

Real-estate Investors, House Prices and Rents: Evidence from Capital-gains Tax Changes

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Abstract

This paper estimates the effects of real-estate investors (i.e. owners of multiple housing units) on housing markets, using a sequence of capital-gains tax changes with differential impact on investors in Israel. We show that the tax changes had a significant impact on investors' activity. In particular, a temporary exemption from the tax for a subset of investors in 2011-13 led sales by treated investors to double. Spatial variation in the treated investors' share across 360 local markets identifies a causal link between investors' activity, house prices, and rents. Using rich administrative data and an instrumental variable strategy, we find that a one-standard-deviation increase in sales causes house prices to fall by 4% and rents to increase by 2%. These effects are larger for smaller and older units, in which investors account for a larger share. The results suggest that policies that deter investors can achieve their stated objective of reducing house prices, but are also exposed to the peril of restricting supply of rental housing units, 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 housing markets, including the US, the UK, and Israel they are also the primary supplier 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. Due to data limitations and inherent difficulties in identification, there is little systematic evidence on the impact of real-estate investors in general, and particularly on their dual role in both ownership and rental real-estate markets. This paper addresses this gap in the literature using novel and exceptionally rich data on investors and housing markets in Israel, and an unanticipated series of capital-gains tax changes which had a heterogeneous impact on investors.

The interest in understanding the role of investors in housing markets grew over the last 15 years as many countries, including Australia, Canada, China, the Netherlands, the UK, the US, witnessed a substantial increase in investors' activity. In the US, the share of investors out of all transactions peaked in the mid 2000's, accounting for 30% of home purchases.¹ Recent studies show that the surge in investors' activity in the US contributed to the rise in housing prices and to the 2008 financial crisis (Albanesi, De Giorgi, and Nosal, 2017, Gao, Sockin, Xiong, 2020). Policymakers around the world also considered investors as a potential cause for rising housing prices, and were concerned about the impact on the economy at large. The Bank of England, for instance, stated that: “the scale and nature of BTL (Buy-To-Let) activity makes it a significant potential amplifier of housing and credit cycles”.²

The Israeli experience offers a useful 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 housing 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 2015.³ At the same time, house prices rose by 80% between 2007 and 2015, outpacing rents which rose by only 40%. In an attempt to mitigate the

¹ Haughwout, Lee, Tracy, and van der Klaauw (2011) estimate that 40-50 percent of all homes in US states that experienced the largest housing booms were purchased as investment properties. Gao et. al write that 30 percent of home purchases during the boom in cities such as Las Vegas were by non-owner-occupiers. We later show that also in Israel, home purchases by real-estate investors accounted for 30 percent of home purchases.

² Available at: 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)

³ https://www.cbs.gov.il/he/mediarelease/DocLib/2019/041/15_19_041e.pdf

price surge, Israeli policymakers introduced policies that explicitly target investors. Accordingly, our research design takes advantage of subsequent tax policy changes which encouraged some investors, but not all, to sell housing units. We use rich data on the stock of housing units, housing transactions and on rental markets to estimate the impact of sales by investors on local housing markets. We first show that treated investors responded to the tax change, while other investors and single-property owners did not. Next, we rely on variation in the share of treated investors across local housing markets to estimate the impact of this shift in supply on house prices and on rents. Notably, we are not aware of previous studies that examine the link between investors' activity and the rental market.

We find that in local markets that had a larger share of investors targeted by the tax changes housing prices fell and rents increased. Our preferred estimate is that a one-standard-deviation increase in sales causes house prices to fall by 4% and rents to increase by 2%. These effects are larger for smaller and older units which are predominantly owned by investors and are typically rented to poorer households. Our results therefore suggest that policies that disincentivize investors have the potential to achieve their stated objective of reducing house prices, but are also exposed to the peril of restricting “buy-to-let” supply in rental markets. The policies therefore have unintended distributional effects. In particular, poorer and more credit constrained populations who are more often renters may be adversely affected.

Theoretically, the impact of real-estate investors on rental markets is ambiguous. From a neoclassical 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. An opposite 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 is irrelevant in the neoclassical framework, may have first order effects on house prices, as demonstrated by the housing search literature (for review see Han and Strange, 2015).

The goal of this paper is to establish a causal link between changes in investors' activity and changes in market prices. Estimating such a link 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 the econometrician. Thus, we may erroneously attribute rise in prices to investors' purchases, although these price increases would have been materialized irrespective of investors' activity. To overcome this difficulty, we take advantage of a sequence of changes in the Israeli capital-gains tax code. Up until December 2010, investors who have sold a housing unit during the previous 4 years paid a capital-gains tax of 25%. Other investors and homeowners were exempted from any capital-gains taxes. In January 2011, following a steep rise in housing prices and in attempt to increase supply of units available for sale, the government also temporarily 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. Rather, it was based on another housing unit which was already sold in the past 1.5-4 years. These investors, therefore, faced an unanticipated reduction in capital-gains tax for 25% to 0%. The temporary exemption ended in June 2013. Shortly after, in January 2014, the government enacted a new reform that eliminated differential treatment of investors and non-investors in capital-gains taxation and applied the same tax rate on all investors.

We base our analysis on the three main data sources. First, we use property tax records on the entire stock of housing in the 77 largest municipalities across Israel, which account for nearly 90 percent of housing stock. Second, we use administrative records on the universe of housing transactions in Israel, starting in 1990, and including overall 2.8M records. We match these records to the property tax records and to the population registry. This procedure enables us to determine the household structure, including changes in marital status and to identify the official residence of the household. Next, using these two datasets, we count the number of units owned by each household in each date, and the share of units owned by investors in 360 different local markets. Third, we construct a rent index for each local market using a detailed rent survey conducted by Israel's Central Bureau of Statistics for the official consumer price index.

To identify the impact of investors, our analysis involves three main stages. First, we show that the subsequent tax changes had a large and persistent impact on investors whose eligibility for the tax exemption changed. In fact, these "treated" investors doubled their probability of sale during the treatment period (Jan 2011-Jun 2013) compared to the preceding two years. Similar

investors that were not affected by the tax changes, and single homeowners who were not subject to the tax in the first place, did not significantly change their behavior. The effect on the probability to sell is even more pronounced when we distinguish between the residence of the investor and other housing units that they own. We also show that these units were more likely to have been bought by non-investors. Second, we document a considerable spatial variation in the composition of treated investors over 360 local housing markets that cover 90% of the housing stock in Israel. These differences are ex-ante uncorrelated with previous price appreciation. Since the changes in the tax code were unanticipated, and the classification into investor type depends on past behavior of investors in other locations, we consider the composition of investors in different local markets as exogenous.

In the last stage of the estimation, we rely on the differences in composition across local markets and also over time due to the tax changes, to construct a predictor of the number of properties sold by investors in each local market and in each half-year. The new variable is similar to a Bartik (1991) instrument, in that it reflects differences in local composition and national level dynamics. Here, the composition is in the ownership type of the housing stock which serves as a proxy for the supply conditions at the local market level. Goldsmith-Pinkham, Sorkin, and Swift (2020) show that estimates obtained with a Bartik-style instrument are equivalent to a weighted average of exactly identified two-stage-least-squares estimators using the share of a single group. Since the shares are arguably exogenous to the local housing market conditions, the predicted number of sales by investors is a valid instrument to identify the causal link. Using this instrument, we find that an increase of one standard deviation in sales decreases house prices by 4%. This effect is significantly larger in smaller units (3 rooms or less) and is virtually absent in new units. These results are in line with the fact that investors only sell used apartments, and that on average these apartments are smaller than housing units sold by non-investors. When we apply the same method to rents, rather than to house prices, we find the opposite effect. An increase of one standard deviation in sales increases rent by 2%. Here, again, the effect is more pronounced for smaller housing units and insignificant for larger housing units.

