Individual Investors' Housing Income and Interest Rates Fluctuations*

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Abstract

Rental properties are a common form of investment, and small individual landlords are widespread in many countries. Using unique data on tax filings from Australia, we show that approximately 20% of median income individuals of middle and retirement age directly own rental properties. This fraction has substantially risen over the last 20 years, in particular for retirement age individuals, who have seen a relative increase of participation in the rental market of 80%. We link the increase in participation to surprise cuts in interest rates, and investors' preference for assets with high recurring income payments and yields. The increase in participation in response to rate cuts is stronger in areas where real estate pays higher rental yields, and where small landlords face lower rent competition from large multifamily developers. Retirement age individuals are also the most likely to use investment properties as a source of recurring income, and, as rates drop, concurrently reduce their fixed income and interest-paying investments. The expansion of rental market participation has important implications. Higher reliance on rental income rises the exposure of middle age and retirement age individuals to local economic shocks. Moreover, increased investment in rental properties, driven by interest rates cuts, leads locally to higher house prices and lower rental yields, especially in areas with constrained land supply.

Keywords: Household Income, Interest Rates, Landlords, House Prices, Rents
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1 Introduction

A growing literature explores the role of institutional and professional investors in housing markets, and their increasing importance over the last decades.[1] However, still relatively little is known about direct investment in the rental market by individuals and households, and, in particular, about the contribution of income from these rental investments to total household income. Nonetheless, small landlords are common across most countries, and total households' wealth invested in non-owner occupied properties is higher than direct investment in financial assets outside of retirement plans, and is approximately equal to one-quarter of the wealth in retirement and insurance plans (Badarinza, Campbell, and Ramadorai, 2016).

The significance of rental income might have even increased within the recent macroeconomic environment, characterized by falling, and then relatively low, interest rates. Besides mechanically reducing income from saving and money market accounts, and thus increasing the contribution of other sources of financial and investment income, drops in interest rates may also have affected the composition of investment income through changes in portfolio composition (see Hau and Lai, 2016, Lian, Ma, and Wang, 2019, Daniel, Garlappi, and Xiao, 2021, and Korevaar, 2021 who finds effects on real estate investments in a historical context).[2] In addition, changes in participation in the rental market and in the demand for rental properties may have effects extending beyond landlords, through the impact on house prices and rents affordability (Favilukis, Mabille, and Van Nieuwerburgh, 2021, Ghent and Leather, 2021).

In this paper, we use unique data from Australian tax filings over the last two decades to study individual investors' rental income, its evolution over time, and how fluctuations in

[1] For example Chinco and Mayer (2016), Badarinza and Ramadorai (2018), Bayer et al. (2020), Favilukis and Van Nieuwerburgh (2021), and Deng et al. (2021) study out-of-town and speculative investors. Gurun et al. (2022), and Garriga, Gete, and Tsouderou (2021) study long-term investors in single family residences.

[2] A growing literature has studied the impact of changes in interest rates on several sources of households' income, but has not specifically explored investment in and income from rental properties. See for example Coibion et al. (2017), Peydro et al. (2021), Greenwald et al. (2021), and Amberg et al. (2022), who study the effects on income composition and financial wealth. Since households' income sources (Smith, Zidar, and Zwick, 2020) and asset holdings (Fagereng et al., 2021, Bach, Calvet, and Sodini, 2022 and Gomes, Haliassos, and Ramadorai, 2021) are highly heterogeneous, rental income effects are also likely to be different across demographic and income groups, and can be extensively studied only with detailed micro-data.

interest rates affected individual investors' decisions to participate in the market for residential, income-producing, real estate. We find that the effects of rate drops on rental market participation have been large, in particular in areas with higher rental yields and less competitive rental markets. Most interestingly, the increase in participation has been largest for retirement age individuals, who seem to use rental housing as a source of recurring income, substituting other yield-generating assets. Individuals with age below 40 have instead reduced their participation in the rental market over time. We then explore the implications for income composition and risk, and study the effects of interest rates-induced investment in rental properties on house prices and rental yields.

