Here Lives a Wealthy Man: Price Rigidity and Predictability in Luxury Housing Markets*

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Revised: April 28, 2018

Key Words: Housing market, luxury housing, housing demand, price rigidity, sticky prices, predictability, Veblen effect

JEL Codes: E31, E32, R21, G14, D12

* We thank the participants of the annual conference of Leibniz Network on Real Estate and Capital Markets, at ZEW, Mannheim, the American Real Estate and Urban Economics Association (AREUEA) annual international conference in Jerusalem, the Israeli Economic Association annual conference, the seminar at the Taub Center for Social Policy Studies in Israel, and the seminar at the Université libre de Bruxelles, for comments and discussions. We are particularly grateful to the discussant at the AREUEA conference Jonathan Halket for constructive thoughts and suggestions, and to John Duca and Dean Gatzlaff, for helpful comments. All errors are ours.

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Abstract

We use novel and unique data to study the effect of price changes in the market for luxury and middle class homes. We find that luxury home sales respond less to price changes than the middle-class home sales; in the market for luxury homes, past prices affect current prices; luxury home prices persist; and prices of luxury homes are stickier than prices of middle-class homes. Recent macroeconomic models predict that housing markets can have counter-cyclical effect, if home prices are flexible. Our findings imply that home prices, especially luxury home prices, may not be flexible enough to generate such effect.

"If I were a rich man…
I'd build a big tall house with rooms by the dozen,
right in the middle of the town,
A fine tin roof with real wooden floors below.
There would be one long staircase just going up,
and one even longer coming down,
And one more leading nowhere, just for show…
I'd fill my yard with chicks and turkeys and geese,
And ducks for the town to see and hear,
Squawking just as noisily as they can.
And each agay and ago and aga and aca,
Will land like a trumpet on the ear,
As if to say, here lives a wealthy man."
(Our emphasis)

"If I Were a Rich Man," ***Fiddler on the Roof*** **(1964)**[1]

1. Introduction

Residential housing sector has a significant effect on the macroeconomy. For example, fixed residential investment comprises between 4%–6% of the US GDP.[2] The figures for other developed economies are similar or even higher. Furthermore, theoretical and empirical studies find that booms and busts in the housing market play an important role in the business cycle (Mishkin et al. 1977, Bernanke 1983, Muellbauer and Murphy 1997, Barsky, et al. 2007, Muellbauer 2012, and Davis and Nieuwerburgh 2015). To emphasize the central role of housing in the US business cycle, Leamer (2014) even titled his paper "Housing Really Is the Business Cycle," which is a revision of the title of Leamer (2008), "Housing Is the Business Cycle."

Fluctuations in housing markets are likely affected by price rigidity, as there is empirical evidence of housing markets' price rigidity and predictability (Case and Shiller 1989, Genesove and Mayer 2001, Genesove 2003, Larsen and Weum 2008). There is also a large literature on segmentation in the housing market, suggesting that different segments of the housing markets respond differently to demand shocks (Piazzesi et al., 2015, Davis and Nieuwerburgh 2015). However, to the best of our knowledge, there are no papers that focus on differences in the price rigidity across the different segments of the housing market.

In this paper, we address this gap in the literature by empirically studying the variation in price rigidity and in predictability between luxury and middle-class housing markets. We study a market for new housing using a unique dataset that includes information for 130 new housing projects that were built during 1995–2005 by 84 different developers. A unique aspect of the data is that they contain the *actual purchase*

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[1] Source: www.youtube.com/watch?v=RBHZFYpQ6nc (accessed April 28, 2018).

[2] Source: Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/A011RE1A156NBEA (accessed April 28, 2018)

prices and the *actual construction costs*, for 8,141 luxury and middle-class housing units included in these projects.

We report four findings. First, we find that for middle-class homes, price cuts tend to increase the sales volume and price rises decrease the sales volume. In the market for luxury homes, however, although price cuts make the homes more affordable, they do not increase the sales volume. Similarly, although price rises make the luxury homes less affordable, they do not reduce the sales volume.

Second, we find that in the market for luxury homes, but not in the market for middle-class homes, price increases (decreases) have a positive (negative) effect on the prices.

Third, analyzing the likelihood of future price changes, we find that in the market for middle-class homes, price changes have little predictive power for future price changes. If anything, price decreases are often followed by price increases. In the market for luxury homes, however, price decreases reduce the likelihood of future price increases, and price increases reduce the likelihood of future price decreases.

Fourth, we show that these effects lead to greater price rigidity in the luxury housing markets than in the market for non-luxury homes.

The findings that in the market for luxury homes, (1) price increases reduce the probability of future price decreases, and (2) price decreases reduce the probability of future price increases, indicate that luxury home prices exhibit statistically significant predictability (Case and Shiller, 1989). Thus, our results suggest that predictability in home prices is related to price levels.

Barsky et al. (2007) emphasize the importance of assessing the extent of price rigidity in durable goods markets, noting that much of the existing empirical evidence on price rigidity comes from non-durable goods markets.[3] Indeed, in their model, housing markets can have a counter cyclical effect on the economy, if home prices are more flexible than non-durable goods' prices. Our findings, however, suggest that home prices, especially in expensive neighborhoods, might not be flexible enough to generate such an effect on the macroeconomy.

We proceed as follows. In section 2, we discuss differences between the markets for luxury and non-luxury homes. In section 3, we describe the data and discuss measurement issues. In section 4, we present the empirical findings. In section 5, we

[3] For surveys, see for example, Taylor (1999), Wolman (2007), Klenow and Malin (2010), and Taylor (2016).

discuss and rule out alternative explanations. We conclude in section 6.

2. The markets for luxury vs. non-luxury homes

There are several reasons to expect differences in buyers' price sensitivity between the market for luxury and non-luxury homes. First, home prices are a good indicator of the socio-economic status of the homeowners as well as their neighbors. Second, home prices reflect the quality of nearby public goods and services such as schools, roads, etc. (Hayes et al. 1998, Downes and Zabel 2001, Mayers 2004, Chay and Greenstone 2005). Third, home prices often signal the effect that the neighborhoods have on job opportunities and children success (Brook-Gunn et al. 1993, Levitt and Vakatesh 2001). Fourth, studies in psychology suggest that people tend to embed their possessions in their self-image, and owning an expensive home can have a positive effect on one's self-image and life-satisfaction (McFarland and Buehler 1995). Fifth, high home prices are indicative of the property's exclusivity.[4]

Finally, a *Veblen* effect (Veblen 1899, Leibenstein 1950, Bagwell and Bernheim 1996, Corneo and Jeanne 1997) is likely present in the housing market. Veblen (or *conspicuous*) goods are goods that are bought partly because they signal the buyers' socio-economic status. Consequently, prices not only measure the value of a Veblen good, they are also one of the attributes that determine the consumers' reservation prices

[4] A good example of the importance of exclusivity for the price of a home is a recent experience of a developer of a Tel-Aviv luxury apartment complex. According to a recent report by the Israeli financial daily, *Globes*, "A NIS 150 million Tel Aviv penthouse with a sea view in a Bauhaus building with NIS 5–10 million apartments has remained unsold for five years." TVM Premium realtor Shlomi Ben Ishai, an expert in marketing luxury apartments, offered an explanation for the developer's failure to sell the penthouse: "Someone buying a penthouse for NIS 70 million or NIS 50 million doesn't want to live in the same building as people who bought an apartment for NIS 5–10 million. They want to live among people like them." Source: Shlomit Tsur, "Billionaires want billionaire neighbors," *Globes*, March 20, 2017, www.globes.co.il/en/article-billionaires-want-billionaire-neighbors-1001181577 (accessed April 28, 2018).

(Ali Sahalia et al. 2004, Mandel 2009, Moav and Neeman 2012, Oosterlinck 2016).[5] Because homes convey a signal about wealth, it is likely that expensive homes are Veblen goods (Hayes et al., 1988). I.e. it is likely that consumers that buy expensive homes are also concerned about the signal they convey by buying a home in that particular neighborhood and for that particular price.

It may be expected, therefore, that consumers will be willing to pay more for a home located in an expensive neighborhood than for a similar home at a neighborhood with lower prices, ceteris paribus. Recent empirical evidence supports this prediction. For example, Piazzesi et al. (2015) find that in each market segment, consumers are willing to pay higher prices for houses located in neighborhoods where most houses are too expensive for them.

For these reasons, we expect that consumers considering a home purchase will be sensitive to signals about the neighborhoods' quality and about the signal, that homeownership in that neighborhood conveys. Moreover, this effect is likely to be stronger in markets for luxury housing since living in an expensive community has a greater conspicuous value in comparison to a middle- or low-class community. In addition, demand for luxury goods typically increases with income, and thus high-income homebuyers are often willing to spend a larger proportion of their income on luxury goods in comparison to middle- or low-income homebuyers (McFarland and Buehler 1995, Vikander 2015).

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[5] The effect of Veblen goods can be quite strong, so much so that some countries impose constraints on conspicuous consumption because of the harm it causes to the poor. Moav and Neeman (2012), for example, discuss how Tajikistan's President has banned gold teeth and large birthday parties, and limited the number of guests invited, as well as the amount of food served at weddings, etc., arguing that wealthy citizens are showing off their wealth, an act that is imitated by the poor who cannot really afford these luxuries. A similar measure was enacted recently in India in an effort to impose a limit on the lavish weddings, which often include days-long celebration, ornate invitations, finery-covered elephants, and gold-adorned bride. According to the February 23, 2017 *New York Times* report by A. Venkataraman and N. Najar ("Here Comes the Bride. Now Count the Rest," New York Edition, p. A4), the Secretary of the Consumer Affairs Department of Jammu and Kashmir State, on February 20, 2017 issued the *Guest Control Order* (Order Number 39-FCS&CA of 2017) which starting April 1, 2017, restricts the number of guests invited to 400–500, and the number of dishes served to 14 (7 vegetarian and 7 non-vegetarian). The order also limits the number of guests that can attend an engagement party to 100. According to the order, penalties will be imposed on violators. The full text of the order is available at http://jkcapd.nic.in/go39(2017).pdf (accessed on March 21, 2017). See also, "No More Big Fat Weddings for Kashmir: Government Limits Number of Guests and Food Served," *Times Delhi*, March 21, 2017 (www.timesdelhi.com/2017/02/21/no-more-big-fat-weddings-for-kashmir-govt-limits-number-of-guests-and-food-served/, accessed on March 21, 2017). These kinds of restrictions, however, are not new, and they go at least as far back as the ancient Greece, where the lawmakers passed sumptuary laws directed particularly against ostentatious displays at funerals and in female dress (Blok, 2013). According to Fine (1983, p. 104), the Greek lawmakers' primary goal was to prevent rival families from ruining themselves by a competition in conspicuous spending. The rulers of Roman Empire also enacted a series of sumptuary laws (*Sumtuariae Leges)* between 182 BC and 18 BC to put a cap on the Roman aristocracy's conspicuous consumption (Dari-Mattiacci and Plisecka 2010). For example, *lex Orchia* of 182 limited the number of guests at a banquet, *lex Fannia* of 161 limited the amount of money spent on a banquet, forbade the serving of fattened hens, etc. (Wyetzner 2002). See also: http://penelope.uchicago.edu/Thayer/e/roman/texts/secondary/smigra*/sumtuariae_leges.html (accessed on April 28, 2018).

3. Data and measurement issues

3.1. Data

We use home price and cost data collected in Israel during 1995–2005. A unique aspect of the data is that they contain *actual purchase prices* and *actual construction costs*. During 1995–2000, the Israeli real per capita GDP grew annually, on average, at about 2.7%. During 2000–2003, the per capita GDP declined annually, on average, by about 1.7%, timewise coinciding with the burst of the US high tech bubble. The growth figures returned to the pre-recession level in 2004–2005. See Figure 1.

The number of housing starts dropped from about 70,000 in 1995 to about 30,000 in 2001, primarily because of a decrease in the number of immigrants.[6] The annual number of housing starts remained stable at about 30,000 during 2001–2005.

From 1995 to 1999, the annual inflation rate was 8.2%, and it decreased to 1.6% in 2000–2005. During 1995–1999, housing prices increased at an annual rate of almost 7%, but decreased at an annual average rate of 2% during 2000–2005. See Figure 2.

Thus, unlike many OECD countries that experienced a housing boom in the early 2000s (e.g., Duca et al. 2010, Muellbauer 2012), in Israel the housing prices declined, in real terms, through most of the period. This was partly the result of the economic slowdown, and partly the result of the Bank of Israel's tight monetary policy. During 1995–2000, the Bank of Israel's benchmark interest rate was between 10%–17%. After 2000, the rate was gradually lowered, reaching 4% at the end of 2001, when it was raised again following the hike in inflation, and then lowered again. See Figure 3.

Our data come from reports of real estate appraisers who monitored housing projects in Israel during 1995–2005, and produced monthly reports for the lending-banks.[7] Each report contains two sections. The first gives information about the attributes, the transaction dates, and the transaction prices (in New Israeli Shekel, NIS) of the housing-units already sold.[8] The second section contains information about the identity of the developer and the lending banks, the project's location, the date when the construction began, the original and the current expected dates of completion, the total number of

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[6] Following the collapse of the USSR, the average annual number of immigrants to Israel during 1990–1994 was over 124,000. It dropped to below 70,000 during 1995–1999. It went further down to about 34,000 in 2000–2005.

[7] The banks use the reports to follow the progress of each project and make decisions about the credit line they extend to the developers. Because these accounts often involve large amounts of money, banks work only with the appraisers that they individually approve. Consequently, although the appraisers are paid by the developers, their assessments tend to be conservative because an appraiser that overvalues a project risks a dismissal by the banks.

[8] During the 1995–2005 period, the US dollar exchange rate varied between NIS 3.042–4.939 per $1 US, averaging NIS 4.09. Source: www.boi.org.il/en/DataAndStatistics/Pages/MainPage.aspx?Level=2&Sid=10&SubjectType=1 (accessed April 28, 2018).

housing-units in the project, the amount of equity invested by the developer, and some general remarks and notes.[9] It also contains information about the initial estimates of the advertisement costs, the initial and current estimates of the profits, and the initial and current estimates of the financial costs as well as total costs.[10]

We use the final report that was available at the time we collected the data. We do not have data, therefore, on all the housing-units sold in all the projects, because some of the projects were under construction when we collected the data. In addition, banks stop monitoring projects if a developer completes the construction work and repays the loan. Thus, if a developer repaid his/her debt and completed all the construction work before he/she finished selling all the housing-units, we do not have data on the final sales.[11] In total, we have data on 8,141 housing-units sold in 130 housing projects constructed by 84 developers in different regions of Israel.

Table 1 reports summary statistics on the housing projects, their location, and the units sold. An average project has 92 units/apartments, and costs NIS 63,500,000 to build. The average equity-to-investment ratio is 14%. The average profit is NIS 5,334,000, which is about 12% of the average total investment. 23% of the projects in the dataset (30 out of 130) are in Tel-Aviv and its suburbs (Gush-Dan), and 36.5% in the Sharon and Center regions (see Figure 4). The average housing-unit had 4.1 rooms, and was sold for NIS 739,086. The average price for a 4-room housing-unit was the highest in Tel-Aviv (NIS 1,018,682) and the lowest in the northern Israel (NIS 423,884).[12]

According to the national-level data that Israel's *Central Bureau of Statistics* (CBS) reports for the period covered by our data-sample, 24% of the new housing starts were in Tel-Aviv metro area, and 40% in the Center and Sharon areas. Also, according to the CBS, the average number of rooms was 4, and the average prices of a 4-room housing-

[9] General remarks and notes may contain details about special features of the project. For example, they might mention that the likely buyers are ultra-religious Jews or older/retired people, etc.

[10] The reports also include warnings and notifications. For example, the appraisers might include a note alerting that the sales volume is below/above expectations or that housing-units are being sold at prices that fall below/above the expected prices. Warnings might also appear if a developer is credit constrained, if he has difficulties completing the project on time, or if there are some new unexpected costs. Unexpected cost changes might be a result of, for example, an entrepreneur's decision to add facilities such as elevators or air-conditioners.

[11] For example, a manager at a construction firm told us that the hardest to sell apartments are those located right above the garbage disposal facilities. According to the manager, when his firm sells all other units in the project, they usually dissolve the sales force, repay the loan, and publish ads in newspapers until a buyer is found.

[12] In Israel, the most common size of housing is 4-rooms: more than 40% of all housing starts in 1995–2005 had 4-rooms. In Supplementary Appendix A, we show that the distribution of the number of rooms in our sample is quite similar to the distribution of the number of rooms in all the housing start projects, as reported by the CBS for the entire Israel, although there is a higher share of small apartments in our sample. Note also that in Israel, living rooms count as one of the rooms. Thus, a 4-room apartment has 3-bedrooms and a living room.

unit in Tel Aviv and northern Israel were NIS 1,109,000 and NIS 420,052, respectively.[13] We believe, therefore, that our sample is reasonably representative of the housing-units sold in Israel during the period our study covers.

