of an aging society have taken place in parallel (Koga, 2006).

The size of household savings is also influenced by *inflation*: it is in a positive correlation with savings. To maintain the real value of their wealth even in the event of high inflation, they increase their savings (Ferrucci – Miralles, 2007; Hüfner – Koske, 2010).

Among the other macroeconomic variables, it also worth mentioning *government's savings*. This is because this sector has a significant impact on the future income of households. One of the most cited correlations is that an increase in public sector savings typically has the opposite effect on the level of household savings. This is due to *Ricardo equivalence*, which argues that fiscal imbalances and rising government debt led to a sharp hike in future household expenditure, to which households respond by increasing their savings (e.g., based on Ricardo equivalence, households increase their savings after tax cuts in preparation for future tax increases).

Table 1: Factors Affecting financial savings based on the theoretical framework

Factor	Related theory, effects	Effect on savings
Income	Permanent income	**Positive**
Interest rates	Substitution, income and wealth effect	**Positive/Negative**
Economic growth	Decreasing propensity to consume	**Positive**/Negative
Wealth	Savings due to consumption of "surplus wealth" / rise in house prices	**Negative**/Positive
Financial deregulation	Widening investment opportunities / easing borrowing constraints	**Positive/Negative**
Demographics	Life cycle hypothesis	**Positive/Negative**
Uncertainty	Precautionary motive	**Positive**
Fiscal processes	Ricardo equivalence	**Positive**

Source: Author's work

The most important factors identified based on the theoretical framework, the related theories and the impact of the factors on savings are summarized in Table 1. As can be seen from the theoretical framework, the impact of each factor on financial savings is not clear, so it is worth looking at empirical studies on the subject.

2.2. Results of empirical studies

In the next subsection, I also present the most important results of the empirical research concluded so far. In part, I first review studies based on aggregate-level macro data and then deal with research using micro-level databases. I close the literature review with the presentation of the results established in previous research on Hungarian data.

2.2.1. Empirical studies based on macro data

After defining the theoretical framework, numerous studies have addressed macroeconomic factors that determine household saving decisions (Callen – Thimann, 1997; Masson et al.,1998; Haque et al., 1999; Bandiera et al., 2000). In this chapter, I first present the results of international empirical studies based on macro data.

The literature also provides examples of analyses focusing only one country or examining several countries at the same time. Models based on macro data are relatively popular because the data are easily accessible and the length of the time series is usually sufficient. However, the disadvantage of conclusions drawn from this type of data is that macro-level data can mask micro-level differences, i.e., these models are unable to handle household heterogeneity. Macro-level data are affected by structural changes even if the characteristics and behaviour of each microunit do not change.

The starting point for most studies is the permanent income or life cycle hypothesis, according to which individuals make their consumption decisions based on their expected income over their lifetime. According to most studies using macro-level data, household savings are mostly driven by current real incomes (wealthier / higher-income households tend to save more), demographic effects (older age groups are expected to save less) and interest rates (current consumption changes) alternative costs influence.

In recent past, in addition to the classical approach, the impact of financial liberalization on savings has begun to be examined. However, due to the heterogeneity of households, researchers have generally suggested micro-oriented research instead of using aggregated data (Hüfner – Koske, 2010). The 2008 crisis, however, gave a new “impetuses” to macro-models, which can be partly explained by the fact that macro-level data can be accessed in a shorter period, allowing researchers to examine the consequences of the crisis sooner.

Many studies conducted after the onset of the crisis sought to answer how households adapted to the shock (Alan et al., 2012; Banks et al., 2012; Kocziszky, 2018). One of the most important findings of recent studies is that the role of inflation may be outweighed by

unemployment expectations, i.e., the role of the precautionary motive has increased, leading to an increase in the saving rate.

The novelty of the models using macro data is that since a deviation from the long-run equilibrium level is conceivable in the short run, an error correction term based on the long-run estimate is used in the model building. One of the most used procedures is to assume a long-term co-movement (cointegration relationship) between income and savings. The advantage of this method is that it can be used to make a reliable forecast of the outcome variable, i.e., savings.

In the error correction model, separate long-run and short-run equations are estimated: the long-run equation is typically written on levels, the short-run change. The method can be used to examine which variables act in the short term and which in the long term. That is, one of the major advantages of these models is that the specification allows for heterogeneity of short- and long-term parameters. In the following, I present the main findings of some studies based on macro data.

Among the error correction models, a study by Ferrucci and Miralles (2007) before the 2008 financial crisis, which basically looks for variables that drive savings. In contrast to the other studies, they did not use directly observable savings in their model but consider indirect savings (the difference between income and consumption and investment). According to their results, savings are influenced by the following factors: general government balance, terms of trade, inflation, rate of income growth, and financial development indicator.

In their paper, Loayza et al. (2000) look for variables that determine savings using a panel estimate. According to their results, savings may show significant inertia. In addition, several country-specific effects were observed in several countries, which moved along with the explanatory variables, which may confirm the need to use micro-level data.

A study containing a panel estimate by Hüfner and Koske (2010) aims to explore common factors that influence the German savings rate. To achieve this, they used a panel estimate for the G7 countries in their study, which also distinguishes between the impact of financial liberalization and the impact of wealth. Based on their results, income, real interest rates and inflation have the greatest impact on savings, however, wealth effect may also have played a significant role (especially in the years before 2010). Based on these, the increase in the German savings rate can be explained by the following two factors: (1) in the late 1990s,

the level of savings lagged the equilibrium rate, (2) the equilibrium savings rate also moved upward in the early 2000s due to declining stock prices.

In their article, Alves and Cardoso (2010) also make an error correction estimate but use only Portuguese data. In addition to the delayed saving rate, the explanatory variables include inflation, real interest rates, GDP growth and the government balance.

In contrast to previous studies, the novelty of the model developed by Carroll et al. (2012) stems from the determination of the optimal amount of wealth to forecast household savings, which also considers the uncertainties influencing household decisions (expected unemployment, wealth shock). In addition to the optimal assets, the model also includes the amount of credit conditions and real estate assets.

In their study, Palenzuela and Dees (2016) also use a panel error correction model, however, they write the equations not for savings but for consumption. However, conclusions can also be drawn from this: the results show that income, real interest rates, indebtedness, unemployment, and stock prices and house prices are the main determinants of household savings.

Overall, there are many empirical studies in the literature that try to shed light on the macroeconomic factors that influence households' saving decisions. Knowledge of consumption theories contributes greatly to the understanding of the motivations behind households' housing investment and saving decisions, so the studies examined also typically aimed at proving these theories.

Many of the studies examining household savings include, in addition to the explanatory factors "suggested" by the theories, other macroeconomic variables to explain the savings rate. Such variables include government and corporate savings, growth, demographics, interest rates and inflation, changes in household wealth and income, the unemployment rate, and indicators capturing financial deepening.

In general, most of the examined indicators have the effect on households' savings as expected from the theories, but there are several variables that have the opposite effect on the aggregate savings rate or have no detectable, significant effect in practice. The most important conclusions of the empirical studies, the main factors influencing the savings, are the following (Table 2).

Table 2: Factors influencing savings based on studies based on international macro data

	Loayza et al.	Ferrucci-Miralles	Hüfner-Koske	Alves-Cardoso	Caroll et al.	Palenzuela-Dees
Change in disposable income	+					
Term of trade	+	+				
Savings rate (lagged)	+			-		
GDP growth		+		+		
Unemployment					+	+
Inflation	-	+	+			
Demographic trends	-	-	-			
Ricardo equivalence	-	-		-		
Disposable income	+		+			+
Real interest rate	-		+/-			+
Housing prices / share price / net wealth in proportion to PDI			-		-	-
Indebtedness*	-	-			-	-

* Indebtedness was quantified by bank loan / GDP or loan / income ratios and net borrowing, the size of outstanding loan, and credit conditions.

Source: Author's work

As I have shown in the section summarizing previous theories, the effect of *real interest rates* on savings is not clear. An increase in interest rates increases savings through the substitution effect between consumption and saving (Palenzuela – Dees, 2016), while it reduces savings through the income effect (Loayza et al., 2000), so studies are often unable to show the effect of this factor due to contradicting effects (Hüfner – Koske, 2010).

Economic growth may also have a positive correlation with the level of savings. This can also be explained by the fact that GDP growth is influenced by household income trends. Higher GDP growth is coupled with higher disposable income and may also have a positive impact on the income outlook for households. This positive correlation was confirmed by Ferrucci and Miralles (2007) and Alves and Cardoso (2010).

Demographic trends can also have an impact on the level of savings: an aging society is accompanied by a decline in savings, which is explained by the growing proportion of retirees in such societies who consume their savings. This phenomenon can be well explained, for

example, by the *dependency ratio* (ratio of dependents to workers) (Loayza et al., 2000; Ferrucci – Miralles, 2007; Hüfner – Koske, 2010).

The behaviour of the government can also affect the level of savings. The behaviour of public finances, *Ricardo equivalence*[4] can be captured by total government debt or the budget balance. The theory claims that higher government debt and / or higher deficits increase savings as households expect austerity (Loayza et al., 2000; Ferrucci – Miralles, 2007; Alves – Cardoso, 2010).

In addition, higher *unemployment* and *inflation* may also increase savings. Uncertainty, thus rising unemployment, also typically increases savings (Carroll et al., 2012; Palenzuela – Dees, 2016). Higher inflation increases savings, as higher savings are needed for households to maintain the real value of their wealth (Ferrucci – Miralles, 2007; Hüfner – Koske, 2010). However, Loayza et al. (2000) showed an opposite relationship. Out of the macro variables, even *terms of trade*[5] can have a positive effect on household savings, as an improving terms of trade increases income levels. However, this effect is typically observed only in the short term (Loayza et al., 2000; Ferrucci – Miralles, 2007).

According to the theory, *housing prices and stock prices* have a negative effect on savings through the wealth effect. This is because an increase in wealth can encourage households to reduce their savings and increase their consumption. Furthermore, higher housing prices necessitate higher mortgage borrowing, which may also reduce net savings (Hüfner – Koske, 2010; Carroll et al., 2012; Palenzuela – Dees, 2016).

As it is expected based on the theories presented earlier, *income* is one the most important factors with a positive impact ((Loayza et al., 2000; Hüfner – Koske, 2010; Palenzuela – Dees, 2016). Furthermore, the *previous level of savings* may also be a significant factor in how household savings evolve. Some studies claim that savings can be characterized by a significant inertia, i.e., current savings trends can also be influenced by past processes, typically positively. This positive effect was also demonstrated by Loayza et al. (2000) in their study looking for variables that determine savings using a panel estimate. At the same time, however, Alves and Cardoso found a relationship in the opposite direction.

[4] Ricardo equivalence: the disruption of the fiscal balance and the surge in government debt will lead to an increase in future household expenditure, to which households will respond by increasing their savings.
[5] Terms of trade show the relative ratio of price changes in exports to imports. If export prices fall to a greater extent or increase to a lesser extent than import prices, the terms of trade deteriorate. In opposite cases, terms of trade improve (CSO, 2010).

Finally, *household borrowing, and indebtedness* can also have a significant effect on the level of savings. The literature examines the effect of indebtedness mainly through changes in credit demand, the growth of which typically reduces net financial savings (Loayza et al., 2000; Ferrucci – Miralles, 2007; Carroll et al., 2012; Palenzuela – Dees, 2016).

2.2.2. Empirical studies based on micro-level databases

The research on macro data found country-specific effects that were not directly observable in several countries, which moved together with explanatory variables. This confirms that micro-level data should be used (Loayza et al., 2000)

In addition, the liberalisation and modernisation of the financial sector has also had a significant impact on the household asset portfolio, with the emergence of newer and newer instruments dramatically reshaping financial markets. The quest for a better understanding and analysis of Hungarian processes has also highlighted the importance of micro-level databases.

Following the 2008 crisis, the saving behaviour of the Hungarian households underwent significant transformation: because of the economic downturn and the unfavourable labour market and income outlook, loan repayments started to increase and net financial savings rose. At the same time, the different groups of the society were impacted differently by the crisis (unfavourable labour market situation, debt burden due to foreign currency loans). Macro data only showed that there is a gradual deterioration in the loan repayment ability of households because of the depreciating forint and the higher interest rates (Hudecz, 2012).

Households in an adverse income and wealth position were hit harder by the difficulties accompanying the increase in debt burdens. In other words, the crisis made it clear that aggregate macro indicators can mask several phenomena that are relevant for the economy. Revealing and understanding these processes has shifted attention from traditional aggregated data to more detailed micro-level databases.

Following the outbreak of the crisis, the importance of micro-level data was also underlined by the Stiglitz – Sen – Fitoussi Report (2009). The authors propose a reform of the statistical accounts currently used, including a comprehensive survey of household wealth. According to the report, it is not only the data shown in aggregate financial accounts that are needed here, but it should be supplemented by indicators that reflect the distribution of income, consumption and wealth.

In their report, Stiglitz and his co-authors focus fundamentally on the study of wealth: they argue that, alongside income, it is the distribution of wealth that determines who has access to the goods and services produced in an economy and to what extent. As consumption depends not solely on income but is also affected by wealth and by options to borrow. Consumption can be increased both by using assets and by taking on debt. Hence, databases are needed that provide data simultaneously on consumption, income, and wealth.

In addition, the distribution of income and wealth is unequal – with only a few percent of the richest holding a significant share of financial assets. This means that a small proportion of households can shape aggregate statistics. Consequently, the average provides little information for example about the material well-being of different groups in an economy.

To shed light on these differences, micro-level databases, individual and/or household level information are required. Different target groups – for example, groups of households in different income deciles, those with higher wealth or no wealth, households with limited credit and liquidity, or those with excessive debt – may react differently to economic shocks. Therefore, knowing the anticipated responses of these groups can greatly help economic policy decisions and thus contribute to a better insight into the evolution of aggregate data.

Studies based on micro-level data, due to the nature of the data used, often seek to answer a specific question: for example, how unemployment affects wealth or how the savings of elderly households have been affected by the crisis (Banks et al., 2012; Basten et al., 2012). Many studies have tried to explain the proportion of risky assets (King – Leape, 1987, Paxson, 1990, Bodie et al., 1992 Cocco et al., 2005). The stems from the fact that empirical observations suggest that high risk aversion causes households to hold only a very low share of equities, which cannot be explained by standard portfolio choice theory. In the literature, this is referred to as the «equity risk puzzle» (Gollier, 2001). Besides, some studies have shown that the financial and subsequent economic crisis also affected household savings decisions (Alan et al., 2012).

Although micro-level databases are generally more difficult to access, they (1) help to identify and manage household heterogeneity in analyses (particularly important in the crisis and post-crisis period), (2) tend to provide more stable patterns of behaviour at the micro-level than aggregate data do.

2.3. Studies on level of savings

In this chapter, I present studies that, since the turn of the millennium, have introduced many novelties in the micro-level database-based analysis of savings processes. What these studies have in common is that, as with studies based on macro data, they seek to explain the level of savings. At the same time, contrary to models based on macro data, the explanatory variables are now derived from a micro-level database, which allows a better understanding of individual households' propensity to save.

In an article, Murata (2003), for example, looks for evidence of precautionary saving. He based his study on a Japanese micro-level database of responses specifically from women. The novelty of his model is that it used explanatory variables that capture the economic outlook and the uncertainty of pensions, in addition to quantifiable data. Results show that in nuclear family households[6] or in households not supported by the parents of individuals constituting the household, there is precautionary saving (primarily due to uncertainties around government pension).

In their study, Ando and Altimari (2004) used micro simulation to forecast Italian savings up to 2100. For the micro simulation, groups were mapped based on the age of the head of household and the demographic characteristics of the family, but the novelty of the model compared to other models is that individual households are used as the basis for the calculations, rather than groups. The model basically consists of three components (1) demographic component, (2) sociological "behaviour" (education, employment, willingness to work), (3) optimisation. In the latter, the correlation between variables and individuals' income is analysed, and households' decisions on savings-consumption and retirement are simulated.

Using the model, Ando and Altimari (2004) concludes that the dramatic ageing of the population should lead to a decline in the aggregate saving rate, but results fail to confirm this. The decreasing number of children and the decline in social security benefits offset this effect, and the aggregate saving rate increases steadily over the initial 30-year period, then declines moderately and stabilises at a level higher than initially.

The novelty of Horioka and Wan's (2007) study is that they perform panel estimation based on micro-level data for Chinese regional disaggregated data. The variables that explain Chinese savings are queried using GMM estimation, the explanatory variables include income growth, dependency ratio, lagged savings, real interest rate, inflation, urban dummy, among

[6] A family in which members of a single nuclear family live together is just a family of parents and their children.

others. Their results show that the high level of Chinese savings can mainly be explained by lagged savings, income growth, real interest rates and inflation.

Beckmann et al. (2013) tested the life cycle theory using micro-level data. Their study was based on the Euro Survey (ONB) and looked at savings flows in Central, Eastern and South-Eastern European countries. The database confirmed the life cycle theory (while older people saved more than expected) and found that in addition to age, education and income play an important role in the saving decisions of households.

Overall, the studies based on micro-level databases have similar results to those based on macro-data: the most important macroeconomic variables in the studies are income, lagged saving, dependency ratio, real interest rate, economic growth and inflation. Thus, the novelty of these studies lies in the fact that they were able to include household-specific factors, such as the age of the head of household, education level and family type, in the explanatory variables (Table 3).

Table 3: Micro-level factors influencing savings based on studies based on international macro data

Variable	Effect on savings
Income	+
Wealth	+
Education	+
Age of the household head	-
Family structure (nuclear family)	+

Source: Author's work

2.4. Studies on the structure of savings

Besides the level of household saving, its structure is also an interesting area of research. Although the theory of portfolio selection makes normative statements about households' portfolio allocation decisions, descriptive research on people's decisions is still a relatively new area. The availability of micro-level databases has made the research possible: the use of micro-level data is essential for the analysis of household wealth structure.

As it can be deduced form the life cycle hypothesis, *age* can affect not only the level of household savings, but also their structure. According to the life cycle hypothesis, older households are expected to increase their savings and to hold less risky assets (Cocco et al. 2005, Bodie at al., 1992) In contrast, some studies have found that age has a positive effect on the probability of holding risky assets, even after taking the effect of wealth size into account

(King – Leape, 1987, Paxson; 1990). This is explained on the one hand by older households having a deeper financial knowledge, and on the other hand, as young households often face liquidity constraints, they prefer liquid assets that are considered relatively safe.

Regarding households' portfolio allocation decisions, several studies have confirmed that increases *in income* and *in wealth* are associated with higher diversification. Uhler and Cragg (1971) were the first to use US household survey data to examine the effects of income and wealth on household portfolio allocation decisions.

Bertaut and Starr-McCluer (2002), as well as Börsch-Supan and Eymann (2002) find that both the holding and the portfolio share of risky assets correlate positively with wealth, and income growth increases the holding of risky assets. However, when they examined the reasons to affect the ratio of risky assets in financial wealth, they found a negative correlation for income. According to Cocco et al. (2005), labour income can be considered a risk-free asset, and its growth increases equity holding.

Research by Alessie et al (2002) on Dutch data also confirmed a positive correlation between total net wealth and risky assets and between the ratio of risky assets and wealth. And Calvet and Sodini (2010) found a strong positive correlation between wealth and the ratio of risky assets in the portfolio.

In addition to income, several studies pinpointed the role of *education* in holding risky assets. Higher education attainment may reduce "cost of entry", so that an increase in educational attainment may have a positive effect on holding risky assets (Haliassos – Bertaut, 1995). However, some studies suggest that higher educational attainment may lead to lower savings, as households with higher educational attainment have lower income risks and therefore save less and do not typically invest it in risky assets (Haliassos, 2005).

Holding risky assets may be affected by the *profession of the household head*, in addition to educational attainment. People more readily invest in the company they work for because they know how it operates. In the literature, this is referred to as the "equity home bias", since it increases households' risks without perceiving it (Lewis 1999, Carroll, 2001).

The *gender* along with the *marital status of the household head* also influences, whether they tend to hold risky assets. Some studies have found that women tend to be more conservative in their investments and hold fewer risky assets than men (Barber – Odean, 2001). Empirical research on marital status has found that households with multiple earners are more likely to hold risky assets. This very well might be explained by the fact that, on the one hand,

income from two different sources provide a coverage for the risks and on the other hand, joint investment decisions mitigate the impact arising from gender differences (Barber – Odean, 2001; Agnew et al., 2003).

The households' *attitude towards risks* may also have an impact on decisions regarding portfolio allocation. Although we should see higher diversification with higher risk aversion, empirical observations fail to support this presumption. Research has found that the more risk-averse a household considers itself to be, the less likely it is to hold risky assets. In other words, it is possible that many households do not fully understand the risk-reducing effect of diversification (Barberis – Huang, 2001). Besides the attitude towards risk, *the background risks perceived by households* (income risk, risk from property ownership) may also play a role in their investment decisions (Guiso – Paiella, 2008; Cocco, 2004; Heaton – Lucas, 2000; Zhan, 2015; Dong – Jiang, 2016; Fratantoni, 1998).

Among external factors, risky asset holding is most affected by transaction and information costs, which have a negative impact on risky asset holding, especially by poorer households. Government policy can also affect households' portfolio allocation decisions. For example, spread of subsidised pension accounts to promote self-care has increased household equity ownership (Bertaut – Starr-McCluer, 2002).

According to Guiso (2003), the holding of risky assets is more widespread in countries considered to be more transparent. Giannetti and Koskinen (2003) find that in countries where minority investor rights are poorly protected, investors are reluctant to invest in shares.

According to Leape (1987), the tax system can affect household decisions by reducing transaction costs. Alessie et al. (2002), as well as Börsch-Supan and Eymann (2002) find that tax incentives have a significant impact on portfolio allocation decisions. Moreover, borrowing constraints can also decrease households' risky asset holdings (Guiso et al, 2001).

Background risks perceived by households may also have a negative impact on risky asset holding. In his article, Zhan (2015) identifies three such background risks: those associated with income risk, the ones associated with property ownership and background risks associated with entrepreneurial income. According to Zhan's (2015) approach, households that are at risk of *employment income risk*, are those working in sectors where unemployment is high. The risk arising from greater exposure to the real estate market may also restrain the risk taken in other markets, such as financial markets *(risk arising from property ownership).* And *entrepreneurial income risk* means that households with a higher weight of entrepreneurial income as their

income ratio, are less likely to invest in risky financial assets (Heaton – Lucas, 2000; Zhan, 2015).

The key factors affecting the holding of risky assets are summarised in Table 4:

Table 4: Factors influencing holding risky assets based on studies based on international macro data

Variable	Effect on holding risky assets
Income	+
Wealth	+
Education	+
Age of the household head	+ / -
Female household head	-
High risk tolerance	+
Employment income risk	-
Risk from property ownership	-
Entrepreneurial income risk	-

Source: Author's work

2.5. Results up to date on Hungarian data

Research based on macro data

Switching to the research on Hungarian data, we can see that Júlia Király was the first to deal with the topic in detail in her 1989 candidate's thesis (Király, 1989). The analysis aimed to describe and capture Hungarian household behaviour using relevant theory and empirical models.

Ábel et al. (1992, 1998) examined changes in the structure of household savings and the impact of interest on financial and real savings between 1970 and 1990. They showed that the real interest rate also influenced financial savings in the socialist economy. Households' real wealth increased during this period: however, the share of financial assets declined relative to the share of housing and durable goods.

Then, the last comprehensive model-based analysis of Hungarian data was prepared in the early 2000s. In their studies, Árvai and Menczel (2000 and 2001) examined the savings decisions of Hungarian households in the second half of the 1990s. One of their key findings is that financial sector liberalisation, easing liquidity constraints, sustained economic growth leading to optimistic income expectations, and impatience with deferred consumption in the years preceding the study may have played a role in the decline in household savings.

In his 2002 article, Mosolygó drew on international trends to understand the decline in domestic savings rates. Expanding on Hungarian savings, he concludes that interest rates play a much larger role in the evolution of savings than assumed. In addition to accounting for the factors affecting savings, he also examines changes in the structure of savings: although savings are quite return-sensitive by item, other specific elements may play a role in these substantial restructuring (Mosolygó, 2002).

In his 2009 study, Bethlendi analysed household savings mainly from the perspective of the credit market. Looking at data over the past almost four decades, he found that despite significant changes in the institutional system, the long-term behaviour of domestic households is characterised by a strong preference for consumption and housing investment over financial savings.

In his doctoral thesis, Tibor Tatay reviewed the factors affecting the financial savings of Hungarian households, the trends in their size and the structure of savings. He believes that it is unrealistic to conclude savings calculations derived from lifelong income expectations, as income expectations are highly unstable in Hungary. Furthermore, Hungarian households are not too familiar with instruments, they do not have the right information and cannot assess the risk of the assets. He proposed a model to develop a domestic health savings scheme, as he believes that in the long run this form of savings could also support domestic savings (Tatay, 2009).

Contrary to analyses of the determinants of savings, Kocziszky et al's 2018 study based on macro data mainly focused on the impact of the financial crisis on household savings. The international comparison is based on savings trends in the Visegrad countries.

They conclude that although after privatisation, the growth of the household income gap slowed down in the 2000s, the process continued after the 2008 crisis, but they estimate that it took at least three to four more years to reach the pre-crisis growth rate. At the same time, wealth gaps may widen more slowly as households have become more cautious and countries'

vulnerabilities have led them to pay more attention to prevention (e.g., macro-prudential regulation, ethical interest rates, and improving the financial culture of households) to cope with the effects of expected financial crises.

In their 2014 study, Palócz and Matheika examined the role of household savings in the stability and growth of economies and trends in Hungarian savings flows between 1995 and 2014 (Palócz – Matheika, 2014). They believe that Hungarian saving trends are in line with international trends: in the mid-2000s, before the onset of the global financial crisis, not only US but also a good part of European households deviated from rational saving behaviour patterns – i.e., they started to over-borrow.

In their 2017 paper, Pandurics and Szalai discussed the theoretical background and evolution of savings. In addition to international trends, they also mapped the Hungarian household savings rate and the factors influencing it, based on which they projected a positive medium-term outlook for the level of domestic savings. They closed their paper by drawing the attention to the risks involved in the real estate market and supplementary pension schemes, which also have a significant impact on savings rates and household wealth.

With my colleagues we also investigated the level of financial savings of Hungarian households and portfolio structure of household wealth based on macro data (Kékesi et al., 2015). The article emphasized a "benefit" of savings, i.e., their role in financing government debt. After the crisis subsided, from 2013 onwards, households also started to restructure their portfolios, using their savings in bank deposits to buy government securities and mutual funds.

These developments have led to a significant increase in public financing. It is important to emphasize, however, that in addition to direct financing, it is also worth looking at indirect financing – including mutual funds and other funds – which accounted for an even larger increase in household financing after 2012.

Micro-level data-based research

Switching to analyses on Hungarian micro-level databases, studies based on Hungarian micro-level data since the turn of the millennium have generally focused on the asset side of household wealth, mainly real wealth.

For example, Bukodi and Róbert (2000) researched how the asset endowment and cultural activity of Hungarian households evolved over time and within particular social groups.

The results of the survey indicate that the wealth situation of Hungarian households depends significantly on the education of the household head and his/her various labour market characteristics (occupation, job status). They found a non-linear relationship between income and household wealth, with those in the last quintile of income groups having a markedly more favourable wealth position than the other groups. When examined by age, they found that middle-aged households have higher wealth than young or old households, in line with life cycle hypothesis.

The TÁRKI Household Monitor also deals with the wealth situation of Hungarian households. The Household Monitor longitudinal cross-sectional household survey series was launched in 1998, and in its framework TÁRKI staff visit around 2000 households. The survey is non-panel and focuses on labour market and income issues, but also includes consumption, wealth, savings, economic expectations, attitudes, social relations, political party choice and religious affiliation (Szívós – Tóth, 2013).

The survey conducted by TÁRKI is only partially suitable for answering questions on the composition of savings, as in the questionnaire no questions are asked about the assets of households accumulated in bank deposits. According to the available macro data (financial accounts), bank deposits account for a significant share of household savings, in almost 20% (MNB, 2021a).

Based on the 2012 survey, Szivós and Tóth analysed the demographic and geographical distribution of housing wealth in 2013 (Szívós – Tóth, 2013). In a subsequent publication (Szívós – Tóth, 2015), they have also addressed the vulnerability of households in more detail. In their analysis they focus on wealth – real estate and financial assets – and loans.

The other Hungarian studies using questionnaire-based surveys mainly focused on lending. A 2007 study dealt with portfolio quality based on a pre-crisis questionnaire survey (Holló, 2007). This showed that the resilience of Hungarian households having loans appeared to be adequate. The author has already at that time highlighted potential risks: a depreciating forint and rising interest rates on the one hand, and rising unemployment on the other, could have a negative impact on the non-performing loan ratio.

Even after the onset of the crisis, the focus was on portfolio quality and the sector's adjustment to the crisis. The Household Budget and Living Conditions Survey (hereinafter: HBLS) was used by Gáspár and Varga (2009) to their micro simulation. They found that

repaying the loan was predominantly difficult in families where the repayment exceeded 40% of household income. However, job losses played only a minor role.

In his study, Hosszú (2011) found that while for lower-income households the problem was caused by the weakening forint and higher interest rates leading to a sudden, huge jump in instalments, for middle-income households faced with similar consequences due to job loss. Balás (2013) also analysed over-indebtedness using the HBLS database. He concluded that as incomes fell, the repayment burden increased in ratio of income, with 14% of households paying more than half of their income. Critically high monthly instalments have mainly affected those with low incomes (Balás, 2013).

In her dissertation, Horváthné Kökény (2014) examined the role of government in the development of households' savings. In her representative survey, based on a questionnaire, she classified the Hungarian households into four groups based on their saving habits (conscious self-care, self-care, living for today, aiming to become self-care). She concluded that the geographical location of residence does not affect Hungarian saving habits, but the type of settlement does. She also demonstrated that government, through the education system, can and does have an impact on the financial literacy of the population, and there is such demand from the public. (Horváthné Kökény, 2014).

Dancsik and colleagues researched the characteristics of defaulting households (Dancsik et al., 2015) It also deals with the demographic and geographical characteristics of the households concerned (age, education, place of residence), in addition to the wealth and income situation of the households (credit/wealth, monthly instalments in ratio of income).

The statistical characteristics, sample size and representativeness of the first comprehensive household wealth survey in Hungary, the Household Finance and Consumption Survey (HFCS) survey, as well as the main statistical characteristics of the sample were discussed in detail in the study by Simon – Valentiny (2016). The results of the survey were summarized with my colleagues (Boldizsár et al., 2016). The article, a few findings of which are also presented in the fourth chapter of the dissertation, provides an overview of the real and financial assets and liabilities of households. The motivation for households' holding risky assets was discussed in another paper (Balogh et al., 2019)

In Chapter 2, I reviewed the theoretical framework and reviewed relevant studies on the topic. All these suggest that both the level and composition of savings are influenced by many factors (Table 5).

Table 5: Key factors affecting the level and composition of savings

	Variable	Effect on savings	Effect on holding risky assets
Macroeconomic variables	Income	+	
	Lagged savings	+	
	Economic growth	+	
	Unemployment	+	
	Inflation	+	
	Aging society	-	
	Ricardo equivalence	-	
Financial system variables, prices	Real interest rate	+/-	
	Indebtedness	-	
	Prices (housing prices, share prices)	-	
	Exchange rate	+	
Micro-level variables	Income	+	+
	Wealth	+	+
	Education	+	+
	Age of the household head	-	+/-
	Family structure (nuclear family)	+	
	Female household head		-
	High risk tolerance		+

Source: Author's work

Gaining insight into the framework and empirical research has also shown that analysing and predicting household saving processes is not a simple task. At the same time, forecasting the level and structure of savings can provide very important information for many economic actors (government, banks, financial service providers).

3. Trends in Hungarian household savings and wealth based on macro-level data

After a summary of the theories and empirical studies on household savings, switching topics, I turn to the savings of the Hungarian households. First, I introduce the wealth of Hungarian households. Although my dissertation focuses mainly on financial savings and wealth, to examine financial wealth in more detail and put it in context, it is essential to deal with other real (mainly real estate) wealth of the households.

In the next subsection, I will expand on one of the main research questions of my research, which is to investigate the macro-level factors that might have been behind Hungarian savings processes after the 2008-2009 crisis. In this chapter, I also briefly discuss the effects of the 2020 coronavirus pandemic on the savings of the households.

In the analysis I focus on financial savings, but I also present in a subsection, also using descriptive analysis and macro-level data, what factors may have contributed to the trend; when the households started to increase real estate held in savings from 2014 onwards and how this may have affected household financial savings.

I will then look at how the financial portfolio of households has evolved since the 2008-2009 crisis, and what major changes have taken place in its structure. Regarding portfolio allocation decisions, I devote a separate sub-section to government securities, as there have been significant changes in this asset since 2012. As a conclusion, I briefly outline, which are the actors' households ultimately provide funding to through their savings.

