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**Article**

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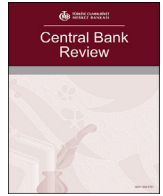
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# The effect of house price changes on cohort consumption in Turkey



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## ABSTRACT

This paper analyzes the relationship between house prices and household consumption in Turkey. We utilize twelve consecutive waves of the Turkish Statistical Institute (TURKSTAT) Household Budget Surveys (HBS) from 2003 to 2014. We construct a pseudo-panel data set using birth-year cohorts following Deaton (1985). We find that house price changes have a positive and significant effect on the growth of cohort consumption. Moreover, the effect of house price changes is stronger for home-owners and it intensifies as we move from young cohorts to old cohorts. We observe that there is a marginally significant and relatively weak relationship between the growth of cohort consumption and house price changes for tenants. However, our pooled sample set is restricted to young and middle-aged cohorts for tenants. In addition, we find that the rise of home-ownership ratio increases the growth of cohort consumption, while the spread of having outstanding housing debt depresses the growth of cohort consumption. Therefore, our empirical findings are in favor of the wealth channel argument.

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## 1. Introduction

This paper analyzes the effect of house price changes on household consumption in Turkey. The importance of housing market in the Turkish economy increased dramatically in the last decade. House sales showed remarkable increases and construction sector became the driving force of economic growth. Moreover, housing wealth is the major component of household wealth in Turkey as in many advanced and emerging market economies. Households tend to invest their savings in the housing market rather than financial markets. Thus, the effect of housing market developments on household consumption and saving behavior may have changed over time. More importantly, we can expect its effects to dominate household behavior in the next years as society ages and house prices continue to soar.

Previous empirical literature concentrates on the impact of ageing population on home-ownership rates and housing wealth accumulation in advanced economies (Chiuri and Jappelli, 2010; Angelini et al., 2014). Several papers analyze the effects of house price changes on monetary variables (Aoki et al., 2004; Iacoviello, 2005; Goodhart and Hofmann, 2008). Moreover, there is an extensive literature on the effect of house prices on household

consumption (Attanasio and Weber, 1994; Iacoviello, 2004; Calcagno et al., 2009; Atalay et al., 2016; Cooper and Dynan, 2016). In particular, Campbell and Cocco (2007) examine the response of household consumption to house price changes using micro-economic data from Family Expenditure Survey (FES) in UK. They suggest that as population ages aggregate consumption becomes more responsive to house price changes since housing wealth is concentrated in the hands of old home-owners. They find that the effect of house prices on consumption is largest for old home-owners, while its effect is small and it is not statistically significant for young households and tenants. Thus, their empirical findings are consistent with the argument that house prices affect household consumption through wealth channel. However, Attanasio et al. (2009) analyze the relationship between house prices and consumption using a longer time span from FES in UK. They discover that the relationship between house prices and consumption is stronger for younger cohorts than older cohorts, which contradicts with the wealth channel argument. As a result, they suggest that common causality must be the most important factor, which links house prices and consumption.

We utilize twelve consecutive waves of the Turkish Statistical Institute (TURKSTAT) Household Budget Surveys (HBS) from 2003 to 2014. We construct a pseudo-panel data set using birth-year cohorts following Deaton (1985). We find that house price changes have a positive and significant effect on the growth of cohort consumption. Moreover, the effect of house price changes is

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stronger for home-owners and it intensifies as we move from young cohorts to old cohorts. We observe that there is a marginally significant and relatively weak relationship between the growth of cohort consumption and house price changes for tenants. However, our pooled sample set is restricted to young and middle-aged cohorts in the case of tenants. In addition, we find that the rise of home-ownership ratio increases the growth of cohort consumption, while having outstanding housing debt depresses the growth of cohort consumption. Thus, our empirical findings are in favor of the wealth channel argument.

The outline of the paper is as follows: Section 2 presents a simple theoretical model to analyze the effect of house prices on household consumption. Section 3 provides a descriptive analysis of the HBS and explains the formation of a pseudo-panel data set using birth-year cohorts. Section 4 presents the econometric results and Section 5 presents the robustness checks. Finally, section 6 concludes this paper with a brief summary of our empirical findings.

## 2. Theoretical background

According to the Permanent Income Theory consumption in each period is equal to a certain fraction of life-time wealth, which is in turn determined by interest rates, the ratio of financial wealth to total wealth and household tastes and preferences (Friedman, 1957; Modigliani, 1986). Here  $C$  is consumption,  $W$  is wealth,  $k$  is the pre-determined fraction of wealth that is consumed in each period,  $i$  is the nominal interest rate,  $\psi$  denotes the ratio of financial wealth to total wealth, which implies the role of liquidity constraints, and  $Z$  represents household tastes and preferences such as age, gender and family size. Lastly,  $h$  and  $t$  denote household and time, respectively (1).

$$C_t^h = k(i, \psi, Z)W_t^h \quad (1)$$

We follow Attanasio and Weber (1994), Campbell and Cocco (2007) and Attanasio et al. (2009) in the derivation of the econometric specifications. If we take the natural logarithm of equation (1), then we reach equation (2), which reveals the roles of explanatory variables explicitly. We assume that the nominal interest rate is the same for all households in the economy. We add house prices,  $P$ , to equation (2) to capture its effects on household consumption. Here  $Y$  is current income and  $\varepsilon$  is the residual term, which emerges from measurement error in consumption and also innovations to permanent income and transitory shocks to current income. Thus, we have to approach equation (2) as an approximation.

$$\ln C_t^h = \alpha_t + \beta_1 \ln i_t + \beta_2 \ln Y_t^h + \beta_3 \ln P_t^h + \varepsilon_t^h \quad (2)$$

Deaton and Paxson (2000) propose that cohort effects on household consumption can be determined by a simple linear model. We follow a similar approach to estimate the effect of house prices on household consumption.<sup>1</sup> A time-series of cross-sectional household surveys allows us to analyze average household consumption and income for different birth-year cohorts. If we take the averages of the natural logarithm of all variables in equation (2) for individuals, who are born in the same year, then we can write the natural logarithm of cohort consumption as a combination of economic variables (3). Here  $c$  denotes birth-year cohorts and the lines over the variables indicate weighted mean

values. We assume that the nominal interest rate remains the same for all cohorts.

$$\overline{\ln C_t^c} = \gamma_t + \delta_1 \ln i_t + \delta_2 \overline{\ln Y_t^c} + \delta_3 \overline{\ln P_t^c} + \varepsilon_t^c \quad (3)$$

If we take the time difference of equation (3), then we reach a cohort consumption growth equation (4), which resembles to an empirically testable version of the well-known random-walk hypothesis, which is first proposed by Hall (1978).<sup>2</sup>

$$\Delta \overline{\ln C_{t+1}^c} = \varrho_t + \vartheta_1 \Delta \ln i_{t+1} + \vartheta_2 \Delta \overline{\ln Y_{t+1}^c} + \vartheta_3 \Delta \overline{\ln P_{t+1}^c} + v_{t+1}^c \quad (4)$$

Finally, we include social and demographic variables, which are denoted by matrix  $Z$ , in equation (5). The presence of  $Z$  in equation (5) allows us to capture the differences in cohort tastes and preferences.

$$\Delta \overline{\ln C_{t+1}^c} = \varrho_t + \vartheta_1 \Delta \ln i_{t+1} + \vartheta_2 \Delta \overline{\ln Y_{t+1}^c} + \vartheta_3 \Delta \overline{\ln P_{t+1}^c} + \vartheta_4 \overline{\ln Z_{t+1}^c} + v_{t+1}^c \quad (5)$$

## 3. Data

HBS are defined as repeated cross-sectional surveys, which do not have a panel dimension. They provide detailed data on household disposable income and consumption expenditures from 2003 to 2014. Unfortunately, HBS indicate whether households live in urban regions or rural regions only from 2003 to 2013.<sup>3</sup> They provide information about participants' age, gender, education, occupation and employment sector. However, the surveys do not include information about households' geographical locations, except for the 2003 survey, which also has a significantly higher number of observations.

