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## Article

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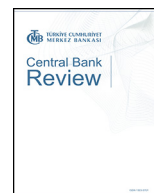
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# The impact of income distribution on house prices<sup>☆</sup>

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## ABSTRACT

Housing market developments have been attracting a great deal of attention in Turkey. Concerns related to supply, particularly at the higher segment of the market, lead these discussions. In this respect, basic regression estimations indicate that over the post-2010 period, income elasticity of house price changes is negative, despite housing being a normal good. In order to reveal the underlying reason, we discuss the role of income distribution. Our empirical analyses suggest that the share of bottom (the top) income quintiles are positively (is negatively) correlated with house price changes. Given the current ample stock of houses, at the high-end of the market, a demand surge led by an increase in the income share of the top income quintile may not put pressure on house prices. In addition, the declining income share of bottom three income quintiles may lead to a reduction in their housing demand. Thus, policies directed to improving income equality might help mitigate the imbalances in the housing market.

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## 1. Introduction

Housing market developments stand out as one of the significant economic concerns in Turkey. This is partly due to severity of the financial collapse in 2008 in the US, which was triggered by the sub-prime mortgage market, and partly due to domestic developments. The mass media repeatedly report that there are concerns related to supply in the housing market, amid tightened financial conditions. Gap between sales figures and occupancy permits, for instance, hints at accumulation of unsold dwelling units, supporting concerns of business circles. Although no official data is available to distinguish the sources of this accumulation, the culprit seems to be the housing projects that target the high-end of the income distribution.

On the price side, we see that after peaking in mid-2016, the real house prices, declined as much as 18% at the end of 2018, which suggests that the imbalance in the market is considerable (Fig. 1). As Case and Shiller (2003) put forward, house prices do not fall quickly to clear the market; in other words, they display nominal

downward rigidity which increases the likelihood of a collapse. In Turkey's case, high inflation, which has been in double digits in recent years, brings down prices in real terms and allows price mechanism to purge excess supply and tilt the market towards equilibrium; although no visible improvement has been observed yet in terms of market clearing.

Over the post-2010 period, we observe a negative correlation between the real income and real house price changes. This counterintuitive-sounding result has been a motivation source for taking into account the distribution of income in addition to income itself. Recently, income distribution has gained further popularity with the seminal work of Piketty (2014). Piketty's work, which focuses on income distribution in the advanced world, displays the acceleration in the deterioration of income inequality starting from the 1970s. In Turkey, the oldest income distribution data, which is available at the World Bank - World Development Indicators Database, dates back to three decades only. This data, which is slightly different from the official TURKSTAT data, suggests only a 0.016 points of improvement in the Gini coefficient between 1987 and 2016.<sup>1</sup> Given miraculous growth rates reached in the early 2010s, accompanied by employment gains and generous minimum wage rate hikes, this improvement may be regarded as small. In

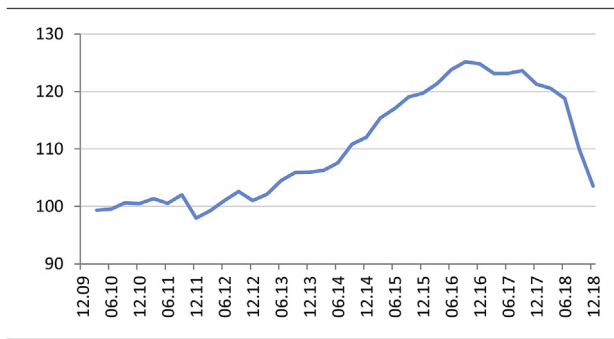
<sup>☆</sup> The views expressed in this study belongs to the authors and do not necessarily represent those of the Central Bank of the Republic of Turkey or its staff.

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<sup>1</sup> The Gini coefficient is a statistical measure of distribution which is commonly used as an indicator of the degree of economic inequality in a country. The coefficient ranges from 0 to 1 where 0 (1) represents perfect equality (inequality).



**Fig. 1.** Housing prices at national level (hedonic, real, 2010 = 100).  
Source: CBRT, TURKSTAT, authors' calculations.

addition, we see deterioration in the income distribution over the recent period.

In this study we aim to analyze the regional housing market in a particular period in Turkey, where we observe substantial supply, falling real prices after a period of rapid increase, accompanied by deteriorating income distribution conditions. Our empirical results, based on a panel data set with 26 statistical regions covering 4 years (2014–2017), reveal that an increase in the Gini coefficient (increased income inequality) reduces the sensitivity of house prices to income changes. When we take a closer look at the distribution of income, we find that increases in the shares of the first, second and third income quintiles are associated with strengthening impact of income changes on house price changes, while an increase in the share of the fifth (top) income quintile is associated with reduced impact of income changes on house price changes over the sample period. These findings may indicate a possible mismatch between the types of houses supplied and the type of houses demanded by potential buyers. Overall, our empirical results for Turkey support the recent theoretical contributions by Määttänen and Terviö (2014) and Kösem (2019) by providing an evidence of the impact of income inequality on house price dynamics from an emerging economy perspective.

The remainder of the study is organized as follows: In the next section, we provide the background of our analysis with observations and a brief review of the related literature regarding the determinants of house prices with an emphasis on income and income inequality. The third section is devoted to empirical analysis where the data, empirical methods and results are presented. The final section concludes the study.

## 2. Background

In this section we aim to shed light on income distribution and its relation with the housing market in Turkey. We first take an initial look at the income distribution data: We compare Turkey's case internationally, then report recent national outcomes to see the evolution, and finally move to regional-level. After discussing developments with respect to income distribution we report our initial findings obtained from the regression analysis which reveals the negative correlation between per capita income and house price changes over the post-2010 period. We then relate the income distribution with the housing market developments. This section ends with a brief literature review.

### a. Income distribution: International Comparison and National Figures

Fig. 2 presents an international comparison of GDP per capita and the Gini coefficients.<sup>2</sup> We compare Turkey with countries which have GDP per capita income above \$10,000 and with those having GDP per capita income above \$20,000. The first dataset covers 72 countries and the second set covers 42 countries.<sup>3</sup> The figures reveal that Turkey lies within the close neighborhood of the regression line in both coverages. However, it is also evident that Turkey has a higher Gini coefficient than peer countries; among the 17 countries within 0.5 standard deviations apart from Turkey, in both directions, 14 of them have more equal income distribution than Turkey when we consider countries with a GDP per capita income higher than \$20,000.

Throughout the study, we do not rely merely on Gini coefficient when analyzing the relation between the income distribution and housing prices. The Gini coefficient, also despised by Piketty (2014), is a synthetic summary statistics that may yield similar results for various income distributions. For this reason, we discuss and analyze other indicators such as poverty rates and shares of income quintiles as well. Such an approach helps for a better understanding of the origins of income inequality.

A glance at income distribution measures in Fig. 3 reveals that period under scrutiny can be broken down into two sub-periods: a recovery period through 2014 and a deterioration period after 2014. Both the Gini coefficient and the share of top income quintile end up with a higher value than the starting value.

### b. Income distribution: Regional Variation

Since we work with a panel data set in order to exploit variation arising from regional differences, analyzing the histogram of Gini coefficient and the income share of the top quintile may be useful in understanding the dynamics of income distribution in Turkey. Even though the changes in aggregate national figures seem to be low, we see a great deal of variation in regional indicators (Fig. 4).

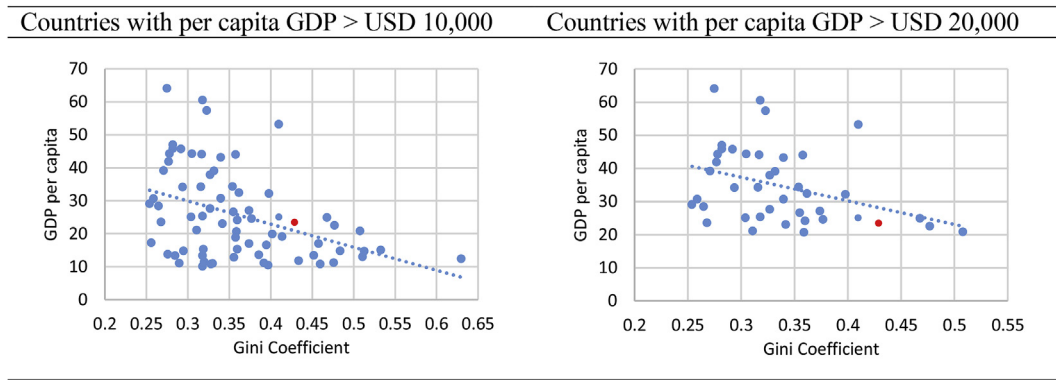
The average regional Gini coefficient being lower than the nation-wide figure implies that metropolitan areas, which have higher weight in total, have worse income distribution than the remaining less urbanized provinces. The outlook of the top income quintile completes this picture.