The investment decisions that we analyze in this work are different from the ones studied by the literature on speculative investment in residential real estate, which focuses instead on investors seeking returns from market timing and price appreciation, sometimes even over relatively short investment periods. Our findings are more related to the literature that explores the increase in rental market participation by long-term investors (Garriga, Gete, and Tsouderou, 2021, Gurun et al. (2022), and te Kaat, Ma, and Rebucci, 2021). However, our analysis is also distinct from these works, since our focus is specifically on the role of individuals, rather than institutional or professional investors, and on the impact on their income.

Australia presents an ideal context for our study. First, the data offer detailed information on rental income. Since in Australia income losses from directly owned real estate properties can be subtracted from taxable income, most individual investors directly own their properties, and thus directly report both their rental income and expenses in tax filings. In the United States, even small investors frequently own their real estate investments through a legal entity, a fact that makes the measurement of rental income more challenging.[3] Second, the data contain information on individuals' demographics and locations of residence, and there is no joint tax filing in Australia. Thus, we can link individual income and its composition with individual

[3]While also in the United States it is possible to deduct rental losses from ordinary income, there are substantial restrictions, which exclude the more affluent landlords, or those with multiple properties. The deduction can be taken only if taxable income is below $100,000, and cannot exceed $25,000.

characteristics.

For what concerns the analysis of changes in participation in the rental market over time, and the effects of interest rates, Australia also has some advantages over the United States. Like the United States and other major industrial countries, Australia has experienced a substantial drop in interest rates over the last two decades. However, Australia has not experienced at the same time a housing bust. The growth of house prices in the country has been largely unaffected by the Great Recession (see Figure 5), and the drops in interest rates were driven by global macroeconomic and monetary policy factors, not by a local housing crisis. In this sense, the Australian situation has been more similar to the one of Canada, Germany, and Chile.

We begin our study by documenting the magnitude and time evolution of direct investment in rental properties. When considering the years from 2017 to 2019, direct investment in the rental market is common. Participation is highest for middle age (40 to 59) and retirement age (60 and older) individuals in the top quintile of income for their age group (more than 35% own rental properties with an average gross rental income of $28,000). However, even among middle age and retirement age individuals with median income, investment in rental properties is quite common: between 17.5% and 20% own rental properties, with an average gross rental income of $17,000.

Investment in the rental market has increased over time. From 2002, the first year in our sample, to 2019, the fraction of individuals reporting income or expenses related to real estate investment properties has increased, in relative terms, by 30% (from 13% to 17%). A large part of such increase has taken place immediately after 2008-2009, and then in the years from 2010 to 2014, when the fraction of landlords is 3.5% larger than in 2002. This pattern is closely negatively correlated with the one in bond yields and interest rates. The expansion in rental market participation is widespread across the entire country: 90% percent of postcodes have seen an increase in the fraction of residents who are landlords.

Most interestingly, we find high heterogeneity across groups based on age and total income. Retirement age individuals with median income within their age group have increased participation in the rental market the most: 80% in relative terms (approximately 9% in absolute terms). The average rental income for retirement age individuals (when averaging over all individuals, including non-landlords) has increased by more than 120%. Large effects are also present for middle income individuals with age between 40 and 59 years old (middle age), for which participation has increased by 18% in relative terms. On the other hand, we find a drop in participation for individuals younger than 40 (in particular, we find a 40% drop for those in the lowest quintiles of total income).