There are 116,959 household observations in the restricted pooled sample from 2003 till 2014. Households, which are composed of individuals, who are living together, and families, whose household head is unemployed or an unpaid family worker are removed from the pooled sample. Individuals that have a negative income level are excluded from the pooled sample. Individuals who were born before 1930 and after 1985 are also excluded from the pooled sample. In addition, the lowest and the highest 1% percentiles of housing wealth are trimmed to eliminate potential outliers from the sample set (Figure A1 and Figure A2). As a result, the final sample set is restricted to families, whose household head is between the ages of 20 and 73 in 2003 (Table 1).

In a seminal paper, Deaton (1985) suggests the use of cohorts from a time series of repeated cross-sectional surveys, when a genuine panel data set is not available. Deaton (1985, pg. 109) defines "cohort" as a group with fixed membership, of individuals which can be identified as they show up in the surveys. Cohorts can be constructed by focusing on a distinct and static feature, which is observed for all individuals or households such as gender or the birth year of the household head (Verbeek, 2008). In this paper, the cross-section dimension of HBS is large and the number of cohorts is assumed to be fixed. The sample set is separated into eleven cohorts using the birth-year intervals of household heads as the

<sup>2</sup> Please see Flavin (1981), Hall and Mishkin (1982) and Campbell and Mankiw (1989).

<sup>3</sup> The definitions of rural and urban regions changed significantly after a recent law extended the jurisdictions of local governments. According to TURKSTAT the size of urban regions increased dramatically from 70% to 90% in 2014. For this reason, HBS 2014 does not provide information about rural and urban households.

<sup>1</sup> Previously, Demery and Duck (2006a and 2006b) followed the same approach to find the empirical importance of cohort effects on household income and consumption in the U.K. economy.

**Table 1**  
Descriptive statistics.<sup>a</sup>

	Number of obs.	Mean	Std. dev.	Min.	Max.
Age	116,959	47.38	13.14	20	84
Female	116,959	11.02%			
University graduate	116,959	11.86%			
Family size	116,959	3.91	1.88	1	30
Home-ownership	116,959	64.85%			
Labor force	116,959	72.48%			
Working-class	116,959	45.49%			
Entrepreneur	116,959	27.00%			
Household disposable income <sup>b</sup>	116,959	12,986.6	11,553.7	0.0	512,239.0
Household saving <sup>b</sup>	116,959	804.5	9062.9	-200,002.8	432,005.1
Home value <sup>b</sup>	91,308	34,891.7	26,171.3	2493.1	175,531.0

<sup>a</sup> Descriptive statistics are calculated using household weights for the restricted sample.

<sup>b</sup> 2003 TL prices.

Source: TURKSTAT Household Budget Surveys

**Table 2**  
Birth-year cohorts.

	1930–1935	1935–1940	1940–1945	1945–1950	1950–1955	1955–1960	1960–1965	1965–1970	1970–1975	1975–1980	1980–1985
2003	1,176	1,431	1,631	2,097	2,846	2,998	3,736	3,286	2,731	1,334	163
2004	398	405	490	657	982	1,057	1,193	1,144	941	494	83
2005	312	384	498	661	874	1,064	1,186	1,097	968	685	143
2006	288	363	461	581	888	998	1,206	1,117	1,092	759	243
2007	247	316	491	623	916	1,019	1,125	1,056	1,068	817	366
2008	275	345	487	587	773	952	1,090	1,046	1,148	825	396
2009	309	382	508	671	844	963	1,130	1,178	1,224	1,001	577
2010	289	374	524	570	834	969	1,219	1,193	1,213	1,013	707
2011	231	352	461	650	709	1,014	1,145	1,163	1,261	1,099	812
2012	229	327	459	628	841	1,011	1,102	1,158	1,203	1,146	823
2013	207	312	405	609	799	959	1,130	1,267	1,368	1,174	989
2014	210	308	423	606	759	970	1,102	1,265	1,302	1,167	1,003
<b>Total</b>	4,171	5,299	6,838	8,940	12,065	13,974	16,364	15,970	15,519	11,514	6,305

Source: TURKSTAT Household Budget Surveys

choice criteria.<sup>4</sup> We observe that there are sufficient observations for each cohort and survey year in the pooled sample (Table 2). We need to comprise a high number of household observations in each cell, since we separate them into home-owner and tenant categories in the next stages of empirical analysis.<sup>5</sup> For that reason, we group households in five year age-intervals when we form birth-year cohorts.

Home-ownership ratio was realized at 64.85% on average between 2003 and 2014, but we see that there are significant differences in home-ownership ratios of cohorts (Table 1). Moreover, we notice that home-ownership ratios are higher in rural regions than urban regions for all cohorts (Fig. 1). Although home-ownership is very common among old and rural households, its percentage decreases steadily as we move towards young and urban households. However, we observe that home values are on average more than

two times higher in urban regions compared to rural regions when we analyze micro-economic data from HBS. This empirical observation also reveals that there is a small amount of observations for tenants among old cohorts in our sample.

We define household saving as the difference between household disposable income and consumption expenditures. We calculate household saving rate as the ratio of household saving to household disposable income. However, we must be cautious when we use this approach for two main reasons. First, poor households tend to under-report their disposable income in budget surveys to continue to benefit from public services such as health care for free. Second, measurement errors in income and consumption are accumulated in saving with this approach. Unfortunately, HBS do not provide data about households' financial wealth accumulation.

First of all, we observe that household saving ratio declined substantially from 2003 to 2014 (Fig. 2). Moreover, home-owners have a higher saving ratio than tenants. There is a direct relationship between household saving ratio and household income level in Turkey (Aktaş et al., 2012; Ceritoğlu and Eren, 2014). Therefore, this empirical observation might stem from higher income level of home-owners. However, if we separate home-owners into two groups with respect to housing debt, then we see that families that have outstanding housing debt on their homes have a significantly higher saving ratio than outright home-owners (Fig. 3). As a result, we can plausibly argue that families that have outstanding housing debt restrict their expenditures and channel their savings to mortgage payments. Moreover, we propose that outright home-owners spend a higher fraction of their income, since they lack the motivation to save to purchase a house. In the next section, we

<sup>4</sup> According to the classification of the TURKSTAT HBS, a family member who plays a greater role than the rest of the members in at least one important issue is selected as the household head. Bringing income into the family is not the main criteria in the selection of the household head. The household head may be male or female though over 90% of them are actually male. The household head does not have to be the highest income earner in the family, but he/she is responsible for managing household income and consumption expenditures. Household head characteristics have a strong influence over household saving preferences.

<sup>5</sup> HBS groups households in four categories with respect to their tenure status: home-owners, tenants, families that live in public housing and households that live in a house owned by a relative. Initially we form birth-year cohort using whole sample. In the next phases of empirical analysis we form birth-year cohorts for home-owners and tenants and we perform econometric estimations for them separately.

