

An Econometric Analysis of Housing Demand in Turkey

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Abstract

In this study, the demand for housing in Turkey was examined by panel data analysis and provincial level data set between 2004 and 2011. The income levels, housing prices, and population were selected as explanatory variables for the study. Two different models were used and the income elasticity was found to be 1.42 and 1.91. The price elasticity was estimated at -0.85 and -0.95 in the models and population indicators positively affected the demand for housing. The findings of the study show that the most important factor affecting the housing demand was the income level of Turkey.

JEL classification numbers: D12, D22 and J11

Keywords: Housing Demand, income elasticity, panel data analysis and co-integration

1 Introduction

In many developing countries, an increasing trend in housing demands has been observed. This has mainly resulted from demographic and economic factors. It can be said that this trend is valid for Turkey as a developing country. Higher population rates, increased urbanization, decreasing averages of household

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population, and the recent economic growth rates have given birth to a higher demand for housing in Turkey. The analysis of housing demand has recently become vitally important for decision makers and market actors because of the widespread effects of the housing sector on the economy. However, studies on this topic in Turkey are rarely found in the literature. It is expected that this article will help to fill the gap in the literature and to understand the structure of housing demand in Turkey.

In this article, housing demands in Turkey were examined by panel data analysis between the years 2004 and 2011. Our study differs from the others in the econometric models and variables used in the regression analysis. This study has been constructed as follows: Firstly, an overview of the housing sector of Turkey has been presented holistically, and from this the literature survey was abstracted. Econometrics models will then be given and the findings of the study will be discussed.

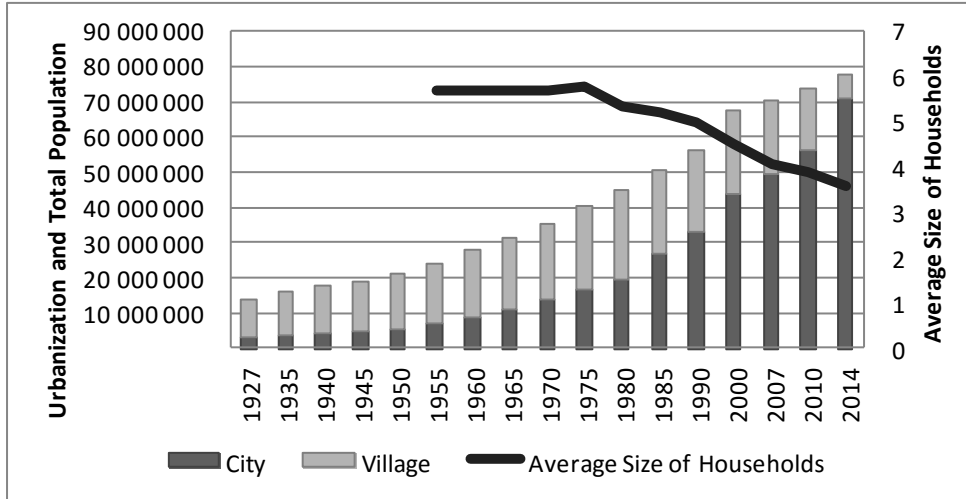
2 Housing demand and supply in Turkey

As in other countries, the basic determinants of housing supply and demand are demographic and economic factors in Turkey. The population of Turkey visibly increased from 20.9 million in 1950 to 44.7 million in 2000 and it reached close to 80 million. While the ratio of urban population to total population was 25 percent in 1950, it jumped to 43.9 percent in 1980 and 64.9 percent in 2000. Now, the ratio is higher than 90 percent and urbanization is higher in the mega cities of Turkey, such as Istanbul, Ankara, Izmir and Bursa (TSI, 2015).

The average household size was 5.7 in 1970 and then it started to decrease. It jumped down to 5.3 in 1980 and 4.5 in 2000. It has been closed to 3.6 in 2014. The average rates for household size were as follows: 5.3 percent in the period of 1950-1980, 4.4 percent in 1980-2000, and 4.00 percent in 2000-2014, (TSI, 2015).