To clarify the relation between different income distribution indicators, we display the scatter plots of Gini coefficients and shares of income quintiles based on 104 observations covering the period from 2014 to 2017 and 26 statistical regions in Fig. 5.

The first three panels (upper row) display the groups with the lowest per capita income. These three groups in total constitute the 60 per cent of the population, but on average they receive around 35 per cent of the total income. It is clear that as the income shares of these groups increase, the Gini coefficient becomes lower and income equality improves. With the fourth income group that receives around the 20 per cent of the total income, this negative relation becomes less apparent. The striking point appears in the top income quintile: This quintile disproportionately receives around 45 per cent of the income and as their income share increases so does the Gini coefficient. In other words, the share of the top income quintile increases at the expense of the bottom three income quintiles and this quintile is the main driver of income inequality. Although this picture is likely to be observed in other

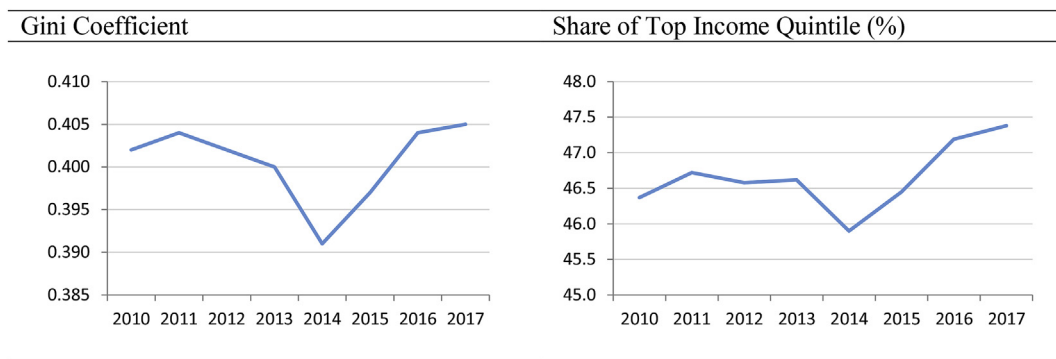
<sup>2</sup> PPP adjusted GDP per capita level (constant, 2011 USD). We covered all countries with both GDP per capita and Gini coefficient data available.

<sup>3</sup> Luxembourg, as an outlier, is excluded from both data sets.



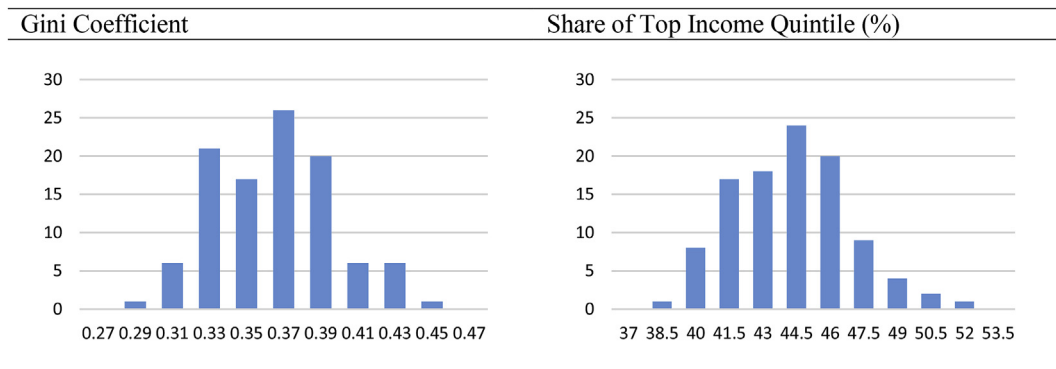
**Fig. 2.** Gini Coefficient vs. Per capita GDP – International Comparison.

Notes: Gini coefficients on the horizontal, GDP per capita (PPP adjusted, in thousand USD) on the vertical axis. The ruby color represents Turkey. 2015 or the latest figure.  
Source: World Bank – WDI Database



**Fig. 3.** Income distribution at national level.

Source: TURKSTAT.



**Fig. 4.** Histogram of income distribution measures.

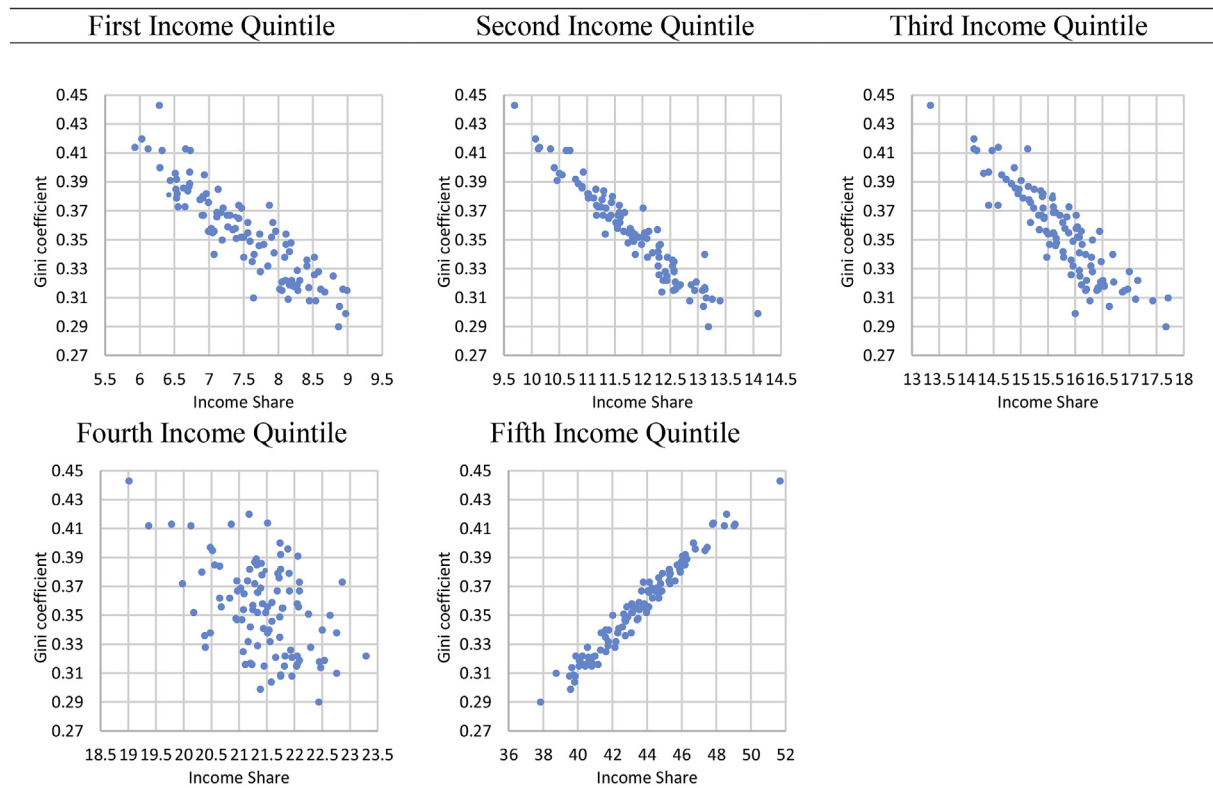
Notes: The data is for 26 statistical regions over the 2014–2017 period. The vertical axis shows the number of observations.  
Source: TURKSTAT.

countries, we do not have an international data set to compare its severity among countries.

