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## **Real-Estate Investors, House Prices and Rents: Evidence from Capital-Gains Tax Changes**

by

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# **Real-Estate Investors, House Prices and Rents: Evidence from Capital-Gains Tax Changes\***

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## **Abstract**

We study the dual role of real-estate investors – households who own multiple housing units – in ownership and rental housing markets in Israel. Exploiting a series of capital-gains tax changes and rich administrative data, we first show that real-estate investors that were subject to an unexpected temporary capital-gains tax exemption increased their sales of housing units by 50%. Predominantly, the housing units sold by investors were purchased by single homeowners and were previously occupied by renters. Next, we exploit spatial variation in the share of the housing stock owned by investors across 360 local markets to examine how investors' activity induced by the tax changes affected local house prices and local rents. We present evidence that a 1 percentage point increase in investors' sales out of stock led house prices to decrease by 14% and rents of new leases to increase by 4%. These effects are larger for smaller and older units, in which investors own a larger share of the stock of housing units. The results suggest that policies that encourage investors to sell can achieve their stated objective of reducing house prices, but also run the risk of restricting the supply of rental housing, and thus adversely affecting renters.

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# 1 Introduction

Households who own multiple housing units, which we refer to as “real-estate investors”, hold a substantial share of the total housing wealth. In many countries, they are also the primary suppliers of rental units. Therefore, their decisions to buy or sell affect the housing market directly, and indirectly, the supply of housing units in the rental market. Investors’ activity has increased over the past two decades in countries such as Australia, Canada, China, the Netherlands, the UK, the US, and Israel, which prompted a policy debate. One common concern is that investors contribute to rising house prices. Recent evidence shows, for example, that the surge in investors’ activity in the US was associated with a rise in house prices prior to the 2008 financial crisis (Haughwout et al., 2011; Albanesi et al., 2017; Gao et al., 2020; Bayer et al., 2021). Policy makers are also concerned about the implications of investors on the economy at large. The Bank of England, for instance, stated that: “the scale and nature of Buy-To-Let activity makes it a significant potential amplifier of housing and credit cycles”.<sup>1</sup> An alternative view emphasizes the role of investors as middlemen that may improve the efficiency of housing markets (Bayer et al., 2020). Despite the growing interest and the policy debate, there is still limited systematic evidence on the efficacy of tax policy on real-estate investors, and on their dual role in the ownership and rental markets.

This paper adds to the debate by estimating the effects of a policy aimed at changing the ownership structure of the housing stock in Israel, and its implications for house prices and rents. We use rich administrative data on investors and housing markets in Israel, and exploit a series of capital-gains tax changes which encouraged some investors, but not all, to sell their housing units at a significantly reduced capital-gains tax rate. Our analysis involves two main empirical exercises. First, we show that investors that were subject to the capital-gains tax exemption, which we define as treated investors, increased their sales by a half compared to otherwise similar real-estate investors. Second, we use the supply shocks induced by the tax changes, and variation across 360 local housing markets in the share of housing units owned by treated investors, to estimate the demand relationship between housing sales, house prices, and rents. We find that additional sales by treated investors significantly reduced local house prices and increased rents. Our preferred estimate is that a 1 percentage point increase in the semiannual rate of investors’ sales causes house prices to fall by 14% and rents on new leases to increase by 4%. Notably, estimating the effect of investors’ activity on rents is novel to the literature.

The main goal of this paper is to establish causal links between tax changes, changes in

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<sup>1</sup>Available at: <https://www.bankofengland.co.uk/statement/fpc/2014/financial-policy-committee-statement-september-2014>. Similar concerns have been voiced in New Zealand (Reserve Bank of New Zealand, 2016), Australia (Reserve Bank of Australia, 2017) and the Netherlands (De Nederlandsche Bank, 2018).

investors' activity, and changes in market prices. Estimating such links is inherently difficult because decisions to sell or buy housing units are driven by capital market conditions and anticipation of rent and price appreciation, which are unobserved by researchers. Thus, researchers may erroneously attribute rising prices to the tax changes and investors' activity, although they would have happened regardless of these actions. Such concerns are important in practice as changes in real-estate taxes are often driven by a desire to change existing price trends. An added complexity is that even if the tax changes are unrelated to existing trends and unanticipated, they often apply to all investors, which prevents the construction of a valid control group.

To overcome these empirical challenges, we take advantage of a sequence of changes in the Israeli capital-gains tax code that affected only a subset of investors. Up until December 2010, investors who have sold a housing unit during the previous 4 years paid a capital-gains tax of 25%. Single homeowners and other investors (i.e., those who have not sold a housing unit in the previous 4 years) were exempt from any capital-gains tax. In January 2011, the government temporarily also exempted investors who had sold a housing unit in the past 1.5-4 years. Importantly, the eligibility for this exemption was not based on the holding period of the housing unit under consideration, or its location. Rather, eligibility was determined based on whether the investor had sold another housing unit in the past 1.5-4 years. The temporary exemption ended in June 2013, and in January 2014, the government enacted a new capital-gains tax law that ties the tax payment to the holding period of the unit sold, eliminating the differential treatment of investors in capital-gains taxation based on sales of other units owned by the same household. This sequence of tax changes allows to examine how investors responded to large decreases and increases in the tax rate over a relatively short time period. Moreover, since the tax changes applied only to a subset of investors, we are able to create a control group of investors, i.e., those who were not affected by the tax change. Other empirical studies of real-estate investors appeal to geographic variation in tax rates, which means that the treatment and control groups consist of different housing units. Finally, since eligibility for the tax exemption was neither based on the location of the unit nor its holding period, we can presumably treat the share of housing stock owned by investors in different local markets as exogenous, and exploit this spatial variation in estimating the impact of investors' activity on house prices and rents.

We base our analysis on several data sources. First, we use annual property tax records on the universe of housing units in the 76 largest municipalities across Israel. These municipalities account for nearly 90% of the total housing stock in Israel. Second, we use administrative records on the universe of housing transactions in Israel between 1990 and 2018. These data include information on the price, date, buyer and seller ids, investors status of the buyer, indicator for sellers who pay capital gains tax and unit characteristics. We match these records

to the population registry, which includes information on the primary residence of the owner, and rich demographic information, such as age, marital status, parents, siblings for all individuals who were either sellers or buyers of a housing unit in Israel between 2002 and 2018. This matching procedure enables us to determine the identity of the household who owns each housing unit, the number of units owned by that household in each date, and the owner's primary residence. In some of the analyses we perform, we use this information at a more aggregated level and compute the share of housing units owned by investors in 360 different local markets at half-year time periods. Third, we use data on rents from a large longitudinal rent survey conducted by Israel's Central Bureau of Statistics for the official consumer price index. The survey includes information on the rental unit location and characteristics, and distinguishes between new leases, which were signed in the last 12 months, and extended leases.

Our first exercise measures the effect of the capital-gains tax changes on sales by investors. We show that prior to the temporary tax exemption there was a sharp discontinuity in the probability of sale by investors who sold another unit just before and just after the 4 years mark – the former subject to a 25% capital-gains tax rate and the latter exempt from it. During the temporary exemption phase, both groups were exempt, and this discontinuity disappears. We quantify the effect of the tax exemption on sales using a controlled difference-in-difference design in which we compare the sales probability of housing units owned by treated investors to control investors (those who sold another unit in the past 1.5, or more than 4 years). The main result of this design is that a reduction of 25% in the capital-gains tax rate increased the sales probability of units owned by treated investors by 50%. In absolute terms, the semiannual sales rate by the treated investors went from 1.2 percentage point out of stock before the exemption to 1.8 percentage point after. A key feature of these additional sales is that most of them were of non-primary housing units (i.e., they are not the primary residence of the owner and thus more likely to be a rental unit) and to non-investor buyers, such as first-time homeowners. When the temporary exemption expired, the sales probability reverted to values almost identical to pre-exemption.

While our findings from the first exercise are informative for understanding the impact of tax changes on investors, we are also interested in evaluating the impact of investors on ownership and rental prices at the market level. Theoretically, this impact is ambiguous. From a classical perspective, the ownership structure of housing is irrelevant for the price of their services; only their aggregate supply matters. In particular, changes in the share of investor-owned housing units, without a change in the total number of units should have a near-zero effect. This is because on net, any change in the number of investor-owned units must drive an identical change in the number of renters (assuming all households own or rent). Therefore, any change in the supply of rental units is accompanied by a near-identical change in their

demand. A more nuanced view recognizes the roles of credit frictions and heterogeneity in the demand for housing which could imply that when the number of rental units declines, the remaining renters are more constrained in their housing choice. Competition among the remaining renters on a shrinking pool of available units pushes the rent up. Similarly, the volume and the timing of housing sales, which do not affect prices in the classical framework, may have large effects on house prices, as demonstrated by the housing search literature (for review see Han and Strange (2015)).

The second empirical exercise addresses this theoretical ambiguity, and estimates the demand relationship between investors' sales induced by the tax changes, prices and rents. We first document considerable spatial variation in the composition of investors over 360 local housing markets. We use the local composition of investors to construct a predictor of the semiannual number of housing units sold by investors in each market. Next, we regress transaction price on the sales predictor. We find that 100 added sales by investors decrease house prices by 34%. Taking into account the size of the stock in each local market and period (which consists on average of 4,276 housing units), we find that a 1 percentage point increase in the semiannual sales rate out of stock lowers house prices by 14%. The coefficient is significantly larger when considering only small units (3 rooms or less) and is virtually absent when considering only new units. Thus, most of the effect of investor sales is concentrated in smaller and older units, in which investors specialize, or alternatively, in units that are typically rented out. We also regress rents on the sales predictor and find the opposite effect. We find that 100 added sales by investors *increases* rent of new leases by 9%. Accounting for the local stock of housing, we find that a 1 percentage point increase in the sales rate out of stock increases rent of new leases by 11%. Here, again, the effect is more pronounced when we restrict attention to smaller housing units, and insignificant when we do so for large housing units. Interestingly, the effect is virtually nonexistent in extended leases (leases beyond the first year) which suggests that existing leases are shielded from market conditions.