3.2 Definition and measurement of key variables

For the empirical analyses, we define three variables. The first is the *time spell between successive sales*, which is the number of days between successive sales in a project. For example, if three housing-units in a project were sold on April 14, 1995, April 30, 1995, and May 21, 1995, then the time spell between the first two sales is 16 days, and between the second and the third, 21 days. Ceteris paribus, a long time-spell between successive sales suggests that the demand for housing in the project is low.

Figure 5 depicts the distribution of the time spell between sales. Panel (a) of the figure depicts the distribution when we use all observations. As the figure indicates, most time spells between sales are relatively short: the median time spell is 4 days, the 90th percentile is 35 days and the 98th percentile is 98 days. For the analyses reported below, we remove 151 outlier observations, those with time spell between sales that exceeds 100 days.[14] Panel (b) depicts the distribution of the time spell between sales after excluding the outliers. The average time spell between two successive sales, after removing the outliers, is 10.8 days with a standard deviation of 16.51 days.

The second variable is the *time spell between price changes*. Our goal is to capture changes in the price of an average housing unit in each project, and for that we need a procedure that will minimize the noise that could be introduced by unobservable characteristics such as the apartment's view, exposure to the sun, distance from the neighbors, buyers' and sellers' negotiation skills, etc.

We therefore do not define as a price change every case of discrepancy between transaction prices of two housing units with similar attributes sold in succession in a project. Instead, we suggest the following recursive procedure to define a price change. We take advantage of the fact that in each project, the housing units are divided according to their types.[15] We categorize housing units as identical if they have the same observed attributes, and the developer classifies them as having the same price. Any

[13] Source: www.cbs.gov.il/publications/build2007/pdf/t77.pdf (accessed April 28, 2018).
[14] The 151 outliers comprise less than 2% of the total sample. Nevertheless, to test for robustness, we re-estimate all the regressions using the full sample. The estimation results, which are included in Supplementary Appendix B, are qualitatively similar to the results we report below.
[15] An example is a project where the developer offers 10 3-room apartments, 60 4-room apartments, 10 4-room apartments with large balconies, 8 5-room apartments, and 2 penthouses.

unobserved heterogeneity still left between the homes that we identify as identical, is therefore minimal (Halket et al., 2015).

For each type of housing unit in a project, we define the price of the first unit of a given type that is sold, as the *baseline price* for that type of housing in that project. We then track the sale prices of each unit of that type. We say that the price has increased (decreased) if we observe that two housing units of the same type were sold successively at a price that was higher (lower) by 5% or more than the baseline. We then treat the price of the second of the two housing units as the baseline price and repeat the process.[16]

Following this definition, we find that there are 755 price changes in the data, 450 positive, and 305 negative. Figure 6 depicts the distribution of the time-spell between price changes. The shortest time-spell between price changes is 0 and the longest 1,809 days. On average, prices change every 238.8 days. The median time spell between price changes is 157 days. For the analyses presented below, we remove two outliers with time spell between price changes that exceeds 1,200 days.[17]

Consistent with menu costs models,[18] the time spell between price changes depends on inflation. During 1995–1999, when the average annual inflation was 8.2%, price changes occurred every 181 days, on average. However, in 2000–2005, when the annual inflation rate was less than 2%, price changes occurred every 259 days, on average.

As argued above, time spells between price changes may vary between luxury homes and less expensive homes. We therefore define a project with an average home price exceeding NIS 1,000,000 (about $250,000) as a *luxury project*, and a project with an average home price below NIS 1,000,000 as a *middle-class project*.[19] For the

[16] For example, suppose that the prices of 9 housing units with similar attributes that were sold in succession in a project are NIS 810,000, NIS 850,700, NIS 810,500, NIS 830,000, NIS 860,000, NIS 850,500, NIS 830,000, NIS 800,000, and NIS 790,000. We say that the price has increased on the fifth sale because both 860,000 and 850,500 exceed the baseline price of 810,000 by at least 5%. Next, treating NIS 850,500 as the new baseline price, we say that the next price change occurs on the ninth sale because both 800,000 and 790,000 are smaller than 850,500 by more than 5%. We use the threshold of 5% because we learned from the real estate appraisers that they tend to interpret price changes of 5% or more as an indicator of a change in the housing *price level*. Our main results, however, are robust to varying the cutoff point within 3%–7% range. We choose to treat the second price rather than the first as the new baseline price, because the market participants (buyers, sellers, and appraisers) are more likely to notice that a price level has changed after they observe a number of successive transactions at new prices.

[17] For robustness, we re-estimated all the regressions using the full sample and report the results in Supplementary Appendix B. Our main results are qualitatively unaffected.

[18] See, for example, Sheshinski and Weiss (1977), Cecchetti (1986), Lach and Tsiddon (1992), Eden (2001), Konieczny and Skrzypacz (2005), Fisher and Konieczny (2006), Knotek (2008), and Gagnon (2009).

[19] We believe that it is reasonable to define non-luxury homes in our sample as middle-class homes because households with incomes below the middle-class were unlikely to buy them. For example, the number of average monthly salaries that are required to buy the apartments in our sample with prices below NIS 1,000,000 is 86 on average. Compare it to about 44 average monthly salaries that were required to buy a housing unit in the UK in 1997 and about 30 in the US in 2000 (which roughly corresponds to the same period as our data sample period). See: www.theguardian.com/money/2017/mar/17/average-house-price-times-annual-salary-official-figures-ons, and

econometric models that we estimate below, we define a dummy for *luxury projects*, which equals 1 if the home is in a luxury project and 0 otherwise. In our data, 20% of the homes belong to luxury projects.

When calculating the price level in a project, we use the initially expected prices, rather than the ex-post prices because we want to focus on projects that were built for the luxury market. We use the average price of housing units in each project rather than the prices of individual homes because in a project targeting the middle-class homebuyers, expensive housing units can serve as a signal: in some projects, developers offer housing units with high prices (triplex, penthouses, etc.) to attract middle-class homebuyers to other housing units in the projects.[20] We, however, want to focus on cases where all the housing units are offered to relatively well-off consumers, to differentiate between projects targeting the middle-class buyers and those that target well-off buyers.

4. Econometric model and estimation results

We present four sets of results. First, we offer evidence on the effect of prices on the demand for luxury and middle-class homes, by estimating a hazard model of the time spell between successive sales. Second, using a hedonic regression of prices, we estimate the effect of price increases and decreases on future prices. Third, we analyze the effect of price increases and decreases on the time spell between price changes for luxury and middle-class housing units. Fourth, we present evidence showing that there is greater price rigidity in the market for luxury homes than in the market for non-luxury homes.

4.1 Hazard model of the time spell between successive sales

We argue above that the buyers' price sensitivity is likely to differ between the market for luxury and non-luxury homes. Following this, we hypothesize that consumers that buy luxury homes are more attentive to signals about the projects' quality than consumers that buy middle class homes. Further, we argue that one easily observed signal is price changes: Price decreases (increases) that signal that the quality is lower (higher) than initially expected might have a negative (positive) effect on the demand for luxury homes. In the market for middle-class homes, however, where the effects of quality on

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www.mybudget360.com/the-magical-2-housing-ratio-between-median-nationwide-home-prices-and-household-income/ (both accessed April 28, 2018).

[20] This is a familiar phenomenon in other durable goods' markets. For example, studies have shown that car manufacturers with superior brand names (e.g., *Ferrari*) extend their halo across every model of vehicle within the brand (*Fiat*, in this case). See, for example, Hirsh et al. (2003).

the demand are not as strong, the effects of the signals are likely to be weaker.

To test this hypothesis, we estimate a hazard function by formulating an accelerated failure time model, where the dependent variable is the *time spell between successive sales*. We would like to avoid imposing on the data assumptions about the effect of the time spell since the last sale, on the likelihood of a sale. We therefore estimate a semi–parametric Cox model, where the coefficient estimates capture the effect of the RHS variables on the probability that a housing unit will be sold, given that a certain amount of time has elapsed since the last sale. A positive (negative) coefficient indicates that the variable has a positive (negative) effect on the likelihood of a sale and, therefore, shortens (lengthens) the expected time spell between sales.

We employ four sets of control variables. The first set of variables captures the differences between the market for luxury and middle-class homes. We expect that if the luxury homebuyers are more attentive to quality signals, then negative (positive) signals about a project's luxury will have a negative (positive) effect on the sales volume. As a proxy for signals about projects' luxury, we use the log of the *number of previous price increases* and the log of the *number of previous price decreases* prior to each sale in a given project.[21, 22]

To identify price increases and price decreases, we follow the definition of price changes, as discussed above. To differentiate between the effects of price increases (decreases) on the demand for middle-class and luxury homes, we include in the regression interaction terms between the log of the *number of previous price increases* (*decreases*) and a dummy for *luxury projects*. In this setting, the main effects capture the influence of the number of previous price increases (decreases) on the demand for middle-class homes. The interaction terms capture the differences between the effects in the markets for luxury and middle-class homes.

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[21] We use this proxy because homebuyers are more likely to be aware of the price trend than of each individual price change in a project. For example, they could know if there were several consecutive price changes, especially if the changes were in the same direction. Other proxies, e.g., the size of a price change, are difficult to calculate since in most projects there are several types of housing units. Consequently, it might be that there is no change in the price of a certain type of housing unit, yet there could be several other price changes that reflect on the luxury of a project. For example, consider a project with 3-, 4-, and 5-room apartments, and suppose that the price of the 3-room apartments decreases once by 7%, and the price of the 4-room apartments decreases once by 8%. It is unclear in this case how to calculate a single measure of the price changes, or measure their effect on the sales volume of the 5-room apartments. Yet the fact that there are already two price cuts in the project likely reflects on the homebuyers' reservation price of the 5-room apartments.

[22] When the number of previous price increases (decreases) is zero, we set the log of the number of previous price increases (decreases) equal to zero. We use the log of the variables rather than their levels to maintain consistency with the measurement of other continuous variables. In Supplementary Appendix C, we report and discuss the estimation results when we use the levels of the number of previous price increases and decreases rather than their logs. The results are qualitatively unchanged.

As another control for the luxury effect, we include in the regression the log of the *average price per room of previously sold housing units*. This variable captures the effect of the prices paid by other homebuyers on the demand for homes in a project. If prices convey a luxury signal, then it might be expected that homebuyers will be more willing to purchase if other homebuyers in the same project paid relatively high prices.

The second set of RHS variables controls for macroeconomic and local market conditions, and include the log of the *real GDP in the previous quarter*, the average Bank of Israel *interest rate* in the previous quarter, the log of the *number of housing starts in the previous quarter*, the log of the *average price of housing units sold in the region in the previous quarter*, the log of the *average NIS/dollar* exchange rate *in the current quarter*, the log of the *population in the previous quarter*, and the log of the *CPI in the previous month*.[23]

The third set of RHS variables controls for the developers' and the projects' characteristics. It includes a dummy which equals 1 if the developer is *financially constrained* and 0 otherwise, a dummy that equals 1 if the project is *delayed beyond the schedule* and 0 otherwise, a dummy which equals 1 if the developer faces *problems with subcontractors* that breach the contract and 0 otherwise, the log of the initially *expected expenditures on advertisement, marketing and promotion*, the initially *expected profit margin* (calculated as the expected profit divided by the expected costs), the log of the initially *expected financial costs*, the *developer's equity share* (calculated as the developer's equity invested in the project divided by the expected costs), a dummy for a project being a *luxury project*, and the log of the *number of housing units sold in the previous month*.[24]

The fourth set of RHS variables controls for the attributes of the housing units and includes the log of the *number of rooms*, and dummies for *high-ceiling*, *garden*,

[23] The exchange rate is included because in the early years of our sample period, many home prices were quoted in US dollars and thus exchange rate fluctuations had immediate implications for the home prices in the New Israeli Shekels.
[24] We include the initially expected expenditures on advertisement, profits, and financial costs, rather than the current expenditures, to avoid endogeneity. We include the number of housing units sold in the previous month because it is likely that high recent sales' volume sends a positive signal about the quality of the housing offered in the project (Banerjee, 1993). We include controls for developers that cannot complete the project on time and for developers that are financially constrained because any information about such difficulties might deter potential homebuyers. We include the developers' equity shares and the expected profit because they might affect the developers' price setting strategy. Because the financial constraint dummy and the dummy for entrepreneurs that are unable to complete the project on time may also raise endogeneity issues if they affect the entrepreneurs' willingness to sell, we estimated the model without these covariates as well. We report the results in Supplementary Appendix D. The main findings we report are robust to this specification change.

penthouse (penthouse, duplex, triplex),[25] *large balcony, safety room, swimming pool*, *single-family*/*multi-family* residential housing, and whether the project targets *ultra-religious* homebuyers. These variables control for hedonic effects.

We also include dummies for the 9 regions of Israel, for the year in which a housing-unit was sold, and for lending banks.[26]

Table 2 summarizes the estimation results. We focus on the coefficients of the variables of interest. For middle-class housing units, the coefficient of previous price decrease is 0.16, and for previous price increases it is –0.25, both statistically significant. This indicates that in our data, more frequent price cuts decreases the average time spell between home sales, while more frequent price rises increase it. In the market for middle-class homes, therefore, the main effect of price changes is a substitution effect.

For luxury housing, however, the coefficient of the interaction term between luxury projects and the *number of previous price decreases* is negative, –0.10, and marginally statistically significant. Further, the difference between the absolute values of the main effect and the interaction term is not statistically significant $\left(\chi^2 = 1.82,\ p > 0.10\right)$. It therefore seems that whereas price decreases increase the likelihood of sales for middle-class housing units, their effect on the likelihood of sales of luxury housing units is much smaller, if at all.

The coefficient of the interaction term between the *luxury projects* and the *number of previous price increases* is positive, 0.30, and statistically significant, but the difference between the absolute values of the main effect and the interaction term is not statistically significant $\left(\chi^2 = 2.15,\ p > 0.10\right)$.

This suggests that in the market for luxury homes, price changes have two effects. First, as in the market for middle-class housing, there is a substitution effect: price cuts increase the likelihood of sales, and price rises decrease the likelihood of sales. Second, there is a reverse luxury effect, which plays a significant role only in the market for luxury homes. Once luxury home prices decline, homebuyers are less willing to buy them, because the price decreases suggest that the homes are not as luxurious as they

[25] Israeli developers tend to use different language to refer to top-floor apartments. The common terms are penthouse, duplex, and triplex. The differences between them are usually minor and the developers often choose a term to convey luxury rather than to distinguish between different home types. In addition, we have only a small number of observations on housing units that the developers classify as either a duplex or a triplex. We therefore bunch them together into one type, and thus use a single dummy variable to control for that type of housing unit.

[26] The 9 regions of Israel are: Center, Tel-Aviv, Sharon, Krayot-Haifa, North, Jerusalem, Haifa, South and Gush-Dan. See Figure 4. We do not have data on housing projects in Judea and Samaria. To save space, we do not report the values of the coefficients of the dummies for the region, the lending banks, and the years.

were thought to be. For the opposite reason, price increases make the homebuyers more willing to buy them. For both price increases and decreases, it appears that the substitution and the luxury effects cancel each other out, so that the likelihood of sales remains about the same after price changes.

Also consistent with the luxury effect hypothesis, we find that the coefficient of the log of the *average price per room of previously sold housing units* is positive, 0.06, and statistically significant, suggesting that homebuyers are more willing to buy housing units in projects where other homebuyers pay high prices. This is consistent with the hypothesis that the prices of previously bought housing-units serve as a signal that has a positive effect on the likelihood of sales.

Thus, in the market for luxury housing, it appears that price decreases signal a loss of prestige and exclusiveness. Consequently, although price cuts increase the affordability of the housing units, they do not increase the likelihood of sales. Price increases seem to have the opposite effect, so that price increases add to the housing unit's luxury, and thus buyers of luxury home are willing to purchase them even after price increases.

4.2. Hedonic regression of prices

Above we estimate the effect of price changes on housing demand using the time spell between successive sales as a proxy for demand. As another proxy, we employ the prices in the framework of a hedonic GMM regression. The dependent variable is the log of *home prices*.

The variables of interest, as before, are the ones that control for the differences between the effects of price changes on the demand for middle-class and luxury homes. The regression therefore includes the log of the *number of previous price increases,* the log of the *number of previous price decreases*, and their interactions with the *luxury project* dummy. In addition, the regression includes all the control variables that were included in the model estimated in section 4.1. To capture the effects of changes in the projects' finance on prices, we include in the regression the log of the *financial costs at the time the housing unit was sold*.

To reduce the possibility of endogeneity, we include the values available at the beginning of the month in which the housing unit was sold. In addition, we use the following instruments for the variables that might be affected by home prices:[27] the *population growth rate in the previous quarter*, the log of the *dollar LIBID interest rate in the previous month* (London Interbank Bid Rate), the *GDP growth rate in the previous quarter*, the log of the *average exchange rate between the NIS and a basket of foreign currencies in the current* and *previous months*, the log of the *index of the construction costs in Israel in the previous quarter*, the log of the *number of housing units in the project*, and dummies for the lending banks.[28] The instruments satisfy Hansen's *J*-test for over-identification of all the instruments: the *J*-statistic's value is 1.07 $\left(p > 0.10\right)$.[29] The GMM estimation results are reported in Table 3.

