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Quantifying and Explaining Stickiness in Housing Rents: A Turkish Case Study with Micro-Level Data*

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Abstract

Using a national panel of housing units, this paper documents that the rate of nominal rigidity in housing rents is high in Turkey between 2008 and 2011. We find that, on average, 31.5 percent of the rents did not change from year to year in nominal terms. We then ask if the incidence of nominal rigidity depends on the turnover status of the housing unit. We show that 35.4 percent of the nonturnover units had rigid rents, while for only 17.1 percent of the turnover units rents did not change. We also present evidence that grid pricing is associated with more than half of the nominal rigidity in housing rents in our sample. The household- and individual-level determinants of the nominal rigidity in rents and turnover status are also investigated using the micro-level details available in our dataset. We document that, relative to the low-income tenants, high-income tenants are less likely to have rigid rents and they are also less likely to change units frequently. This finding suggests that search and moving costs impose frictions that amplify the opportunity costs of high-income tenants; thus, they are more likely to agree on reasonable rent increases for the purpose of saving time and reducing emotional stress.

JEL codes: E31, R21, R31.

Keywords: Housing rents; nominal rigidities; turnover; grid pricing.

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1 Introduction

Price adjustments are sluggish. This is a well-documented fact across time/sectors/countries and for a wide variety of products. For example, Klenow and Kryvtsov (2008) show, using comprehensive micro-level data from the US retail establishments, that the median duration of a price is approximately 4 months—7 months after excluding sales. The duration is around 15 months at the 90th percentile. Observed patterns of price changes provide empirical foundations for the New Keynesian macro models, which mostly rely on the assumption that prices exhibit a certain degree of stickiness.[1] These models are designed for analyzing the short-run real effects of monetary shocks, which would not be easy to obtain without nominal price rigidities. Thus, quantifying and explaining the magnitude of price stickiness is important for refining our understanding of the real effects of monetary policy.

A particularly important price category to examine the degree of nominal rigidity is housing rents. Documenting stickiness in housing rents is critical for three main reasons. *First*, rents constitute a significant fraction of the household budget. For example, for the renters in the US, rent expenditures represent around 20–30 percent of yearly income [Genesove (2003)].[2] Among the renters in Turkey between 2008–2011 (which is also the sample we work with), yearly housing rent expenditures constitute a little less than half of the yearly income of the household head and around 30 percent of the annual household income. *Second*, the market for housing rentals has certain characteristics setting it apart from the market for ordinary goods such as supermarket goods. The most obvious one is that ordinary goods have a fixed price tag applying equally to all customers. Housing rents, however, can be tailored to a particular tenant based on the landlord's subjective and objective evaluations.[3] These evaluations might be based on whether the tenant is a new one or a continuing one, i.e., turnover matters a lot. Another is that housing rents are subject to contracts, which is an additional source

[1] See Calvo (1983) for an example of time-dependent reasoning, i.e., only a certain fraction of prices change in any given time period. There is also a large literature explaining staggering with the existence of small menu costs implying state dependency rather than time dependency [e.g., Sheshinski and Weiss (1977), Caplin and Spulber (1987), Caballero and Engel (1991), Caplin and Leahy (1991), Golosov and Lucas (2007), Gertler and Leahy (2008), Nakamura and Steinsson (2008), and Midrigan (2011)].

[2] Many of the early empirical work on price rigidities focus on items constituting only a tiny share of household budget. For example, Cecchetti (1986) uses newsstand magazines, Kashyap (1995) focuses on catalog items such as chamois shirts and fishing rods, and Lach and Tsiddon (1996) work with data on wine, fish, and meat products.

[3] This also implies that supermarket goods are subject to menu costs, while housing rents are not.

of price rigidity. *Third*, the determination of housing rents involves a considerable amount of additional costs such as negotiation and information acquisition costs. In the presence of these costs, the nominal price in the previous period serves as a good benchmark for those parties who are not willing to bear these costs.

Our main purpose in this paper is to quantify and explain the magnitude of nominal rigidity in housing rents. We use a new dataset from Turkey for the 2008–2011 period, which is a national panel of housing units providing rich information on housing rents along with a comprehensive set of household- and individual-level characteristics.[4] We present three main findings. First, we find that, on average, 31.5 percent of the rents did not change from year to year in nominal terms. We then ask if the incidence of nominal rigidity depends on the turnover status of the housing unit. Performing pairwise comparisons across the years in our sample, we show that 21.4 percent of the units in our sample experienced a turnover (i.e., had a new tenant) in the following year. We further show that 35.4 percent of the nonturnover units had rigid rents, whereas for only 17.1 percent of the turnover units rents did not change; thus, turnover status is an important determinant of nominal rigidity in rents. Finally, we present evidence that grid pricing can be associated with 68 percent of the observed nominal rigidity in housing rents in our sample. In other words, the tendency to round rents to the nearest multiple of 10, 25, 50, and 100 can explain a significant fraction of rent stickiness.

We also investigate the household- and individual-level determinants of the rigidities in rents and turnover status. We find that the education level of the household head does not play a systematic role on these two outcomes. However, the annual income and employment status of the household head have some interesting implications on the degree of rigidities and turnover. We show that being employed reduces the probability of rigidity and the probability of turnover. We also show that the yearly income of the household head is negatively correlated with the probability of rigidity and the probability of turnover. Moreover, being married, older, and living in a more populated household reduces the probability of turnover,

[4] The dataset is called the Income and Living Conditions Longitudinal Survey 2008–2011 compiled by the Turkish Statistical Institute. See Section 2 for more detailed information on the dataset along with some institutional background about the market for rental units in Turkey.

while they do not have any impact on the probability of rigidity.

There is a large empirical literature on price rigidities.[5] However, the literature reporting direct evidence on rigidities in housing rents is rather small. Among the very few, Genesove (2003) uses Annual Housing Survey 1974–1981 panel data to document that 29 percent of the rental units in the US had no yearly change in nominal rents. Hoffmann and Kurz-Kim (2006) show, using German data for the period 1998–2003, that the longest price durations are found for housing rents. There is another literature comparing the *ex ante* user cost of housing with actual rents and arguing that, on average, actual rents rise slower than the user cost; thus, using actual rents rather than the user cost in the CPI accounting imposes a downward bias on the consumer inflation [see, e.g., Dougherty and Van Order (1982), Bajari, Benkard, and Krainer (2005), Gordon and van Goethem (2008), and Verbrugge (2008)]. Although the papers in this literature raise rents stickiness as an important source of this gap, they do not provide additional evidence on rent stickiness. Finally, theoretical studies incorporating stickiness in rents include Wang and Zhou (2000) and Lai, Wang, and Yang (2007).