3.1. Development of real estate and financial wealth of Hungarian households

Household assets consist not only of the net financial assets[7] they own, but also of real assets. In the national accounts, the balance sheet of households includes value of the stock of dwellings and other buildings, (garages, workshops, storerooms, holiday homes, other real estate), machinery required to productive activities of households (machinery, equipment) and tangible assets related to agricultural activity (farm animals, plantations) (Baranyai-Csirmaz et al., 2016).[8] I focus on the value of household main residence (HMR) among all types of real

[7] Net financial assets include foreign savings as well as domestic savings.
[8] According to the statistical methodology, durable goods (e.g., motor vehicles, furniture, consumer durables) are not entered as accumulation but as consumption. Likewise, stocks held for consumption (e.g., food, clothing, tools) are not considered either. In addition, the households' acreages and the value of the land belonging to the property are also not included (Baranyai-Csirmaz et al., 2016).

assets, as this type of asset accounts for a significant share of the sector's real assets, also according to national accounts data.

In the case of Hungary, it is also worth analysing real estate assets in addition to financial assets, as Hungarian households clearly prefer holding real assets, including real estate, to financial assets (Boldizsár et al., 2016). This finding stems from the fact that people view home ownership as a priority. This is confirmed by the Household Finance and Consumption Survey (HFCS), a joint OECD/ECB survey of households in the euro area.

According to the micro survey, 84 percent of Hungarian households own their residential property (HFCS, 2014). In terms of financial wealth, almost all households have a bank account – and thus some kind of financial asset – but only 60% of households have financial assets of more than HUF 150,000, and only 20% have investments other than bank deposits (Boldizsár et al., 2016).

In concert with the above, households' real estate assets well exceed their net financial wealth (Figure 3). I made my own estimate of the real estate assets: based on the housing market index (Banai et al., 2017) of the CSO for residential real estate, collected during the 2011 census. It was not the national accounts dataset I used to estimate real estate assets.

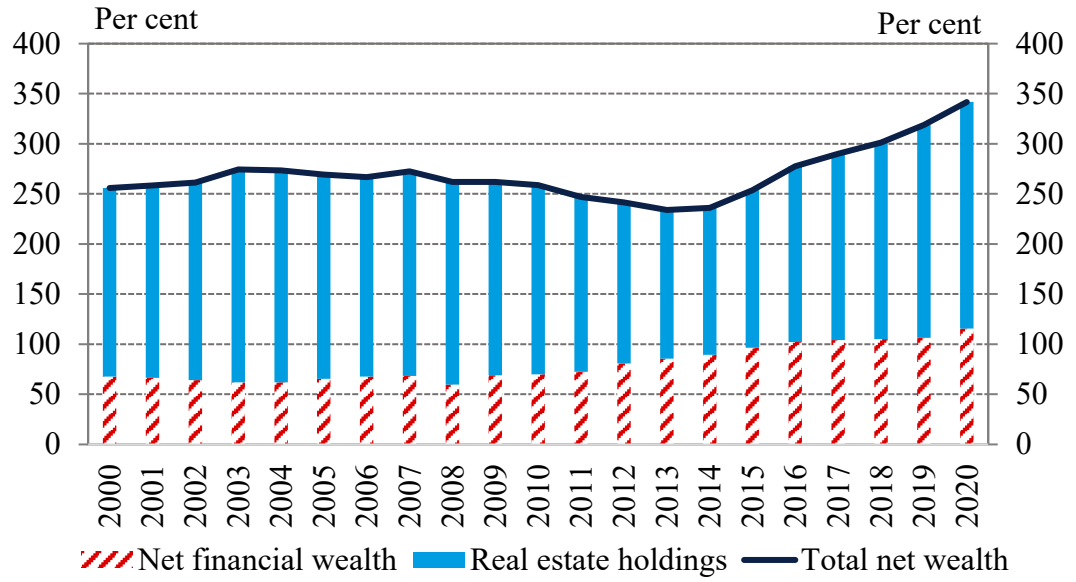
The results show that net financial assets, which were broadly stable until 2010, began to rise after the crisis, while housing assets declined until 2014 – since then, both assets have shown significant growth. In Hungary, the value of real estate is almost twice the net financial wealth of households.

Real estate wealth stood at 190 percent of GDP in the early 2000s, before it grew to more than 210 percent of GDP at the end of 2003, mainly due to the housing price boom. Subsequently, however, housing wealth as a share of GDP declined slightly, despite the price increases. The contraction in the housing market following the onset of the 2008-2009 crisis, as demand contracted, has also had an impact on stock figures, with housing assets accounting for around 150% of GDP at the end of 2013. In the following years, however, housing wealth rose sharply again due to price increases in the housing market, and by 2020 it exceeded 220 percent of GDP.

Overall, it can be established that the assets of households are dominated by real assets, including real estate, and the share of financial assets is lower. The change in the households' net financial assets is smaller than in housing assets: It settled between 60 and 70 percent of

GDP between 2000 and 2010, and then grew significantly after 2010. From 2014 onward, both assets started a significant growth.

Figure 3: Net financial and real estate assets of households as a proportion of GDP*



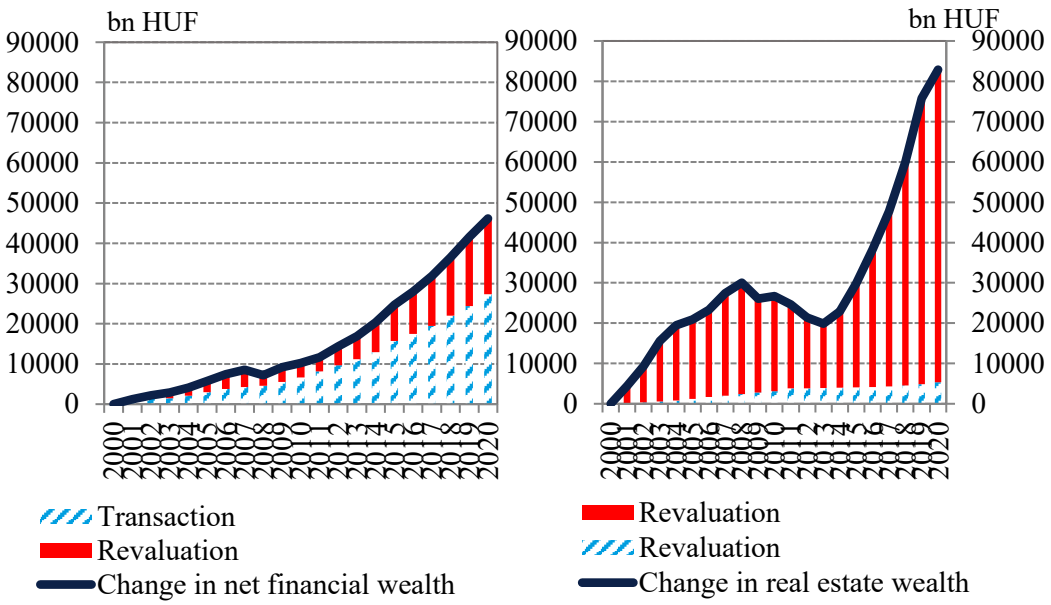
* The value of real estate is self-estimated based on CSO data and the MNB housing market index (Banai et al., 2017).

Source: MNB (2021a), MNB (2021d) CSO (2021e), author's work

The development of housing assets is significantly influenced by house prices, investments are only of minor importance, while net financial assets are greatly affected by transactions in addition to revaluation (Figure 4). The purchase of a second-hand home at the sector level does not reduce net financial assets, as the value of the home is shown for the seller regardless if purchased on credit or without. Therefore, as income and credit conditions improve, the market can only balance itself in the short term with rising prices.

This process took place in the 2000s until the crisis, when real estate assets grew. After the crisis eased, in the market under pressure from sellers, prices fell, which was accompanied by a decline in real estate assets. After 2014, however, prices rose again, which was also reflected in the growth of housing wealth (Békés et al., 2016). Contrary to this, the accumulation of financial assets, which more or less evenly increased before and after the crisis, has the biggest impact on the development of financial assets. Until the mid-1990s, financial wealth was mainly affected by transactions, but thereafter revaluation also significantly affected the value of financial assets (Tatay, 2009). While net financial assets of households increased because of the revaluation of financial assets, the revaluation of loans moderated them, albeit to a lesser extent, mainly due to the revaluation of foreign currency loans.

Figure 4: Factors of the net financial and housing wealth of the Hungarian households (cumulated values)



Source: MNB (2021a), MNB (2021d) CSO (2021e), author's work based on Vadas (2007)

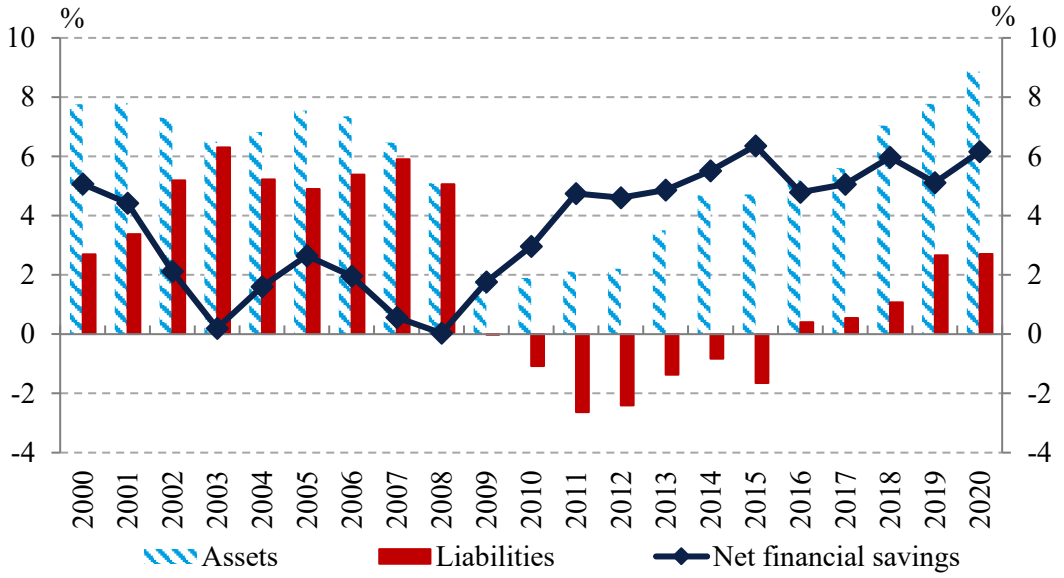
3.2. Financial savings and wealth of Hungarian households after the 2008-2009 crisis

In this chapter, I examine how the financial wealth and savings of Hungarian households progressed in the period following the 2008-2009 financial crisis. However, to understand the processes, it is essential that I first briefly review the "situation" of the Hungarian households when they were hit by 2008-2009 crisis. In the analysis I focus on transactions, as we can anticipate the savings decisions of households from these data –transactions are processes that take place by mutual consent of economic actors (Baranyai-Csirmaz et al., 2016). I place less emphasis on revaluation[9], the other factor that determines the financial wealth of households, but where necessary, especially in the development of stock data, I also describe the effect of this factor.

The net financial savings of the Hungarian households decreased to close to zero by the mid-2000s (Figure 5), with growing indebtedness playing significant therein. In the early 2000s, rising incomes facilitated by expansive fiscal policy, followed by income expectations that became overly optimistic because of EU accession, led to accelerating household consumption and an increase in lending.

[9] Revaluation is defined as changes in stocks due to changes in the prices of assets and liabilities (changes in foreign exchange rates and changes in market prices).

Figure 5: Net financial savings of Hungarian households ss a share of GDP *



* Underlying trends adjusted for one-off effects
(pension fund reform, early repayment scheme, forint conversion)

Source: MNB (2021a), author's work

In the early 2000s, in addition to improving income prospects, the financial sector development also supported the jump in retail lending. The introduction of subsidized forint lending also significantly increased household borrowing, which also led to a rapid decline in net savings.

Significant borrowing failed to decrease even because of the fiscal adjustment measures of 2006, as their income-reducing effect was considered temporary by households (Palócz – Matheika, 2014). Therefore, due to the still optimistic income expectations, households smoothed consumption expenditures with increasing borrowing. In addition, because of the high domestic interest rates warranted by a significant budget deficit and with the purpose of achieving the inflation target, households also decided to take out foreign currency loans in an increasing ratio (Banai, 2016; Erhardt et al., 2015).

Therefore, the result of the financial crisis of 2008 hitting Hungary was that in addition to the high budget deficit, the net financial savings of households decreased to zero percent. All this led to a situation where external funds had to be relied upon to finance the economy, clearly indicating that the Hungarian economy was on an unsustainable path (Hoffmann et al., 2013b).

At the same time, not only the jump in borrowing, but also the decrease in domestic household gross savings played a significant role in reducing the net financial savings of households, thus increasing the country's external vulnerability. The fact that albeit households' financial assets increased in the pre-crisis period also played a significant role in these unsustainable processes, as a significant part of the increase came from additional savings originating from the sale and purchase of second-hand dwellings. The reason behind is that if a given household finances the purchase of a used home from borrowing, it not only increases the debts of the sector, but also appears in the financial assets of the household selling the property. In other words, in addition to the indebtedness of the household sector, the risk of external vulnerability was also increased by the fact that a diminishing part of the gross financial savings of households came from income (from fundamental, productive economic processes).

On the one hand, the growth of financial assets was also supported by the rise in mortgage placements since the 2000s: at the beginning of the millennium, subsidized housing loans (home-building program) were behind the expansion. In addition, following the tightening of program conditions, the spread of foreign currency loans and property secured loans also contributed to the trend (Erhardt et al., 2015).

Therefore, due to the deteriorating income situation, increasing consumption and borrowing of households because of fiscal austerity, not only the gross financial savings of the sector, but also "fundamental" savings originating from underlying processes, not related to borrowing, have significantly decreased. Overall, household savings in Hungary gradually declined until the crisis, mainly due to a decline in GDP based income: the level of consumption as the proportion of GDP was stable between 52 and 54 percent during this period (Eurostat, 2021b). This means that in the years before the crisis, household incomes fell, but their consumption did not: they used their wealth to smooth their consumption (Palócz – Matheika, 2014).

Starting from the autumn of 2008, significant changes were seen in the consumption and savings decisions of Hungarian households (Hoffmann et al., 2013b; Palócz – Matheika, 2014; Erhardt et al., 2015; Kékesi et al., 2015; Boldizsár – Kékesi, 2017). After the onset of the crisis, savings rose significantly, and precautional savings considerations intensified with a sharp decline in consumption rate. Next, based on the theories outlined in Chapter 2, I demonstrate the channels, how the crisis that began in the autumn of 2008 affected savings.

The theoretical views presented claim that crises tend to significantly reduce household incomes. If income decline is perceived to be persistent by households, the magnitude of

financial savings will increase. According to the life cycle and permanent income theory, savings are expected to increase due to dropping incomes. At the same time, if households considered a part of the income shock as transient, there could even have been a decline in savings.

This was the case in Poland: the net financial savings of households have decreased significantly there since the beginning of the crisis and have been negative for a good period (Eurostat, 2021a). This occurred while there was a significant decline in financial assets, still borrowing decreased less than in other countries. This means that Polish households smoothed their consumption better – mainly from increasing their financial assets to a lesser degree. The Polish economy was able to grow despite the crisis, which may have been due to a higher level of consumption smoothing by households.

Based on the theory of precautional savings and wealth effects, we could also theorize an increase in financial savings in Hungary. Uncertainties regarding the expected income of households increased dramatically: in addition to falling income, they also had to reckon with the rise in unemployment and the depreciation in exchange rate (Felcser – Körmendi, 2010). As a result of the crisis, the forint depreciated, and shares' and government securities' prices began to plummet: households' financial assets declined. And declining wealth tends to dampen household consumption with a parallel increase in savings.

The crises brought on an increase in real interest rates (Felcser – Körmendi, 2010), because of hikes in bank interests and falling inflation. The level of real interest rates may have affected net financial savings via two factors, both of which had an upward effect on net financial savings. As a result of rising lending rates, household borrowing declined significantly (of course, other factors may have played a role in this as well: the depreciating forint, regulatory changes, and the narrowing of credit supply). And the rise in deposit rates could, in theory, have prompted households to increase their financial assets.

Although financial claims did not increase in parallel with the rise in real interest rates, the level of real interest rates still had a significant effect on Hungarian savings (for more details, see the subchapter dealing with the portfolio structure of Hungarian households). In the initial phase of the crisis – due to the increased interest rate level and presumably risk aversion – Hungarian households significantly increased their deposits (Figure 10). This trend was reversed in parallel with an increased risk appetite and a gradual decline in interest rates: In 2010, households began to downsize their bank deposits, leading to a pre-crisis portfolio structure.

Introducing stricter liquidity constraints also led to an increase in the net financial savings of the household sector. In addition to declining credit demand, declining credit supply may also have boosted savings. However, the crisis was accompanied by a sharp decline in the credit supply (willingness to lend) by the banks. Household thus were not able to smooth consumption with borrowing, borrowing by households fell, so increasing net financial savings.

On the financing side, the increase in net financial savings took place while there was a decline in borrowing, but in parallel with this, there was also a decline observed in financial assets. Thus, the tightening of liquidity constraints has increased financial savings through a reduction in borrowing.

In parallel with net borrowing, the increase in financial assets also decreased (Figure 5) In addition to the decline in income, the number of real estate sales dropped in parallel with the decline in housing loans, so the financial assets of households selling real estate did not increase, i.e., it can contribute to the reduction of financial assets.

Households' net financial savings rose to above 3 per cent after the outbreak of the crisis from the typically almost zero value as a proportion of GDP in the years before the crisis. Starting from 2011 this trend continued: both net and gross savings increased (Figure 5). Tax exemptions, the strengthening of the prudential motive and the payment of real yields also contributed significantly to the improvement.

This increase in household savings may also have been supported by the introduction of the flat tax on personal income in 2011, as it increased disposable income among higher income groups, such as those with higher savings rates. The additional income generated through tax reduction may have been reflected in the improvement of the net lending position. There may be another potential explanation for this, namely that households first saw the additional income from the transformation of the PIT system as a one-time source of income, i.e., as a non-permanent income, therefore saving more from this source.

In addition, the volatility of the forint/Swiss franc exchange rate may have contributed to the increase in savings – households may have formed a safety buffer due to frequent changes in instalments (precautionary motive). In addition, early repayment scheme may have contributed to the increase in savings. Within the early repayment scheme, between October 2011 and February 2012, households repaid HUF 1,350 billion in loans, which meant savings in the amount of HUF 370 billion for households due to the applied preferential exchange rate. Among the measures to reduce the credit burden on households, early repayment scheme was

one with one of the biggest effects. Under this framework, between October 2011 and February 2012, households had to option to repay their foreign currency loans at the exchange rate of CHF/HUF 180 for Swiss francs and at EUR /HUF 250 for euro loans. That is, they were able to repay their loans at a rate nearly 25 percent lower than the actual exchange rate.

Thanks to the early repayment program, household debt decreased by HUF 1,350 billion by repaying HUF 980 billion. However, the option of early repayment was for the most part only realistic to households that were able to generate the capital needed to repay the foreign currency loan either from their financial savings or by taking out another loan. Due to the difference between the current and the preferential repayment rate, banks incurred losses on loans repaid cheaper (Erhardt et al., 2015). Early repayment scheme also affected savings: on the one hand, the program allowed households to defer their consumption expenditures to create a savings buffer, and on the other hand, households began to rebuild their financial assets used for the early repayment after the program.

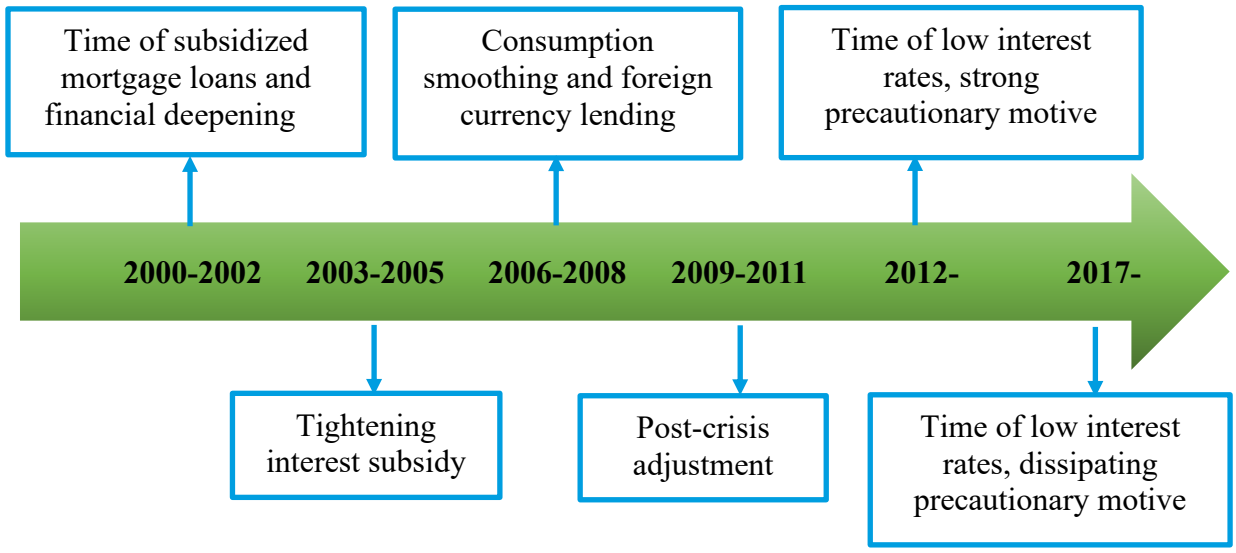
Post-crisis developments (declining incomes, rising unemployment, and the higher instalments) have encouraged households to increase gross financial savings. At the same time, in addition to the increase in income supported by the reform of the tax system, the repayment of loans also contributed to the increase in the net financial savings of households. Uncertainty over rising unemployment due to the crisis, rising instalments due to the depreciating forint, and the consequent declining consumption were also reflected in the decline in credit demand (MNB, 2009; MNB, 2010; Figure 5). Similarly to credit demand, credit supply also declined: on the one hand, the depletion of external funds and, on the other hand, the rapid deterioration of the loan portfolio had a negative effect on banks' supply (Várhegyi, 2010; Banai, 2016).

As a result of all these processes, the net financial savings of households increased from close to 0 before the crisis to close to 6 percent of GDP by 2015-2017 (Figure 5). The precautionary motives could only start to dissipate from 2017: income growth, improving economic prospects and a return to confidence in the banking system will lead to a pick-up in consumption, so the slight decline in net financial savings over this period can be explained by these factors (Figure 5).

I have summarized the most important "chapters" of savings in the years following the turn of the millennium on 6. It is important to emphasize though that many individual factors make it difficult to assess the savings processes of the years following the 2008 crisis. These include the introduction of a flat tax on personal income tax, the reform of the pension system,

the payment of real yields (Kékesi – P. Kiss, 2011), as well as the early repayment program announced in September of 2011 (Erhardt et al., 2015).

Figure 6: Major periods of net financial savings of Hungarian households



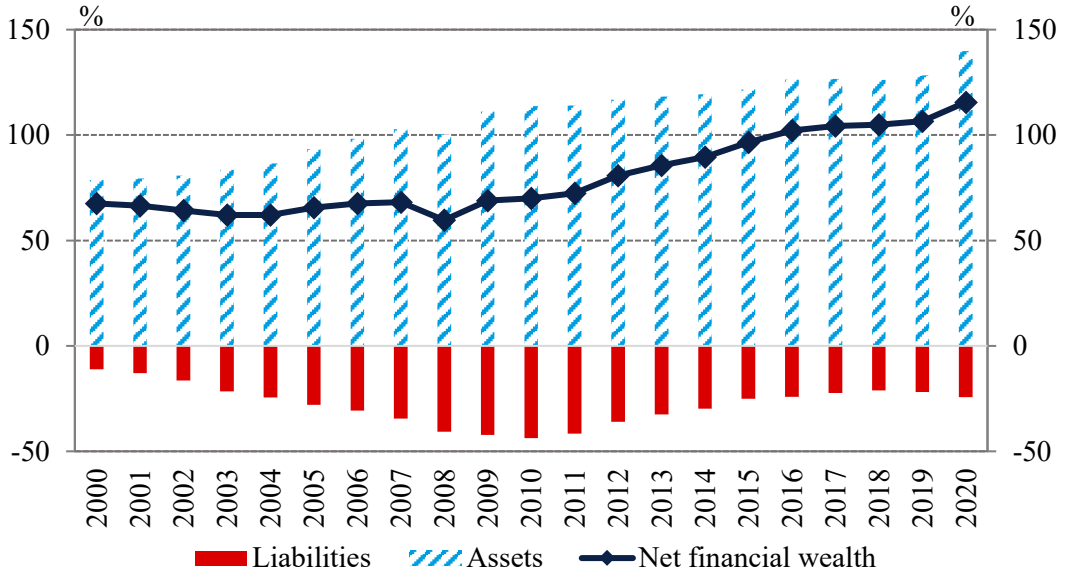
Source: Author's work based on Kékesi et. al. (2015)

The increase in savings is clearly seen not only in transaction data, but also in the stock indicator, in the net financial wealth owned by households. Since 2010, the net financial wealth of the Hungarian households has increased by more than HUF 26,000 billion, to 116 percent of GDP (MNB, own calculation based on 2021a). The resulting high level of domestic savings is very favourable for economy as household savings as a source of internal financing significantly reduce the country's external vulnerability (Boldizsár – Kékesi, 2017).

By the end of 2020, the wealth of the Hungarian households significantly exceeded the values observed in the region (Eurostat, own calculation based on 2021a): net wealth, which accounts for almost 116 percent of GDP, was 140 percent of gross assets and 24 percent of debt (Figure 7). The increase in net financial wealth was supported by both an increase in financial assets and a decrease in financial liabilities, as we also saw earlier in the transaction data. Financial assets contributed more to the increase: since 2009, the stock of financial assets as the proportion of GDP has increased by almost 30 percentage points. The decrease of financial liabilities was also accompanied by an increase in net financial wealth: the stock has declined

by 18 percent of GDP since 2009 (albeit since 2018, we have seen a slight increase in financial liabilities).

Figure 7: Net financial wealth of Hungarian households as a proportion of GDP



Source: MNB (2021a), author's work

Between 2009 and 2020, the nominal increase in net financial assets amounted to more than HUF 26,000 billion, major part of which (55 per cent) can be attributed to new savings indicating the propensity to save (MNB, own calculation based on 2021a). The second biggest impact was the revaluation of stocks: this contributed nearly 35 percent to growth. Another 5-5 percent can be explained by government measures related to retail foreign currency loans (early repayment, settlement and forint conversion) and other stock changes (Figure 8).

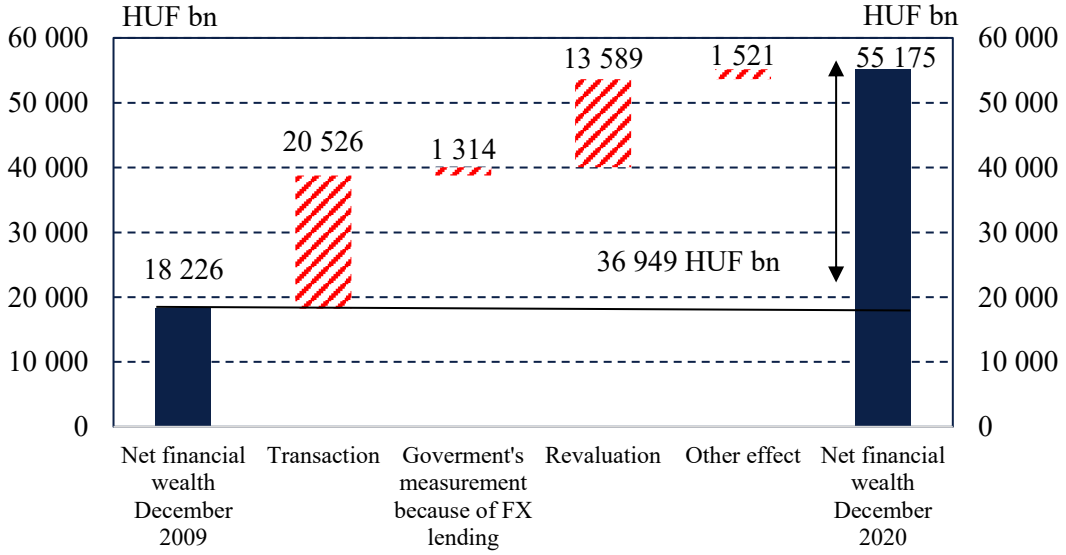
Most of the revaluation can be explained by the revaluation of financial assets, including the revaluation of business shares (listed, non-listed, other shares). Financial assets also grew by the increase in the forint value of foreign currency assets due to the depreciation of the forint. However, the growth of net financial wealth was slowed down by an increase in foreign currency debts in the period under review due to the depreciation of the forint. (Foreign currency liabilities increased only due to revaluation, as no further foreign currency borrowings were made at that time.)

Among government measures, the preferential early repayment, the unilateral increase of interest rates by banks and the settlement by applying the exchange rate gap should be highlighted. In the early repayment scheme, between October 2011 and February 2012,

households repaid HUF 1,350 billion in loans. The applied preferential exchange rate increased financial savings and wealth of Hungarian households by about HUF 370 billion.

When foreign currency loans were converted into forints, there was a settlement which was necessary due to the unilateral interest rate increase and the exchange rate gap applied by the banks. The settlement of outstanding loans denominated in foreign currency reduced the outstanding loan portfolio by more than HUF 760 billion, which meant an increase in financial savings and wealth by the same amount (Csortos–Sisak, 2016).

Figure 8: Net financial wealth of households



Source: MNB (2021a) and author's work based on Boldizsár–Kékesi (2017)

At the beginning of the coronavirus epidemic that erupted in 2020, it was not clear how the crisis caused by the epidemic would affect the financial savings of households. The previous, 2008-2009 crisis was accompanied by a substantial increase in the financial savings of households, which was exacerbated, among other things, by the fact that the previous significant borrowing was repaid. A decline in household financial savings due to the epidemic could not be ruled out, as the coronavirus epidemic could have caused a large drop in incomes and thus a decline in financial savings due to a sharp decline in external demand and employment.

In 2020, however, the net financial savings of Hungarian households – after a small increase – exceeded 6 percent of GDP (Figure 5). Gross financial savings may have been increased by, for example, restrictions on certain services (such as rules for restaurants and accommodation), as well as curfews. During the coronavirus epidemic, net borrowing did not

decrease, so that, unlike in the previous crisis, so-called “forced savings” on loans could not now increase net financial savings (similarly to the previous year's level, favourable “Baby Loans” may have contributed). However, it is difficult to assess the effect of the moratorium on repayment: if households have stashed the extra savings generated by the moratorium aside, the moratorium will have a neutral effect on net savings. However, if the instalment was used to cover their expenses, it could even have reduced the savings (Boldizsár et al., 2021a).

The coronavirus epidemic also had a significant impact on the time course of household savings in 2020. In the third quarter of 2020, financial savings, considered historically high, developed in a way that net financial savings significantly decreased, mainly due to a decrease in financial asset accumulation. This decrease is presumably mainly explained by the consumption postponed due to the first wave of the epidemic (which is also confirmed by the consumption data). However, due to uncertainties and closures due to the second wave of the epidemic in the autumn, net financial savings increased significantly again at the end of 2020 (Boldizsár et al., 2021b).

3.3. The development of households’ real estate wealth during the 2010s

Following the significant recovery of the housing market since 2014, it should be examined how the stock of real estate in households developed in the period relevant to my research, and what factors influenced households’ decisions to change the level of real estate.

Households' propensity to save is influenced by income and interest rates the most – but these factors affect real estate investment and financial savings differently within savings: while rising incomes can stimulate both forms of saving, falling interest rates have a positive effect on investment, but in the case of savings, the correlation is not clear. Even though most Hungarian households keep their assets in real estate, the accumulation of financial assets has been dominant since the crisis, despite the low yield environment. Meanwhile, in tandem with the increase in financial savings, retail real estate investment declined.

The formidable increase in net financial savings after 2008 did not mean that Hungarian households were less inclined to buy their own real estate: the downturn in the housing market was attributable to deteriorating home buying conditions because of the crisis. The deteriorating economic outlook and the tightening of borrowing conditions narrowed the second-hand and new housing markets, which also encouraged households to increase financial savings as uncertainty intensified – similar trends were observed at the international level, as well.

After 2014 however, the purchase of second-hand homes also started to grow strongly. Home prices, which fell by more than 40 per cent in real terms (Figure 9), rising income expectations and declining lending rates have created favourable conditions to resume second-hand housing market transactions. The low return on financial investment also encouraged investment property purchases, which may have been supported by house price hike and the spread of short-term rentals. In contrast, the value of housing investment began to decline slowly after the crisis and is still historically low. Although the most important factors in housing investments (income, interest rates, expectations) have developed favourably since 2014, housing investments have lagged significantly behind the level seen at the beginning of the new millennium. This may also have been since the housing market reacts to income cycles with a delay.