Several other studies demonstrate the contribution of increasing real-estate investors to rising house prices. Focusing on the boom in US house prices in the 2000's, Haughwout, Lee, Tracy, and van der Klaauw (2011) identify investors as mortgage borrowers who hold two or more first mortgages. They show that nearly half of all homes in states that experienced the largest

housing booms were purchased by investors. Albanesi, De Giorgi, and Nosal (2017) and Albanesi (2018) use similar data and identification and provide a narrative study of the role of investors in the housing boom. Using different methods and focusing on the Los Angeles metropolitan area, Bayer, Geissler, Mangum, and Roberts (2020) distinguish between “middlemen” and “speculator” investors'. They document a sharp rise in speculator investor activity in the years leading to the financial crisis. Gao, Sockin, Xiong (2020) use cross-sectional variation at the state-level in capital-gains taxes as an instrument to identify investor activity. They find that investor purchases, which were more common in the states with lower capital-gains tax, contributed to rising house prices and to the severity of the economic downturn in 2007-2009. Taking 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 each individual can own had a significant cooling effect on newly constructed unit sales volume and prices.

This paper adds to the literature by providing direct evidence on investor’s activity based on two distinguishing features. First, the analysis uses unique and comprehensive administrative data. We combine confidential data on housing transactions with population registry and property tax records that pinpoint the exact number of housing units owned by each household, and the stock of investor-owned units in small local areas. We also distinguish between the investor’s official residence and other owned properties. Other studies typically rely on indirect data on mortgages or on matching names on deeds, which are incomplete and cannot provide a full account of the investor’s activity.

Another distinguishing feature is that our empirical strategy identifies the causal link between investor sales, prices, and rents at fine local areas based on tax changes. We rely on tax *changes* that differentially affected investors to construct a predictor of sales at fine local areas (approximately 4000 housing units). We show that the temporary exemption from capital-gains tax caused the probability to sell for the affected investors to double. Best and Kleven (2018) also study housing market response to tax changes and complement our results. 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 this paper, they find that the temporary reduction in taxes caused a rise in the transaction volume of some owners, but not others. However, their data does not allow to distinguish investors from non-investors, or to estimate their effect on market prices of individual units or rents.

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 curtail investor ownership of housing units had the unintended consequence of raising rents. One notable exception, albeit without a particular reference to investors, is by Gete and Reher (2018), who show that an increase in the rate of mortgage denials in the US during and following the Great Recession contributed to a rise in rents relative to the counterfactual.

Our results suggest that real-estate investors respond to taxation and play an important role in both the ownership and rental housing markets. Based on theoretical considerations, it implies that heterogeneity in housing services demand and credit constraints, which are typically viewed as important determinants of house prices, are also important determinants of rents. While our empirical strategy is based on a temporary policy change that showed modest aggregate effects, we believe that the implications extend to other policy measures, such as banning foreign real-estate investors or raising the transaction taxes which may have a bigger overall impact. 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.

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. Results are presented in section 4 and section 5 concludes.

Background

Our analysis focuses on the Israeli housing markets in the period 2009-2015. During this period, the housing market experienced large changes. In particular, the share of real-estate investors out of all households in Israel more than doubled, rising from 4.2% in 2009 to 9.9% in 2015.⁴ Likewise, the share of renting households has also been increasing between 2003 and 2015 (Raz Dror and Shamir, 2017). In 2015, 32.4% of Israeli households lived in a non-owned residence, similar to the EU (31%), the US (36%) and the UK (37%).

Renting households are typically smaller, younger and earn a lower income than homeowners. Investors are typically households who own 2 or 3 properties. Real-estate investors are the primary suppliers of rental units. 90% of rental housing units are owned by investors, with the rest owned by firms and public sector entities. 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, Hoffmann, 2020).

The steep rise in investors' activity in the real-estate market coincided with a rise in house and rent prices. Panel A of Figure 1 presents house price and rent indices, which rose between 2008 and 2018 by 100% and by 50%, respectively. House prices in Israel rose, in part, due to the low interest rate environment following the 2008 financial crisis, and limited supply of new housing units. The Israeli economy has done relatively well in overcoming the financial crisis, but nevertheless interest rate remained low ever since, making real-estate investments more attractive.⁵ Panel B of Figure 1 shows the share of purchases and sales by investors out of all transactions in each quarter in Israel. In 2007, investors purchased 27 percent of transacted properties, and by the end of 2010, their share increased to 36 percent. Even when deducting the housing units sold by investors in each quarter, the stock of housing units owned by investors grew steadily. In 2011, this trend slowed significantly after the government introduced higher purchase tax and an exemption from capital-gains tax for a subset of investors. The dates of the main tax reforms are marked by dashed vertical lines.⁶ While these measures may have been effective in limiting

⁴See the media release by the CBS: https://www.cbs.gov.il/he/mediarelease/DocLib/2019/041/15_19_041e.pdf

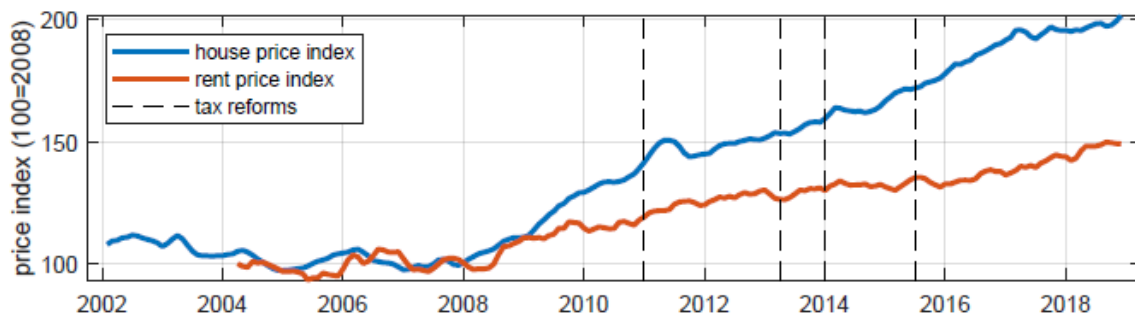
⁵ Another likely driver for the surge in investors' activity in real-estate markets is the new tax on capital-gains in the Israeli stock exchange adopted in 2003.