Several mechanisms can drive these time series patterns. First, lower rates might induce individuals to "reach for income". Individuals who have a preference for receiving periodic income payments from their investment assets may be satisfied with earning interest income from money market accounts when interest rates are high. However, cuts in interest rates may push them to look for other assets paying a substantial part of their return through income (yields). Daniel, Garlappi, and Xiao (2021) show that this channel results in an increase in holdings of high dividend paying stocks following interest rate cuts, especially for retirement age individuals. Alternatively, in the presence of "reaching for yield" behavior, investors might increase allocations towards risky assets, including real estate, when the risk free rate drops, just to achieve higher total returns.[4]

Second, individuals and households might find investing in real estate attractive during the period of our study because of Australia's rising house prices. This behavior might be tied to the over-extrapolation and fear-of-missing-out effects, which also push renters to enter the housing market during housing booms (Agarwal, Hu, and Huang, 2016, Armona, Fuster, and Zafar, 2019, and Kuchler and Zafar, 2019), and have been shown to drive the behavior of house flippers and speculative investors in the United States (Chinco and Mayer, 2016, and Bayer et al., 2020). Even if price growth does not affect beliefs, it may induce higher investment just because individual investors owning a primary residence may use their increased home equity

[4]Hau and Lai (2016) and Lian, Ma, and Wang (2019) document that this bias leads retail investors to shift asset allocations from bonds to stocks when interest rates decline. Korevaar (2021) finds behavior consistent with reaching for yield in the real estate market, using historical evidence from the 18th century.

to fund the purchase of rental properties.[5]

Third, cuts in interest rates coincide with a drop in the cost of debt, and may also coincide with a relaxation of underwriting standards and lending constraints. This in turn would make it easier and less costly for investors to raise debt. In particular, the relaxation of lending standards has been shown to be a driver of investors' contribution to the United States housing boom before the financial crisis (Haughwout et al., 2011).

To disentangle the mechanisms listed above, we use several empirical strategies. First, we relate postcode-level direct participation in the residential housing market to cumulative changes in interest rates around monetary policy announcements, realized over the fiscal year, and control for concurring fluctuations in stock market returns, mortgage spreads, and local house prices. We find that a 1% drop in the rate on 6-month Australian certificates of deposit, induced by surprises around announcements, results in an (absolute) increase in the fraction of individuals earning rental income of 1.8%. Interestingly, rental market participation is also negatively related to recent increases in house prices in the postcode of residence of individual investors, which is at odds with the predictions of the price growth channel mentioned above.

We then turn to exploring cross-sectional differences across postcodes. Since individual investors are likely to purchase rental properties located close to their primary residence (Ahern and Giacoletti, 2022), we use characteristics of the local rental market in which the investors live to identify whether their behavior is driven by a preference for rental income. First, we show that the increase in the fraction of individuals earning rental income, in response to a drop in rates, is larger in areas that have historically offered high rental yields, and thus provide higher income payments. Second, we construct a measure of local rental market competition, based on the presence of high-density residential zoning. The intuition is that the supply of high-density multifamily zoning increases competition in the rental market, lowering rents and yields. Indeed, we show that this measure is inversely correlated with local rental yields, and

[5] Gargano, Giacoletti, and Jarnecic (2022) show that, by relaxing borrowing constraints, local price growth plays an important role in shaping searches of buyers who look for their primary residence.

that the increase in rental market participation by individuals in response to rate drops is stronger in areas where high-density residential zoning is scarcer.

Moreover, the fact that the largest response to falling rates takes place for middle-income individuals of age 60 or older (retirement age) is consistent with the reaching for income channel. If the effects were driven purely by a relaxation of credit constraints, we would have expected the effects to be stronger for low-income and younger individuals, who tend to be more constrained due to lower wealth. Also, if the effects were driven by over-extrapolation of price growth, to match the results in the data, we would need to assume that retirement-age individuals are the most prone to over-extrapolating. This is in contrast with the results in Armona, Fuster, and Zafar (2019), who show that younger individuals extrapolate the most. On the other hand, retirement-age individuals with median income within their age group are the most likely to be looking for stable sources of income to complement their pension and retirement flows. Rental income accounts for roughly 50% of gross income for these individuals, when they are landlords.[6]

Most importantly, when analyzing the composition of gross financial income over time, we find that, as rates drop, retirement age individuals are indeed substituting income from fixed income investments and interest rates with real estate income.