In the context of the developments seen, both the financial and real estate assets of households have increased significantly since 2014. While in the case of financial assets, mostly transactions increased wealth, in the case of real estate, the substantial part of the expansion came from the revaluation. That is why the aggregate real estate assets of households have been more volatile in the past than the nominal value of total net financial assets.

The sudden and significant upsurge in the value of residential property is not an unprecedented process in Hungary. There was also a larger period of real estate purchases during the change of regime, but this was due to unusual factors. According to Zsoldos (1997), there was a significant increase in the ratio of both total wealth and private housing wealth to disposable income that began in 1987, ending only in the second half of 1991.

As Zsoldos pinpoints: households feared hyperinflation in the late 1980s, in the uncertain political and economic environment, investing their wealth almost entirely in real assets, primarily real estate. This pushed up property prices and high yields led to high yield expectations, giving an additional push to property prices.

In the development of the housing market after the change of regime, two boom periods can be identified: Between 1999 and 2004, and then from 2014 until present (until the middle of 2021). In the case of a used home transaction, a purchase also means a sale, so the number of transactions is basically determined by how many sellers and how many buyers enter on the market. The number of sellers depends on the selling price, if buyers are willing to buy at a higher price, more and more sellers will sell their homes.

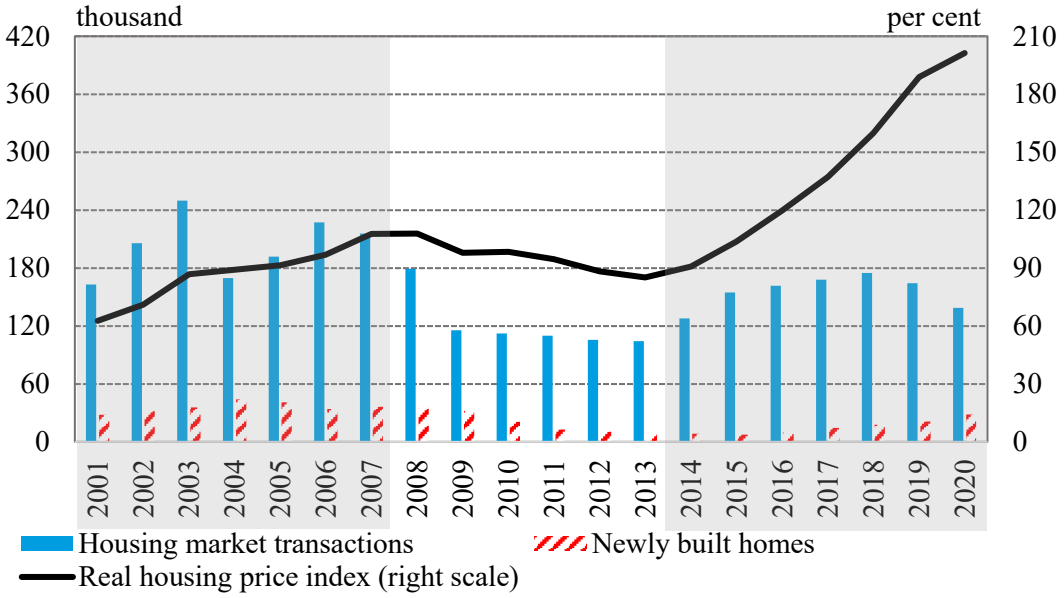
A common feature of both upswings following the change of regime was that the rapid growth in housing market transactions was accompanied by a significant rise in prices. The price jump around the turn of the millennium took place in the second-hand housing market, which through rising prices had a pull effect on the start-up of new housing investments. The increase was also due to the improvement of households' income prospects, subsidized forint housing loans and the spread of foreign currency lending.

Rising and then stabilizing home prices kept home purchases high until the year of the crisis. The number of transactions was growing further, if the seller financed the purchase of a larger property from the purchase price.

However, because of the crisis that began in 2008, the number of second-hand housing transactions fell sharply (from 240,000 to 80-90,000 per year), leading to a decline in the real housing price index of more than 40 percentage points (Figure 9). However, starting in 2014, the number of housing market transactions increased again, which was accompanied by an increase in second-hand housing prices. The explanation for this was that by 2014, all factors were in place for households to start increasing their savings more and more in real estate.

Starting in 2014, the higher number of housing market transactions shows a clear preference by households to buy a home. New and used house prices move together (MNB, 2017), so in the case of higher prices, it pays more and more for businesses to start a new investment. However, due to the time required for the investment, new housing transactions can only take place with a time lag.

Figure 9: Housing market transactions and housing prices



Source: MNB (2021d), CSO (2021a), CSO (2021b), author's work

Note: Data on housing market transactions have been available since 2001.

After the crisis, new housing market transactions slowed significantly and reached their lowest point by 2013. Although second-hand housing transactions started to rise again at the end of 2013, prompting a substantial rise in house prices, the volume of new homes sold before the 2008-2009 crisis is still nowhere, however, the high number of building permits already projects an increase in housing investments.

When households decide to buy real estate, they reduce their financial wealth, increase their real wealth, while in the case of a sale, the opposite happens. In the case of second-hand dwellings representing most housing transactions, the seller and buyer behind the real estate transaction also belong to the household sector: while the former reduces its real assets and increases its financial assets, the latter decreases its financial assets and increases its real estate.

The number of sellers basically correlates with the price of the property. It is a way more complex issue, which are the factors the number of buyers depends on. As the purchase of a home involves a significant financial investment, the buyer can either use the available financial assets or to expand possibilities the buyer can also borrow to increase real estate wealth.

In both cases, the increase in real estate is determined on the one hand by the buyer's previously accumulated and future (expected) income, and on the other hand by the interest. In addition, it is also worth to consider that a household will probably engage in home purchases with declining financial wealth if they are relatively certain that no liquid asset will be required

forthcoming: therefore, in addition to income expectations, the chances of unemployment may be particularly important.

On the one hand, the increase in our real estate savings was due to an improved *income situation* achieved by significantly increasing employment and wages. After the crisis was over, rising incomes as well as employment growth were again accompanied by an increase in housing market transactions. It is important to note that rising incomes are positively correlated with both growth in housing wealth and accumulation of financial assets. A positive income outlook is required for both to expand.

On the other hand, in parallel with the decline in unemployment, the public's confidence in economic processes has increased significantly. Buying a home is usually a long-term commitment, whether made from savings or credit, which presupposes a stable and predictable environment – that is, the role of *precaution* should be emphasized. After the crisis of 2008-2009, soaring unemployment increased insecurity, which in conjunction with tightening housing subsidies decreased the number of home purchases. Since 2012, unemployment has declined substantially (despite the economic downturn caused by the coronavirus) and consumer confidence has also improved, contributing to the resurgence of the second-hand housing market.

Third, *dropping interest rates on loans* and implementing the concept of a *fair banking system* by the central bank made home purchases from mortgage more and more attractive. Since 2012, interest rates on market-rate home loans have fallen substantially, in line with the interest rate cut cycle, allowing many to buy a home, significantly increasing second-hand home transactions. The substantial decline in housing loan interest rates may have significantly contributed to the increase in the number of transactions for second-hand flats in Hungary, and thus to the rise in house prices.

Finally, *declining returns on financial assets* may have greatly boosted investment-type real estate purchases (based on Erdélyi – Horváth, 2007). The decline in central bank interest rates will affect the portfolio decisions of the household sector not only through the decline in lending costs. In parallel with the decline in the base rate, interest rates on time deposits and interest paid on government securities also fell.

The return on investments, which still paid 6-7 per cent interest in 2012, fell to 2-3 per cent in 2014, so for many it may have seemed like a higher return on investment (not or only partially considering the risks) to buy a house and then rent it, on top, this type of home

purchases for investment purposes was further supported by other factors. On the one hand, faltering confidence in investment service providers, on the other hand, the rise in house prices caused by the factors listed above, and finally the expected benefits of property leasing boosted by the emergence of short-term housing rentals. (Drabancz – El-Meouch, 2017).

Thus, overall, low yields shifted those with savings towards real assets, which was not reflected though in the decline in financial savings.

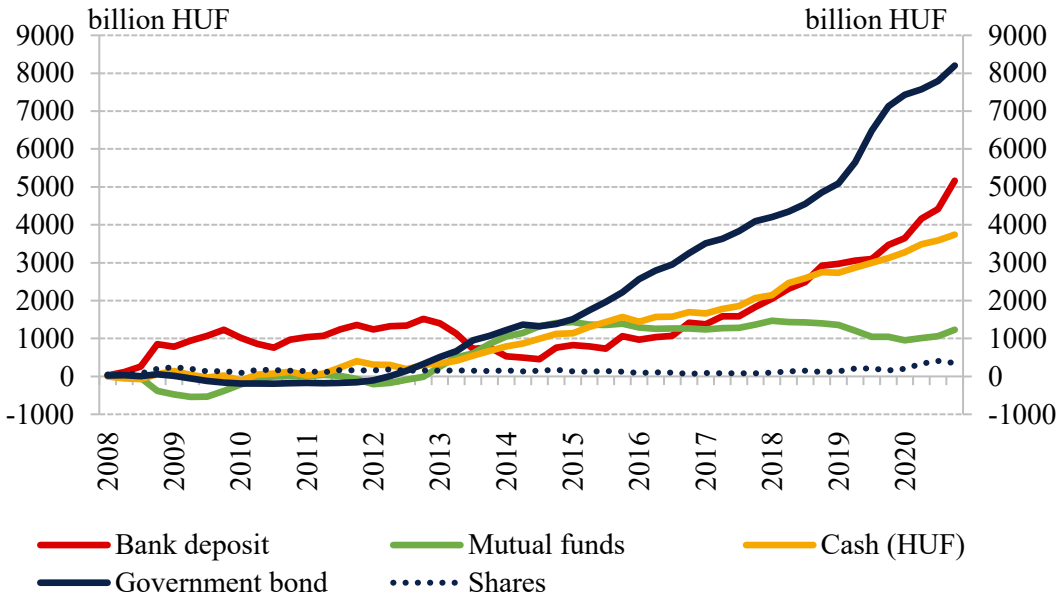
3.4. Structure of the financial portfolio of Hungarian households

In addition to households' savings and the level of wealth, an important question is also what factors influence portfolio allocation decisions, so I will expand on this issue in the next subsection. Households significantly restructured their financial asset portfolios on several occasions in the 2000s (first due to the introduction of the interest tax in 2006). It should be noted, however, that despite the significant restructuring in transactions, the share of individual financial assets within wealth has remained relatively stable: among financial assets, in addition to equities and directly owned shares, bank deposits continue to represent the highest weight (after other equity) (own calculation based on MNB, 2021a, Figure 11). That is, the portfolio restructuring can be seen most when examining cumulated transaction data – which is why I use *transaction data* in the first part of the chapter.

Households significantly restructured their financial assets even after the onset of the financial crisis: a large increase in bank deposits was accompanied by a decrease in savings held in mutual funds and government bond. (Figure 10). The process can be attributed to rising interest rates on bank deposits, in parallel with the central bank base rate, and to the sharp decline in risk appetite due to the crisis (Kékesi et al., 2015).

In addition, the decline in risky assets may have been caused by a significant decline in the supply of credit following the onset of the crisis: people simply sold some of their assets to improve financial situation. Following the easing of the crisis, in parallel with the return of risk appetite, households again turned to riskier assets. From 2009 – primarily in accordance with improving capital market sentiment – there was an increase in the demand for mutual funds, and subsequently priority was again given to bank deposits (Figure 10).

Figure 10: Changes in the most important financial assets of households (cumulated transactions, quarterly data)



Source: MNB (2021a), author's work

In 2012, a change was observed in households' behaviour: although households continued to invest in bank deposits, they began to prefer government securities and mutual funds in their savings decisions. This may have been partly since households used part of their savings held in bank deposits and mutual funds for early repayments, resulting in a slight decline of financial assets.

From the end of 2012, capital flows from bank deposits to securities began to flow not only from recent savings, but also from existing stocks, meaning that in 2013 we saw a significant withdrawal of deposits, while households continued to increase their cash and savings held in securities. The restructuring was primarily supported by the fact that, due to the declining cycle of the central bank base rate as of August 2012, interest rates on bank deposits have substantively declined. The behaviour favouring risky assets can thus be explained primarily by the low inflation and interest rate environment.

Restructuring was also driven by higher yields on government securities, the introduction of a financial transaction levy in 2013, and a health contribution on interest income. One of the most important factors, however, is that the retrospective yield on mutual funds and the interest rate on government securities popular with households were significantly higher than the interest rates on bank deposits of the same maturity. In addition, forint government securities and mutual funds that invested more than 80 percent of their assets in forint

government securities were exempt from the health contribution (eho) on interest income. Because of the yield decline, households chose, out of investment types of similar risks, government securities with substantial yield premiums as well as bonds and money market funds.

In addition to securities, the low yield environment may have also increased household demand for cash (Figure 10), which may be explained by the loss in opportunity costs incurred in cash declined with declining interest rates. The demand for cash by the public may also have been boosted by the strengthening of the precautionary motive. One possible explanation for this is that cash is one of the most readily available, risk-free forms of savings. Low inflation and the gradual expansion of retail trade could have also played a role in the level of cash balances, while the role of the grey economy may also not be ruled out completely. In addition, the introduction of a financial transaction levy and free cash withdrawal may have had an impact on growth (Kékesi – Kóczián, 2014).

Overall, it can be established that increases in household income, low inflation and declining yields have led to increases in government securities and liquid assets. The accumulation of government securities by households was continuous after 2012, which is justifiable by its significant yield advantage over other forms of investment.

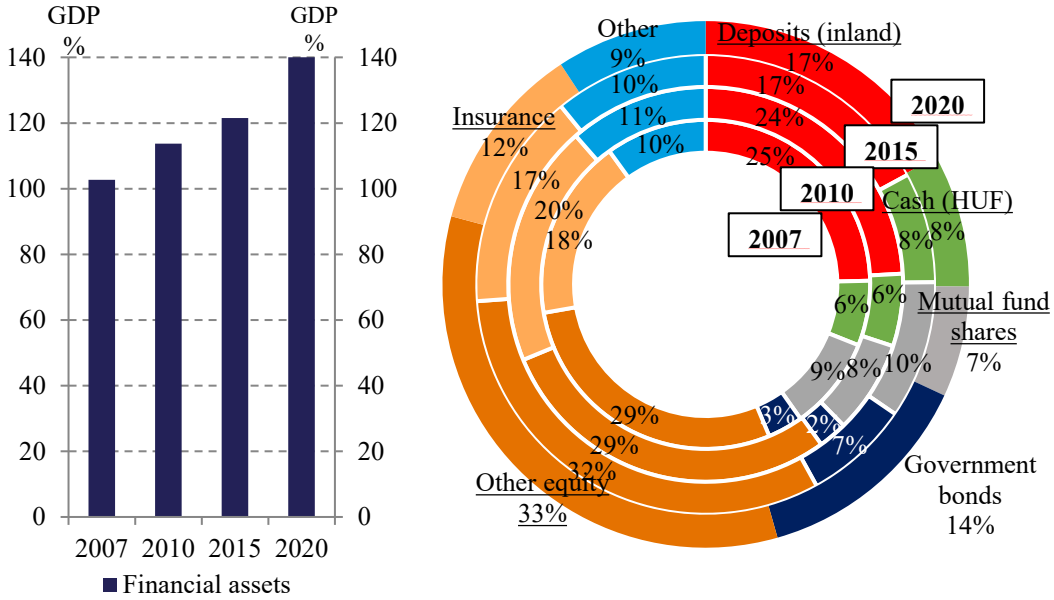
Regarding the mutual fund market, the asset values of money market and bond funds with lower risk securities gradually decreased, while the stock of higher risk mixed and real estate funds increased (see later, Figure 20). Considering this, it is conceivable that due to the low returns attainable in the market, some investors started to prefer riskier forms of investment in the hope of higher returns.

However, this growing appetite for risk failed to lead to an increase in demand for shares, the stock of shares held by households hardly increased because of transactions (purchases). That is, while the low interest rate environment and inflation have led to an increase in demand for liquid forms of investment such as demand bank deposits and cash (and risk-free government securities), purchases of shares have remained limited.

Turning to the stock data, the effect of the portfolio restructuring starting in 2012 is now clearly visible in the development of household financial assets. The gross financial wealth of households rose from 100 percent of GDP (2007) to 140 percent by the end of 2020 (Figure 11). The portfolio restructuring can be observed not only in the cumulative transactions presented earlier, but also when examining ratios within the stock data.

While the share of bank deposits did not change significantly between 2007 and 2010, by the end of 2015 the effect of portfolio restructuring decreased by about 8 percentage points and represented a similar proportion at the end of 2020 (Figure 11). In parallel with the declining weight of bank deposits, mostly the share of savings in government securities by households increased: the share of government securities in household financial assets increased from 2 per cent in 2010 to about 14 per cent by the end of 2020. Despite the restructuring since 2012, bank deposits and rather illiquid business shares still account for almost half of households' gross financial assets.

Figure 11: Households' stocks of financial assets and the composition of financial assets



Note: Other receivables from the general government because of changing the pension system were recorded as part of household insurance.

Source: MNB (2021a), author's work based on Kékesi et al. (2015)

When examining structure of financial assets, I mainly examined transaction data, as this is the best way to deduce the financial allocation decisions of households. However, during the period of portfolio restructuring, in addition to transactions (new savings), to a lesser extent, revaluations also increased. About a third of the change in the stock of financial assets can be related to revaluation: among financial assets, the value of shares (other equity) appreciated the most (almost 85% of the revaluation can be related to this). In addition, the value of foreign currency assets (foreign currency deposits, currency) expressed in forints also increased due to the weakening of the forint. Furthermore, the returns achieved by life insurance and pension funds also resulted in higher financial wealth of households.

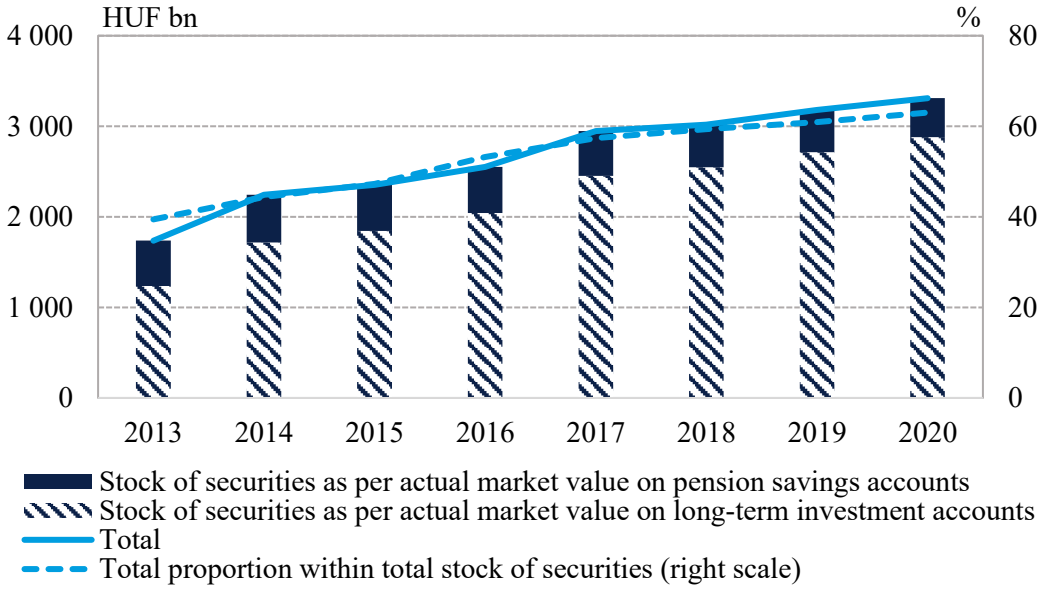
Turning to the maturity of savings, financial account data show that households are less willing to commit in the long run (MNB, 2021a; Figure 11). In practice, all this is reflected in the fact that financial assets with longer maturity carry less weight within the wealth of households. Bank deposits can be considered as a liquid form of investment (and are also considered by households). The demand for liquidity is well demonstrated by the fact that households mainly prefer deposits with a maturity of up to one year or sight deposits. According to monetary statistics, more than 70 per cent of household deposits are sight deposits, and this ratio is already close to 90 per cent, including deposits made within one year.

Regarding the other forms of savings, it can be concluded that households preferred more liquid assets. Out of the mutual funds, open-ended ones are also the most popular (BAMOSZ, 2021), as they have no maturity date, they can be redeemed within a few days. In addition, households initially favoured government securities with shorter maturities of all (starting in 2012, the one-year Interest-bearing Treasury bill and then the One-year Government bond were one of the most sought-after assets).

Even though households primarily choose short-term financial assets, government incentives can also have a significant effect on households' portfolio allocation decisions. These, in turn, favour longer-term savings. One of the most common and well-known is the long-term investment account (LTA), where the deposited savings are interest tax exempt after a five-year savings period. A long-term investment account is also a securities account, so it can function not only as a bank deposit, but securities (such as government bonds or shares) can also be purchased from the amount saved. However, LTA became less attractive after government securities purchased after June 1, 2019 became fully tax exempt.

In addition to long-term investment accounts, pension savings accounts also encourage long-term savings with the tax breaks they provide. Typically, a larger amount is deposited in long-term investment accounts, the value of average assets exceeded HUF 11 million at the end of 2020, while account holders hold an average of HUF 4.6 million on pension savings account (Figure 12). Total assets placed on LTA and pension savings account amounted to about HUF 3,300 billion at the end of 2020, which is about 20% of the total securities portfolio of households. Overall, long-term savings of households in this form accounted for only 5% of gross financial assets at the end of 2020 (based on MNB, 2021a; MNB 2021b).

Figure 12: Savings placed on long-term investment accounts



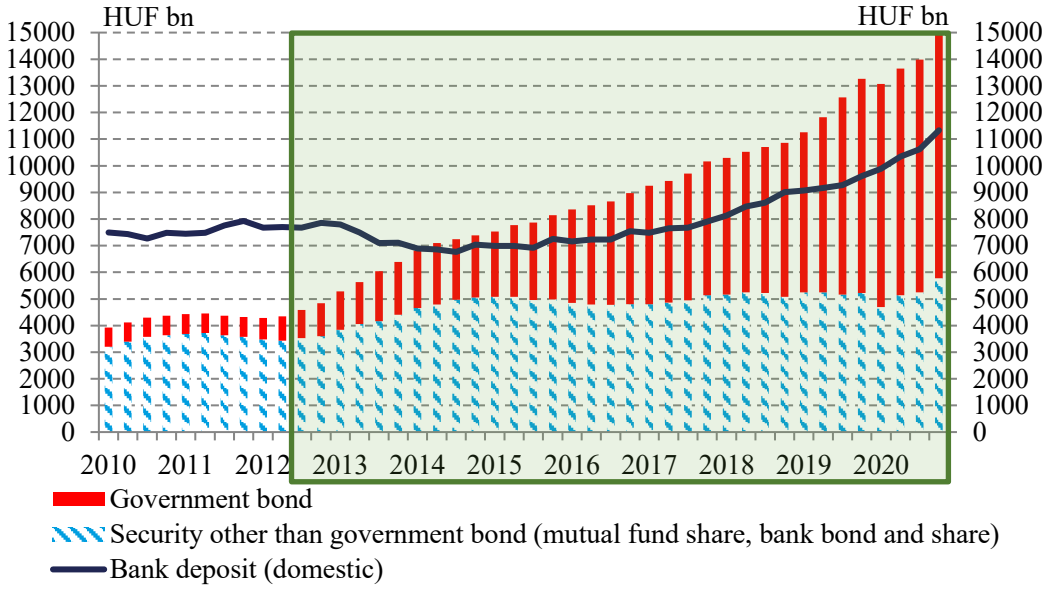
Source: MNB (2021b), author's work

All in all, we can conclude that since 2012, government securities and mutual funds have come to the fore in the asset allocation decisions of households. Due to the portfolio restructuring, including the growth of the government securities portfolio, by the end of 2018, the securities portfolio of households already significantly exceeded the stock of bank deposits. There were times in portfolio restructuring when households bought securities not only from their new savings, but also used their existing bank deposits for this purpose.

Between the beginning of 2013 and the middle of 2014, households withdrew nearly HUF 1,000 billion from their bank deposits, while further increasing their cash and securities-type savings. From 2016 onwards, however, the savings held in this form of investment increased again. Overall, the result of the inflow of new savings to securities and their reallocation from bank deposits resulted in the Hungarian households already holding more money in securities (more than 60 per cent in government securities at the end of 2020) than in bank deposits (Figure 13).

Purchases of securities has been ongoing ever since – the stock of government securities of households already exceeded HUF 9,100 billion at the end of 2020, which is favourable for the government's internal financing and external vulnerability. In the next subsection, I explain the strengthening demand for retail government securities based on Kékesi et al. (2015).

Figure 13: Securities and bank deposits held by Hungarian households (quarterly data)



Source: MNB (2021a), author's work based on Kékesi et al. (2015)

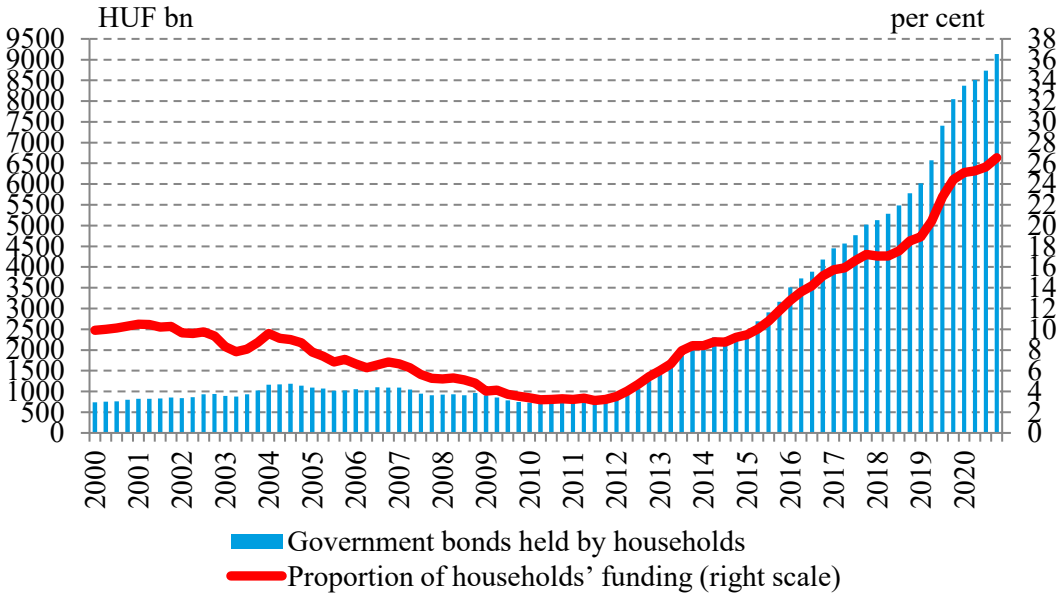
3.5. The growing importance of government securities within household savings

Within financial assets, I would like to focus on government securities, as there has been a significant change in this type of asset during the period under review. According to the data of the financial accounts, the stock of government securities of Hungarian households increased from 1989 to 2004, then started to decrease, and by 2010 it was significantly lower than the levels experienced previously (Kékesi et al., 2015). The role of households in financing government debt also declined during this period, although this may also have been since at the end of 2011 government debt, which accounted for 51.9 per cent of GDP, sharply started to rise. Thus, the almost unchanged stock of government securities of households financed a smaller and smaller proportion of government debt, and the share of retail financing fell below 3.3 per cent by the beginning of 2010 (Figure 14).

The impact of rising retail savings was not reflected in government securities after the 2008-2009 crisis: although government securities represent one of the safest forms of investment, households' stock of government securities did not increase. This is mainly due to competition for funding: the banking sector began to compete intensively for retail savings – on the one hand, banks promised higher interest rates, and on the other hand, the success of attracting deposits was helped by marketing (Kékesi et al., 2015).

For government securities, there was a further disadvantage arising from the less widespread sales channel and the fact that securities targeted at households at that time were less flexible, while households could choose from a wide range of deposit types and maturities in case of bank deposits. However, the new government strategy for 2012 supported (supports) a shift in households' "attitude" towards government securities, and due to the trend started from the beginning of 2012, the stock of government securities rose to over HUF 9,100 billion at the end of 2020, i.e., households finance public finances. In this chapter, I briefly review the factors that may have played a role in the expansion of the retail government securities portfolio.

Figure 14: Stock of government securities held by households



Source: MNB (2021a), author's work based on Kékesi et al. (2015)

When making portfolio allocation decisions, Hungarian households can buy not only traditional but also retail government securities. Retail government securities can be classified as risk-free assets, as the state guarantees the payment of full principal and interest regardless of the value limit, and this claim does not expire (Kékesi et al., 2015).

As Hungarian households can buy not only government securities issued by the Government Debt Management Agency (GDMA) specifically for the public, but also government securities issued to a wider audience, the Hungarian National Bank (MNB) and the Government Debt Management Agency (GDMA) statistics may vary. GDMA's statistics include retail government securities held by all sectors (including banks), while the MNB shows all (not just retail) government securities held by households.

Retail securities were also sold before 2012: Hungarian households could also buy, for example, Interest-bearing Treasury Bills (ITB), Premium Hungarian Government Bonds (PHGB) and Treasury Savings Bonds at the branches of the Hungarian State Treasury (MÁK). Later this offer was further extended with the 6-month Treasury Saving Bill (TSB), the Premium Euro Hungarian Government Bond (PEHGB), the Baby Bond as well as the Bonus Hungarian Government Bond (BHGB), and in June of 2019 with Hungarian Government Bond Plus (HGBP+).

The most important features of retail government securities are summarized in Table 6. While earlier, households could only choose from a smaller supply, the range of government securities sold to the sector has increased significantly since 2012, both in terms of maturity, denomination, and interest rates.

Table 6: Government securities held by Hungarian households, June 2021

Papers name	First issuance	Maturity	Interest	Denomination	Points of Sale
T-bill (Treasury Savings Bill)		1-2 years	Fixed, step-up rate interest	HUF	Magyar Posta Zrt.
One-year Hungarian Government Security (formerly Interest-Bearing Treasury Bill)	January, 2000	12 months	Fixed interest, predetermined before issuance	HUF	MÁK, WebKincstár and commercial banks, investment service providers
Premium Hungarian Government Security	December, 2010	3 or 5 years	Yearly increment of price levels + interest rate premia	HUF	MÁK, WebKincstár and commercial banks, investment service providers
Premium Euro Hungarian Government Bond	November, 2012	3 years	Harmonized index of consumer prices in euro zone + interest rate premia	EUR	MÁK, WebKincstár
Baby Bond	December, 2013	19 years	Yearly increment of price levels + interest rate premia	HUF	MÁK, WebKincstár
Hungarian Government Security Plus	June, 2019	5 years	Fixed, step-up rate interest	HUF	MÁK, on WebKincstár and in commercial banks, investment service providers, in print by Magyar Posta Zrt.

Securities discontinued					
Treasury Savings Bills (Plus)		1 years	Fixed, step-up rate interest	HUF	Magyar Posta Zrt.
Semi-Annual Treasury Bond (formerly 6-month T-bill)	April, 2011	6 months	Fixed interest	HUF	MÁK
Bonus Hungarian Government Bond	March, 2014	4, 6 or 10 years	12 Discounted T-bills treasury bills interest rate + interest rate premia	HUF	MÁK, on WebKincstár and in commercial banks
Hungary 2Y Government Bond	April, 2017	2 years	Fixed interest	HUF	MÁK, on WebKincstár and in commercial banks

Source: GDMA (2021b), author's work based on Kékesi et al. (2015)

Initially, the stock of shorter-term securities grew and then demand shifted steadily towards longer-term securities. Although household demand has also increased for longer maturities since mid-2014, more than half of the outstanding portfolio matured within a year until the introduction of the new government security. All this can be explained by the fact that a significant part of the demand for retail government securities was initially related to the purchase of a single paper, the Interest-bearing Treasury Bill [10] which was partly due to the extensive sales network of the paper. The other major type of household government security is the Premium Hungarian Government Bond [11], where only a minor net purchase could be observed. Albeit during this period the interest rate of the premium Hungarian government bond exceeded that of the Interest-Bearing Treasury Bill, the term premium of securities with longer-terms was not enough for their demand to achieve a more significant growth rate. In other words, the increasing stock of government securities held by households experienced until mid-2014 was not primarily linked to securities sold exclusively at MÁK agencies, but to Interest-Bearing Treasury Bill sold also through commercial banks.

At the same time, households' demand for longer-term government securities increased significantly from mid-2014 (Figure 15). Presumably, because of the narrowing difference in

[10] One-year Hungarian Government Bond (formerly Interest-bearing Treasury Bill, ITB) is a fixed-rate one-year government security with an annual interest rate of 2.5 percent in June 2021.
[11] A security with a floating rate, 3 and 5-year maturity, the interest rate of which is calculated as the sum of the annual average percentage change of the consumer price index, as officially published by the Central Statistical Office for the year preceding the year of interest payment due (but not less than zero), and the interest premium.

interest rates, the stock of short-term treasury bills decreased from March 2014. At the same time, however, savings in longer-term government securities have grown.