#### c. Initial observations on house price, income and income distribution

After discussing the income distribution in detail, we now go back to our initial observations regarding the house prices and income. We first report the findings from a basic panel regression, on which our

negative income elasticity arguments are based (Table 1). We call it basic because income measures appear as the only explanatory variables. The first point to highlight is that the positive correlation, albeit statistically insignificant, obtained from the estimation for the 2011–2014 period disappears as we go along. Estimations for 2011–2017 and 2014–2017 periods reveal that the change in per capita income is negatively associated with house price changes. The negative correlation obtained from the estimations is independent of time/region fixed effects and alternative income measures.



**Fig. 5.** Shares of income quintiles and the Gini coefficient.

Notes: The data depicts the share of each income quintile in total income against the Gini coefficient for 26 statistical regions over the period of 2014–2017, at yearly frequency. The horizontal (vertical) axis shows the share of income quintile (Gini coefficient).

Source: TURKSTAT.

**Table 1**

Regional real house prices and regional real income.

Dependent variable: dlog (Real Regional House Price Index)									
dlog (GDP p.c.)	–0.163*	–0.140*	–0.203*	–0.155	0.0544	0.128	–0.353		
	(0.08)	(0.08)	(0.11)	(0.11)	(0.19)	(0.12)	(0.21)		
dlog (MeanIncome)								–0.108	
								(0.09)	
dlog (MedianIncome)									–0.096
									(0.09)
Constant	0.02***	0.07***	0.03**	0.07***	0.03	0.03**	0.09***	0.10***	0.01***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)	(0.012)	(0.01)	(0.01)	(0.01)
Observations	182	182	182	182	78	104	104	78	78
Region FE	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	2011–2017	2011–2017	2011–2017	2011–2017	2011–2013	2011–2014	2014–2017	2015–2017	2015–2017
R-squared	0.02	0.27	0.15	0.40	0.74	0.60	0.69	0.77	0.77

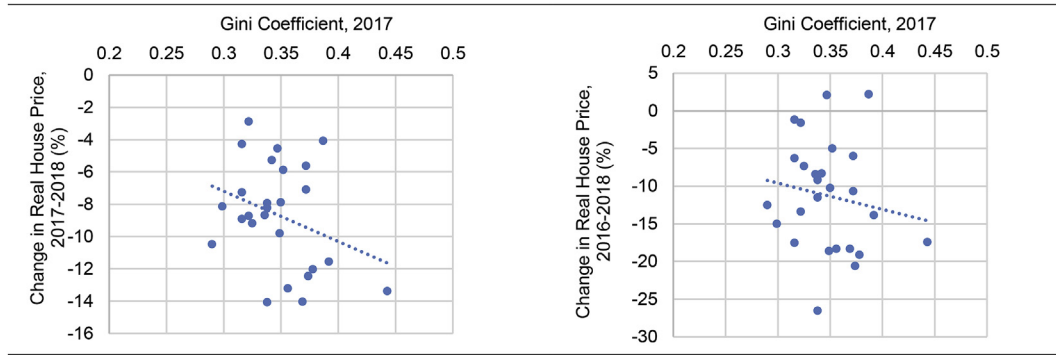
Notes: Yearly data. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional income figures with regional CPI. Income variables used are GDP per capita, mean and median personal disposable income in real terms. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

As we have discussed earlier, income distribution might be a major mechanism that can elucidate this unexpected outcome. Before presenting our empirical work, we can lend support from cross section data in this respect. In Fig. 6, we depict the scatter plot of regional Gini coefficients as of 2017 and the real house price changes between the 2016–2017 (left) and the 2016–2018 period (right). Both figures reveal a negative correlation between the income inequality and house price changes.

As an alternative measure for the housing market, we also use

the price to rent ratio instead of price increases. Display in Fig. 7 is a scatter plot of price to rent ratio (in years) and income distribution related indicators. We also employ an alternative income distribution measure: income share of the top quintile. We attain a similar empirical evidence, suggesting a negative correlation between the house price/rent ratio and income inequality as well.

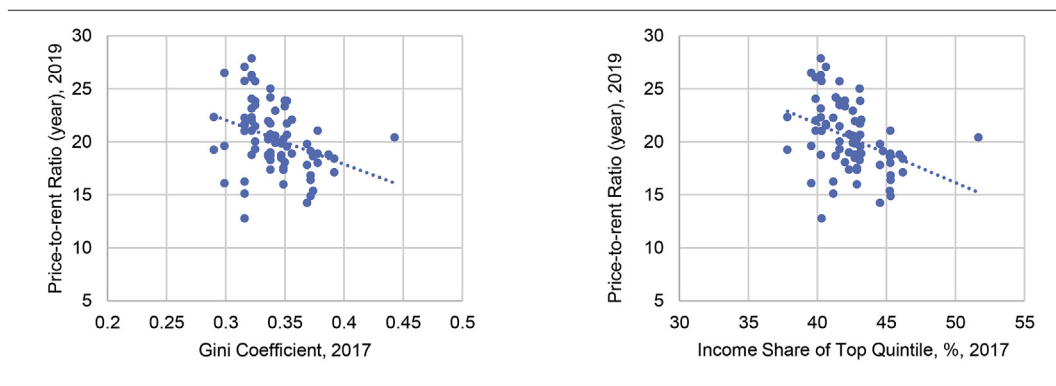
Overall, initial observations yield a negative income–house price relationship and suggest that the income inequality seems to have a say, over the sample period.



**Fig. 6.** Income inequality and changes in real house price.

Notes: The figures show regional Gini coefficients in 2017 along with the percent change in real regional house prices over 2017–2018 and 2016–2018 periods.

Source: CBRT, TURKSTAT, authors' calculations.



**Fig. 7.** Income inequality and price/rent ratio.

Notes: The figures show regional Gini coefficients in 2017 along with the most recent (March 2019) price/rent ratios calculated in years, collected from “zingat.com” website. The price/rent ratios are available for provinces. In the scatter plots, the regional Gini coefficient is used for each province in the region.

Source: TURKSTAT, REIDIN ([zingat.com](http://zingat.com)), authors' calculations.

#### d. Related literature

The first strand of literature focuses on investigating the relationship between the house prices and fundamentals, including income and per capita income. These studies mainly estimate an error-correction specification taking into account the long-run relationship (e.g. Abraham and Hendershott, 1996; Capozza et al., 2002; Meen, 2002; Galin, 2006; Case and Schiller, 2013). These studies depart from the idea that in the housing market, even if the house prices and income move in different directions in the short run, the error correction mechanism between the two variables will eventually push them towards their long-run steady relationship. Still, even though many studies explore the co-integration between the two, there is no consensus on whether the house prices and income are co-integrated. One of the main explanations is the lack of the right supply and demand shifters which would appropriately reflect the housing market dynamics as argued by Durmaz (2011).

Another strand of literature specializes in analyzing the determinants of house prices through the use of multivariate analysis. In addition to income, these studies also take into account interest rates, demographics and supply-related factors such as the available housing stock or construction costs (e.g. Nellis and Longbottom, 1981; Case and Shiller, 1990; Abelson et al., 2005; Liu and Shen, 2005; Greiber and Setzer, 2007; Esteban and

Altuzarra, 2008; Chen et al., 2007; Guo and Wu, 2013; and Ceritoğlu, 2019). The major conclusion of these studies is that house prices depend positively on income per capita, wealth and population growth, and negatively on mortgage interest rate. However, there are also studies suggesting that the house price and income relation may turn out to be negative at times. Pour et al. (2013) show that the income-house price relationship was negative in Iran, stemming from the massive oversupply of property and large volume of construction activity during the periods of real economic growth. Xu and Tang (2014) also provide evidence for the negative income-house price relationship in the UK during the 1971–2012 period, arguing that it was due to conflicting consumer choices regarding real estate investment and other expenditures.

The above-cited two strands of literature mainly focus on house price and income relationship, placing less or no emphasis on the distribution of income and income inequality. A new branch of literature on housing markets takes not only the income but also the income inequality into account. Määttänen and Terviö (2014), who are among the pioneers in this respect, develop a model and show that the impact of income on house prices depends on the shapes of the distribution of income and that of the housing quality. In their empirical application, they find that the observed increase in income inequality had a negative impact on average house prices in six US metropolitan areas over the 1998–2007 period. In a recent contribution, Kösem (2019) also supports the finding of negative



impact of income inequality on house prices in the US, further arguing that access to mortgage finance partially mitigates this negative impact. Zhang, Jia and Yang (2016), on the other hand, argue that income inequality is also an important factor driving both the price to income ratio and the housing vacancy rates in China.