The coefficient of the log of the *average price per room of previously sold housing-units* is positive, 0.21, and statistically significant, suggesting that previous prices serve as a signal for the projects' quality. This confirms that there is a cascade effect in housing prices, with new buyers willing to pay more if the previous buyers were willing to pay more (Banerjee 1993, Piazzesi et al. 2015).[30]

The coefficient of previous price increases is negative, –0.32, but statistically insignificant. The coefficient of price decreases is positive, 0.74, and statistically significant. It therefore seems that for middle-class homes, price increases (decreases) usually happen in projects that started with relatively low (high) initial prices. Alternatively, it might be that price increases (decreases) are often followed by price decreases (increases), so that prices tend not to diverge from the initially expected prices.

For luxury housing, the coefficient of the interaction term between *luxury-projects* and *previous price decreases* is negative, –3.23, and statistically significant. The difference between the absolute values of the main effect and the interaction term is statistically significant $\left(\chi^2 = 6.98, p < 0.01\right)$. In addition, the coefficient of the interaction term between *luxury-projects* and *previous price increases* is positive, 1.97, and statistically significant. The difference between the absolute values of the main effect and

[27] We instrument the following variables: whether the *developer is financially constrained*, whether *there are problems with subcontractors* that breach the contract, the *number of previous price increases* and *decreases, the number of housing units sold in the previous month* and whether the *project is delayed beyond schedule*.

[28] The basket of exchange rates is calculated by the Bank of Israel as a weighted average of Deutsche Mark, UK Pound, French Frank, Japanese Yen and US dollar. The Deutsche Mark and the French Frank were replaced by the Euro in 2000. Source: www.boi.org.il/en/Markets/ExchangeRates/Pages/efectinf.aspx (accessed on April 28, 2018). The LIBID is the average of the interest rates at which major London banks borrow from each other.

[29] The values of the first stage *F*-statistics on the excluded instruments are all greater than 15.

[30] Housing advertisements sometimes include the prices of previously sold apartments. Sales personnel seem to be aware of the positive effect that previous prices have on the buyers' willingness to pay. See, for example, www.nytimes.com/2013/05/26/realestate/restoring-a-sag-harbor-eyesore.html?_r=0&adxnnl=1&ref=housing&adxnnlx=1369392961-56GwiEt9iio/rJUImjQwFA (accessed on April 28, 2018).

the interaction term is also statistically significant $\left(\chi^2 = 4.74, p < 0.05\right)$. It appears, therefore, that consumers are willing to pay more for luxury homes if prices in the project have increased in the past, but less if prices in the project have decreased in the past.

These results, along with those of the previous section, suggest that for luxury homes, past price changes carry information beyond the information conveyed by the current market conditions. Price increases signal that the project is even more prestigious and exclusive than initially expected, and thus homebuyers are willing to pay more. Price decreases convey a negative signal and, therefore, homebuyers are willing to pay less.

4.3. Time spell between price changes

The results above suggest that homebuyers are willing to pay more if previous homebuyers paid high prices. In addition, we find evidence suggesting that luxury homes price increases (decreases) convey a positive (negative) signal about the projects' conspicuousness. Thus, it seems that for luxury homes, past price increases (decreases) have a positive (negative) effect on the price and the sales volume.

These results suggest that in the market for luxury homes, the current prices can potentially influence the likelihood of future price changes, and therefore, the likelihood of future price changes can be predicted based on previous price changes: price increases should reduce the likelihood of future price decreases while price decreases should increase the likelihood of future price increases.

To test these hypotheses, we estimate two Cox semi-parametric accelerated failure time models, where the dependent variable is the *time spell between price changes*. The first model estimates the likelihood of price increases, while the second, the likelihood of price decreases.

To capture the luxury effect, we include the same variables as above: log of the *number of previous price increases*, the log of the *number of previous price decreases*, their interactions with the *luxury project* dummy, and the *average price per room of previously sold housing-units.* We also include all the control variables as in the regression of the time spell between sales (section 4.1). The estimation results for the likelihood of price decreases are reported in Table 4, and for the likelihood of price increases in Table 5.

The estimation results indicate that price increases and decreases have different effects on the markets for luxury and middle-class homes. Consider first the regression of the likelihood of price decreases, Table 4. The coefficients of *the number of previous price increases*, 0.11, and *the number of previous price decreases*, 0.06, are both statistically insignificant. Thus, in the market for middle-class homes, it seems that price changes are determined by the fundamentals and consequently, past price changes do not predict future price changes.

However, the coefficient of the interaction term between *luxury projects* and *the number of previous price increases* is negative, –0.70, and statistically significant. The difference between the absolute values of the interaction and the main effect is statistically significant $\left(\chi^2 = 6.30, p < 0.05\right)$. This suggests that when all the variables are set to their mean values, then an increase in the *number of previous price increases* in a project from two to three, is associated with a decrease in the likelihood of a price decrease by about 33% relative to the baseline.

Next, consider the regression of the likelihood of price increases, Table 5. The coefficient of *the number of previous price increases*, –0.20, is statistically insignificant. The coefficient of *the number of previous price decreases*, 0.35, is significant, suggesting that in the market for middle-class homes, price increases often follow price decreases so that prices remain close their initial levels.

At the same time, the interaction term between *luxury projects* and *previous price decreases*, –1.01, is negative and significant. Further, its absolute value is greater than the value of the main effect $\left(\chi^2 = 5.15, p < 0.05\right)$. In the market for luxury homes, therefore, price decreases are associated with a reduction in the likelihood of future price increases. These results suggest that when all the variables are set equal to their mean values, then an increase in the number of price cuts from two to three, reduces the likelihood of price increases by about 20% relative to the baseline.

To summarize, we find again that in the luxury housing market, price changes appear to carry information that is beyond the information captured by other variables: buyers interpret price decreases as signaling a drop in the project's conspicuousness and consequently, prices in the project are not likely to bounce back again. Price increases, on the other hand, are interpreted as a positive signal and, consequently, they reduce the likelihood of future price decreases.

The hypothesis that developers try to avoid price changes and especially price cuts when homes are sold at high prices, is further supported by the finding that the coefficient of log of the *average price per room of previously sold housing units* is negative and significant in both regressions. The negative coefficient in the regression of price increases, –0.30, suggests that when homes are sold at high prices, it is more difficult to increase them further in comparison to the prices of homes that are sold at lower prices, perhaps because only a small set of homebuyers can afford to pay the higher prices.

The negative coefficient in the regression on price decreases, –0.28, cannot, however, be interpreted similarly, because it is unclear why it will be more difficult to lower the prices of expensive housing units than to lower the prices of inexpensive housing units, ceteris paribus. We therefore interpret the results as suggesting that when prices are high, developers try to avoid price cuts even under adverse conditions. That is, they understand that price cuts carry a negative signal with the potential of reducing the homebuyers' reservation prices.

4.4. Price rigidity in the market for luxury homes

The results above suggest that in comparison to middle-class homes prices, luxury home prices might be more rigid. Indeed, we show above that developers have incentive to avoid negative signals associated with price cuts of luxury homes. We also find that price decreases (increases) reduce the likelihood of price hikes (cuts). Together, these findings suggest that there will be fewer price changes in the market for luxury homes than in the market for middle-class homes. To test this hypothesis, we estimate probit regressions of the likelihood of price increases and of the likelihood of price decreases.

The dependent variable in the regression of the price decreases (increases) is a *dummy that equals* 1 *if the price has decreased (increased) in the current transaction and 0 otherwise*. The independent variables are the same as in the regression of the time spell between sales (section 4.1). Here we do not include the controls for the log of the *number of previous of price increases* and the log of the *number of previous price decreases* since these variables might be correlated with the likelihood of future price changes.[31]

Table 6 summarizes the results of the regression of price decreases, and Table 7, the regression of price increases. As may be expected when price decreases (increases) reduce the likelihood of price hikes (cuts), we find that the coefficients of *luxury projects* in both regressions are negative. In the regression of price decreases, the coefficient, –0.31, is statistically significant, implying that if all the independent variables are set equal

[31] In Supplementary Appendix E, we summarize the results of the regressions when we include controls for previous price changes. The main results remain qualitatively unchanged.

to their means, the likelihood of a price change is 1.9% smaller in a project of luxury homes than in a project of middle-class homes. This is a significant decrease, given that when all the variables are set equal to their mean values, the unconditional likelihood of a price decrease is 3.7%.

We also find that the coefficient of *luxury projects* is negative in the regression of price increases. The coefficient, –0.21, is statistically significant, implying that if all the independent variables are set equal to their mean values, the likelihood of a price increase is 1.9% smaller for a project of luxury homes than a project of middle-class homes. When the variables are set equal to their means, the unconditional likelihood of a price increase is 5.5%. Thus, the conditional effect we find is significant, although, relatively, it is slightly less strong than the effect on price decreases.

To summarize these findings, it appears that luxury home developers make fewer price changes than middle-class home developers. This is consistent with the findings that in the market for luxury homes, price increases (decreases) reduce the likelihood of future price cuts (hikes), because they convey a positive (negative) signal.

In the market for luxury homes, therefore, price changes tend to be in the same direction and, consequently, it is less likely that a price increase (decrease) will follow a price decrease (increase) than in the market for middle-class homes, where price changes can happen in both directions. In addition, our findings suggest that luxury home developers are likely to be particularly reluctant to cut prices even when the sales volume is low. This may explain, why in the market for luxury homes, the downward price rigidity is stronger than the upward price rigidity.

5. Ruling out other possible explanations

In this section we discuss five alternative interpretations of our findings and argue why they cannot explain the results in our view. First, the time spell between sales could be affected by the developers' selling strategy. In particular, developers might act to lengthen the time spell between sales if they anticipate price increases. This, however, is not likely during the time-period we study. As discussed above, the credit constraints were quite severe during the sample period. Indeed, according to the Bank of Israel, credit constraint was viewed by Israeli project developers as either the most significant, or the second most significant constraint that they faced.[32] The developers, therefore, had strong incentive to sell as many units as they could, as quickly as possible. That is because according to the contract between the borrowers and the banks, revenues could be used to pay back the loans and, therefore, cutting the time spell between sales would allow them to save on the interest payments. Indeed, at the time, the developers were not allowed to use the revenues until the loan was fully paid back. In addition, the banks lend money to developers via a credit line, and they extend further credit to a developer only if s/he satisfies minimum revenue criteria. During the sample period we study, developers were therefore unlikely to deliberately extend the time spell between sales.

Second, it could be that price changes affect the time spell between sales because they affect the homebuyers' expectations. Under this interpretation, price changes affect the demand because they induce expectations of future price increases and decreases. I.e., generating a positive or a negative frenzy that encourages transactions (Hendry, 1984, Muellbauer and Murphy, 1997). We believe, however, that this interpretation cannot explain our findings.

During the period we study, home prices were relatively stable or even decreasing, and thus it is unlikely that price changes in a single project could affect the expectations about the direction of the change in the *price level* of housing. In addition, we control for the regional home prices, and thus we indirectly control for the homebuyers' expectations about changes in the price level, in regions where the projects are located.

In addition, we find that price changes have substantial effect only in the market for luxury homes. If the price changes would have affected future demand because they affect the homebuyers' expectations, then we should have also observed a similar effect for the middle-class homes. Our results suggest, however, that the effect is significantly stronger in the market for luxury homes than for middle-class homes.

Third, it could be that our hedonic variables do not capture all the attributes of the homes. For example, some of the observed variations in the prices could be because of differences in the unobserved quality rather than in the price level. Recall, however, that we classify homes as belonging to the same type if the developer has classified them in the same price group. Therefore, the differences between homes belonging to the same type are likely to be small, and should not merit a price difference greater than 5%. In

[32] Source: Bank of Israel *Annual Report* 2004, p. 97, www.boi.org.il/en/NewsAndPublications/RegularPublications/Pages/eng_doch04e_1.aspx, and the Bank of Israel Business Survey, 2000–2005, www.boi.org.il/he/Research/RegularReports/Pages/CompeniesSurveys.aspx, in Hebrew, both accessed April 28, 2018.

addition, this effect, if present, would be more important for luxury, high-end housing units, because in the luxury homes' market, the homes are often custom-made to fit the homebuyers' needs and tastes. Therefore, if unobserved heterogeneity is present, it is more likely to be greater in the market for luxury homes than in the market for middle-class homes. The estimation results we report, therefore, are conservative.

Fourth, some of our findings could be driven by the thinness of the luxury home market (e.g., Arnott, 1989). If the market for luxury homes is thinner than the market for middle-class homes, then the developers of luxury homes could have more market power, and hence greater flexibility to adjust prices in comparison to the developers of the middle-class homes. However, this argument cannot explain the correlation between previous price changes and the sales' volume because if developers of luxury homes had greater market power than developers of middle-class homes, than they should have been less affected by past events.

Moreover, reports from the period suggest that at the time, the market for luxury homes was relatively booming, while the market for middle-class homes was stagnating. In relative terms, therefore, it is likely that the market for luxury homes was actually thicker than the market for middle-class homes.[33] Furthermore, the average initially expected financial cost of a luxury project, NIS 79,500,000, were considerably higher than the average initially expected financial costs of a middle-class project, NIS 55,300,000. Therefore, if anything, developers of luxury homes had greater incentive than developers of middle-class homes, to adjust prices in response to changes in market conditions to maximize the sales volume. According to the terms of the contract between developers and the banks, the revenues were used to pay back the loans and, consequently, sales volume could have a significant effect on the financial costs.

Fifth, because most luxury projects in Israel are located in Tel-Aviv area, it might be that our results capture the effect of a project being located in Tel-Aviv, Israel's economic capital, rather than a luxury effect. In Appendix F, we estimate the regressions again after removing observations on homes sold in Tel-Aviv. The results we report remain qualitatively unchanged. We therefore conclude that the effect we report is not an artifact of the luxury homes being located in Tel-Aviv.

[33] See www.nrg.co.il/online/16/ART1/805/264.html, and www.knesset.gov.il/mmm/data/pdf/m01743.pdf (both in Hebrew), both accessed April 28, 2018.

6. Conclusion

Using a unique data on transaction prices and the actual costs of 8,141 new housing-units sold in Israel during 1995–2005, we offer evidence that in luxury housing markets, price changes carry information beyond the information captured by market conditions. Past price hikes increase the homebuyers' demand and past price cuts reduce it. These results hold after controlling for the projects' characteristics, for the attributes of the housing units, and for regional and aggregate market conditions.

These results suggest that in the luxury homes' market, homebuyers often buy homes to signal their socio-economic status, and pay attention to signals about the project's luxury. Consequently, they are willing to pay less for homes after price cuts, because the lower prices reduce the homes' luxury value. Similarly, they are willing to pay more after price hikes, because the higher prices increase the homes' luxury value.

We further find that in the market for luxury housing, price cuts diminish the probability of price increases, while price hikes reduce the likelihood of future price decreases. Furthermore, our results suggest that the consumers' interest in projects' luxury, leads to a decrease in the likelihood of price changes: as prices increase, the developers seem to make fewer price changes. This might be because they try to avoid price cuts, even in the face of unfavorable market conditions because they do not want to send negative signals about the luxury value of their project.

Our findings offer a possible explanation why homebuyers are willing to pay the highest prices for luxury housing units. They may also explain the findings reported in other studies that show that increases in home inventories in luxury housing neighborhoods do not lead to price cuts (Piazzesi et al. 2015). Finally, they may also explain some of the differences found between private sellers selling their own homes, and project developers who sell many homes in new projects and thus must consider the effects of a price cut on the prices of other housing units (Genesove 2003, Caplin and Leahy 2011, Stroebel 2016, Piazzesi et al. 2015).

The findings that in the market for luxury housing (1) price increases reduce the likelihood of future price decreases, and (2) price increases reduce the likelihood of further price increases, suggest that in our data, luxury home prices exhibit statistically significant predictability. Moreover, our interpretation of these results suggests that the consumers' search for luxury can explain, at least partly, this predictability.

The findings on the rigidity of luxury home prices might have a broader relevance.

There is some evidence that a low-end luxury effect might be observed during periods of easy credit, where low-income households purchase homes that are beyond their means, like during the subprime boom in the US prior to 2008 (Duca et al. 2011, Muellbauer 2012).[34] Such luxury effects may explain why markets for durable and semi-durable goods behave differently in recessions and expansions over the business cycle (Case and Shiller 1998, Rajan 1994, Larsen et al. 2008).

Our findings may explain also why in recessions home prices do not always go down enough to clear the markets. Thus, although some models predict that flexible durable goods' markets can significantly reduce the negative effects of business cycles, the homebuyers' search for luxury is likely to lead to price rigidities at least in some segments of the market. These rigidities might be playing a role in propagation of business cycles (Barsky et al. 2007).

[34] This could not be the case in Israel, however. During the period we study, interest rates on 20–30 year mortgages have been high, around 5.50%–6.00%, on average. In addition, the Israeli mortgage market must comply strictly with the tight mortgage standards set by the Bank of Israel. These constraints, combined with high housing prices relative to the incomes earned, and substantial down-payment requirements, usually about 30% of the home price, made home ownership out of reach of most low-income households (Friedman and Ribon 2014, Nagar and Segal 2014).