The fact that GDMA issued new retail government securities in March 2014 could have played a role in the above. Interest rates of the securities were linked to the average auction yield of one-year T-bills: securities with shorter-term ensured a yield premium of 1.75 percentage points, and those with longer-term a yield premium of 2.5 percentage points above the yield of the one-year T-bills. The stock of long-term securities, however, has started to grow significantly only after that, since June 2014. An important factor in this was that, from then on, Premium and Bonus Hungarian Government Bonds were not only sold at the offices of the Hungarian State Treasury and through the internet (WebKincstár), but also through the branch networks of distributors (commercial banks).

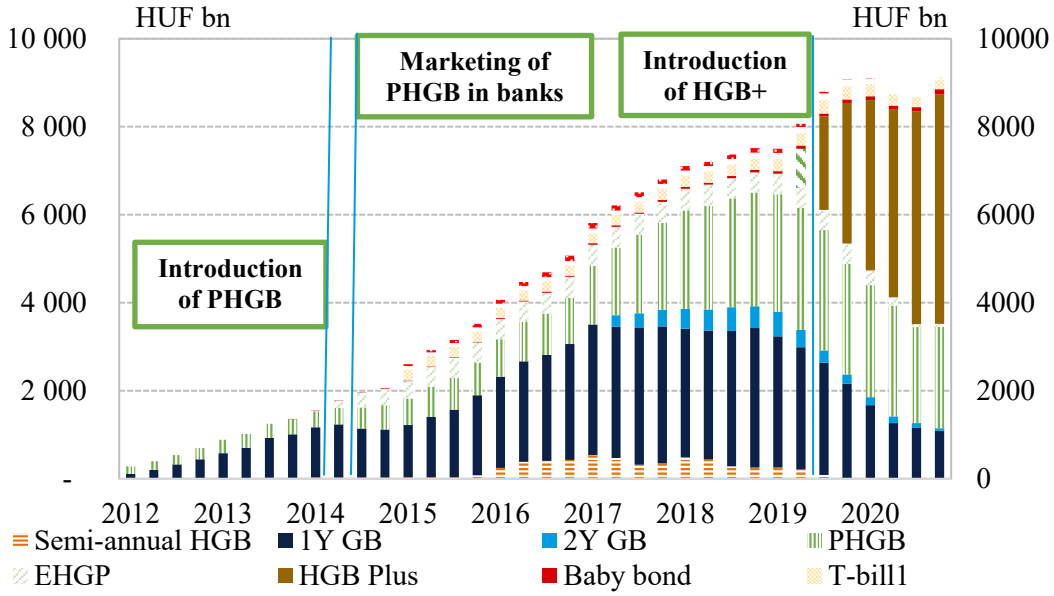
As a result of the government securities strategy introduced in 2012, the stock of government securities held by households increased greatly. However, the change in retail preferences led to a slight slowdown in retail purchases of government securities in early 2018. In response to this, the new retail government securities strategy set the goal of increasing the stock of government securities held by households to HUF 11,000 billion by 2023, i.e., an average annual net increase of HUF 1,100 billion.

As part of the new strategy, the new "top product" of GDMA, Hungarian Government Security Plus, appeared in June 2019, of which Hungarian households bought more than HUF 1,000 billion in less than two months (however, only a part of the purchases came from new sources in the first period transfers from existing government securities savings may also have been high) (Csortos et al., 2019).

Hungarian Government Security Plus is a banded, fixed-rate retail government security with a maturity of 5 years. The interest rate is 3.5% per annum in the first half of the year, 4.0% p. a. in the second half of the year, 4.5% p. a. in year 2, 5.0% p. a. in year 3, 5.5% p. a. in year 4, 6.0% p. a. in year 5, which will be credited in the same series of government securities. Another "novelty" of the scheme is that the security is repurchased from investors at net 100% exchange rate plus the accrued interest on the repurchase value date on the 5th working day following the interest payment (GDMA, 2021b).

The popularity of Hungarian Government Security Plus is well illustrated by the fact that by the end of 2020, this retail government security already accounted for more than half of the government securities portfolio held by households, nearly HUF 5,200 billion.

Figure 15: Government security holding of households broken down by types



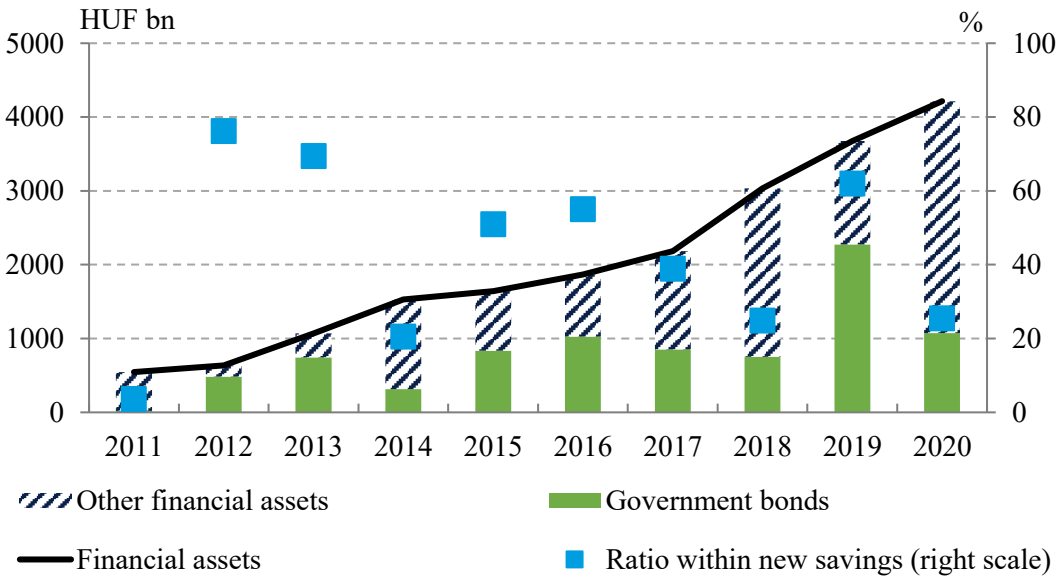
Source: GDMA (2021a), author's work

As a result of the introduction of new bonds, the role of Hungarian households in financing government debt has been steadily increasing in recent years. The appeal of retail financing has been significantly improved not only by the return advantage over alternative investments, but also by the retail government securities schemes offered to households. However, the strong growth in demand was mainly due to the yield spread: the yield spread between treasury bills and interest rates on bank deposits with an agreed maturity of up to one year turned positive at the end of 2011 (Figure 17).

Many factors may have played a role in the growth of government securities portfolio, including Interest-bearing Treasury Bills held by households (currently One-Year Government Bonds). The main drivers of growth in retail government securities were the change in the investment climate (points 1 to 3) and the government's financing strategy focusing on internal resources (points 4 to 6).

(1) *Households' savings increased significantly.* After the autumn of 2008, serious changes were observed in the consumption and saving decisions of Hungarian households. Since the onset of the crisis, savings increased significantly, in which, at the beginning strengthening precautionary considerations may have played a role. Not only net but also gross savings rose sharply, which, unlike in the past, did not come from household borrowing (Figure 5). Thus, households could not only restructure their existing assets, but spent their recently accumulated savings on purchasing government securities (Figure 16).

Figure 16: Accumulation of households' financial assets and the expansion of government securities (based on transactions)



Source: Author's work based on MNB (2021a)

(2) *Declining inflation and interest rates.* As a result of the low inflationary and gradually declining interest rate environment, the role of interest rate advantage could also be appreciated. This must have also been supported by the fact that, parallel to falling household lending banks needed less deposit for funding, which may also have been reflected in lower levels of deposits' interest rates.

(3) *Securitization.* The rationale behind households purchasing government securities, that is securitization, could be the yield advantage, as well as the development of the financial system. The latter is of key importance because in this case it could be permanent.

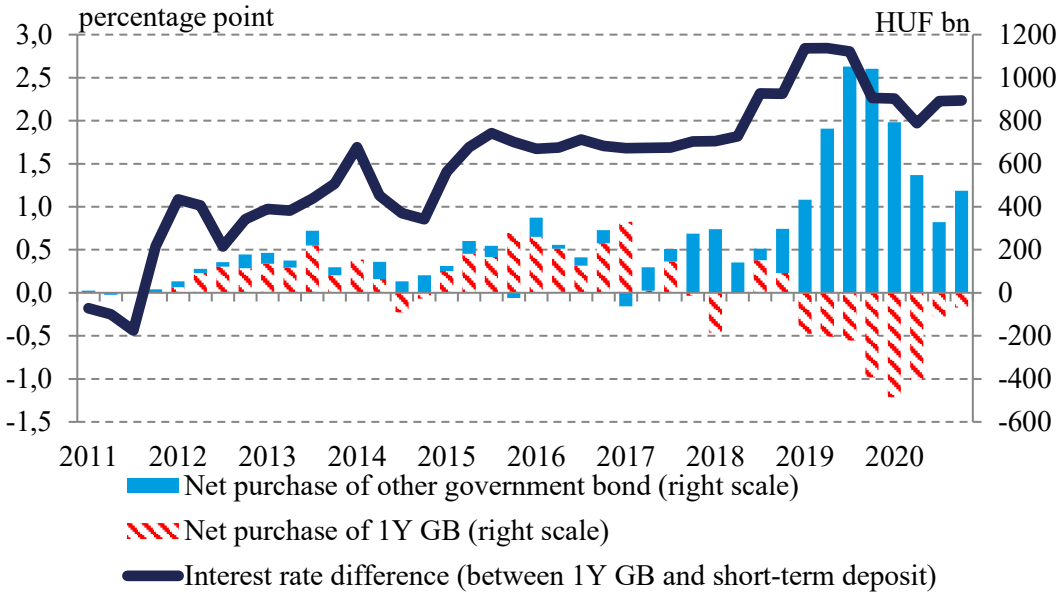
(4) *Interest advantage.* Until the summer of 2014, the interest rate on Interest-bearing Treasury Bills was on average one percentage point higher than the average interest rate on one-year bank deposits. Subsequently, in parallel with the decline in the interest rate spread, demand also declined. From early 2015, the spread widened again to more than 150 basis points. Despite the persistence of the gap, demand declined again from early 2018. This could only be changed when the One-year Government Bond yield grew to 2.5 percent in the summer of 2018 and the interest rate spread rose above 200 basis points (Figure 17).

(5) *Supportive government policy.* In the case of Interest-bearing Treasury Bills, it was also an advantage that, in addition to the offices of the Hungarian State Treasury, retail government securities were also offered at the branches of eight commercial banks and online.

The sales channels were later modified for several papers (Bonus and Premium Bonds), and the number of MÁK offices also increased, which also simplified the purchasing process. Furthermore, to achieve the government's goals, GDMA also launched a major marketing campaign to promote government securities (advertising campaign and the launch of allampapir.hu).

(6) *Health contribution tax exemption, interest income tax exemption.* The appeal of government securities vis-a-vis bank deposits may also have been further enhanced by the fact that from August 2013 investments in forint government securities – and in certain mutual funds[12] – were exempted from the health contribution on interest income (Kékesi – Kóczián, 2014). Longer-term government securities earlier used to fit well into the profile of long-term investment accounts, which also allowed households to avoid paying interest tax. As another government measure, interest on government securities purchased after June 2019 will be fully exempt from paying personal income tax.

Figure 17: Households' net government securities purchases and the interest rate spread of bank deposits and One-year Hungarian Treasury Bills



Note: The source of the households' monthly purchase of government securities is GDMA. Net purchases are construed as the difference between gross purchases and matured securities.

Source: GDMA (2021a), MNB (2021c), Kékesi et al. (2015)

Next, a brief summary on the economic impacts, benefits and risks of households' purchases of government securities will follow. One of the most important consequences of

[12] Return on investments held in mutual funds is exempt from health care tax supposing that in line with internal policies they invest in forint government securities in an amount of at least 80 percent.

households purchasing government securities, which is in the interests of the economy as a whole and not only of the government, is that an increase in domestic financing can reduce external debt, which is crucial for the economy's external vulnerability. Reduced external financing from the perspectives of external vulnerability – through decreasing external debt – should be considered a positive development. It should be noted though that even if households placed their savings in the financial intermediary sector instead of purchasing government securities, the scale of domestic financing of the general government would not necessarily decline. This could occur if household funds were placed at intermediaries which invest all funds received into government securities.

The higher interest received on government securities is directly transferred to households. The effect of the additional income thus obtained depends fundamentally on the income-saving situation of the social stratum holding the government securities. This is because the degree of marginal propensity to consumption depends on household income or wealth: households with higher level of income or wealth tend to have lower marginal propensity to consumption (Carroll et al., 2014). Thus, increased income level thereof due to higher interest income on government securities tends to bring about, through increased savings, a further decline in the external vulnerability of the economy. If the interest income of households with lower levels of income or wealth rises, then growth contribution of household consumption may be higher. In other words, the purchase of government securities by households can have a positive effect on the external vulnerability of the economy and on economic growth.

Upon analysing expanding household financing, the costs of financing should also be examined. Pricing of retail government securities is very favourable for households; so, the question arises whether external funds should be converted to domestic funds. Costs of financing, however, should be analysed on the consolidated government level: high level of external fundraising through increased short-term debt may lead to higher international reserves (Hoffman et al., 2013). Given this, the cost of government financing by the household sector shall not necessarily exceed the costs of financing from other markets, moreover, the interest income shall in full be received by the household sector directly, with second round effects thereof – either on the revenues of the general government (for example rising VAT revenues because of consumption) or on its financing.

It may be that the rise of retail government securities displaces banks and financial intermediaries in raising funds, meaning that retail government securities draw the necessary funds from other players, thereby limiting the supply of bank credit and negatively affecting

economic growth. However, in terms of the loan-to-deposit ratio of banks, we can see that it is not the retail banking source that is the bottleneck in corporate lending. (MNB, 2019). Banks can raise the funds needed for lending: either by raising deposit rates or by raising funds abroad. However, financial corporations may be more seriously affected by the increase of government securities held by households – however, the "losses" of these service providers are mitigated by the fact that government securities were purchased mainly from new savings, i.e., assets of financial corporations did not decrease (except for the HGB+ scheme). However, the purchase of government securities by households may have a negative effect on lending in the longer term, or if funds of government securities are existing savings (rising interest rates).

It should also be noted that it is not necessarily a disadvantage for general government if households hold government securities indirectly, as the stock of government securities held (indirectly) through financial intermediaries (compared to retail government securities) may provide it with a more stable funding. As for example mutual funds, due to several investors, can invest into longer-term government securities since there is only a smaller influence of individual decision-making on the funds of mutual funds. Financial intermediaries can bring together several small investors, thus can provide the general government with funding on a longer-term, because of which they can help reduce renewal risks of the government debt through the decrease of debt maturing within a year. This, however, has a cost: less interest income is received by households. Similarly, pension funds and insurance companies are typically able to purchase government securities on a longer-term, thus financing the general government is ensured under lower levels of uncertainty.

Although the share of domestic government debt financing has increased a lot since 2012, short-term retail government securities may pose a renewal risk. The increase of the households' government securities portfolio has resulted in a decrease in the average remaining maturity of government debt: short-term retail government securities may pose a renewal risk.

This is also supported by the fact that according to the original maturity, the stock of retail government securities maturing within one year reached HUF 3,000 billion by the beginning of 2017, which meant that an average of nearly HUF 250 billion of retail government securities matured per month next year, which by itself carries a significant renewal risk. (This short maturity is also observed in the case of bank deposits since more than 80 percent of total deposits outstanding are made up of one-year term deposits or sight deposits.)

The risk of renewal may be further increased if banks also start collecting deposits more competitively. The fact that banks need funding from retail deposits could also have a

meaningful impact on the development of households' financial assets. If banks trying to ensure forint funds – along with raising interest rates – start deposit-taking, then it could well be that the stock of government securities held by households will also decline. The rationale behind this is that households make their choices of investment opportunities based on yields offered, thus their funds released as government securities mature may not necessarily be reinvested to finance the general government.

However, the persistence of interest rate advantage and the emergence of the new construction (HGB+) reduced the risk of renewal borne by the state and increased the risk borne by households. However, the risk to public finances may be mitigated by many factors: on the one hand, the fact that, based on international experience, the stock of government securities held by households is more stable than that of non-residents, and on the other hand, if interest rates persist, new favourable interest rate schemes emerge.

A good example of the first factor is the end of 2011 and the beginning of 2012, when in a turbulent market environment, GDMA quickly and appreciably raised the interest rate on retail government securities, which thus offered a more favourable interest rate than government securities on the market and deposits. This probably contributed to the fact that at the end of 2011 the government securities portfolio held by households did not decrease, while non-residents reduced their government securities portfolio by about HUF 250 billion.

3.6. Which sectors are financed by households?

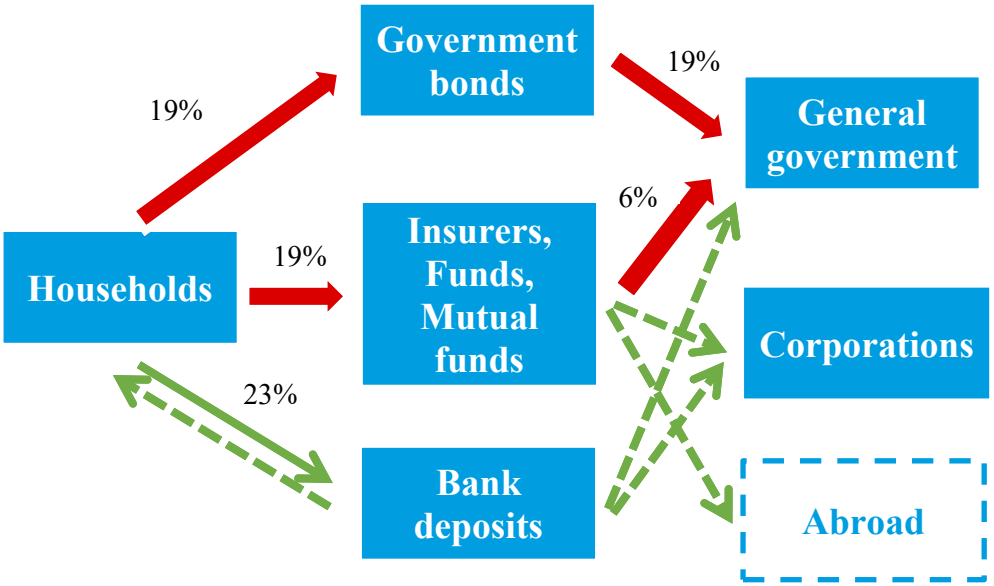
In the previous subsections, I have reviewed the financial assets held by households, and in this section, I examine which sectors are ultimately financed by households holding these financial assets. Ultimately households finance the other sectors (government, corporations, and the foreign sector) through their decisions on asset allocation. Household savings provide funding for domestic economy, government, and companies (partly also for the foreign sector by holding foreign assets).

To get a more accurate picture of which sector Hungarian households finance, it is worth quantifying not only direct financing, but also indirect financing through investment funds, insurance companies and funds. Direct financing by households means when the asset purchased is recorded in the balance sheet of households as receivables from the relevant sector (for example government securities). In contrast, in indirect financing, households own assets through financial intermediaries (mutual funds, insurance companies, funds).

To quantify the financing of government debt by households, it is also important to consider the indirect holding of government securities. In examining retail financing, only government securities held directly by households are usually examined. At the same time, government securities indirectly owned by households are also part of retail financing, the extent of which I will quantify in the next subsection.

Indirectly held securities are also part of public funding, as on the one hand the types of investments offered by financial intermediaries have an impact on the savings held in the portfolio (depending on the type) and on the other hand households receive a return on indirect investments. For example, in case of mutual funds households may choose from, among others, bond or even real estate mutual funds, in other words, households' decisions on portfolio allocation can reflect their preferences households (Figure 18).

Figure 18: Direct and indirect funding by households, 2020



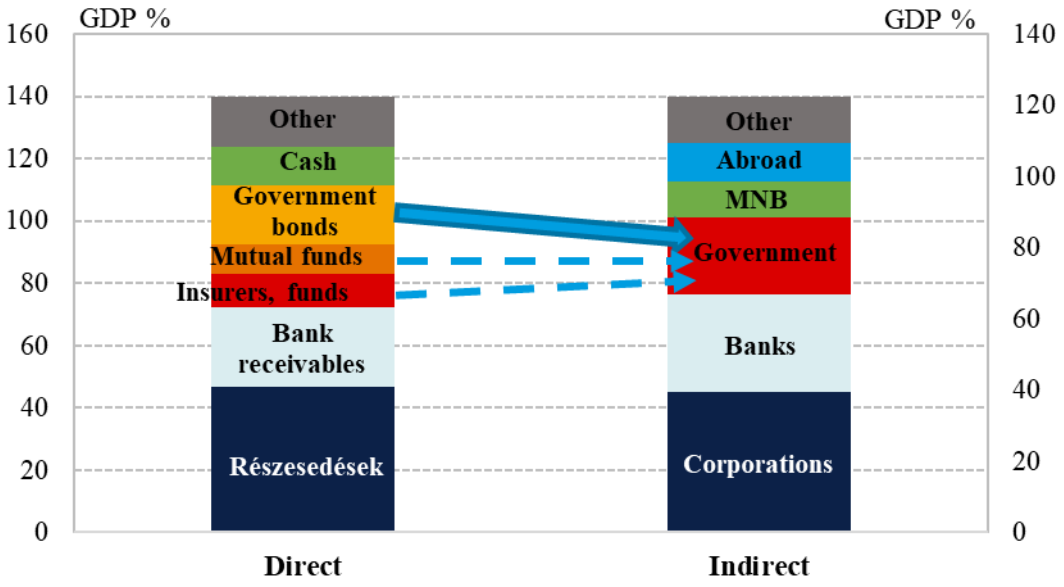
Source: Author's work based on Kékesi et al. (2015)

Note: The arrows show the value of funding as a percentage of GDP. Values are not shown in dashed arrows, as it is not clear which bank assets / investments are financed by deposits / mutual funds. Furthermore, it is not shown in the figure, but households also finance the rest of the world and the Magyar Nemzeti Bank directly.

According to the data at the end of 2020, households held government securities, which accounted for almost 19 per cent of GDP directly[13] and almost 25 per cent of GDP, including indirect holding (Figure 19). Households finance the government directly through holding government securities, at the same time the sector also holds government securities indirectly, through mutual funds, insurers, and funds. Thus, the household sector holds a much larger amount of government securities than those held directly, amounting to about 25 per cent of GDP (Figure 19) (the right-hand side, where I also considered the assets of households held through financial intermediaries).

[13] The stock of indirectly held government securities of households is based on assumptions, and considerable uncertainty surrounds it. Bank deposits are not considered as part of indirect financing since upon placing their savings into banks, households do not make their decisions based on the asset portfolio of the banks.

Figure 19: Gross financial wealth of Hungarian households as a proportion of GDP (December 2020)



Source: own calculation based on MNB (2021a), Kékesi et al. (2015)

Note: In the figure, receivables from private pension fund assets are included in the other category, which ultimately finances the state. The reason why I did not categorize under the state in the figure was to include the extent of direct and indirect government securities holdings by households.

The rise in retail government securities came to a temporary halt in mid-2014, albeit households also provided "fresh" funds to the government through mutual funds during this period. This temporary halt may have occurred because the interest rate advantage of retail government securities over short-term bank deposits fell below 1 percentage point (Figure 17).

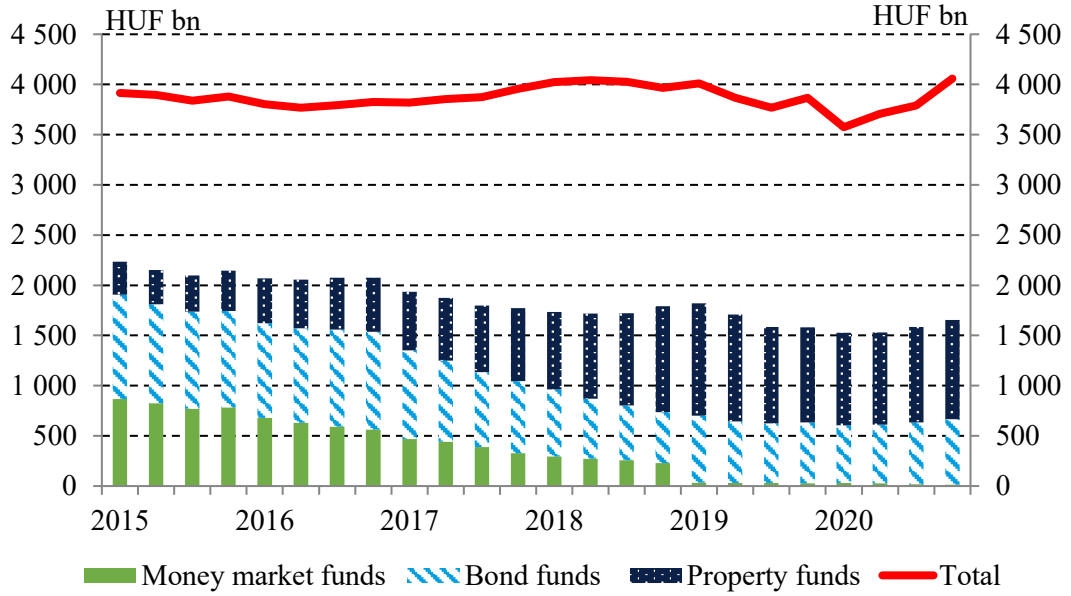
The dropping demand for short-term securities was only partially offset by demand for long-term securities (BHGB and PHGB), so the growth of retail government securities slowed down significantly. However, mutual fund purchases and thus indirect financing of the general government continued.

While in the past households preferred money market funds, this changed in 2013: the assets managed by bond funds increased significantly, from HUF 300 billion to close to HUF 1,000 billion (Figure 20). Households typically make their decisions based on retrospective yields achieved by mutual funds, thus in the rise a decisive role must have been played by rising exchange rates due to falling returns (retrospective yield of money market funds could have increased to a smaller extent because of low bank interest rates and shorter-term government

securities). As a result of the restructuring, households' savings in bond funds exceed the money market funds.

However, from mid-2015, household savings held in bond funds also started to decline, presumably due to a change in households' expectations of returns in a low interest rate environment (and mutual funds no longer offered outstanding retrospective returns). Therefore, households began to prefer real estate funds over bond funds. Nevertheless, household savings held in bond funds are still well above 2012 levels. All this also means that indirect financing of government debt by households has increased due to the rise of bond funds.

Figure 20: Households' mutual funds split by basic types



Source: Author's work based on Kékesi et al. (2015)

Note: In addition to the highlighted items, all funds include, but are not limited to, equity, hybrid, guaranteed and derivative funds, as well as venture and private equity funds and other unclassified funds.

In the first part of chapter three, with the help of descriptive analysis, I examine how savings of Hungarian households developed in the 2000s, with special emphasis on the period following the financial crisis of 2008-2009 and what factors may have been behind the Hungarian savings processes. The most important conclusions of the chapter were the following:

1. After the 2008-2009 crisis, the behaviour of the Hungarian households underwent a change. On the one hand, this can be explained by the strengthening of precautionary considerations coming to the fore due to cyclical changes in the macro environment (declining incomes, rising unemployment, and increasing instalments due to the revaluation of foreign currency

loans). On the other hand, in addition to cyclical factors, structural factors may have played a growing role, such as wage growth, the income-boosting effect of tax reforms, debt cap rules and the government's incentives supporting long-term savings. The decline in yields in Hungary from 2012 onwards was not accompanied by a decline in savings: until 2016, precautionary considerations could have had a significant impact on consumption-saving decisions. From 2017 onwards however, the expansion of incomes, the improving economic outlook, and the recovery of confidence in the banking system contributed to the recovery of consumption, which was accompanied by a smaller decline in savings.

2. Following the outbreak of the crisis Hungarian households started to save an increasing portion of their disposable income. The increase in net saving may have been initially linked to so-called "forced saving" due to rising loan instalment, but it may also have been supported by a reduction in borrowing due to demand and supply factors. The increase in net savings however, exceeded this, which may be traced back to the rapid growth of financial assets.
3. The increase in savings is clearly seen not only in transaction data, but also in the stock indicator, in the net financial wealth owned by households. Major part of the increase in net financial wealth (55 per cent) can be attributed to new retail savings, which indicate a propensity to save (own calculation based on MNB, 2021a). The second biggest effect was exerted by the revaluation of holdings, which contributed to almost 35 per cent of the growth. Government measures related to household FX loans (early repayment scheme, settlement, and forint conversion) and other variation in stocks accounted for another 5 per cent each.
4. The growth of the net financial savings and wealth of Hungarian households also significantly supported the increase in the net lending of the economy. The increased accumulation of financial assets of Hungarian households may have also contributed to the recovery of sustainable economic growth.
5. In recent years, there were several factors in Hungary that have prompted households to start increasing their savings in real estate: in conjunction with declining yields, falling loan interest rates on the one hand and the creation of a central banking concept of a fair banking system have made loan-financed housing more attractive, on the other hand diminishing returns on alternative investments also encouraged the purchase of investment property. At the same time the purchase of second-hand dwellings alone would not have increased households' real estate assets, still because of rising demand due to the improving income situation and credit conditions, real estate prices increased substantially after 2014.

In the second part of the third chapter, I dealt with the structure of the financial assets of Hungarian households after the financial crisis of 2008-2009 and examined the changes in the structure of the financial portfolio of the Hungarian households. The most important findings in this regard were the following:

1. The fundamental reason of the increasing share of securities within the portfolio of households' savings is the changing yield environment. During the first 2008-2009 post-crisis years households placed their additional savings into bank deposits, which was probably the result of increasing deposit yields as well as households' risk averse attitude. Since the beginning of 2012, during households' portfolio allocations, securities have been gaining ground: among these primarily government securities. The relative growth of government securities was also helped by the supporting government strategy (eho- and personal income tax exemption, expansion of the sales network, marketing campaigns). Thus, while in 2011 government securities represented a mere 2 percent within financial assets of households, the figure by the end of 2020 rose above 14 percent, which is high even in international comparison.
2. The low-yield environment may have increased, besides the securities, cash demands of households as well, since the opportunity cost of holding cash has declined due to falling interest rates. In addition to the strengthening of the precautionary motive, declining inflation, the gradual expansion of retail sales, and the introduction of the financial transaction levy and free cash withdrawals may have played a role in the level of cash held by households.
3. Ultimately, households finance the main sectors (government, corporations, and the foreign sector) through their decisions on asset allocation. Households funds the main domestic sectors not only directly, but also through other financial intermediaries (e.g., mutual funds, insurance companies, pension funds) (indirect financing). According to my calculations, Hungarian households' total government securities holdings amount to around 25 per cent of GDP, well in excess of direct holdings (19 per cent of GDP).
4. Overall, the Hungarian households also strengthened the capacity of the country to withstand shocks by investing an increasing portion of their higher savings in Hungarian government securities, thus providing internal funds to the state. As a result of this process, public funding of the government has increased significantly, which may reduce the country's external vulnerability through the strengthening of internal funding.

4. The wealth position of Hungarian households based on micro-level data

In this chapter, I examine the saving behaviour of Hungarian households using the first detailed domestic database. The survey, which covers a wide range of different asset items, asked not only about the financial and non-financial assets of households but also about the income and consumption/saving habits of the household members. In other words, the database offers the possibility not only to analyse household assets and liabilities, but also to explore the relationship between household income and other demographic characteristics.

The HFCS (Household Finance and Consumption Survey) is the first comprehensive survey to provide detailed household wealth, income and indebtedness data at the household level. The following is a brief overview of previous surveys on household wealth from different perspectives.

There are two regular surveys of Hungarian households (HBLS and Household Monitor), which focus mainly on consumption, income and demographic characteristics, as well as on wealth and saving patterns. Since 1993, the HCSO has produced the Household Budget and Living Conditions Survey (HBLS) every year, which includes detailed household income, consumption and demographic data. In recent years, the survey has also included a question on subjective living conditions (Gáspár – Varga, 2009).

Another regular survey is the TÁRKI Household Monitor, which has been covering the labour market and household income since 1992 and provides detailed information on, among other things, wealth, savings and consumption (Szívós – Tóth, 2013). In addition, HCSO regularly collects micro-level questionnaire data on housing in the What do we live in? survey (HCSO, 2016).

In this chapter of the dissertation, I focused more on the wealth of Hungarian households because, unfortunately, the available micro-level databases do not contain data on flow-type variables (e.g., savings). This does not allow a comparative analysis of wealth, as only three years (2014, 2017 and 2020) of the HFCS survey have been included so far (the results of the latter will be finalised in autumn 2021, and the 2014 and 2017 databases are not comparable for all variables due to differences in sampling methodology).