Against this background, our empirical paper focuses on the short-run dynamics of house prices in a multivariate regression setting and is thus related to two strands of literature above. Moreover, similar to last strand of literature discussed, our paper also takes the income distribution into account, providing empirical evidence from an emerging economy perspective.

### 3. Empirical Analysis

In Table 1, we have reported a set of simple panel regression results where income measures appear as the only explanatory variable. However, income is not the only determinant of the changes in house prices. Therefore, we extend our empirical analysis by integrating income distribution-related indicators as well as major supply and demand shifters in the housing market.

#### a. Data and methodology

One severe limitation we encounter during this study is related to data availability for Turkey. The official housing price index has been published on a monthly basis since 2010. On the other hand, income distribution data at either national or regional level are released on an annual basis. As a result, we end up with only a few years of observation. In order to overcome this difficulty, and to benefit from cross-regional variation, we collect region-wise data to explore the relation between housing price dynamics and income distribution. Given that regional income distribution data starts from 2014, we are forced to implement our empirical work with this narrower data set. Overall, the empirical analysis covers the 2014–2017 period and the cross section part refers to 26 statistical regions defined according to NUTS 2 classification (Nomenclature of Territorial Units for Statistics classification, second division) of TURKSTAT.<sup>4</sup>

Here, we elaborate on the house prices, and relevant demand and supply shifters (main economic and demographic variables related to the housing market). The real house price is computed by deflating the nominal regional hedonic house price index, released by the Central Bank of Republic of Turkey (CBRT) with the regional consumer price index (CPI) of TURKSTAT. Regional per capita GDP and unemployment rates are also published by the TURKSTAT. The real per capita GDP is calculated by deflating the GDP per capita by the regional CPI. The regional stock of real housing credit data of the CBRT is double-differenced to obtain the difference in credit flows.<sup>5</sup> Additional stock is the gap between the number of occupancy permits for dwellings granted and the number of new house sales and in a year recorded in a region; both figures are taken from the TURKSTAT. Expectations data is from the Consumer Tendency Survey, which is conducted by TURKSTAT in cooperation with the CBRT. Specifically, expectations data refers to answers given to “the probability of buying or constructing a house (over the next 12 months)” question. The descriptive statistics of the main variables along with the definitions of additional control variables are presented in Table 2.

Even though the disposable income is the appropriate variable

**Table 2**  
Descriptive statistics – house price and main supply and demand shifters.

	Obs	Mean	Std. Dev.	Min	Max
<i>Main Variables</i>					
dlog (Real House Price)	104	0.02	0.05	−0.10	0.15
dlog (GDP p.c.)	104	0.03	0.02	−0.05	0.11
d (Expectation)	104	−0.61	0.89	−2.00	0.45
Additional stock	104	6147.4	9337.3	−10392	48026
d (d (Housing credits))	104	−478.8	2097.1	−18137.1	2488.4
Unemployment rate	104	9.72	4.75	3.40	28.30
<i>Additional Controls</i>					
dlog (Housing loan rate)	104	−0.41	2.72	−6.25	3.40
dlog (Construction cost)	104	0.01	0.03	−0.02	0.06
dlog (Average registry price)	104	0.10	0.07	−0.17	0.28
dlog (Sales)	104	0.07	0.13	−0.41	1.13
dlog (Sales by mortgage)	104	0.04	0.12	−0.24	0.31
d (Sales, first hand)	104	1255.5	2246.2	−7505	10852
Share of mortgage sales	104	0.31	0.05	0.09	0.39
dlog (Saving deposit)	104	−11.34	0.71	−12.92	−10.07
d (Real rent)	104	−0.02	0.03	−0.09	0.08
d (Price/Rent)	104	0.02	0.02	−0.05	0.08
d (Marriage)	104	−295.0	29907.8	−110652	120991
d (Divorce)	104	29.87	322.61	−902	1883
dlog (Population)	104	0.01	0.01	−0.01	0.03
Working-age population	104	0.41	0.04	0.32	0.48
Average age	104	32.76	4.09	24.11	39.33
log (Density)	104	4.53	0.92	3.27	7.92
d (Share of TOKİ)	104	−0.01	0.08	−0.67	0.08
log (Initial price)	104	5.72	0.20	5.14	6.18

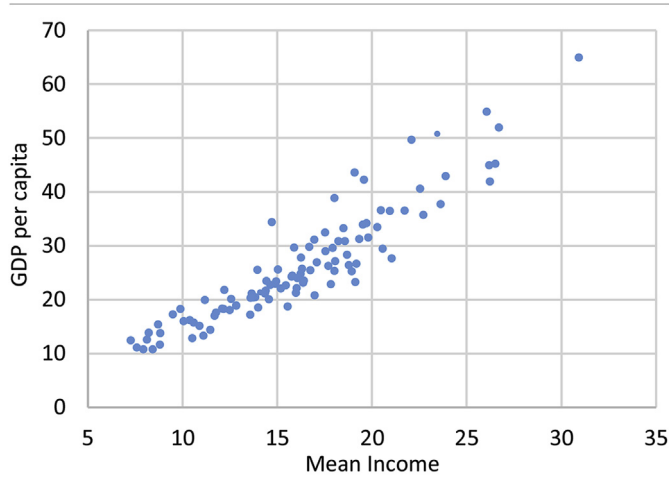
Notes: The descriptive statistics are reported as the average of regions over the sample period of 2014–2017. The real house price is the regional hedonic house price index deflated by the regional CPI. The real regional housing loan rate is calculated by taking the difference of nationwide average housing loan rate and regional inflation. The regional cost of construction is calculated by deflating the nationwide cost of construction index by regional CPI. Average registry price is calculated as the share of average price per sale and average size of the dwelling declared at the registry at the time of a sale, which is calculated for provinces and then aggregated to regions. Sales is the total number of house sales in a region. Sales by mortgage are the number of sales where the buyer took a housing credit. First hand sales refer to the number of new houses sold. Share of mortgage sales is the share of house sales through mortgage in all house sales in a region. Saving deposit is the real per capita savings calculated by deflating nationwide savings per capita with regional CPI. Real rent is the regional rent price index deflated by the regional CPI. Price/rent is calculated by dividing (non-hedonic) regional house price index by the regional rent price index. Marriage (divorce) shows the number of marriages (divorces) in a region. Population is the regional population. Working age population is the share of 25–55 year-olds in total regional population. Average age is the average age of regional population. Density is the number of people per square kilometer. Share of Housing Development Administration (TOKİ) is the estimated share of TOKİ sales in total house sales in a region. Although no direct TOKİ sales data is available, the detailed housing contract information per province is available. By collecting the number of housing units to be produced, and assuming that the units are on sale with a lag of 1–3 years after the year of contract, a proxy of TOKİ sales is calculated by the authors by taking the moving average of number of units to be produced 1–3 years before, and lagging it by one period. When a project includes multi-provinces (a rare observation), the units are distributed equally to each province. Finally, initial price is proxied by the average price per unit declared at the registry in the first year of the sample, deflated by the regional CPI.

to be used in the analysis, the regional data on this variable is shorter than per capita GDP when we consider the changes in income (only 3 years of observations are available in this case). Hence, we prefer to use the per capita GDP in the empirical analysis as the main income indicator, both due to its longer availability and to its close relationship with mean disposable income (Fig. 8).

The second set of data refers to those related to income distribution on a regional basis which are available from the TURKSTAT. In addition to the Gini coefficient, we use two definitions of poverty rate: Poverty rate<sub>50</sub> (60) shows the share of population whose income is less than 50 (60) percent of the median income. Share<sub>“z”</sub>/1 variables refer to the ratio of the mean income of upper

<sup>4</sup> Ganioglu and Seven (2019) also provide evidence for heterogeneity in regional housing markets of Turkey.

<sup>5</sup> Regional credit stock is also deflated by the regional CPI.



**Fig. 8.** GDP per capita vs. Mean Disposable Income.

Notes: The figure depicts regional GDP per capita and mean disposable income over the sample period and across regions, in 1000 Turkish lira.

Source: TURKSTAT.