Our paper is very closely related to Genesove (2003). Our estimate for the degree of nominal rigidity in housing rents, which is 31.5 percent, is very close to his estimate of 29 percent. Genesove reports that the fraction of the turnover units in his sample is 35 percent, while ours is only 21 percent. So, the incidence of turnover is much smaller in our study. Similar to his results, we also document that the degree of nominal rigidity is much higher for nonturnover units. In particular, we find that housing rents for 17.1 percent and 35.4 percent of the observations did not change for turnover and nonturnover units, while Genesove calculates these numbers as 14 percent and 36 percent, respectively. Genesove shows that "a little less than half of the nominal rigidity can be ascribed to grid pricing" in the US. Our results on grid pricing are sharper: we find that grid pricing can be associated with 68 percent of the nominal rigidity and this number is close to 100 percent for turnover units. This suggests that, for new tenants, there is a strong tendency for setting rents as round numbers. Unlike Genesove,

[5]Recent studies include Baharad and Eden (2004), Bils and Klenow (2004), Levy and Young (2004), Zbaracki, Ritson, Levy, Dutta, and Bergen (2004), Baudry, Le Bihan, Sevestre, and Tarrieu (2007), Heidhues and Koszegi (2008), Nakamura and Steinsson (2008), and Bouakez, Cardia, and Ruge-Murcia (2009).

we do not find any systematic relationship between rigidity and unit size or building type. Different from Genesove's analysis, we have access to individual-level data for the renters and we are able to estimate the correlations between the probability of rigidity in housing rents and various individual-level characteristics including income, education, employment status, marital status, age, etc.

To sum up, our paper contributes to the literature in three ways. First, this is one of the very few papers in the literature presenting direct evidence on housing rents. In particular, to our knowledge, this is the first paper documenting the degree of nominal rigidity in housing rents in a developing country using micro-level data. Second, our paper is the first to link data on housing units to data on the corresponding household members. This enables us to examine if rent rigidities can be explained by individual-level characteristics. Finally, this is the first paper investigating the role of the household income level on renting behavior. We document that high-income households are less likely to change units frequently. When the high-income households choose not to change units, they are less likely to have rigid rents. This mechanism suggests that search and moving costs impose frictions that amplify the opportunity costs of high-income tenants; thus, they are more likely to agree on reasonable rent increases each year for the purpose of saving time and reducing emotional stress.

The plan of the paper is as follows. Section 2 describes our data and provides the institutional details on the market for rental units in Turkey. Section 3 presents the main descriptive results. Section 4 performs various regressions for the purpose of understanding the sources of rigid rents. Section 5 concludes.

2 Data

2.1 Turkish Income and Living Conditions Survey

The Turkish Income and Living Conditions Survey (ILCS) is a publicly available and nationally representative micro-level dataset compiled by the Turkish Statistical Institute. Major topics that the survey focuses on include: housing, labor market status, poverty, income level, social exclusion, demography, and health. The ILCS datasets have been published annually since 2006 consistent with the EUROSTAT standards.[6]

The ILCS datasets are available in both cross-sectional and panel data formats. The cross-sectional sample is larger than the panel data sample and, moreover, the latter is a subset of the former. Each observation in the ILCS is assigned two ID numbers: an individual-level ID number and an ID number for the housing unit that the individual resides in. In other words, observations are classified at both individual level and housing unit level. This means that we are able to map individual-level details such as age, education, employment, and income into unit-level details such as unit size, building type, rent, etc.

We build our analysis on the housing-unit panel dataset of the ILCS. This dataset follows housing units over time and provides information about unit characteristics, housing rents, and characteristics of the residents. It is also possible to observe whether the residents of the unit have changed from year to year or not—while it is not possible to trace the movers' destinations. There are three waves of panel data compiled in four-year intervals: 2006–2009, 2007–2010, and 2008–2011. Information on actual rents is available only for the 2008–2011 wave of the survey. For this reason, we work with the 2008–2011 panel, which has 2,976 distinct households in each year of the survey.[7] In each household, only the individuals of age 15 and above are surveyed.[8] We restrict our sample to renters only.

Finally, we provide brief information on the sampling design of the ILCS. A multi-stage—i.e., stratified and cluster—sampling method is used. Household is defined as the final sampling unit. The cross-sectional sample contains information at the region (NUTS1) and location (urban/rural) level.[9] The panel sample, however, does not provide any geographical details. Although, as we mention above, the panel sample is a subset of the cross-sectional sample, the ILCS does not allow linking the geographical information in the cross-sectional dataset to

[6]Between 2002 and 2005, information on income distribution and poverty were extracted from another survey, the Household Budget Survey.

[7]The cross-sectional questionnaire is given to around 15,000 subjects, with a nonresponse rate of approximately 9 percent.

[8]The survey excludes the population in nursing homes, prisons, military barracks, hotels, private hospitals, and child care centers along with the immigrant population.

[9]Settlements with a population of 20,000 or less are classified as rural areas, while those with 20,001 or more are classified as urban areas.

the panel observations. That said, we develop a method to transfer the geographical details available in the cross-sectional sample into the panel dataset that we work with. For details, see Section 4.2.1 and, especially, Footnote (17).

2.2 Institutional Details

In this subsection, we summarize the relevant institutional features of the market for housing rentals in Turkey. We start with the details of the contractual arrangements between the tenant and landlord. The Turkish real estate sector is weak in terms of the availability of professional real estate and leasing services. In most cases, rents are determined by a direct personal negotiation between the landlords and tenants, while the involvement rate of a real estate agency is low. The typical contract length for rentals is one year or less.

Whether eviction is easy or difficult is important for the degree of nominal rigidity in rents. If it is easy to evict the incumbent renters, then landlords may have incentives to evict them for the purpose of raising rents, which may have implications for rent rigidities. Housing markets in Turkey is regulated under the code of obligations. The code has undergone a substantial change on July 1st 2012. The previous code was leading to conflict and duality in implementation; the new code mostly removes these problems. Both codes are based on the main principle of protecting tenants' rights. Due to this protectionist nature, eviction has never been an easy process in Turkey. Moreover, the conflicting nature of the old code was making eviction even more difficult. The new code, joined with low professionalization and short duration of contracts, provides some advantages to the landlord and makes eviction relatively easier. We work with the dataset for 2008–2011, a period during which the old code was in effect and, thus, eviction was difficult.

Based on the 2012 Turkish Statistical Institute figures, there are 20 million households in Turkey, 13.8 million of which have been residing in urban areas. Among the 20 million households, the home ownership rate is approximately 57.5 percent and the remaining 42.5 percent are renters. The home ownership rate is around 50.5 percent in urban areas, while it goes up to 73.4 percent in rural areas. Around 49 percent of all households live in apartments, but this rate is as high as 74.5 percent in urban areas. As of 2012, 56.3 percent of the households still use stove as the main heating system—41.2 percent in urban areas.

Rents are included in the CPI with a weight of 5.45 percent and the overall housing services (including rents, renovation materials for dwelling, water, electricity, gas, and other fuels) has a CPI share of approximately 16.4 percent. The share of housing services in household consumption expenditures is 26 percent and this rate is roughly similar across home owners and renters. For high-income households, the share of rent expenditures is higher than that for low-income groups. Housing services have a share of 7.1 percent in the GDP as of 2012—a little less than 2 percent for rentals.