Household savings can be calculated from the Household Budget and Living Conditions Survey (HBLS) on a residual basis, as all income and consumption items (including household income spent on renovations and housing investments) are included in this questionnaire. Therefore, at the beginning of my research, I tested whether the savings concluded could be

used for further analysis. The results obtained showed that the residual savings estimate from the HBLS database is not useful for any research in this direction, as its fit to macroeconomic variables is not satisfactory. It would therefore be inappropriate to use the survey for this purpose.

4.1. Database – general characteristics of the Hungarian HFCS survey

In recent years, especially after the 2008-2009 crisis, micro statistics have become have gained growing importance in addition to the statistical data available at the national economy level for the financial situation of households. This can be explained, among other things, by the fact that a significant share of financial assets is held by the richest top few percent of the population, so that a small proportion of households may play a decisive role in the change of aggregate data. Macro statistics (and the arithmetic average typically used) provide little information on the financial well-being of different strata of an economy. The responses to economic shocks may differ substantially between groups. For example, low- and high-income groups, the poor and the wealthy, consumers with credit and liquidity constraints, or over-indebted households are all priority groups whose behavioural responses can greatly support economic policy making and generally help to better monitor aggregate developments.

Household wealth (financial and non-financial) has already been surveyed in several countries. In the United States, the population has been interviewed about their financial situation every three years since the 1980s, and similar surveys were carried out in some European countries before the financial crisis.

The need for data arising from the financial crisis prompted the European Central Bank to launch a household survey, the HFCS, based on a common methodology and questionnaire. The HFCS is the first internationally harmonised statistics to collect information on household consumption, income, real and financial assets and liabilities in an analytical framework. A micro-level database is available from the household questionnaire survey, which allows an in-depth analysis of the phenomena indicated by the macro-level data.

The first fieldwork was carried out between 2008 and 2010 with 15 member states in the eurozone (the survey is compulsory for eurozone countries). In the second wave in 2014, five countries were added to the survey: Ireland, which had not participated in the first round, Latvia and Estonia, which joined the eurozone after the first round, and Poland and Hungary, which joined the survey voluntarily. The third wave was added in 2017 and the fourth wave in 2020.

Hungary has been collecting data on a voluntary basis[14] from the second wave (2014 onwards), with the latest survey in 2020. Around 6,000 households were surveyed in all three surveys. In addition to questions on households' financial assets and liabilities, the questionnaire also covers demographic characteristics and consumption patterns – overall, this is the most comprehensive data collection in the European Union. International results for the latest wave (2020) are not available at the time of writing this dissertation.

After the first wave of the HFCS (2010), aggregate variables derived from micro-level data have been compared with economy-wide information from financial accounts for several countries. The comparison can help to assess the quality of the survey, answer questions about the usability of the database and provide a good starting point for a sub-division of the aggregate data, which allows a deeper analysis of the household wealth items. Among the countries surveyed, the share of aggregate data from financial accounts that can be observed from micro-level data was examined for Austria, Finland, Italy and the Netherlands (Andreasch –Lindner, 2014; Honkkila – Kavonius 2013).

Table 7: Comprehensive HFCS data (2014) and the "hit rate" of financial instruments by financial accounts

	Finland	Italy	Netherlands	Austria	Hungary
Deposits	55%	33%	49%	35%	73%
Bonds and other debt securities	15%	17%	55%	33%	64%
Insurance (pension, life)	21%	16%	24%	37%	52%
Mutual funds	69%	28%	67%	51%	52%
Listed shares	87%	36%	21%	30%	19%
Total financial assets[15]	39%	22%	30%	44%	47%
Loans	90%	45%	92%	NDA	65%

Source: Andreasch – Lindner (2014), Honkkila – Kavonius (2013), based on the calculation of Boldizsár et al. (2016)

[14] In addition to Hungary, Poland also completes the survey on a voluntary basis.
[15] For total assets, the coverage of the HFCS database is relatively low, which may be because the survey does not fully capture country-specific financial assets. In Hungary, for example, the receivable on the general government related to private pension funds is included in the financial accounts, but the HFCS data do not include information on this instrument.

Several methodological problems with questionnaire surveys have been identified in the past, which were also encountered in respect to the underlying database. The data quality of the first wave is variable. While the coverage of real assets is over 80 percent and the coverage of credit variables is also favourable, ranging from 40 to 90 percent, the coverage of financial assets is only 20 to 50 percent. This problem has been addressed by over-representing rich households (Simon – Valentiny, 2016). The survey tends to underestimate household financial assets: overall, less than half of macro financial assets are included in the HFCS data (Table 7).

The ratios between micro- and macro-level data vary across countries by asset category. The coverage of individual assets was lowest in the Italian survey, but also in Austria relatively few assets were found. In contrast, the Finnish HFCS database shows an extraordinary similarity with macro statistics for some instruments (full coverage), which can be explained by the fact that the questionnaire survey was supplemented with information from administrative data sources (Honkkila – Kavonius, 2013).

Compared to international data, the Hungarian HFCS database is characterised by relatively high coverage. The Hungarian survey was able to find a relatively high proportion of certain instruments on the asset side, based on the financial accounting categories. However, the coverage of loans is significantly lower than in the Finnish and Dutch data.

The international literature has also attempted to identify the factors that might account for the discrepancies. Differences may be due to differences in the approach to micro- and macro-level data, differences in the timing and method of data collection, differences in household coverage, and differences in sampling procedures. Differences may also be since macro-level data may include assets and liabilities of self-employed, self-employed and non-profit organisations, which are not included in the household survey.

Data collection may also be hampered by the fact that there are few observations from wealthier households, resulting in a lack of information on the highest value assets (Honkkila – Kavonius, 2013). Some of these differences can be addressed in the sampling process (for example, by overweighting high-income earners to reduce the difference between the two edges of the distribution), but the two statistics are not substitutes for each other. At the same time, the HFCS survey data can complement the analysis of the financial accounts, as the distribution of wealth within each asset group is similar in the two databases (Andreasch – Lindner, 2014).

4.2. Hypotheses on the financial wealth of Hungarian households

In the following subsection, I verify frequently cited but not verified stylized facts and establish relationships regarding the financial wealth of Hungarian households. Based on the results of the domestic and international survey, I formulate hypotheses, which I finally verify by means of calculations. I formulate my hypotheses (Table 8) based on the literature reviewed and macro-level data on Hungarian household savings.

Table 8: Hypotheses tested in the empirical research

	Hypothesis
Level of financial assets	**H1:** As income and educational attainment increase, gross financial savings gradually grow, and more and more households have investments.
	H2: Hungarian households' real estate holdings are greater than financial wealth, irrespective of income.
	H3: Does a household's income position, and the educational attainment, age and risk profile of the head of household, and the family structure influence whether or not a household has financial assets amounting to more than its three-month cost of living?
	H4: The amount of households' financial wealth is influenced by their income position, and the educational attainment, age and risk profile of the head of household, along with the family structure.
Structure of financial assets	**H5:** Irrespective of their attitude to risks, Hungarian households hold more liquid financial assets than investments.
	H6: As households' income rises, the wealth held in different types of assets becomes more diversified (less concentrated).
	H7: Risky asset holding depends mostly on the wealth and income of households.

Source: Author's work

To test each hypothesis, I use the databases of the 2014 and 2017 HFCS surveys in Hungary. The first block of variables used to test the hypotheses is household data, constituting the most important characteristics of households. Among the demographic characteristics, I examine the effects of household size (number of children), marital status and age of household head (Table 9). I have also considered the education level of household head (I have also considered any financial education when examining the ownership of risky assets). A separate variable is the self-reported investment attitude of the female household head and the household, i.e., the extent to which he/she considers himself/herself a risk taker investor.

Household data also include household income, which is one of the most important variables when examining financial wealth.

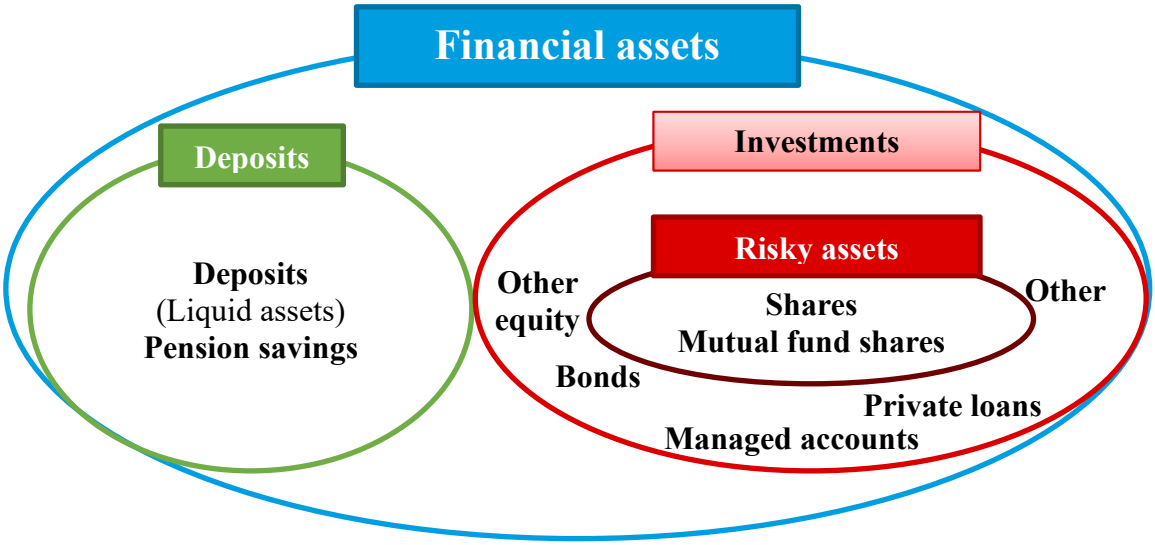
Using the database available to me, I have also constructed a set of key variables regarding assets. In the HFCS survey, the gross financial wealth of the household was basically constructed according to the financial account rows. The survey also asked about the type of assets (time deposit, sight deposit, bonds, mutual fund shares) each household held their savings in. In addition, the value of other equity, which is considered as financial asset in the same way as financial accounts, was also assessed.

In the HFCS database, financial assets are composed of the following financial assets: bank deposits, mutual fund shares, bonds, stocks, other equity, managed accounts, private loans, voluntary pension savings/life insurance and other financial assets.

For the analysis of wealth, I have divided the forms of savings into two groups, distinguishing between “deposits” (bank deposits and pension savings) and “investments” (other financial investments: mutual fund shares, bonds, stocks and shares, investment accounts, private credit and other financial savings). The category of investments was defined to include fewer liquid assets that require conscious decision making. Based on the literature, pension savings can be considered as investments, however, due to the long-term nature of these savings and the fact that in Hungary, there is also a significant employer contribution – thus a less conscious decision – I have included these savings in the deposits category for the purpose of my analysis.

When examining whether a household holds a risky asset, I used a narrower category: I only considered whether the household holds shares or mutual fund shares. I only considered bank deposits as a liquid form of savings.

Figure 21: Classification of financial assets in the thesis



Source: Author's work

In addition to gross financial assets, in some cases I have used net financial assets, which is calculated as the difference between gross financial assets and total financial liabilities of households. Among the wealth variables, I even worked with real estate wealth: in determining its measure, I used only the existence and value of the first property (HMR: Household Main Residence).

Derived variables constitute the third group of variables in my research. I measured the existence of household motivation to save by whether the household indicated any (or more than one) savings goal in the questionnaire. I considered a household as liquidity-constrained if the liquid assets did not exceed one month's gross income. When examining risky asset holding, background risks were also identified: income risk, housing risk, entrepreneurial risk. These were quantified based on the data available in the database as follows: households are considered to be exposed to employment income risk if all their income is received from employment. The higher the portion of real estate in total wealth, the higher the housing risk. The higher the share of entrepreneurial income in total income, the higher the entrepreneurial risk. Of course, in addition to the variables highlighted, I also derived several other variables to test the hypotheses. However, I will not specifically describe them, as their content can be clearly identified.

Table 9: Variables used in empirical research

Household **Content of variable**	**Variable code adopted from the HFCS database**
marital status	PA0100
number of children	DNH017
sex of household head[16]	RA0200
education of household head	PA0200
job classification	PE0400
risk taker/risk averse	HD1800
inherited, received a large gift	HH0100
Asset **Content of variable**	**Variable code adopted from the HFCS database**
gross financial assets	DA2100
net financial assets	DN3001
bank deposits	DA2101
mutual fund shares	DA2102
bonds	DA2103
other equity	DA2104
shares	DA2105
managed accounts	DA2106
private loans	DA2107
other assets	DA2108
voluntary pension fund/life insurance	DA2109
value of HMR	DA1110
financial liabilities	DL1000
Derived **Content of variable**	**Variable code adopted from the HFCS database**
motivation to save	HI0400
liquidity-constrained household	DA2101<DI2000/12
income risk	DI2000=DI1100
housing risk	DA1400/DA3001
entrepreneurial risk	DI1200/DI2000

Source: Author's work

When testing hypotheses, I also used survey weights for representativeness, but in cases where I modelled households' decision making, I did not do so.

The variables adopted for my research from the very extensive database available are presented in Table 9. The table also indicates which variables adopted from the HFCS database were used to create them.

[16] The sex of the household head was determined according to the reference person completing the questionnaire.

4.2.1. Examination of the level of financial wealth

Hypothesis 1 (H1): As income and educational attainment increase, gross financial savings gradually grow, and more and more households have investments.

Methodology

My first hypothesis is an often-quoted stylized fact that I try to prove by statistical means. To simply compare the gross financial wealth of Hungarian households in different aspects, I first use descriptive statistics (I focus on medians instead of averages). I decide whether there is a significant difference in gross financial wealth between groups by using a two-sample one-tailed t-test for a normal distribution of the variable. And to test normality, I use the Kolmogorov-Smirnov test. If the variable does not follow a normal distribution, I decide using the Kruskal-Wallis non-parametric test.

Analysis and results

As income increases, the value of financial assets held by households shows a steady rise. In addition, the survey shows that the portion of households holding investments (risky assets) increases gradually with income: while 6.5 percent of households in the lowest income quintile have financial assets, almost 25 percent in the highest income quintile (Table 10).

I have included financial assets of households other than bank deposits (and pension savings) under investments, and in subsequent analyses I will pay particular attention to what the literature defines as risky assets within investments, namely shares and mutual fund shares.

For both deposits and investments, the median value of financial assets rises gradually in sync with the increase of income. Households in the low-income category tend to hold their savings in less risky assets, typically bank deposits, while higher-income households tend to hold a higher proportion of their savings in investments.

The majority of investments, more than half, are held by the top income quintile. Furthermore, households in the higher income bracket hold a lower proportion of deposits and i.e., they tend to prefer riskier (security-type) forms of investment. The low risk-taking propensity of Hungarian households is also demonstrated by the trend that despite the fact that this category has the highest participation rate, only a quarter of households hold such savings.

The survey data also confirm the expected correlation that wealthier households with higher incomes tend to have higher value of financial assets. It is also worth pointing out here

that the lowest income quintile has very low value of financial assets and the high-income quintile has significantly more savings.

When looking at households by education, the results are almost identical: those with primary education tend to have very low value of financial assets and keep their savings predominantly in bank deposits. Households with higher education and with more substantial financial savings, on the other hand, hold a much higher proportion of risky assets. In other words, higher education supports the diversification of financial assets: in addition to a more advanced financial culture, the higher risk-taking propensity of these households may also play a role.

Table 10 suggests that higher income and educational attainment increase the probability of holding gross financial wealth and risky assets. Descriptive analysis of this kind (showing participation rates) only shows how gross financial wealth and investment evolve according to a given aspect, but this method of analysis cannot deal with partial effects.

It is easy to see that, for example, education and income are strongly correlated and it is therefore worth examining their effects simultaneously to show whether the separate effects of each factor are significant in terms of gross financial wealth and risky financial asset holding. Therefore, I will investigate this in Hypotheses H3 and H7 respectively – using a model-based approach to show how the factors investigated in the descriptive section and those derived from theory, filtering out the interaction of variables, affect household holding of gross financial assets and risky assets.

Table 10: Changes in the financial assets of Hungarian households, 2017

2017	Deposits	Investments		Gross financial wealth
	median value (HUF)	median value (HUF)	participation rate (%)	median value (HUF)
Total households	**500,000**	**1,450,000**	**13.9%**	**530,994**
Breakdown by income				
less than 20%	150,000	500,000	6.5%	180,000
20-39%	250,000	1,000,000	10.2%	300,000
40-59%	350,000	1,500,000	10.1%	400,000
60-79%	500,000	1,000,000	19.9%	800,000
80-100%	1,870,000	2,234,341	22.8%	2,158,920
Breakdown by education of household head				
Primary or less	94,000	300,000	5.6%	100,000
Max. secondary	300,000	750,000	9.5%	350,000
Tertiary	1,552,000	2,000,000	24.9%	2.050,000

Note: The deposits category includes sight and time deposits, as well as pension accounts.

Source: HFCS (2017), author's work based on Boldizsár et al. (2016)

In addition to producing descriptive statistics, when testing hypothesis H1, I also examined if there is a significant difference between the value of financial assets and the value of investments held across the different income and education groups. To test this, I use a one-way ANOVA test if there is a normal distribution of financial wealth (the direction of the difference is decided by a two-sample one-tailed t-test). The financial wealth and investment variables are first logarithmized, as both variables are strongly right skewed. However, I have to reject the H_0 hypothesis based on the Shapiro-Wilk test: the financial wealth and investment variables do not follow a normal distribution not even after logarithmicization.

In the case of one-way analysis of variance, it is important that the data measured on an interval scale or a ratio scale is normally distributed. If the variable of interest is not normally distributed, the Kruskal-Wallis test should be performed. The Kruskal-Wallis test can be used to compare more than two independent groups (a non-parametric test equivalent to one-way ANOVA and an extension of the Mann-Whitney U test). Table 11 shows the mean rank of the variables in each group and provides chi-square values, degrees of freedom and significance levels. The results show that there was a statistically significant difference between groups ($p < 0.05$, H_1, group averages are not equal).

Table 11: The outcomes of the Kruskal-Wallis test for financial wealth and investment variables

	Financial wealth		Investment	
	Observation	Rank	Observation	Rank
Breakdown by income				
less than 20%	518	872,855	70	22,273
20-39%	865	1,640,000	120	46,813
40-59%	965	2,020,000	158	76,797
60-79%	1,011	2,400,000	254	114,204
80-100%	1,174	3,350,000	360	203,117
	$chi^2(4) = 435.49$ p=0.00		$chi^2(4) = 72.46$ p=0.00	
Breakdown by education of household head				
Primary or less	415	576,380	45	10,271
Max. secondary	1,881	3,600,000	230	83,732
Tertiary	2,237	6,100,000	687	369,201
	$chi^2(2) = 599.48$ p=0.00		$chi^2(2) = 106.37$ p=0.00	

Source: HFCS (2017), author's work

The result of testing hypothesis H1 is, therefore, that there is a significant difference between the value of financial assets and investments (risky assets) across the different income and education groups, and that an increasing share of households have investments. The descriptive statistics suggest that the value of gross financial assets saved and investments (risky assets) increases gradually with increasing income and education (there is a positive relationship between the variables), but further examinations (model building) are needed to confirm this.

Hypothesis 2 (H2): Hungarian households' real estate holdings are greater than financial wealth, irrespective of income.

Methodology

My second hypothesis is also a repeatedly declared view: for Hungarian households, property ownership is very important (Boldizsár et al., 2016). My hypothesis is not quite this, as I formulated the hypothesis with an eye to its verification by statistical methods. To test the hypothesis, I first present a simple comparison of the residential property owned by Hungarian households according to different criteria (here again, I focus on medians instead of averages). Next, I do a cross-tabulation analysis: the fact that a given household owns more financial than real estate assets is not independent of the income quintile it belongs to. Finally, whether the share of real estate assets in total wealth differs significantly across groups is decided by a one-tailed t-test when the variable is normally distributed. And to test normality, I use the Shapiro-Wilk statistic. If the variable does not follow a normal distribution, I decide using the Kruskal-Wallis non-parametric test.

Analysis and results

We are not greatly mistaken when we say that almost everyone in Hungary owns property, or if they do not, they aspire to have one. Based on the HFCS survey data, we can say that Hungary has the second highest share of households owning residential property – after Slovakia – among the countries surveyed. The lowest proportions of households in the eurozone are in Germany, Austria and France, presumably due to the development of the rental market. In other words, in contrast to many Western European countries, for Hungarian households, homeownership is the primary consideration (Boldizsár et al., 2016). In Hungary, this is reflected in the fact that, according to HFCS data, more than 80 percent of households live in the property they own (partly or fully) (Table 12).

Looking at the evolution of the value of the HMR by income quintile, the value of housing (and also the ownership rate) increases gradually as income increases, i.e., higher income allows for the purchase of a more valuable housing. The median value in the top quintile in 2014 was almost three times higher than in the first quintile. The 2017 data show that this gap has narrowed.

It is also observed that the participation rate increases only slightly (from 81 to 85 percent) as educational attainment rises, but its median value shows a substantial increase, presumably in line with rising incomes in conjunction with higher educational attainment.

Across all data, the median value of a property was close to HUF 8 million in autumn 2014, but by 2017 this had risen to HUF 12 million. In other words, the increase observed in the macro-level data is also evident in the micro-level data (the valuation of real estate is basically self-reported, so this also means that the Hungarian population is aware of the increase in real estate prices since 2014).

Table 12: Households' real estate assets

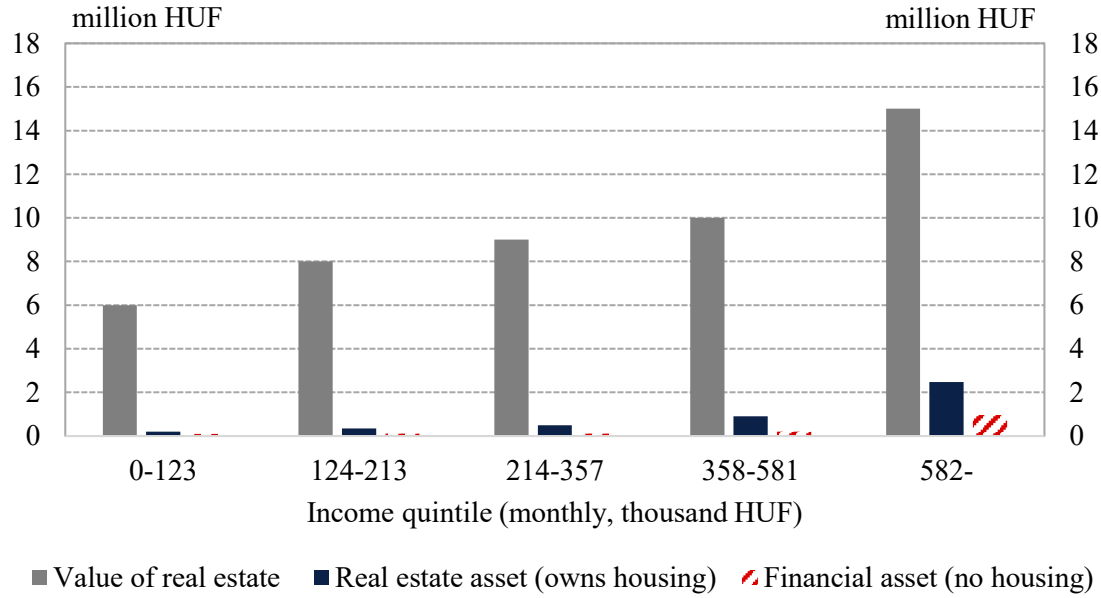
	2014		2017	
	median value (HUF)	**participation rate (%)**	**median value (HUF)**	**participation rate (%)**
Total households	**8,016,466**	**84.2**	**12,000,000**	**83.9**
Breakdown by income				
less than 20%	5,010,291	77.9	8,000,001	82.0
20-39%	6,262,866	82.1	10,000,001	82.9
40-59%	8,016,466	84.6	10,000,001	81.7
60-79%	9,018,526	86.3	13,000,000	84.3
80-100%	14,028,817	90.2	18,000,002	88.6
Breakdown by education of household head				
Primary or less	4,509,263	81.0	6,000,002	80.5
Max. secondary	8,016,466	84.8	10,000,001	84.7
Tertiary	13,026,760	85.4	15,999,999	85.2

Source: HFCS (2014), HFCS (2017), author's work based on Boldizsár et al. (2016)

HFCS survey data show that households in the lower income quintile have very low level of financial assets (Table 10, Figure 22). In other words, if the household does not own a property – unable to buy a property due to a lack of financial savings – this situation has been changed by the fact that certain family allowances (baby loan, CSOK) are partly counted as a co-financing when taking out a loan.

According to descriptive statistics from the 2017 HFCS survey results, looking at the relationship between housing wealth and financial assets, what we see is that even in the top income quintile, the median value of financial assets held by households does not come close to the median value of their housing wealth. For barely 20% of Hungarian households, financial assets exceed the median value of their housing assets. This trend may have been supported by the increase in housing prices since 2014. In other words, based on descriptive statistics alone, one can surmise that owning real estate is more important than holding financial assets (Figure 22).

Figure 22: Total real estate* and financial wealth (median) by income quintiles, 2017



Source: HFCS (2014), author's work based on Boldizsár et al. (2016)

* The median of housing values was computed based on the data of total households.

However, based on the cross-tabulation analysis carried out, the fact that a given household has more financial than real estate assets is not independent of the income quintile it belongs to (the statistics are presented in Table 13). The p-value obtained from the chi-square test is 0, i.e., at all confidence levels, hypothesis H_1 is accepted, there is a significant relationship between the two variables. In other words, accumulation in financial savings can be considered as a conscious behaviour for households with better income situation. The preference for real estate assets is not confirmed for all income quintiles.

Table 13: Relationship between income and preference for property, 2017

		More financial assets than real estate assets		
		No	Yes	Total
Income quintile	1	670,712	95,932	766,644
	2	662,590	103,627	766,217
	3	632,932	131,895	764,827
	4	613,630	152,192	765,822
	5	616,975	148,398	765,373
	Total	**3,196,839**	**632,044**	**3,828,883**
Pearson $chi^2(4)$ = 25,000 p=0.00				

Source: HFCS (2017), author's work

I also examined whether there is a significant difference in the ratio of financial wealth to total wealth (including the value of HMR) across income groups. Neither the variable thus constructed, nor its logarithmic form follows a normal distribution according to the Shapiro-Wilk statistic. Since the variable under study is not normally distributed, the Kruskal-Wallis test should be applied. Table 14 shows the average rank of the variables in each group, as well as the chi-square values, degrees of freedom and significance level. The results show that there is a statistically significant difference between the groups ($p < 0.05$, group means are not equal). That is, the proportion of financial wealth differs across income groups: higher income is associated with a higher proportion of financial investments.

Table 14: The outcome of Kruskal-Wallis test for the financial assets as a share of total assets variable, 2017

	Observation	Rank
Breakdown by income		
less than 20	518	1,060,000
20-39	865	1,800,000
40-59	965	2,090,000
60-79	1 011	2,380,000
80-100	1 174	2,950,000
	$chi^2(4)$ = 83.74 p = 0.00	
Breakdown by education		
Primary or less	415	842,654
Max. secondary	1,881	3,930,000
Tertiary	2,237	5,510,000
	$chi^2(2)$ = 98.34 p = 0.00	

Source: HFCS (2017), author's work

The outcomes of the hypothesis H2 test led to the following conclusions: (1) Even though the median value of financial assets held by households in the top income quintile does not come close to the median value of their housing wealth, income affects whether a household owns more financial assets than housing wealth. (2) There is a significant difference in the ratio of financial wealth to total wealth across income groups – i.e., for better-off households, accumulation in financial savings can be considered a conscious behaviour. Based on the tests carried out, I cannot accept hypothesis H2: it is not independent of income whether a household has more real estate assets than financial assets.

Hypothesis 3 (H3): Does a household's income position, and the educational attainment, age and risk profile of the head of household, and the family structure influence whether or not a household has financial assets amounting to more than its three-month cost of living?

Methodology

To test the hypothesis, I used the simplest model of the logistic regression model family, the binary logistic regression, the so-called logit model. This methodology allows to identify the impact of factors influencing the probability of an event occurring.

Logistic regression is one of the General Linear Models (GLM).[17] One of the most important features of logistic regression (binary logistic regression, the so-called logit model) is that the dependent variable is discrete, not continuous. The binary variable has only two observed value (0 and 1). In this case, the outcome variable expresses whether or not a household has financial assets amounting to more than its three-month cost of living.

Logistic regression can be rated as a classification procedure because it is used when observations are assigned to one of predefined, mutually exclusive groups based on information obtained from the explanatory variables.

Another important feature of the model is that there is no requirement for the distribution of the explanatory variables, making it particularly suitable for classifying outcome variables with discrete distributions. The explanatory variables can be nominal, ordinal or higher (interval and ratio) scaled variables. One of the possible values (usually the first or the last) of the explanatory variables measured at the nominal or ordinal level is recorded, against which the effect on the outcome variable is estimated.

The occurrence of categories of outcome variable y can usually be estimated imprecisely using the traditional least squares method in the linear regression model framework. First, the outcome variable is not continuous, and second, a unit change in the explanatory variable is not assumed to result in the same shift in the outcome variable over the entire range. Third, the outcome variable estimated by linear regression does not fall within the [0;1] interval required for probabilities. The logit transformation addresses these problems. The logit transformation means that instead of taking the dependent variable, it logarithmizes the ratio of the probabilities

[17] Logistic regression is presented based on Kovács, Erzsébet: Statistical analysis of financial data (2011).

of its occurrence and non-occurrence and fits a linear model to it. The odds ratio of the dependent variable is also called the odds or odds ratio (p/(1-p)) and its logarithm is the logit.

That is

$$\ln\left(\frac{p}{1-p}\right) = \ln(odds) = \log it\ (p) = \beta_0 + \beta_1 x_1 + \ldots + \beta_p x_p$$

or

$$\text{odds} = \left(\frac{p}{1-p}\right) = \exp(\beta_0 + \beta_1 x_1 + \ldots + \beta_p x_p) = e^{\underline{\beta^T x}}$$

The term exp(bi) is typically used to interpret logistic regression models, which shows how many times a unit increase in x_i changes odds (Kovács, 2011).

However, the average marginal effect (AME) is often used to evaluate the results of logistic regression. This can be explained by the fact that the marginal effect is easier to be interpreted than the odds ratio, since the possible values of the marginal effect as a measure are limited (Bartus, 2003). A further argument in favour of the marginal effect is that the odds ratio may give a false picture of the magnitude of the causal relationship.

Nevertheless, the interpretation of the results is much easier with the odds ratio than with the average marginal effect, since the odds ratio is solely a function of the parameter estimation, independent of the observations. The main difficulty in calculating the marginal effect in logistic regression is that the marginal effect varies from observation to observation (Bartus, 2003), i.e., it is difficult to summarise the marginal effect from observation to observation in a single number. This problem is addressed by the method of averaging: the indicators thus calculated are the sample-wise averages of the “individual” marginal effects associated with each observation, which we call the average marginal effect. The average marginal effect is the percentage change in the probability of a given event occurring.

In the case of logistic regression, the adequacy of fit of the classification is indicated by the classification table, i.e., the proportion of observations that the model classifies correctly. The adequacy of classification can be varied by changing the so-called cut value, which means that it classifies the observations according to the estimated probability values for each observation and compares this with the original group classification (the most commonly used cut value is 0.5). This can also affect the overall percentage, but in particular the proportion of observations correctly classified into each category is sensitive to the adjustment of the cut value (Kovács, 2014).

Receiver Operating Curve (ROC) and AUC value (AUC = Area Under the Curve) calculated from it are suitable graphical methods to assess the adequacy of fit of logistic regression (Kovács, 2014).

The two axes of the ROC curve are represented by two ratios: the y-axis is the sensitivity of the test (positives/ones correctly detected), and the x-axis is the so-called "false alarm" (1 to 1 minus negatives/zeros correctly detected). The ROC curve indicates a better model the faster and the higher it rises towards the 45-degree line. The size of the area under the curve is given by AUC value calculated from the trapezoids, with a maximum value of 1. AUC measure can also be used to select between models. The following can be said about the adequacy-of-fit of logit models according to the rule of thumb:

- 0.90-1 = excellent
- 0.80-0.90 = good
- 0.70-0.80 = moderate
- 0.60-0.70 = poor
- 0.50-0.60 = the model is not suitable for differentiation (Kovács, 2014, p. 146).

When calculating logistic regression using statistical software packages, we may encounter the pseudo R^2 indicator. The pseudo R^2 indicator is a "pseudo" R^2 indicator, as it differs from the R^2 indicator of OLS regression, as it does not measure the proportion of variance explained by the model (in logistic regression, variance is recorded as the variance of the standard logistic distribution). There are several variants and different pseudo R^2 indicators can give very different assessments of model fit, and there is no single variant that the statistician would prefer. Many authors in the literature therefore caution against direct interpretation of pseudo R^2, especially when they can be used to choose between several models (Kovács, 2014).