**Table 3**  
Descriptive statistics – income distribution related indicators.

	Obs	Mean	Std. Dev.	Min	Max
Gini	104	0.35	0.03	0.29	0.44
Poverty rate_50	104	10.20	2.28	5.10	15.90
Poverty rate_60	104	16.97	2.73	10.30	23.70
Share_2/1	104	1.58	0.09	1.40	1.86
Share_3/1	104	2.11	0.16	1.78	2.47
Share_4/1	104	2.88	0.30	2.36	3.63
Share_5/1	104	5.87	0.92	4.27	8.23
IncomeShare_1	104	7.52	0.76	5.93	8.99
IncomeShare_2	104	11.83	0.85	9.69	14.08
IncomeShare_3	104	15.75	0.80	13.34	17.71
IncomeShare_4	104	21.44	0.72	19.01	23.29
IncomeShare_5	104	43.46	2.61	37.84	51.67

Notes: The descriptive statistics are reported as the average of regions over the sample period of 2014–2017. Gini is the regional Gini coefficient. Poverty rate\_50 (60) shows the share of population whose income is less than 50 (60) percent of the median income. Share variables show the ratio of the mean income of upper quintiles to that of the 1st income quintile. Income share variables refer to the share of each income quintile in total income of a region. Each quintile refers to 20 percent of the population. These indicators are from the Income and Living Conditions Survey of TURKSTAT.

quintiles to that of the first income quintile, where  $z = 2, 3, 4, 5$ . Income share variables refer to the share of each income quintile in total income of a region. Each quintile refers to 20 percent of the population, where fifth quintile refers to the top income group. Table 3 reports descriptive statistics for income distribution measures.

Regarding the empirical methodology, we utilize a suite of fixed effects panel regressions in order to test the impact of income distribution on house prices in this analysis. The specification that we estimate is as follows:

$$\Delta \ln(P_{i,t}) = \alpha + \beta \Delta \ln(Inc_{i,t}) + \theta \Delta \ln(Inc_{i,t}) * D_{i,t} + \sum_{j=1}^k \theta_j \Delta X_{i,t,j} + \varepsilon_{i,t} \quad (1)$$

where  $P_{i,t}$  is the real house price index in region  $i$  in year  $t$ ;  $Inc_{i,t}$  is the real GDP per capita in region  $i$  in year  $t$ ;  $D_{i,t}$  represents the selected income distribution indicator; vector  $X_j$  represents  $j$  control variables (representing selected demand and supply shifters) and  $\varepsilon_{i,t}$  is the error term. In the empirical analysis, we alternate the income distribution indicator in each specification among the variables listed in Table 3.

#### b. Estimation results

First, we start by reporting the estimation results where the Gini coefficient is selected as the income distribution measure, in Table 4.

The first column uses per capita income and its interaction with the Gini coefficient as the only explanatory variables. We add other major variables successively and reach our base model (the last column of the table) where we control for housing purchase expectations, additional stock, housing credits and the unemployment rate. We argue that controlling for the unemployment rate helps suppress the cyclical effects in income distribution. We first observe that estimations yield a positive and statistically significant income elasticity opposed to findings in Table 1. Yet, starting from the first column, we also observe that the interaction term of per capita income and the Gini coefficient has a statistically significant and negative coefficient, suggesting that the income elasticity of house prices actually depends on the level of income distribution/inequality over the sample period. Considering that higher values of the Gini coefficient refer to deterioration in income inequality, results reveal that the impact of income changes on house price changes is stronger in regions where the income inequality is lower. This impact is also robust when major indicators are controlled for.

To evaluate the impact of income changes on house prices, we need to take the level of income inequality into consideration. Taking the sample mean of Gini coefficient (0.35), the estimated impact of income changes on house price changes are in the range of (−0.34 to −0.26), suggesting that with the income inequality set at the sample mean, we end up with the initial results of Table 1. Nonetheless, the dependence on the Gini coefficient evidently implies that if the income equality improves, we may reach a point where the impact of income changes on house prices turns out to be positive, as expected. According to the results in Table 4, an improvement in the sample mean Gini coefficient of as much as 0.03–0.04 points (i.e. lowering the Gini from sample mean of 0.35 to 0.31–0.32) would be needed.

Finally, we observe that the major supply and demand shifters included in the specifications assume the expected signs and they are mostly statistically significant at conventional levels.<sup>6</sup> Apart from these variables, an extensive set of additional control variables are included in the analysis, where the impact of income distribution on the income elasticity of house prices is found to be robust (Appendix, Table A1 to A3).<sup>7</sup>

After the analysis of the relation between house prices and

<sup>6</sup> As an alternative measure of housing credits, we also employed the ratio of regional housing credits to regional GDP. The estimations yield similar results.

<sup>7</sup> As the regional data in panel estimations contain the entire population, in the statistical inference, statistical distributions can be assumed to be normal. In the study however, we report the results of the statistical inference based on t-distribution, given that these results are more conservative. The significance levels further improve when we assume normal distribution for statistical inference.



**Table 4**

House prices and income distribution with major controls.

Dependent variable: dlog (Real Regional House Price Index)					
dlog (GDP p.c.)	2.064 (1.293)	2.892* (1.610)	3.273** (1.378)	3.571** (1.516)	3.553** (1.355)
dlog (GDP p.c.)*Gini	–6.644* (3.554)	–8.909* (4.443)	–9.954** (3.736)	–10.83** (4.156)	–10.98*** (3.794)
d (Expectation)		0.620** (0.279)	0.750** (0.295)	0.855*** (0.303)	0.728*** (0.248)
d (Expectation)*Gini		–0.146 (0.124)	–0.178 (0.105)	–0.159 (0.112)	–0.199* (0.115)
Additional stock			–2.18e-06** (1.04e-06)	–1.88e-06* (9.84e-07)	–1.27e-06 (9.14e-07)
d (d (Housing credits))				3.16e-06* (1.63e-06)	3.55e-06** (1.64e-06)
Unemployment rate					–0.00676* (0.00378)
Constant	0.102*** (0.0126)	0.344*** (0.122)	0.498*** (0.153)	0.554*** (0.155)	0.554*** (0.135)
Observations	104	104	104	104	104
R-squared	0.700	0.705	0.721	0.731	0.755

Notes: The estimations include region and year fixed effects. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional figures with regional CPI. The real regional house price index is the regional hedonic house price index deflated by regional CPI. GDP p.c. refers to GDP per capita. Income distribution is captured by the Gini coefficient. Expectation refers to consumers' expectations for buying a house, taken from the Consumer Tendency Survey. Additional stock is the difference between the number of housing occupancy permits issued and the number of new sales on a regional basis. Housing credits is the real stock of live regional mortgage credits. Unemployment rate is the regional unemployment rate in a given year. Sample period: 2014–2017. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1.

**Table 5**

Impact of income distribution on real house prices – alternative measures.