The rent data that Genesove uses are compiled by the BLS and are used for the purpose of calculating the rent changes in the US Consumer Price Index. The rent data in the ILCS, however, do not constitute a base for the rents in the CPI.[10] The ILCS panel data suggest that the rent inflation rates are 10 percent, 6.8 percent, and 7 percent for 2008–09, 2009–10, and 2010–11, respectively, while the actual rent inflation rates have been 8.2 percent, 4.3 percent, and 4.3 percent for the same periods [see Table (1)]. It seems that the ILCS somewhat overestimates the rent inflation. The reason for this overestimation is that the ILCS oversamples the poor—since its main purpose is to understand the income and living conditions of the low-income households—and rent increases are relatively large in percentage terms for low-rent units.

3 Descriptive Properties of Yearly Changes in Housing Rents

3.1 Basic Facts on Nominal Rigidities

We start our analysis by matching the consecutive survey years in a pairwise manner. Specifically, we construct three distinct two-year balanced panel datasets. The first one focuses on those housing units which are occupied by renters both in 2008 and 2009. In this structure, we can observe the actual rental rate of the same unit both in 2008 and 2009, which allows

[10] The rent data for CPI are extracted from the Household Budget Survey, which is a cross-sectional dataset and, therefore, does not allow for the analysis of rent stickiness.

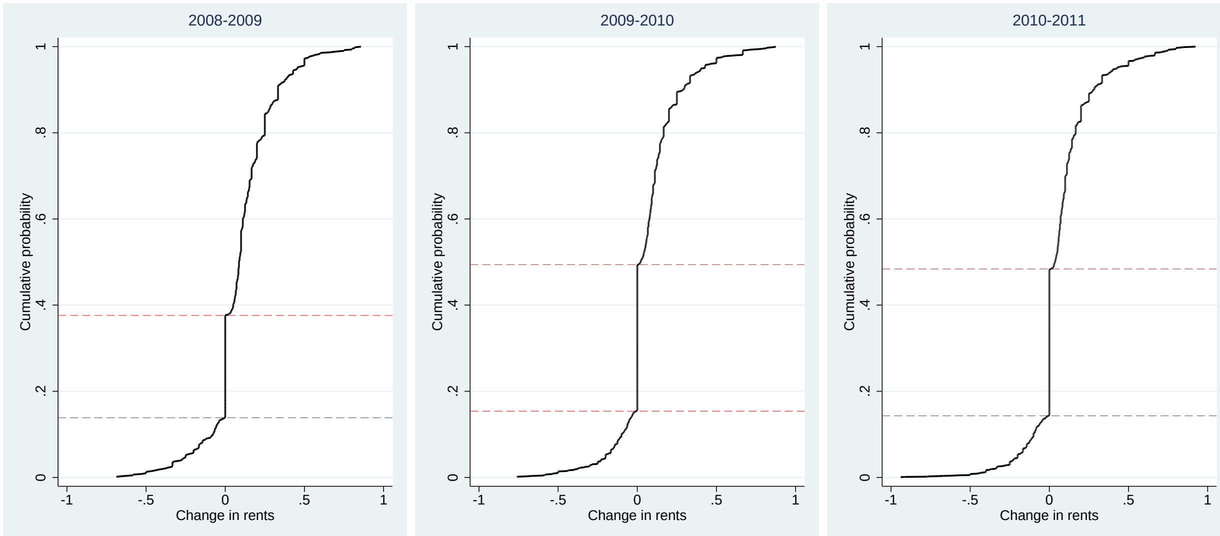

Figure 3.1: Empirical CDFs of yearly changes in nominal rents.

us to see whether the rent has changed or not over a year. We also observe whether the same tenant occupies the unit in both years or there is a new tenant in 2009. The same procedure is followed to construct two additional datasets for 2009–2010 and 2010–2011. The nominal growth rate of the housing unit's rent is simply calculated via the formula $dr = \ln r_t - \ln r_{t-1}$, where r_t is the nominal rent in year t. Figure (3.1) plots the cumulative distribution functions of dr for these three sets of observations. The vertical portion of each cumulative distribution—bounded by dashed horizontal reference lines—marks the fraction of housing units with exactly zero yearly change in rents. Obviously, the degree of nominal rigidity in housing rents is significant.

Table (1) summarizes the main facts.[11] In the entire sample, the incidence of nominal rigidity in housing rents is 31.5 percent. When we look at the years separately, we see that the incidence moves in the range of 23.4–33.3 percent. It is interesting to note that the lowest rate is recorded in 2008–2009, i.e., the crisis period. Clearly, the tendency—measured both in terms of the mean and median changes—to increase rents is higher in 2008-2009 than the following periods. This suggests that adjustments in housing rents are more likely to be exercised during turbulent periods.

The dispersion of yearly rent changes is described by two different statistics: Q3-Q2 and

[11] The number of observations is increasing over time due to the rotating nature of the dataset.

	2008-2009	2009-2010	2010-2011	All years
Percent negative change	13.5	15.2	14.1	14.3
Percent zero change (nominal rigidity)	23.4	33.3	33.3	31.5
Percent positive change	63.1	51.5	52.6	54.2
Median	0.087	0.022	0.036	0.048
Mean	0.100	0.068	0.070	0.075
Standard deviation	0.204	0.190	0.192	0.194
Q3-Q2	0.113	0.114	0.089	0.095
Turnover rate	0.212	0.216	0.213	0.214
# of observations	628	1168	1672	3468
CPI inflation	0.053	0.083	0.067	–
Rent inflation	0.082	0.043	0.043	–

Table 1: Nominal rigidity, by year.

standard deviation. Following Genesove (2003), we construct the statistic "Q3-Q2," which describes the distance between the median and the 75th percentile.[12] Genesove argues that Q3-Q2 is relatively more stable than the standard deviation. For our sample, both the Q3-Q2 and standard deviation are fairly stable across years. Moreover, there is no significant relationship between any of these measures and the extent of nominal rigidity in rents.

3.2 Turnover versus Nonturnover Units

Based on year-on-year comparisons, we document that, on average, tenants change in the 21.4 percent of all units in our sample.[13] This percentage is quite similar across years. We show that the incidence of nominal rigidity significantly varies with turnover status. As we report in Table (2), the incidence is 17.1 percent in turnover units, while it is 35.4 percent (more than twice) in nonturnover units. In the crisis period, the incidence is only 8.3 percent in turnover units, whereas it goes up to 27.5 percent (more than three times) in nonturnover units. This suggests that the increased rate of upward price adjustments during turbulent times is not due to increased turnover rates, but mostly due to decreased incidence of nominal rigidity in turnover units.

Figure (3.2) presents a year-on-year comparison of the empirical inverse cumulative distribu-

[12] Genesove calls this statistic "dispersion."

[13] We identify the turnover status from the question "when did you move in?"