In the last part of the paper, we focus on the effects of the expansion in rental market participation on income risk, and on house prices and rental yields. Investment in rental properties can lead to under-diversification of financial asset portfolios, and of the income flows of individual investors. Indeed, to the extent that landlords don't diversify their real estate portfolio, and own properties in the same metropolitan area or region in which they live, their reliance on rental income is going to make them more exposed to local economic fluctuations.

To assess the impact on income risk in the data, we study the effects of foreign demand-driven fluctuations in iron ore prices on the local economy of Western Australia, which is heavily

[6]Landlords with age above 60 are also the most likely to extract positive income from their properties, with more than 80% of them earning positive net income, even after substracting depreciation expenses.

dependent on exports of the commodity. We show that these fluctuations affect not only labor income in the region, but also landlords' rental income. In this area of Australia, the income of middle age landlords is twice more sensitive to commodity price fluctuations than the one of non-landlords. The income of retirement age landlords is strongly exposed to commodity price shocks, while the income of non-landlords in retirement age has no significant exposure.

We then turn to the effects that investments in rental properties, induced by interest rates cuts, have on house prices and rental yields. We use micro-data on individual house sales and rental listings to measure investment volume by postcode and month, by identifying properties that, after purchase, are re-listed for rent within the year. We then instrument investment volume with shocks to money market rates induced by policy surprises, interacted with indicators for high rental yield areas, and show that a 1% increase in investment in rental properties in a postcode generates 0.4% excess price growth over the following year. This estimate increases to 0.8% in postcodes with low land supply elasticity. The increase in prices over the following year is not matched by a corresponding increase in rents. Thus, higher investment coincides with a drop in rental yields.

The rest of the paper proceeds as follows. Section 2 describes the datasets used in our study and presents summary statistics. Section 3 provides raw evidence on rental income, and on the increase in individuals' participation in the rental market over time. Section 4 ties the increase in participation to the drop in rates and disentangles the economic channels. Section 5 provides further evidence on heterogeneous effects across age groups. The implications for income dynamics and housing markets are presented in Section 6. Finally, Section 7 concludes.

2 Data and Summary Statistics

Our study of rental income and its evolution over time requires detailed income data for a broad cross-section of the population, as well as complementary information on other income sources and on demographic characteristics and locations of residence. Moreover, to analyze the real effects of rental property investors on house prices and rents, we require both listings and transactions in the sale and rental market. In this section, we describe how the data used in this study meet these requirements and present summary statistics.

2.1 Postcode and Individual Tax Records

We first use a postcode-level dataset tracking individuals' taxable income and its components over the fiscal years ending from June 2002 to June 2019 (the Australian fiscal year starts on July 1st and ends on the June 30th). The dataset covers the entire population and, for each income source, contains information on aggregate postcode income and on the number of individuals in the postcode declaring the income source. Net rental income is among the components of income that we can track over the entire sample period. We can then measure the fraction of landlords residing in each postcode, and its evolution over time.

We then also use an anonymized random sample of individual tax returns. The sample is a repeated cross-section for the fiscal years ending from June 2003 to June 2019, and covers 1.5% of Australian taxpayers.[7]. Note that this is indeed information on individual tax payers, since the Australian system does not allow for joint filing. The data are made available by the Australian Tax Office (ATO), and contain the single line items in each tax return, pertaining to both non-investment income (salary and wages, pensions, business income), investment income (interest income, dividend income, Australian real estate rental income, foreign investment income, and other sources), and capital gains. Table 1 displays summary statistics for these individual data. All amounts are expressed in terms of 2019 Australian Dollars.[8]

For what concerns real estate rental income, which is the focus of our study, the individual-level tax returns provide highly detailed information. Only net real estate income is taxed, and negative rental income is considered a loss, and deducted from other income sources for tax purposes. However, landlords have to report the gross rental income collected over the year,

[7] The number of total taxpayers over our sample period ranges between 10 and 14.7 million.