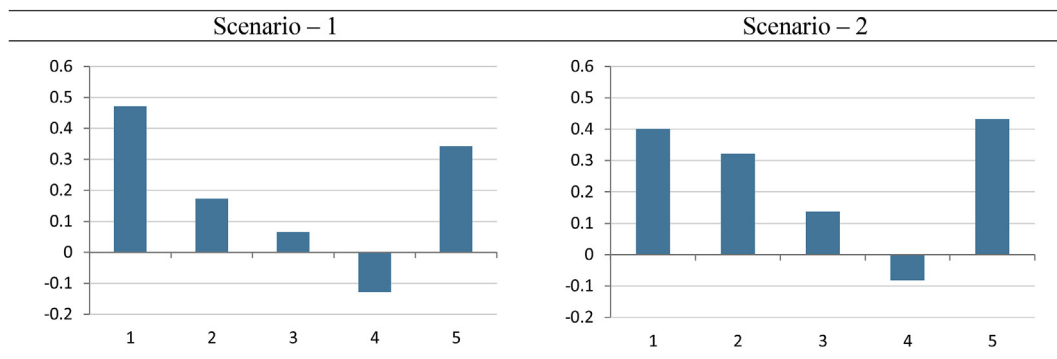
Dependent variable: dlog (Real Regional House Price Index)						
dlog (GDP p.c.)	0.891 (0.701)	1.496 (0.911)	4.743 (2.869)	4.072* (2.087)	3.179** (1.434)	2.079** (0.829)
d (Expectation)	0.672** (0.260)	0.674** (0.266)	0.706** (0.267)	0.753** (0.280)	0.740** (0.267)	0.723*** (0.246)
Additional stock	–1.23e-06 (1.13e-06)	–1.18e-06 (1.12e-06)	–9.91e-07 (1.02e-06)	–1.19e-06 (1.05e-06)	–1.30e-06 (1.04e-06)	–1.31e-06 (9.04e-07)
d (d (Housing credits))	2.71e-06 (1.92e-06)	2.67e-06 (1.86e-06)	2.60e-06 (2.03e-06)	2.60e-06 (1.90e-06)	2.69e-06 (1.76e-06)	3.41e-06** (1.60e-06)
Unemployment rate	–0.00670* (0.00392)	–0.00686* (0.00396)	–0.00723* (0.00389)	–0.00705* (0.00379)	–0.00751* (0.00382)	–0.00703* (0.00370)
dlog (GDP p.c.)*Poverty50	–0.128* (0.0688)					
d (Expectation)*Poverty50	–0.00171 (0.00204)					
dlog (GDP p.c.)*Poverty60		–0.110** (0.0517)				
d (Expectation)*Poverty60		–0.00198 (0.00153)				
dlog (GDP p.c.)*Share_2/1			–3.218* (1.785)			
d (Expectation)*Share_2/1			–0.0608* (0.0331)			
dlog (GDP p.c.)*Share_3/1				–2.092** (0.979)		
d (Expectation)*Share_3/1				–0.0489** (0.0236)		
dlog (GDP p.c.)*Share_4/1					–1.226** (0.496)	
d (Expectation)*Share_4/1					–0.0300** (0.0131)	
dlog (GDP p.c.)*Share_5/1						–0.408*** (0.136)
d (Expectation)*Share_5/1						–0.00811* (0.00418)
Constant	0.527*** (0.151)	0.521*** (0.148)	0.497*** (0.144)	0.524*** (0.145)	0.541*** (0.145)	0.565*** (0.135)
Observations	104	104	104	104	104	104
R-squared	0.746	0.748	0.744	0.754	0.754	0.761

Notes: The estimations include region and year fixed effects. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional figures with regional CPI. Expectation refers to consumers' expectations for buying a house. Sample period: 2014–2017. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1. Poverty50 (60) shows the share of population whose income is less than 50 (60) percent of the median income. Share\_ variables show the ratio of the mean income of upper quintiles to that of the first income quintile.

**Table 6**  
House prices, income and income distribution.

Dependent variable: dlog (Real Regional House Price Index)					
dlog (GDP p.c.)	–4.380*** (1.497)	–4.569** (1.824)	–5.493* (2.816)	–5.269 (5.007)	5.074** (1.942)
d (Expectation)	0.599** (0.242)	0.572** (0.237)	0.554** (0.260)	0.547* (0.279)	0.736*** (0.249)
Additional stock	–1.33e-06 (9.32e-07)	–1.33e-06 (9.83e-07)	–1.05e-06 (9.74e-07)	–9.01e-07 (1.02e-06)	–1.19e-06 (9.26e-07)
d (d (Housing credits))	3.11e-06* (1.66e-06)	3.34e-06** (1.60e-06)	3.70e-06** (1.73e-06)	3.49e-06* (1.75e-06)	3.74e-06** (1.67e-06)
Unemployment rate	–0.00720* (0.00365)	–0.00660 (0.00388)	–0.00704* (0.00399)	–0.00626 (0.00397)	–0.00660* (0.00376)
dlog (GDP p.c.)*IncomeShare_1	0.542** (0.198)				
d (Expectation)* IncomeShare_1	0.0114** (0.00527)				
dlog (GDP p.c.)*IncomeShare_2		0.354** (0.153)			
d (Expectation)*IncomeShare_2		0.00717* (0.00413)			
dlog (GDP p.c.)*IncomeShare_3			0.324* (0.179)		
d (Expectation)*IncomeShare_3			0.00383 (0.00471)		
dlog (GDP p.c.)*IncomeShare_4				0.227 (0.234)	
d (Expectation)*IncomeShare_4				0.00102 (0.00588)	
dlog (GDP p.c.)*IncomeShare_5					–0.125*** (0.0444)
d (Expectation)*IncomeShare_5					–0.00186 (0.00139)
Constant	0.564*** (0.139)	0.551*** (0.138)	0.530*** (0.138)	0.488*** (0.143)	0.552*** (0.134)
Observations	104	104	104	104	104
R-squared	0.764	0.748	0.740	0.733	0.752

Notes: The estimations include region and year fixed effects. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional figures with regional CPI. Expectation refers to consumers' expectations for buying a house. Sample period: 2014–2017. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1. Income\_share variables refer to the share of each income quintile in total income of a region. Each quintile refers to 20 percent of the population.



**Fig. 9.** Income elasticity of house price changes under an improved income distribution.

Notes: Scenario-1: The shares of the first four quintiles are set to sample mean plus two standard deviations, and the share of top quintile is set to sample mean minus two standard deviations. Scenario-2: The shares of the first four quintiles are set to maximum figures observed in the sample, while that of the top quintile is set to minimum value in the sample. Each column refers to total impact of income changes on real house price changes according to the coefficient estimates of the respective column of Table 6, where the income changes are interacted with the share of a specific income quintile. The horizontal axis refers to income quintiles.

income inequality through the Gini coefficient, we employ alternative income inequality measures to check the robustness of our argument. In Table 5, we first use poverty rates and ratios of mean income of upper quintiles to the first income quintile. In this case, the ratio of the fifth quintile to the first quintile corresponds to the frequently used 80/20 (or in some countries 90/10) ratio. Table 5 clearly displays that all the interaction terms of income distribution measures with changes in income are statistically significant and negative at conventional levels in this setting as well. Thus, as expected, the deterioration in other income inequality measures also reduces the impact of income changes on house price changes.

In Table 6, we use the share of income quintiles separately, where in each specification the change in income is interacted with the share of a certain income quintile.

Estimation results are in accordance with the outlook exhibited in Fig. 5. Increase in the share of the first three income quintiles from total income strengthens the impact of income changes on house price changes. This effect becomes insignificant when the share of the fourth income quintile is considered. What is interesting is that the coefficient turns negative when the income changes are interacted with the income share of the top quintile. This finding suggests that a deterioration in income distribution stemming from an increase in the income share of the top quintile is associated with lower income elasticity of real house prices. The supportive impact of lower income quintiles and the harming impact of the top quintile in a way support the common understanding that there are imbalances in the housing market. In other words, given the stock of unsold houses, a possible demand surge led by an increase in the income share of the top income quintile is not strong enough to offset the declining demand due to lower income shares of the bottom three income quintiles. As we witness an increase in the income share of top quintile over the sample period, such a finding may be signaling a saturation at high income-oriented section of the housing market or to supply exceeding demand in the high-end of the housing market. If there were no imbalances in the housing market we would expect to find a positive coefficient for all interaction terms in Table 6, suggesting that relative income increases of any income quintile would push the average house price up as theoretically expected for normal goods.

Overall, the findings so far suggest that the increase in income inequality has adversely affected the housing market over the sample period. Also, the findings imply that any improvement in the income equality may help restore the proper functioning of the housing market by eliminating the imbalances. In this framework, given the estimations reported in Table 6, we can conduct several “what if” analyses. For instance (scenario 1), if we increase the sample mean shares of the first four income quintiles by two standard deviations, and decrease that of the top quintile by two standard deviations (after ensuring that they sum up to 100) and compute income elasticity with these income shares, what would be the elasticity estimations? We can conduct another (scenario 2) “what if” exercise with the maximum income shares observed in the sample for the first four quintiles and the minimum income share observed for the fifth quintile. Again we ensure that the sum of income shares is equal to 100. Fig. 9 demonstrates that income elasticity, given the supply structure of the market and keeping other variables unchanged, would return to positive territory in both scenarios. The outlook obtained from both scenarios is intuitively quite similar. Since the estimated coefficient for the fourth quintile is not statistically significant in both cases, we do not put much emphasis on that. These counterfactual analyses clearly suggest that there is room for policy, such as tax policy, that can

mop up the oversupply in the market via tilting the income distribution.<sup>8,9</sup>

#### 4. Conclusion

Housing market is related not only to the real sector through construction activity, but also to the financial sector. Therefore, a healthy outlook in the housing market is an important ingredient of financial stability. Given that a considerable number of financial crises in the economic history -including the 2008 global crash- had their roots in the housing market, an imbalance in the market can easily raise concerns and undermine confidence.