		2008-2009	2009-2010	2010-2011	All years
Percent negative change	T	28.1	23.0	21.6	23.5
Percent zero change (nominal rigidity)	T	8.3	18.7	19.4	17.1
Percent positive change	T	63.6	58.3	59.0	59.4
Mean percentage change	T	9.5	11.2	11.2	10.9
Percent negative change	N	9.3	13.0	12.0	11.9
Percent zero change (nominal rigidity)	N	27.5	37.3	37.1	35.4
Percent positive change	N	63.2	49.7	50.9	52.7
Mean percentage change	N	10.1	5.7	5.9	6.6
Percent negative change	Total	13.5	15.2	14.1	14.3
Percent zero change (nominal rigidity)	Total	23.4	33.3	33.3	31.5
Percent positive change	Total	63.1	51.5	52.6	54.2
Mean percentage change	Total	10.0	6.8	7.0	7.5

Table 2: Nominal rigidity, by year and turnover status.

tions of turnover versus nonturnover units in our sample. The most prominent fact Figure (3.2) communicates is that, apart from nominal rigidity, the magnitudes of the negative and positive changes are much smaller in nonturnover units than turnover units. In other words, continuing tenants are not subject to sharp yearly increases in housing rents relative to new tenants. The bargaining process can offer an explanation justifying these patterns. To be precise, bargaining with a continuing tenant may be less cumbersome than bargaining with a new tenant as it saves time, reduces stress for both parties, and minimizes the information acquisition costs [Genesove (2003)]. These pecuniary and nonpecuniary costs jointly make the nominal price at time $t-1$ a good proxy for determining the nominal rent at time t. Formally speaking, an *ex post* surplus emerges as a consequence of the bargaining between the landlord and tenant. This surplus will also be a function of the costs mentioned above. The existence of these costs smooths out the price changes—in both directions—for the continuing tenants.

3.3 Unit Size and Building Type

Genesove (2003) finds that nominal rigidity is less pronounced for units in small buildings than in large ones. He argues that building size proxies the landlord size. The cost of acquiring information is potentially smaller for larger landlords. The easiest way to understand the main idea is to think in terms of fixed costs. If there are fixed costs associated with information

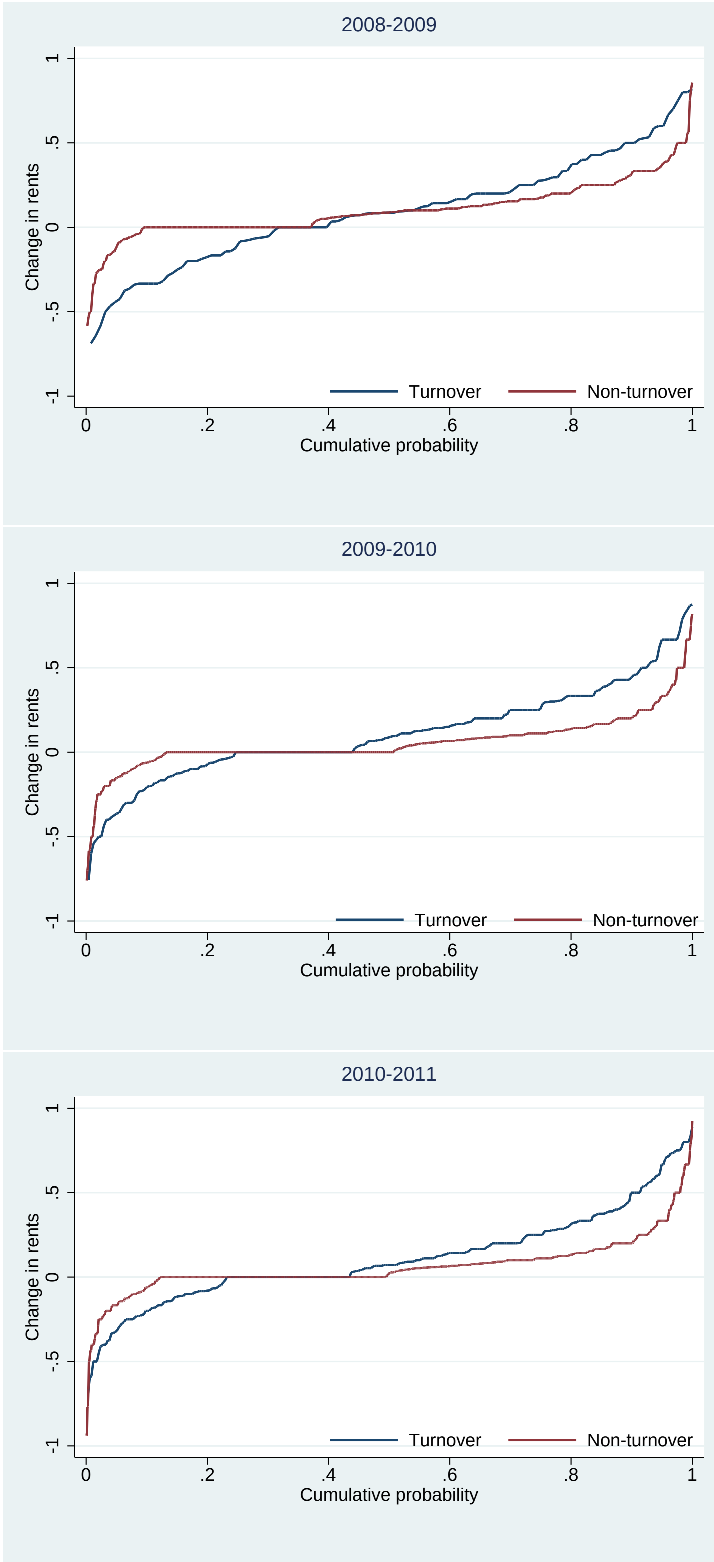

Figure 3.2: Empirical inverse CDFs of yearly changes in nominal rents, by turnover status.

	Neg. change (%)	Zero change (%)	Pos. change (%)	# of obs.
1	25.0	20.8	54.2	24
2	15.7	25.2	59.1	318
3	14.0	31.8	54.2	1619
4	14.4	32.8	52.8	1414
5	11.3	28.2	60.5	70
≥ 6	13.6	40.9	45.5	23
Total	14.3	31.5	54.2	3468

Table 3: Nominal rigidity, by unit size (# of rooms excluding kitchen, bathroom, and toilets).

	Neg. change (%)	Zero change (%)	Pos. change (%)	# of obs.
25–50	14.3	29.8	55.9	84
51–70	16.5	26.2	57.3	412
71–90	14.2	31.2	54.6	1176
91–110	13.7	35.2	51.1	923
111–130	13.7	30.6	56.3	586
131–150	17.6	30.3	52.1	165
$\geq$151	12.6	33.6	53.8	122
Total	14.3	31.5	54.2	3468

Table 4: Nominal rigidity, by unit size (square meters).

acquisition, then landlords owning multiple housing units will be more willing to pay the cost than those owning a single unit. This result is reasonable for the US, because there are many large real estate firms in the rental market and it sounds realistic to think that the units rented by them are probably subject to a smaller incidence of rigidity.