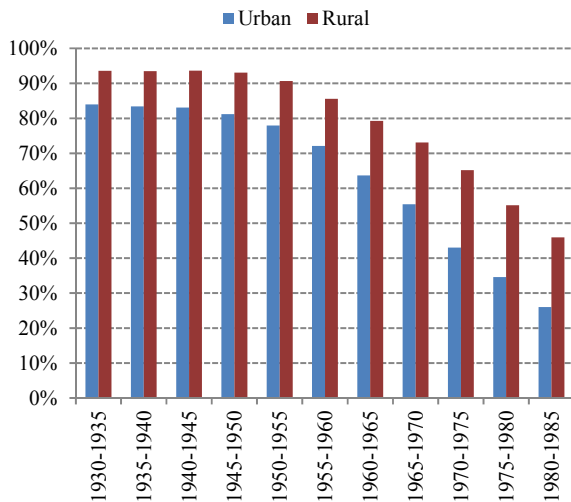


Fig. 1. Home-ownership Ratios (2003 – 2013 period average).  
Source: TURKSTAT Household Budget Surveys, Author's calculations

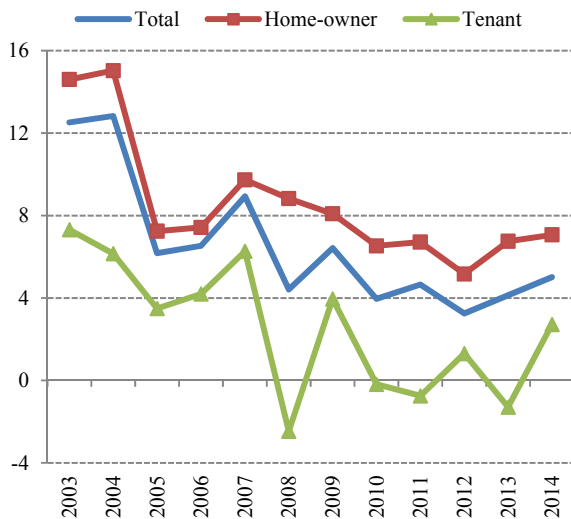


Fig. 2. Household Saving Ratios with respect to Tenure Status (%).  
Source: TURKSTAT Household Budget Surveys, Author's calculations

test the validity of this proposition and search for the reasons behind the relationship between household consumption and house prices.

In the HBS households are questioned about the selling price of their residences with respect to market conditions in the survey month and their responses are recorded in current TL prices. Home-owners and households, who live in public housing or in a residence owned by a family member, are asked about the market value of their houses, but tenants are not asked this specific question. According to their subjective evaluations house price indices, which are based on 2003, are calculated using weighted average home values for each cohort separately.<sup>6</sup> In a similar fashion Calcagno et al. (2009) calculates capital gains in housing using households' subjective evaluations from the Bank of Italy's Survey of Household Income and Wealth. Main economic variables *i.e.*

<sup>6</sup> See Figure A3, Figure A4 and Figure A5 at the appendix.

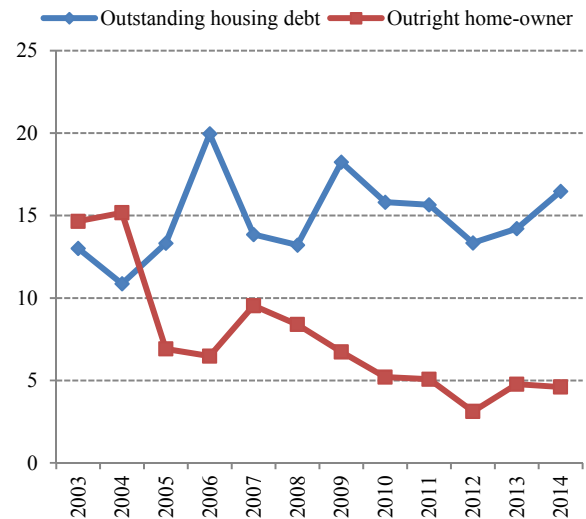


Fig. 3. Household Saving Ratios with respect to Housing Debt (%).  
Source: TURKSTAT Household Budget Surveys, Author's calculations

household income and consumption and home values are deflated to 2003 TL prices using year-end TURKSTAT Consumer Price Index (CPI).<sup>7</sup> Thus, we analyze real house price changes. Our definition of consumption covers household expenditures on non-durable goods and services as in Campbell and Cocco (2007), whereas Attanasio et al. (2009) include both durable and non-durable consumption in their analysis. Durable goods are home appliances, medical equipment, consumer electronics, new and second-hand automobile purchases and jewelry and watches for personal consumption.<sup>8</sup> Finally, we deflate nominal interest rates on housing credit, which are extended to households by deposit banks, by CPI to calculate real interest rates (Figure A8).

CBRT publishes monthly House Price Index (HPI) for whole country and geographical regions at NUTS2 level, but HPI starts from January 2010.<sup>9</sup> We observe that house prices continue to increase sharply and there is a high degree of heterogeneity in house prices between geographical regions (Fig. 4). House prices showed a very rapid increase in İstanbul, whereas the rise in house prices remained lower than country average in Ankara region and house prices moved parallel to country average in İzmir region. Moreover, the upward trend in nominal house prices that we measure using micro-economic data from HBS appears compatible with HPI inflation.

<sup>7</sup> TURKSTAT collects individual and household disposable income figures for the twelve months period prior to the survey month, but not for the calendar year due to the design of the survey questionnaires. For instance, if a household participates in HBS in September 2008, then annual household disposable income will refer to the twelve months period between September 2007 and September 2008. However, the monthly inflation rates are quite high and there are significant differences in the inflation rates of geographical regions in Turkey. TURKSTAT includes a regional and monthly inflation variable in HBS since 2003. Household disposable income and housing wealth are inflated to the year-end (December) prices of the corresponding survey year by multiplying with this inflation index. Annual household disposable income and housing wealth are divided by year-end consumer price indices for each survey year and all economic variables are analyzed in 2003 TL prices.

<sup>8</sup> See Appendix for more information on the definition of durable goods and Figure A7 for their growing economic importance.

<sup>9</sup> See CBRT House Price Index for more information about the Turkish housing market. <http://www.tcmb.gov.tr/wps/wcm/connect/tcmb+en/tcmb+en/main+menu/statistics/real+sector+statistics/house+price+index/monthly+developments>.

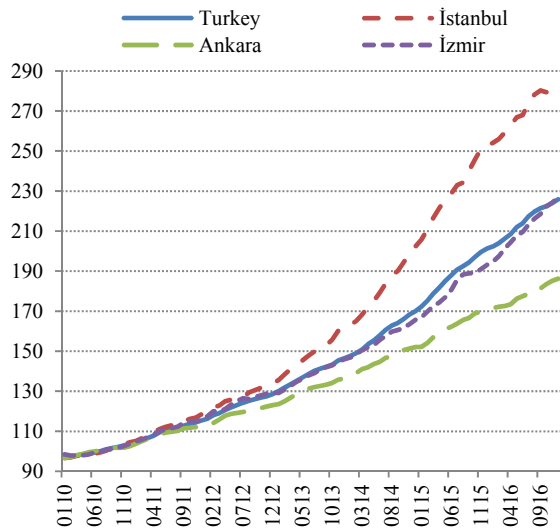


Fig. 4. House price indices (2010 = 100).  
Source: CBRT

#### 4. Econometric results

The dependent variable in the random effects regressions using our pseudo-panel data set is the first-difference of the natural logarithm of cohort consumption. The main explanatory variables are the first-differences of the natural logarithm of cohort income, the natural logarithm of house price index, which is calculated for each cohort separately, and the natural logarithms of real and nominal interest rates. The weighted mean values of social and demographic variables, which are calculated separately for each cohort, are also included in the estimations. There are a total of 121 observations in the pseudo-panel regressions, which is a small sample size, but all the regression coefficients are estimated precisely. The regression coefficients of the growth of cohort income and house price changes are statistically significant at 1% confidence level and have the expected positive signs in all estimations. Moreover, we find that there is a negative and significant relationship between the growth of cohort consumption and nominal interest rate changes. All estimations, which are presented in columns 1 to 8, include demographic variables (Table 3). The presence of demographic variables does not change the significance levels of the explanatory variables, but the sizes of the regression coefficients of the growth of cohort income, real interest rate changes and nominal interest rate changes drop slightly.