As shown in Figure 1, higher population rates, higher urbanization, and decreased household size have caused higher housing demand, especially in mega cities in Turkey. The government, building societies (The type of financial institutions that were based on lending money to society members to buy houses), and private enterprise have tried to meet the housing needs. The yearly data for permission received for housing and housing sectors in Turkey are represented in Figure 2.

Figure 1: Population, Urbanization, and the Average Size of Households in Turkey



Prior to 1980, house production had been largely been conducted by private sectors, and government had minimal involvement. During the period 1980-2003, private enterprise maintained its leading role in housing production, but at the same time, building societies also had an important role in the housing sector. In some years during that period, the proportion of building societies passed the 30 percent and still government had no role in the sector. The year of 2003 was a breaking point in housing production. At that time, government became actively involved in housing construction, expanding to 13 percent of all

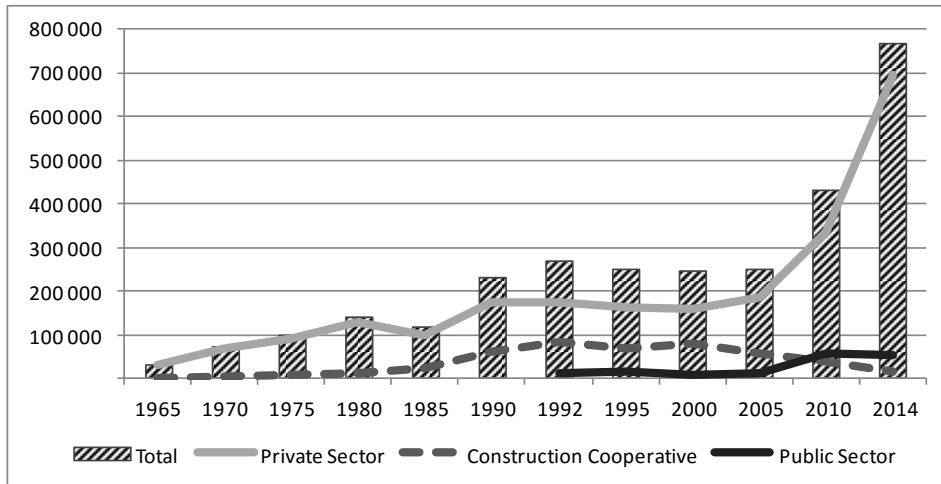
housing production in 2010. In contrast, the role of building societies started to decline during that time. The private sector continued to strengthen its position in housing production

The Housing Development Administration (HAD),³ whose structure was changed significantly in 2003, is a leading public institution in housing production. HAD has been directly connected under the supervisions of the prime ministry of Turkey by statutory amendment enacted in 2003. There have been also significant political developments in Turkey in this period in which the Justice and Development Party (AKP) has looked to the government for assistance. The housing sector has been one of the major structural changes in Turkey during the

³ In Turkish, this institution is known as TOKİ.

AKP government (TOKİ, 2016).

Figure 2: The Number of Received Permit in Housing Production and Sectoral Distribution



3 Literature

Studies estimating the housing demand have long been conducted in developed countries (e.g., De Leeuw, 1971; Mayo, 1981; Malpezzi and Mayo, 1987; Fulpen, 1988; and Malpezzi, 1999). It is possible to group these studies into two groups that analyzed different countries. In the first group of studies, the authors especially focused on housing specialties using cross sectional data. In the second group, they saw the houses as consuming goods and analyzed housing demand using time series (Fulpen, 1988). Both studies attempted to explain housing demand using economic and demographic factors, even though different methods and models were used. In the next part of this article, the effects of demographic and economic factors on Turkey's housing demand were examined by econometric models. These results will be compared and contrasted with the existing literature.