Our analysis also sheds light on the local demand for housing and how it is affected by the ownership structure. We first verify that the additional sales by investors did actually change the local share of units held by investors. We find that each additional sale induced by the temporary tax exemption, on average, shifted one unit from investors to non-investors. Then, we consider an IV interpretation, in which the sales shocks, induced by the tax changes, move house prices and rents only through changes in the ownership structure. Under this interpretation, the estimates of the inverse-demand semi-elasticity of local house prices and rents on new leases with respect to investors' share are 7.3 and -1.8 respectively. These estimates are economically significant, which suggests that local demand for housing, both for ownership and rental services, are quite inelastic in the short term. This characterization of the local demand for housing stands in stark contrast to classical theories, in which local demand should

be nearly perfectly elastic, and is in line with more recent findings on segmented housing markets (Piazzesi, Schneider, and Stroebel, 2020), and on the large potential effect of a small number of transactions by speculators on house prices (Piazzesi and Schneider, 2009; Bayer, Geissler, Mangum, and Roberts, 2020).

The causal interpretation of the link between investors' activity and market prices hinges on the validity of the sales predictor as an exogenous supply shifter. Similar to shift-share instrumental variable design, the predictor of sales by investors can be considered an exogenous supply shifter either because the investor type shares are exogenous, or because the aggregate changes in sales probability ("shocks") are exogenous (Borusyak, Hull, and Jaravel, 2018). One particular concern may be that the investor composition captures unobserved characteristics that predict house price appreciation. We address this concern by showing that the investor sales predictor is uncorrelated with previous price appreciations. As argued above, changes in the tax code were largely unanticipated, and the classification into investor types depends on past behavior of investors in other locations and other housing units, and thus not likely to be set in expectations of the tax changes.

Our results suggest that tax policies that target investors have the potential to significantly change investors' behavior and the ownership structure of the housing stock. Moreover, a small increase in the number of housing units sold by investors significantly reduces local house prices and at the same time increases rents. While our empirical strategy is based on a temporary tax change that has modest aggregate implications, we believe that those implications extend to other policy measures with a much wider reach, such as banning foreign real-estate investors or raising transaction taxes. In many countries, homeownership is promoted as a steppingstone in building wealth for young households. Yet policies that target investors with the intention to promote homeownership, may unintentionally raise rents and hurt the poorest households.

Several papers study the impact of real-estate taxes on transaction volume, albeit without particular focus on investors. Closely related to our work, Shan (2011) explores the impact of a change in the US capital-gains tax law in 1997 on sales volume in suburbs of Boston. She uses a new rule which excluded \$500K of capital gains and exploits variation in unit-level predicted capital gains to show that the exemption increased semiannual sales rate of units with sub-\$500K capital gains by 0.4-0.62 percentage point. This is a similar magnitude to what we find, though from a slightly higher baseline of 2.2 percentage point compared to 1.2 in our data. Best and Kleven (2018) also study transaction volume response to tax changes that complement our findings. They use notches in the UK transaction-tax code and a temporary "tax holiday" in 2008-2009 to estimate the effect of taxes on transactions. Similar to our paper, they find that a temporary reduction in taxes causes a rise in the transaction volume of some units, but not others.

Our paper differs from Shan (2011) and Best and Kleven (2018) in three important ways. First, we document that the tax change led to a change in the ownership structure of housing. The administrative data that we use allows us to distinguish between investors and non-investors. We show that the tax exemption triggered a reallocation of housing units from treated investors to non-investors. Second, we provide direct evidence on sales by investors of similar housing units. The tax policy that we study increased the sales of units based on the owners' characteristics and not the unit characteristics. Both Shan (2011) and Best and Kleven (2018) use a research design that assigns housing units into treatment and control groups based on the value of the unit. Thus, their identification relies on common trend for different types of units, or alternatively, only applies to units near the tax policy cutoffs. Finally, our design allows us to use the change in sales volume to estimate the impact on local housing prices and rents.

Other papers use variation in investor activity to estimate their role in housing booms. Haughwout, Lee, Tracy, and Van der Klaauw (2011) and Albanesi, De Giorgi, and Nosal (2017) document that investors were mostly active in US states that experienced the largest housing booms before the crisis. Bayer, Geissler, Mangum, and Roberts (2020) also document a sharp rise in speculator investor activity in the Los Angeles metropolitan area in the years leading to the financial crisis. Gao, Sockin, and Xiong (2020) use cross-sectional state-level variation in capital-gains taxes to argue that purchases by investors, which were more common in states with lower capital-gains taxes, contributed to rising house prices and to the severity of the economic downturn which followed. Focusing on the housing boom in China, Somerville, Wang, and Yang (2020) show that restrictions imposed by local governments in 2010–11 on the number of residential properties that each individual can buy had a significant cooling effect on newly constructed units, sales volume and prices.

Similar to these papers, we also document a large impact of investor activity on house prices. Two main features distinguish our contribution. First, we focus on a spatial variation that affected the supply of housing rather than the demand for housing units. We exploit variation in the composition of investors, and a temporary tax exemption that encouraged investors to sell. As a result, we are able to identify the local demand relationships between house prices, rents, and investor sales. Second, we use unique data which enable us to pinpoint the exact number of housing units owned by each household and distinguish between the household's primary and non-primary housing units. Other studies typically rely on indirect measures from data on mortgages, or matching names on deeds, which are incomplete and cannot provide a full account of each investor's activity.

Lastly, to the best of our knowledge, this paper is among the first to document a link between the composition of ownership of the housing stock and rental markets. We document how a policy to reduce investor ownership of housing units had the unintended consequence

of raising rents. This result reveals a policy tradeoff: encouraging investor sales may reduce prices and benefit those who intend to buy, but at the same time may hurt renters who do not want to, or even cannot, buy. Two notable exceptions, albeit without a direct reference to investors are Diamond, McQuade, and Qian (2019) and Gete and Reher (2018). Diamond et al. (2019) examine the impacts of rent control on tenants and landlords in San Francisco, and Gete and Reher (2018) shows that an increase in the rate of mortgage denials in the US contributed to a rise in rents relative to the counterfactual.

The rest of the paper is organized as follows. Section 2 provides background on investors activity in Israel and Section 3 presents the datasets used for our analysis. Section 4 examines the effect of the capital gains tax reform on investors' sales and section 5 explores the effect of investors' sales on house prices and rent. Section 6 concludes.

## 2 Background on the Israeli Real-Estate Market

The Israeli experience offers a unique setting for studying the role of real-estate investors. A steep rise in investors' activity in the last 15 years coincided with a steep increase in house prices. The share of real-estate investors out of all households quadrupled between 2007 and 2015, rising from 2.5% in 2007 to nearly 10% in 2015.<sup>2</sup> At the same time, house prices rose by 70% between 2007 and 2015, outpacing rents which rose by only 30%. Our analysis focuses on the the time period between 2009-2014. During these years, the share of real-estate investors out of all households in Israel more than doubled, rising from 4.2% in 2009 to 9.1% in 2014.<sup>3</sup> Likewise, the share of renting households increased.<sup>4</sup>

The steep rise in investors' activity in the real-estate market coincided with a rise in house and rent prices. Figure 1 presents hedonic house price and rent indices, which rose between 2007 and 2018 by 100% and by 40%, respectively. In an attempt to mitigate the price surge and increase the number of housing transactions, the Israeli government announced a significant change in capital-gains tax levied on investors. Up until 2011, investors who sold a housing unit paid a flat 25% capital-gains tax. However, investors who did not sell any other unit in the preceding four years were exempt from this tax. Starting from January, 2011 and until June, 2013, this exemption was extended to investors who did not sell any other unit in the preceding 1.5 years. For a short six months period between July, 2013 and until December, 2013 the new exemption on those who sold another unit in the past 1.5-4 years expired. Starting from January 2014, a new tax code came into effect which no longer distinguished sales by

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<sup>2</sup>See [www.cbs.gov.il/he/mediarelease/DocLib/2019/041/15\\_19\\_041e.pdf](http://www.cbs.gov.il/he/mediarelease/DocLib/2019/041/15_19_041e.pdf).

<sup>3</sup>See [www.cbs.gov.il/he/mediarelease/DocLib/2019/041/15\\_19\\_041e.pdf](http://www.cbs.gov.il/he/mediarelease/DocLib/2019/041/15_19_041e.pdf)

<sup>4</sup>In 2014, 32.7% of Israeli households lived in a non-owned residence. Raz Dror and Shamir, 2017: <https://economy.pmo.gov.il/councilactivity/housing/documents/rent.pdf> This is largely similar to the share of renters in the EU (31%), the US (36%), and the UK (37%). See (Bracke, 2015) for patterns in the UK.

the history of the owners transactions, and instead determined the capital-gains tax rate on investors based solely on the holding period of the particular unit sold. The tax changes are displayed in Figure 2 as vertical dashed lines.



Figure 1: House prices and rents in Israel (2007 - 2018)

*Notes.* The figure displays house price and rent indices based on hedonic regression of log house price (or rent) on property characteristics, year-month and locality-statistical area fixed-effects. The value of each index is normalized to 100 in January 2007. *Sources.* Data on house prices are from the Israel Tax Authority. Data on rent are from a rental survey conducted by the Central Bureau of Statistics.