In Turkey, however, the rental market is not dominated by professionals unlike the US. Housing is widely regarded as an investment good (or an insurance) by the households. Because of this reason, we mostly see individual landlords bargaining with the tenant directly rather than salaried professionals. Given this fact, our *ex ante* expectation is that the link between rigidity and unit size or building type should be weaker in Turkey. To detect these links, we present simple cross tabulations of rigidity across units of different sizes and units in different building types. Table (3) and Table (4) summarize the incidence of rigidity for units of differing sizes. Unit size is measured in two ways in our dataset: (1) by the number of rooms excluding kitchen, bathroom, and toilets and (2) by square meters. We find weak evidence that larger units—both in terms of the number of rooms and square meters—are more likely to exhibit

	Neg. change (%)	Zero change (%)	Pos. change (%)	# of obs.
Detached	13.2	30.2	56.6	805
Semi-detached	13.0	22.3	64.7	139
Building <10 units	13.8	32.1	54.1	1501
Building ≥10 units	16.3	33.1	50.6	1023
Total	14.3	31.5	54.2	3468

Table 5: Nominal rigidity, by building type.

no change in rents.[14] This is contrary to Genesove's finding.

Table (5) documents the link between rigidity and building type. The Income and Living Conditions Survey groups units under four categories: detached units, semi-detached units, buildings with less than 10 units, and buildings with 10 units and above. A simple eyeball test reveals that there is no significant relationship between the incidence of nominal rigidity and building type. Again, this result does not support Genesove's claim. We believe that the discrepancy between Genesove's results and ours is due to the differences in the ownership structure between the US and Turkey.

To summarize, we find that the degree of nominal rigidity is significant in Turkey; that is, a nonnegligible fraction of housing rents do not change yearly. We also show that this rigidity is more pronounced for nonturnover units. The magnitudes are in line with those reported for the US by Genesove (2003). We also show that, unlike the US case, the unit size and building type variables do not offer a systematic explanation but standard bargaining theories seem to hold for the Turkish case. Next we dig deeper into the micro foundations of the nominal rigidity in housing rents in Turkey by exploiting the micro-level details that our dataset offers.

4 Explaining Nominal Rigidities in Rents

4.1 Grid Pricing

One potential explanation for the observed nominal rigidity in housing rents is that there is a tendency to price on a grid, i.e., prices tend to be rounded to the multiples of, say, X. In that

[14] We also find that the tradeoff is mostly between the negative change and no change categories; that is, the degree of nominal rigidity increases with unit size, while the percentage of declining rents decreases with unit size.

Grids	Whole sample	Turnover	Non-turnover
100	35.2	32.4	35.9
50	29.1	32.0	28.3
25	7.9	7.9	7.9
10	24.4	24.1	24.4
5	2.3	2.4	2.2
1	1.2	1.1	1.2

Table 6: Raw grid points, percentage.

case, when a shock necessitates raising the price by Y, where $Y < X$, this will either lead to a zero change or a change by X. This mechanism can itself generate rigidity in rents to some extent. In this subsection, we use the method proposed by Genesove (2003) to estimate the extent to which grid pricing is associated with nominal rigidity in housing rents in Turkey.

Table (6) provides summary information on grids over the whole sample and for turnover versus nonturnover units separately. The table should be read as follows. In the whole sample, 35.2 percent of the rents are multiples of 100, 29.1 percent are multiples of 50 (but not 100), 7.9 percent are multiples of 25 (but not 50 and 100), 24.4 percent are multiples of 10 (but not 50 and 100), and 2.3 percent are multiples of 5 (but not 10, 25, 50, and 100). The remaining 1.2 percent are multiples of 1 (but not 5, 10, 25, 50, and 100). Observe that these patterns are preserved for turnover and nonturnover units, except that nonturnover units slightly have more rounding to 100 and less rounding to 50 than turnover units. The table suggests that grid pricing is present and it is significant.

Figure (4.1) plots the probability distribution of rents as a histogram. The line plot is a standard Kernel density estimate. We make two observations. *First*, the rent distribution exhibits a certain degree of bi-modality; that is, there are two peaks in the distribution—one is around the overall mean of the distribution (approximately 312 Turkish liras per month) and the other is around 500 Turkish liras per month (there is significant bunching at the levels of 450, 500, and 550). The latter peak itself signals the existence of grid pricing in rent determination. *Second*, the grid intervals specified in Table (6) are not too large or too small with respect to the observed rent distribution.

Dependent variable: Rigidity dummy				
	Whole sample	**Turnover**	**Non-turnover**	**Whole sample**
Year Dummies				
2008–09	omitted	omitted	omitted	omitted
2009–10	0.288***	0.511***	0.272***	0.283***
	(0.069)	(0.195)	(0.075)	(0.069)
2010–11	0.273***	0.533***	0.249***	0.265***
	(0.065)	(0.187)	(0.072)	(0.066)
Grid Points				
1&5	omitted	omitted	omitted	omitted
10	0.421**	4.038***	0.377**	0.417**
	(0.166)	(0.168)	(0.175)	(0.166)
25	0.595***	4.034***	0.577***	0.586***
	(0.179)	(0.272)	(0.190)	(0.179)
50	0.923***	4.803***	0.865***	0.913***
	(0.163)	(0.146)	(0.173)	(0.164)
100	1.039***	4.802***	0.982***	1.026***
	(0.162)	(0.141)	(0.171)	(0.163)
Unit Size (Square Meters)				
$\geq$ 151	omitted	omitted	omitted	omitted
131–150	-0.037	-0.893*	0.091	-0.034
	(0.160)	(0.467)	(0.175)	(0.161)
111–130	-0.008	0.030	0.015	0.018
	(0.134)	(0.337)	(0.147)	(0.135)
91–110	0.140	-0.041	0.184	0.152
	(0.130)	(0.327)	(0.143)	(0.132)
71–90	0.021	-0.146	0.069	0.034
	(0.129)	(0.324)	(0.142)	(0.131)
51–70	-0.086	-0.239	-0.035	-0.066
	(0.143)	(0.354)	(0.148)	(0.145)
25–50	0.053	-0.665	0.170	0.081
	(0.198)	(0.646)	(0.215)	(0.200)
Building Type				
Semi-detached	omitted	omitted	omitted	omitted
Detached	0.269**	0.275	0.277*	0.275**
	(0.129)	(0.363)	(0.142)	(0.129)
Building $<$ 10 units	0.194	0.059	0.216	0.178
	(0.126)	(0.357)	(0.138)	(0.127)
Building $\geq$ 10 units	0.196	0.130	0.206	0.170
	(0.129)	(0.365)	(0.142)	(0.132)
Log of nom. rents	–	–	–	0.047
				(0.056)
Constant	-1.743***	-5.940***	-1.631***	-1.992***
	(0.241)	(0.490)	(0.262)	(0.388)
Φ–restricted	0.103	0.001	0.133	0.099
Φ–unrestricted	0.321	0.182	0.357	0.318
Log likelihood	-2,044	-299	-1,690	-2,044
N	3,403	701	2,702	3,403

Table 7: Nominal rigidity, grid pricing: probit regression.