Recent studies about Turkey will be analyzed. Lebe and Aktas (2014) examined the housing demand with Johansen and Juselius' co-integration methods and vector error correction models were used in terms of 1970 and 2011. GDP per capita, housing prices, interest rates, industrialization, employment in agricultural sector, and marital status were selected as explanatory variables. Results showed that GDP per capita, marital status and industrialization positively affected the

demand for housing in Turkey, although housing prices, interest rates and employment in the agricultural sector had a negative effect on demand for. In the long term, the most important factors that affected the demand for housing were income level (with a coefficient between 3.28 and 5.388), industrialization, and agricultural employment. No significant effects on interest rates in the demand for housing in Turkey were found.

Bekmez and Ozpolat (2014) used vector autoregressive models for the years between 1992 and 2012 in order to research regional housing demand in Turkey comparatively. They explained the demand for housing with the variables of GDP, money supply, inflation rates, and the unemployment rates. In other studies, Bekmez and Ozpolat (2013) analyzed the determinants of housing demand with Johansen's co-integration tests conducted from 1986 to 2009 and inflation rates, unemployment rates, interest rates, GDP per capita, and the stock exchange indicator were taken as explanatory variables. In the long run, the most important factor affecting the housing demand was GDP per capita. Unemployment even affected housing demand positively in the short run; however, it had negative effects in the long run. Inflation had positive effects, while interest rates have insignificant, but negative effects on housing demand. Substitution effects of housing were tested by stock exchange indicators that were affected negatively in the long run but there was no significant substitution effect of stock exchange indicators on housing demand. Bekmez and Ozpolat (2013) in the third article in this survey checked the demand for housing in Turkey with vector error correction models from 2000 to 2012, and they found inelastic income effects in the short run, and elastic income effects in the long run on demand for housing. In addition, they stated that urban transformation had significant effects on demand for housing and income elasticity.

Ozturk and Fitoz (2009) determined the factors affecting demand for housing with ordinary least square methods and Johansen-Juselius' co-integration models in the years between 1968 and 2006. In the article, GDP per capita, consumer price index, GINI coefficient, interest rates, urbanizations, and M2 to GDP ratio were considered as explanatory variables. They found positive relationships between the explanatory variables of GDP per capita, consumer price index and interest rates with the dependent variable, demand for housing. However, insignificant relationships between demographic factors and demand for housing were found.

Halicioğlu (2007) examined the demand for housing with autoregressive distributed lag models for Turkey from 1964 to 2004. Income level, price, and urbanization were taken as explanatory variables and income level was found to be the most significant variable, followed by price and urbanization, respectively.

Durkaya and Yamak (2004) used seven different regressions for housing demand. They determined the demand with the variables of price level, real housing cost, population, and industrialization. The income elasticity coefficient varied between 1.9 and 3.8; the price elasticity varied from -0.003 and -0.1.

4 Models, Data Set and Results

We aimed in this study to determine the housing demand for Turkey with panel data analysis. The data for the analysis were collected for 78 cities⁴ and cover the years between 2004 and 2011.⁵ We used the econometric models inspired from the literature. The numbers of constructed houses were taken as dependent variables and these variables represent the housing demand (HD). The explanatory variables used were real income level (GDP), housing prices (HP), and urban population (UP) or urban population growth rates (UPG). Real income level per capita (GDP) were represented by gross value added per capita in the study. These variables were published by Turkish Statistical Institute for 26 statistical subdivisions of Turkey, and the average values were calculated in each subdivision. Real housing prices (HP) were calculated by dividing total housing values for every sub-division by the total number of houses.