[8] Calculations are based on the Consumer Price Inflation index published by the Royal Bank of Australia, available at https://www.rba.gov.au/inflation/measures-cpi.html

along with all deductible expenses, which are interest expenses, capital investments, and other expenses. Other expenses also include non-cash expenses, such as depreciation, while interest expenses are a good proxy for debt services since many loans issued to real estate investors by Australian banks are interest-only (with adjustable interest rates).[9] Some of these details are also available in the postcode-level data, but only after 2011.

Moreover, the individual-level data include information of important characteristics like age,[10] gender, partner status (married, or in de-facto relationships, which have legal status under Australian law), location of residence,[11] and occupation.[12] Figure A.1 in the Appendix displays the composition of our sample in terms of these characteristics, while Figure A.2 displays the age composition across deciles of taxable income.

2.2 Sales and Listing Data

To measure the impact of rental market investments on the housing market, we use data from Corelogic. The data cover the two largest states, Victoria and New South Wales (located on the East Coast), and the largest state on the West Coast, Western Australia. Jointly, these markets account for the majority of the total number of sales and rental listings in Australia. The data spans the period from January 2005 to December 2019, and includes unique property identifiers, and information on the postcode where the property is located, as well as property size and number of bedrooms, bathrooms, and car spaces. For both sale and rental listings,

[9] In the case of co-ownership, gross rents and expenses are split across co-owners, and each co-owner reports on her return only the fraction of income and expenses that are of her competence.

[10] Individuals are grouped into 11 age categories: 70 and over, from 65 to 69, from 60 to 64, from 55 to 59, from 50 to 54, from 45 to 49, from 40 to 44, from 35 to 39, from 30 to 34, from 25 to 29 and from 20 to 24. We drop from the sample individuals under 20 years of age.

[11] The location of residence is assigned based on 33 areas. For the most populated states (New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania) we know whether the individual lives in the capital city, in a high urbanization area, in a low urbanization area, in other urban areas or in a rural area. For the Northern Territory we observe whether the individual lives in the capital city, in a high urbanization area, or in a low urbanization area. The mapping between postcodes and these areas is available upon request.

[12] Individuals are divided into 9 groups, based on the first digit of the Australian and New Zealand Standard Classification of Occupations (ANZSCO). More specifically, managers, professionals, technicians and trades workers, community and personal service workers, clerical and administrative workers, sales workers, machinery operators and drivers, laborers, and consultants and apprentices.

we observe the initial listing date, the original listing price, and each successive modification of the listing price (along with the date on which each modification took place). For sales we observe the sale date and price. Table A.1 displays summary statistics.

3 Housing Income and Rental Market Participation

In this section, we present raw evidence on the magnitude and time-patterns of direct investments in rental properties, across groups of individuals based on age and total income.

3.1 Who Invests in the Rental Market?

We begin our analysis by exploring differences in rental market participation across groups of households based on age and total income. We choose these characteristics since they have high power in explaining both income and asset composition (Fagereng et al., 2021, Gomes, Haliassos, and Ramadorai, 2021).

In Figure 1, we use data on individual tax filings in 2017-2019 to split individuals into three age groups (25 to 39, young, 40 to 59, middle age, and 60 and older, retirement age), and income quintiles within age groups. Panel (a) shows the fraction of landlords in each subgroup. We identify landlords as individuals earning any gross income, or facing any expenses, on a rental property over the year. As we may expect, direct participation in the rental market is increasing in income and age. Participation is in general lowest (below 5%) for young individuals with income below the median, and highest (above 35%) for middle and retirement age individuals with income in the top quintile of their age group. Most interesting is the fact that participation in the rental market is relatively common even for individuals belonging to intermediate income deciles. When considering middle age and retirement age individuals in the 50th and 60th income percentile of their age group, we find participation rates of roughly 17.5% and 20%.