Five features of the capital gains tax changes make them particularly attractive for our empirical analysis. First, the temporary exemption during January 2011-June 2013 applied only to a subset of investors (investors who had sold another housing unit in the previous 1.5 to 4 years). We consider these investors as treated investors. Investors whose previous sale of a housing unit occurred 4 years or more before the current sale did not pay capital-gains tax both before and after the January 2011 tax changes. This differential impact on a subset of investors allows us to compare the response of investors affected by the policy to otherwise similar investors. Second, eligibility for the capital-gains tax exemption was based on the sale of another unit. Therefore, the allocation into treatment and control groups is not likely to depend on the characteristics or location of the units themselves. For instance, an investor that considered selling a housing unit in Tel Aviv in 2012 was subject to the exemption if she sold another unit, say in 2009, anywhere in Israel. Third, the initial phase of the tax change was unexpected. It was announced in late 2010 and came into effect in January 2011. Moreover, the change was scheduled to take effect for exactly two years (until December 2012).<sup>5</sup> Due

<sup>5</sup>See a news article from December 2010 reporting on the tax change: <https://www.themarker.com/re>

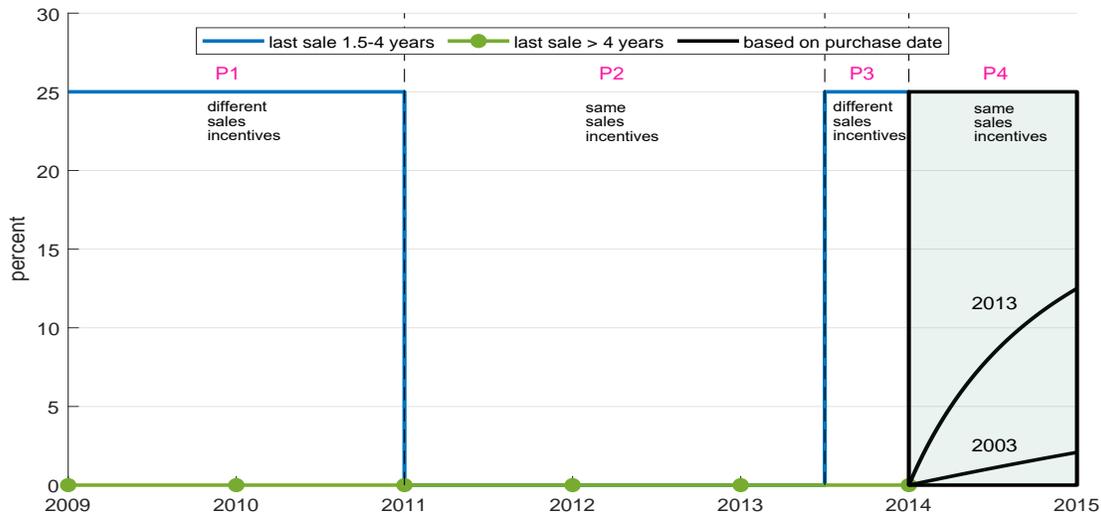


Figure 2: Changes in capital-gains taxes in Israel

*Notes.* The lines show the capital-gains tax rate for residential properties owned by investors between 2009 and 2014. Until 2011 (P1), a 25% tax rate applied only to investors who sold another property in the 4 years before the current sale (blue line). Investors who did not sell in the previous 4 years were exempt (green line). Between 2011 and 2013H1 (P2), investors who sold another property 1.5-4 years before the current sale were also exempted. In 2013H2 (P3) the temporary exemption expired. Starting from January 2014 (P4), the tax rate is determined by the holding period of the property. For instance, when selling a property purchased in 2003, capital-gains up to 2014 are exempted, but a 25% tax rate applies for capital gains from 2014 onward.

to early elections that were announced in October 2012 and took place in January 2013, the exemption stayed in effect for additional six months. Since it was difficult to predict the tax changes, strategic behavior by investors in anticipation of tax changes is unlikely to have played a major role in their sale decisions. Fourth, the tax rates changed several times for the same treatment group. This provides more than one differential treatment points, which can independently confirm the behavioral effect of the tax. Furthermore, during the exemption period (P2) and the new tax regime (P4) the treatment group and the control group faced the same tax rate and so their sales behavior can be compared on equal grounds. Lastly, the reduction in capital gains tax rate was large: from 25% to 0%. Since house prices were rising fast at the time, the reduction was likely to remove a large disincentive to sell. Therefore, we would expect considerable changes in the sales behavior of those treated.

Renting households are typically smaller, younger, and earn a lower income than homeowners. Investor households who typically own 2 to 3 units, own about 90% of rental housing units, where the rest are owned by firms and public sector entities ((Hausman, Ramot-Nyska, and Zussman, 2021). Rental units are typically smaller and older than owner-occupied units.

The typical rent contract is for 12 months (90% of contracts), and the mean lease duration is 4.5 years (Ater, Elster, Genesove, and Hoffmann, 2020).

### **3 Data and Descriptive Statistics**

Our analysis is based on several administrative data sources covering about ninety percent of Israel's housing stock and all transacted properties as well as annual social and demographic characteristics of buyers and sellers. Moreover, we obtained data on all new housing supply and a survey of a representative sample of rental units across Israel. Last, we complement the analysis with data from the Israeli census conducted in 2008. Below, we describe the main data sources.

#### **3.1 Housing Stock**

We obtain annual data on the housing stock from the property tax records covering the largest 76 municipalities. The data cover 1.87 million housing units as of 2011, and grows by about 30,000 every year to reach 2.13 million housing units by mid-2019. For each unit, we observe the location at the statistical-area level and identification number of the owner and resident. In each statistical area (4-digit code) there are between 3,000 and 5,000 residents, and an average of 1,000 housing units. Since housing turnover is relatively low, we aggregate the data into 360 sub-quarters (3-digit code), which we consider as local housing markets. The average number of housing units in each local market and each year is 4,276.

#### **3.2 Housing Purchase Transactions**

The transaction data include information on 2.8 million residential real-estate transactions carried out in Israel between 1990 and 2018, as documented by the Israel Tax authority. Each transaction includes the identification number of the buyer and seller, the price, date, location at the statistical-area level, investors status of the buyer, indicator for sellers who pay capital gains tax, as well as property characteristics, including the number of rooms, area, and building age. For the 2.5 million buyers and sellers that appear in the data, the Central Bureau of Statistics (CBS) supplies annual demographic information based on Israel's population registry between 2002 and 2018. The information includes the location of the primary residence, marital status, number of children, spouse, children, and parents identification numbers, and other individual characteristics, including gender and year of birth. The mean number of transactions within each local market and half-year period is 92.

We merge the housing stock and transaction data to indicate investors activity over times. First, we identify owners as investors, i.e., households who own multiple housing units. The average number of housing units owned by investors in each local market between 2009 and 2014 is 1,548 (36% of all housing units). These include the housing units they live in as well

as the housing units they buy to let. Investors sell on average 26 housing units within a local market and half-year, which is 28% of all sales. We also use the demographic information on owners to construct an indicator of the primary residence of an investor. We consider a primary residence any unit that appears in the same statistical area that is listed as residence in the population registry.

Second, we focus in this paper on investors affected by a temporary capital gains tax exemption. These are investors who sold another property 1.5-4 years earlier. Thus, for each investor and housing unit, we calculate the time that passed since she sold another housing unit. Treated investors own on average 199 housing units per local market (5% of all housing units, and 13% of housing units held by investors). Treated investors sell on average 3 housing units in each local market and half-year period, which accounts for 3% of all sales and almost 12% of investors' sales in the sample period.

Table 1 provides summary statistics of housing units sold by different types of sellers over the sample period. Overall, we observe 400 thousand transactions (column 1), 80% are resales of existing housing units and the rest are new units (column 2). The mean number of rooms (including a living room) is 3.6 and the floor area is 82.7 squared meters (890 squared feet). The mean age of the structure is 29.2 years and the mean price is just over 1 million Shekels (approximately 300 thousand US dollars). A quarter of sales are by household who we identify as investors. We further split the sales by investors into sales of their primary unit of residence (column 3) and any other units they own (column 4). Non-primary units (which are likely rental units) are smaller, older, and cheaper than the primary units. Columns 5 and 6 present characteristics of transacted housing units separately for sales by treated investors (investors who sold another property 1.5-4 years earlier) and by control investors (all other investors). The differences in size and age between the control and treatment sales are statistically significant, but economically small, especially compared to the differences between investors and non-investors.

### **3.3 Rent Survey**

Data on rent are based on a monthly rent survey conducted by the Central Bureau of Statistics. This survey covers a representative sample of rental units and is constructed by sampling renters from other surveys conducted by the statistical agency. Each observation includes information on the rent, month, location and number of rooms in the property. The structure of the survey is a rotating panel, in which the first observation is always a household who recently moved in, and is sampled as long as it did not move out. We therefore consider the first observations of each household to be "new leases" and subsequent observations "extended leases". The survey includes 63 thousand total observations and 23 thousand new leases between 2009 and 2014. 61% of renters live in a unit with 3 rooms or less (including a

Table 1: Mean characteristics of housing units that were sold, 2009-2014

|                      | all sellers |             | investors |             |                   |                   |
|----------------------|-------------|-------------|-----------|-------------|-------------------|-------------------|
|                      | all         | resale only | primary   | non-primary | treated investors | control investors |
|                      | (1)         | (2)         | (3)       | (4)         | (5)               | (6)               |
| Number of rooms      | 3.6         | 3.4         | 3.7       | 3.3         | 3.4               | 3.4               |
| Area ( $m^2$ )       | 82.7        | 76.9        | 84.1      | 71.8        | 75.1              | 75.7              |
| Building age (years) | 29.2        | 34.7        | 30.1      | 40.3        | 39.6              | 36.8              |
| Price (mil. ILS)     | 1.07        | 0.98        | 1.18      | 0.91        | 1.01              | 0.99              |
| <i>N</i>             | 399,258     | 318,922     | 31,496    | 69,195      | 11,626            | 89,412            |

*Notes.* The table reports mean characteristics of housing units sold between 2009 and 2014, by seller and unit types. Columns 1 and 2 focus on the full sample, and on housing units sold by a previous owner (as opposed to new units sold by contractors). Columns 3 and 4 compare primary (3) and non-primary (4) housing units sold by investors. Investors reside in larger, newer and more expensive housing units compared to housing units that investors rent out. Columns 5 and 6 compare the units sold by treated and control investors. These units have similar characteristics. See text for more details. *Sources.* Transaction data from the Israel Tax Authority.

living room). Average rent is 3.2 thousand Shekels per month (approximately 1 thousand US dollars).

### 3.4 Construction of New Housing Units

Since 1995, the Central Bureau of Statistics collects annual data on the construction of new housing units.<sup>6</sup> For each local market the data include the number of building starts and completions of housing units. According to these data, between 2009 and 2014, 141 thousand new housing units started and 118 thousand completed construction, which is roughly 6% of the housing stock.

In sum, we construct a panel of the housing units, number of sales and price and rent indices in 360 Israeli local markets for each half-year between 2009 and 2014. Three patterns in the data are important for our analysis. First, investors in Israel hold a substantial share of the housing stock (36%). Second, 13% of investors' housing units are held by investors who were affected by the temporary capital gains tax exemption we analyze in this paper. Third, investors more often sell their non-primary housing units, which are smaller than their primary units. This distinction will aid our analysis of the effect of investors on the housing and rental market in the last section of the paper.