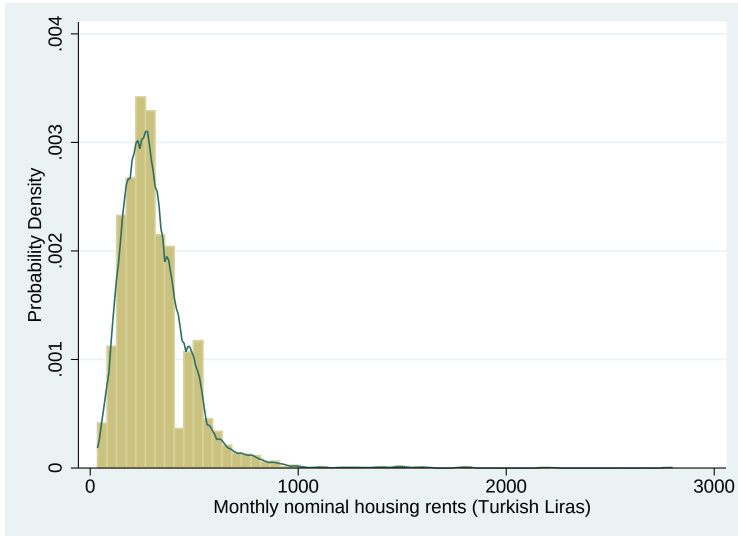

Figure 4.1: Distribution of rents.

To estimate the extent to which grid pricing tends to correlate with the degree of nominal rigidity in rents, we run a probit regression as described by Genesove (2003). First, we construct a dummy variable "rigidity" taking 1 if the rent has not changed over the year and 0 otherwise. This binary rigidity variable will be our dependent variable in the probit regression. The explanatory variables are: year dummies, the dummy variables for grids, dummy variables for unit size, dummies for building type, and the natural logarithm of the nominal rent level. The 2008–2009, the lowest grid (in which we collapse 1 and 5), the largest unit, and the semi-detached building dummies are omitted. We report our estimates in Table (7). The first and fourth columns use the whole sample, and the second and third use turnover and nonturnover units, respectively. "Φ–unrestricted" is the predicted probability of rigidity and "Φ–restricted" is the predicted probability after restricting all of the grid dummies to be zero. Thus, the difference between the two can be attributed to the explanatory power of grid pricing. Our analysis suggests that around 68 percent of the nominal rigidity tend to be related to grid pricing over the whole sample. This is much higher than the grid pricing tendency in the US estimated by Genesove, as he finds that a little less than half of the nominal rigidity can be attributed to grid pricing. We find that grid pricing is associated with almost 100 percent of the nominal rigidity in turnover units and around 63 percent in nonturnover units in the sample. This means that the factors leading to rigid nominal rents other than

	1	5	10	25	50	100
1	**14**	1	5	3	6	11
	1	0	1	1	0	2
5	1	**17**	19	8	16	18
	1	**8**	7	1	5	3
10	4	8	**397**	40	184	212
	0	2	**107**	6	40	54
25	2	12	31	**78**	75	73
	1	2	8	**42**	36	35
50	4	14	163	72	**427**	307
	0	3	52	35	**225**	168
100	6	15	190	75	286	**609**
	1	6	75	45	167	**380**

Table 8: Transition matrix for grid points: number of transitions.

grid pricing are only relevant for nonturnover units.

It is reasonable to think that the tendency of setting housing rents on the grids might be larger at higher rent levels. If this is the case, then one should expect that adding the level of nominal rents into the regression would reduce the explanatory power of grid pricing. In the fourth column of Table (7), we repeat our whole-sample regression by adding the natural logarithm of the nominal rent level as a regressor. The nominal rent level as a regressor does not change our original results; that is, grid pricing is still associated with more than 65 percent of the nominal rigidity.[15] We see a positive coefficient on the rent level, but it is not statistically significant. This suggests that accounting for the idea that the tendency of rigidity might be a function of the rent level does not seem to hold in our analysis.

Taken at the face value, these results mean that grid pricing is likely a dominant factor in rent determination and the housing unit characteristics such as unit size and building type

[15] The results of the separate regressions for turnover and nonturnover units are also not affected from the inclusion of the nominal rent level as a regressor.

have almost no role in explaining the rigidity tendency. That said, there is still one source of potential non-robustness in our results that needs further investigation: the omitted grid category (i.e., 1 & 5) represents only 3 percent of the observations in our dataset. If the units in the omitted category are less likely to exhibit rigidity, the role of grid pricing might have been overestimated in our regressions.[16] The notable differences between the coefficients for the turnover versus nonturnover units also reinforce these concerns.

To check for the validity and robustness of our estimates, we construct a simple transition matrix to observe how rent changes evolve across the grids [see Table (8)]. The rows of the matrix refer to the initial state and the columns refer to the destination state. The numbers in each cell correspond to the aggregate number of transitioning units in our sample. For example, the number of units transitioning from the 100-grid to 50-grid is 286. The non-transitioning units are given on the diagonal in bold characters. The second entry in each cell describe the number of units that are above the average nominal rent level, where the average is calculated across all rental units in the corresponding survey year. For example, among the 286 units that are transitioning from the 100-grid to 50-grid, 167 of them occur in units with above-average rental payments.

The transition matrix reveals that around half of the rental units in our sample rotate across the 50–100 grids (i.e., the two-by-two sub-matrix on the lower-right partition indicated in red color). We call these the "type-1" units. The rest of the units are somehow related to the smaller grids and we call those units the "type-2" units. The transitions basically say that grid pricing is important; thus, our results regarding the significance of grid pricing seem robust based on an eyeball test.

Two more concerns remain: the impact of the rent level and other unit characteristics on the tendency of grid pricing. It is clear from the transition matrix that the rent level has some role to play, although the regression results in the column 4 of Table (7) say the opposite. Specifically, for type-1 units, approximately 58 percent of the transitions occur across high-rent

[16] However, this does not mean that our approach is technically wrong. Our regressions reflect a comparison between the tendency to set prices on grids versus non-grids. Genesove (2003) adopts a similar strategy, but his omitted category is around 10 percent of his sample, which is reasonably high.