Another way to judge the model's adequacy of fit is the Hosmer-Lemeshow test. The Hosmer-Lemeshow test divides the observations into a number g of groups based on the estimated probabilities (10 groups are usually defined). It examines whether the number of events that actually occur in each group is equal to the predicted number. If there is a significant difference (low p-value, the null hypothesis of the test is rejected), the model is not a good fit (Fliszár et al., 2016).

Analysis and results

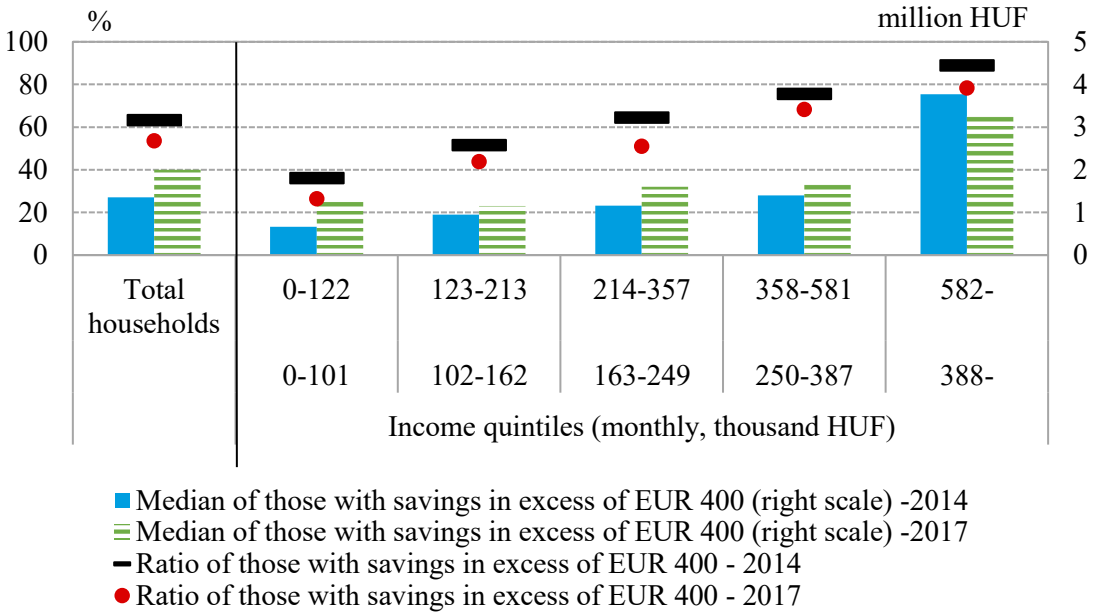
Before presenting the model, I first describe how the value of these financial assets in excess of the liquidity buffer has evolved across income groups using descriptive statistics. Our conjecture, which is presumably confirmed by both the descriptive statistics and the model, is that as income increases, a larger share of households owns a financial asset that exceeds the liquidity buffer.

Overall, around 60 percent of Hungarian households have enough financial assets to cover 3 months of household living costs in the event of a job loss (Figure 23). The liquidity buffer is defined as €400, which, based on 2014 data, could cover three months of household living expenses (utility bills and food). However, when looking at income groups separately, only the highest income groups have a share of households that can finance their consumption for 3 months from their accumulated savings that is close to 100 percent (although in their case, the three months' consumption would probably be higher). For the lowest income households, less than half have a sufficient liquidity buffer.

Comparing the results of the two years (the 2014 and 2017 surveys), although the amount of savings accumulated by households with savings above the liquidity buffer has increased, the share of households with savings below the liquidity buffer has also increased. However, the different methodologies of the two surveys may play a role in this. Despite the relatively high proportion of households with no liquidity buffer among the lowest income earners, there are still households in this group who have significant savings.

The median of financial assets of those with financial assets of at least €400 increases only slightly between the first four income quintiles, while it is outstanding in the highest income group (more than double the median of the fourth quintile). In other words, the level of financial wealth does not gradually increase across income quintiles, suggesting that in the long run, high financial wealth is only available to the highest income earners. Similar results were obtained by Bukodi and Róbert (2000) in their survey of durable goods: they recorded a high level of wealth among the highest income earners.

Figure 23: Share of people with savings more than €400 and median of savings



Source: HFCS (2014), HFCS (2017), author's work

However, when modelling financial wealth in excess of the liquidity buffer, I also examined the effect of demographic factors in addition to household income, and whether the effect of the risk attitude of the household head towards investments and the value of the property they own could be detected. For the analysis, I used the HFCS Hungarian database: observations from 2014 and 2017 were examined together. In contrast to the previous hypothesis testing, I did not use survey weights to model individual decisions. The reason for the omission of weights lies in the fact that the tests used are sensitive to increasing the number of observations in this way. The use of weights may reduce the p-value, make variables incorrectly significant, and thus lead to incorrect conclusions.

The binary outcome variable in the logistic regression is one if a given household has financial wealth in excess of three months' cost of living. The three-month cost of living (liquidity buffer) is defined as €400, as I have shown earlier, which, based on 2014 data, can cover three months of household living expenses (utilities and food).

For the explanatory variables, I have also examined the effect of the marital status of the household head among demographic characteristics, as well as the effect of whether there are children in the household. For educational attainment, I used primary education as the reference group, and for the age of the household head, I used young households (the latter implying that the head of household is under 40). Female household head is also included as a

separate variable, as the literature suggests that this may also influence household saving behaviour (even when all other factors are excluded).

A dummy variable is also used to account for the effect of the two different inclusion years used in the study (2014 and 2017). I also considered the household's self-reported investment attitude, i.e., the extent to which it considers itself a risk-averse investor. Finally, I also examined whether the value of HMR owned by a household affects its accumulation of financial assets. The parameter estimates of the model, exp(bi), i.e., how many times a unit increase in a given variable changes the odds, the odds, are given in Table 15.

Table 15: Outcomes of the logistic regression modelling financial asset holdings

	Coefficient	Standard error	z	P>z	95% confidence interval		exp(bi)
Income (log)	0.489	0.35	13,960	0.000	0.420	0.557	1.63
Educational attainment							
Secondary	0.643	0.068	9,480	0.000	0.510	0.776	1.90
Tertiary	1.401	0.078	17,990	0.000	1.248	1.553	4.06
Age							
40-69	0.046	0.074	0,620	0.534	-0.099	0.190	1.05
Above 70	-0.364	0.087	-4,190	0.000	-0.534	-0.194	0.69
Female household head	-0.044	0.055	-0,810	0.421	-0.152	0.063	0.96
Marital status	0.199	0.057	3,500	0.000	0.088	0.311	1.22
Any child?	-0.034	0.066	-0,520	0.606	-0.163	0.095	0.97
Year effect	-0.700	0.050	-13,930	0.000	-0.799	-0.601	0.50
Risk aversion	-0.641	0.052	-12,270	0.000	-0.743	-0.539	0.53
HMR (log)	0.370	0.029	12,710	0.000	0.313	0.428	1.45
Constant	-7.779	0.388	-20,030	0.000	-8.540	-7.018	0,00

Prob>chi2=0 Log likelihood=-5498.6772 Pseudo R2=0.1854

Note: Female household head=0, if male, 1, if female; Marital status=0, if no partner, 1, if yes; Any child? =0, if no, 1, if there is; Year effect=0, if based on data of 2014 survey, if data of 2017 survey 1; Risk aversion=0, if risk taker, 1, if risk averse.

Source: Author's work

I also estimated the average marginal effects (AMEs). The AME is the number of percentage points by which a given variable changes the probability of a given event occurring. I used the average marginal effects from the model to evaluate the results, which are summarised in Table 16.

Table 16: Average marginal effect size of logistic regression

	Average marginal effects (AMEs)	Standard error	z	P>z	95% confidence interval	
Income (log)	0.088	0.006	14.420	0.000	0.076	0.100
Educational attainment						
Secondary	0.136	0.015	9.260	0.000	0.107	0.164
Tertiary	0.277	0.016	17.160	0.000	0.246	0.309
Age						
40-69	0.008	0.013	0,620	0.535	-0.018	0.034
Above 70	-0.068	0.016	-4,200	0.000	-0.100	-0.036
Female household head	-0.008	0.010	-0,810	0.420	-0.027	0.011
Marital status	0.036	0.010	3,510	0.000	0.016	0.056
Any child?	-0.006	0.012	-0,520	0.606	-0.029	0.017
Year effect	-0.126	0.009	-14,400	0.000	-0.143	-0.109
Risk aversion	-0.115	0.009	-12,570	0.000	-0.133	-0.097
HMR (log)	0.067	0.005	13,060	0.000	0.057	0.077

Source: Author's work

The results show that with income growth, the probability of holding financial assets increases: on a logarithmic scale, a one-unit increase in income (i.e., a 2.7-fold increase in income) increases the probability of holding financial assets by almost 9 percentage points.

The results for educational attainment also confirm what was observed in the descriptive analysis: educational attainment increases the probability of holding financial assets even when the effect of other factors (e.g., income, age) is removed. Secondary education and tertiary education increase the probability of such holding by 13.6 and 27.7 percentage points respectively.

Compared to young people, the elderlies (over 70) show a drop of almost 7 percentage points – i.e., older households are less likely to hold more than three months' worth of financial assets to cover three months of living costs. The result confirms the life cycle hypothesis, i.e., older households are less likely to hold financial assets. No significant result was obtained for middle-aged households. Being in this group varies the probability of holding financial assets by -1.8-3.4 percentage points at the 95% significance level, so this variable is not significant in the model. Based on the theory, we would expect that households should save for old age at

this age, i.e., belonging to this age group increases the probability of holding financial assets. This may be explained by the very broad definition I used for the middle-aged age group.

Being a *'dual-earner' family* has a positive effect on the probability of holding financial assets, but the effect is only small – it increases the probability by about 3.6 percentage points. The variables for *female household head and the presence of child* are not significant at the usual significance levels. In the case of female household heads, based on the literature, I would expect it to increase the probability of saving, as women are typically more cautious and risk-averse – they are "more likely" to save for unexpected expenses (e.g., Barber–Odean, 2001). If there is a child, compared to households without a child, I expected that having a child would reduce the probability of holding financial wealth due to child-related expenditures. However, an opposite relationship is also possible, possibly explained by the need to hold a larger liquidity buffer in these households. The insignificance of the variable may be since these two effects hold simultaneously.

The probability of holding financial wealth also decreased for households in the 2017 survey compared to 2014: this is somewhat at odds with the fact that financial accounts data show that household financial wealth increased significantly over this period (MNB, based on 2021a). This may be explained by the fact that the two surveys follow different methodologies, but also draws attention to the fact that an examination of the concentration of financial wealth may be warranted.

Interestingly, *risk aversion* also reduces the probability of holding financial assets. This may be explained by the tendency that households do not necessarily save to mitigate risk, i.e., the role of precautionary motives may be lower in saving decisions. However, it is important to be aware of the limitations of the variable: it only tried to capture risk attitudes towards investments.

Finally, the probability of holding financial assets increases with the value of the HMR (increasing the value of the property by one unit on a logarithmic scale – i.e., increasing the value of the HMR by 2.7 times – increases the probability by 6.7 percentage points).

This result is not surprising as we saw earlier in Hypothesis H2, owning residential property is important for Hungarian households – and households have more financial assets in addition to higher property values. One could imagine an inverse relationship, in which case those with higher value HMR would be less likely to hold financial assets, as they would no longer need to accumulate financial wealth to buy property. However, the property wealth

variable needs to be treated with caveats due to endogeneity[5], as there is simultaneity in the relationship between the two variables.

In fact, higher real estate and financial wealth can be simultaneously the result of higher wealth in general (positive relationship). But another effect is also possible, which makes it worth leaving the variable in the model: when someone buys property, he or she typically does so at the expense of his or her financial wealth, i.e., property directly reduces financial wealth (negative relationship). For reasons of endogeneity[18], I will therefore partially omit its use in my subsequent model runs related to the verification of H4.

I first evaluate the adequacy of fit of the model classification using the classification table. The classification table is in fact a cross-tabulation showing the joint distribution of the actual and estimated values of the outcome variable, here the classification according to the existence of financial assets. The overall hit rate of the model is 72.43%. The model correctly classifies savers in 74.78% of cases, and non-savers in 66.58%. I cut value is set at 0.5, changing it did not change the adequacy of classification significantly. However, the results of the table suggest that further evaluation is worthwhile (Table 17).

Table 17: Classification table of logistic regression

	There are savings (prognosticated)	No savings (prognosticated)	Ratio of those correctly classified
There are savings	**5 467**	**1 844**	74.78%
No savings	**979**	**1 950**	66.58%
Total			**72.43%**

Note: Cut value 0.5

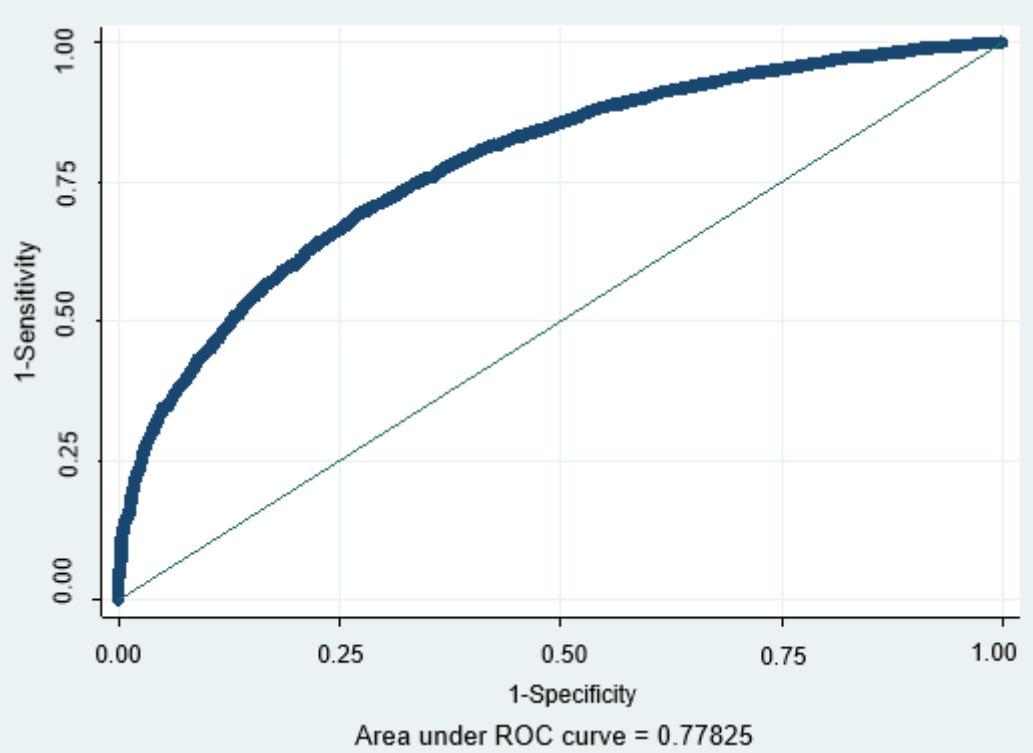
Source: Author's work

The dependence of the classification table on the cut value affects the assessment of the adequacy of classification (Fliszár, 2016). To eliminate this and to graphically display the discriminative power of the model, ROC curve can be used, which takes all cut values into account (Figure 24). Its two dimensions are FPR (false positive rate/(1-specificity)) and TPR (true positive rate/sensitivity). If the model classifies everything correctly, the area under the ROC curve is equal to 1. If the model performs a completely random classification, i.e., the model is inadequate, the area under ROC curve is 0.5. The area under ROC curve of the model

[18] In econometrics, endogeneity refers to situations in which the explanatory variable is correlated with model error term. Endogeneity can arise from several sources: it can be caused by omitted variables and measurement error, as well as by simultaneity. In this case the latter, simultaneity, may be present (i.e., the variables interact).

described above is 0.7825, which indicates that the model's performance is better than acceptable: a value of around 80 percent already indicates a favourable classification ability (Kovács, 2014).

Figure 24: ROC in the model approximating the probability of holding financial assets



Source: Author's work

The value of pseudo R^2 is 0.1854, which I do not evaluate because many authors in the literature caution against direct interpretation (Kovács, 2014).

The Hosmer-Lemeshow test provides information on the applicability of the fitted model. The results obtained suggest caution: at the usual significance levels (p value 0), the null hypothesis of the test should be rejected, significant deviations from the predicted values are found in the model fit, and the model fit is questionable.

The following conclusions can be drawn for hypothesis H3:

Whether a household has financial assets amounting to more than its three-month cost of living is influenced by the *educational attainment* of the household head in addition to the household *income.* On a logarithmic scale, a one-unit increase in income (i.e., a 2.7-fold increase in income) increases the probability of having financial assets by 8.8 percentage points.

Secondary education increases the probability of holding by 13.6 percentage points and tertiary education by 27.7 percentage points.

Compared to the young, the *elderlies* (70+) show a decrease of almost 7 percentage points – meaning that older households are less likely to hold financial assets amounting to more than its three-month cost of living. The result confirms the life cycle hypothesis, i.e., older households are less likely to hold financial assets.

Among family structure variables, the *'dual-earner' family* positively affects the probability of holding financial assets. Gender of household head (female household head) and the presence of child do not affect the probability of holding financial assets

In formulating the hypothesis, I have defined *risk aversion* as a possible influencing factor. The results obtained suggest that risk aversion does not increase but decreases the probability of households holding financial assets. It is possible that households do not necessarily save to mitigate risk, but due to the limited nature of the variable (only investment attitudes were considered), it is worthwhile to treat the result with caution.

Hypothesis 4 (H4): The amount of households' financial wealth is influenced by their income position, and the educational attainment, age and risk profile of the head of household, along with the family structure.

Methodology

To identify the saving behaviour of Hungarian households, I used the Heckman selection model, a novel approach to the study of this topic. Heckman selection model will be presented in more detail, given the importance of this model in my empirical research.

In addition to the existence of financial wealth, it is also worth examining the factors that determine the extent to which a household has financial wealth. However, when examining the extent of financial wealth, we may run into the problem of missing observations: it is therefore worth looking at a possible way to address this.

To explain the null/missing value of the outcome variable, we can basically use three types of econometric approaches based on Humphreys (2013):

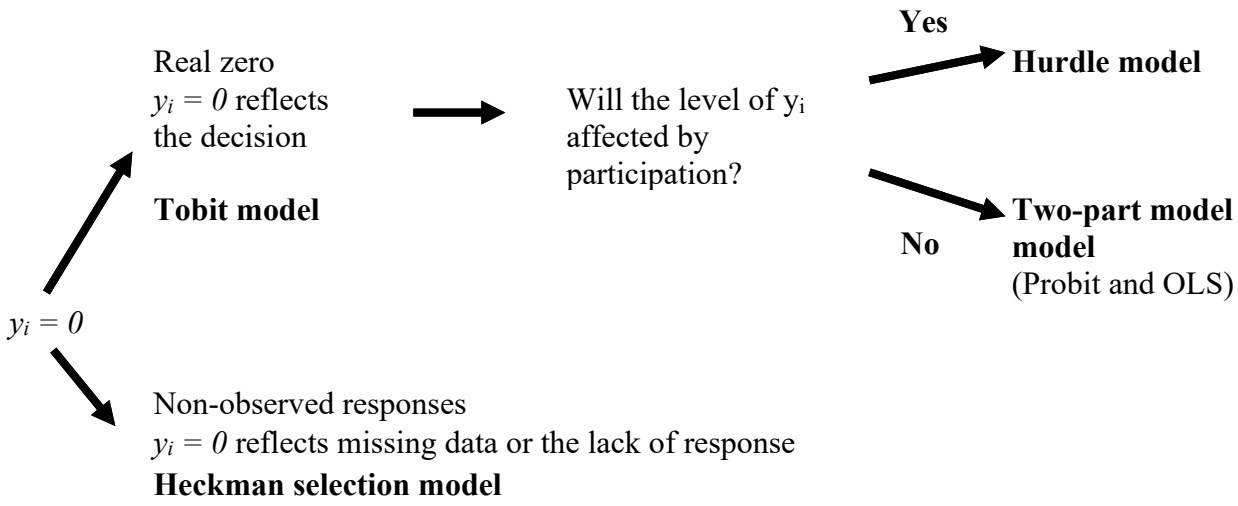
1. *Sample selection models* (Heckman selection model). The use of these models is justified when the outcome variable is zero due to unobserved responses. That is, the fact that $y_i = 0$ is not informative when estimating the level of y_i.

2. *Two-part models.* These models are appropriate when $y_i = 0$ is a true zero, i.e., it reflects the actual decision of the respondent. Furthermore, bipartite models are appropriate when selection and quantity decisions occur in time succession.

3. *Hurdle models.* These models are appropriate when $y_i = 0$ is a true zero, i.e., it reflects the actual decision of the respondent. Furthermore, Hurdle models are appropriate when participation and consumption decisions occur simultaneously in time.

Figure 25 summarises the possible solutions for unobserved and observed zeros – in which case which model should be used.

Figure 25: Choice of estimation method for zero outcome variables



Source: Own editng based on Humphreys, 2013

In the following, I will deal with the problem of selection bias and the Heckman selection model in more detail, as I believe that when examining household financial wealth, we run into the problem of selection bias in the cases described above (of course, the existence of zero outcome variables is not the only decision criterion). In fact, in the database I use, the proportion of missing data for the financial wealth variable is very high: the level of financial wealth is a "sensitive" issue for households, and non-response is common. The proportion of zero values is also relatively high – but as it is a variable that I have trained, it is more relevant to focus on missing data. Summary data for the financial wealth variable are presented in Table 18.

Table 18: Table summarising the financial wealth variable

	Number of observations	Ratio in sample
Missing value	**2 254**	**18.95%**
Zero	**2 348**	**19.74%**
Other	**7 292**	**61.31%**
Total	**11 894**	**100.00%**

Source: Author's work

There are basically two versions of the selection bias problem. Classical selection bias is when a proportion of respondents have no information about the outcome variable. One of the most frequently cited examples, for example, is when we want to estimate the effect of women's education on their income, we encounter the problem that a proportion of women do not have a paid job and thus have no income. If these women do not have a job because they have not continued their education, then estimating the impact of education on income may give biased results (Smits, 2002).

In the other variant of the selection bias problem, which is less relevant to my research, information on the outcome variable is available, but the selection of respondents was selective. An example of this phenomenon can be found when we want to study the impact of migration on income. If we simply run a regression in which income is the outcome variable and the explanatory variables include a 'migration' dummy (whether the respondent migrated in the past), we can obtain a biased estimate of the migration effect, since the distribution of respondents (between immigrants and non-migrants) were not random. People who choose to migrate may differ in many (measured and unmeasured) characteristics from those who do not. If these characteristics are related to income, the dummy coefficient of migration may pick up these effects and this may lead to biased estimates (Smits, 2002).

Heckman (1979) introduced a two-stage regression procedure to study the selection problem. The first step in Heckman selection model is the so-called selection mechanism, which estimates the survival model of observations for the entire sample using a probit regression. The second step is a regression model based only on the selected observations, using this surrogate variable as a correction factor.

1. Selection equation

$$Z_i^* = \boldsymbol{w_i'\gamma} + \mathrm{u}_i\,;\; Z_i = 1\; ha\; Z_i^* > 0,\; otherwise\; 0. \qquad (6)$$

$$Prob\,(Z_i = 1|\boldsymbol{w_i}) = \boldsymbol{\phi}\,(\boldsymbol{w_i'\gamma})\; and\; Prob\,(Z_i = 0|\boldsymbol{w_i}) = 1 - \boldsymbol{\phi}\,(\boldsymbol{w_i'\gamma}) \qquad (7)$$

where Z_i^* is the continuous variable of the selection;

Z_i is the binary selection variable for the i-th observation;

w_i is the vector of variables affecting selection for the observation;

w_i is the sensitivity of selection to these variables;

u_i the unobservable factor affecting selection;

ϕ is the distribution function of the standard normal distribution, $\phi = 1$ for survivors, $\phi = 0$ for non-survivors.

In Heckman selection model, the error terms of this selection equation are used to construct a variable controlling for selection bias, called lambda (λ) or the inverse Mills ratio (IMR). This variable reflects the effect of all unmeasured characteristics associated with selection.

2. Regression equation

$$Y_i = \boldsymbol{X_i'\beta} + \varepsilon_i \;\; Z_i = 1 \quad (8)$$

where Y_i is the outcome variable of the regression equation;
Z_i is the binary selection variable for the i-th observation;
X_i is the vector of variables affecting the regression for the observation;
β the sensitivity to these variables;
ε_i is the unobservable factor affecting regression.

It is the second step of the Heckman selection model that we are really "interested in", where the effects of the explanatory variables on the outcome variable are quantified in an OLS regression. We include the variable controlling for selection bias in the regression equation. Since this factor reflects the effect of all unmeasured characteristics that are related to the decision under consideration, the coefficient of this factor "captures" the part of the effect of these characteristics that is related to the outcome variable. Since we are controlling for the effect of the unmeasured characteristics associated with the outcome variable, the other explanatory variables in the equation are already free of this effect and the estimation results in unbiased coefficients (Smits, 2002).

Based on the assumptions of the Heckman model, the error terms (u_i, ε_i) in the selection and regression equation are independent of each other and follow a bivariate normal distribution [0, 0, 1, σ_ε, ρ]. The correlation between the error terms is ρ. In the case where the ρ correlation value is not 0, the selection of observations is not random, so the OLS β coefficient estimates of the regression equation are biased by selection, and therefore the Heckman selection model is relevant. In this case, the Heckman parameter λ is also significant, and the results obtained can be interpreted within the framework of the model.

The difficulty in applying the Heckman procedure is that at least one variable must be found that tends to affect the binary variable, but not the outcome variable in the regression

equation. If such a variable does not exist (and sometimes even if it does exist), identification problems may arise and the addition of a correction factor to the regression equation may lead to estimation difficulties and unreliable coefficients. Heckman was awarded the Nobel Prize in Economics in 2000 for his work in this area.

Analysis and results

To estimate the financial wealth level model, I used a total of 11,894 observations from 2014 and 2017 from the HFCS database. I trained the outcome variable of the regression equation of the model (log_savings) using the variable DA2100 of the database: since it is mainly the financial wealth exceeding the three-month cost of living that is of interest for the research question, observations – which are under liquidity buffer – were replaced with zero (the database does not contain exactly zero values, but observations below €100 already came to more than 1000). Although the normality of the outcome variable is not a prerequisite for estimating linear regression, many of the tests used show a better fit when normality is satisfied. For strongly right-skewed variables, logarithmic adjustment can help to achieve normality (Fliszár, 2016). The financial wealth variable does not follow a normal distribution even after logarithmization according to the Kolmogorov-Smirnov test (p value 0). [19]

The outcome variable in the selection equation is the binary variable used in hypothesis H3, i.e., whether a given household has financial wealth exceeding three months' living costs. Thus, in Heckman selection model, we model not only the binary variable 0 or 1 in the logistic regression (wealth more or less than €400), but also the level of savings in the 'yes' case.

The explanatory variables used for the selection and regression equations of the Heckman selection model are based on the explanatory variables used in the testing of the H3 hypothesis. The difficulty of the procedure, described earlier, is that it is necessary to find at least one variable that tends to affect the binary variable but not the savings rate.

Before running the first results, I constructed two such explanatory variables based on what I had read in the literature and my experience in researching the topic.

The first is the Variable of *Inheritance*, which is often discussed in the literature as a variable that affects savings (e.g., Zagorsky, 2012; Martinello, 2016; Korom, 2016). However, the focus is mainly on its impact on the flow type variable. To understand the "operation" of this variable, it is worthwhile to refer to buffer-stock theory. According to buffer-stock theory,

[19] However, due to the transformation performed, the skewness became closer to zero and the kurtosis also lower.

consumption and saving decisions have two outcomes: impatience and prudence. Impatience leads to a preference for present consumption over future consumption, while prudence encourages saving. The theory suggests that every household has a desirable wealth/permanent income ratio, and that if wealth is below this ratio, the prudence motive is stronger, and savings rise. And if wealth is higher than the desired level, consumption increases at the expense of savings because of impatience (Carroll, 1996).

An unexpected inheritance increases this ratio, so that consumption takes precedence and savings are negatively affected by the inheritance. However, if it is an expected inheritance, i.e., the heir does not have to buy, for example, a residential property because of the inheritance, this can have a positive impact on savings and thus on financial wealth. All of this suggests that those who inherit are more likely to have financial wealth more than three months' costs of living. The fact of inheritance no longer necessarily affects the level of financial wealth, since in the questionnaire the fact of inheritance/gift affects not only financial wealth but also other assets (e.g., real estate). The value of the *Inheritance* variable is 1 if the household has inherited or received a gift of higher value, 0 if not.

The other is the variable *Motivation*, which is constructed from the variable savings goals (HI0400). In the questionnaire, there were several types of saving goals, if the household head marked at least one of them, the value of this *Motivation* variable is 1, i.e., the household wants to save. If the household does not have a savings goal, the value of this variable is 0. The following variable may be a good selection variable because the savings goal may influence whether a household saves or has financial assets. However, this variable no longer affects the value of financial assets accumulated by a given household. The explanatory variables of the model are presented in Table 19.

Table 19: Table summarising the explanatory variables of the Heckman selection model

Explanatory variable	Explanation	Assumed sign of coefficient
Regression equation		
Income (log_{income})	Logarithm of annual household income	+
Educational attainment (educ)		
Secondary	Educational attainment=0, if primary, 1, if secondary, 2 if tertiary	+
Tertiary		+
Age (age)		
40-69	Age=0, if household head is under 40, 1, if 40-69, 2 if over 70 years of age	+
Over 70		-
Female household head (female)	Female household head=0, if male, 1, if female	+/-
Marital status (haspartner)	Marital status=0, if no partner, 1, if there is	+
Any child? (child)	Any child?=0, if none, 1, if there is	+/-
Year effect (time)	Year effect=0, for 2014 survey data, for 2017, 1	+/-
Risk aversion (notrisk)	Risk aversion=0, if risk taker, 1, if not	+/-
HMR (log_{HMR})	Logarithm of value of the household's residential property	+/-
Selection equation		
Motivation (motive)	Motivation=0, if the household has no savings motive, 1, if it has	+
Inheritance (inherit)	Inheritance=0, if no major amount/item is inherited or received as a gift, 1, if it has been	+

Source: Author's work

The structure of the equations in Heckman selection model looks as follows with respect to household saving decisions:

1. **Selection equation**

$$savings_i^* = \alpha_o + \alpha_1 log_{income} + \alpha_2 educ_1 + \alpha_3 educ_2 + \alpha_4 age_1 + \alpha_5 age_2 + \alpha_6 female + \alpha_7 haspartner + \alpha_8 child + \alpha_9 time + \alpha_{10} notrisk + \alpha_{11} log_{HMR} + \alpha_{12} motive + \alpha_{13} inherit + u_i \quad (9)$$

$$savings_i = 1 \; if \; savings_i^* > 0, \; otherwise \; 0. \quad (10)$$

$$Prob\,(Z_i = 1|\boldsymbol{w_i}) = \boldsymbol{\phi}\,(\boldsymbol{w_i'\alpha}) \text{ és } Prob\,(Z_i = 0|\boldsymbol{w_i}) = 1 - \boldsymbol{\phi}\,(\boldsymbol{w_i'\alpha}) \quad (11)$$

where

$savings_i^*$ is the continuous variable of selection,

$savings_i$ is the binary selection variable for the i-th observation – if financial assets exceed three months' cost of living (Z_i),

log_{income}, $educ_1$, $educ_2$, age_1, age_2, *female, haspartner, child, time, notrisk,* log_{HMR}, *motive, inherit* are the explanatory variables of the selection equation ($\mathbf{w_i}$),

α_i are the coefficients of the selection equation,

u_i is the non-observable factor affecting selection,

w_i is the vector of variables pertaining to observation, influencing selection,

ϕ is the distribution function of the standard normal distribution.

2. Regression equation

$$log_{savings} = \beta_0 + \beta_1 log_{income} + \beta_2 educ_1 + \beta_3 educ_2 + \beta_4 age_1 + \beta_5 age_2 + \beta_6 female + \beta_7 haspartner + \beta_8 child + \beta_9 time + \beta_{10} notrisk + \beta_{11} log_{HMR} + \varepsilon_i \quad (11)$$

$$when \; savings_i = 1, \quad (12)$$

where

$log_{savings}$ is the outcome variable of the regression equation,

log_{income}, $educ_1$, $educ_2$, age_1, age_2, *female, haspartner, child, time, notrisk,* log_{HMR} are the explanatory variables of the regression equation,

β_i are the coefficients of the regression equation,

ε_i a $log_{savings}$ is the non-observable factor affecting selection,

Before interpreting the coefficients of the equations, I first examine the validity of the selection model's applicability. I omit the numerical interpretation of the parameters in the selection equation because I interpreted them in the logistic regression of Hypothesis H3[20]. The obtained results are very similar, here I only highlight the larger differences – coefficients with different signs, significance.