Our goal is to examine the effects of residential real-estate investors on house prices and

<sup>6</sup>Available on-line at <https://www.cbs.gov.il/he/Statistics>

rents. Estimating this relationship is inherently challenging as investors decisions are likely to be dependent on current prices and expected price movements. For instance, expectation for higher rents in a certain location due to transportation developments, would attract investors and raise property values simultaneously, even without a causal link. Conversely, investors may more readily sell houses where they expect house prices to decline. To overcome this challenge, we employ a difference-in-differences strategy to evaluate the impact of capital-gains tax reform on sales volume by treated investors. Then, we construct a predictor of investors' sales based on the share of stock owned by treated investors in each local market and each period. This predictor does not depend on local demand conditions but shifts the quantity of houses offered for sale. Finally, we use the predicted number of sales to instrument for the actual number of units sold by investors in each local market, and separately estimate the effect of investors sales on prices and rent. In sections 4 and 5 below, we describe our empirical strategy in detail.

## 4 The Effect of Capital-Gains Tax on Investors' Sales

Our analysis relies on the changes in the capital-gains tax rates presented in Figure 2. Until 2011, a 25% capital-gains tax rate applied only to investors who sold another property in the four years before the current sale. This sharp discontinuity in the tax code led to discontinuity in the sales rate of investor-owned housing units at 4 years following their previous sale. Panel A of Figure 3 reports the sales rates of investor-owned units in 2009 by the time since last sale in the 1.5-6.5 years range. In 2009, the mean semiannual sales rate by investors who sold another unit 3-4 years before the current sale are 1.2 percentage points. The mean semiannual sales rate by investors who sold another unit Comparing them to investors who sold another unit in the 4-5 years range is over 2 percentage points. This reflects a lock-in effect for sellers who are required to pay tax based on the history of their sales. In contrast, Panel B of Figure 3 reports the same rates in 2012, in which investors above and below the 4-year cutoff faced the same tax treatment. Here, the sales rate of investors who sold another unit in the past 3-4 years is 2.1 percentage points and there is no discernible jump around the 4 years threshold. Appendix Figure A.2 displays the same calculation conducted in every half-year between 2009 and 2014. The discontinuous jump at 4 years is there in 2009H1-2010H2 and 2013H2, and is absent in all other periods confirming the result.<sup>7</sup>

To quantify the extent of the effect of the tax rate on sales, we calculate the sales rate for the treatment and control groups at the national level. We define the treatment group as units owned by treated investors: those who sold another property in the previous 1.5-4 years, and the control group is all the other investor owned units. Figure 4 presents the semiannual sales rate of the treatment and control groups. The sales rate of the treatment units has been lower

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<sup>7</sup>Rows of figure A.2 represent different tax periods, P1-P4, as defined above

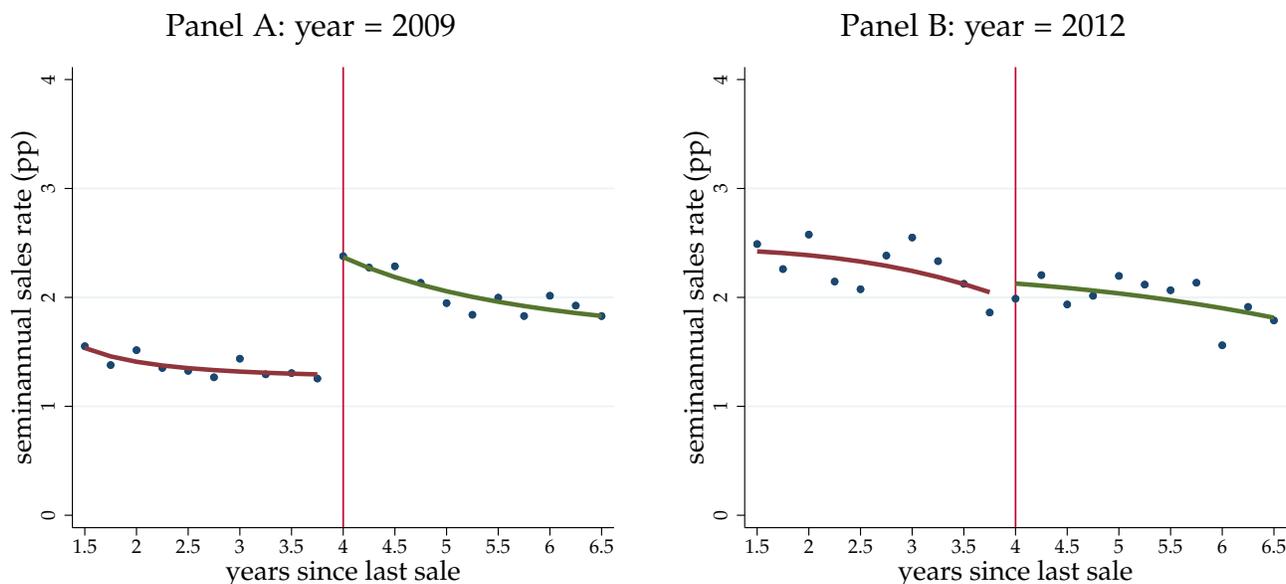


Figure 3: Sales rates of investor owned units by time since last sale

*Notes.* Blue dots represent the semiannual sales rate of housing units owned by investors in each quarter-year bin defined by the time since the last sales by the owner. Lines represent second-degree polynomials fitted separately below (red) and above (green) 4 years. Rates are calculated at a quarterly frequency then averaged over the full year. Panel A reports rates in 2009, in which investors who sold another unit in the last 4 years were subject to a 25% capital-gains tax rate. Panel B reports rate in 2012, in which all investors who did not sell another unit in the last 1.5 years were exempt from capital-gains tax. In 2009 there is a discontinuity in sales rate at 4 years since the last sale. In 2012 this discontinuity disappears. See text for more details. *Sources.* Data on the housing stock are from 76 municipalities' property tax files. *Source:* Data on sales are from the Israel Tax Authority.

than that of the control units before 2011 (P1), in line with the evidence presented earlier. The mean semiannual sales rate by treated investors is 1.2 percentage points in this period. Then, shortly after the adoption of the tax reform, the sales rate of treatment units rises all the way to the level of sales by the control group. Interestingly, during 2011-2013H1 (P2) the sales rate of treatment and control follows a similar pattern and is almost identical. The mean semiannual sales rate by treated investors is 1.8 percentage points in this period. Following the expiration of the temporary exemption for the treatment group in 2013H2 (P3) the sales rate of treatment units plummets. Finally, starting from January 2014, the capital gains tax rate is no longer determined by the timing of the previous sale, eliminating all differences in taxes between treatment and control, and the sales rates of the two groups converge. One possible concern is that the numbers in Figure 4 are driven by different spatial composition of treatment and control groups. For example, sales may have gone up in P2 in areas in which many treatment units are. To address this concern we also use a fixed-effect regression using

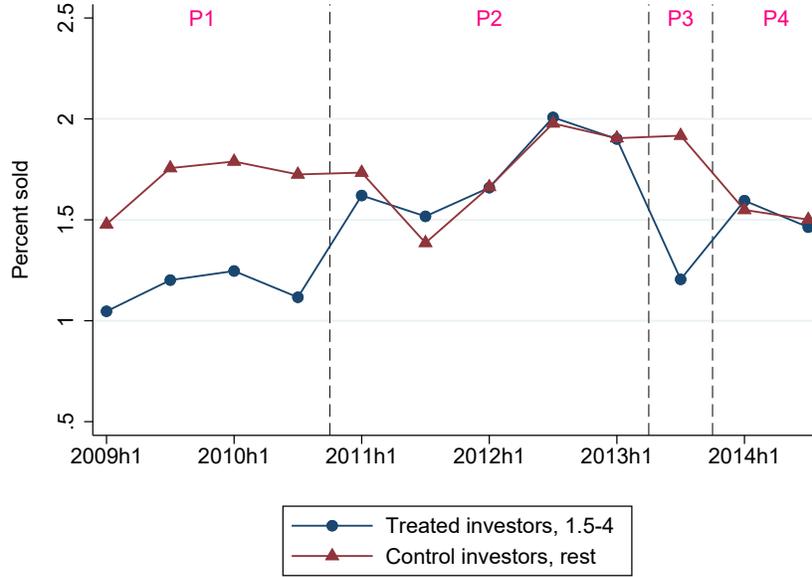


Figure 4: The effect of the tax reform on sales by investors

*Notes.* The figure displays sales shares out of stock separately for treated investors and for all other investors. The share of sales by treated investors increased to the level of sales of control investors when the capital-gains tax was removed (P2), diverged when the differential tax rate was in place again (P3), and similar when the differential tax rate was eliminated (P4). See text for more details. *Sources.* Data on the housing stock are from 76 municipalities' property tax files. Data on sales are from the Israel Tax Authority.

the following difference-in-differences specification:

$$\text{percent sold}_{ijt} = \beta_{it} \text{treated investors}_i + \delta_j + \theta_t + \varepsilon_{ijt} \quad (1)$$

where "percent sold" is the share of sales out of the stock of housing units owned by each investor type ( $i$ ) in every local market ( $j$ ) and half year ( $t$ ), "treated investors" is an indicator which is equal to 1 for investors who sold another property in the last 1.5-4 years, and 0 for all other investors,  $\theta$  is a half-year fixed-effect,  $\delta$  is a local market fixed effect and  $\varepsilon$  is an error term. The equation is estimated at the local area level using the number of units owned by each type as frequency weights, essentially capturing the sales rates at the unit level. Figure 5 plots the value of the  $\beta$  coefficients from equation (1). Similar to the aggregate aggregate trends, treated investors sell less often than control investors before the 2011 reform (P1) and during the second half of 2013 (P3), and just as often during the exemption period (P2) and the equal treatment period (P4). This gap reflects a lock-in effect, similar to the capital-gains tax effect in the US housing market estimated by Shan (2011).<sup>8</sup>

The results so far indicate that during the times when treated investors were subject to the

<sup>8</sup>Appendix figure A.1 uses a similar specification but a narrower definition of the treatment and control groups with similar qualitative results.