⁶ Until 2011, investors' purchase tax had two bands with the lower band liable to pay 3.5% of the price and the upper band 5%. In 2011, the tax authority added a third band, and the liability grew to 5, 6 and 7%. In late 2013, two additional bands were added with tax liability of 8 and 10%. Finally, in mid-2015, investors purchase tax rose significantly, leaving only two bands with 8 and 10% tax liability. These changes are significant, and one can observe

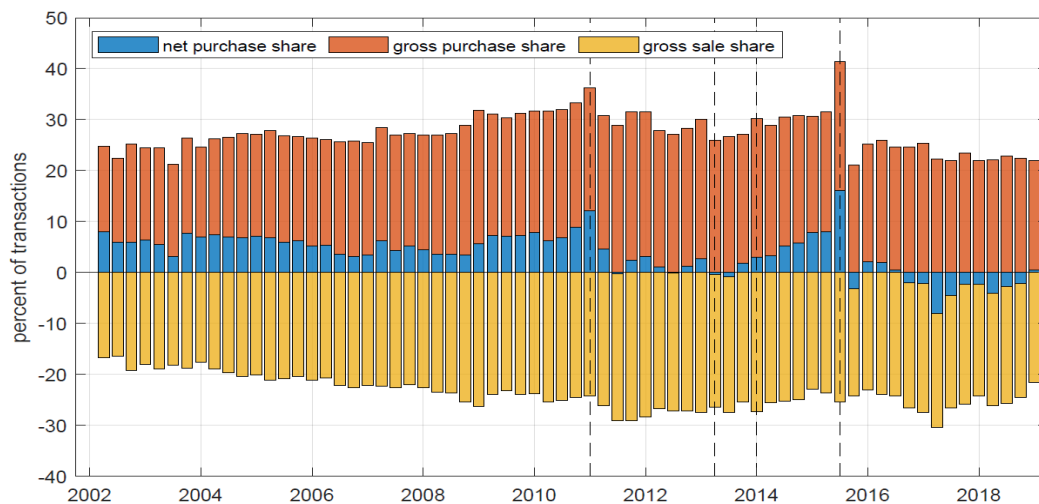
investors' activity in these markets, what was their actual impact on housing prices remains an open question.

Figure 1- Investor's activity in Israel

Panel A-



Panel B-

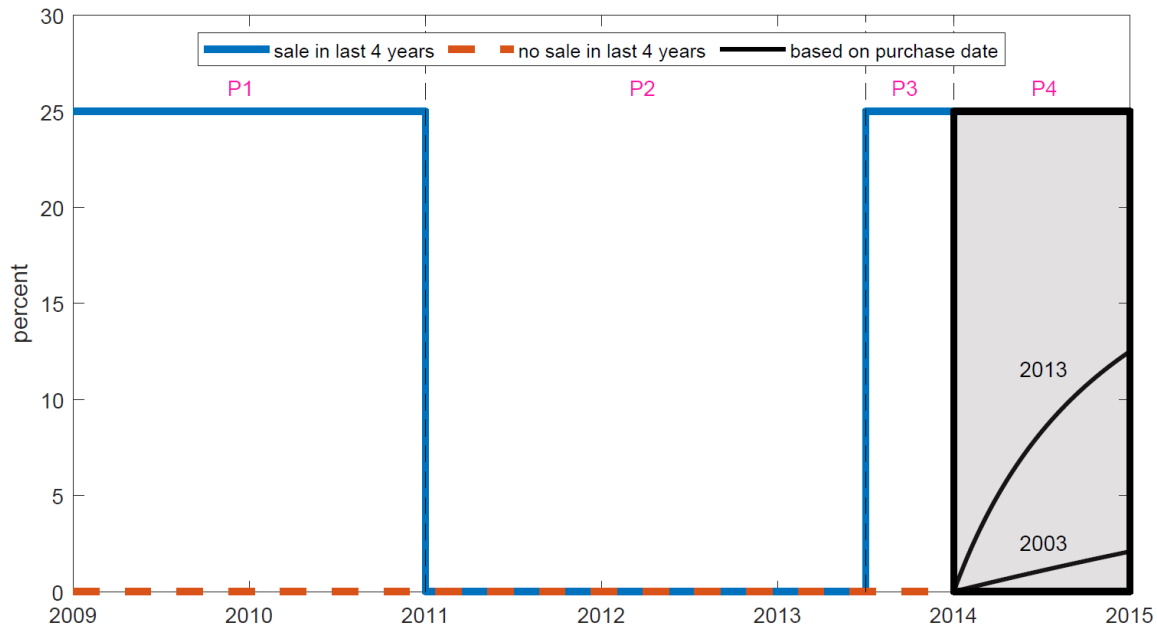


In our analysis, we focus on a series of changes in capital gains-taxes between 2009 and 2015. These changes, shown graphically in Figure 2, were adopted to encourage investors to sell housing units. Before 2011, investors who decided to sell their property had to pay 25% capital gains tax. However, if they did not sell any other property in the four years before the current sale, they were exempted from paying capital gains tax. This created an incentive for investors to wait four years between sales. In 2011, Israel decided to exempt almost all investors from capital gains

in Panel B of Figure 1, the rise in investors purchases leading to each tax change. That is, investors increased purchases to avoid the higher tax requirements. Even though these changes are important, it is hard to empirically estimate their effect as they affected all investors in Israel at the same time. Thus, disentangling their impact out of other events that occurred in the housing market at the same time is challenging. Instead, we focus on a different set of capital gains tax changes, that differentially affected some investors, but not all of them.

taxes, for a limited period until mid-2013. Investors still had to pay capital gains taxes if they sold another property up to 18 months before the current sale. In the second half of 2013, the temporary exemption expired. In January 2014, a new tax code was adopted, in which capital gains tax is no longer determined by the history of transactions, but rather by the holding period of the property they sell.

Figure 2- Capital Gains Tax Rate



Five important features of the capital gains tax changes make them particularly attractive from an identification point of view. First, the reform applied only to a subset of investors, i.e. those who had sold *another* housing unit 1.5 to 4 years prior to the current sale, which we consider as the treated investors. Single homeowners and 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 and June 2013 tax changes. This differential impact on different types of investors is important because it allows us to compare the response of investors targeted by the policy to other arguably similar investors. Our main control group is investors who sold another property 4-10 years prior to the current sale. These investors are ex-ante similar to the treatment group in all but the timing of their last sale.

Second, the eligibility for the temporary capital-gains tax exemption was based on whether the investor had already sold a different property. Therefore, the classification into treatment and control group of the investors is not likely to depend on the characteristics or location of the unit

they currently own and consider selling. For instance, an investor that considers selling a housing unit in Tel Aviv in 2012 will be exempted from the tax if he sold another unit, say in 2009 anywhere in Israel.

Third, the reform was unexpected; it was announced in late 2010 and should have been in effect for two years (until the end of 2012).⁷ Then the parliament decided to dissolve itself and call for unscheduled early elections, which led to the exemption staying in effect for an additional six months. Accordingly, we conclude that strategic or anticipation concerns by investors are unlikely to have an important role in this setting.

Fourth, the tax changes were adopted, then removed and then a new tax regime was implemented. This series of changes provide another important source of temporal variation which we exploit. It strengthens the causal interpretation of the impact of capital gains tax on investor's activity by exploiting not only the adoption of the tax, but also its removal. Fifth, 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 provide the treated investors with a substantial incentive to sell.

⁷See for example an article in "The marker" that announces the new tax regime in December 2010: <https://www.themarker.com/realestate/1.562304>

3 Data and Descriptive Statistics

Our research is based on several administrative and proprietary data sources that cover about ninety percent of Israel's housing stock and all transacted properties as well as annual socio-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 on listings for dwellings available for sale and rent from Israel's leading website for classified ads. Below, we describe the main data sources and in Table 1 we provide summary statistics for a set of variables used in our analysis.