The dummy coefficients of the regression equation of the Heckman selection equation cannot be interpreted in the usual way for the coefficients of the OLS estimate, i.e., the β_i coefficient obtained here does not show the effect of a unit shift in x_i explanatory variable on the outcome variable with other explanatory variables remaining unchanged. The correction proposed by Halvorsen and Palmquist needs to be performed on the parameters (Halvorsen – Palmquist, 1980), because the coefficients of the regression equation are semilogarithmic coefficients. The marginal effect on its outcome variable (in our case, the logarithm of financial wealth) can be derived from both the selection equation and the regression equation.

However, in my research I do not aim to construct a predictive model, i.e., to estimate the amount of financial wealth held by a given household. It is also much more important for economic policy makers and financial companies to be aware of what factors and how they affect the existence and extent of financial wealth. Therefore, in the case of the regression equation, in accordance with the research goal of the dissertation, I interpret only the direction of the effect of the variables on the level of financial wealth. However, I would like to highlight the fact that there has been a change in the direction of the effect of the variable compared to the selection equation.

I use the Stata software package for the analysis. In the first model run, I used only the *Inheritance* variable as the selection variable, and due to the endogeneity that arose, I first constructed the model without the *Housing* variable. The estimation results of the Heckman model are presented in Table 20.

[20] There is usually no big difference between the results of the probit and logit model. The two model types differ from each other only in the type of transformation they use and the assumptions they make for the distribution of the error term. For the probit model, the estimated probability is described by the standard normal distribution, for the logit model by the logistic distribution function (Greene, 2003).

Table 20: Table summarising the outcomes of Heckman selection model (Model 1)

	Selection equation		Regression equation	
	Coefficient	Standard error	Coefficient	Standard error
Income (log)	0.288***	0.017	0.459***	0.031
Educational attainment				
Secondary	0.495***	0.036	0.026	0.079
Tertiary	1.017***	0.04	0.570***	0.104
Age				
40-69	0.095**	0.036	0.347***	0.041
Above 70	-0.129**	0.044	0.492***	0.056
Female household head	-0.045	0.03	-0.156***	0.037
Marital status	0.159***	0.031	-0.083*	0.04
Any child?	-0.004	0.035	0.009	0.039
Year effect	-0.169***	0.032	-0.110**	0.041
Risk aversion	-0.351***	0.028	-0.313***	0.041
Inheritance	-0.311***	0.034		
Motivation	0.350***	0.031		
Constant	-2.305***	0.168	4.289***	0.382
Mills				
lambda	-0.270*	0.141		
rho	-0.202			

$* p < 0.05; ** p < 0.01; *** p < 0.001$

Source: Author's work

The coefficient of the inverse Mills ratio (λ) is statistically significant (p = 0), which means that selection bias is present when examining the financial wealth of Hungarian households. That is, the application of Heckman selection model is justified. This is supported by the correlation between the error terms (u_i, ε_i) of the selection and regression equations -0.202. If the ρ correlation value is not 0, the β coefficients of the OLS estimate are distorted, which can be corrected by Heckman selection method.

While the value of lambda (λ) is included in most empirical research using Heckman selection model, the value of rho (ρ) correlation is already much lower (e.g., Certo et al., 2016 examined strategic management research from this perspective). In the dissertation I do not interpret the value of rho (ρ) either, because due to its "nature" it is extremely sensitive to the

specifications of the model, and the significance of lambda already includes the value of rho (ρ), so lambda (λ) is sufficient when evaluating the selection model (Certo et al.).

Table 20 also shows that most of the explanatory variables in the selection and regression equations are significant, with signs consistent with those observed in logistic regression and expected from the literature.

Consistent with my earlier expectation, the results of the selection equation support that, in addition to *income*, *educational attainment* is an important determinant of financial wealth.

Contrary to my expectation, the sign of the *Inheritance* variable, defined as a selection variable, is negative. As I have shown earlier, inheritance should increase the probability of holding financial wealth, since the amount received increases the amount of financial wealth, and if it is the inheritance of other assets, it may have a positive effect on the accumulation of financial assets (since, for example, the household does not have to buy real estate). The buffer-stock hypothesis assumes that inheritance increases the amount of wealth to be held, so that consumption increases at the expense of savings due to impatience, (current) savings are negatively affected by inheritance, but wealth does not decrease in the long run compared to the initial level. In other words, a household that inherits or receives a larger amount as a gift should increase the probability of accumulating financial wealth.

The results of the model suggest that the sign of the *Inheritance* variable is negative, i.e., if a household inherits or receives a larger amount as a gift, it reduces the probability of accumulating financial wealth. A possible explanation for this could be that households that inherit or receive larger gifts are more "reliant" on other – presumably related – households, so that they do not need to hold financial wealth because of the expected support they receive from them. Inheritance could identify selection, but this is not necessarily the case in the Hungarian data. Therefore, my next model run is conducted without this selection variable.

The sign of the *Motivation* variable, defined as the other selection variable, is positive, as expected: i.e., the existence of a savings goal increases the propensity to hold financial wealth.

As in the logistic regression, variable *Female household head* and the presence of child is not significant in the selection equation at the usual significance levels.

However, in the regression equation, the coefficient of *female household head* is already significant. Based on the literature, I would expect that having a female household head would increase the probability of saving, as women are typically more cautious and risk-averse – they

are “more likely” to save for unexpected expenses. In contrast, the sign of the variable *Female household head* is negative. In my opinion, this can be explained by the fact that households, where there is a female household head, are often households where mothers raise their children alone. One possible explanation I considered is that, as the financial situation of these households may be worse than that of dual-earner families, the sign of the variable may turn negative. To verify my hypothesis, I constructed two other models: first, I added to the original model the variables *One-earner female headed* and *Dual-earner female-headed* households and *One-earner male-headed* households (cross-correlations), with which I re-run the regression. On the other hand, I also re-run the model with the cross-correlation variables *Male Household Head with Child*, *Female Household Head with Child*, *Female Household Head without Child*. However, in the regression equation, the sign of the cross-section with all female household heads was negative at the usual significance levels. These results suggest that the variable is robustly negative for most specifications, i.e., the results refute the preconception that women save more.

The *existence of a child* variable is not significant in either the selection or the regression equation. This can be explained by the reasons explained in the logistic regression (the wealth reducing effect of child-related expenditure and the need for a higher liquidity buffer are counteracting).

The Secondary education variable is significant in the selection equation, and it is insignificant in the regression equation. This implies that this education level increases the probability of holding financial assets, but no longer affects the amount of wealth held by the household – i.e., there is no significant difference in the level of financial wealth compared to those with primary education.

In the selection equation, the coefficient of *Elderly* (70+) variable is negative – i.e., older households are less likely to hold more than three months' worth of financial assets to cover their cost of living. This result confirms the life cycle hypothesis, i.e., older households are less likely to hold financial assets. However, in the regression equation, the sign of this variable is already positive: that is, older households who have financial assets also have higher financial assets than younger households. This suggests that the elderly population in Hungary is very heterogeneous: relatively few elderly households have financial wealth, but those, who do have financial wealth, their wealth is significant. This is somewhat contradictory to the life cycle hypothesis, i.e., that older households “use up” their savings. This could be explained by the

bequest motive: older households want to ensure that the next generation has the necessary assets.

The sign of middle-aged households is significant in both the selection equation and the regression equation and, as expected, the sign is positive. I defined the middle-aged age group (40-70) very broadly, so I looked at other classifications – but defining the variable differently led to similar results.

A *'dual-earner' family* has a positive effect on the probability of holding financial assets but is less significant in the regression equation. This implies that this variable has a positive effect on financial wealth, but less of an effect on the extent of financial wealth (another model run is worth looking at).

As in the logistic regression, the sign of the *Year effect* variable is negative in both equations – this is probably explained by the fact that the 2014 and 2017 surveys were conducted with different methodologies. A surprising result is that *risk aversion* also reduces the probability of holding financial assets and the amount of financial wealth held. One possible explanation for this, which I have already mentioned in the results of the logistic regression, could be that households do not necessarily save to mitigate risk, i.e., the role of precautionary motives may be lower in their saving decisions.

For Model 2, I have also used only the *Motivation* selection variable to explore the factors that influence the level of financial wealth (Table 21).

Table 21: Table summarising the outcomes of Heckman selection model (Model 2)

	Selection equation		Regression equation	
	Coefficient	Standard error	Coefficient	Standard error
Income (log)	0.291***	0.017	0.573***	0.034
Educational attainment				
Secondary	0.505***	0.036	0.277***	0.085
Tertiary	1.033***	0.040	0.990***	0.118
Age				
40-69	0.104**	0.036	0.377***	0.042
Above 70	-0.123**	0.044	0.451***	0.056
Female household head	-0.041	0.030	-0.173***	0.037
Marital status	0.71***	0.031	-0.028	0.041
Any child?	-0.009	0.034	-0.008	0.039
Year effect	-0.151***	0.032	-0.227***	0.044
Risk aversion	-0.357***	0.028	-0.434***	0.044
Motivation	0.366***	0.031		
Constant	-2.928***	0.154	2.645***	0.436
Mills				
lambda	0.429	0.166		
rho	0.317			

** $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$*

Source: Author's work

The coefficient of the inverse Mills ratio (λ) is also significant for the second model, although only at a significance level of $p<0.05$. However, the result obtained still confirms that Heckman selection model is justified. The correlation value ρ is also significantly different from 0 (0.317), the coefficients estimated by simple least squares are not unbiased.

In interpreting the results of the model, I will only discuss the differences with the first model.

The sign of the variable *Motivation*, defined as the sole selection variable, remains positive, as expected: i.e., the existence of a savings goal increases the propensity to hold financial wealth.

A further difference is that the coefficient for *households with secondary education* in the regression equation is now significant here: i.e., there is a meaningful difference in the level of financial wealth compared to those with primary education.

However, the coefficient for *'dual-earner' households* has become insignificant in the regression equation. This implies that this variable has a positive effect on the existence of financial wealth, but no effect on the level of financial wealth. I also ran the model with this variable omitted from the regression equation. Overall, I still obtained significant results, suggesting that this variable can be used as a selection variable alongside the *Motivation* variable.

In addition to the model with only the *Motivation* selection variable (Model 2), I also constructed a model with *HMR* variable. Using Heckman selection model is also justified with this variable, as the least squares estimated coefficients are not unbiased. The results show that both the probability of holding financial assets and the amount of financial wealth increase with the value of *HMR*. However, because of the endogeneity problem described earlier (as indicated by the positive sign of the variable), it is worth treating the variable with caveats.

Based on the results of Heckman selection model, the most important variables affecting financial wealth are shown in Table 22.

Table 22: The most important variables affecting financial assets based on the model

Variables	Effect on holding financial assets	Effect on the level of financial assets held
Income	Positive	
Educational attainment	Positive	
Age	Negative – belonging to the "elderly" age group reduces the probability of holding	Positive – if the elderly household has financial wealth, its level is already increased by belonging to this age group
'Dual-earner' family	Positive	No effect

Source: Author's work

Outcomes obtained from testing hypothesis H4 support the idea that, in addition to *income*, *educational attainment* is an important determinant of the existence and extent of financial wealth.

Elderly households over 70 are less likely to hold more than three months' worth of financial assets to cover their cost of living. This result confirms the life cycle hypothesis that

older households are less likely to hold financial assets. However, elderly households that do have financial wealth also have higher financial wealth than younger households, so it is not necessarily true that elderly households "use up" their savings. This could be explained by the bequest motive: older households want to ensure that the next generation has the necessary assets. In other words, the elderly population in Hungary is very heterogeneous: relatively few elderly households have financial assets, but those that do have financial assets have significant financial assets. This makes the older society more fragmented than the younger one in terms of financial wealth.

Among family structure variables, the *'dual-earner' family* has a positive effect on the probability of holding financial assets, but no effect on the level of financial wealth. The gender of the household head (female household head) has no effect on the probability of holding financial assets but carries a negative effect on the level of financial wealth. The presence of children has no effect on the probability of holding financial assets, nor on the level of financial wealth.

In formulating the hypothesis, I have defined *risk aversion* as a possible influencing factor. The results suggest that risk aversion does not increase but decreases the probability of households holding financial assets and the level of financial wealth they possess. It is possible that households do not necessarily save to reduce risk, but due to the limited nature of the variable (the question referred only to investment attitude), the outcome obtained should be taken with reservations.

4.2.2. Examining the structure of financial wealth

Hypothesis 5 (H5): Irrespective of their attitude to risks, Hungarian households hold more liquid financial assets than investments.

Methodology

The questionnaire also asked whether the household head considers himself/herself a risk taker or risk averse – the prevalence of each asset is already grouped according to this variable. I use data from the 2014 survey on the basis that this variable in 2014 has proved to be more reliable in our other examinations. Those households were considered risk takers, based on the questionnaire data, which indicated in the question on their investment attitudes that they take 'average', 'above average' or 'substantial' financial risk to achieve above average returns. That is, the rating is not based on observed behaviour but on the subjective opinion of the respondents.

The main characteristics of Hungarian households broken down by this variable are shown in Table 23. The median income, financial assets and housing property values of risk averse households are also lower than those of risk taker households. In terms of demographic characteristics, the outcomes are in line with the literature: households that identify themselves as risk takers have a lower proportion of female household heads and a higher proportion of household heads with tertiary education. Although the proportion of households with children is similar in both groups, the theoretical frequencies are not similar across groups based on the chi-square test ($p=0.00$).

Table 23: Main household characteristics by risk attitude 2014

	Risk averse	Risk taker
	HUF	HUF
Income (median)	181,795	258,682
Financial wealth (median)	920,305	1,467,014
Deposits (median)	860,493	1,234,726
Investments (median)	901,853	2,004,117
Housing (median)	8,016,466	10,020,582
	%	%
Ratio of women	45.9	33.8
Ratio of those with tertiary education	24.3	45.1
Ratio of those with child/children	23.2	27.4

Source: HFCS (2014), author's work

Note: Groups that identify themselves as risk averse or risk takers differ significantly (p=0.00) in the value of income, financial assets, housing, deposits and investments, according to the Kruskal-Wallis test. Based on the chi-squared test performed, theoretical frequencies do not match in each group.

The first of my hypotheses on the structure of financial wealth is also a frequently cited hypothesis: Hungarian households prefer more liquid forms of savings, regardless of their risk attitudes (Boldizsár et al., 2016). To test the hypothesis, I first present the frequency of each instrument for different risk attitudes. Among the possible explanations regarding preference for more liquid forms of savings, I highlight savings objectives: the preference of Hungarian households for more liquid forms of savings may traced back to savings objectives. Finally, I also conduct a cross-tabulation analysis – I examine whether a household's possession of liquid financial assets is independent of their risk attitude.

Analysis and evaluation of outcomes

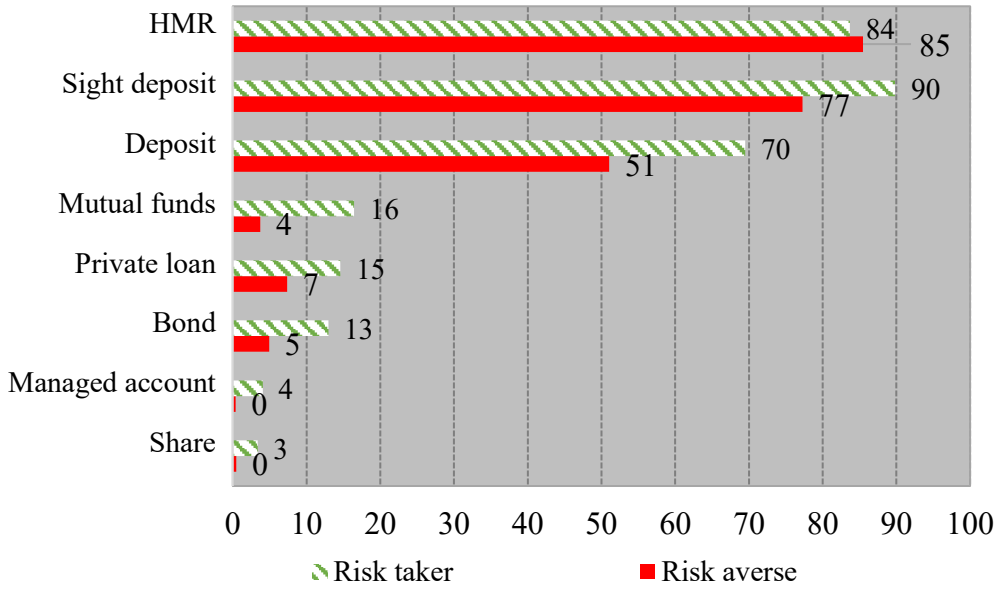
In testing the hypothesis, I first present the frequency of each asset. Frequencies show that bank assets are also held in higher proportions by risk-taking households, however, there is an even greater difference between investment-type assets. In other words, a higher number of risk taker households hold mutual fund shares and bonds in terms of frequencies (Figure 26).

It is also worth pointing out at the same time that within the investment type assets in Hungary, the bond category mainly includes assets (bond funds, government bonds) that are relatively low risk and can be considered safe.

However, from the descriptive statistics, we can only infer the partial effect of risk taking: to filter out the interaction of variables, we have conducted a logistic regression with my co-authors (Balogh et al., 2019), which is described in Hypothesis H7.

However, risk averse households have a slightly higher prevalence of homeownership – 85 percent of households classified in this type own their own home, while this proportion is slightly lower for risk taking households at 84 percent (the difference was not found to be significant based on the Kruskal-Wallis test performed).

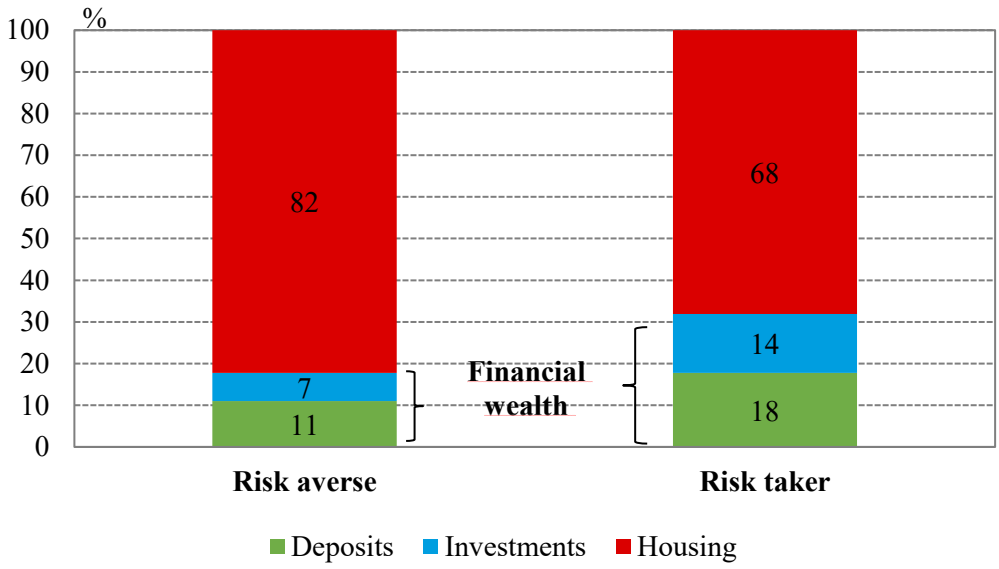
Figure 26: Frequency of holding financial assets in households with different risk attitudes



Source: HFCS (2014), author's work based on Boldizsár et al. (2016)

However, all this underlines the point in examining not only the frequency of each asset, but also its share within household wealth. Therefore, I also prepared the portfolio structure of the two groups (risk averse and risk taker households). Based on the obtained results, we can see that the proportion of the value of residential real estate (HMR) in case of risk averse households is much higher, exceeding 80 percent, while in case of risk takers 70 percent. I also calculated the ratios only for financial assets – based on this, the preference for more liquid forms of savings is more pronounced in both groups, in the case of risk takers about 56 percent, and in risk averse group almost 62 percent of liquid assets within financial assets (Figure 27).

Figure 27: Portfolio structure of risk averse and risk taker households



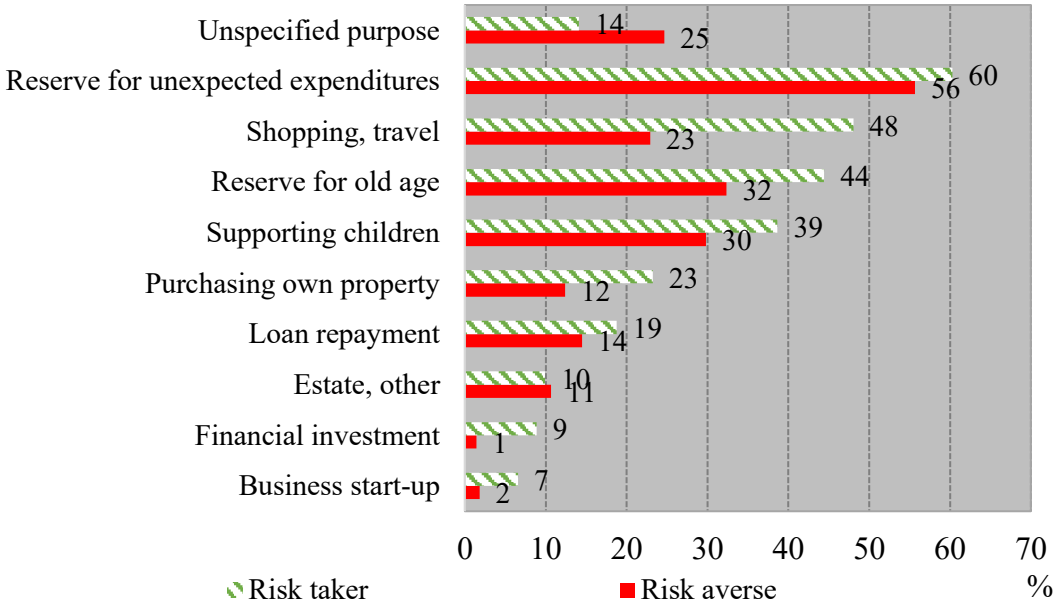
Source: HFCS (2014), author's work

Figure 28 shows that the two most frequently mentioned savings aims are to cover unexpected costs and to save for consumption, which may also play a role in the preference for more liquid forms of savings. The latter is more common among risk takers. The high ranking of pension savings among savings targets is somewhat surprising, especially in view of the relatively low popularity of long-term savings in Hungary.

Financial investment and the business aim are the last of the savings aims (the former was only rated by 9 percent of even risk-taking households and the latter by 7 percent), presumably since only higher income groups can afford longer-term savings. Higher risk appetite is also characteristic of wealthier and higher income groups, i.e., risk takers represent the majority for all savings purposes.

Even in the first wave of HFCS, the precautionary saving was one of the most important savings aims, followed by savings for old age. Interestingly, precautionary savings were highest in the Netherlands (92 percent) and lowest in Germany (42 percent). The other savings aims show a very heterogeneous picture by country. Mention of debt repayment as a target was typically higher where household indebtedness is also higher than, for example, in Hungary (Le Blanc et al., 2014).

Figure 28: Savings targets of households with different risk attitudes



Note: Frequencies. For savings aims, the household completing the questionnaire could indicate more than one savings target, but 21.7 percent of respondents did not indicate a savings target at all. Figure shows what percentage of all households mentioned the given savings aim.

Source: HFCS (2014), author's work based on Boldizsár et al. (2016)

93 percent of households that consider themselves risk averse and 83 percent of risk taker households own more liquid than fixed assets. To verify that households hold more liquid than fixed assets, regardless of their risk attitude, I conducted a cross-tabulation analysis. However, based on the cross-tabulation analysis performed, the fact that a given household has more liquid financial assets than fixed assets, regardless of its attitude towards risk (statistics are presented in Table 24). The p value resulting from the chi-square test is 0, i.e., hypothesis H_1 must be accepted for all confidence levels, there is a significant relationship between the two variables. I also performed the analysis to determine whether a particular household has a liquid financial asset depends on its risk attitude. Based on the chi-square test, accept hypothesis H_1 here as well, i.e., the two variables are not independent of each other. In other words, based on this, I cannot accept Hypothesis H5, according to which Hungarian households hold more liquid financial assets regardless of their risk attitude.

Table 24: Relationship between risk attitude and preference for liquid assets, cross-tabulation, 2014

		Has more liquid than invested assets		
		No	**Yes**	**Total**
Risk taker	**Yes**	196,966	978,777	**1,175,743**
		16.8%	83.2%	**28.5%**
	No	215,536	2,736,392	**2,951,928**
		7.3%	92.7%	**71.5%**
	Total	**412.502**	**3.715.169**	**4.127.671**
		10.0%	**90.0%**	
Pearson chi^2(4) = 83,000 p=0.00				

Source: HFCS (2014), author's work

The results of descriptive statistics suggest that risk attitudes can influence the choice of financial instruments. However, we can only deduce from the descriptive statistics and the cross-tabulation analysis the partial effect of risk-taking, so this needs to be further investigated. To filter out interaction between variables, we performed a logistic regression together with my co-authors (Balogh et al., 2019), which is described in Hypothesis H7.

Hypothesis 6 (H6): As households' income rises, the wealth held in different types of assets becomes more diversified (less concentrated).

Methodology

To verify the hypothesis, I used the Herfindahl-Hirschman index, an indicator often used to measure concentration. It is very simple to estimate and has a high data compression capability. Commonly used form of the indicator:

$$HHI = \sum_{i=1}^{n} s_i^2 \qquad (13)$$

In the equation, s_i is also the share of the i-th group (in our case, the ratio of the given asset within the total assets). The pointer can take values between 0 and 1. However, when calculating the HHI, the share is often not expressed as a number between 0 and 1, but as a percentage, in which case the value of the HHI ranges from 0 to 10,000. A value close to 0 indicates a low concentration, while a value close to 1 reflects a high concentration. In each income quintile, I calculate the degree of concentration of assets separately and then compare the obtained results – if the value of the indicator decreases for higher income households, hypothesis H6 can be justified, according to which income is more diversified (less concentrated) in each asset type. wealth.

Analysis and results

Examining all financial assets of Hungarian households by income brackets, it can be observed that the higher the household income, the lower the value of residential real estate within total assets (Figure 29). While in the lowest income quintile, real estate accounts for more than 90 percent of total wealth, in the case of the highest income, real estate no longer accounts for 60 percent of total wealth. However, the weight of other real assets – motor vehicles and other valuables – is growing in line with income.

It can also be seen that low-income households have virtually no business share, while for high-income households (in the fourth and fifth fifths), this asset accounts for about 20 percent of wealth. This presumably also means that those with a stake can earn a higher income than households that do not have a share of the business.

Overall, the weight of financial assets in the total wealth of the population, regardless of their income status, reaches a low level, approaching 40 percent only in the case of the highest-income households. The share of financial assets in the other income quintiles is only 5-20 percent of total assets. Within financial assets, the weight of investments is low in the first

four income quintiles, but for those with the highest incomes, this proportion is already higher, but here it does not even reach 5 percent. To determine how the concentration develops in each group, I computed the Herfindahl-Hirschman index (HHI or Herfindahl index) for each income quintile, which shows that the higher the income of a given household, the lower the concentration of its assets. While in the first fifth the value of the index is 8,489, for those with the highest income it is 3,928 (Table 25).

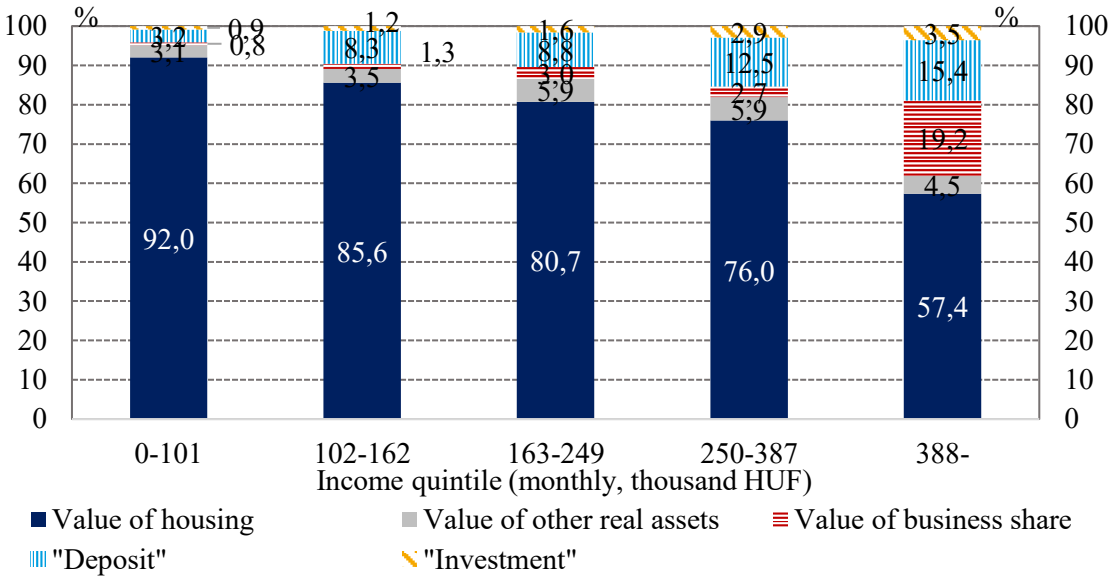
Table 25: Concentration of wealth elements

Income quintile	Value of HHI index
1	8,489
2	7,418
3	6,637
4	5,979
5	3,928

Note: Value of HHI index in each income quintile

Source: Author's work

Figure 29: Distribution of households' assets by income quintiles



Source: HFCS (2014), author's work based on Boldizsár et al., (2016)

Hypothesis 7 (H7): Risky asset[21] holding depends mostly on the wealth and income of households.[22]

Methodology

Logistic regression was used to identify household factors influencing risky asset holding (a description of its logistics methodology is provided in Hypothesis H3). To answer this question, we used the international HFCS database, however, before performing the regression, we considered it necessary to aggregate the countries with the most supply-side similarities in the regression on households' risky asset holdings, so we performed a cluster analysis.

In this study, we performed agglomerative hierarchical clustering, which has the advantage over the other commonly used method, K-means cluster analysis, that it does not require any assumptions about the number of groups. In a hierarchical cluster analysis, at the outset each observation is considered a separate cluster and based on the chosen distance calculation and aggregation procedure, merges the nearest groups step by step, resulting in a cluster containing all observations, if not interrupted. For the aggregation procedure of hierarchical clustering, the whole chain (farthest neighbour – which connects the two closest groups with the smallest distance between the most distant elements), the Euclidean distance was considered when calculating the distance (Kovács, 2014).

The countries were clustered according to capital market depth based on the three stock market indicators of the Worldbank database (stock market capitalization, value of traded shares, turnover ratio). If we want to examine the holding of risky assets by households, we first need to define risky assets. Based on the literature, we considered equities to be a risky asset, and in addition to indirect equity holding, direct investment should also be considered. That is, the logistic regression outcome variable takes a value of 1 if the household has some risky asset, i.e., holds a share or mutual fund.

Analysis and results

Examining the holding of risky assets is important not only from the households' viewpoint but also from the viewpoint of companies: in this way, households can benefit from

[21] I considered shares and mutual funds to be risky financial assets, and I defined households with savings held in listed shares or mutual funds as risky asset holders.
[22] To confirm the hypothesis, I use our article E. Balogh – Zs. Kékesi – B. Sisak (2019): Analysis of households' investment decisions based on international data, published in the The Financial and Economic Review.

the capital income of companies, while for companies, households constitute an alternative source of financing to the banking system.

How much risky assets are held also depends significantly on the supply side. In our study (Balogh et al., 2019), we showed that there is a strong relationship between supply and demand for risky assets: in countries where firms rely more on capital market sources for financing, households also more likely to hold risky assets (such as shares).[23] While in countries with a higher per capita GDP, companies may have equity funding in excess of 100 percent of GDP, in Hungary this only amounts to 20 percent of GDP.

For grouping of countries by supply side we used cluster analysis, for which we used stock market capitalization, the value of traded shares and turnover ratio variables. One of the four groups obtained by hierarchical clustering (cluster I) can be identified as a group of countries with less developed stock exchanges – Hungary is included, while another cluster (cluster III) can be considered as a group of countries with developed stock exchanges based on all indicators. The first group was named 'Less Active Stock Exchange' and the second as 'More Active Stock Exchange' (Table 26).

Table 26: Group of countries created by clustering

I.	II.	III.	IV.
Austria	Belgium	Finland	Italy
Cyprus	Ireland	France	Spain
Estonia	Luxemburg	Netherland	
Greece	Malta	Germany	
Poland			
Lithuania			
Hungary			
Portugal			
Slovakia			
Slovenia			

Source: Balogh et al. (2019)

We used the international database of the 2014 HFCS survey to analyse the impact of household characteristics on risky asset holding. We estimated by logistic regression which household characteristics affect the probability of risky asset holding (Table 27).

[23] Significant differences can be observed between the groups of countries created based on stock market characteristics in terms of capital market depth. In the case of the group with an active stock market, which consists mainly of Anglo-Saxon countries, a higher proportion of households have risky asset holdings – in contrast to countries that use mainly bank financing.