Applications were calculated by Eviews and Stata software programs. The model is stated in Equation 1:

$$LHD_{i,t} = \beta_0 + \beta_1 LHP_{i,t} + \beta_2 LGDP_{i,t} + \beta_3 LUP_{i,t} + u_{i,t} \quad (1)$$

Where, $i = 1, \dots, 78$ and $t = 2004, \dots, 2011$

Logarithms of the variables were taken and the capital of L represents the logarithms operator. Therefore, betas are the coefficients and give us the elasticity of the variables and “u” means the error term. Theoretically, it is expected that there will be negative relationships between price and demand and positive relationships between income and population in the housing demand.

⁴ Batman, Ardahan and Düzce were excluded because of lacking data.

⁵ We could only reach the data at the provincial level for Turkey between the years 2004 and 2011.

In the second model, we took urban population growth rates and the models are given at Equation 2:

$$LHD_{i,t} = \beta_0 + \beta_1 LHP_{i,t} + \beta_2 LGDP_{i,t} + \beta_3 UPG_{i,t} + u_{i,t} \quad (2)$$

Where, $i = 1, \dots, 78$ and $t = 2004, \dots, 2011$

Firstly, the stationary properties of the series were checked by LLC (Levin, Lin and Chu) and IPS (Im, Pesaran and Shin) unit root tests and the results are given in Table 1.

When the LLC unit root tests results were taken into account, it could be seen that all series are stationary in level, $I(0)$, with constant and trend. According to the IPS tests, except for LUP and UPG, all series are stationary in level. All series are stationary after taking the first difference, but unit root tests can be calculated in the first difference with constant and trend because of having short time series.

Table 1: Panel *Unit-root Tests*

Variables	LLC TEST		IPS TEST	
	On level values		On level values	
	With constant	With constant and trend	With constant	With constant and trend
LHD	-7.27 ^A	-29.90 ^A	1,07	-1.48 ^C
LHP	-26.95 ^A	-87.50 ^A	-6.12 ^A	-4.19 ^A
LGDP	-3,50 ^A	-76.08 ^A	2.52	-6.85 ^A
LUP	-7.43 ^A	-15,09 ^A	-3,44 ^A	-0,81
UPG	4.02	-10.69 ^A	4,52	0,60
	In the first difference		In the first difference	
LHD	-25.78 ^A	NA	-7.16 ^A	NA
LHP	-78.81 ^A	NA	-10.07 ^A	NA
LGDP	-86,05 ^A	NA	-14.24 ^A	NA
LUP	-13,84 ^A	NA	-6,19 ^A	NA
UPG	-9,14 ^A	NA	-2.15 ^B	NA

Note: A, B and C indicate the 1%, 5% and 10% of levels of significance, respectively. Newey-West bandwidth was used with Bartlett Kernel. Schwarz Information Criteria was chosen for optimal lag numbers. NA is numerical aperture.

It is assumed that the coefficients of the series vary among the cross sections homogeneously and the possibility of heterogeneity was neglected. Then, the possibilities of the time (λ) and unit effects (μ) were tested by Score and LR tests.

As a result, regression models include both time and unit effects that means a null hypothesis if there is unit and time effects cannot be rejected.

$$H_0 : \mu, \lambda = 0$$

$$H_1 : \mu, \lambda \neq 0$$

Two-way panel data analyses were taken into account. That is to say slope parameters are constant but constant terms vary among time and units. Our models are illustrated.

$$LHD_{i,t} = \beta_{0i,t} + \beta_1 LHP_{i,t} + \beta_2 LGDP_{i,t} + \beta_3 LUP_{i,t} + u_{i,t} + \mu_i + \lambda_\tau \quad (3)$$

$$LHD_{i,t} = \beta_{0,it} + \beta_1 LHP_{i,t} + \beta_2 LGDP_{i,t} + \beta_3 LNUPG_{i,t} + u_{i,t} + \mu_i + \lambda_\tau \quad (4)$$

The samples of the study were not selected from a specific group. In fact, the entire universe was included in the models. Therefore, the random effects panel data analysis are expected to provide more suitable results rather than fixed effects panel data analysis (Baltagi, 2008). Nevertheless, the models were tested by the Hausman Test and chi-square statistics are not significant. Both models were in a 5 percent level of significance, so the fact that the null hypothesis of random effects is suitable cannot be rejected. As a result, two-way random effects panel data analysis was chosen and the findings are given in Table 2.