We observe that the natural logarithm of household size affects the growth of cohort consumption positively and significantly in all estimations. The growth of cohort consumption decreases with age, but its rate slows down as age increases. Moreover, the growth of cohort consumption is negative for female household heads. Although there is a positive relationship between the growth of cohort consumption and the percentage of university graduates in a cohort, their relationship does not appear to be significant aside from the second estimation, which is shown in column 2 of Table 3.

The direction of the relationship between the growth of consumption and real interest rates depends on the reciprocal forces of income and substitution effects. Income effect reduces the growth of consumption, whereas substitution effect raises the growth of consumption, since it leads to the postponement of consumption. Wealth effect reinforces substitution effect as expected future incomes are discounted with interest rates, which will also lead to a

decrease in consumption when the interest rate increases. Ultimately, this is an empirical issue, which depends on household preferences (Attanasio and Weber, 2010). Our econometric results indicate that substitution effect dominates income effect, since we observe that the regression coefficients of the first differences of nominal and real interest rate on the growth of cohort consumption are negative and statistically significant (Table 3). These empirical observations indicate that if there is an expected increase in interest rates, then households consume a larger proportion of their income in the current period to take advantage of positive developments in the financial markets, which suppresses the growth rate of consumption.<sup>10 11</sup>

We introduce the percentage of home-owners in each cohort as a control variable instead of house price changes in the estimations, which are presented in columns 4, 5 and 6 of Table 3. We observe that there is a positive and statistically significant relationship between the growth of cohort consumption and home-ownership at 5% confidence level in columns 4 and 6. The regression coefficient of real interest rate changes is also statistically significant at 5% confidence level in column 6. However, home-ownership is marginally significant at 10% confidence level in column 5 and the regression coefficient of nominal interest rate changes is not statistically significant in this case. These empirical findings support the view that housing wealth has a direct and significant effect on household consumption.

At this point, we need to determine the reasons behind the positive relationship between the growth of cohort consumption and house price changes. Campbell and Cocco (2007) find that house price increases stimulate household consumption by raising households' perceived wealth and by relaxing borrowing constraints in the UK. However, Attanasio et al. (2009) suggest that house price changes and household consumption are together influenced by common factors using a longer time span from FES in the UK. The main proposition is that housing wealth is mainly accumulated in the hands of old cohorts and as a result of that the

<sup>10</sup> We also estimate random effects regressions using the levels of nominal and real interest rates as explanatory variables rather than their first-differences in the cohort consumption growth regressions. We observe that the regression coefficients of nominal and real interest rates are positive, which confirms that substitution effect dominates income effect, but they are not statistically significant. As a result, we discover that cohorts are more responsive to changes in interest rates than the levels of interest rates in our sample. Both nominal and real interest rates display a strong downward trend in the period of analysis, which might have been more influential on household behavior (Figure A8). Moreover, the elasticity of intertemporal substitution is measured as the responsiveness of the growth of consumption to expected real interest rates (Hall, 1988). However, the size of the regression coefficient of real interest rates is very small, which leads to the prediction of very high level of intertemporal elasticity of substitution. Previous empirical literature notifies that the size of the elasticity of intertemporal substitution is measured higher when micro-economic data is used rather than aggregate data (Havranek et al., 2015).

<sup>11</sup> Furthermore, we separate households that have outstanding housing debt and households that do not have housing debt into two groups in order to find out whether house price changes and interest rates affect their consumption patterns differently or not. However, households that have outstanding housing debt constitute only a small fraction of our pooled sample and we do not have enough observations to fill each cell when we distribute indebted households to birth-year cohorts and survey years. For this reason, we perform our empirical analysis for households that do not have housing debt using the same approach. At this point, we assume that households that do not have housing debt are lenders in the financial markets, whereas households that have outstanding housing debt are borrowers. The econometric results are very similar to our main findings. We observe that there is a positive and statistically significant relationship between the growth of cohort consumption and the growth of cohort income and also house price changes. We find that both nominal and real interest rate changes affect the growth of cohort consumption negatively and significantly in this restricted sample as in full sample. As a result, we can conclude that the sensitivity of households to interest rates does not differ with respect to their lender or borrower status.

**Table 3**  
Random effects regressions for full sample.

	1	2	3	4	5	6	7	8
ΔCohort income	0.502*** (0.0709)	0.437*** (0.0811)	0.520*** (0.0677)	0.687*** (0.0497)	0.681*** (0.0502)	0.697*** (0.0423)	0.437*** (0.0832)	0.517*** (0.0725)
ΔHouse prices	0.201*** (0.0470)	0.240*** (0.0543)	0.196*** (0.0452)					
ΔNominal interest rate		−0.0513*** (0.0157)			−0.0158 (0.0155)		−0.0506*** (0.0146)	
ΔReal interest rate			−0.0140** (0.00645)			−0.0162** (0.00712)		−0.0137** (0.00625)
Home-ownership				0.0667** (0.0335)	0.0575* (0.0343)	0.0922** (0.0437)		
Old							0.246*** (0.0710)	0.210*** (0.0652)
Middle-aged							0.237*** (0.0385)	0.184*** (0.0308)
Young							0.215*** (0.0566)	0.166*** (0.0541)
Constant	−0.00650 (0.0310)	−0.0346 (0.0312)	−0.0140 (0.0320)	0.0418 (0.0288)	0.0326 (0.0296)	0.0388 (0.0269)	−0.0234 (0.0405)	−0.00320 (0.0457)
R-squared	0.78	0.80	0.79	0.72	0.72	0.73	0.80	0.79
Demographic variables <sup>a</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	121	121	121	121	121	121	121	121
Number of cohorts	11	11	11	11	11	11	11	11

Robust standard errors in parentheses.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

<sup>a</sup> Demographic variables include age, age-squared, the percentages of female household heads and university graduates, the natural logarithm of family size.

relationship between the growth of cohort consumption and house price changes must be stronger for old cohorts with respect to young cohorts. [Attanasio et al. \(2009\)](#) find that the link between the growth of cohort consumption and house price changes is stronger for young cohorts compared to old cohorts. We test this hypothesis by introducing the interaction terms of house price changes with the dummy variables for age groups in the last estimations, which are reported in columns 7 and 8. We categorize cohorts, who were between the ages of 54 and 73 in 2003 as old; cohorts, who were between the ages of 34 and 53 in 2003 as middle-aged and finally, cohorts, who were between the ages of 20 and 33 in 2003 as young. We observe that the regression coefficient of the growth of cohort income is positive and statistically significant at 1% confidence level in both cohort consumption growth equations. We find that all interaction terms have the expected positive signs and they are statistically significant at 1% confidence level. Moreover, the sizes of the interaction terms decrease monotonically as we move from old cohorts to young cohorts. Therefore, our empirical findings are in line with [Campbell and Cocco \(2007\)](#) and we claim that house price changes affect household consumption positively through housing wealth channel.