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Figure 1. GDP and housing starts, 1995–2005

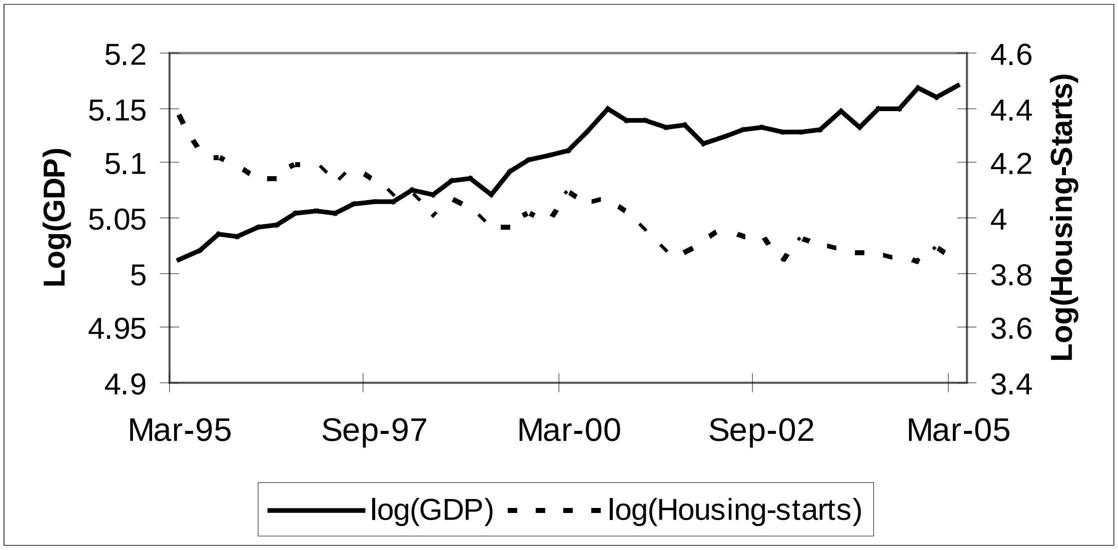


Figure 2. CPI and housing price index, 1995–2005

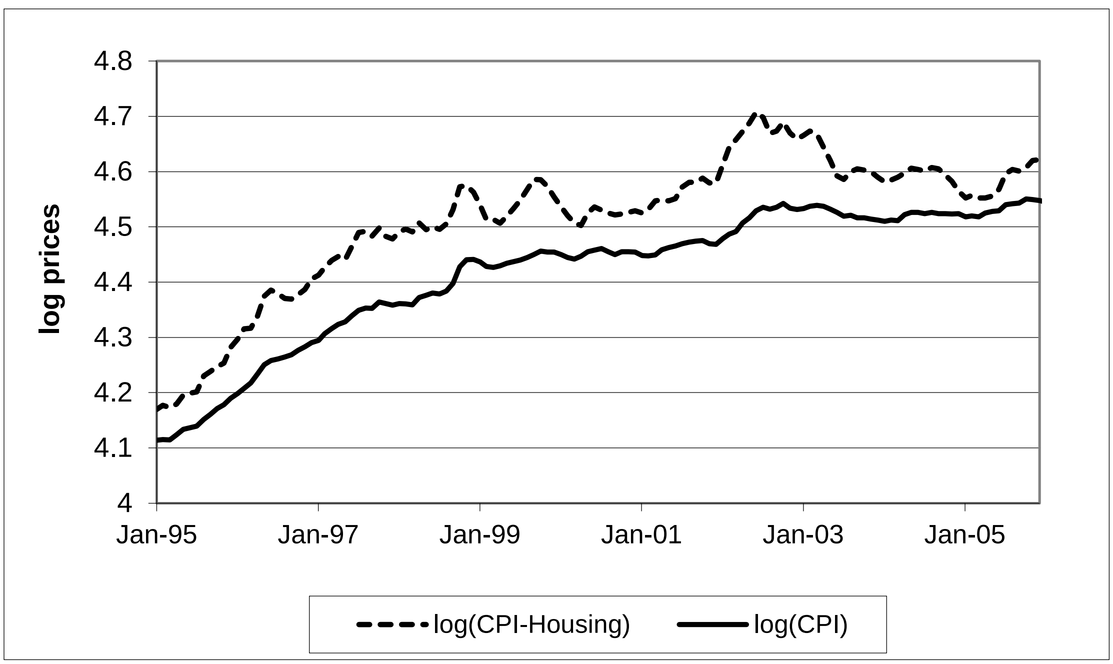


Figure 3. The Bank of Israel's benchmark interest rate

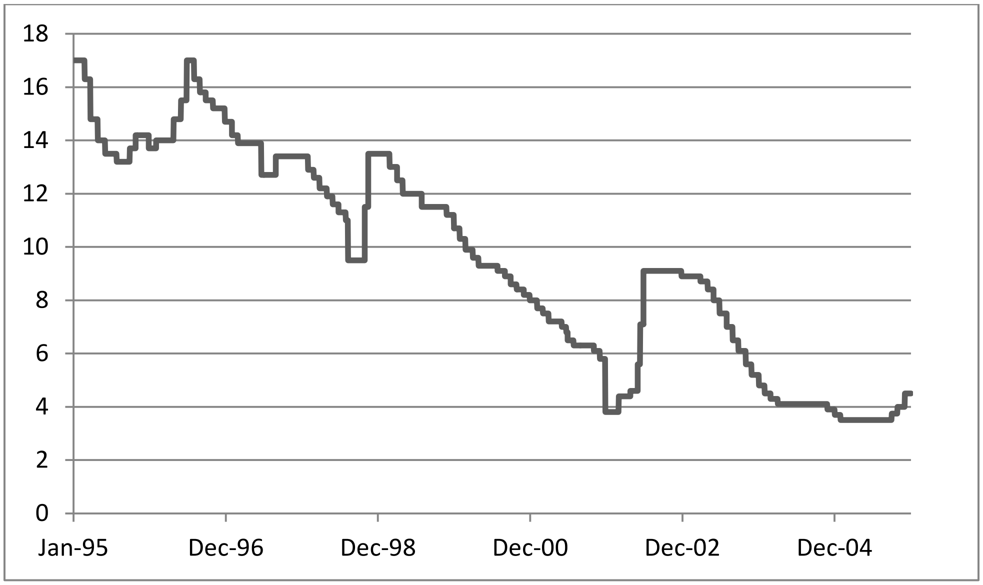
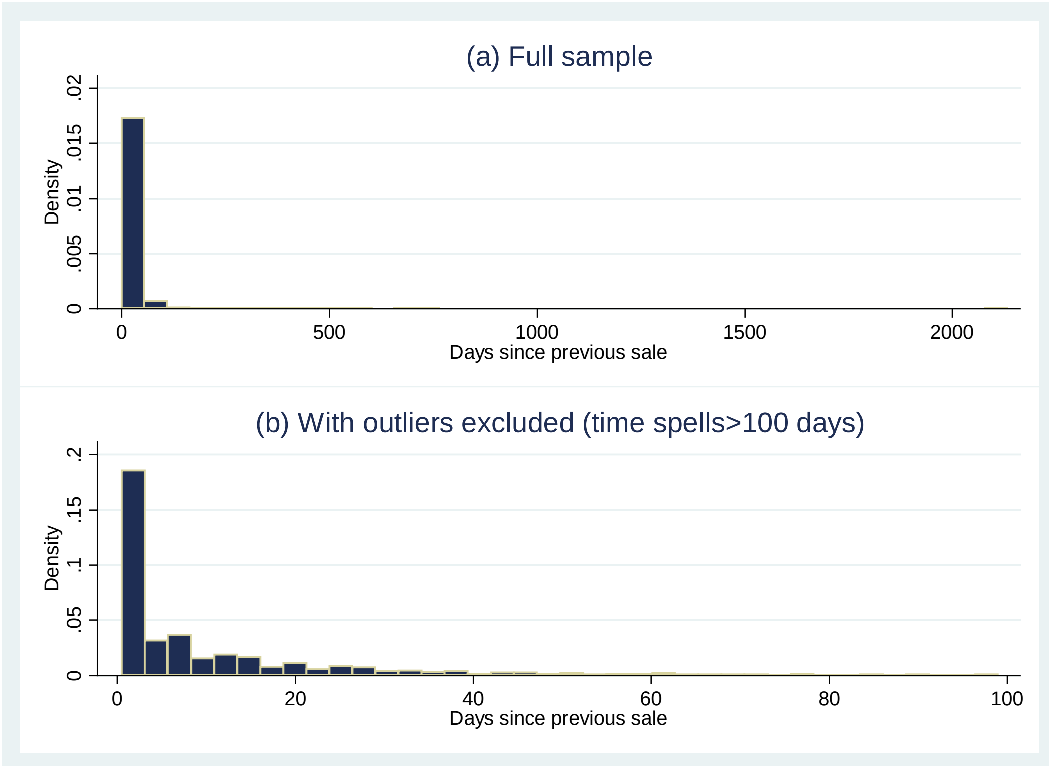


Figure 4. Nine regions of Israel

Figure 5. Distribution of the time spell between successive home sales



Notes:
Panel (a) is based on the full sample with n = 8141. Panel (b) is based on the sample after excluding 151 outliers, leaving n = 7990. The outliers excluded are the observations for which the time spell between successive sales exceeds 100 days. See the text in section 3.2 for details.

Figure 6. Distribution of the time spell between price changes

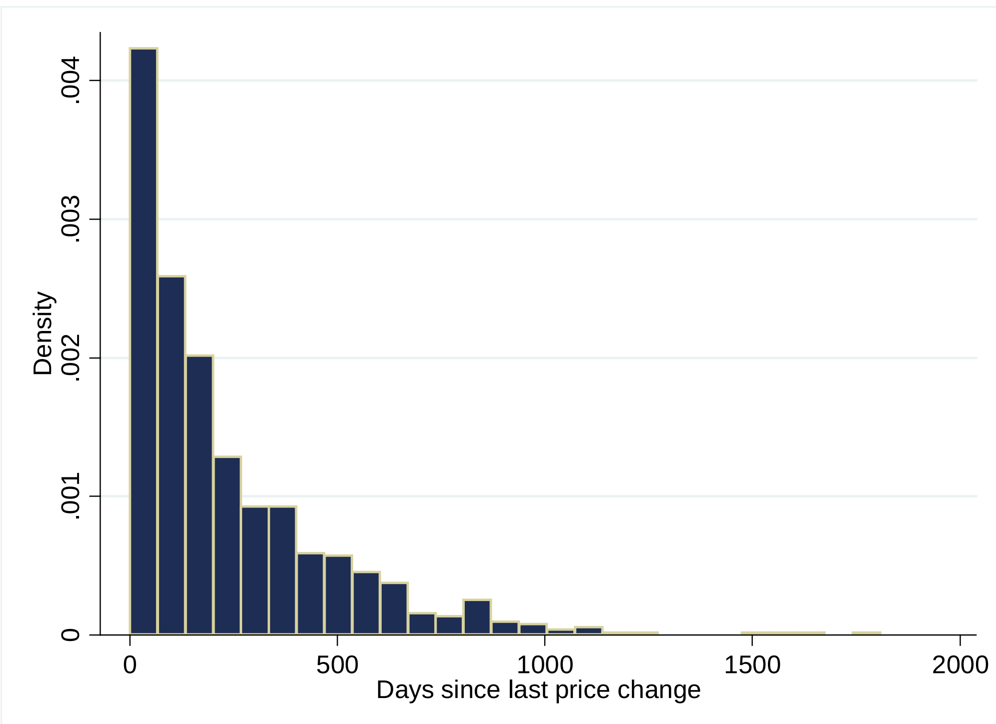


Table 1. Summary statistics

	Average		Average
Projects per Developer	1.55 (1.25)	Actual duration (days)	1,165.2 (603.3)
Housing-units per project	91.7 (121.9)	Number of rooms	4.1 (1.16)
Expected total cost (NIS)	62,000,000 (78,900,000)	Price (NIS)	739,086 (536,031)
Expected financial costs (NIS)	6,106,801 (12,000,000)	**Shares of Housing Units**	
Actual total costs (NIS)	63,500,000 (80,700,000)	single family /multi-family	10%/90%
Actual financial costs (NIS)	6,832,638 (12,900,000)	Penthouse (penthouses, duplex, triplex)	7.6%
Expected cost of advertisement & promotion (NIS)	2,894,407 (7,666,252)	Housing units with a garden	7.4%
Expected profit (NIS)	8,302,517 (21,115,250)	Housing units with a pool	6.3%
Actual profit (NIS)	5,334,138 (21,139,090)	Sold to ultra-religious Jews	16%
Expected duration (days)	1,037.8 (544.7)	Number of observations	8,141

Notes:
Standard deviations are reported in parentheses.

Table 2. Time spell between sales

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	–0.25*** (0.030)	log of the initially expected expenditures on advertisement	0.09*** (0.021)
Log of the number of previous price decreases	0.16*** (0.031)	Initially expected profit margin	–0.23*** (0.074)
Luxury project×log of the number of previous price increases	0.30*** (0.044)	log of the initially expected financial costs	–0.04** (0.020)
Luxury project×log of the number of previous price decreases	–0.10* (0.053)	Equity share	–0.58*** (0.146)
Log of the average price per room of previously sold housing units	0.06*** (0.015)	Luxury project	–0.19*** (0.049)
Log GDP	–3.86*** (0.627)	Log of number of housing units sold in previous month	0.11*** (0.014)
Interest rate	0.01 (0.012)	Log of the number of rooms	–0.29*** (0.058)
Log of the number of housing starts	–0.21 (0.157)	High-ceiling	–0.87*** (0.156)
Log of the average price of housing units sold in the region	0.03* (0.017)	Garden	–0.04 (0.046)
Log of the average NIS/US dollar exchange rate	0.76 (0.510)	Penthouse	–0.02 (0.044)
Log Population	12.61*** (2.293)	Large balcony	0.11 (0.109)
Log CPI	0.19 (0.961)	Safety-room	–0.11 (0.174)
Financially constrained	0.00006 (0.005)	Pool	0.09 (0.056)
Project delayed beyond schedule	–0.93 (0.112)	Single family	–0.19*** (0.041)
Problems with subcontractors	1.63*** (0.376)	Ultra-religious	0.55*** (0.056)
χ^2		1649.3	
N		7,789	

Notes:
1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of sales.
2. The dependent variable is the time spell between successive sales.
3. The regression includes dummies for the region where the projects are located, and the year in which the housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table 3. Hedonic regression of housing prices

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	–0.32 (0.257)	Initially expected profit margin	–0.52 (0.321)
Log of the number of previous price decreases	0.74*** (0.275)	log of the initially expected financial costs	1.53** (0.808)
Luxury project×log of the number of previous price increases	1.97** (0.871)	Equity share	3.15*** (1.176)
Luxury project×log of the number of previous price decreases	–3.23*** (1.038)	Luxury project	0.74*** (0.220)
Log of the average price per room of previously sold housing units	0.21*** (0.054)	Current financial costs	–1.95*** (0.868)
Log GDP	–0.60 (0.856)	Log of number of housing units sold in previous month	–0.23 (0.161)
Interest rate	0.02 (0.024)	Log of the number of rooms	0.39 (0.347)
Log of the number of housing starts	0.19 (0.321)	High-ceiling	–0.10 (0.234)
Log of the average price of housing units sold in the region	–0.02 (0.034)	Garden	0.31*** (0.088)
Log of the average NIS/US dollar exchange rate	–1.16 (1.337)	Penthouse	0.40*** (0.083)
Log population	4.52 (4.173)	Large balcony	0.53*** (0.231)
Log CPI	–2.53* (1.45)	Safety-room	1.23** (0.626)
Financially constrained	–0.25 (0.196)	Pool	0.65** (0.307)
Project delayed beyond schedule	7.69*** (3.26)	Single family	–0.26* (0.149)
Problems with subcontractors	–26.97*** (12.83)	Ultra-religious	0.39 (0.292)
log of the initially expected expenditures on advertisement	0.43*** (0.166)	Constant	–20.586 (33.202)
F-test	43.8		
Hansen *J*-test	1.07		
N	7,789		

Notes:
1. The table reports the results of a hedonic GMM regression.
2. The dependent variable is the log of the home prices.
3. The regression includes dummies for the region in which the projects are located and the year in which the housing-unit was sold.
4. The instruments include the population, the log of the dollar LIBID interest rates in the previous month, the log of the average exchange rate of a basket of foreign currencies in the previous month, the GDP growth rate in the previous quarter, the log of the number of housing units in the project, the log of the index of the construction costs in the previous quarter, and dummy variables for the lending banks.
5. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
6. Robust standard errors are reported in parentheses. Hansen *J-test* is a test of over-identification of all the instruments.
7. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table 4. Time spell between price decreases