Rental income is a relevant component of income at an aggregate level. Panel (b) shows that when averaging across all individuals, including non-landlords, the average gross annual rental income is $3,000-$4,000 for middle age and retirement age individuals in the middle of the income distribution, and $11,000-$12,000 for those in the top quintile of the income distribution. When the sample is restricted only to landlords (panel c), middle and retirement age individuals in the middle of the income distribution earn annual gross income of $15,000 and $18,000 from rental properties, while individuals in the same age groups, but in the top quintile of income, earn $27,000 and $31,000.

In Figure 2 we further study income composition for landlords in years 2017 to 2019, and we find additional evidence of the importance of rental income, especially for landlords in the older segments of the population. For landlords of age 60 and older (retirement age), and with median income, rental income is more than 50% of total gross income. This fraction is higher for landlords in the bottom quintile of total income, while higher income landlords appear to have a higher fraction of income from salaries and pensions, and a large fraction of income produced by investment trusts.[13]

3.2 Time-Series Patterns

Given the high level of participation in the rental market over the last few years, it is natural to ask how this behavior has evolved over time. While participation was already significant two decades ago (in the years from 2002 to 2004, approximately 13% of Australian individuals reported income or expenses related to an investment in real estate) it has substantially increased since then, reaching 17% in the years 2017 to 2019. In relative terms, this represents approximately a 30% increase.

[13]Figure A.3 provides some further insights into the interpretation of this evidence. It shows two separate measures of net earnings for individual landlords across age and income groups. The left panel shows the fraction of landlords, by age group and income quintile, who earned positive income, measured as the difference between gross rent and interest expenses (interest expenses are a good proxy for mortgage services in Australia, since most real estate investment loans are interest only). Almost all landlords of age 60 and older extract positive cash flows after interest expenses. In the right panel, we account for all expenses, which include non-cash items such as depreciation. Still, 80% of retirement age landlords declare positive taxable income on their rental properties.

To better understand when this large increase took place, and its dynamics over time, we estimate the following regression equation:

$$FracLL_{i,t} = \sum_{t=2003}^{2019} \delta_t + \mathcal{B}X_{i,t} + \alpha_i + e_{i,t} \tag{1}$$

where $FracLL_{i,t}$ is the fraction of landlords in postcode i and time t. α_i is a postcode fixed effect, and $X_{i,t}$ is a vector of postcode controls, which in this specification contains only postcode population growth. δ_t captures the average change in the fraction of landlords across postcode, with respect to the one in year 2002.

Estimates of the coefficients δ_t are reported in Panel (a) of Figure 3.[14] While there was a small increase already in the early 2000s, large part of the increase in rental market participation takes place immediately following years 2008 and 2009, and then in the years from 2010 to 2014, when the fraction of landlords is 3.5% larger than in 2002. Moreover, the increase in the fraction of landlords appears to have taken place uniformly across the country. Panel (b) of Figure 3 shows the distribution of the fraction of landlords by postcode of residence, both in the years from 2002 to 2004 and from 2017 to 2019. We can see that the entire distribution shifts to the right: the 25th percentile moves from 10% to 13.5%, the median moved from 13% to 16%, and the 75th percentile moved from 16% to 19%; 90% of postcodes experience an increase in the fraction of landlords.

Figure 4 explores heterogeneity across households. In particular, it shows changes in participation rates and in average rental income (across all individuals, including non-landlords), between the years from 2017 to 2019 and the years from 2003 to 2005, and for different income quintiles within different age groups. Differences across groups are remarkable. In relative terms, the largest increases occur for senior individuals with income between the 20th and the 60th percentile of their group, whose participation increases by 80% (roughly 9-10% in absolute

[14] Confidence intervals are based on standard errors double-clustered by year and state. Australia is officially divided into six states (Queensland, New South Wales, South Australia, Tasmania, Victoria, and Western Australia), the Northern Territory, and the capital city of Canberra. In our estimates, we treat all these territories as states, and thus divide Australia into eight states.

terms). Average rental income for the same group (across both landlords and non-landlords) increases by 120%. Substantial increases are also present for middle age and middle-income individuals, who increase participation by 15% (2% in absolute terms), and increase rental income by 60%. The fraction of young landlords instead decreases. The largest drop is for the lowest income group, and is equal to 40%.