[Campbell and Cocco \(2007\)](#) notify that house price changes are related to the growth of household consumption, particularly for households that are more likely to be borrowing constrained. However, they find that this effect is driven by national rather than regional house prices, which suggests that house price changes might be important for tenants as well as home-owners. If house price increases affect household consumption patterns of both home-owners and tenants positively, then this empirical finding will contradict our wealth channel argument. We estimate the random effects regressions for home-owners and tenants separately to test the validity of this hypothesis. The econometric results from the random effects regressions for home-owners are very similar to our previous findings for whole sample. The regression coefficients of the growth of cohort income and house price changes have the expected positive signs and they are statistically significant at 1% confidence level in all estimations ([Table 4](#)).

However, there are two main differences between the econometric results for whole sample and home-owners. First, the size of the regression coefficient of the growth of cohort income is larger, while the size of the regression coefficient of house price changes is smaller in this case. Second, we insert the percentage of households that have outstanding housing debt on their homes in each cohort as a control variable instead of home-ownership in the estimations, which are presented in columns from 4 to 6 of [Table 4](#). We observe that there is a negative and statistically significant relationship between the growth of cohort consumption and having outstanding housing debt at 5% confidence level in column 6, which supports our argument that families that have outstanding housing debt restrict their expenditures and channel their savings to mortgage payments. We introduce the interaction terms of house price changes with the dummy variables for age groups in the last estimations, which are presented in columns 7 and 8. We find that the interaction terms for old cohorts and middle-aged cohorts have the expected positive signs and they are statistically significant at 1% confidence level. However, the interaction term for young cohorts is not statistically significant. Moreover, the sizes of the interaction terms decrease systematically as we move from old cohorts to young cohorts. Therefore, our econometric results are in favor of the wealth channel argument.

We perform the same empirical analysis for tenants to examine the validity of our wealth channel argument. If house price changes affect household consumption of home-owners and tenants in the same direction, then we must conclude that any association between house prices and household consumption must depend on macro-economic factors such as consumer confidence and financial market developments. However, the econometric results from the random effects regressions for tenants are different than our previous findings for whole sample and for home-owners ([Table 5](#)). At this point, we must specify that the numbers of observations in the random effects regressions fall to 77, because there are a small number of tenants among old households, which reduces the size of cohort cells dramatically and as a result of that we restrict our sample to middle-aged and young households. Thus, we can follow

**Table 4**  
Random effects regressions for home-owners.

	1	2	3	4	5	6	7	8
ΔCohort income	0.674*** (0.0533)	0.622*** (0.0554)	0.674*** (0.0496)	0.787*** (0.0656)	0.785*** (0.0621)	0.783*** (0.0628)	0.644*** (0.0574)	0.696*** (0.0491)
ΔHouse prices	0.118*** (0.0298)	0.157*** (0.0324)	0.119*** (0.0316)					
ΔNominal interest rate		−0.0529*** (0.0151)			−0.0342** (0.0158)		−0.0478*** (0.0163)	
ΔReal interest rate			−0.0126** (0.00527)			−0.0133** (0.00545)		−0.0119** (0.00504)
Outstanding housing debt				−0.107 (0.0735)	−0.0863 (0.0699)	−0.130** (0.0623)		
Old							0.178*** (0.0455)	0.154*** (0.0461)
Middle-aged							0.129*** (0.0381)	0.0790** (0.0396)
Young							0.0662 (0.0604)	0.0118 (0.0523)
Constant	−0.0503* (0.0300)	−0.0474* (0.0250)	−0.0469 (0.0311)	−0.0182 (0.0381)	−0.0197 (0.0368)	−0.00895 (0.0403)	−0.0147 (0.0354)	−0.0104 (0.0404)
R-squared	0.84	0.85	0.85	0.83	0.83	0.84	0.86	0.85
Demographic variables <sup>a</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	121	121	121	121	121	121	121	121
Number of cohorts	11	11	11	11	11	11	11	11

Robust standard errors in parentheses.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

<sup>a</sup> Demographic variables include age, age-squared, the percentages of female household heads and university graduates, the natural logarithm of family size.

**Table 5**  
Random effects regressions for tenants.

	1	2	3	4	5
ΔCohort income	0.545*** (0.0556)	0.541*** (0.0513)	0.560*** (0.0575)	0.538*** (0.0503)	0.556*** (0.0561)
ΔHouse prices	0.0796 (0.0511)	0.0954* (0.0513)	0.0802 (0.0494)		
ΔNominal interest rate		−0.0270 (0.0188)		−0.0252 (0.0188)	
ΔReal interest rate			−0.00857 (0.0122)		−0.00815 (0.0123)
Middle-aged				0.134** (0.0656)	0.121* (0.0630)
Young				0.0382 (0.0614)	0.0225 (0.0606)
Constant	−0.0190 (0.0607)	−0.0464 (0.0611)	−0.0331 (0.0546)	−0.00297 (0.0910)	0.0103 (0.0852)
R-squared					
Demographic variables <sup>a</sup>	Yes	Yes	Yes	Yes	Yes
Number of observations	77	77	77	77	77
Number of cohorts	7	7	7	7	7

Robust standard errors in parentheses.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

<sup>a</sup> Demographic variables include age, age-squared, the percentages of female household heads and university graduates, the natural logarithm of family size.

only seven cohorts, who were between the ages of 20 and 53 in 2003, for eleven years.

We observe that there is a positive and statistically significant relationship at 1% confidence level between the growth of cohort consumption and the growth of cohort income in all estimations. However, the regression coefficient of house price changes is marginally significant only when we include nominal interest rate changes in the estimation. Moreover, the regression coefficient of house price changes on the growth of cohort consumption is estimated smaller for tenants compared to whole sample and home-owners. However, we notice that the growth of cohort consumption is not affected from nominal interest rate changes and real interest rate changes significantly unlike previous estimations. When we insert the interaction terms of house price changes with the dummy variables for age groups along with interest rate changes, we find that the interaction terms for middle-aged cohorts

are statistically significant at 5% confidence level and marginally significant at 10% confidence level, which are reported in columns 4 and 5 of Table 5, respectively. However, the interaction terms for young cohorts are not statistically significant as before. Cohort income emerges as the main determinant of cohort consumption for tenants apart from demographic variables. The econometric findings for tenants cast doubt on the sole role of wealth channel, but at this point we must mention that our pooled sample set is restricted to young and middle-aged cohort in the case of tenants.<sup>12</sup>

<sup>12</sup> If we repeat this econometric analysis by including old cohorts in the sample despite their small cell size, then we find that house price changes do not affect the growth of cohort consumption significantly even when we include interest rate changes in the estimations. Moreover, we observe that the interaction terms of house price changes with the dummy variables for age groups are not statistically significant at all.