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	0.11 (0.197)	log of the initially expected expenditures on advertisement	0.63*** (0.130)
Log of the number of previous price decreases	0.06 (0.167)	Initially expected profit margin	0.40 (0.586)
Luxury project×log of the number of previous price increases	–0.70** (0.294)	log of the initially expected financial costs	–0.03 (0.136)
Luxury project×log of the number of previous price decreases	0.06 (0.350)	Equity share	1.28 (0.907)
Log of the average price per room of previously sold housing units	–0.28*** (0.103)	Luxury project	0.30 (0.360)
Log GDP	4.31 (3.32)	Log of number of housing units sold in previous month	0.01 (0.095)
Interest rate	0.01 (0.07)	Log of the number of rooms	–0.64** (0.303)
Log of the number of housing starts	–0.29 (0.757)	High-ceiling	1.63 (1.05)
Log of the average price of housing units sold in the region	0.02 (0.085)	Garden	0.10 (0.292)
Log of the average NIS/US dollar exchange rate	–1.84 (2.548)	Penthouse	0.23 (0.247)
Log Population	–8.28 (12.977)	Large balcony	–0.42 (0.610)
Log CPI	0.05 (5.250)	Safety-room	1.56 (0.955)
Financially constrained	–0.34** (0.165)	Pool	–0.56 (0.465)
Project delayed beyond schedule	–0.67 (0.625)	Single family	0.10 (0.266)
Problems with subcontractors	–33.21*** (3.97)	Ultra-religious	–0.93** (0.388)
χ^2	2623.0		
N	7,789		

Notes:

1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price decreases.
2. The dependent variable is the time spell between price decreases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parenthesis.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table 5. Time spell between price increases

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	–0.20 (0.142)	log of the initially expected expenditures on advertisement	0.40*** (0.108)
Log of the number of previous price decreases	0.35*** (0.133)	Initially expected profit margin	–0.45 (0.541)
Luxury project×log of the number of previous price increases	0.21 (0.238)	log of the initially expected financial costs	0.15 (0.122)
Luxury project×log of the number of previous price decreases	–1.01*** (0.323)	Equity share	0.46 (0.717)
Log of the average price per room of previously sold housing units	–0.30*** (0.088)	Luxury project	0.25 (0.279)
Log GDP	–0.79 (2.854)	Log of number of housing units sold in previous month	0.10 (0.071)
Interest rate	–0.02 (0.054)	Log of the number of rooms	–0.59** (0.239)
Log of the number of housing starts	–0.71 (0.681)	High-ceiling	0.58 (1.063)
Log of the average price of housing units sold in the region	0.07 (0.068)	Garden	0.32 (0.222)
Log of the average NIS/US dollar exchange rate	6.58*** (2.02)	Penthouse	0.45*** (0.196)
Log Population	–8.62 (10.447)	Large balcony	–0.46 (0.385)
Log CPI	0.34 (3.809)	Safety-room	1.19 (1.170)
Financially constrained	–0.03 (0.032)	Pool	–0.32 (0.350)
Project delayed beyond schedule	–2.19*** (0.593)	Single family	–0.31 (0.225)
Problems with subcontractors	5.16*** (1.598)	Ultra-religious	0.10 (0.404)
χ^2		391.4	
N		7,789	

Notes:

1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price increases.
2. The dependent variable is the time spell between price increases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parenthesis.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table 6. Regression of the likelihood of a price decrease

Variable	Coefficient	Variable	Coefficient
Luxury project	–0.31*** (0.116)	log of the initially expected financial costs	0.12** (0.047)
Log of the average price per room of previously sold housing units	0.155 (0.029)	Equity share	0.53 (0.339)
Log GDP	3.60** (1.576)	Log of number of housing units sold in previous month	–0.13*** (0.035)
Interest rate	0.02 (0.030)	Log of the number of rooms	–0.09 (0.128)
Log of the number of housing starts	0.40 (0.344)	High-ceiling	0.49 (0.533)
Log of the average price of housing units sold in the region	–0.05 (0.042)	Garden	–0.14 (0.123)
Log of the average NIS/US dollar exchange rate	–1.64 (1.189)	Penthouse	–0.04 (0.105)
Log Population	–3.40 (5.75)	Large balcony	–0.11 (0.248)
Log CPI	–2.17 (2.338)	Safety-room	0.34 (0.497)
Financially constrained	–0.03* (0.016)	Pool	–0.05 (0.178)
Project delayed beyond schedule	0.41 (0.251)	Single family	0.09 (0.104)
log of the initially expected expenditures on advertisement	0.01 (0.048)	Ultra-religious	–0.39*** (0.141)
Initially expected profit margin	0.34 (0.21)	Constant	–11.32 (46.339)
χ^2		130.6	
N		7,787	

Notes:
1. The table reports the results of estimating a probit model for the probability of price decreases.
2. The dependent variable is a dummy variable that equals 1 if the price has decreased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parenthesis.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table 7. Regression of the likelihood of a price increase

Variable	Coefficient	Variable	Coefficient
Luxury project	–0.21** (0.095)	log of the initially expected financial costs	0.08* (0.042)
Log of the average price per room of previously sold housing units	0.15*** (0.026)	Equity share	0.64** (0.299)
Log GDP	1.46 (1.425)	Log of number of housing units sold in previous month	–0.07** (0.030)
Interest rate	–0.01 (0.026)	Log of the number of rooms	0.13 (0.112)
Log of the number of housing starts	–0.10 (0.344)	High-ceiling	0.29 (0.514)
Log of the average price of housing units sold in the region	–0.02 (0.036)	Garden	0.004 (0.097)
Log of the average NIS/US dollar exchange rate	1.48 (1.068)	Penthouse	0.07 (0.087)
Log Population	–3.68 (4.973)	Large balcony	–0.27 (0.199)
Log CPI	–0.65 (1.991)	Safety-room	0.26 (0.490)
Financially constrained	–0.01 (0.010)	Pool	0.09 (0.144)
Project delayed beyond schedule	0.43** (0.174)	Single family	–0.02 (0.094)
log of the initially expected expenditures on advertisement	–0.05 (0.045)	Ultra-religious	–0.27** (0.113)
Initially expected profit margin	0.15 (0.174)	Constant	11.69 (38.458)
χ^2		124.7	
N		7,787	

Notes:
1. The table reports the results of estimating a probit model for the probability of price increases.
2. The dependent variable is a dummy variable that equals 1 if the price has increased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parenthesis.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

<u>Online Supplementary Appendix</u>
(Not for Publication)

Here Lives a Wealthy Man: Price Rigidity and Predictability in Luxury Housing Markets

April 28, 2018

In this appendix, we compare the distribution of the housing units, by number of rooms, in our sample to the distribution of the number of rooms in all the housing start projects, as reported by Israel's Central Bureau of Statistics (CBS) for the entire Israel ("population"). The goal of the comparison is to show that the data set we employ is representative of the housing projects built in Israel during the sample period.

In addition, we present the results of estimating various additional econometric models, which for lack of space we are unable to discuss in the paper. The goal of the additional analyses is to check the robustness of the results we are reporting to changes in various choices we made in the paper regarding questions about data measurement and model specification.

Among the issues we examine here are the treatment of outliers, the use of transformed RHS variables, possible problems of simultaneity bias, a possible problem of omitted variables, and the possibility that the findings we report about luxury effect are driven by the concentration of a large fraction of luxury homes in Tel Aviv area, Israel's economic capital.

In the discussion that follows, we focus on the coefficients and the effects of the variables of interest.

<u>The appendix consists of 6 sections</u>:

Appendix A. Distribution of Housing Units by Number of Rooms

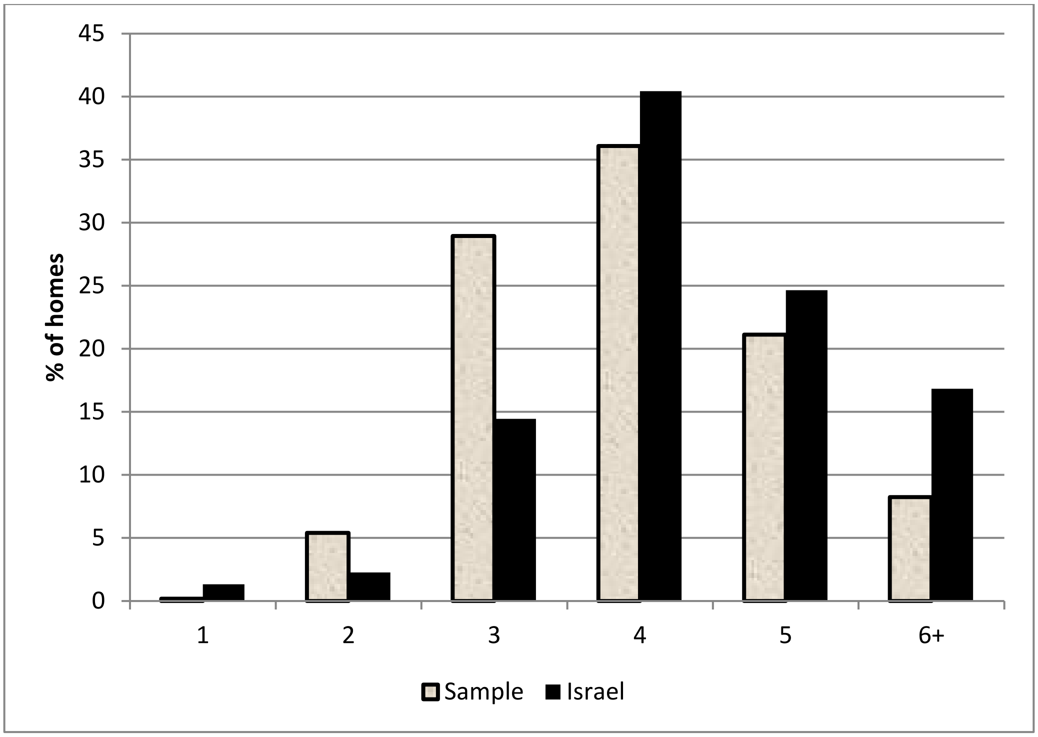
Figure A1 depicts the distribution of housing units, by number of rooms, in our data set (dark colored bars) and in the "population" of housing starts (light colored bars).[1] As the diagram shows, the shares of the most common types of housing units, i.e., those with 4 and 5 rooms, in our data and in the population, are almost the same.

At the same time, it seems that small housing units, those with 2 and 3 rooms are somewhat overrepresented in our sample relative to the population of housing starts. Consequently, the shares of relatively large housing units, those with 6 or more rooms, are smaller than in the population.

However, housing units with 2–3 rooms and with 6 rooms and above, compose only a small share of all housing starts in the sample period. We therefore conclude that our sample is reasonably representative of the types of housing units built in Israel during the sample period, 1995–2005.

[1] The source of the data on housing starts in Israel is the Central Bureau of Statistics (CBS): www.cbs.gov.il/publications15/build2014_1620/pdf/tab07.pdf (accessed June 4, 2017).

Figure A1. Housing starts by number of rooms, 1995–2005, in our sample and in Israel



Appendix B. Treatment of Outliers

In the paper, we exclude observations if the time spell between sales is greater than 100 days or if the time spell between price changes is greater than 1200 days. To check the robustness of our findings to this treatment of the outliers, we re-estimate all the regressions using the full sample. The estimation results are reported in Tables B1–B6.

We find that in the regression of the time spell between sales (see Table B1), the coefficient of the interaction term between *the number of previous price increases* and *luxury project* is positive, 0.30, and statistically significant. The coefficient of the interaction term between *the number of previous price decreases* and *luxury project* is negative, –0.11, and statistically significant. The coefficient of the log of the *average price per room of previously sold housing units* is also positive, 0.45, and statistically significant.

Thus, the results when we use the full sample are similar, and perhaps even stronger, than the ones we report in the paper. In particular, they suggest that higher past prices and more frequent price increases in the market for luxury homes serve as a positive signal that can increase the likelihood of sales. Past price decreases, on the other hand, serve as a negative signal that can reduce the sales volume.

In the hedonic regression of housing prices (see Table B2), we find that the coefficient of the interaction term between *the number of previous price increases* and *luxury project* is positive 1.67, and statistically significant. The coefficient of the interaction term between *the number of previous price decreases* and *luxury project* is negative, –2.62, and statistically significant. The coefficient of the log of the *average price per room of previously sold housing units* is also positive, 0.17, and statistically significant.

This lends another support to the hypothesis that in the market for luxury homes, past prices convey a signal. It seems that higher past prices and more frequent past price increases convey a positive signal that facilitates high future prices. Price decreases, on the other hand, have a negative effect on future prices.

In the regression of the time spell between price decreases (see Table B3), we find that the coefficient of the interaction term between the *number of previous price increases* and *luxury project* is negative, –0.74, and statistically significant. In addition, in the regression of the time spell between price increases (see Table B4), the coefficient of the interaction term between the *number of previous price decreases* and *luxury project* is negative, –0.94, and statistically significant.

Thus, when we use the full sample, we find, as we find in the paper, that in the market for luxury homes, price increases (decreases) convey a positive (negative) signal that can reduce the likelihood of price decreases (increases). At the same time, the coefficient of the log of the *average price per room of previously sold housing units* is negative and statistically significant in both regressions –0.24 (in the regression of the time spell between price decreases, Table B3) and –0.26 (in the regression of the time spell between price increases, Table B4), respectively. This suggests that when prices increase, developers make fewer price changes, possibly because it is difficult to increase the prices of housing units that are offered at high prices, while at the same time they want to avoid the negative signal conveyed by price decreases.

In the regressions of the likelihood of a price decrease and a price increase (see Tables B5 and B6, respectively), we find that as may be expected, the likelihood of a price change is smaller in projects of luxury homes than in projects of middle class homes. The coefficient of the *luxury project* dummy in the regression of the likelihood of a price decrease (see Table B5) is negative, –0.32, and statistically significant. Similarly, in the regression of the likelihood of a price increase (see Table B6) the coefficient of the *luxury project* dummy is negative, –0.33, and statistically significant.

Therefore, also when we use the full sample, we find that there are fewer price changes in the market for luxury homes than in the market for middle class homes. These findings suggest that the results we report in the paper are not sensitive to the way we treat the outlier observations.

Table B1. Time spell between sales

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	–0.25*** (0.032)	Log of the initially expected expenditures on advertisement	0.10 (0.021)
Log of the number of previous price decreases	0.15*** (0.029)	Initially expected profit margin	–0.26*** (0.077)
Luxury project×log of the number of previous price increases	0.30*** (0.043)	Log of the initially expected financial costs	–0.04* (0.022)
Luxury project×log of the number of previous price decreases	–0.11** (0.049)	Equity share	–0.42*** (0.145)
Log of the average price per room of previously sold housing units	0.45*** (0.069)	Luxury project	–0.18*** (0.045)
Log GDP	–3.65*** (0.632)	Log of number of housing units sold in previous month	0.13*** (0.015)
Interest rate	–0.01 (0.012)	Log of the number of rooms	–0.24*** (0.056)
Log of the number of housing starts	–0.32* (0.162)	High-ceiling	–0.77*** (0.160)
Log of the average price of housing units sold in the region	0.03 (0.016)	Garden	–0.02 (0.044)
Log of the average NIS/US dollar exchange rate	–0.60** (0.292)	Penthouse	–0.11 (0.042)
Log population	12.06 (2.245)	Large balcony	0.09 (0.092)
Log CPI	0.54 (0.977)	Safety-room	0.04 (0.135)
Financially constrained	–0.004 (0.005)	Pool	0.09 (0.054)
Project delayed beyond schedule	–0.86*** (0.115)	Single family	–0.16*** (0.040)
Problems with subcontractors	0.96*** (0.314)	Ultra-religious	0.45*** (0.069)
χ^2	1,694.7		
N	7,940		

Notes
1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of sales.
2. The dependent variable is the time spell between successive sales.
3. The regression includes dummies for the region in which the projects are located, and the year in which the housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table B2. Hedonic regression of housing prices

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	–0.34** (0.164)	Initially expected profit margin	–0.42* (0.232)
Log of the number of previous price decreases	0.69*** (0.189)	Log of the initially expected financial costs	1.09** (0.555)
Luxury project×log of the number of previous price increases	1.67** (0.653)	Equity share	1.94*** (0.615)
Luxury project×log of the number of previous price decreases	–2.62*** (0.849)	Luxury project	0.74*** (0.187)
Log of the average price per room of previously sold housing units	0.17*** (0.038)	Current financial costs	–1.41** (0.590)
Log GDP	0.08 (0.741)	Log of number of housing units sold in previous month	0.20 (0.121)
Interest rate	0.02 (0.019)	Log of the number of rooms	0.11 (0.271)
Log of the number of housing starts	0.05 (0.215)	High-ceiling	–0.03 (0.129)
Log of the average price of housing units sold in the region	–0.01 (0.025)	Garden	0.25*** (0.065)
Log of the average NIS/US dollar exchange rate	0.06 (0.202)	Penthouse	0.40*** (0.064)
Log population	0.48 (2.718)	Large balcony	0.33** (0.135)
Log CPI	–1.97* (1.055)	Safety-room	0.71* (0.368)
Financially constrained	–0.08 (0.139)	Pool	0.33** (0.160)
Project delayed beyond schedule	4.42*** (1.684)	Single family	–0.19 (0.141)
Problems with subcontractors	–15.42*** (5.26)	Ultra-religious	0.15 (0.155)
Log of the initially expected expenditures on advertisement	0.29*** (0.100)	Constant	9.08 (21.235)
F-test		46.2	
Hansen *J*-test		0.57	
N		8,069	