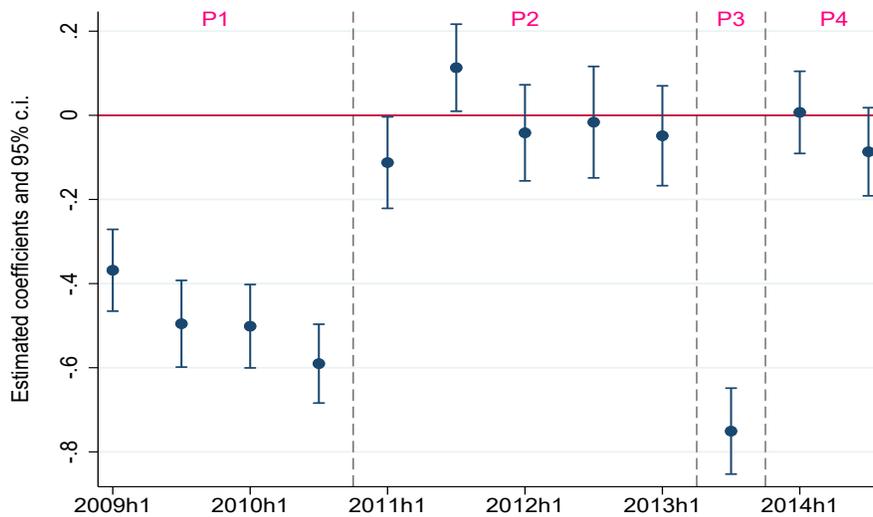


Figure 5: Differential tax incentives lead to different sale volume

*Notes.* The figure displays  $\beta$  coefficients (and 95% confidence intervals) from equation (1). The regression results suggest that the tax exemption induced treated investors to sell housing units that they own. See text for details.

capital-gains tax, some of them waited for the 4 year lock-in period to expire before selling. This means that they were essentially avoiding taxes. Other investors may also avoid paying taxes due to other exemptions or simply because they have accrued capital losses on their units. Do the treated investors who sell their units actually pay taxes? We address this question using the housing purchase transaction data, which indicates for each transaction whether the seller paid capital gains tax or not. Figure 6 shows that while between 2009 and 2010 more than 30% of "treated" sellers paid the tax, between 2011 and the first half of 2013 a much smaller percent of treated investors pay it.<sup>9</sup> The share of treated sellers who pay the tax jumps back to around 30% in the second half of 2013, when the temporary exemption expires. During 2014, the share who pay this tax doubles (reaching 60% of sales by treated investors) as the new tax code is determines the tax rate by the holding period of the specific unit, and applies to all sales by investors, regardless of their sales' history.<sup>10</sup>

## 5 The Effects of Investors' Sales on House Prices and Rent

We continue the analysis by constructing a prediction of sales based on the share of stock owned by treated investors in each local market and half-year. Figure 7 maps the share of

<sup>9</sup>The share of treated investors who pay the tax is not zero during this period, as there are additional conditions for the exemption, such as requirement that the sale price be lower than 2.2 millions Israeli Shekels, and holding period of at least 1.5 years.

<sup>10</sup>The share of treated investors who pay the tax is not 100 during this period, since not every seller has a positive capital gain, especially as expenses on housing improvements can be deducted from it.

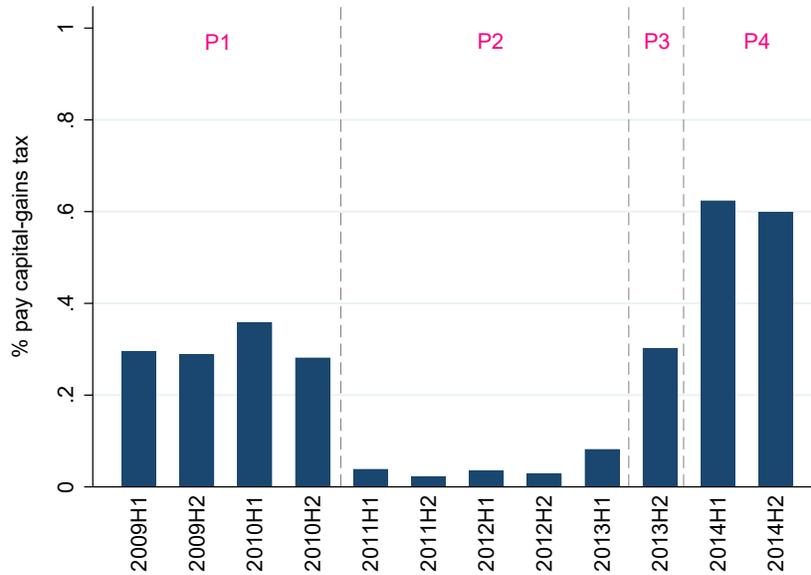


Figure 6: The effect of the tax reform on capital-gains tax payments by treated investors

*Notes.* The figure displays the share of sales by treated investors who paid a capital-gains tax in every half-year period between 2009 and 2014. The figure shows that when the tax exemption was granted (P2), very few treated investors paid capital-gains taxes. In P1 and P3, treated investors were potentially subject to the tax and many of them pay. In P4, the capital-gains tax was no longer based on elapsed time from the previous sale. See text for details. *Sources.* Data on sales are from the Israel Tax Authority.

stock held by investors and by treated investors, in Israel’s central district in 2010. While the map on the left hand side shows a pattern of investors mainly concentrating in Tel Aviv and in city centers (highlighted in red), the map on the right-hand side portrays a lot more variation across adjacent local markets in terms of the share of treated investors.

We use this spatial variation in market activity to investigate whether it translates into changes in housing prices and in rent prices at the market level. Specifically, we examine how housing prices and rental prices have changed in local markets where more investors that were affected by the tax changes owned properties. Our instrumental variable approach assumes that the year in which the investor sold another housing unit in a different location in Israel has no direct impact on the prices or rents paid in the local market at the time the investor contemplates selling the current property.

A possible concern is that the effect on prices may reflect fundamental differences between areas with higher or lower share of treated investors. As a result, they may follow a diverging price trend that can show up in our analysis. To address this concern, Figure 8 plots the price growth across local markets against the share of stock held by treated investors at the end of 2010 (i.e. before the tax exemption). The black dots represent the price growth pre-treatment, between 2009H2-2010H2. There is no noticeable difference in pre-trends, and the coefficient

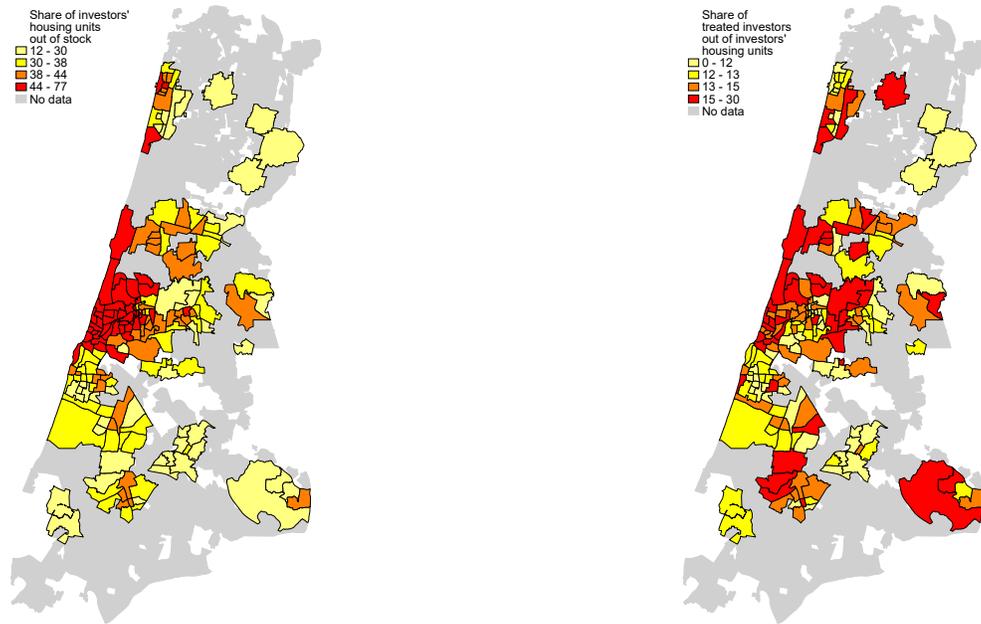


Figure 7: All and treated investors' share out of housing stock, center of Israel, 2010

*Notes.* The map highlights 171 local markets (sub-quarters) in 30 municipalities at the center of Israel. For each market, investors' share of housing stock (on the left) and the share of treated investors' stock out of housing units owned by all investors (on the right) are presented. The map displays considerable heterogeneity in the share of housing units owned by investors, and in housing units owned by treated investors. For instance, In Jerusalem - bottom right of the map - less than 30% of units are owned by investors (light yellow on the left map), and 30% of these units are owned by treated investors (red on the right map). *Sources.* Data on the housing stock are from 76 municipalities' property tax files. Data on sales are from the Israel Tax Authority.

of correlation is -0.06 and insignificant. Thus, the identification of causal effects of investor's activity on house prices relies on the exogenous nature of the temporal variation in capital gains tax regimes, and the spatial variation in the location of affected investors. The blue dots in Figure 8 show the price growth after the tax reform, between 2010H2-2011H2. It reveals a striking pattern: house price growth during 2011 are negatively correlated with higher share of stock held by treated investors. To estimate investors' effect over time and across locations, we now turn to construct our instrument. We use equation (1), to predict the percent of sales out of stock by each investor type ( $i$ ) - treated or control - in each local market ( $j$ ) and half-year period ( $t$ ). We summarize investors predicted percent of sales out of stock of each investor type in each location and period, multiplied by the share of housing units that each type owns. This gives us the probability of investors' sales in each local market and half-year. Finally, the predicted number of sales by investors in each market and period is the product of

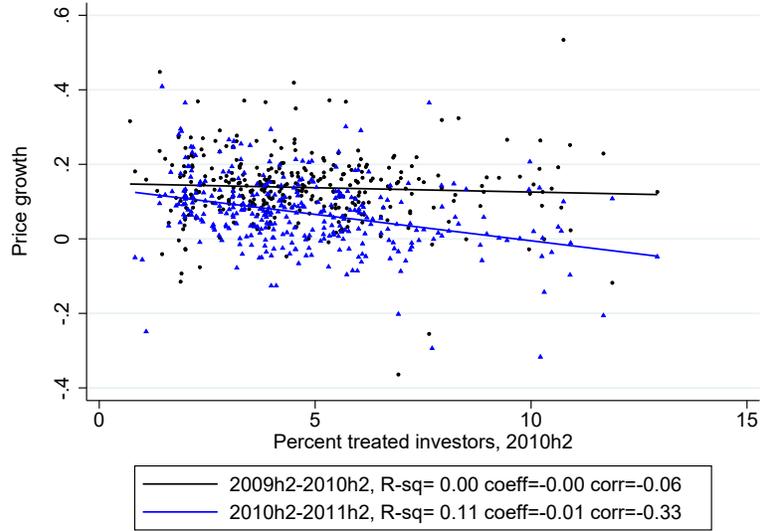


Figure 8: House price growth and percent of treated investors at the end of 2010

*Notes.* The figure displays house price growth across local markets separately for 2010 (i.e from 2009H2 to 2010H2) and for 2011 (2010H2 to 2011H2), against the share of stock held by treated investors in the end of 2010. According to the figure, the presence of treated investors in a local market had no association with the local price growth when investors were subject to the tax in 2010. In contrast, when treated investors were exempted from the capital-gain tax in 2011, a negative relationship arises between their presence in a local market and house prices. See text for details. *Sources.* Data on the housing stock are from 76 municipalities' property tax files. Data on sales are from the Israel Tax Authority.

the probability of investors' sales and the total number of housing units owned by investors.<sup>11</sup> Next, we use this instrument for sales by investors in each local market and period to estimate the effect of investors activity on housing market outcomes.