It is interesting to note that retirement age individuals increase participation the most. Landlords belonging to this group almost always extract positive net income from their properties (see Figure A.3 in the Appendix). These same landlords also are very reliant on rental income, which is a key component of their total gross income, as mentioned above (Figure 2).

4 Interest Rates and Housing Income

In this section, we use postcode-level tax data and panel regressions to establish the relationship between interest rate changes and investors' participation in the rental market, and to test alternative explanations for this empirical fact.

4.1 The Economic Environment

In the United States, the great recession and the following years coincided both with a sharp drop in interest rates and large fluctuations in the real estate market, which experienced a large boom-bust cycle. Previous work has shown how this large cycle was induced by, and has subsequently generated, multiple unique effects, such as large fluctuations in lending standards (see Mian and Sufi, 2011, Keys, Seru, and Vig, 2012, and Keys et al., 2013), government interventions (Agarwal et al., 2017 and Gabriel, Iacoviello, and Lutz, 2020), and highly procyclical beliefs on the future evolution of house prices (see Case, Shiller, and Thomson, 2015 and Kaplan, Mitman, and Voilante, 2020). Given this wide variety of effects at play in the data, it is challenging to tie the behavior of real estate investors, both institutions and individuals, and fluctuations in interest rates and monetary policy.

However, in other countries, such as Australia, the situation of real estate markets has been substantially quieter during, preceding, and following the years of the Great Recession. Nonetheless, largely in response to the situation in international markets, and likely due to other long-term trends common to all developed economies, the last decade has been characterized in Australia by dovish monetary policy, and declining interest rates, along the same lines as in the United States. Panel (a) of Figure 5 shows the evolution of the rate on 6-month certificates of deposit (CDs) issued by Australian banks, and 10-year bond yields for Australian government bonds, over the years from 2002 to 2019, along with the average residential rental yield across Australian postcodes.[15] The drop in government bond yields over the sample of our study is particularly striking. For instance, the 6-month CDs rate was above 7% in 2008, and has dropped all the way to 1% in 2019. On the other hand, rental yields are remarkably stable, and don't show the massive fluctuations that are instead present in the data for the United States (Piazzesi and Schneider, 2016).

Panel (b) shows the evolution of house prices, using a country-level index, and indices for the two most populous states (New South Wales and Victoria). All indices are normalized to be equal to 100 in 2002. We can see that the great recession did not coincide with a drop in house prices. Rather, across Australia, house prices were 15% up in 2009 compared to 2006 (35% up in Victoria). They were more than 25% up in 2012 (58% up in Victoria). Thus, the drop in interest rates did not coincide with a housing crisis. In this sense, the Australian experience is similar to other major economies such as Canada in North America, Germany in Europe, and Chile in South America. On the other hand, the sustained increase in house prices may *per se* have induced an increase in participation in the rental market, either through a beliefs or a home-equity accumulation channel. In the next section, we discuss in detail competing mechanisms through which the economic environment of the last 20 years may have triggered higher investment in rental properties.

[15] The rental yield is constructed as the ratio of the median (annualized) rent and the median price in the postcode, based on Corelogic postcode-level indexes.