Notes

1. The table reports the results of a hedonic GMM regression.
2. The dependent variable is the log of home prices.
3. The regression includes dummies for the region in which the projects are located and the year in which the housing-unit was sold.
4. The instruments include the population, the log of the dollar LIBID interest rates in the previous month, the log of the average exchange rate of a basket of foreign currencies in the previous month, the GDP growth rate in the previous quarter, the log of the number of housing units in the projects, the log of the index of the construction costs in the previous quarter, and dummy variables for the lending banks.
5. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
6. Robust standard errors are reported in parentheses.
7. Hansen *J-test* is a test of over-identification of all the instruments.
8. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table B3. Time spell between price decreases

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	0.12 (0.189)	Log of the initially expected expenditures on advertisement	0.61*** (0.126)
Log of the number of previous price decreases	0.01 (0.165)	Initially expected profit margin	0.46 (0.551)
Luxury project×log of the number of previous price increases	–0.74*** (0.288)	Log of the initially expected financial costs	–0.001 (0.135)
Luxury project×log of the number of previous price decreases	0.07 (0.339)	Equity share	1.37 (0.895)
Log of the average price per room of previously sold housing units	–0.24*** (0.092)	Luxury project	0.26 (0.356)
Log GDP	4.24 (3.315)	Log of number of housing units sold in previous month	0.03 (0.095)
Interest rate	–0.005 (0.068)	Log of the number of rooms	–0.540 (0.295)
Log of the number of housing starts	–0.44 (0.756)	High-ceiling	1.69 (1.089)
Log of the average price of housing units sold in the region	0.01 (0.083)	Garden	0.16 (0.286)
Log of the average NIS/US dollar exchange rate	–3.67 (1.028)	Penthouse	0.26 (0.244)
Log population	–8.53 (12.773)	Large balcony	–0.38 (0.609)
Log CPI	0.63 (5.181)	Safety-room	1.61 (0.959)
Financially constrained	–0.30*** (0.101)	Pool	–0.51 (0.440)
Project delayed beyond schedule	–0.67 (0.597)	Single family	0.11 (0.261)
Problems with subcontractors	–6.25** (2.946)	Ultra-religious	–0.93** (0.383)
χ^2		3048.5	
N		8,069	

Notes
1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price decreases.
2. The dependent variable is the time spell between price decreases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table B4. Time spell between price increases

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	–0.18 (0.139)	Log of the initially expected expenditures on advertisement	0.411*** (0.108)
Log of the number of previous price decreases	0.31**	Initially expected profit margin	0.43 (0.719)
Luxury project×log of the number of previous price increases	0.13 (0.232)	Log of the initially expected financial costs	–0.14 (0.120)
Luxury project×log of the number of previous price decreases	–0.94*** (0.311)	Equity share	–0.41 (0.523)
Log of the average price per room of previously sold housing units	–0.26*** (0.084)	Luxury project	0.23 (0.277)
Log GDP	–0.56 (2.906)	Log of number of housing units sold in previous month	0.12 (0.072)
Interest rate	–0.07 (0.053)	Log of the number of rooms	–0.50 (0.238)
Log of the number of housing starts	–0.60 (0.717)	High-ceiling	0.72 (1.065)
Log of the average price of housing units sold in the region	–0.02 (0.070)	Garden	0.35 (0.219)
Log of the average NIS/US dollar exchange rate	–0.90** (0.398)	Penthouse	0.41** (0.195)
Log population	0.395 (10.169)	Large balcony	–0.47 (0.376)
Log CPI	1.58 (3.842)	Safety-room	1.18 (1.148)
Financially constrained	–0.02 (0.025)	Pool	–0.34 (0.342)
Project delayed beyond schedule	–2.11*** (0.572)	Single family	–0.30 (0.225)
Problems with subcontractors	4.31*** (1.543)	Ultra-religious	0.02 (0.391)
χ^2		395.5	
N		8,069	

Notes
1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price increases.
2. The dependent variable is the time spell between price increases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table B5. Regression of the likelihood of a price decrease

Variable	Coefficient	Variable	Coefficient
Luxury project	–0.32*** (0.113)	Log of the initially expected financial costs	0.12** (0.046)
Log of the average price per room of previously sold housing units	0.16*** (0.027)	Equity share	0.56 (0.332)
Log GDP	3.58 (1.564)	Log of number of housing units sold in previous month	0.04 (0.035)
Interest rate	0.02 (0.030)	Log of the number of rooms	–0.07 (0.125)
Log of the number of housing starts	0.40 (0.339)	High-ceiling	0.53 (0.537)
Log of the average price of housing units sold in the region	–0.04 (0.042)	Garden	–0.12 (0.120)
Log of the average NIS/US dollar exchange rate	–1.24 (1.151)	Penthouse	–0.03 (0.104)
Log population	–4.01 (5.694)	Large balcony	–0.09 (0.247)
Log CPI	–2.04 (2.296)	Safety-room	0.38 (0.487)
Financially constrained	–0.03 (0.015)	Pool	–0.04 (0.172)
Project delayed beyond schedule	0.38 (0.242)	Single family	0.08 (0.101)
Log of the initially expected expenditures on advertisement	0.01 (0.047)	Ultra-religious	–0.39*** (0.139)
Initially expected profit margin	0.35* (0.197)	Constant	–6.94 (45.776)
χ^2		140.5	
N		8,065	

Notes
1. The table reports the results of estimating a probit model for the probability of price decreases.
2. The dependent variable is a dummy variable that equals 1 if the price has decreased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table B6. Regression of the likelihood of a price increase

Variable	Coefficient	Variable	Coefficient
Luxury project	–0.33** (0.093)	Log of the initially expected financial costs	0.07* (0.040)
Log of the average price per room of previously sold housing units	0.16*** (0.024)	Equity share	0.65** (0.292)
Log GDP	1.22 (1.416)	Log of number of housing units sold in previous month	–0.07** (0.029)
Interest rate	–0.02 (0.024)	Log of the number of rooms	0.13 (0.110)
Log of the number of housing starts	–0.08 (0.340)	High-ceiling	0.28 (0.515)
Log of the average price of housing units sold in the region	–0.03 (0.034)	Garden	–0.01 (0.096)
Log of the average NIS/US dollar exchange rate	0.25 (0.317)	Penthouse	0.06 (0.086)
Log population	–2.88 (4.802)	Large balcony	–0.29 (0.197)
Log CPI	–0.37 (1.962)	Safety-room	0.26 (0.481)
Financially constrained	–0.003 (0.009)	Pool	0.08 (0.142)
Project delayed beyond schedule		Single family	–0.03 (0.094)
Log of the initially expected expenditures on advertisement	–0.04 (0.044)	Ultra-religious	–0.30*** (0.111)
Initially expected profit margin	0.15 (0.171)	Constant	8.11 (37.077)
χ^2			132.2
N			8,065

Notes
1. The table reports the results of estimating a probit model for the probability of price increases.
2. The dependent variable is a dummy variable that equals 1 if the price has increased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Appendix C. Using the Levels of the Number of Previous Price Changes

In the paper, we estimate the regressions using the logarithmic transformations of the *number of previous price increases* and the *number of previous price decreases*. Measuring the *number of previous price increases* and *decreases* in logarithms, however, has the disadvantage of forcing us to set the value of the variables to 0 whenever the number of previous price increases or decreases is 0. Consequently, the variable we use in the manuscript attains the same value 0, whenever the number of previous price increases or decreases is either 0 or 1.

We believe that this is a reasonable procedure, because the homebuyers are probably not aware of every single price change, but are likely to know about price changes if there are several consecutive price changes in the same direction.

Nevertheless, to test the robustness of this assumption, we report below the results of re-estimating all the regressions that we estimate in the paper, when we employ as the dependent variables the *number of previous price increases* and the *number of previous price decreases*, rather than their logs (see Tables C1–C4). We also include in the regressions, the interaction terms of the *number of previous price increases* and *decreases* with the dummy variable for a *luxury project*.

To allow a comparison, we use the same sample as we use in the paper. I.e., we exclude the observations with a time spell between sales greater than 100 days, and with a time spell between price changes greater than 1,200 days.[2]

In the regression of the time spell between sales (see Table C1), we find that the coefficient of the *number of previous price increases* is negative, –0.03, and statistically significant. The coefficient of the *number of previous price decreases* is positive, 0.04, and statistically significant. Thus, in the market for middle-class homes, we find that the substitution effect dominates, so that, ceteris paribus, price increases reduce the likelihood of future sales, while price cuts increase the likelihood of future sales.

The interaction term between *luxury project* and the *number of previous price increases* is positive, 0.05, and statistically significant. Further, the difference between the absolute values of the main effect of the *number of previous price increases* and the

[2] We do not re-estimate the regressions of the likelihood of price decreases and increases (Tables 6 and 7 in the paper) because they do not include the *log of the number of previous price increases* and the *log of the number of previous price decreases* as the RHS variables.

interaction with *luxury project* is marginally statistically significant $\left(\chi^2 = 2.92,\ p < 0.10\right)$.

Thus, when we use the *number of previous price increases*, we find that in the market for luxury homes, the effect of the positive signal generated by price increases is stronger than the substitution effect. Consequently, when we use the levels of the variables, we find that in the market for luxury homes, price increases increase the likelihood of future sales.

The interaction term between the *number of previous price decreases* and *luxury project* is negative, –0.01, but statistically insignificant. Its absolute value is also smaller than the value of main effect of the *number of previous price decreases* $\left(\chi^2 = 4.81,\ p < 0.05\right)$. Thus, when we use the levels of the variables, we find that although in the market for luxury homes there is some evidence of a negative signal generated by price decreases, the effect is small and statistically insignificant.

In addition, we find that although the effect of the log of the *average price per room of previously sold housing units* is positive, 0.02, it is statistically insignificant. Therefore, we find that there is some evidence that the prices of previously sold housing units affects the sales volume, but the effect is weak.

In sum, when we use the logs of the variables, we find evidence supporting the hypothesis that in the market for luxury homes, both price increases and price decreases have a signaling effect on the sales volume. We also find that the past prices have an effect on the sales volume. When we use the levels of the variables, we find that in the market for luxury homes, only price increases have a statistically significant effect that can increase the sales volume. The effect we find is even stronger than we find when we use the logarithmic transformations of the *number of previous price increases* and *decreases*. The effects of previous price decreases and of past prices on the sales volume are of the right sign, but statistically insignificant.

In the hedonic regression of housing prices (see Table C2), we find results that are qualitatively similar to the ones we find when we use the logarithms of the *number of previous price increases* and *decreases*. The coefficient of the *number of previous price increases* is negative, –0.11, and statistically significant, while the coefficient of the *number of previous price decreases* is positive, 0.22, and statistically significant. These results suggest that for middle-class homes, either prices tend to fluctuate around a mean value, or that price increases (decreases) usually occur in projects with relatively low (high) initial prices.

The coefficient of the interaction terms of the *number of previous price increases* with the dummy for *luxury project* is positive, 0.73, and statistically significant. The difference between the absolute value of the interaction term and the absolute value of the main effect is statistically significant $\left(\chi^2 = 3.56,\ p < 0.10\right)$.

The coefficient of the interaction term of the *number of previous price decreases* with the dummy for *luxury project* is negative, –1.28, and statistically significant. The difference between the absolute value of the interaction term and the absolute value of the main effect is also statistically significant $\left(\chi^2 = 5.38,\ p < 0.05\right)$.

These results suggest that in the market for luxury homes, price changes have a special role in signaling the luxury of the projects. A price increase (decrease), which is a positive (negative) signal, increases (decreases) the reservation prices that the homebuyers are willing to pay.

In the hedonic regression of housing prices, the coefficient of the log of the *average price per room of previously sold housing units* in the project is positive, 0.30, and statistically significant. Thus, it seems that past prices serve as a signal with positive effect on homebuyers' reservation prices.

In the regression of the time spell between price decreases (see Table C3), we find that the coefficients of both the *number of previous price increases* and the *number of previous price decreases*, –0.02 and 0.008, respectively, are statistically insignificant. It therefore seems that in the market for middle-class homes, previous price changes cannot predict future price changes.

However, the coefficient of the interaction term between the *number of previous price increases* and the *luxury project* dummy is negative, –0.12, and statistically significant. Thus, in the market for luxury homes, it seems that previous price increases predict that that the likelihood of future price decreases is small.

In the regression of the time spell between price increases (see Table C4), we find that the coefficients of both the *number of previous price increases* and the *number of previous price decreases*, –0.08 and 0.10, respectively, are statistically significant. Thus, price increases are correlated with a smaller likelihood of future price increases, and price decreases are correlated with a greater likelihood of future price increases.

This suggests again that in the market for middle-class homes, prices tend to fluctuate around some mean value. Consequently, if the prices decreased they tend to increase. If they increased, they tend not to increase again.

However, the coefficient of the interaction term between the *number of previous price increases* and the *luxury project* dummy is negative, –0.27, and statistically significant. The difference between the absolute value of the main effect of the *number of previous price increases* and the interaction with *luxury project* is marginally statistically significant $\left(\chi^2 = 3.75, p < 0.10\right)$. Thus, in the market for luxury homes, it seems that previous price increases are correlated with a reduction in the likelihood of future price decreases.

Table C1. Time spell between sales

Variable	Coefficient	Variable	Coefficient
Number of previous price increases	–0.03*** (0.005)	Log of the initially expected expenditures on advertisement	0.09*** (0.021)
Number of previous price decreases	0.04*** (0.008)	Initially expected profit margin	–0.19*** (0.072)
Luxury project×Number of previous price increases	0.05*** (0.010)	Log of the initially expected financial costs	–0.04* (0.020)
Luxury project×Number of previous price decreases	–0.01 (0.047)	Equity share	–0.59*** (0.145)
Log of the average price per room of previously sold housing units	0.02 (0.014)	Luxury project	–0.10** (0.047)
Log GDP	–3.97*** (0.626)	Log of number of housing units sold in previous month	0.12*** (0.015)
Interest rate	0.008 (0.012)	Log of the number of rooms	–0.30*** (0.058)
Log of the number of housing starts	0.24 (0.155)	High-ceiling	–0.81*** (0.147)
Log of the average price of housing units sold in the region	0.03* (0.017)	Garden	–0.038 (0.046)
Log of the average NIS/US dollar exchange rate	0.79 (0.506)	Penthouse	–0.005 (0.044)
Log population	12.37*** (2.287)	Large balcony	0.10 (0.115)
Log CPI	0.34 (0.967)	Safety-room	–0.19 (0.176)
Financially constrained	0.002 (0.005)	Pool	0.06 (0.056)
Project delayed beyond schedule	–0.96*** (0.111)	Single family	–0.19 (0.041)
Problems with subcontractors	1.62*** (0.379)	Ultra-religious	0.55 (0.058)
χ^2	1,727.5		
N	7,789		

Notes

1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of sales.
2. The dependent variable is the time spell between successive sales.
3. The regression includes dummies for the region in which the projects are located, and the year in which the housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table C2. Hedonic regression of housing prices

Variable	Coefficient	Variable	Coefficient
Number of previous price increases	–0.11* (0.065)	Initially expected profit margin	–0.67 (0.469)
Number of previous price decreases	0.22** (0.083)	Log of the initially expected financial costs	1.81* (0.947)
Luxury project×Number of previous price increases	0.73* (0.376)	Equity share	4.58** (2.049)
Luxury project×Number of previous price decreases	–1.28** (0.521)	Luxury project	0.75*** (0.278)
Log of the average price per room of previously sold housing units	0.30*** (0.084)	Current financial costs$_t$	–2.33** (1.130)
Log GDP	–0.53 (1.282)	Log of number of housing units sold in previous month	–0.34** (0.164)
Interest rate	0.01 (0.034)	Log of the number of rooms	0.57 (0.421)
Log of the number of housing starts	–0.005 (0.343)	High-ceiling	–0.20 (0.256)
Log of the average price of housing units sold in the region	–0.03 (0.048)	Garden	0.32*** (0.122)
Log of the average NIS/US dollar exchange rate	–2.53 (2.00)	Penthouse	0.47*** (0.110)
Log population	5.85 (5.513)	Large balcony	0.74** (0.356)
Log CPI		Safety-room	1.26 (0.814)
Financially constrained	–0.39 (0.288)	Pool	0.86* (0.489)
Project delayed beyond schedule	10.80* (5.536)	Single family	–0.35* (0.202)
Problems with subcontractors	–37.61** (17.892)	Ultra-religious	0.76 (0.526)
Log of the initially expected expenditures on advertisement	0.56** (0.265)	Constant	–29.58 (42.390)
F-test		24.9	
Hansen *J*-test		0.57	
N		7,789	

Notes
1. The table reports the results of a hedonic GMM regression.
2. The dependent variable is the log of home prices.
3. The regression includes dummies for the region in which the projects are located, and the year in which the housing-unit was sold.
4. The instruments include the population, the log of the dollar LIBID interest rates in the previous month, the log of the average exchange rate of a basket of foreign currencies in the previous month, the GDP growth rate in the previous quarter, the log of the number of housing units in the projects, the log of the index of the construction costs in the previous quarter, and dummy variables for the lending banks.
5. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
6. Robust standard errors are reported in parentheses.
7. Hansen *J-test* is a test of over-identification of all the instruments.
8. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table C3. Time spell between price decreases