Using this prediction, we can estimate the following specification:

$$\log y_{ijt} = \beta \widehat{\text{investors' sales}}_{jt} + \gamma X_i + \delta_j + \theta_t + \varepsilon_{ijt} \quad (2)$$

where  $i$  denotes an observation (either a housing transaction or a rent survey record),  $j$  denotes the local market,  $t$  is the half-year period,  $y_{ijt}$  is either the transaction price or the reported rent,  $\widehat{\text{investors' sales}}_{jt}$  is the predict number of sales by investors,  $X_i$  are housing unit characteristics,  $\delta_j$  is a local market fixed effect,  $\theta_t$  is a time fixed-effect, and  $\varepsilon_{ijt}$  is an error term, which we assume is clustered at the local market level. Housing unit characteristics include the number of rooms, the floor area, and the building age.

We estimate equation (2) using for house prices and rents. Table 2 presents the results for prices. Column 1 includes all transactions. We find that 100 additional predicted sales

<sup>11</sup>Formally, the predictor is:  $\widehat{\text{investors' sales}}_{jt} = \underbrace{\left( \sum_i \widehat{\text{percent sold}}_{ijt} \times \text{share of units}_{ijt} \right)}_{\text{probability of investors' sales}} \times \text{all investors' units}_{jt}$

by investors decrease house prices by 34%. The effect is larger in housing units with up to 3 rooms (column 2) and in used apartments (column 5), while insignificant for larger housing units with more than 3 rooms (column 3) or new housing units (column 4). These patterns could be explained by the different characteristics of the housing units owned by investors and rented out, which are on average smaller and older (see Table 1). In Appendix Table A1, we repeat this analysis but replace the predicted sales with the the predicted sales rate by investors out of the total housing stock (essentially, dividing the predictor by the number of units in a local area). We find that a 1 percentage point increase in investors' sales rate out of total stock lowers house prices by 14%, which is in line with our main results.

Table 3 shows the estimates for rents. Column 1 uses all the available observations. We find that 100 added sales by investors increases rent by 4%, but this estimator is insignificant. The effect is larger and significant (9-10%) for housing units with up to 3 rooms (column 2) and in new leases (column 4). The effect on rental rates of housing units with more than 3 rooms is negative and insignificant (column 4) and it is zero for extended leases (column 5). The last finding indicates that existing leases shield the renters from changes in the market condition. In Appendix Table A2, we repeat the analysis dividing investors' sales by the number of housing units in each local market and half-year, and find that a 1 percentage point increase in investors' sales rate out of stock increases rent of small housing units by 8% and new leases by 11%. These are larger estimates compared to those in Table 3, though slightly less accurately measured.

How does the sales by investors affect prices? One possible interpretation is that the additional sales by investors change the share of units owned by investors, and this change in the ownership structure affects prices. To explore this interpretation, we first verify that the additional sales, captured by the sales predictor, changed the share of units owned by investors. Table 4 column 1 shows the results of a regression of the change in the investors share (out of the local stock of housing) on the predicted sales. A 100 additional sales by investors reduced the investors share by 3 percentage points. Since there are 4,276 housing units in each area on average, this roughly represent a one-to-one reallocation of units from investors to non-investors.

Following this result, we estimate regressions of house prices and rents on the change in the investor share, using the predicted sales as an instrument. This interpretation requires stronger assumptions, which effectively rule out all channels through which sales by investors may affect prices other than the change in the ownership structure. While these assumptions are unrealistic, we find this exercise instructive, as it provides rough estimates of the demand elasticity at the local market level. Table 4 columns 2-4 present the estimates for prices, and columns 5-7 present the estimates for rents. A one percentage point increase in the share of housing units held by investors increases house prices by 7.3% (column 1) and decreases rent

Table 2: The effect of investors' predicted sales on house prices

|                     | all units | $\leq 3$ rooms | $> 3$ rooms | new units | resale units |
|---------------------|-----------|----------------|-------------|-----------|--------------|
|                     | (1)       | (2)            | (3)         | (4)       | (5)          |
| Predicted sales     | -0.34***  | -0.41***       | -0.20*      | 0.18      | -0.33***     |
| by investors (/100) | (0.07)    | (0.08)         | (0.08)      | (0.12)    | (0.07)       |
| Unit char.          | ✓         | ✓              | ✓           | ✓         | ✓            |
| Half year FE        | ✓         | ✓              | ✓           | ✓         | ✓            |
| Local market FE     | ✓         | ✓              | ✓           | ✓         | ✓            |
| $R^2$               | 0.75      | 0.72           | 0.69        | 0.75      | 0.74         |
| Observations        | 399,081   | 179,974        | 219,107     | 80,258    | 318,823      |

*Notes.* The table presents OLS regression results of estimating Equation (2), where transacted price is the dependent variable. Column (1) includes all housing units transacted between 2009 and 2014. Columns (2)-(5) use different subsets of transacted housing units; " $\leq 3$  rooms" are units with 1.5-3 rooms; " $> 3$  rooms" are units with 3.5-5 rooms; "new units" are recently built units sold by companies, and "resale units" are non-new units. "Predicted sales by investors" is the number of housing units predicted to be sold by investors (divided by 100) in each local market and half year. All regressions include unit characteristics (rooms, area and building age), half-year and local market fixed-effects. Standard errors are clustered by local market and shown in parentheses. The results suggest that additional sales of 100 units decrease prices by 34%. The decrease is larger for smaller housing units (column 2) and for resale units (column 5). For new units, we do not find evidence for a change in house prices due to increase in sales by investors.

on new leases by 1.8% (column 6). Since the instrument captures supply shocks, the estimates are the inverse-demand semi-elasticity with respect to investor shares. They imply that local housing demand, both for ownership and rental services, is quite inelastic.

We now turn to analyze the forces driving our new finding, namely the effect of investors' activity on rent. To uncover the mechanism driving the results we examine the type of units sold by treated investors and the types of buyers to whom they sell. In general, between 2009 and 2015, investors sell more often housing units they do not reside in (see Table 1), i.e. housing units that are most likely rental units. Panel A of Figure 9 focuses on the number of units sold by treated investors before and after the tax reforms, separately for primary and non-primary units.<sup>12</sup> Here again, one can observe that throughout the period, there are less sales of primary housing units relative to non-primary units. Both types of housing units are sold more often during the exemption period between 2011-2013H1 (P2) and from 2014 onward (P4), but most of the added sales are non-primary (rental) housing units. Panel B of Figure 9 considers the identity of buyers of housing units to whom the treated investors

<sup>12</sup>The sales are divided by the overall stock they own in Israel. Similar results are attained when dividing the sales by the number of transactions instead.

Table 3: The effect of investors' predicted sales on rent

|  | all units<br>(1) | $\leq 3$ rooms<br>(2) | $> 3$ rooms<br>(3) | new leases<br>(4) | extended leases<br>(5) |
|--|------------------|-----------------------|--------------------|-------------------|------------------------|
| Predicted sales<br>by investors (/100) | 0.04<br>(0.03)   | 0.10***<br>(0.04)     | -0.09<br>(0.05)    | 0.09*<br>(0.05)   | -0.00<br>(0.04)        |
| Unit characteristics                   | ✓                | ✓                     | ✓                  | ✓                 | ✓                      |
| Half year FE                           | ✓                | ✓                     | ✓                  | ✓                 | ✓                      |
| Local market FE                        | ✓                | ✓                     | ✓                  | ✓                 | ✓                      |
| $R^2$                                  | 0.74             | 0.70                  | 0.73               | 0.77              | 0.73                   |
| Observations                           | 63,298           | 38,845                | 24,453             | 23,428            | 39,870                 |

*Notes.* The table presents OLS regression results estimating equation (2) using rent as the dependent variable. Column (1) includes all rental units in the survey. Columns (2)-(3) are based on a subset of rental units in the survey; " $\leq 3$  rooms" are units with 1.5-3 rooms, " $> 3$  rooms" are units with 3.5-5 rooms. Columns (4)-(5) utilize the panel structure of the survey as tenants are repeatedly surveyed periodically until they leave the rental unit. New leases are leases that appear for the first time and extended leases are subsequent appearances of the same rental units and tenants. "Predicted sales by investors" is the number of housing units predicted to be sold by investors (divided by 100) in each local market and half year. All regressions include the number of rooms, half year fixed-effects and local market fixed-effects. Standard errors clustered by local market, are in parentheses. The results suggest that rent at small housing units increased significantly in markets where treated investors are predicted to sell more units. The positive effect on rent is insignificant for extended leases, which likely exhibit rigidity in the rent.

sell: either investors or non-investors. The figure illustrates the surge in sales during the exemption period between 2011-2013H1 (P2) and from 2014 onward (P4), especially to non-investor buyers.