Table 27: Outcomes of logistic regression modelling risky asset holding

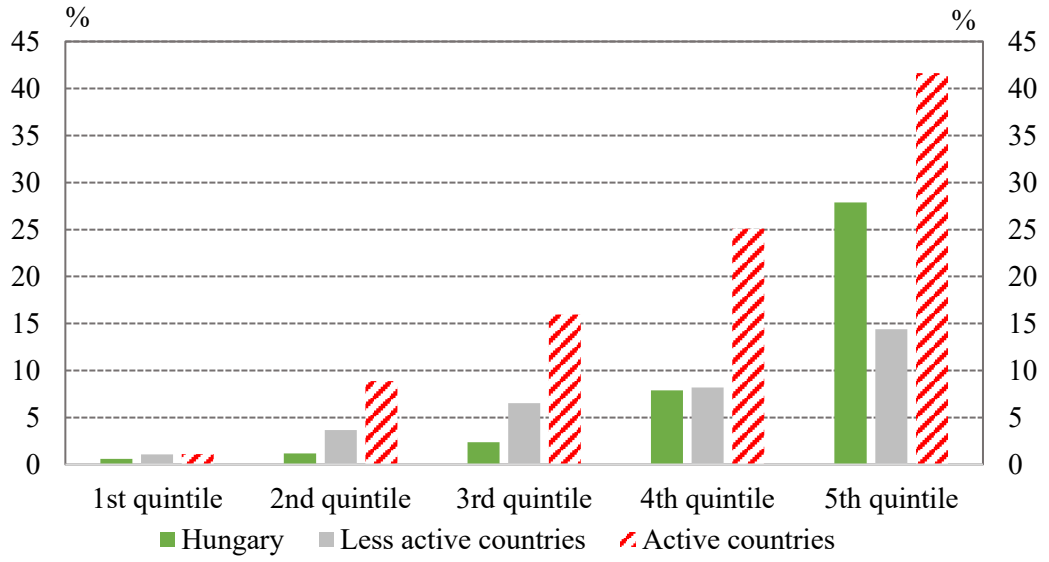
		Degree of average marginal effects (AMEs)	
		Less active stock exchange	More active stock exchange
Total household income (log)		0.031***	0.078***
By wealth	**First quintile**	−0.056**	−0.124***
	Second quintile	−0.029***	−0.06***
	Fourth quintile	0.003	0.063***
	Fifth quintile	0.049***	0.155***
Tertiary education		0.049***	0.056***
Working in the financial sector		0.055***	0.096***
Risk-taking in investments	**Average**	0.08***	0.137***
	Above average	0.134***	0.238***
	Outstanding	0.088**	0.156*
Number of children		−0.006	−0.017**
Female household head		−0.018**	−0.033***
Liquidity constraint		−0.021***	−0.058***
Age		0.000	0.000
Exposure to the employment market		−0.023*	−0.123***
Income from business		−0.0005***	−0.001***
Owning Housing		−0.031**	−0.047**
Sample size		23 430	21 200

** p < 0.05; ** p < 0.01; *** p < 0.001*

Source: Balogh et al. (2019)

As demonstrated by the results shown in Table 27, in our study we concluded that whether a given household holds a share or a mutual fund depends largely on how much wealth and income a household holds. At the same time, in the group of countries with an active stock market, households with lower wealth (income) also hold a significant risky asset, while in the other group of countries, which also includes Hungary, this is much less typical (Figure 30).

Figure 30: Ratio of risky asset holders per wealth quintiles



Source: HFCS (2014), author's work based on Balogh et. al. (2019)

According to the results of the model, a 10 percent increase in household income increases the probability of risky asset holding by 0.31 percent on average, while in the group II of countries by approximately 0.8 percent. The regression includes dummy variables of wealth quintiles created at country level, with the median, i.e., the third, quintile as the reference group. It is clear in both groups of countries that households in the higher quintiles are gradually holding more risky assets. However, it should also be noted that in the case of countries with less active capital markets, such as Hungary, the separation of the top wealth quintile from the others also stands out.

In the logistic model, we were able to show the positive effect of other factors that are relevant according to the literature and intuition, but their magnitude is smaller. For example, the existence of a *liquidity constraint* also matters – someone who does not have savings set aside due to precautionary motives is less likely to hold a share or mutual fund. Based on the regression, this factor reduces the probability of risky asset holding by 2.1 percent.

Decreasing information barriers, such as *education and employment in certain economic (such as financial) sectors*, also increase the probability of holding risky assets. In the case of Hungary, according to the logistic regression, higher education increases the probability of risky asset holding by 4.9 percent and employment in the financial sector by 5.5 percent. Although the role of *demographic characteristics* (number of children, marital status, age) in risky asset

holding is smaller, the female household head and the higher number of children reduce the probability of holding such assets (the former by 1.8 percent and the latter by 0.6 percent).

In addition, according to the literature, there are non-identifiable or hard-to-identify risks that an individual must consider when making investment decisions. These include high *real estate and labour market exposures* (significant reliance on income from work) and the *greater weight of entrepreneurial income*, which can be considered more volatile than wages. These factors also negatively impact the holding of risky financial assets.

Self-reported *investment attitudes* also have an impact on households' holdings of risk assets: risk-averse households hold significantly lower levels of risky assets in both active and less active equity markets. The probability of holding risky assets increases by 8 percent in case of an average risk taker and by 13.4 percent in case of an above-average risk taker.

At the time of writing this article (Balogh et al., 2019), the results of the 2017 survey were not yet available, so we used the 2014 data. Furthermore, we decided to use the international database, as for Hungary only the results of 2014 had some, relatively few observations in case of risky asset. However, when preparing my dissertation (in 2021), the results of 2017 are already available, so it is worthwhile to establish factors for the risky asset holding only for Hungary.

The binary outcome variable of logistic regression equals one if a particular household has a risky asset. Like our article, I considered shares and mutual funds to be risky assets.

The explanatory variables – similarly to our article – include (logarithmized) income and wealth quintiles of households. In case of educational attainment, I took primary education as the reference group. In addition, I used the household's self-reported investment attitude, i.e., if and how much they consider themselves risk takers – I considered it as a reference group if a given household does not take any risk. Among the demographic characteristics, I also examined the effect of the household head’s age, as well as the number of children living in the given household. The female household head is also included as a separate variable, as according to the literature, this can also influence holding risky assets by households. I also examined the effect of a household having *a liquidity constraint.*

I considered the effect of *exposure to the labour market*, i.e., whether a given household has employee income, influences the probability of holding risky assets (Zhan, 2015). I also included the ratio of *entrepreneurial income* to total income as an explanatory variable (Heaton – Lucas, 2000). Furthermore, I also examined whether the proportion of HMR within the total wealth influences risky asset holding (*real estate ownership risk*). Finally, using a dummy variable, I also considered the effect of two different years of data recording (2014 and 2017). The parameter estimates of the model, the exp (b_i) values, i.e., how many times the unit increase of the given variable changes the odds, are shown in Table 28.

Table 28: Outcomes of logistic regression modelling risky asset holding performed solely on Hungarian data

	Coefficient	Standard error	z	P>z	95% confidence interval		Odds
Income (log)	0.610	0.066	9.230	0.000	0.481	0.740	1.841
By wealth							
2nd quintile	0.827	0.380	22.180	0.029	0.083	1.572	2.287
3rd quintile	1.473	0.351	4.200	0.000	0.786	2.160	4.361
4th quintile	2.289	0.338	6.780	0.000	1.627	2.951	9.866
5th quintile	3.387	0.336	10.080	0.000	2.729	4.046	29.580
Tertiary education	0.658	0.097	6.820	0.000	0.469	0.848	1.932
Working in the financial sector	0.085	0.172	0.500	0.620	-0.251	0.422	1.089
Risk taking							
Average	1.101	0.096	11.490	0.000	0.914	1.289	3.008
Above average	1.525	0.129	11.850	0.000	1.273	1.777	4.595
Extraordinary	1.617	0.278	5.810	0.000	1.072	2.162	5.039
Number of children	-0.067	0.054	-1.230	0.218	-0.174	0.040	0.935
Female household head	0.008	0.091	0.090	0.930	-0.170	0.186	1.008
Liquidity constraint	-0.707	0.103	-6.880	0.000	-0.908	-0.505	0.493
Age	0.002	0.004	0.600	0.548	-0.005	0.010	1.002
Exposure to employment market	-0.084	0.124	-0.680	0.499	-0.327	0.159	0.919
Entrepreneurial income	-0.527	0.233	-2.260	0.024	-0.984	-0.070	0.590
Owning Housing	-0.964	0.179	-5.390	0.000	-1.314	-0.613	0.381
Year effect	-1.213	0.093	-13.050	0.000	-1.395	-1.031	0.297
Constant	-10.894	0.682	-15.980	0.000	-12.230	-9.558	0.000

Prob>chi2=0 Log likelihood=-2105.2518 Pseudo R2=0.3095

Note: According to the classification table that helps to establish the adequacy of model classification, the total hit rate of the model is 93.09%. The model correctly classifies those who do not hold risky assets in 93.87%, while those who hold risky assets in only 54.85%.

The value of the area under the ROC curve of the model described above is 0.8908, based on which the performance of the model is better than acceptable: a value around 90 percent already indicates its excellent classification ability (Kovács, 2014).

Source: Author's work

To evaluate the results, I also calculated the average marginal effects from the model, which I summarized in Table 29.

Table 29: Degree of average marginal effects of logistic regression

	Average degree of marginal effects (AMEs)	Standard error	z	P>z	95% confidence interval	
Income (log)	0.031	0.003	9.380	0.000	0.025	0.038
By wealth						
2nd quintile	0.008	0.004	2.170	0.030	0.001	0.016
3rd quintile	0.021	0.005	4.670	0.000	0.012	0.030
4th quintile	0.051	0.005	9.370	0.000	0.040	0.061
5th quintile	0.131	0.008	17.190	0.000	0.116	0.146
Tertiary education	0.034	0.005	6.830	0.000	0.024	0.043
Working in the financial sector	0.004	0.009	0.500	0.620	-0.013	0.022
Risk taking						
Average	0.054	0.005	11.160	0.000	0.045	0.064
Above average	0.086	0.009	9.710	0.000	0.069	0.103
Extraordinary	0.094	0.023	4.040	0.000	0.048	0.139
Number of children	-0.003	0.003	-1.230	0.218	-0.009	0.002
Female household head	0.000	0.005	0.090	0.930	-0.009	0.009
Liquidity constraint	-0.036	0.005	-6.890	0.000	-0.046	-0.026
Age	0.000	0.000	0.600	0.548	0.000	0.001
Exposure to the employment market	-0.004	0.006	-0.680	0.499	-0.017	0.008
Entrepreneurial income	-0.027	0.012	-2.260	0.024	-0.050	-0.004
Owning Housing	-0,049	0,009	-5,390	0000	-0,067	-0,031
Year effect	-0,062	0,005	-13,380	0,000	-0,071	-0,053

Source: Author's work

The results in Table 29 show that the probability of holding a risky asset increases in parallel with the increase in *income*: on a logarithmic scale, an increase of one unit in income (i.e., a 2.7-fold increase in income) increases the probability of holding a risky asset by nearly 3 percentage points.

Larger *wealth* also increases the probability of holding risky assets. The regression includes the dummy variables of the wealth quintiles, with the first quintile as the reference group. In the higher quintiles, households gradually hold more risky assets, and belonging to the top wealth group increases the probability of risky asset holding by more than 13 percentage points on average.

According to the results obtained for education, *tertiary education* increases the probability of holding a financial asset even if we filter out the effect of other factors (for example, income, age). Tertiary education increases the probability of maintenance by 3.4 percentage points. On the other hand, whether a household head *works in the financial sector* has no effect on holding risky assets.

Even after controlling for the wealth, income and demographic characteristics of Hungarian households*, the investment attitude of the household head* has a significant effect. The probability of holding risky assets increases by 5.4 percentage points for households with an average appetite for risk and by 8.6 percentage points for those belonging to those with the highest risk tolerance (high risk) category.

The existence of a *liquidity constraint* negatively affects the probability of holding financial assets – it reduces the probability by about 3.6 percentage points. The *female household head, number of children, and age* variables are not significant at standard significance levels.

Among background risks, the *entrepreneurial risk* is significantly negative: households with a higher weight of entrepreneurial income within their income are less likely to invest in risky financial assets. The probability of holding risky assets is also reduced by the *real estate ownership risk* – the risk arising from increased exposure to the real estate market may restrain the risk taken in other markets, such as financial markets. However, *the labour market* exposure variable was not significant for the Hungarian data.

Households participating in the 2017 survey also saw a decrease in the probability of holding a risky asset compared to 2014, which may be since the two surveys were conducted using different methodologies.

I obtained similar results based on the regression performed only on the Hungarian and 2017 data. Only a few demographic factors (number of female household heads and children), employment in the financial sector and labour market exposure risk were not significant in the case of Hungarian data. The most important variables are summarized in Table 30.

Table 30: Factors affecting risky asset holding based on statistical models

Factor	Variable	Effect on holding risky asset
Wealth situation	Wealth, income	**Positive**
Lack of information barriers	Educational attainment, working in the financial sector	**Positive**
Risk	Liquidity constraint, perceived background risk, risk aversion	**Negative**
A few demographic characteristics	Female household head, number of children	**Negative/Neutral**

Source: Author's work based on Balogh et al. (2019) and my own results

Hypothesis H7, claiming that the *income and wealth* of households is a significant and significant influencing factor for the risky asset holding of households, was confirmed. In addition to these factors, the *lack of information barriers* (educational attainment and working in the financial sector, for example) also has a strong positive effect on the probability of risky asset holding.

Among the risks, *liquidity constraint* is also an important influencing factor: those who cannot save in liquid form for precautionary considerations are less likely to hold a risky asset. *Labour and real estate market exposure* and the higher weight of *entrepreneurial income* also have a negative impact on the holding of risky financial assets. Households' self-reported investment attitude is also an important factor in making investment decisions: risk averse households hold risky assets at a significantly lower rate. However, the role of household demographic characteristics (number of children, marital status, age) in risky asset holding is smaller.

5. Summary

Household savings, due to their role in investment, can be one of the most important factors in economic growth. However, opinions on the factors influencing the level and portfolio of household savings are already sharply divided in the literature. In my dissertation, I analysed this relationship in Hungary after the turn of the millennium, especially in the period since the 2008-2009 crisis.

The second chapter of the thesis looks at and summarises the theories and literature on households' financial savings. The classification used here is new in that it examines the empirical literature based on micro- and macro-level data separately. In addition to papers on the level of financial savings (wealth), studies on the factors influencing the composition of savings are also described. The grouping employed for the literature is used throughout the dissertation.

The third chapter looks at macro-level data using a descriptive analysis to examine how Hungarian households' savings evolved after the 2008–2009 crisis and which factors may have influenced the development of savings in Hungary. Changes in the composition of Hungarian households' financial portfolio are then also analysed. The most important new results of the chapter are described below.

1. Hungarian households' savings rose considerably after the crisis due to precautionary motives that gained prominence due to cyclical factors. Such cyclical factors included rising unemployment and household indebtedness (sharp increases in repayment instalments on FX loans). These motives may have been tempered since 2017, as unemployment declined, FX loans were converted into forint, and outstanding household borrowing diminished.
2. Along with cyclical elements, structural factors were also increasingly key in shaping Hungarian households' savings. For instance, such factors include wage growth, the income-boosting effect of tax reforms, debt cap rules and the government's incentives supporting long-term savings. The fall in yields from 2012 in Hungary did not entail a drop in savings, similar to most European countries, which was probably heavily influenced by strong precautionary motives and the above-mentioned structural factors.
3. The rise in net financial savings was reflected in the expansion of households' net financial wealth. Hungarian households' net financial wealth stood at 116 per cent of GDP by the end of 2020, which is considerably higher than the figures typical for the CEE region

(author's calculation). The growth in financial assets was assisted not only by the accumulation of financial assets, but also by a major revaluation. As regards financial liabilities, the structure of outstanding loans changed fundamentally due to the forint conversion, and households' FX exposure fell significantly. The majority of the growth in net financial wealth (55 per cent) is linked to new household savings, suggesting a rise in the propensity to save (author's calculation based on the financial accounts). The second biggest effect was exerted by the revaluation of holdings, which contributed to almost 35 per cent of the growth. Government measures related to household FX loans (early repayment scheme, settlement and forint conversion) and other variation in stocks accounted for another 5 per cent each.

4. Since 2014, households' financial wealth increased along with their real estate holdings, with the latter significantly exceeding net financial wealth. I prepared my own estimate for real estate holdings based on the HCSO's data on residential properties from the 2011 census and the MNB's housing market index. While financial wealth was boosted more by transactions, in the case of real estate most of the expansion was due to revaluation.
5. There has been a major shift in the structure of households' financial assets in recent years, and the fundamental reason for the increasing share of securities is the changing yield environment. In the first years following the 2008–2009 crisis, households placed their new savings in bank deposits, which was probably the result of rising deposit yields as well as households' risk-averse behaviour. Starting from early 2012, households reduced the share of their bank deposits and increased their savings held in securities, primarily in the form of government securities. The rise in households' funding of the government was attributable to the supportive government strategy and the outstanding yield spread. Consequently, government securities held directly by households amounted to over HUF 9,100 billion by the end of 2020. While in 2011 government securities represented merely 2 per cent within households' financial assets, by late 2020 the figure had risen to 14 per cent, a high figure even by international standards. The amount of government securities held by households expanded in all quintiles, especially in the top one, between 2014 and 2017.
6. According to financial accounts data Hungarian households do not like to make long-term commitments (MNB, 2021a; Figure 11): long-term financial assets account for a smaller share within Hungarian households' wealth. Although they generally prefer short-term savings, government incentives (e.g. long-term investment accounts) may divert investments towards longer-term savings. The analysis of micro-level data also showed

that if a household has more liquid financial assets than investments, this is related to its attitude to risk (households claiming to be risk-seeking hold fewer liquid assets). In other words, familiarity with risks and the enhancement of financial literacy may also point towards growing investments.

7. Ultimately, households finance the main sectors (general government, corporations and non-residents) through their asset allocation decisions. Households finance the main domestic sectors not only directly, but also through other financial intermediaries such as mutual funds, insurers and pension funds (indirect financing). According to my calculations, Hungarian households' total government securities holdings amount to around 25 per cent of GDP, well in excess of direct holdings (19 per cent of GDP). This is exceptionally high compared to other European countries. Besides Hungary, only households in Portugal (17 per cent), Italy (11 per cent) and Malta (10 per cent) hold government securities wealth over 10 per cent of GDP (the European average is quite low, at merely 2.8 per cent of GDP).

Based on the available macro data, the expansion in Hungarian households' net financial savings and wealth contributed significantly to the rise in the economy's net lending. In addition, Hungarian households also strengthened the capacity of the country to withstand shocks by investing an increasing portion of their higher savings in Hungarian government securities, thus providing internal funds to the state. However, household financing can also entail risks: the short-term portfolio could pose rollover risks for the government, households have a greater exposure to inflation on account of the fixed-rate papers, and the banking system also has fewer available funds (although banks did not feel this constraint during my research).

After the 2008–2009 crisis, the borrowing attitude changed, but the tepid rise in consumption and the issues with loan repayments showed that the aggregate data for the individual sectors do not provide enough information for understanding economic trends. After the crisis hit, Hungarian households' net financial wealth surged, although this does not necessarily mean that it increased for all households. There were widespread calls to create a uniform database on Hungarian households' income, consumption and wealth position. Accordingly, in Chapter 4, Hungarian households' savings are examined empirically using the euro area Household Finance and Consumption Survey (HFCS).

My empirical research results confirmed the situation outlined in the literature; at the same time some differences are noticeable:

8. As expected, income and educational attainment have a positive effect on whether Hungarian households have financial assets higher than three months cost of living.

The examination of micro-level data showed that households' financial wealth increases along with income (H1). The value of financial assets held by households expands steadily as income increases: while in the lowest income quintile merely 6.5 per cent of households have financial savings, in the top quintile 25 per cent do so.

When examining households based on education, the results are basically the same: those with basic education typically have very little financial savings, while those with a head of household who has higher qualifications have more sizeable financial savings.

Consistent with the results obtained while examining Hypothesis 1, more and more households have a liquidity buffer as their income increases (providing adequate financial reserves for a potential loss of job). Nevertheless, close to 40 per cent of Hungarian households do not have enough financial wealth to cover their cost of living for three months (H3). The amount of financial wealth does not exhibit a gradual rise across income categories, which suggests that in the long run large financial wealth can be accumulated by only those who have the highest income. Similar results were obtained on Hungarian data by Bukodi and Róbert (2000), who registered the outstanding wealth position of the highest earners.

The descriptive analysis cannot address partial effects, and therefore a model-based approach (logistic regression) was used for Hypothesis 3. In modelling financial wealth in excess of the liquidity buffer, households' income position and education as well as demographic factors were examined, along with whether the effect of the head of household's attitude to risk can be shown in investments, and whether the results are influenced by the value of the property owned by households. The analysis built on the Hungarian database of the HFCS.

Whether households have more savings than their three-month cost of living is influenced positively by their *income* and the *educational attainment* of the head of household. When increasing income by one unit on the logarithmic scale (in other words multiplying it by 2.7), the probability of holding financial assets rises by 8.8 percentage points. Secondary school qualifications increase the likelihood of holding by 13.6 percentage points, while a higher education degree does so by 27.7 percentage points.

Compared to the young generations, *the old* (those aged over 70) exhibited an almost 7-percentage point decline, meaning that older households are less likely to hold financial assets

in excess of their three-month cost of living. The obtained result confirms the life-cycle hypothesis, i.e. that older generations are less inclined to hold financial assets.

Among the variables of family structure, the *'dual-earner' family model* has a positive effect on the probability of holding financial assets. The gender of the head of household (female head of household) and having children does not influence the likelihood of financial asset holding. Accordingly, contrary to expectations, women are not more cautious and are not more likely to accumulate reserves than men, and the situation of families with children does not differ from similar families without a child.

All in all, the results obtained basically confirm the correlations expected based on the literature: income, wealth and the 'dual-earner' family model have a positive influence on the accumulation of financial assets, while older heads of household have a negative impact (H3).

9. The main property of Hungarian households is their housing.

Not only macro- but also micro-level data show that obtaining property is crucial for Hungarian households. In Hungary, this is reflected in the fact that 83 per cent of households live in a property they own (partly or wholly). As income rises, the value of the main residence gradually grows (as does the participation rate), in other words higher income entails higher value homes. The importance of holding wealth in real estate is also supported by the fact that for 80 per cent of households, real estate holdings exceed financial assets.

This is not necessarily a "novelty": owner-occupied homes represent the largest proportion of households' wealth in European Union countries. On average, around 60 per cent of the households in the countries that participated in the HFCS wave own their main residence. Nonetheless, the actual figures vary considerably across countries: while in Germany and Austria less than half of all households live in their property, this ratio is over 80 per cent in Spain, Slovakia and Slovenia (Arrondel et al., 2014). Still, the share of Hungarian households owning their main residence is high by European standards, and in fact, it is the second highest after Slovakia (Boldizsár et al., 2015).

The examination of Hypothesis 2 shows that even in the top income quintile, the median of the financial assets held by households does not come close to the median value of their main residence. At the same time, the tests performed demonstrate that income influences whether households have more financial assets than real estate holdings.

10. As expected, the level of financial asset accumulation of Hungarian households is positively influenced by income and education.

The modelling approach used for the conclusion (Heckman selection model) is a novelty in analysing the topic (H4). The results produced by the Heckman selection model confirm that, besides income, educational attainment is a major determinant in the existence and size of financial wealth: in other words, education not only has cross-effects (higher educational attainment, higher income), it also exerts a direct impact.

Along with income and education, age is also an essential factor in the level of savings. Older households above the age of 70 are less likely to hold financial assets in excess of their three-month cost of living. However, for the old households that do have financial wealth, it is larger than that of younger generations. This suggests that in contrast to other countries, Hungary has a highly heterogeneous old generation: relatively few old households have financial wealth, but those that do, have considerable wealth. This somewhat contradicts the claim of the life-cycle hypothesis that older households "use up" their savings, which could be attributable to the *bequest motive:* old households seek to provide the necessary funds to the next generations, so they are less likely to have financial wealth. Accordingly, there is an even wider gap within older generations than within younger ones.

Among the variables affecting the level of savings, one should also mention the 'dual-earner' family model, which has a positive effect on the probability of holding financial assets but does not influence the amount of financial wealth. A peculiar finding from the analysis of Hungarian data is that the gender of the head of household does not impact the probability of financial asset holding but having a female head of household exerts a negative effect on the size of financial wealth. Another observation is that having children does not have bearing on the existence or size of financial wealth.

11. Risky asset holding of Hungarian households – similarly to other countries – is basically determined by the income and wealth of the household.

The value of financial assets (mutual fund shares, bonds, shares, stocks, managed accounts, private loans and other financial savings) other than bank deposits owned by Hungarian households gradually increases as income grows. In the low-income category, households usually hold less risky assets such as bank deposits, while the share of deposits is lower within financial assets among those with higher income (H1).

For Hypothesis 7, a model-based approach was used to explore how the factors analysed in the descriptive section and derived from the theory affect households' risky asset holding, adjusting for their effects on each other.

It can be concluded from the structure of households' portfolio that households' risky asset holding is mainly determined by their income and wealth position. Based on the literature, only shares and mutual fund shares are deemed risky assets, but despite the exposure, other equity holdings are not usually seen as risky.

As *income* increases, the likelihood of risky asset holding grows: multiplying income by 2.7 raises the probability of having risky assets by close to 3 percentage points. Greater *wealth* also increases the chances of holding risky assets: belonging to the top wealth group increases the likelihood of risky asset holding by over 13 percentage points on average.

The *absence of informational constraints* (higher educational attainment and employment in financial sectors) also has a highly positive effect on the probability of risky asset holding. In addition, households' self-assessed *investment attitude* is also an important factor in making investment decisions: risk-seeking households are more inclined to invest in risky assets.

Among risks, *liquidity constraints, real estate market exposure* and *entrepreneurial risk* have a negative impact on Hungarian households' risky asset holding. Contrary to the findings in the international literature, demographic characteristics (number of children, marital status, age) do not play an observable role in risky asset holding. According to Hungarian data, the labour market exposure[24] variable is also not significant.

We obtained similar results while analysing international data with my colleagues (Balogh et al., 2019). Only a few demographic factors (female head of household, number of children), employment in the financial sector and labour market exposure were significant according to the HFCS data on participating European countries. The hypotheses and key findings of the empirical study are presented in Table 31.

[24] Households are deemed to be exposed to income risk if all their income comes from employment.

Table 31: Overview of the analysis

	Hypothesis	Analysis	Results	
Level of financial wealth	**H1:** As income and educational attainment increase, gross financial savings gradually grow, and more and more households have investments.	Descriptive statistics	For both factors, financial wealth expands, but in order to prove that they have a positive effect on net financial savings, the data must be adjusted for the impact of the variables on each other.	√
	H2: Hungarian households' real estate holdings are greater than financial wealth, irrespective of income.	Descriptive statistics	The median of real estate holdings is higher than financial wealth in all income quintiles. But having more financial assets than real estate holdings is not independent of the income quintile the households belong to. In higher income quintiles, more households have greater financial wealth than real estate holdings.	X
	H3: Does a household's income position, and the educational attainment, age and risk profile of the head of household, and the family structure influence whether or not a household has financial assets amounting to more than its three-month cost of living?	Logistic regression	Income, wealth and the 'dual-earner' family model have a positive influence on the accumulation of financial assets, while older heads of household and risk aversion have a negative impact.	√
	H4: The amount of households' financial wealth is influenced by their income position, and the educational attainment, age and risk profile of the head of household, along with the family structure.	Heckman selection model	In addition to income, educational attainment is a strong determinant in the existence and size of financial wealth.	√

	Hypothesis	Analysis	Results	
Composition of financial wealth	**H5:** Irrespective of their attitude to risks, Hungarian households hold more liquid financial assets than investments.	Descriptive statistics	The crosstabs analysis showed that if a household has more liquid financial assets than investments, this is related to its attitude to risk.	X
	H6: As households' income rises, the wealth held in different types of assets becomes more diversified (less concentrated).	Descriptive statistics	Depending on income position, the share of financial assets in households' total wealth varies, with the highest concentration found in the first income quintile, and the lowest in the fifth.	√
	H7: Risky asset holding depends mostly on the wealth and income of households.	Logistic regression	Along with income and wealth, the perceived underlying risks, liquidity constraints, demographic features and informational constraints also influence risky asset holding.	√

Source: Author's work

It was shown that the size of household savings is influenced by various factors, which makes it difficult to analyse and forecast such savings. However, projections of the level and composition of savings may provide crucial information for several economic agents (government, banks, financial service providers).

The results obtained from micro-level data basically confirm the correlations expected based on the literature: income, wealth and the 'dual-earner' family model have a positive influence on the accumulation of financial assets, while older heads of household have a negative impact. Contrary to expectations, female heads of household are not more cautious and are not more likely to accumulate reserves, and the situation of families with children does not differ from similar families without a child.

The results also show that, besides income, educational attainment is a central determinant of Hungarian households' financial wealth. Age also plays an important role in savings, but the Hungarian results diverge from what could be expected based on the international literature. Even though older households are less likely to hold financial assets in excess of their three-month cost of living, for the old households that do have financial wealth, it is larger than that of younger generations. This suggests that – in contrast to other countries – Hungary has a highly heterogeneous old generation.

It can be concluded from the composition of households' portfolio that households' risky asset holding is mainly determined by their income and wealth position, just as in other European countries. Employment in the financial sector and labour market exposure bear no relevance to Hungarian households' risky asset holding.

The trends in households' financial savings are crucial from the perspective of economies' level of development and external vulnerability. This is particularly true of less developed countries, as internal funding is key in successful convergence and higher economic growth (Prasad et al., 2007). If internal funds are permanently insufficient, it has a negative effect on all sectors, potentially leading to reduced investor confidence, exchange rate volatility and depreciation, as well as rising interest rate spreads.

If households have substantial financial savings (wealth), the financial sector's chances to obtain funds improve, which enhances the opportunities for financing investments in the long run. As household savings increase (and the household portfolio is realigned), the government can rely more on financing from domestic agents, which contributes to a more stable debt profile.

The findings of the dissertation show that Hungary has a very heterogeneous old generation, and the gap within it is even wider than within younger generations as regards financial wealth. After understanding the differences in more detail, the options for mitigating them should be reviewed. First, I argue that old-age differences could be reduced by providing government incentives for long-term savings (mainly pension savings). This would also exert a positive impact on old households' resilience to crises. Second, providing direct subsidies to this generation should be considered (perhaps the minimum amount of the old-age pension should be reviewed).

The results also point out the economic policy tools that can influence for example households' risky asset holding. First, as the level of economic development (GDP, income) increases along with the rise in households' financial wealth, the amount of their investments in risky financial assets will probably grow as well. Second, other factors (e.g. education, financial literacy) also influence risky asset holding. Higher educational attainment promotes the diversification of financial assets, which may be due to improved financial literacy as well as the greater risk appetite of such households. Therefore, targeted economic policy measures, such as the development of financial literacy and raising the average level of education, could facilitate the development of the Hungarian capital market and financial intermediary system.

The findings also indicate avenues for further research. First, the investigation that has been started could be continued with macro-level data: household savings can be modelled using several methodologies, but one of the most often used approaches assumes a long-term co-movement (a cointegration relationship) of income and savings. This estimation process uses different equations for long-term and short-term scenarios, with the former used for the levels and the latter for the changes, so that it can be determined separately which variables have a short-term and which have a long-term effect. The advantage of this is that it provides a reliable estimate for household savings (Palenzuela et al., 2016). So far, modelling has been hampered by the fact that Hungarian savings were influenced by several idiosyncratic factors (payment of real returns, early repayment scheme, forint conversion), and therefore the results produced by the model up until now were not necessarily reliable.

Second, micro-level data provide a way to examine a factor concealed by macro-level data, namely the concentration of household wealth. Although international data show that by international standards Hungarian households have substantial financial wealth relative to the country's level of economic development, Hungarian surveys suggest – as often cited in the press – that many households do not have savings.

In a study published in cooperation with my colleagues, it was demonstrated that, according to 2014 survey data, Hungarian households' financial assets are highly concentrated, just as in other countries. If – in addition to net financial wealth – Hungarian households' real estate holdings are also considered, much greater wealth equality can be observed, although around one half of all households still control merely 10 per cent of total wealth (Boldizsár et al., 2015).

In addition to a further examination of concentration, the reason behind the factors causing the inequality should also be explored, namely the individual contributions of the factors to the Gini coefficient. This can be done, for instance, with the Shapley value.

All in all, I believe that my thesis contributes to a better understanding of the factors shaping Hungarian households' savings and the identification of (1) the factors that influenced the post-crisis adjustment and the development of savings after the 2008–2009 crisis based on macro-level data, as well as of (2) the factors that affected the level and composition of households' financial wealth based on micro-level data.

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