Variable	Coefficient	Variable	Coefficient
Number of previous price increases	–0.02 (0.034)	Log of the initially expected expenditures on advertisement	0.60*** (0.130)
Number of previous price decreases	0.008 (0.051)	Initially expected profit margin	0.42 (0.592)
Luxury project×Number of previous price increases	–0.12** (0.054)	Log of the initially expected financial costs	0.01 (0.136)
Luxury project×Number of previous price decreases	–0.03 (0.083)	Equity share	1.28 (0.899)
Log of the average price per room of previously sold housing units	–0.15* (0.089)	Luxury project	0.04 (0.338)
Log GDP	5.086 (3.322)	Log of number of housing units sold in previous month	–0.02 (0.091)
Interest rate	0.02 (0.067)	Log of the number of rooms	–0.61** (0.287)
Log of the number of housing starts	–0.13 (0.761)	High-ceiling	1.60 (1.077)
Log of the average price of housing units sold in the region	0.020 (0.088)	Garden	0.05 (0.296)
Log of the average NIS/US dollar exchange rate	–2.35 (2.550)	Penthouse	0.20 (0.247)
Log population	–6.00 (12.985)	Large balcony	–0.45 (0.623)
Log CPI	–0.43 (5.299)	Safety-room	1.77* (0.956)
Financially constrained	–0.35* (0.182)	Pool	–0.73 (0.457)
Project delayed beyond schedule	–0.89 (0.653)	Single family	0.07 (0.259)
Problems with subcontractors	–38.46*** (4.316)	Ultra-religious	–0.67* (0.400)
χ^2		1,402.1	
N		7,860	

Notes

1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price decreases.
2. The dependent variable is the time spell between price decreases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table C4. Time spell between price increases

Variable	Coefficient	Variable	Coefficient
Number of previous price increases	–0.08*** (0.026)	Log of the initially expected expenditures on advertisement	0.374*** (0.110)
Number of previous price decreases	0.10*** (0.039)	Initially expected profit margin	–0.38 (0.545)
Luxury project×Number of previous price increases	0.02 (0.053)	Log of the initially expected financial costs	–0.10 (0.122)
Luxury project×Number of previous price decreases	–0.27*** (0.092)	Equity share	0.48 (0.698)
Log of the average price per room of previously sold housing units	–0.19** (0.076)	Luxury project	0.23 (0.249)
Log GDP	–1.77 (2.864)	Log of number of housing units sold in previous month	0.06 (0.070)
Interest rate	0.001 (0.054)	Log of the number of rooms	–0.56** (0.238)
Log of the number of housing starts	–0.74 (0.679)	High-ceiling	0.74 (1.065)
Log of the average price of housing units sold in the region	0.09 (0.069)	Garden	0.24 (0.227)
Log of the average NIS/US dollar exchange rate	6.23*** (2.023)	Penthouse	0.42** (0.198)
Log population	–6.69 (10.600)	Large balcony	–0.43 (0.395)
Log CPI	1.10 (3.865)	Safety-room	1.34 (1.141)
Financially constrained	–0.03 (0.032)	Pool	–0.39 (0.341)
Project delayed beyond schedule	–2.34*** (0.601)	Single family	–0.34 (0.224)
Problems with subcontractors	5.59*** (1.626)	Ultra-religious	–0.005 (0.325)
χ^2		391.4	
N		7,860	

Notes
1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price increases.
2. The dependent variable is the time spell between price increases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Appendix D. Simultaneity Bias

In the models that we estimate in sections 4.1, 4.3, and 4.4 of the paper, we employ RHS variables that control for (a) whether or not the developer is financially constrained (*Financially constrained*), (b) whether or not the developer has problems with subcontractors who breach the contract (*Problems with subcontractors*), (c) whether or not the project is delayed beyond schedule (*Project delayed beyond schedule*), and (d) the log of the number of housing units sold in the previous month.

These variables may cause a problem of simultaneity bias, as they may be affected by the time spell between sales, and by the time spell between price changes. Therefore, as a robustness check, we estimated these regressions without these four variables. The results are summarized in Tables D1–D5.

We find that in the regression of the time spell between sales (see Table D1), the coefficient of the interaction term between *the number of previous price increases* and *luxury project* is positive, 0.32, and statistically significant. The coefficient of the interaction term between *the number of previous price decreases* and *luxury project* is negative, –0.06, as we hypothesize in the paper, but it is statistically insignificant. The coefficient of the *average price per room of previously sold housing units*, 0.12, is also positive and statistically significant.

Thus, even after removing the control variables that may cause endogeneity, the estimation results support the hypothesis that in the market for luxury homes, past prices affect the sales volume. In particular, they suggest that higher past prices and greater number of price increases in the market for luxury homes serve as a positive signal that can increase the likelihood of sales.

In the regression of the time spell between price decreases (see Table D2), we find that the coefficient of the interaction term between *the number of previous price increases* and *luxury project*, –0.71, is negative and statistically significant. In addition, in the regression of the time spell between price increases (see Table D3), the coefficient of the interaction term between *the number of previous price decreases* and *luxury project*, –0.77, is negative and statistically significant.

Thus, even after we remove the controls that may cause endogeneity, we find that in the market for luxury homes, price increases (decreases) convey a positive (negative) signal that can reduce the likelihood of price decreases (increases). At the same time, the coefficient of the log of the average price per room of previously sold housing units is negative and statistically significant in both regressions. It is –0.22 in the regression of the time spell between price decreases (see Table D2), and –0.24 in the regression of the time spell between price increases (see Table D3). This suggests that when prices are relatively high, developers make fewer price changes, possibly because it is difficult to increase the prices of housing units that are already offered at high prices. At the same time, however, they also would want to avoid the negative signal conveyed by price decreases.

In the regression of the likelihood of a price decrease (see Table D4), the coefficient of the *luxury project* dummy is negative, –0.30, and statistically significant. Similarly, in the regression of the likelihood of a price increase (see Table D5), the coefficient of the *luxury project* dummy is also negative, –0.18, also statistically significant. Thus, as may be expected, we find that the likelihood of a price change is smaller in projects of luxury homes than in projects of middle class homes. However, note that the coefficient of the *luxury project* dummy in the regression of the likelihood of a price increase, –0.18, is only marginally statistically significant, while in the regression of the likelihood of a price decrease, –0.30, it is statistically significant at 1%. Moreover, the latter is larger in the absolute value.

Therefore, when we remove the controls that may cause endogeneity, we find that the results are consistent with the hypothesis that developers in the market for luxury homes want to avoid price decreases more than they would like to avoid price increases: the results suggest that in the market for luxury homes, prices are sticky downwards, but less sticky upwards, if at all. It follows, therefore, that the results we report in the paper are not sensitive to possible endogeneity of the suspected RHS variables.

Table D1. Time spell between sales

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	–0.30*** (0.030)	Initially expected profit margin	–0.27*** (0.072)
Log of the number of previous price decreases	0.17*** (0.032)	Log of the initially expected financial costs	–0.05*** (0.019)
Luxury project×log of the number of previous price increases	0.32*** (0.044)	Equity share	–0.25* (0.138)
Luxury project×log of the number of previous price decreases	–0.06 (0.053)	Luxury project	–0.22*** (0.049)
Log of the average price per room of previously sold housing units	0.12*** (0.14)	Log of the number of rooms	–0.33*** (0.055)
Log GDP	–3.58*** (0.612)	High-ceiling	–0.91*** (0.158)
Interest rate	0.01 (0.012)	Garden	–0.03 (0.045)
Log of the number of housing starts	–0.26* (0.156)	Penthouse	0.01 (0.042)
Log of the average price of housing units sold in the region	0.03* (0.017)	Large balcony	0.10 (0.119)
Log of the average NIS/US dollar exchange rate	0.89* (0.515)	Safety-room	0.03 (0.169)
Log population	12.59*** (2.264)	Pool	0.18*** (0.054)
Log CPI	–0.29 (0.983)	Single family	–0.20*** (0.040)
Log of the initially expected expenditures on advertisement	0.12*** (0.021)	Ultra-religious	0.63*** (0.055)
χ^2	1,577.4		
N	7,789		

Notes
1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of sales.
2. The dependent variable is the time spell between successive sales.
3. The regression includes dummies for the region in which the projects are located, and the year in which the housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table D2. Time spell between price decreases

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	0.11 (0.178)	Initially expected profit margin	0.25 (0.588)
Log of the number of previous price decreases	0.07 (0.159)	Log of the initially expected financial costs	–0.19 (0.131)
Luxury project×log of the number of previous price increases	–0.71** (0.298)	Equity share	1.62** (0.818)
Luxury project×log of the number of previous price decreases	0.38 (0.334)	Luxury project	0.15 (0.363)
Log of the average price per room of previously sold housing units	–0.22** (0.085)	Log of the number of rooms	–0.74*** (0.258)
Log GDP	4.83 (3.331)	High-ceiling	1.52 (1.010)
Interest rate	0.01 (0.067)	Garden	0.03 (0.291)
Log of the number of housing starts	–0.15 (0.739)	Penthouse	0.24 (0.248)
Log of the average price of housing units sold in the region	0.01 (0.086)	Large balcony	–0.14 (0.616)
Log of the average NIS/US dollar exchange rate	–2.17 (2.545)	Safety-room	2.21** (0.978)
Log population	–6.43 (12.683)	Pool	–0.42 (0.440)
Log CPI	–0.60 (5.155)	Single family	0.14 (0.260)
Log of the initially expected expenditures on advertisement	0.73*** (0.134)	Ultra-religious	–1.02** (0.408)
χ^2		230.0	
N		7,789	

Notes
1. T The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price decreases.
2. The dependent variables is the time spell between price decreases.
3. The regression includes dummy variables for the 9-regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table D3. Time spell between price increases

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	–0.24* (0.139)	Initially expected profit margin	–0.72 (0.502)
Log of the number of previous price decreases	0.41*** (0.134)	Log of the initially expected financial costs	–0.26 (0.114)
Luxury project×log of the number of previous price increases	0.18 (0.236)	Equity share	1.23** (0.614)
Luxury project×log of the number of previous price decreases	–0.77** (0.301)	Luxury project	0.33 (0.267)
Log of the average price per room of previously sold housing units	–0.24*** (0.083)	Log of the number of rooms	–0.57** (0.223)
Log GDP	–0.63 (2.831)	High-ceiling	0.39 (1.060)
Interest rate	–0.004 (0.053)	Garden	0.28 (0.218)
Log of the number of housing starts	–0.83 (0.666)	Penthouse	0.51*** (0.193)
Log of the average price of housing units sold in the region	0.08 (0.071)	Large balcony	–0.36 (0.385)
Log of the average NIS/US dollar exchange rate	6.55*** (1.994)	Safety-room	1.46 (1.142)
Log population	–9.35 (10.311)	Pool	0.03 (0.323)
Log CPI	–0.34 (3.815)	Single family	–0.35 (0.221)
Log of the initially expected expenditures on advertisement	0.47*** (0.106)	Ultra-religious	0.36 (0.397)
χ^2		381.3	
N		7,860	

Notes
1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price increases.
2. The dependent variables is the time spell between price increases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table D4. Regression of the likelihood of a price decrease

Variable	Coefficient	Variable	Coefficient
Luxury project	–0.30*** (0.115)	Equity share	0.42 (0.332)
Log of the average price per room of previously sold housing units	0.14*** (0.028)	Log of the number of rooms	–0.11 (0.118)
Log GDP	3.64** (1.580)	High-ceiling	0.52 (0.533)
Interest rate	0.02 (0.030)	Garden	–0.14 (0.124)
Log of the number of housing starts	0.58* (0.342)	Penthouse	–0.03 (0.105)
Log of the average price of housing units sold in the region	–0.05 (0.043)	Large balcony	–0.01 (0.260)
Log of the average NIS/US dollar exchange rate	–2.01* (1.180)	Safety-room	0.36 (0.500)
Log population	–2.91 (5.706)	Pool	–0.13 (0.173)
Log CPI	–1.72 (2.305)	Single family	0.11 (0.104)
Log of the initially expected expenditures on advertisement	0.01 (0.050)	Ultra-religious	–0.54 (0.158)
Initially expected profit margin	0.27 (0.212)	Constant	–18.04 (46.212)
Log of the initially expected financial costs	0.09* (0.049)		
χ^2		109.2	
N		7,860	

Notes
1. The table reports the results of estimating a probit model for the probability of price decreases.
2. The dependent variable is a dummy variable that equals 1 if the price has decreased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10% **- Significant at 5%. ***- Significant at 1%.

Table D5. Regression of the likelihood of a price increase

Variable	Coefficient	Variable	Coefficient
Luxury project	–0.18* (0.097)	Equity share	0.53* (0.286)
Log of the average price per room of previously sold housing units	0.13*** (0.026)	Log of the number of rooms	0.04 (0.106)
Log GDP	1.09 (1.403)	High-ceiling	0.26 (0.503)
Interest rate	–0.004 (0.025)	Garden	–0.002 (0.097)
Log of the number of housing starts	0.05 (0.336)	Penthouse	0.06 (0.087)
Log of the average price of housing units sold in the region	–0.02 (0.036)	Large balcony	–0.29 (0.203)
Log of the average NIS/US dollar exchange rate	1.33 (1.054)	Safety-room	0.21 (0.489)
Log population	–4.11 (4.922)	Pool	–0.04 (0.141)
Log CPI	0.13 (1.970)	Single family	0.02 (0.094)
Log of the initially expected expenditures on advertisement	–0.08* (0.045)	Ultra-religious	–0.31*** (0.121)
Initially expected profit margin	0.19 (0.175)	Constant	16.19 (38.446)
Log of the initially expected financial costs	0.10** (0.042)		
χ^2		113.7	
N		7,860	

Notes
1. The table reports the results of estimating a probit model for the probability of price increases.
2. The dependent variable is a dummy variable that equals 1 if the price has increased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Appendix E. Omitted Variables

In the paper, in estimating the regressions of the likelihood of a price decrease and the likelihood of a price increase, we did not control for changes in the CPI, and for previous price changes. Below, we report the results of estimating these regressions after adding these control variables. Specifically, we add two control variables, which capture the change in the CPI in the current and previous months, (*change in* CPI_t and *change in* $CPI_{t\text{-}1}$). In addition, we include the log of the *number of previous price increases* and the log of the *number of previous price decreases*. See Tables E1 and E2.

In estimating the regressions, we use the same dataset as we use in the paper. I.e., we exclude the observations with a time spell between sales greater than 100 days, and with a time spell between price changes greater than 1,200 days.

We find that in the regression for the likelihood of a price decrease (see Table E1), the coefficient of the *luxury project* dummy is negative, –0.27, and statistically significant. In the regression for the likelihood of a price increase (see Table E2), however, the coefficient of the *luxury project* dummy is negative, –0.15, but statistically insignificant.

These results suggest that once we control for the *number of previous price increases* and the *number of previous price decreases*, we find asymmetric price rigidity in the market for luxury homes. Specifically, in the market for luxury homes, prices are more rigid downwards than in the market for middle-class homes, but not upward.

This asymmetry can be explained by our findings that in the market for luxury homes, price cuts convey a negative signal that can have a negative effect on the demand for homes in a luxury project. Therefore, it is possible that developers of luxury projects try to avoid price decreases more than they avoid price increases.

The finding of asymmetry, however, is not strong. We obtain it only when we include in the regressions variables that could potentially lead to a problem of endogeneity bias.