**Table 6**  
Random effects regressions excluding the youngest and oldest cohorts.

	Total			Home-owners			Tenants	
	1	2	3	4	5	6	7	8
ΔCohort income	0.389*** (0.0748)	0.475*** (0.0686)	0.698*** (0.0859)	0.589*** (0.0591)	0.642*** (0.0527)	0.749*** (0.0443)	0.457*** (0.0562)	0.473*** (0.0492)
ΔHouse prices	0.247*** (0.0496)	0.197*** (0.0389)		0.163*** (0.0374)	0.121*** (0.0334)		0.115* (0.0675)	0.102 (0.0652)
ΔNominal interest rate	−0.0555*** (0.0204)			−0.0585*** (0.0188)			−0.0174 (0.0226)	
ΔReal interest rate		−0.0133* (0.00804)			−0.0118* (0.00628)			−0.00543 (0.0141)
Home-ownership/Outstanding housing debt <sup>b</sup>			0.0916** (0.0411)			−0.203*** (0.0635)		
Constant	−0.0626 (0.0688)	−0.0175 (0.0653)	0.0362 (0.0557)	−0.0359 (0.0430)	−0.0136 (0.0460)	−0.00685 (0.0365)	−0.0275 (0.0555)	−0.00978 (0.0460)
R-squared	0.80	0.79	0.71	0.86	0.84	0.83		
Demographic variables <sup>a</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	99	99	99	99	99	99	66	66
Number of cohorts	9	9	9	9	9	9	6	6

Robust standard errors in parentheses.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

<sup>a</sup> Demographic variables include age, age-squared, the percentages of female household heads and university graduates, the natural logarithm of family size.

<sup>b</sup> The effect of home-ownership is estimated for whole sample, whereas the effect of having outstanding housing debt is estimated for home-owners.

## 5. Robustness checks

As a robustness check, we exclude the youngest and the oldest cohorts from our sample set and repeat our main estimations, which are presented in Table 6. The econometric results from our restricted sample set are close to our former results from the unrestricted sample. The number of observations in the random effects regressions falls to 99 for full sample and home-owners and 66 for tenants in this case, but the main explanatory variables are estimated precisely. The regression coefficient of the growth of cohort income is positive and statistically significant at 1% confidence level in all cohort consumption growth equations. The regression coefficient of house price changes is also positive and statistically significant at 1% confidence level in all estimations for whole sample and home-owners. Moreover, we observe that the rise of home-ownership ratio increases the growth of cohort consumption, while the spread of having outstanding housing debt reduces the growth of cohort consumption significantly, which are reported in columns 3 and 6 of Table 6, respectively. However, the regression coefficient of house price changes is marginally significant at 10% confidence level for tenants only when we add nominal interest rate changes in the estimation, which is reported in column 7 of Table 6.

Our empirical analysis up to this stage reveals that house price changes affect the growth of cohort consumption positively and significantly. The strength of this relationship increases monotonically as we move from young cohorts to old cohorts. Moreover, we find that house price changes raise the growth of cohort consumption of home-owners significantly. Although our econometric results support the wealth channel argument, we must highlight that previous empirical papers for advanced economies suggest that common factors such as financial variables or collateral effects for liquidity-constrained households could also be the source of the connection between house prices and household consumption (Campbell and Cocco, 2007; Attanasio et al., 2009; Calcagno et al., 2009; Atalay et al., 2016).

We already discuss the effects of nominal and real interest rate changes on the growth of cohort consumption. We add the first difference of the natural logarithm of Consumer Confidence Index, which is derived from the Consumer Tendency Survey, which is implemented jointly by TURKSTAT and CBRT, to the cohort consumption growth equations in order to test the common factor

hypothesis (Table 7). We think Consumer Confidence Index is a suitable candidate to test the common factor hypothesis, since it sums up aggregate variables that might influence household consumption and saving behavior. The numbers of observations in the random effects regressions fall to 110 for full sample and home-owners and 70 for tenants, since the CBRT Consumer Confidence Index is available from 2004; but the main explanatory variables are estimated precisely as before.

We observe that there is a positive and statistically significant relationship between the growth of cohort consumption and house price changes even when we control for the growth of cohort income, real interest rate changes and the change in Consumer Confidence Index for whole sample and home-owners.<sup>13</sup> Moreover, the interaction terms of house price changes with the dummy variables for age groups have the expected positive signs they are still statistically significant at 1% confidence level for whole sample. In the case of home-owners only the interaction term of the old cohorts is statistically significant. The sizes of the interaction terms decrease systematically as we move from old cohorts to young cohorts as before. However, home-ownership ratio and having outstanding housing debt are not statistically significant on the growth of cohort consumption, which are reported in columns 3 and 6 in Table 7, respectively. As a result, our econometric results provide further evidence in favor of the wealth channel argument.

The change in Consumer Confidence Index affects the growth of cohort consumption significantly in addition to the growth of cohort income for tenants. However, the regression coefficient of house price changes is marginally significant on the growth of cohort consumption, which is shown in column 7 of Table 7. The interaction term for middle-aged cohorts is also statistically significant at 5% confidence level, which is presented in column 8 of Table 7. If we repeat this econometric analysis by including old cohorts in the sample despite their small cell size, then we find that house price changes do not affect the growth of cohort consumption significantly even though we include consumer sentiment in

<sup>13</sup> We also estimated the random effects regressions using nominal interest rate changes instead of real interest rate changes. The regression coefficient of nominal interest rate changes was negative and statistically significant at 1% confidence level in all estimations for whole sample and home-owners, but it was not statistically significant in the estimations for tenants.

**Table 7**  
Random effects regressions including consumer sentiment.

	Total			Home-owners			Tenants	
	1	2	3	4	5	6	7	8
ΔCohort income	0.503*** (0.0677)	0.732*** (0.0338)	0.494*** (0.0800)	0.626*** (0.0938)	0.775*** (0.0801)	0.646*** (0.0876)	0.494*** (0.0420)	0.487*** (0.0409)
ΔHouse prices	0.172*** (0.0548)			0.120*** (0.0412)			0.0876* (0.0456)	
ΔReal interest rate	-0.0170** (0.00753)	-0.0174** (0.00759)	-0.0168** (0.00748)	-0.0154*** (0.00573)	-0.0138** (0.00538)	-0.0147*** (0.00546)	-0.00442 (0.0125)	-0.00396 (0.0127)
ΔConsumer sentiment	-0.129*** (0.0237)	-0.177*** (0.0245)	-0.130*** (0.0233)	-0.0850*** (0.0241)	-0.0925*** (0.0305)	-0.0841*** (0.0243)	-0.130*** (0.0372)	-0.123*** (0.0396)
Home-ownership/Outstanding housing debt <sup>b</sup>		0.0378 (0.0545)			-0.0789 (0.0787)			
Old			0.193** (0.0814)			0.156*** (0.0573)		
Middle-aged			0.151*** (0.0373)			0.0739 (0.0566)		0.126** (0.0625)
Young			0.141** (0.0588)			0.0265 (0.0499)		0.0364 (0.0616)
Constant	-0.0299 (0.0380)	0.0144 (0.0205)	-0.0229 (0.0432)	-0.0524 (0.0374)	-0.0276 (0.0510)	-0.0298 (0.0440)	-0.0501 (0.0561)	-0.0157 (0.0713)
R-squared	0.77	0.73	0.77	0.82	0.81	0.83		
Demographic variables <sup>a</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	110	110	110	110	110	110	70	70
Number of cohorts	11	11	11	11	11	11	7	7

Robust standard errors in parentheses.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

<sup>a</sup> Demographic variables include age, age-squared, the percentages of female household heads and university graduates, the natural logarithm of family size.

<sup>b</sup> The effect of home-ownership is estimated for whole sample, whereas the effect of having outstanding housing debt is estimated for home-owners.