Table 1- Summary Statistics

Variables	Mean	Sd
Total properties	4,304.5	2,045.2
Investors' properties	1,565.4	955.9
Investors who sold 1.5-4 years earlier	206.1	155.4
Total sales	73.7	49.1
Investors' sales	25.8	19.0
Investors who sold 1.5-4 years earlier	1.7	3.4
Predicted sales of used apartments	69.9	47.2
Building starts	20.6	62.1
Observations	5,040	

3.1 Housing Stock

Annual information on Israeli stock in urban areas comes from 77 municipalities property tax files. The data covers 1.87 million housing units in mid-2011, grows by about 30,000 every year, and reaches 2.13 million housing units by mid-2019. For each property, the data include the location of the property (locality and statistical area) and fictitious id number of the property owner. In each locality and statistical area there are between 3,000 and 5,000 residents, and an average of about 1,000 housing units. Since each statistical area is quite small and thus have limited number of transactions, we aggregate adjacent statistical areas in each locality into 360 local markets in Israel. The average number of housing units in each local market is 4,304 (see Table 1).

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 information on the price, date, location (locality and statistical area), investors

status of the buyer, and property characteristics (number of rooms, area, 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 location (locality and statistical area), family (marital status, number of children, spouse ID, parents IDs) and individual characteristics (fictitious ID, gender, birth year).

First, we rely on these two datasets to 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 2015 is 1,565 (36% of all housing units). These include the apartments they live in as well as the apartments they buy to let. 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 property owner who appears in the housing stock data, we calculate the time that has gone by since he sold another property in Israel. Treated investors have on average 206 properties in each local market (5% of all housing units, and 13% of housing units held by investors). Third, we are interested in the effect of the tax on investors' sales activity. Table 1 presents the number of sales in each local market conducted by either all homeowners, only investors or only treated investors (who sold another property 1.5-4 years earlier).

Between 2009 and 2015, the average number of used housing units sold in each local market and half a year is 74, which is 1.7% of stock. Similarly, investors sell on average 26 housing units, which are 1.7% of the stock that they own. Investors who sold another property 1.5-4 years earlier, however, sell on average only 0.8% of their housing units (1.7 housing unit). The lower sale rate by these investors is likely due to the higher capital gains tax they face before the 2011 tax reform.

The goal of our analysis is to establish causal relationships between investors' activity, house prices, and rents. For various reasons, measures of realized investors' activity may not be good instruments. We thus construct an IV of the predicted sales of housing units in each period and location, based on the share of stock held by different owner types and the capital gains tax they face at each period. The construction of the IV is described in the second stage of the results section. The average number of predicted sales is 70, with a standard deviation of 47 (see Table 1). We now turn to describe the sources used for creating the outcome variables of interest: prices, rent, housing construction and listed ads.

The price index in each local market and half a year is based on the above-mentioned transactions dataset, provided by the Israel Tax authority. Table 2 provides summary statistics of used apartments sold by investors and non-investors, separately for the period where differential capital gains tax was levied and during the capital gains temporary exemption. In both periods, properties sold by investors are on average older, smaller and have lower prices. Over the entire period (2009-2015), there are about 500 thousand transactions, of them 80% are sales of used apartments (and the rest are new apartments). Based on the number of rooms, about 44% of transacted properties are small housing units (up to 3 room).

Table 2- Characteristics of transacted used apartments

	Sellers Investors		Sellers Non-Investors	
	Mean	Sd	Mean	Sd
Without Exemption (2009-2010 & 2013H2)				
Price (in million NIS)	0.92	0.60	1.02	0.62
Rooms	3.43	0.88	3.68	0.91
Area	77.8	33.8	87.0	35.1
Building Age	37.2	40.1	26.7	35.7
Observations	43,434		145,611	
During Exemption (2011-2013H1)				
Price (in million NIS)	1.03	0.63	1.12	0.64
Rooms	3.43	0.88	3.68	0.91
Area	77.6	31.8	87.5	33.9
Building Age	36.9	35.7	26.4	32.5
Observations	46,443		130,114	

3.3 Rent Survey

Data on rent is based on a monthly rental survey conducted by the CBS. This survey covers a representative sample of rental units across Israel. Each observation includes information on the rent, month, location (locality and statistical area) and number of rooms in the property. We rely on this survey to construct a rent index in the 360 local markets we focus on. There are about 82 thousand observations between 2009 and 2015, of them 61 percent are small housing units (i.e. up to 3 rooms).

3.4 Construction of New Housing Units

These data, provided by the CBS, covers all new housing units built in Israel between 2003 and 2018. For each project, it specifies the location (locality and statistical area), the number of units and starting date. In the 360 local markets we focus on, there are about 104 thousand building

starts completed between 2009 and 2015, with an average of 280 new housing units in each local market.

3.5 Listed Ads for Dwellings

We obtained data on listings for dwellings available for sale and rent. The data, available from Yad2 Israel's leading website for classified ads, covers the period from January 2012 to December 2018. For each ad, we have its start date, address, listed price and a rich set of property characteristics. In the 360 local markets we focus on, there are about 472 thousand rental ads and 149 thousand ads for sale between 2012 and 2015. While 68 percent of rental ads are small (i.e. up to 3 rooms), only 36 percent of for-sale ads are small. We rely on these ads to construct price and rent indices using hedonic regressions of the logged price on number of rooms and location-period fixed-effects.

In sum, we constructed 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 2015. Three patterns in the data are important for our analysis. First, investors in Israel hold a substantial share of the housing stock (36%). Second, while on average 1.7 percent of housing units are sold each half year, investors who sold another property 1.5-4 years earlier sell on average only 0.8 percent they own. We claim this is a result of the higher capital gains tax they face, and we will discuss this further in the next section. Third, the composition of houses for sale on the market is different than rental housing units in terms of the number of rooms. While only 44 percent of sales (and 36 percent of for-sale ads) are small apartments, 61 percent of rent survey observations (and 68 percent of rental ads) are small (i.e. up to 3 rooms). This distinction will aid our analysis of the effect of investors on the housing and rental market in the last section of the paper.

4 Estimation and Results

Our goal is to examine the effects of residential real-estate investors on house prices and 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 develop a three-stage empirical strategy. In the first stage, we employ a difference-in-differences strategy to evaluate the impact of capital-gains tax reform on sales volume by treated investors. Second, we construct a predictor of 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. In the third step, we use the predicted number of sales to instrument for the actual number of units sold in each local market, and separately estimate the effect of sales on prices and rent. Below we describe each stage in detail.