Table E1. Regression of the likelihood of a price decrease

Variable	Coefficient	Variable	Coefficient
Luxury project	–0.27** (0.123)	Log of the initially expected expenditures on advertisement	0.03 (0.489)
Log of the number of previous price increases	0.19*** (0.063)	Initially expected profit margin	0.28 (0.214)
Log of the number of previous price decreases	–0.10 (0.063)	Log of the initially expected financial costs	0.03 (0.050)
Log of the average price per room of previously sold housing units	0.07** (0.035)	Equity share	0.51 (0.343)
Log GDP	3.43 (1.616)	Log of number of housing units sold in previous month	–0.12*** (0.036)
Interest rate	0.02 (0.032)	Log of the number of rooms	–0.12 (0.127)
Log of the number of housing starts	0.30 (0.351)	High-ceiling	0.52 (0.527)
Log of the average price of housing units sold in the region	–0.05 (0.043)	Garden	–0.14 (0.123)
Log of the average NIS/US dollar exchange rate	–2.27 (1.451)	Penthouse	–0.03 (0.106)
Log population	–1.75 (6.188)	Large balcony	–0.10 (0.245)
Log CPI	–1.84 (2.406)	Safety-room	0.34 (0.496)
Financially constrained	–0.03* (0.015)	Pool	–0.02 (0.179)
Project delayed beyond schedule	0.20 (0.163)	Single family	0.12 (0.104)
Change in CPI	0.72 (6.94)	Ultra-religious	–0.44*** (0.139)
Change in lagged CPI	5.46 (6.465)	Constant	–21.64 (49.420)
χ^2		140.9	
N		7,787	

Notes

1. The table reports the results of estimating a probit model for the probability of price decreases.
2. The dependent variable is a dummy variable that equals 1 if the price has decreased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the current level of CPI, as well as the change in the CPI in the current and the previous months.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table E2. Regression of the likelihood of a price increase

Variable	Coefficient	Variable	Coefficient
Luxury project	–0.15 (0.102)	Log of the initially expected expenditures on advertisement	–0.05 (0.046)
Log of the number of previous price increases	0.001 (0.054)	Initially expected profit margin	0.14 (0.176)
Log of the number of previous price decreases	0.07 (0.054)	Log of the initially expected financial costs	0.06 (0.045)
Log of the average price per room of previously sold housing units	0.12*** (0.034)	Equity share	0.61 (0.299)
Log GDP	1.64 (1.438)	Log of number of housing units sold in previous month	–0.07** (0.030)
Interest rate	–0.02 (0.026)	Log of the number of rooms	0.11 (0.114)
Log of the number of housing starts	–0.03 (0.351)	High-ceiling	0.26 (0.509)
Log of the average price of housing units sold in the region	–0.02 (0.036)	Garden	0.02 (0.097)
Log of the average NIS/US dollar exchange rate	1.59 (1.064)	Penthouse	0.08 (0.087)
Log population	–3.81 (4.964)	Large balcony	–0.26 (0.200)
Log CPI	–0.66 (1.983)	Safety-room	0.25 (0.489)
Financially constrained	–0.003 (0.011)	Pool	0.11 (0.145)
Project delayed beyond schedule	0.41** (0.173)	Single family	–0.02 (0.095)
Change in CPI	–8.59 (6.159)	Ultra-religious	–0.29*** (0.114)
Change in lagged CPI	–0.18 (5.730)	Constant	15.28 (38.407)
χ^2		137.9	
N		7,787	

Notes
1. The table reports the results of estimating a probit model for the probability of price increases.
2. The dependent variable is a dummy variable that equals 1 if the price has increased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks, and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the current level of CPI, as well as the change in the CPI in the current and the previous months..
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10% **- Significant at 5%. ***- Significant at 1%.

Appendix F. Ruling out Tel-Aviv Effect

The majority of the luxury projects that are built in Israel, are located in Tel-Aviv area, the economic capital Israel's. It is therefore possible that our proxy for luxury projects merely captures the effect of the projects being located in the economic capital, rather than the luxury effect. We partly deal with this possibility in the paper by including a dummy for homes located in Tel-Aviv. As a further robustness check, we report below the results when we exclude the observations on the homes located in Tel Aviv. The estimation results are reported in Tables F1–F6.

We find that in the regression of the time spell between sales (see Table F1), the coefficient of the interaction term between *the number of previous price increases* and *luxury project* is positive, 0.41, and statistically significant. The coefficient of the interaction term between *the number of previous price decreases* and *luxury project* is negative, –0.16, and statistically significant. The coefficient of the log of the *average price per room of previously sold housing units* is also positive, 0.06, and statistically significant.

Thus, the results we obtain when we use the full sample, are similar to the results we report in the manuscript. In particular, they suggest that higher past prices and more frequent price increases in the market for luxury homes, serve as a positive signal that can increase the likelihood of sales. Past price decreases, on the other hand, serve as a negative signal that can reduce the sales volume.

In the hedonic regression of housing prices (see Table F2), we find that the coefficient of the interaction term between *the number of previous price increases* and *luxury project* is positive 2.23, and statistically significant. The coefficient of the interaction term between *the number of previous price decreases* and *luxury project* is negative, –4.47, and statistically significant. The coefficient of the log of the *average price per room of previously sold housing units* is also positive, 0.05, although it is statistically insignificant.

Thus, even after we exclude the observations on the homes located in Tel-Aviv, we find that past prices changes convey a signal. It seems that despite excluding from the regression sample a large proportion of luxury homes, we still find that more frequent past price increases convey a positive signal that facilitates higher future prices. Price decreases, on the other hand, have a negative effect on future prices.

In the regression of the time spell between price decreases (see Table F3), we find that the coefficient of the interaction term between the *number of previous price increases* and *luxury project* is negative, –0.30, but statistically insignificant. In the regression of the time spell between price increases (see Table F4), the coefficient of the interaction term between the *number of previous price decreases* and *luxury project* is negative, –0.1.72, and statistically significant.

Thus, when we exclude the observations on the homes located in Tel-Aviv, we find that price decreases have a negative effect on the likelihood of further price increases. However, we do not find that price increases have a significant negative effect on the likelihood of price decreases. It seems therefore that the removal of the observations on luxury homes reduced the power of the regressions. Nevertheless, we still find that the main result we report in the manuscript, that price decreases have a negative effect on future price increases, still holds.

The coefficient of the log of the *average price per room of previously sold housing units* is negative and marginally significant in both regressions, –0.17 (in the regression of the time spell between price decreases, Table F3) and –0.23 (in the regression of the time spell between price increases, Table F4), respectively. This suggests that when prices increase, developers make fewer price changes, possibly because it is difficult to increase the prices of housing units that are already offered at high prices, while at the same time, they want to avoid sending the negative signal conveyed by price cuts.

In the regressions of the likelihood of a price decrease (see Table F5), we find that the likelihood of a price decrease is smaller in projects of luxury homes than in projects of middle class homes. The coefficient of the *luxury project* dummy is negative, –0.21, and marginally significant. In the regression of the likelihood of a price increase (see Table F6), however, the coefficient of the *luxury project* dummy is negative, –0.05, but statistically insignificant.

Therefore, when we exclude observations on the homes sold in Tel-Aviv, we find asymmetric price rigidity in the luxury home market. Specifically, in the market for luxury homes, prices are more rigid downward than in the market for middle-class homes, but not upward. This asymmetry can be explained by the findings that in the market for luxury homes, price cuts convey a negative signal that can have a negative effect on the demand for homes in a luxury project. Therefore, it is possible that developers of luxury projects try to avoid price decreases more than they try to avoid price increases.

Table F1. Time spell between sales

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	-0.26*** (0.031)	Log of the initially expected expenditures on advertisement	0.08*** (0.029)
Log of the number of previous price decreases	0.17*** (0.032)	Initially expected profit margin	-0.27*** (0.082)
Luxury project×log of the number of previous price increases	0.41*** (0.056)	Log of the initially expected financial costs	-0.05* (0.026)
Luxury project×log of the number of previous price decreases	-0.16** (0.083)	Equity share	-0.51*** (0.153)
Log of the average price per room of previously sold housing units	0.06*** (0.016)	Luxury project	-0.19*** (0.054)
Log GDP	-3.94*** (0.664)	Log of number of housing units sold in previous month	0.11*** (0.015)
Interest rate	0.001 (0.012)	Log of the number of rooms	-0.37*** (0.066)
Log of the number of housing starts	-0.15 (0.166)	High-ceiling	-0.89*** (0.150)
Log of the average price of housing units sold in the region	0.05*** (0.018)	Garden	-0.05 (0.048)
Log of the average NIS/US dollar exchange rate	1.24** (0.564)	Penthouse	-0.04 (0.048)
Log population	12.68*** (2.43)	Large balcony	0.19 (0.119)
Log CPI	0.64 (1.069)	Safety-room	-0.12 (0.180)
Financially constrained	-0.002 (0.149)	Pool	0.10* (0.058)
Project delayed beyond schedule	-0.89*** (0.119)	Single family	-0.17*** (0.042)
Problems with subcontractors	1.47*** (0.384)	Ultra-religious	0.58*** (0.057)
χ^2	1634.0		
N	6,919		

Notes

1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of sales.
2. The dependent variable is the time spell between successive sales.
3. The regression includes dummies for the region in which the projects are located, and the year in which the housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parentheses.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table F2. Hedonic regression of housing prices

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	-0.22 (0.164)	Initially expected profit margin	0.29 (0.408)
Log of the number of previous price decreases	0.70*** (0.224)	Log of the initially expected financial costs	-0.44 (0.830)
Luxury project×log of the number of previous price increases	2.23** (1.114)	Equity share	-2.10*** (0.695)
Luxury project×log of the number of previous price decreases	-4.47*** (1.350)	Luxury project	-0.10 (0.382)
Log of the average price per room of previously sold housing units	0.05 (0.049)	Current financial costs	0.37 (0.874)
Log GDP	0.71 (0.889)	Log of number of housing units sold in previous month	-0.45*** (0.115)
Interest rate	-0.04** (0.020)	Log of the number of rooms	0.86*** (0.146)
Log of the number of housing starts	-0.52** (0.241)	High-ceiling	0.20 (0.157)
Log of the average price of housing units sold in the region	0.15*** (0.047)	Garden	-0.20** (0.085)
Log of the average NIS/US dollar exchange rate	2.21* (1.295)	Penthouse	-0.02 (0.184)
Log population	-7.86** (3.589)	Large balcony	-1.81 (0.406)
Log CPI	2.94 (2.143)	Safety-room	-0.03 (0.511)
Financially constrained	-13.98*** (3.375)	Pool	-0.12 (0.184)
Project delayed beyond schedule	-3.92*** (1.507)	Single family	-0.19* (0.099)
Problems with subcontractors	8.43*** (3.176)	Ultra-religious	-0.81*** (0.266)
Log of the initially expected expenditures on advertisement	0.07 (0.063)	Constant	65.36** (29.65)
F-test		23.1	
Hansen *J*-test		4.17	
N		6,919	

Notes:
1. The table reports the results of a hedonic GMM regression.
2. The dependent variable is the log of the home prices.
3. The regression includes dummies for the region in which the projects are located and the year in which the housing-unit was sold.
4. The instruments include the population, the log of the dollar LIBID interest rates in the previous month, the log of the average exchange rate of a basket of foreign currencies in the previous month, the GDP growth rate in the previous quarter, the log of the number of housing units in the project, the log of the index of the construction costs in the previous quarter, and dummy variables for the lending banks.
5. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
6. Robust standard errors are reported in parentheses. Hansen *J-test* is a test of over-identification of all the instruments.
7. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table F3. Time spell between price decreases

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	0.05 (0.210)	log of the initially expected expenditures on advertisement	0.51*** (0.196)
Log of the number of previous price decreases	0.004 (0.192)	Initially expected profit margin	0.15 (0.877)
Luxury project×log of the number of previous price increases	-0.30 (0.414)	log of the initially expected financial costs	0.43 (0.221)
Luxury project×log of the number of previous price decreases	-0.31 (0.547)	Equity share	1.58 (0.994)
Log of the average price per room of previously sold housing units	-0.23* (0.117)	Luxury project	0.40 (0.512)
Log GDP	5.81 (3.606)	Log of number of housing units sold in previous month	-0.07 (0.099)
Interest rate	0.04 (0.073)	Log of the number of rooms	-0.39 (0.364)
Log of the number of housing starts	-0.16 (0.805)	High-ceiling	1.54 (1.064)
Log of the average price of housing units sold in the region	0.05 (0.117)	Garden	0.29 (0.300)
Log of the average NIS/US dollar exchange rate	-0.81 (2.882)	Penthouse	0.37 (0.251)
Log Population	-1.79 (13.790)	Large balcony	0.02 (0.648)
Log CPI	-3.81 (5.734)	Safety-room	1.34 (0.984)
Financially constrained	1.48 (0.505)	Pool	-0.46 (0.544)
Project delayed beyond schedule	-0.93* (0.520)	Single family	-0.04 (0.293)
Problems with subcontractors		Ultra-religious	-0.76* (0.454)
χ^2	219.7		
N	6,919		

Notes:

1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price decreases.
2. The dependent variable is the time spell between price decreases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parenthesis.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table F4. Time spell between price increases

Variable	Coefficient	Variable	Coefficient
Log of the number of previous price increases	-0.35** (0.150)	log of the initially expected expenditures on advertisement	0.56*** (0.159)
Log of the number of previous price decreases	0.44*** (0.153)	Initially expected profit margin	-0.42 (0.759)
Luxury project×log of the number of previous price increases	0.30 (0.310)	log of the initially expected financial costs	-0.34 (0.176)
Luxury project×log of the number of previous price decreases	-1.72*** (0.488)	Equity share	0.78 (0.958)
Log of the average price per room of previously sold housing units	-0.16* (0.087)	Luxury project	0.74* (0.380)
Log GDP	-0.50 (3.182)	Log of number of housing units sold in previous month	0.04 (0.079)
Interest rate	-0.0004 (0.055)	Log of the number of rooms	-0.29 (0.312)
Log of the number of housing starts	-0.45 (0.754)	High-ceiling	0.81 (1.067)
Log of the average price of housing units sold in the region	0.01 (0.068)	Garden	0.26 (0.245)
Log of the average NIS/US dollar exchange rate	7.40*** (2.339)	Penthouse	0.61*** (0.206)
Log Population	-5.79 (11.727)	Large balcony	-0.03 (0.414)
Log CPI	0.31 (4.371)	Safety-room	1.32 (1.176)
Financially constrained	0.80 (0.527)	Pool	0.07 (0.411)
Project delayed beyond schedule	-1.82** (0.786)	Single family	-0.47* (0.263)
Problems with subcontractors	4.25** (2.162)	Ultra-religious	-0.09 (0.373)
χ^2	257.8		
N	6,919		

Notes:
1. The table reports the results of estimating a Cox semi-parametric accelerated failure time (AFT) model for the likelihood of price increases.
2. The dependent variable is the time spell between price increases.
3. The regression includes dummy variables for the 9 regions of Israel, for the lending banks and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parenthesis.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table F5. Regression of the likelihood of a price decrease

Variable	Coefficient	Variable	Coefficient
Luxury project	-0.21* (0.111)	log of the initially expected financial costs	
Log of the average price per room of previously sold housing units	0.15 (0.031)	Equity share	
Log GDP	3.96*** (1.098)	Log of number of housing units sold in previous month	-0.15*** (0.035)
Interest rate	0.02 (0.023)	Log of the number of rooms	-0.07 (0.145)
Log of the number of housing starts	0.05 (0.272)	High-ceiling	0.27 (0.544)
Log of the average price of housing units sold in the region	-0.007 (0.039)	Garden	-0.02 (0.124)
Log of the average NIS/US dollar exchange rate	-0.81 (0.720)	Penthouse	0.02 (0.114)
Log Population	-1.90 (2.412)	Large balcony	-0.04 (0.250)
Log CPI	-0.38 (1.186)	Safety-room	0.10 (0.500)
Financially constrained	0.59** (0.234)	Pool	-0.006 (0.127)
Project delayed beyond schedule	0.60** (0.268)	Single family	0.07 (0.104)
log of the initially expected expenditures on advertisement	0.05 (0.077)	Ultra-religious	-0.28** (0.112)
Initially expected profit margin	0.12 (0.223)	Constant	-34.15 (21.151)
χ^2		117.9	
N		6,911	

Notes:
1. The table reports the results of estimating a probit model for the probability of price decreases.
2. The dependent variable is a dummy variable that equals 1 if the price has decreased in the current transaction and zero otherwise.
3. The regression includes dummy variables for for the lending banks and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parenthesis.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.

Table F6. Regression of the likelihood of a price increase

Variable	Coefficient	Variable	Coefficient
Luxury project	-0.05 (0.096)	log of the initially expected financial costs	-0.02 (0.056)
Log of the average price per room of previously sold housing units	0.16*** (0.027)	Equity share	1.04*** (0.313)
Log GDP	-0.41 (1.026)	Log of number of housing units sold in previous month	-0.08*** (0.030)
Interest rate	-0.004 (0.019)	Log of the number of rooms	0.22 (0.127)
Log of the number of housing starts	0.18 (0.242)	High-ceiling	0.25 (0.535)
Log of the average price of housing units sold in the region	-0.06* (0.030)	Garden	0.02 (0.102)
Log of the average NIS/US dollar exchange rate	1,38** (0.611)	Penthouse	0.09 (0.095)
Log Population	0.82 (2.078)	Large balcony	-0.18 (0.206)
Log CPI	-2.03** (1.028)	Safety-room	0.24 (0.485)
Financially constrained	0.57*** (0.215)	Pool	0.23** (0.111)
Project delayed beyond schedule	0.53*** (0.172)	Single family	-0.06 (0.098)
log of the initially expected expenditures on advertisement	0.05 (0.066)	Ultra-religious	-0.16* (0.093)
Initially expected profit margin	-0.04 (0.183)	Constant	-1.37 (17.730)
χ^2	117.2		
N	6,911		

Notes:
1. The table reports the results of estimating a probit model for the probability of price increases.
2. The dependent variable is a dummy variable that equals 1 if the price has increased in the current transaction and zero otherwise.
3. The regression includes dummy variables for the lending banks and for the year in which a housing-unit was sold.
4. For the following variables, we use the data for the quarter before each sale: GDP, the interest rate, the number of housing starts, the average price of housing units sold in the region, and the population. We use the CPI of the previous month.
5. Robust standard errors are reported in parenthesis.
6. *- Significant at 10%. **- Significant at 5%. ***- Significant at 1%.