In this paper, we aimed to shed light on an anomaly we have observed in the housing market, which is the negative income elasticity of house prices estimated for the post-2010 period. Among many factors, income distribution emerged as an important channel to clarify this issue. Keeping concerns related to supply in mind, we searched for empirical evidence to this end. It should be reminded at this point that, the limited time series dimension of the dataset available complicated the handling of the subject. Nevertheless, we benefit from the regional variation to discuss the relation between income distribution and the housing market via a panel regression setting.

Our initial findings, which depend on the Gini coefficient, suggest that income inequality is negatively correlated with house price changes. In order to better understand the underlying relations, we replaced the Gini coefficient with the income shares of the population quintiles. Such an analysis reveals that while the income shares of the bottom three quintiles are positively correlated with house price changes, the opposite outcome is obtained for the top income quintile.

Our empirical results suggest that finding different impacts of income quintiles on house prices is worth consideration, although controlling for income distribution fell short of attaining positive income elasticity over the sample period. Given the current ample stock of houses, possibly at the high-end of the market, a demand surge led by an increase in the income share of the top income quintile may not put pressure on house prices. Moreover, the declining income share of bottom three income quintiles may lead to a reduction in their housing demand. Thus, policies directed to improving income equality might help mitigate the imbalances in the housing market.

<sup>8</sup> In Turkey, three largest metropolitan areas, İstanbul, Ankara and İzmir -all of which constitute a separate statistical region- are home to around one third of the total population, and account for almost half of the total GDP. The most salient observation in terms of income distribution is that income share of the top quintile in major provinces is almost 4 percentage points higher than the remaining 23 statistical regions. To control for the impact of these big cities, we repeat our regressions by excluding them. The estimation results are presented in the Appendix Table A4-A5. We observe that the coefficients change to some extent and the income share of the third quintile turns statistically insignificant, while the main conclusions do not change.

<sup>9</sup> Our results point to heterogeneous income elasticities of house prices based on the share of different income groups. In this regard, and as motivated by our analysis, looking at the income elasticities of house prices together with the income share of different quintiles only, provides a complete aggregate picture. Otherwise, the aggregate level estimations might also contain the impact of the changes in the composition of the data. Therefore, when detailed data is available, instead of aggregate level estimations, estimating the income elasticity of house prices for each quintile and then aggregating these elasticities with the income shares of these quintiles would give a better predication of aggregate elasticity.

## Appendix

Table A1

House Prices and Income Distribution with Additional Controls – 1

Dependent variable: dlog (Real Regional House Price Index)						
dlog (GDP p.c.)	3.681** (1.557)	3.915** (1.564)	3.578** (1.547)	3.884** (1.652)	3.571** (1.538)	3.600** (1.542)
dlog (GDP p.c.)*Gini	–11.32** (4.266)	–12.02*** (4.300)	–10.82** (4.244)	–11.79** (4.680)	–10.82** (4.205)	–10.93** (4.260)
d (Expectation)	0.0102 (0.626)	2.012** (0.815)	0.919** (0.342)	0.852*** (0.305)	1.037** (0.390)	0.850** (0.310)
d (Expectation)*Gini	–0.181 (0.113)	–0.183 (0.118)	–0.158 (0.109)	–0.182 (0.124)	–0.159 (0.116)	–0.158 (0.113)
Additional stock	–2.20e-06* (1.07e-06)	–2.38e-06** (9.76e-07)	–1.89e-06* (1.02e-06)	–1.67e-06 (1.10e-06)	–1.62e-06 (1.13e-06)	–1.81e-06 (1.21e-06)
d (d (Housing credits))	2.76e-06* (1.44e-06)	2.84e-06* (1.47e-06)	3.28e-06* (1.71e-06)	3.29e-06* (1.64e-06)	3.16e-06* (1.57e-06)	3.10e-06* (1.58e-06)
dlog (Housing loan rate)	0.00716 (0.00514)					
dlog (Construction cost)		1.365 (0.892)				
dlog (Average registry price)			0.0314 (0.0460)			
dlog (Sales)				0.0198 (0.0242)		
dlog (Sales by mortgage)					0.0464 (0.0726)	
d (Sales, first hand)						3.22e-07 (1.77e-06)
Constant	0.196 (0.263)	1.049*** (0.360)	0.580*** (0.172)	0.543*** (0.158)	0.629*** (0.186)	0.548*** (0.167)
Observations	104	104	104	104	104	104
R-squared	0.738	0.737	0.732	0.732	0.732	0.731

Notes: The estimations include region and year fixed effects. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional figures with regional CPI. Expectation refers to consumers' expectations on buying a house. Sample period: 2014–2017. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1. The real regional housing loan rate is calculated by taking the difference of nationwide average housing credit interest rate and regional inflation. The regional cost of construction is calculated by deflating the nationwide cost of construction index by regional CPI. Average registry price is calculated as the share of average price per sale and average size of the apartment declared at the registry at the time of a sale, which is calculated for provinces and then aggregated to regions. Sales is the total number of house sales in region. Sales by mortgage are the number of sales where the buyer took a housing credit. First hand sales refer to number of new houses sold.

Table A2

House Prices and Income Distribution with Additional Controls – 2

Dependent variable: dlog (Real Regional House Price Index)						
dlog (GDP p.c.)	3.475* (1.829)	3.718** (1.695)	3.934** (1.642)	3.305* (1.682)	3.744** (1.614)	3.637** (1.609)
dlog (GDP p.c.)*Gini	–10.54* (5.149)	–11.18** (4.712)	–11.88** (4.558)	–9.981** (4.639)	–11.24** (4.381)	–11.02** (4.462)
d (Expectation)	0.862*** (0.306)	0.0861 (0.542)	0.639* (0.338)	0.885*** (0.308)	0.871*** (0.304)	0.862*** (0.305)
d (Expectation)*Gini	–0.150 (0.140)	–0.165 (0.116)	–0.191 (0.131)	–0.135 (0.125)	–0.152 (0.112)	–0.161 (0.115)
Additional stock	–1.91e-06* (1.02e-06)	–1.84e-06 (1.12e-06)	–2.19e-06* (1.13e-06)	–2.01e-06* (1.01e-06)	–2.00e-06* (1.04e-06)	–1.84e-06* (1.04e-06)
d (d (Housing credits))	3.14e-06* (1.65e-06)	9.53e-07 (1.36e-06)	2.29e-06 (1.37e-06)	3.11e-06* (1.58e-06)	3.20e-06* (1.64e-06)	3.59e-06 (2.93e-06)
Share of mortgage sales	0.0414 (0.250)					
dlog (Saving deposit)		–0.186 (0.116)				
d (Real rent)			0.339 (0.351)			
d (Price/Rent)				0.223 (0.333)		
d (Marriage)					7.95e-08 (1.06e-07)	
d (Divorce)						3.62e-06 (1.58e-05)
Constant	0.543*** (0.169)	1.049*** (0.360)	0.580*** (0.172)	0.543*** (0.158)	0.629*** (0.186)	0.548*** (0.167)

(continued on next page)

**Table A2** (continued)

Dependent variable: dlog (Real Regional House Price Index)						
Observations	104	104	104	104	104	104
R-squared	0.731	0.737	0.732	0.732	0.732	0.731

Notes: The estimations include region and year fixed effects. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional figures with regional CPI. Expectation refers to consumers' expectations on buying a house. Sample period: 2014–2017. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1. Share of mortgage sales is the share of house sales through mortgage in all house sales in a region. Saving deposit is the real per capita savings. Real rent is the regional rent price index deflated by the regional CPI. Price/rent is calculated by dividing (non-hedonic) regional house price with regional rent price index. Marriage (divorce) shows the number of marriages (divorces) in a region.