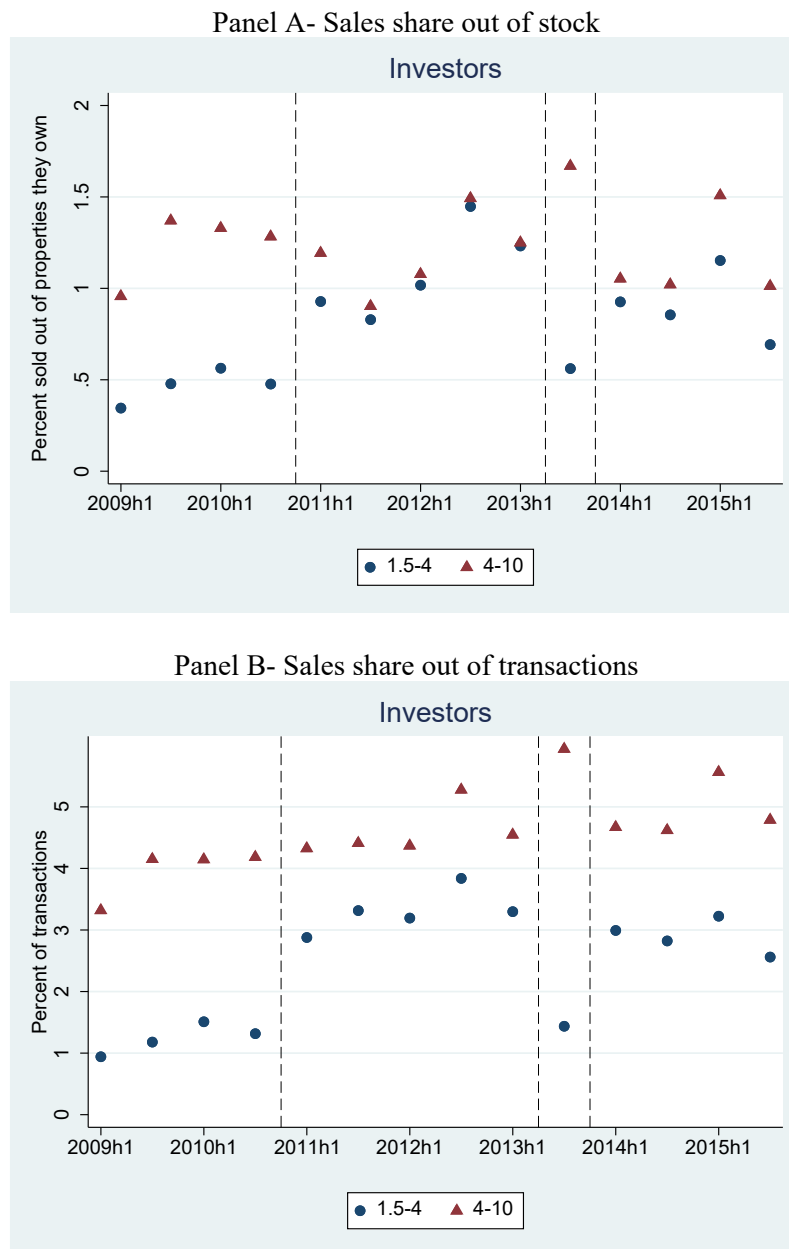
4.1 First Stage: Effect of the Capital-Gains Tax Reform on Sales' Volume

Our analysis relies on the changes in the capital-gains tax rates presented in Figure 2. We compare decisions by investors who were affected by the tax change and other groups of homeowners. Figure 3 shows how the share of units sold by treated investors before and after the tax changes and compares it to the share of units sold by investors who sold another property in the last 4-10 years.⁸ Panel A of Figure 3, focuses on the share of sales out of the total stock of housing units owned by each investor type, whereas Panel B reports the share of sales out of total transactions of used apartments in each half-year in Israel. Both figures depict a similar pattern: the share of sales by treated investors has been lower than the share of sales by other investors between 2009 and 2011 (P1). Then, shortly after the adoption of the tax reform, the share of sales by treated investors rises and the pattern of sales becomes nearly identical to the pattern of sales by the control group. This pattern continues for 2.5 years (during 2011-2013H1 (P2), and then in the second half of 2013 (P3), as the temporal exemption from the capital gains expired, we see a drop in the number of sales. Finally, starting in January 2014, the capital gains tax rate is no longer

⁸ We present results using the threshold of 10 years, though other thresholds (e.g., 6.5 years) give similar qualitative results.

determined by the timing of the previous sale but rather by the holding period of the property. This again implies that both treated investors and other investors see a similar tax rate which leads to another spike in the share of sales by affected investors, from 2014 onward (P4).

**Figure 3- Tax reform impact on sales by investors
who sold another property 1.5-4 vs 4-10 years earlier**



While the patterns shown in Figure 3 are based on the total sales by the different types of investors, similar results hold once we focus on local markets. Specifically, we estimate the following difference-in-differences specification:

$$y_{ilt} = \alpha + \beta_{it}Treated - investors_{it} * Tax_t + \delta_l + \theta_t + \varepsilon_{ilt}$$

where y is the outcome of each owner type in each local market and half year (share of sales out of total transactions / share of sales out of the stock of housing units they own); *Treated-investors* is a dummy for investors who sold another property in the last 1.5-4 years, *Tax* is a set of dummy variables for the four different tax periods – P1 (2009-2011), P2 (2011-2013H1), P3 (2013H2) and P4 (2014-2015); δ is a local market fixed effect; θ is a half-year fixed-effect; and ε_{ilt} is a well-behaved error term clustered at the local market level.

We present the estimation results, comparing the treatment group to three different control groups. First, investors who sold another unit 4 to 10 years before the current sales. Second, investors who did not sell any unit in the last 10 years, and third single homeowners (i.e., non-investors). The relevant difference between the treatment and control is the different capital gains tax that they face before 2011 and in the second half of 2013. The first three columns of Table 3 use the percent of sales out of stock, as in Panel A of Figure 3. The last three columns of Table 3 use the number of sales divided by the overall number of transactions in each local market as the dependent variable, like Panel B of Figure 3.⁹ We perform the estimation using three groups of homeowners as control groups: investors who sold another property in the last 4-10 years (columns 1 and 4), above 10 years earlier (columns 2 and 5) and single homeowners (columns 3 and 6). Overall, this analysis demonstrates that investors' activity in the market is sensitive to the rate of capital-gains tax that they face.¹⁰ For all six specifications, the estimated share of sales by treated investors rises significantly during both the capital gains exemption period (P2) and the new tax calculation method starting in 2014 (P4). In contrast, this share is considerably lower during the

⁹ An observation here is the share held by two types of homeowners in each local market and half year. Overall, our panel has 5,040 observations (14 half-years and 360 local markets), but we do not observe transactions in every local market and half year. There are transactions only in 4,613 observations. Note that 9,226 observations that appear in Table 3 represent 4,613 observations for each type in the analysis.

¹⁰ In separate analyses, we also examine how did the prices of properties that treated investors sold change before and after the tax change. By estimating this equation at the transaction level and controlling for housing characteristics, we find that treated investors used to sell housing units at lower prices before the tax change and at roughly similar prices after the tax change.

periods in which the tax rate is higher (P1 and P3). In column 1 for example, during P1 treated investors sell 0.8 percent less of their stock relative to the control group of investors who sold another property in the last 4-10 years. We claim that this gap reflects a lock-in effect of treated investors caused by the capital gains tax they face before 2011. Then in P2 the gap between them decreased by 0.6, which means they almost sell the same percent of stock as the control group during the capital gains tax exemption. Once again in P3 there are less sales by treated investors as the exemption is removed (-0.4%). Finally, in P4 the capital gains tax rate is no longer based on the history of transactions, and we document another increase in their relative sales (0.5%).