**Table 8**  
Random effects regressions for geographic regions.

	Urban				Rural			
	1	2	3	4	5	6	7	8
ΔCohort income	0.382*** (0.0672)	0.387*** (0.0698)	0.593*** (0.0691)	0.386*** (0.0678)	0.467*** (0.106)	0.464*** (0.105)	0.646*** (0.0639)	0.470*** (0.106)
ΔHouse prices	0.278*** (0.0453)	0.285*** (0.0377)			0.213*** (0.0715)	0.218*** (0.0686)		
ΔNominal interest rate	0.00343 (0.00771)				0.0193* (0.0117)			
ΔReal interest rate		-0.00224 (0.00471)		-0.00344 (0.00488)		0.00568 (0.00458)		0.00601 (0.00408)
Home-ownership			0.0380 (0.0801)				0.0607 (0.0382)	
Old				0.392*** (0.0607)				0.259** (0.118)
Middle-aged				0.208*** (0.0388)				0.171*** (0.0544)
Young				0.247*** (0.0433)				0.217*** (0.0452)
Constant	-0.0178 (0.0640)	-0.00313 (0.0598)	0.0237 (0.0657)	-0.0117 (0.0615)	-0.190** (0.0770)	-0.142* (0.0752)	-0.105* (0.0593)	-0.169* (0.0939)
R-squared	0.75	0.75	0.64	0.76	0.66	0.66	0.58	0.66
Demographic variables <sup>a</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	110	110	110	110	110	110	110	110
Number of cohorts	11	11	11	11	11	11	11	11

Robust standard errors in parentheses.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

<sup>a</sup> Demographic variables include age, age-squared, the percentages of female household heads and university graduates, the natural logarithm of family size.

empirical analysis. Moreover, we see that the interaction terms of house price changes with the dummy variables for age groups are not statistically significant.

We investigate the effect of house price changes on cohort consumption with respect to rural and urban regions as another

robustness check. The econometric results are similar to our earlier findings (Table 8). We observe that there is a positive and statistically significant relationship between the growth of cohort consumption and the growth of cohort income in all estimations. Moreover, house price changes have a positive and statistically

significant effect on the growth of cohort consumption for both urban and rural cohorts. The regression coefficients of the growth of cohort income are larger in the cohort consumption growth equations for rural cohorts, whereas the regression coefficients of house price changes are larger for urban cohorts. We introduce the interaction terms of house price changes with the dummy variables for age groups, which are presented in columns 3 and 4 for urban cohorts and in columns 7 and 8 for rural cohorts, respectively. We find that the interaction terms for all age groups have positive signs and they are statistically significant. The interaction terms for old cohorts have the largest regression coefficients for both urban and rural cohorts, but the regression coefficients of the interaction terms for young cohorts are also sizeable. The numbers of observations in the random effects regressions drop to 110; since HBS provides information about rural and urban households from 2003 to 2013.

Finally, that there might be a simultaneous relationship between cohort consumption and cohort income. For this reason, we repeat our empirical analysis with random effects Instrumental Variables (IV) regressions, where the lagged values of the growth of cohort income are used as instruments.<sup>14</sup> Once more we observe that there is a positive and statistically significant relationship between the growth of cohort consumption and the growth of cohort income. However, the number of observations in the estimations drops considerably in this case. In addition, we estimated fixed effects regressions for all equations, but Hausman test results reveal that the estimated regression coefficients are not systematically different from each other. Thus, we present econometric results from random effects regressions throughout the paper. As a caveat we must mention that the short time dimension of HBS limits the scope of empirical analysis. Unfortunately, the short time span of HBS does not allow us to investigate the impact of house price changes on the growth of consumption for each cohort separately. It will be interesting to analyze housing market developments as new waves of HBS become available in time.

## 6. Conclusion

This paper analyzes the relationship between house price changes and household consumption in Turkey. This topic is especially important for the Turkish economy, since house prices showed remarkable increases recently. Moreover, the age structure of the population is expected to change gradually in the next years. We discover that the rise in house prices play an important role on household consumption and saving behavior. Home-owners perceive their housing wealth higher as house prices rise, which affects their consumption decisions positively. However, we understand that families that have outstanding housing debt restrict their consumption and channel their savings to credit payments. We observe that home-ownership ratio is decreasing over time, while the percentage of home-owners that have outstanding housing debt is higher in 2014 than 2003, which puts pressure on household finances and consumption.

Median age in Turkey is 30.4 according to the HBS 2014, whereas median age is higher than 40 in most OECD countries. Our young population and falling family size suggest that new household

formation and housing demand will continue to grow in the next years. TURKSTAT population projections indicate that youth dependency ratio will fall, while old dependency ratio will continue to increase. Moreover, working-age population will become older even if its fraction in total population remains high.<sup>15</sup> At the same time, maturity of housing credit extended by deposit banks to households is only 8 years on average. Our empirical findings reveal that the relationship between house price changes and the growth of consumption is stronger for old cohorts than young cohorts. As a result, we predict that the effect of house price changes on household consumption will become larger as population ages. Consequently, household saving ratio might fall further in Turkey due a positive wealth effect.

## Appendix

**Consumption:** Consumption is collected at the household level and reported according to United Nations (UN) Classification of Individual Consumption According to Purpose (COICOP) codes in HBS. Household expenditures on durable goods are subtracted from total consumption expenditures to find household expenditures on non-durable goods and services in empirical analysis.

**Durables goods:** Furniture (511), carpets and flooring materials (512), refrigerators and freezers (531), washing machines, tumble dryers and dishwashers (532), ovens (533), heaters, air conditioning (534), sewing and knitting machines (536), basic household appliances (537), small electrical household appliances (5321), repair tools and equipment (551), medical tools and equipment (6131), new (711) and used car (712) purchases, motorcycles (7121), bicycles (7131), telephone and telefax equipment (821), equipment for reception, recording and reproduction of sound (911), TV sets, video-cassette players and tapes (912), photographic and cinematographic equipment (9121), optical tools (9122), data processing equipment (9131), tools used for recording pictures and sounds (9141), major durable goods for fun outside home (921), musical instruments (9221), home entertainment devices (9222) and jewelry, watches and clocks (12311) are categorized as durable goods in this study. Their COICOP-HBS codes are presented in parenthesis.

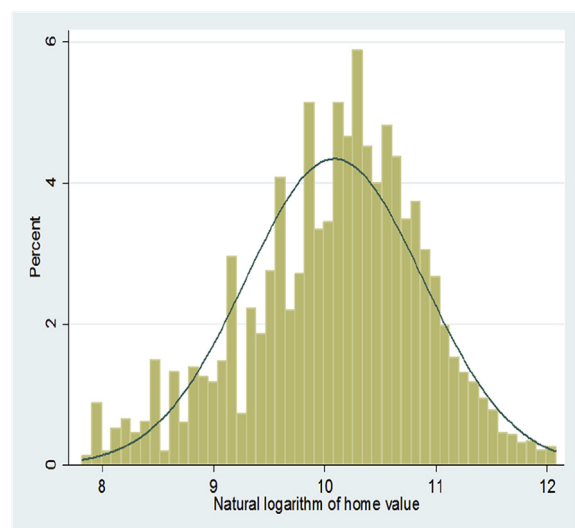
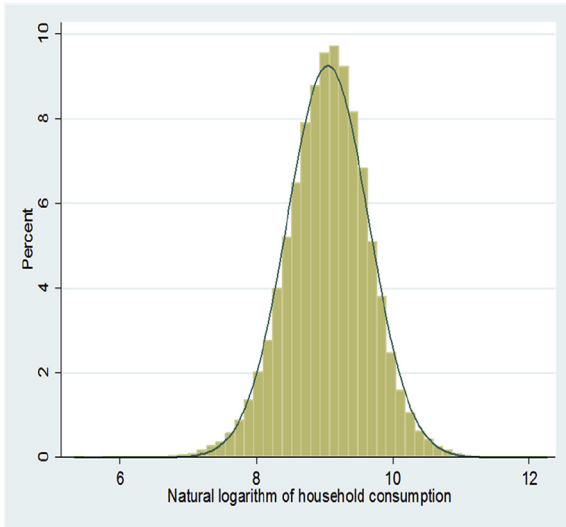