Given these observations, the tax reform has two effects on the rental market: (a) lower supply of rental units as investors sell, and (b) lower demand as non-investors buy these housing units and become homeowners.<sup>13</sup>

Among non-investors who buy during the exemption period, 51% are first-time buyers and over 80% did not reside in the local market prior to their purchase. Most of them (60%) move into the area up to two-years after they purchase the housing unit. The average age

<sup>13</sup>The latter finding is in line with the stated goal of the capital-gains tax temporary exemption to increase homeownership rates in Israel. Several studies have explored individual decisions to rent or to own housing. Examples include Ben-Shahar (1998), Sinai and Souleles (2005) and Han (2010) who develop models of individuals' decision to rent or own with respect to risk. Other studies explore the social trade-off between homeowners and renters. For instance, homeownership is positively correlated with better citizenship (DiPasquale and Glaeser, 1999) and attaining better education outcomes (Haurin et al., 2002), but negatively correlated with labor mobility (Ringo, 2014).

Table 4: Change in investors' share of stock as an instrument

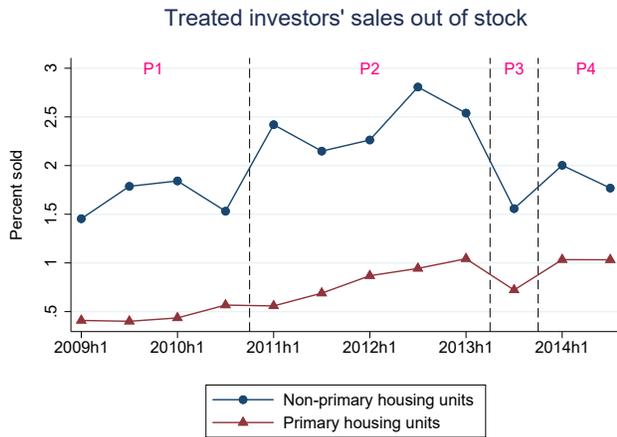
|  | $\Delta$ investor share | house prices      |                   |                   | rents           |                   |                 |
|--|-------------------------|-------------------|-------------------|-------------------|-----------------|-------------------|-----------------|
|  |                         | all               | $\leq 3$<br>rooms | resale<br>only    | all             | $\leq 3$<br>rooms | new<br>leases   |
|  | (1)                     | (2)               | (3)               | (4)               | (5)             | (6)               | (7)             |
| Predicted sales<br>by investors (/100) | -0.03***<br>(0.01)      |                   |                   |                   |                 |                   |                 |
| $\Delta$ investor share                |                         | 7.33***<br>(1.43) | 6.41***<br>(1.26) | 7.38***<br>(1.53) | -1.01<br>(0.99) | -2.76**<br>(1.20) | -1.77<br>(1.09) |
| Unit characteristics                   |                         | ✓                 | ✓                 | ✓                 | ✓               | ✓                 | ✓               |
| Half year FE                           | ✓                       | ✓                 | ✓                 | ✓                 | ✓               | ✓                 | ✓               |
| Local market FE                        | ✓                       | ✓                 | ✓                 | ✓                 | ✓               | ✓                 | ✓               |
| $R^2$                                  | 0.08                    | 0.41              | 0.25              | 0.37              | 0.41            | 0.24              | 0.46            |
| Observations                           | 4,320                   | 399,081           | 179,974           | 318,823           | 63,298          | 38,845            | 23,428          |

*Notes.* Columns (2)-(7) in the table presents IV regression results where house prices (columns 2-4) and rents (columns 5-7) are the dependent variable, and the change in investors share of stock is the instrument. In column (1) we estimate equation (2) where the outcome variable is the change in investors' share of stock. " $\Delta$  investors share" is the share of investors out of stock at the end of the period (half-year) minus their share at the beginning of the period. "Predicted sales by investors" is the number of housing units predicted to be sold by investors (divided by 100) in each local market and half year. All regressions include half year and local market fixed-effects. IV regressions include unit characteristics. Standard errors, clustered by local market, in parentheses. The results suggest that the share of investors fell in markets where investors' sales were predicted to be higher (column 1). Moreover, an increase in investors' local activity likely result in higher prices, particularly for non-new, smaller units, and also for lower rents at small housing units.

of non-investors who enter their new unit is 43, older than non-investors who do not move in who are on average 37 years old. The marital status of movers is also different: 12% are single and 70% are married, while non-investors who do not move in are 33% single and 52% married. This implies that non-investors can also offer housing units for rent, while renting or living with their parents or other relatives. However, in our data between 2009-2014, investors' non-primary units comprise 52% of their stock, while non-investors' non-primary units only comprise 19% of stock. Thus, sales by investors to non-investors should lower the quantity of households who rent houses. But what should happen to rent?

From a neoclassical perspective rents will not change, since without change in aggregate supply, any change in the number of investor-owned units must drive an identical change in the number of renters. Changes in ownership structure should have near-zero effect on rent. The same goes for prices; if supply of new housing units does not change, the increase in

Panel A: Type of units sold by investors



Panel B: Type of buyers to whom investors sell

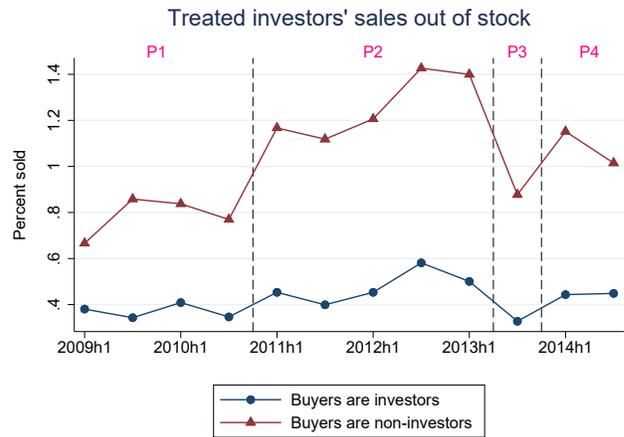


Figure 9: The effect of tax changes on treated investors

*Notes.* The figure displays the share of sales out of housing stock by “treated investors” between 2009 and 2014. Panel A plots these shares separately for sellers who sell their primary housing units and sellers who sell their non-primary units. Panel B plots the shares of sales separately for housing units sold to investors vs. non-investors buyers. Panel A show that investors are more likely to sell non-primary units, and Panel B shows that investors sell predominantly to non-investors, particularly during the tax exemption period (P2). *Sources.* Data on sales are from the Israel Tax Authority. Data on seller’s residence are from Israel’s population registry.

investors’ sales should not affect prices. However, our estimates of both price and rent response to increased sales by investors are significant. We argue that frictions, such as changes in volume and timing of housing sales do affect rents.

To further explore these frictions, we now compare the effect of investors’ sales across local markets with different initial supply of new housing units. In table 5 we estimate equation (2) separately for subsets of the 360 local markets in our sample. We estimate equation (2) separately for areas with either above (columns 1 and 3) or below (columns 2 and 4) median share of new housing completions in 2008. In columns 1 and 2, we find that prices of all housing units decrease as a result of investors’ sales in areas with either high or low supply of new units. In columns 3 and 4, we find that investors’ sales affect rent of new leases less in areas with higher supply of new units (where the estimated coefficient in column 3 is 8% and insignificant and in column 4 it is significant and leads to 12% higher rent). Here, the new supply of housing units offsets the effect of lower supply of rental units, brought about by investors’ sales. In sum, in areas with limited supply of new housing units, investors’ sales increase rent more significantly as they decrease the supply of rental units.

Table 5: Effect on price and rent by supply of new housing units

|  | house prices, all sales           |                                  | rents, new leases                 |                                  |
|--|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|
|  | high share<br>of new units<br>(1) | low share<br>of new units<br>(2) | high share<br>of new units<br>(3) | low share<br>of new units<br>(4) |
| Predicted sales<br>by investors (/100) | -0.28***<br>(0.10)                | -0.30***<br>(0.11)               | 0.08<br>(0.08)                    | 0.12*<br>(0.07)                  |
| Unit characteristics                   | ✓                                 | ✓                                | ✓                                 | ✓                                |
| Half year FE                           | ✓                                 | ✓                                | ✓                                 | ✓                                |
| Local market FE                        | ✓                                 | ✓                                | ✓                                 | ✓                                |
| $R^2$                                  | 0.70                              | 0.76                             | 0.74                              | 0.77                             |
| Observations                           | 202,978                           | 196,103                          | 11,030                            | 12,398                           |

*Notes.* The table presents OLS regression results using house price and rent as dependent variable, and distinguishing between local market with low/high share of new housing units. Columns (1) and (2) rely on sales of all housing units, and columns (3) and (4) rely on first-time leases in the rental survey. Columns (1) and (3) focus on local markets with above median share of new housing completions, while columns (2) and (4) consider local markets with below median share of new housing completions, in the preceding half-year period. “Predicted sales by investors” is the number of housing units predicted to be sold by investors (divided by 100) in each half year and local market. All regressions include unit characteristics, half year and local market fixed-effects. Standard errors are clustered by local market are in parentheses.

## 6 Conclusion

This paper achieves two goals. First, it sheds light on the efficacy of tax policy on investors in changing the ownership structure of the housing stock. We study a temporary tax exemption offered to some real-estate investors in Israel to encourage them to sell their housing units. We begin with estimating the effect of the tax exemption on sales by investors using a difference-in-differences approach. While the direction of the estimated effect is not surprising in itself, that is, the exemption eliminated a lock-in effect and led to a rise in sales, the magnitude is remarkable: A temporary exemption from a 25% capital-gains tax led the semiannual sales rate of investor owned unit to increase by 50%, from 1.2 percentage points to 1.8. Importantly, we find that the additional sales are mostly of non-primary units, which are likely to be rentals, and to non-investor buyers, which implies a change in the ownership type of those units.

Second, we measure the implications of the ownership changes on local housing market conditions. We use variation in investor composition across 360 local markets to construct a local predictor of sales by investors. In our main regression specification, we estimate the

local demand response of prices to the additional predicted sales by investors. Our preferred estimate is that an increase of sales by investors of 1 percentage point of the total housing stock is associated with a 14% drop in house prices. The same increase of sales by investors is also associated with lower supply of rental units, which leads to a 4% increase in rents of new leases. Both of these impacts of the investor sales on house prices and rents are stronger as we restrict attention to smaller units, in which real-estate investors specialize.

These results suggest that tax policies aimed at investors have the potential to significantly change the investors' behavior and the ownership structure of the housing stock. Moreover, a small local increase in the supply of housing units by investors significantly reduces local house prices and increases local rents. A high house price sensitivity suggests that the demand for housing units in a local market is quite inelastic in the short-term, and so is the demand for rental housing. From a theoretical perspective, this is at odds with theories that view local housing markets as close substitutes, and supports theories of spatially segmented markets (Piazzesi, Schneider, and Stroebel, 2020).