Dependent variable: Rigidity dummy		
	Type-1	**Type-2**
Year Dummies		
2008–09	omitted	omitted
2009–10	0.312***	0.423***
	(0.109)	(0.156)
2010–11	0.324***	0.429***
	(0.102)	(0.151)
Unit Size (Square Meters)		
$\geq$ 151	omitted	omitted
131–150	-0.021	-0.611
	(0.118)	(0.501)
111–130	0.101	-0.042
	(0.121)	(0.291)
91–110	0.193*	-0.134
	(0.096)	(0.298)
71–90	0.101	-0.221
	(0.121)	(0.309)
51–70	-0.003	-0.417
	(0.154)	(0.387)
25–50	0.043	-0.712**
	(0.124)	(0.301)
Building Type		
Semi-detached	omitted	omitted
Detached	0.316***	0.212
	(0.098)	(0.332)
Building $<$ 10 units	0.294	0.112
	(0.243)	(0.401)
Building $\geq$ 10 units	0.169	0.201
	(0.223)	(0.299)
Log of nom. rents	0.045**	0.041
	(0.019)	(0.047)
Constant	-2.230***	-3.686***
	(0.203)	(0.433)
Log likelihood	-1,823	-1,543
N	1,629	1,774

Table 9: Nominal rigidity, grid pricing: separate probit regressions for type-1 versus type-2 units over the whole sample.

units, while only around 33 percent of the type-2 transitions are realized across high-rent units. This suggests that differences in the rent change rates across type-1 and type-2 units might, to some extent, be mechanically related to the rent level, which implies that high-rent units tend to change rents less frequently. To investigate whether the role of unit characteristics on the tendency of rent rigidity differs across type-1 versus type-2 units, we run two separate probit regressions of the rigidity dummy on year, unit size, and building type dummies. Table (9) presents the estimates. The results suggest that unit characteristics still do not have much explanatory power. That said, we see that smaller type-2 units are less likely, while medium-size type-1 units are more likely to have rigid rents. Building type seems to have no systematic impact on the incidence of rigidity.

Overall, we conclude that grid pricing is likely an important determinant of nominal rigidity in housing rents in the Turkish market. The level of rents do not seem to have a significant effect on the incidence of rigidity in the aggregate regressions. However, a simple transition-matrix approach reveal that there is a group of units transitioning across 50–100 grids (type-1 units), others transitioning across the remaining grids (type-2 units), and type-1 units are more likely to be high-rent units than the type-2 units. Further analysis yields the result that, for type-1 units, the level of rents positively effects the incidence of rigidity. This means that, in the high-rent units, rents are adjusted less frequently; but, when they are adjusted, they are set at the largest grid levels such as 50 or 100. We also find that unit characteristics such as unit size (in terms of the number of rooms and/or area of the unit) or building type (detached, semi-detached, large/small buildings) do not have a strong effect on rigidity.

4.2 Characteristics of the Household Head

In this subsection, we match the unit-level data with the individual-level details. Following the conventions in the applied work on household-level data, we focus on the characteristics of the household head. Our main purpose is to investigate whether the observed characteristics of the household head is in a systematic relationship with the observed nominal rigidity in housing rents. We perform this task in two steps. First, we directly use the rigidity dummy as our dependent variable. Based on our findings in Section 2, which basically say that turnover is critical for the incidence of rigidity, we investigate the micro-level determinants of turnover behavior at the second step. Our main focus is to document basic correlations—rather than causal relationships—between the individual-level variables and the unit-level outcomes.

4.2.1 Rigidity Tendency

We have details on the annual income, employment status, education level, and age of the household head. The annual income contains the income from all sources during the survey year and we use the natural logarithm of annual income in our regressions. Following the conventions in the empirical labor economics literature, we describe the employment status of the household head with three dummy variables: employed, unemployed, and not in labor force (NILF). As for the education level of the household head, we construct 6 dummy variables: no degree, primary school, secondary school, high school, vocational high school, and college & above. We include the age of the household head into our regressions as a quadratic polynomial to capture the potential nonlinearities over the life-cycle. The "rigidity" dummy is our dependent variable. We focus only on the "nonturnover" units, because running this regression only makes sense for those units having the same tenant in two consecutive years. Because income, employment status, and education are clearly endogenous, we run three separate regressions using only one of them in each regression. We also include year dummies, unit size dummies, building type dummies, region dummies (at the NUTS1 level), a dummy variable indicating whether the unit is located in an urban versus rural area, a dummy variable for marital status (taking 1 if the household head is married and 0 if nonmarried), and the number of individuals residing in the unit.[17] We run a probit regression and we report the marginal effects along with robust standard errors.

[17] The publicly available panel dataset of the Income and Living Conditions Survey has no information on the location of the housing units for confidentiality purposes. There is also a cross-sectional module of the same survey, which provides two types of location information: region (at the NUTS1 level) and urban/rural status of the housing unit. Observations in the panel dataset is a subset of the observations in the cross-sectional module; however, there is no panel identifier in the cross-sectional dataset. That said, it is still possible to produce a synthetic panel identifier. We create a new unit ID number using the same unit characteristics both in the cross-sectional and panel modules. This new ID number is uniquely matched across the two datasets. Note that similar techniques are used to utilize the hidden panel dimension of the Current Population Survey (CPS) data in the US, which is originally a cross-sectional data set [see, e.g., Fujita and Ramey (2009)]. Note also that, based on the NUTS1 classification, Turkey consists of 12 broad regions: (1) Istanbul, (2) West Marmara, (3) Aegean, (4) East Marmara, (5) West Anatolia, (6) Mediterranean, (7) Central Anatolia, (8) West Black Sea, (9) East Black Sea, (10) North East Anatolia, (11) Middle East Anatolia, and (12) South East Anatolia.

Dependent variable: Rigidity			
Year dummies	Yes	Yes	Yes
Unit size dummies	Yes	Yes	Yes
Building type dummies	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes
Location dummy	Yes	Yes	Yes
Family Variables			
Married	-0.033*	-0.008	-0.038*
	(0.018)	(0.023)	(0.019)
# of HH members	0.003	0.001	-0.004
	(0.009)	(0.009)	(0.009)
Age (of HH head)	0.0026	0.0018	0.0021
	(0.0022)	(0.0021)	(0.0021)
$Age^2/100$	-0.0007	-0.0009	-0.0009
	(0.001)	(0.001)	(0.001)
Log income	-0.0027**	–	–
	(0.001)		
Employment Status			
NILF	–	omitted	–
Unemployed	–	-0.031	–
		(0.046)	
Employed	–	-0.077**	–
		(0.032)	
Education			
No degree	–	–	omitted
Primary school	–	–	0.018
			(0.051)
Secondary school	–	–	0.014
			(0.055)
High school	–	–	0.035
			(0.057)
Voc. high school	–	–	0.009
			(0.052)
College & above	–	–	-0.059
			(0.054)
N	2,702	2,702	2,702

Table 10: Nominal rigidity, individual-level determinants: probit regression, marginal effects, nonturnover units.

Our estimates are reported in Table (10). The first column says that a 10 percent increase in the yearly income of the household head reduces the probability of rigidity by 2.7 percentage points in nonturnover units. The second column suggests that the probability of rigidity is 7.7 percent lower when the household head is employed, while being unemployed does not have a statistically significant effect on rigidity. The third column says that the probability of rigidity does not depend on the education level of the household head. Although the education coefficients are statistically insignificant, their signs suggest that the probability of rigidity is lowest when the household head has a college education or other graduate-level degrees. We also find that being married reduces the probability of rigidity by around 3.5 percentage points. The age of the household head does not have a statistically significant effect on the probability of rigidity.