Table 3- The effect of capital-gains taxes on sales by different homeowners

Dependent Variable	Sales share out of stock			Sales share out of transactions		
	Investors 4-10 (1)	Investors 10+ (2)	Non- Investors (3)	Investors 4-10 (4)	Investors 10+ (5)	Non- Investors (6)
P1×Treatment	-0.77*** (0.05)	-1.04*** (0.05)	-1.54*** (0.04)	-2.29*** (0.16)	-19.19*** (0.34)	-73.41*** (0.55)
P2×Treatment	0.62*** (0.06)	0.58*** (0.05)	0.89*** (0.05)	0.98*** (0.19)	1.05*** (0.31)	5.63*** (0.41)
P3×Treatment	-0.40*** (0.09)	-0.31*** (0.06)	0.04 (0.06)	-1.76*** (0.29)	-1.74*** (0.45)	3.73*** (0.54)
P4×Treatment	0.47*** (0.06)	0.38*** (0.05)	0.62*** (0.05)	0.42** (0.20)	1.58*** (0.36)	3.26*** (0.45)
Half-year Fes	Yes	Yes	Yes	Yes	Yes	Yes
Local market FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,371,977	5,920,065	14,843,670	9,226	9,226	9,226
R-square	0.39	0.65	0.67	0.29	0.73	0.95

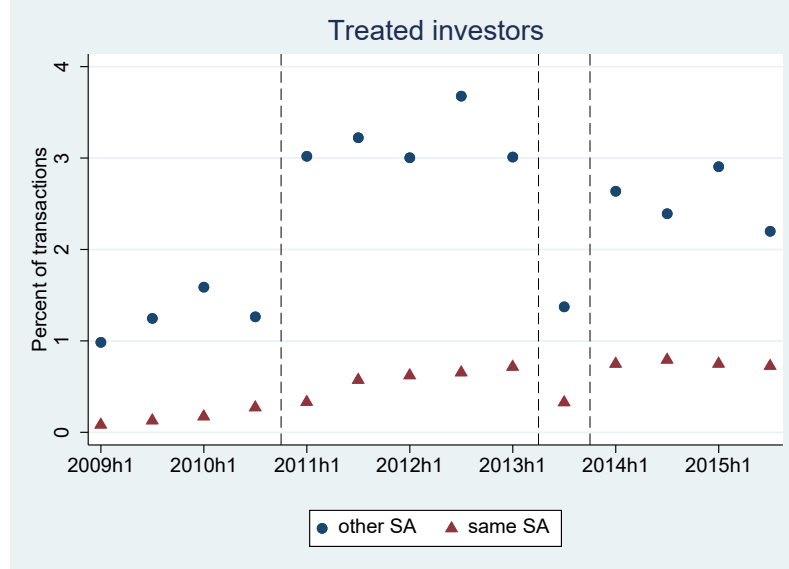
So far, we show that the tax changes led to a higher volume of sales by treated investors. Next, we take advantage of our data to perform two more analyses. First, we distinguish between housing units in which investors live in and other housing units that they own.¹¹ We use this distinction to examine whether investors were more likely to sell housing units where they do not live in. Second, we examine whom did these investors sell the units to.

¹¹ Specifically, the demographic information on sellers from Israel's population registry includes their locality and statistical area every year. We compare these data with the location of their housing units, to classify their sales into two groups: "same SA"- housing units in the same statistical area versus "other SA"- housing units in a different statistical area. We assume that the former are the units the investors reside in, and the latter are the units they offer for rent.

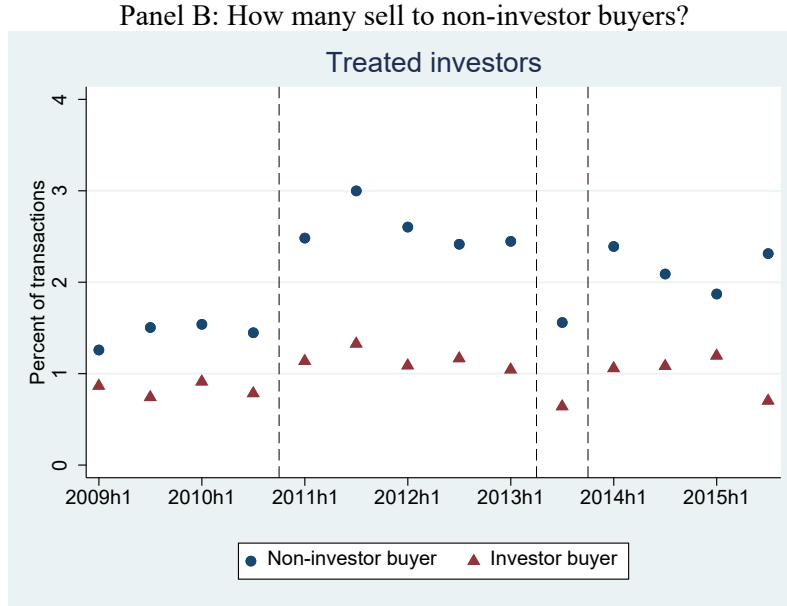
Panel A of Figure 4 shows how the number of units sold by treated investors changed before and after the tax reforms, separately for units where they live in and for other units.¹² There are fewer sales of housing units in the “same SA” relative to housing units in “other SA” throughout the period. Both groups are sold more often during the exemption period between 2011-2013H1 (P2) and from 2014 onward (P4), but most of the added sales are in “other SA”, which are most likely rental housing units. Panel B of Figure 4 considers the identity of buyers from the treated investors: either investor or non-investor. 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.

Figure 4- Effect on supply and demand for rental units

Panel A: How many sell an apartment in the SA they live in vs in another SA?



¹² The sales are divided by the overall number of transactions of used apartments in each half year in Israel. Similar results are attained when dividing the sales by the stock of housing units instead.