Our results also highlight the unintended distributional effects of housing policies. The specific policy under consideration—a temporary exemption from capital-gains taxes on investors—has clear winners and losers. Investors who sell their rental units with reduced taxes and first time home buyers who buy at a reduced price benefit, but poorer and more credit constrained renting households who face higher rents on new leases and other taxpayers who need to make up for lost tax revenue lose. We believe this trade-off should be an integral part of housing policy debates.

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# A Appendix

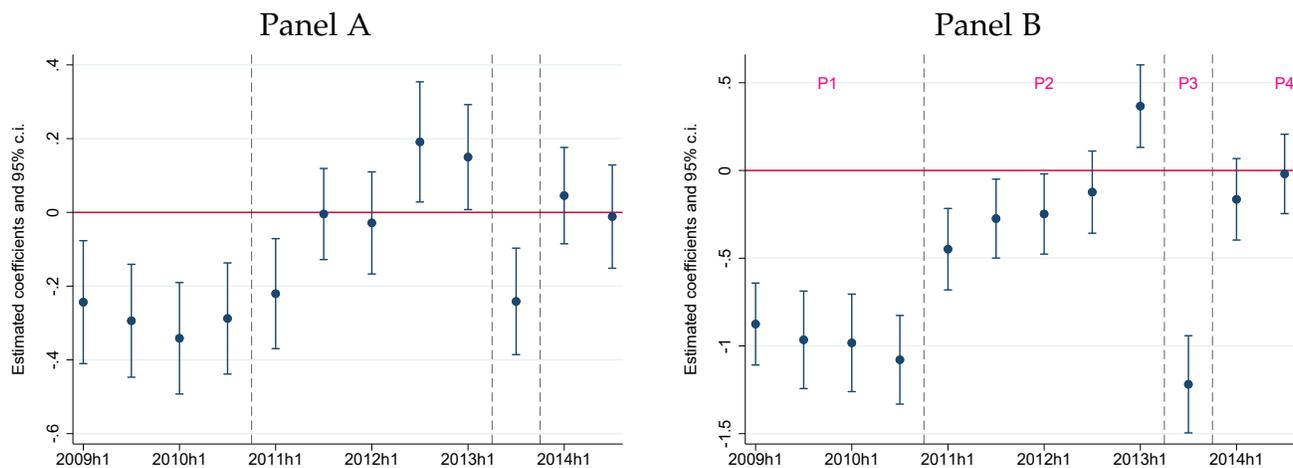


Figure A.1: The effect of the tax change on sales by investors

*Sources.* Data on the housing stock are from 76 municipalities' property tax files. Data on sales are from the Israel Tax Authority: Karmen Database.

*Notes.* The figure displays  $\beta$  coefficients (and 95% confidence intervals) from equation (1). In panel A, the estimation is limited to treated investors who sold another housing unit in the past 3-4 years and control investors who sold another housing unit in the past 4-5 years. Panel B further restricts the estimation to 3.5-4 and 4-4.5 years, respectively.

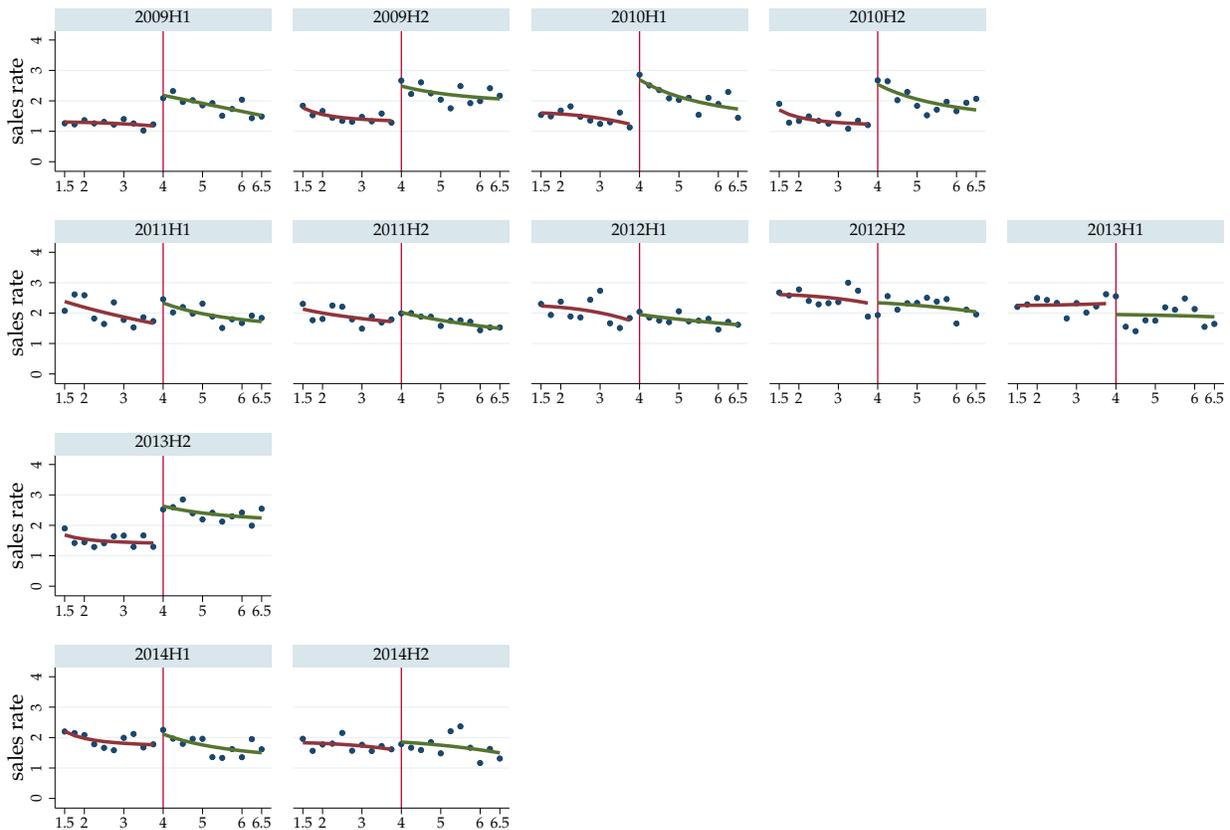


Figure A.2: Discontinuity by half year

*Notes.* Blue dots represent the semiannual sales rate of housing units owned by investors in each quarter-year bin defined by the time since the last sales by the owner. Lines represent second-degree polynomials fitted separately below (red) and above (green) 4 years. Rates are calculated at a quarterly frequency then averaged over the half-year period, 2009H1-2014H2. Each row represents a treatment period (P1)-(P4). See text for details.

*Sources.* Data on the housing stock are from 76 municipalities' property tax files. Data on sales are from the Israel Tax Authority.

Table A1: Effect of investors predicted sales' share of stock on prices

|                       | (1)       | (2)            | (3)         | (4)       | (5)          |
|-----------------------|-----------|----------------|-------------|-----------|--------------|
|                       | all units | $\leq 3$ rooms | $> 3$ rooms | new units | resale units |
| Predicted sales       | -0.14*    | -0.24***       | -0.14       | -0.05     | -0.13*       |
| by investors (/stock) | (0.08)    | (0.08)         | (0.09)      | (0.09)    | (0.08)       |
| Unit characteristics  | ✓         | ✓              | ✓           | ✓         | ✓            |
| Half year FE          | ✓         | ✓              | ✓           | ✓         | ✓            |
| Local market FE       | ✓         | ✓              | ✓           | ✓         | ✓            |
| $R^2$                 | 0.75      | 0.72           | 0.69        | 0.75      | 0.74         |
| Observations          | 399081    | 179974         | 219107      | 80258     | 318823       |

*Sources.* Data on house purchase transactions are from the Israel Tax Authority: Karmen Database.  
*Notes.* Column (1) includes transactions of all housing units. Columns (2)-(5) are based on a subset of transacted housing units; " $\leq 3$  rooms" are housing units with 1.5-3 rooms, " $> 3$  rooms" are units with 3.5-5 rooms, "new units" are recently built housing units sold by companies, and "resale units" are units sold again to a new buyer. "Predicted sales by investors" is the number of housing units predicted to be sold by investors in each local market and half year, divided by the total number of housing units in each local market and half year. All regressions include unit characteristics (rooms, area and building age) half year fixed-effects and local market fixed-effects. Estimated by OLS. Standard errors, clustered by local market, in parentheses.

Table A2: Effect of investors predicted sales' share of stock on rent

|                       | (1)       | (2)            | (3)         | (4)        | (5)             |
|-----------------------|-----------|----------------|-------------|------------|-----------------|
|                       | all units | $\leq 3$ rooms | $> 3$ rooms | new leases | extended leases |
| Predicted sales       | 0.03      | 0.08*          | -0.09       | 0.11*      | -0.01           |
| by investors (/stock) | (0.04)    | (0.04)         | (0.06)      | (0.06)     | (0.04)          |
| Unit characteristics  | ✓         | ✓              | ✓           | ✓          | ✓               |
| Half year FE          | ✓         | ✓              | ✓           | ✓          | ✓               |
| Local market FE       | ✓         | ✓              | ✓           | ✓          | ✓               |
| $R^2$                 | 0.74      | 0.70           | 0.73        | 0.77       | 0.73            |
| Observations          | 63298     | 38845          | 24453       | 23428      | 39870           |

*Sources.* Data on rental units are from a rental survey conducted by the Central Bureau of Statistics.

*Notes.* Column (1) includes all rental units in the survey. Columns (2)-(3) are based on a subset of rental units in the survey; " $\leq 3$  rooms" are units with 1.5-3 rooms, " $> 3$  rooms" are units with 3.5-5 rooms. Columns (4)-(5) utilize the panel structure of the survey as tenants are repeatedly surveyed periodically until they leave the rental unit. We distinguish between "new leases", i.e. leases that appear in the survey for the first time and "extended leases", i.e. subsequent appearances of the same rental units and tenants. "Predicted sales by investors" is the number of housing units predicted to be sold by investors in each local market and half year, divided by the total number of housing units in each local market and half year. All regressions include unit characteristics (number of rooms), half year fixed-effects and local market fixed-effects. Estimated by OLS. Standard errors, clustered by local market, in parentheses.