**Table A3**

House Prices and Income Distribution with Additional Controls – 3

Dependent variable: dlog (Real Regional House Price Index)						
dlog (GDP p.c.)	3.570** (1.532)	3.527** (1.564)	3.559** (1.516)	3.431** (1.535)	3.888** (1.595)	3.609** (1.591)
dlog (GDP p.c.)*Gini	–10.84** (4.202)	–10.66** (4.332)	–10.78** (4.183)	–10.47** (4.196)	–11.83** (4.451)	–10.98** (4.442)
d (Expectation)	0.857*** (0.307)	0.848*** (0.303)	0.714 (1.040)	0.741* (0.401)	0.846*** (0.302)	–0.822 (4.960)
d (Expectation)*Gini	–0.165 (0.114)	–0.122 (0.112)	–0.154 (1.01e-06)	–0.162 (0.112)	–0.183 (0.123)	–0.160 (0.117)
Additional stock	–1.88e-06* (9.90e-07)	–1.80e-06* (1.01e-06)	–1.93e-06* (9.91e-07)	–1.88e-06* (1.01e-06)	–1.59e-06 (1.10e-06)	–1.96e-06* (1.03e-06)
d (d (Housing credits))	3.17e-06* (1.65e-06)	2.86e-06** (1.32e-06)	3.22e-06* (1.66e-06)	3.35e-06* (1.82e-06)	3.47e-06* (1.69e-06)	3.27e-06* (1.75e-06)
dlog (Population)	–0.148 (0.578)					
Working-age population		–1.778 (1.143)				
Average age			–0.0108 (0.0757)			
log (Density)				–0.184 (0.533)		
d (Share of TOKİ)					–0.0554 (0.0327)	
log (Initial price)						0.336 (1.016)
Constant	0.556*** (0.157)	1.406** (0.592)	0.840 (1.999)	1.955 (4.104)	0.539*** (0.158)	–2.148 (8.117)
Observations	104	104	104	104	104	104
R-squared	0.731	0.745	0.731	0.732	0.734	0.731

Notes: The estimations include region and year fixed effects. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional figures with regional CPI. Expectation refers to consumers' expectations on buying a house. Sample period: 2014–2017. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1. Population is the regional population. Working age population is the share of 25–55 year-olds in total regional population. Average age is the average age of regional population. Density is the number of people per square kilometer. Share of TOKİ is share of TOKİ sales in total house sales in a region. Although, no direct TOKİ sales data is available, the detailed housing contract information per province is available. By collecting the number of housing units to be produced, and assuming that the units are on sale with a lag of 1–3 years after the year of contract, a proxy of TOKİ sales is calculated by taking the moving average of number of units to be produced 1–3 years before, and lagging it by one period. When a project includes multi-provinces (a rare observation), the units are distributed equally to each province. Initial price is proxied by the average price per unit declared at the registry in the first year of the sample, deflated by the regional CPI.

**Table A4**

Impact of Income Distribution - Alternative Measures – Excluding 3 Big Cities

Dependent variable: dlog (Real Regional House Price Index)						
dlog (GDP p.c.)	0.918 (0.704)	1.496 (0.911)	4.743 (2.869)	4.072* (2.087)	3.179** (1.434)	2.079** (0.829)
d (Expectation)	1.008** (0.359)	0.674** (0.266)	0.706** (0.267)	0.753** (0.280)	0.740** (0.267)	0.723*** (0.246)
Additional stock	1.36e-06 (1.05e-06)	–1.18e-06 (1.12e-06)	–9.91e-07 (1.02e-06)	–1.19e-06 (1.05e-06)	–1.30e-06 (1.04e-06)	–1.31e-06 (9.04e-07)
d (d (Housing credits))	2.42e-05** (1.14e-05)	2.67e-06 (1.86e-06)	2.60e-06 (2.03e-06)	2.60e-06 (1.90e-06)	2.69e-06 (1.76e-06)	3.41e-06** (1.60e-06)
Unemployment rate	–0.00727** (0.00341)	–0.00686* (0.00396)	–0.00723* (0.00389)	–0.00705* (0.00379)	–0.00751* (0.00382)	–0.00703* (0.00370)
dlog (GDP p.c.)*Poverty50	–0.130* (0.0713)					
d (Expectation)* Poverty50	–0.00193 (0.00202)					
dlog (GDP p.c.)* Poverty60		–0.110** (0.0517)				
d (Expectation)* Poverty60		–0.00198 (0.00153)				



**Table A4** (continued)

Dependent variable: dlog (Real Regional House Price Index)						
dlog (GDP p.c.)*Share_2/1						
						–3.218*
						(1.785)
d (Expectation)* Share_2/1						–0.0608*
						(0.0331)
dlog (GDP p.c.)* Share_3/1						–2.092**
						(0.979)
d (Expectation)* Share_3/1						–0.0489**
						(0.0236)
dlog (GDP p.c.)* Share_4/1						–1.226**
						(0.496)
d (Expectation)* Share_4/1						–0.0300**
						(0.0131)
dlog (GDP p.c.)* Share_5/1						–0.408***
						(0.136)
d (Expectation)* Share_5/1						–0.00811*
						(0.00418)
Constant	0.586***	0.567***	0.583***	0.577***	0.572***	0.587***
	(0.166)	(0.160)	(0.169)	(0.164)	(0.167)	(0.162)
Observations	92	92	92	92	92	92
R-squared	0.774	0.768	0.778	0.782	0.776	0.772

Notes: The estimations include region and year fixed effects. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional figures with regional CPI. Expectation refers to consumers' expectations on buying a house. Sample period: 2014–2017. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1. Poverty50 (60) shows the share of population whose income is less than 50 (60) percent of the median income. Share\_ variables show the ratio of the mean income of upper quintiles to that of the first income quintile. The estimations exclude İstanbul, Ankara and İzmir, all of which constitute a separate statistical region.

**Table A5**

House Price, Income and Income Quintiles – Excluding 3 Big Cities

Dependent variable: dlog (Real Regional House Price Index)					
dlog (GDP p.c.)	–4.210**	–3.607**	–3.005	–1.690	3.949*
	(1.546)	(1.693)	(2.477)	(4.147)	(2.278)
d (Expectation)	0.920**	0.916**	0.965**	0.929**	1.051***
	(0.367)	(0.348)	(0.393)	(0.350)	(0.345)
Additional stock	7.60e-07	1.06e-06	1.78e-06	1.78e-06*	1.20e-06
	(1.46e-06)	(1.48e-06)	(1.19e-06)	(9.94e-07)	(1.45e-06)
d (d (Housing credits))	2.16e-05*	2.30e-05*	2.62e-05**	2.56e-05**	2.44e-05**
	(1.24e-05)	(1.17e-05)	(1.16e-05)	(1.06e-05)	(1.17e-05)
Unemployment rate	–0.00748**	–0.00702*	–0.00753*	–0.00715*	–0.00712**
	(0.00330)	(0.00356)	(0.00378)	(0.00366)	(0.00343)
dlog (GDP p.c.)*IncomeShare_1	0.515**				
	(0.205)				
d (Expectation)* IncomeShare_1	0.0108*				
	(0.00535)				
dlog (GDP p.c.)*IncomeShare_2		0.271*			
		(0.140)			
d (Expectation)*IncomeShare_2		0.00475			
		(0.00452)			
dlog (GDP p.c.)*IncomeShare_3			0.165		
			(0.155)		
d (Expectation)*IncomeShare_3			–0.000349		
			(0.00425)		
dlog (GDP p.c.)*IncomeShare_4				0.0597	
				(0.193)	
d (Expectation)*IncomeShare_4				–0.000441	
				(0.00569)	
dlog (GDP p.c.)*IncomeShare_5					–0.0995*
					(0.0530)
d (Expectation)*IncomeShare_5					–0.00125
					(0.00154)
Constant	0.590***	0.573***	0.566***	0.549***	0.583***
	(0.164)	(0.160)	(0.164)	(0.160)	(0.160)
Observations	92	92	92	92	92
R-squared	0.781	0.759	0.754	0.750	0.762

Notes: The estimations include region and year fixed effects. The output regarding region and year fixed effects is omitted. Real figures are calculated by deflating regional figures with regional CPI. Expectation refers to consumers' expectations on buying a house. Sample period: 2014–2017. Clustered (by region) standard errors in parentheses. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1. Income\_share variables refer to the share of each income quintile in total income of a region. Each quintile refers to 20 percent of the population. The estimations exclude İstanbul, Ankara and İzmir, all of which constitute a separate statistical region.

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