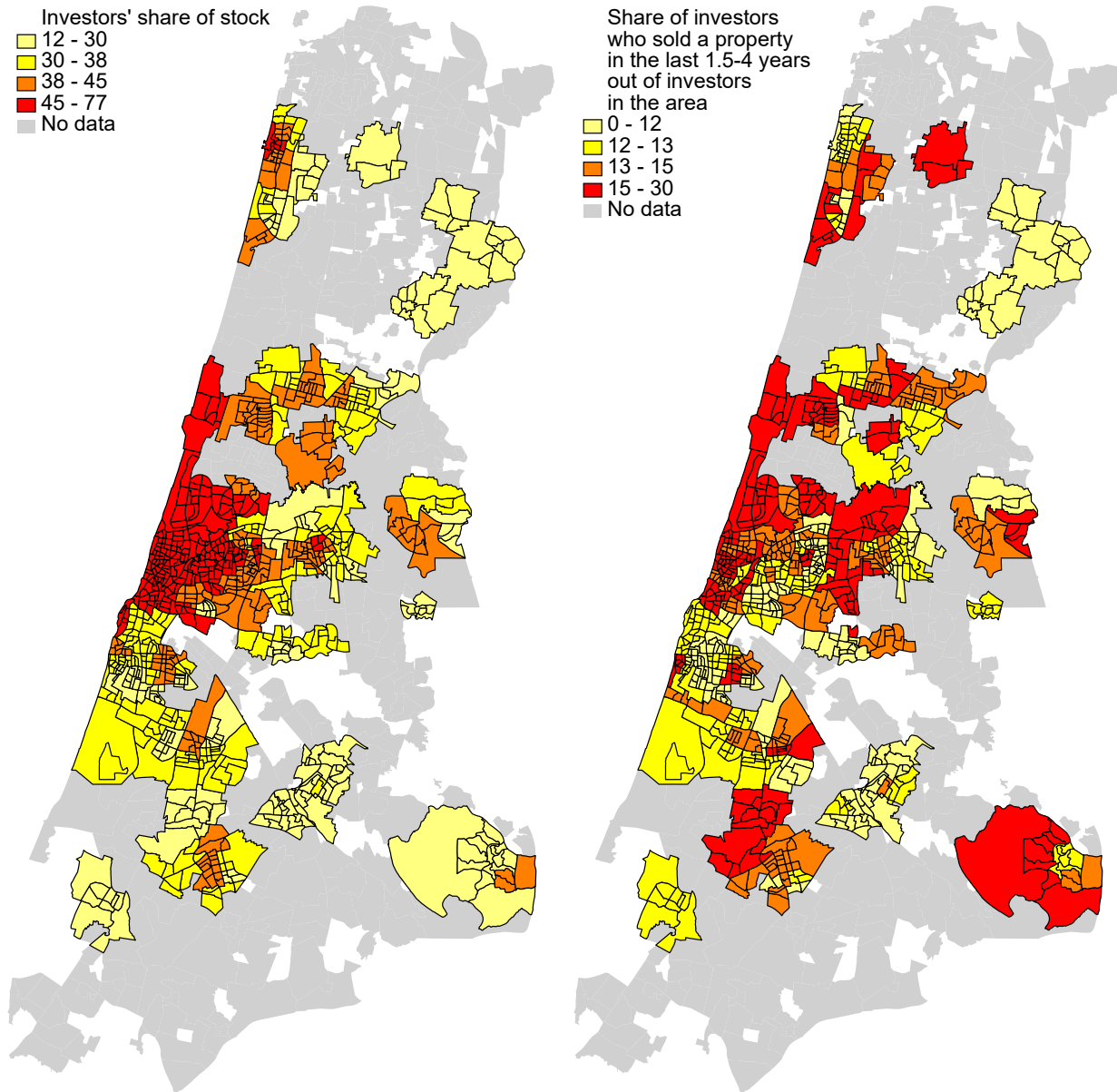


In sum, we show that the tax reforms led to higher volume of sales by treated investors. We also document indications for contradicting impact of the tax reform on the rental market; lower supply of rental units as investors sell, and lower demand as non-investors buy these housing units and become homeowners.

4.2 Second Stage: Constructing a Prediction of Sale's Volume

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 5 maps the share of stock held by investors and by treated investors, in Israel's central district in 2010. While the map on 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.

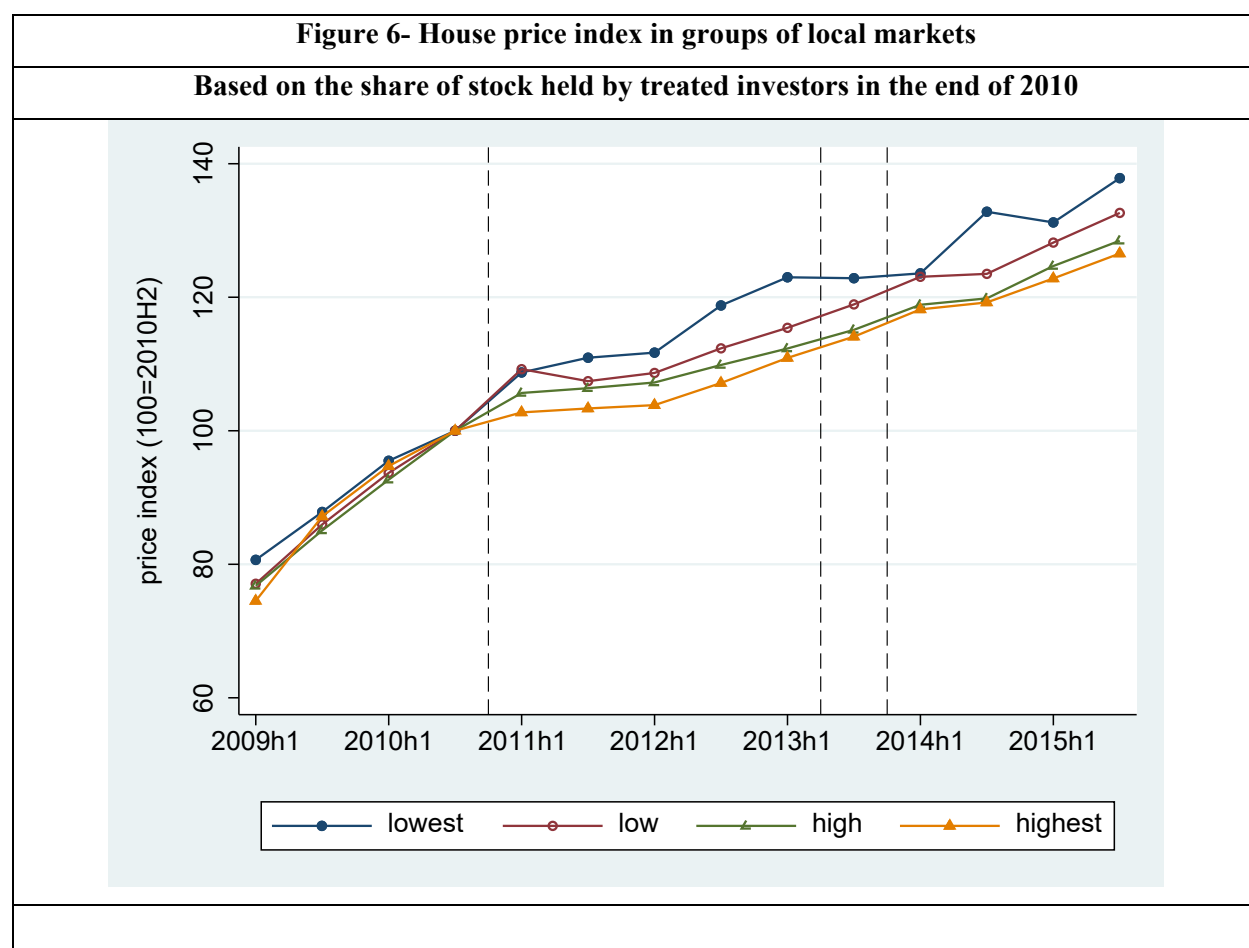
Figure 5- Investors' share of stock and treated investor share
Center of Israel, 2010



In the second stage of our analysis, we use this presumably exogenous spatial variation in market activity to investigate whether it translates into meaningful 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.

One way to examine the validity of our instrumental variable approach, is to calculate the price index in four groups of local markets in our panel, classified by the share of stock held by treated investors in the end of 2010 (i.e. before the tax exemption). The indices are presented in Figure 6, and do not suggest the existence of pre-trends: all four groups of local markets had similar price trends, regardless of the quartile they belong to, in terms of the share of stock owned by treated investors in 2010. Thus, the identification of causal effects of investor's activity on house prices relies on the exogenous nature of the temporal variation in capital tax regimes, and the spatial variation in the location of affected investors. Interestingly, after the adoption of the tax reform in 2011, one can observe a striking pattern: house prices increased **less** in local markets with higher share of stock held by affected investors. To estimate this effect over time and across locations, we now turn to construct our instrument.



We begin by predicting the probability of sale for each housing unit based on the actual number of sales by each owner type in every location and tax period. We estimate the following equation:

$$1. \text{Percent sold}_{ilt} = \alpha + \beta_{it} \text{Owner Type}_i * \text{Tax}_t + \delta_l + \theta_t + \varepsilon_{ilt}$$

where *Percent sold* is calculated as the number of sales divided by the stock of housing units of each owner type in each local market and half year; *Owner Type* is a set of indicators for the following five homeowners groups: non-investors, investors who sold another property in the last 0-1.5, 1.5-4, 4-10 or above 10 years ago; *Tax* is a set of dummy variables for the four different tax periods – P1 (2009-2011), P2 (2011-2013H1), P3 (2013H2) and P4 (2014-2015); δ is a local market fixed effect; θ is a half-year fixed-effect; and ε_{ilt} is a well-behaved error term clustered at the local market level. The equation is estimated using housing units' frequency weights. We use this estimation to predict the probability of sales by each homeowner in each local market and half year.