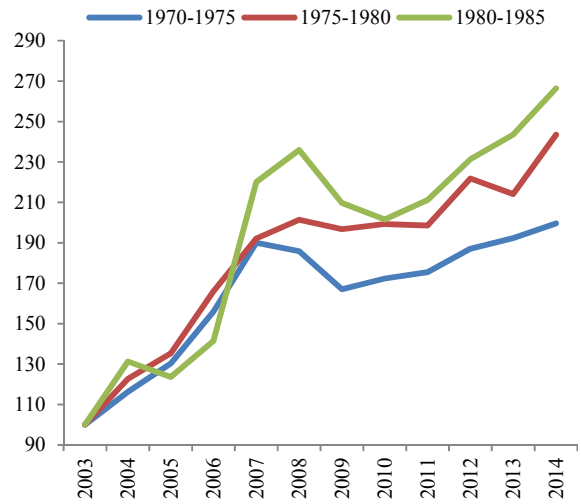
Fig. A1. The Distribution of Housing Wealth (2003 TL prices). Source: TURKSTAT Household Budget Surveys, Author's calculations

<sup>14</sup> McKenzie (2004) discusses asymptotic properties of Ordinary Least Squares (OLS) and Instrumental Variables (IV) estimators and recommends the use of OLS estimation for a pseudo-panel data set if the cross-section dimension is large, but the time dimension of a microeconomic data set is short. Actually, using cohort values in estimations is identical to an IV approach, where group averages are used as instruments for individual observations.

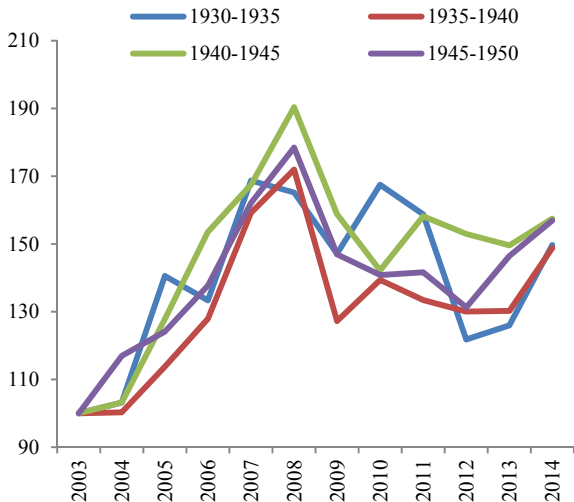
<sup>15</sup> See Figure A6.



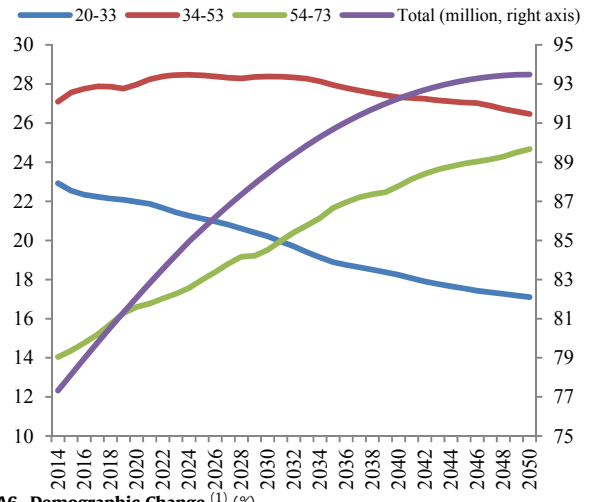
**Fig. A2. – The Distribution of Household Consumption (Natural Logarithm, 2003 TL prices).**Source: TURKSTAT Household Budget Surveys, Author's calculations



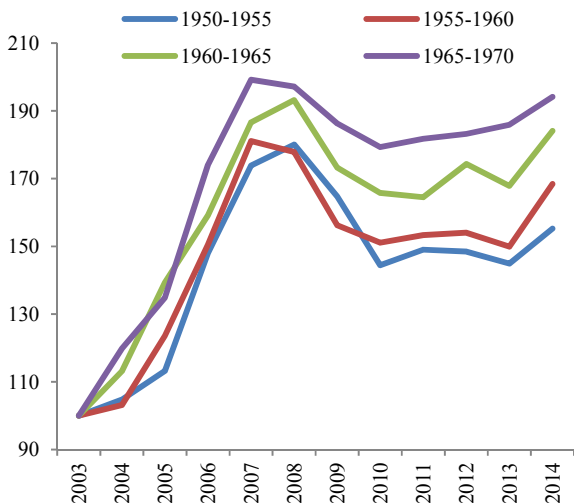
**Fig. A5. House Price Index (2003 = 100).**Source: TURKSTAT Household Budget Surveys, Author's calculations



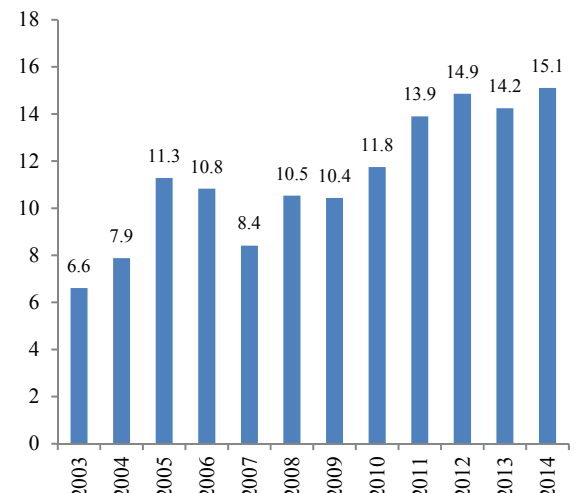
**Fig. A3. House Price Index (2003 = 100).**Source: TURKSTAT Household Budget Surveys, Author's calculations



**Fig. A6. Demographic Change <sup>(1)</sup> (%).**  
(1) Individuals who are younger than 20 and who are older than 73 are not included in this graph. Source: TURKSTAT Population Projections



**Fig. A4. House Price Index (2003 = 100).**Source: TURKSTAT Household Budget Surveys, Author's calculations



**Fig. A7. The Share of Durable Goods in Household Consumption Expenditures (%).**Source: TURKSTAT Household Budget Surveys, Author's calculations

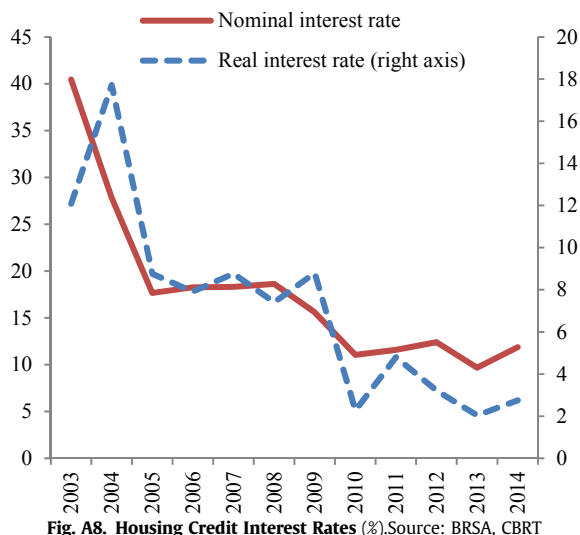


Fig. A8. Housing Credit Interest Rates (%). Source: BRSA, CBRT

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