Although we do not report the regression outcomes for the regional/locational dummies, we think that it is worthwhile to comment on the estimates. Note that we only observe regions at the NUTS1 level [see Footnote (17)] and the location of the unit as urban versus rural. We do not observe the exact city/jurisdiction size. However, we observe a sharp geographical pattern in the data: the incidence of nominal rigidity in housing rents is smaller in developed areas—i.e., the regions containing the large metropolitan areas in Turkey such as Istanbul, Ankara, and Izmir—than less developed areas. Moreover, we find that the incidence of rigidity is lower in urban areas than rural areas. Region-level indicators are important in the analysis of rental markets. In the context of our analysis, regional variation in the tightness of the rental market—where tightness is defined as the number of available rental units divided by the number of households actively seeking rental units—might be an important factor determining the degree of nominal rigidity in rents. For example, some regions (such as Istanbul, Mediterranean area, Aegean area, etc) are subject to a large volume of immigration, which can increase the demand for rental units and tighten the rental market.[18] Unfortunately, we do not have indicators to measure rental market tightness directly, as this requires a different type of data. Still, we believe that region and location dummies can, to some extent, capture

[18]Theoretically speaking, supply will also respond in this case. However, changes in housing supply is a longer-term phenomenon. Given that our analysis captures a time interval of four years, it is reasonable to think that housing supply is approximately fixed in this argument.

the regional differences in rental market tightness. Our results suggest that the incidence of rigidity is lower in tighter rental markets, i.e., in more developed regions and in urban areas. We perform our regressions both with and without region/location dummies; in both cases, the coefficients for unit characteristics have no explanatory power. This suggests that our estimates that rigidity is lower in more developed urban areas is potentially due to differences in rental market tightness rather than regional differences in unit characteristics.

Overall, the main messages that this regression communicates are as follows. When the income level is high—either measured directly or proxied by employment status and education—we see that the probability of rigidity is low. This might mean that high-income households have higher opportunity costs and, therefore, they are more willing to stay in the same unit in case of a positive rent shock, rather than seeking a replacement. We will complement these arguments with the analysis presented below.

4.2.2 Turnover Status

The turnover status deserves special attention, since it is a critical determinant of nominal rigidity in housing rents. Our descriptive analysis in Section 3 reveals that the incidence of rigidity among nonturnover units is more than twice of the incidence among turnover units. Then, the critical question is: what explains turnover behavior? We construct a dummy variable "turnover" taking 1 if the unit has changed tenants and 0 otherwise. We then perform a probit regression similar to the one described above. Table (11) documents the marginal effects.

We find that a 10 percent increase in the yearly income of the household head reduces turnover probability by 2.3 percentage points. We also show that the only significant employment status dummy is the one for "employed" and it suggests that units with an employed household head are 6.5 percent less likely to change units. For education, although the dummy variable for high-school graduation is statistically significant, we do not see any systematic relationship between turnover behavior and the education level of the household head. We also find that the turnover probability declines with the age of the household head. In particular, increasing

Dependent variable: Turnover			
Year dummies	Yes	Yes	Yes
Unit size dummies	Yes	Yes	Yes
Building type dummies	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes
Location dummy	Yes	Yes	Yes
Family Variables			
Married	-0.039*	-0.048**	-0.038*
	(0.020)	(0.022)	(0.021)
# of HH members	-0.014*	-0.014*	-0.009
	(0.008)	(0.008)	(0.008)
Age (of HH head)	-0.0011*	-0.0011***	-0.0010***
	(0.0006)	(0.0005)	(0.0005)
$Age^2/100$	0.0004	0.0004	0.0005
	(0.0011)	(0.0012)	(0.0011)
Log income	-0.0023***	–	–
	(0.0008)		
Employment Status			
NILF	–	omitted	–
Unemployed	–	-0.027	–
		(0.041)	
Employed	–	-0.065***	–
		(0.023)	
Education			
No degree	–	–	omitted
Primary school	–	–	0.022
			(0.035)
Secondary school	–	–	0.049
			(0.039)
High school	–	–	0.081*
			(0.044)
Voc. high school	–	–	0.031
			(0.039)
College & above	–	–	0.021
			(0.038)
N	3,403	3,403	3,403

Table 11: Turnover, individual-level determinants: probit regression, marginal effects.

the age of the household head by 1 year reduces the probability of turnover by around 1.1 percentage points.[19] Unlike our results for the rigidity probability, we find that the region and location of the rental units do not have a statistically significant effect on the incidence of turnover.

Thinking together with our results in Section 4.2.1, we find that high income and employment

[19]There are several papers in the literature arguing that housing mobility is higher for younger individuals and the turnover probability goes down with age. For example, Halket and Vasudev (2013) show that the incidence of turnover goes down as life-cycle income and family size uncertainties are resolved. Smith, Rayer, Smith, Wang, and Zeng (2012) document that disability rates increase with age and this leads to a reduction in turnover probability at old ages. There are other papers showing that this tendency may exhibit cross-country variation. For example, Banks, Blundell, Oldfield, and Smith (2010) find that, in the United States, the turnover probability might be high at old ages due to desire to be closer to children/grandchildren, to live in a warmer winter climate, or to reduce the cost of living, while in the United Kingdom housing turnover is quite low for older people.

reduces both the turnover probability and the probability of rigidity among the nonturnover units. This seems contradictory, but the "opportunity cost" argument explains these estimates jointly; that is, high-income households have higher opportunity costs and, thus, they tend to exhibit nonturnover behavior and once they choose to stay in the unit that they currently live, they are more likely to adjust their rents on a yearly basis.

5 Concluding Remarks

In this paper, we examine the degree of nominal rigidity in housing rents using data from the Turkish Income and Living Conditions Longitudinal Survey between 2008 and 2011. We document that the degree of nominal rigidity in rents is significant. Specifically, we find that, on average, 31.5 percent of the rents in Turkey do not change on a yearly basis. Although the tendency for inflation indexation is expected to be strong in Turkey due to the hyperinflation experience in the near history, it is interesting to observe that nearly one third of the rents remain unchanged from year to year. This is comparable to the estimates reported for the US, which is 29 percent.

Although the existing research on the extent of rent rigidity is informative, the mechanisms offered in this literature to explain rigid rents are not equally clear. One of the innovative features of this paper is that we utilize the micro-level details offered in our dataset to understand the behavioral foundations of rigid rents. Specifically, we document that high-income households are less likely to change units frequently. On the other hand, when they choose not to change units, they are less likely to have rigid rents. This mechanism suggests that search and moving costs impose frictions that amplify the opportunity costs of high-income tenants; thus, they are more likely to agree on reasonable rent increases each year for the purpose of saving time and reducing emotional stress. Additional empirical research is needed to test the existing hypotheses and propose new ones.

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