Table 2: Estimation Outputs

Dependent Variable LHD				
Variables	Model 1		Model 2	
	Co-efficient	t statistics	Co-efficient	t statistics
Constant	3,556	0,382	-2,68	-0,70
LHP	-0,846 ^A	-2,07	-0,92 ^A	-2,47
LGDP	1,91 ^A	6,09	1,42 ^A	5,38
UPG	4.29E-07 ^A	3,39		
LUP			0,82 ^A	8,55
R ²	0,129		0,408	
A.R ²	0,125		0,405	
DW st.	1,501		1,53	
F st.	30,75 ^A		142,6 ^A	

Notes: A and B indicate the 1% and 5% of levels of significance, respectively. Newey-West bandwidth was used with Bartlett Kernel. Schwarz Information Criteria was chosen for optimal lag numbers. Robust estimators were used (White Cross-section heteroscedasticity adjustment method were selected)

The coefficients of housing prices (HP) were found statistically significant and the negative signs are parallel with economic theory as expected. That means there are negative relationships between housing prices and demand. Income coefficients are also statistically significant and have positive signs and the coefficients are greater than 1. In other words, housing is a luxury good for the Turkish people and housing demand is more sensitive to changes in income level. Starting from these findings, it can be said that possible shocks in the GDP level will cause vital contractions and recessions in the construction industry and spill over into the Turkish economy. Both demographic variables are found statistically significant and have positive signs as expected theoretically.

Given the analysis in Table 2, the overall findings are statistically significant by looking at F statistics but this might be accounted for by the fact that Durbin Watson (DW) statistics are quite far from 2, which can be perceived as a sign of spurious regression problems. Therefore, the long-term relationships were examined by Pedroni Co-integration tests and the output is given at Table 3.

Table 3: Pedroni Co-Integration Tests

Model 1				
	Only Intercept		Intercept and Trend	
	statistic	weighted statistic	statistic	weighted statistic
v-Statistic	-2.93	-3.619	-4.209	-5.785
rho-Statistic	4.964	5.201	8.208	8.256
PP-Statistic	-10.96 ^A	-8.267 ^A	-14.386 ^A	-15.70 ^A
ADF-Statistic	-4.26 ^A	-3.234 ^A	NA	NA
Model 2				
	Only Intercept		Intercept and Trend	
	statistic	weighted statistic	statistic	weighted statistic
v-Statistic	-2.335	-3.493	-3.032	-6.074
rho-Statistic	4.00	4.375	7.688	8.074
PP-Statistic	-14.17 ^A	-14.501 ^A	-17.192 ^A	-19.68 ^A
ADF-Statistic	-6.272 ^A	-7.458 ^A	NA	NA

Notes: A indicates the 1% of levels of significance, respectively.

At least one co-integrated vector was found in the two models so series are related in the long run. The results of the Pedroni Co-integration tests, the findings in Table 2, can be interpreted theoretically.

5 Conclusion

In this study, the demand for housing in Turkey has been examined by panel data analysis. The important factors affecting the demand for housing have been found to be income level, housing prices, and population, respectively. The income elasticity has been estimated higher (greater than 1) and price elasticity lower (lower than 1). In the article, the most significant factors that affect housing demand are the income levels of Turkey. This is parallel with the literature.

The fact that income is the most significant factor affecting housing demand reveals the importance of appropriate mortgage funding policies for middle and lower income families. Therefore, effective and reasonable mortgage financing systems to increase housing ownership needs to be developed by decision makers. From a macroeconomic view, increases in production and at the same time employment in the housing sector will support the economy to recover from middle income trap. The urbanizations momentum of Turkey continues to affect the housing demand positively.

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