Table 4 present the results from estimating equation (1). The estimated coefficients of the interactions between sales by investors who sold another housing unit 1.5-4 years earlier and the four periods of capital gains tax are highlighted in bold. Once again, one can observe the pattern of increased sales by affected investors during the capital gains exemption period (P2) and the new tax calculation method starting in 2014 (P4).

We rely on this estimation to predict the number of sales of used housing units in each location and period. Specifically, we multiply the predicted probability of sale of each homeowner type in each location and period, by the corresponding number of housing units that each type owns. This product gives us the predicted number of sales described in Table 1. the average number of predicted sales is 70, while the average of actual sales is 74. Moreover, there is a strong positive correlation between these two variables ($r = 0.96$). In the next stage, we estimate the effect of one standard deviation of predicted sales on housing market outcomes.

Table 4-Predicted sales of used apartments

	Sales share out of stock
Investors 0-1.5 x P1	-0.31 ^{**} (0.12)
Investors 0-1.5 x P2	1.07 ^{***} (0.09)
Investors 0-1.5 x P3	-0.51 ^{***} (0.11)
Investors 0-1.5 x P4	0.01 (0.09)
Investors 1.5-4 x P1	-1.41 ^{***} (0.04)
Investors 1.5-4 x P2	0.88 ^{***} (0.05)
Investors 1.5-4 x P3	0.04 (0.06)
Investors 1.5-4 x P4	0.62 ^{***} (0.05)
Investors 4-10 x P1	-0.63 ^{***} (0.05)
Investors 4-10 x P2	0.25 ^{***} (0.04)
Investors 4-10 x P3	0.42 ^{***} (0.07)
Investors 4-10 x P4	0.13 ^{***} (0.05)
Investors 10plus x P1	-0.33 ^{***} (0.05)
Investors 10plus x P2	0.29 ^{***} (0.02)
Investors 10plus x P3	0.33 ^{***} (0.04)
Investors 10plus x P4	0.21 ^{***} (0.03)
Half-year FEs	Yes
Local market FEs	Yes
Observations	21,694,062
R-square	0.44

4.3 Third Stage: Estimating Effects of Investors on House Prices and Rent

Using the prediction of sale's volume constructed above as an IV, we can estimate the following equation:

$$2. \log y_{ilt} = \alpha + \beta \text{predicted sales}_{lt} + \delta_l + \theta_t + \varepsilon_{ilt}$$

Where y is the outcome (prices/rent /ads); *predicted sales* is the number of housing units predicted to be sold (divided by 100); δ is a local market fixed effect; θ is a half-year fixed-effect; and ε_{ilt} is a well-behaved error term clustered at the local market level.

First, we estimate equation (2) using the price index in each local market and half-year as the dependent variable. The results of this estimation using all housing transactions, are in column 1 of Table 5. We find that 100 additional predicted sales decrease house prices by 8%. The standard deviation of predicted sales stands is 47, so a one-standard-deviation increase in sales causes house prices to fall by 4%. 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 above 3 rooms (column 3) or new housing units (column 4). These patterns could be explained by the different properties of the housing units sold by investors, which are on average smaller and older (see Table 2).

Table 5- Effect on House Prices

<i>Dependent Variable: Price index (in logs)</i>							
	All	Up to 3	Above 3	New	Used	W/o	With
	(1)	Rooms	Rooms	Apartments	Apartments	Building	Building
	(1)	(2)	(3)	(4)	(5)	Starts	Starts
Predicted Sales (/100)	-0.08*** (0.03)	-0.11*** (0.03)	-0.02 (0.04)	-0.00 (0.07)	-0.07** (0.03)	-0.06 (0.04)	-0.08* (0.04)
Half-year Fes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local market FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,819	4,706	4,784	3,811	4,815	3,100	1,719
R-square	0.97	0.97	0.95	0.84	0.97	0.97	0.98

Second, we estimate equation (2) using the rent index in each local market and half-year as the dependent variable. The results of this estimation using all surveyed housing units, are in column 1 of Table 6. We find that 100 additional predicted sales increase rent by 4%. The standard deviation of predicted sales stands is 47, so a one-standard-deviation increase in sales causes rent

to increase by 2%. The effect is larger in housing units with up to 3 rooms (column 2) while insignificant for larger housing units with above 3 rooms (column 3). Columns 4 and 5 address the availability of new housing units, measured by the number of new building starts in the local market. Specifically, we estimate equation (2) separately for local markets without building starts (column 4) and find that rent increased significantly there, as investors sold more housing units. Conversely, rent did not rise in areas with new housing supply (column 5). In contrast, in columns 6 and 7 of Table 5, we find similar effects on house prices for local markets with or without new building starts.

Table 6- Effect on Rent

<i>Dependent Variable: Rent index (in logs)</i>					
	All	Up to 3 Rooms	Above 3 Rooms	W/o Building Starts	With Building Starts
	(1)	(2)	(3)	(4)	(5)
Predicted Sales (/100)	0.04* (0.02)	0.07** (0.03)	-0.00 (0.03)	0.07** (0.03)	-0.05 (0.04)
Half-year Fes	Yes	Yes	Yes	Yes	Yes
Local market FEs	Yes	Yes	Yes	Yes	Yes
Observations	4,597	4,455	4,319	2,972	1,625
R-square	0.96	0.94	0.91	0.96	0.98

Third, Table 7 provides results from estimating equation (2) using either the number of listed ads for dwelling (Panel A), or indices of listed prices and rent (Panel B). These data come from Israel's leading website for online ads, "Yad2". The data starts in 2012, and so we limit the analysis to the years 2012-2015. We find that 100 additional predicted sales, are correlated with an increase in the number of "for sale" ads by 31 percent (column 1 of Panel A). The increase is larger for ads of housing units with less than 3 rooms (52%) and insignificant for larger units with above 3 rooms (columns 2 and 3 of Panel A, correspondingly). We observe similar patterns for rental ads (columns 4-6 of Panel A). However, we do not find a significant effect on listed prices (columns 1-3 of Panel B), nor on listed rent (columns 4-6 of Panel B).

Table 7- Effect on Listed Ads for Dwellings

Panel A: Number of listed ads						
<i>Dependent Variable: log number of ads</i>						
	For Sale Ads			Rental ads		
	All	Up to 3 Rooms	Above 3 Rooms	All	Up to 3 Rooms	Above 3 Rooms
	(1)	(2)	(3)	(4)	(5)	(6)
Predicted Sales (/100)	0.31*	0.52**	0.14	0.18	0.39**	0.07
	(0.16)	(0.25)	(0.18)	(0.20)	(0.18)	(0.21)
Half-year Fes	Yes	Yes	Yes	Yes	Yes	Yes
Local market FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,608	2,520	2,591	2,617	2,604	2,588
R-square	0.93	0.87	0.92	0.93	0.94	0.91

Panel B: Listed prices and rent						
<i>Dependent Variable</i>	<i>Listed price index (in logs)</i>			<i>Listed rent index (in logs)</i>		
	All	Up to 3 Rooms	Above 3 Rooms	All	Up to 3 Rooms	Above 3 Rooms
	(1)	(2)	(3)	(4)	(5)	(6)
Predicted Sales (/100)	-0.02	-0.03	0.01	-0.02	-0.01	-0.02
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Half-year Fes	Yes	Yes	Yes	Yes	Yes	Yes
Local market FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,608	2,520	2,591	2,617	2,604	2,588
R-square	0.99	0.98	0.98	0.99	0.99	0.98

5 Conclusion

TBD

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