4.2 Competing Mechanisms

First, lower money market rates and bond yields may directly affect investment in real estate properties, by making rental income more attractive. A key channel through which this may take place is investors' "reaching for income" behavior. Some investors may have a preference for high-income paying (high-yield) assets. When rates are high, investors are able to earn substantial income from money market accounts and bonds. However, cuts in interest rates may push investors to look for other assets paying a substantial part of their return in cashflows. In financial markets, Jiang and Sun (2019) and Daniel, Garlappi, and Xiao (2021) show that this channel results in higher demand for high-dividend stocks, especially by older investors and retirees. Investors use these high-dividend stocks to generate stable income flows for their consumption needs. Financing consumption with dividends rather than capital gains avoids the monetary and attention costs of regularly selling stock holdings, and may act as a self-control device because it does not require trading to liquidate assets.[16] In this respect, rental real estate appears to be an attractive asset for reaching for income, due to the monthly frequency of periodic payments, and the large contribution of the yield component to the total returns of the asset.[17] Investors' behavior may also be driven by "reaching for yield", which instead entails shifting allocations towards higher risk, higher return assets when risk free rates drop.[18] Korevaar (2021) documents evidence consistent with reaching for yield using historical data from the 18th century, even though evidence for reaching for income, or reaching for yield in modern real estate markets is still limited. A crucial aspect that can be exploited to disentangle reaching for income from reaching for yield is that investors reaching for income specifically

[16] Indeed, Baker, Nagel, and Wurgler (2007) and Di Maggio, Kermani, and Majlesi (2020) show that household consumption is significantly more responsive to dividend payouts than unrealized capital gains.

[17] See evidence from Demers and Eisfeldt (2021) for US single family residences. Figure 5 also shows that the average rental yield across postcodes in Australia is rather high, approximately equal to 5%. Average annual price growth over the same period was approximately 7%, which means that rental yields constitute more than 40% of gross real estate returns.

[18] In financial markets, Hau and Lai (2016) and Lian, Ma, and Wang (2019) document that households shift from bonds to stocks when interest rates decline. Becker and Ivashina (2015) and Di Maggio and Kacperczyk (2017) provide evidence of reaching for yield for institutional investors. Rather than from behavioral biases, it stems from performance-related incentives.

focus on the rental payment component of returns, while investors reaching for yield care about total returns, not necessarily just income payments.

Second, higher investment in rental properties may coincide with a drop in interest rates, just because house prices are growing at the same time. In other words, investors' decision to purchase rental properties might have been driven by the sustained price growth over the years from 2002 to 2018. This might be because of expectations of future price growth, as has been documented for home buyers and housing investors in the United States (Agarwal, Hu, and Huang, 2016, Chinco and Mayer, 2016, Armona, Fuster, and Zafar, 2019, and Bayer et al., 2020). Alternatively, individual investors who were homeowners may have used their increasing home equity to fund the purchase of rental properties.

Third, due to the lumpy nature of the asset, real estate transactions frequently involve the use of leverage. Changes in the level of interest rates determine changes in households' cost of debt, and may also coincide with changes in underwriting standards or lending constraints. To the extent that these effects ease borrowing for real estate investors, they may induce higher investment in rental properties.

4.3 Empirical Evidence

To investigate the relationship between interest rate changes and individual investors' participation in the rental market, we estimate the following regression equation:

$$FracLL_{i,t} = \gamma \Delta y_t + \mathcal{B} X_{i,t} + \alpha_i + e_{i,t}, \tag{2}$$

where Δy_t is the change in yield y between fiscal years $t-1$ and t, α_i is a postcode fixed effect, and $X_{i,t}$ is a vector of controls that are meant to capture general market trends, and competing mechanisms. More specifically, to control for general financial markets and economic conditions, we include the average daily stock market return in year t, the change in dividend yield, and the Business Conditions Index published by the Australian Bureau of Statistics. To control for the effects of local price growth on investors' behavior, we include postcode-level house price growth over the year (matched with the postcode of residence of the individuals). To further control for how "hot" the local market conditions are, we also include postcode-level population growth. Finally, to capture the real estate lending conditions channel, we include as a control changes in the mortgage rate spread over the 10-year yield between $t-1$ and t. Fluctuations in lending standards and in the pricing of mortgage default risk should be reflected in credit spread changes. However, it might still be the case that investors are responding to changes in rates because they affect their cost of debt, especially when we consider long term treasury yields.

Our estimates are reported in Table 2. Quite interestingly, with double-clustered standard errors by year and postcode, the control variables, with the exception of postcode-level house price growth, have insignificant coefficients. Price growth has a significant effect, but its sign is negative, which implies that individual participation in the rental market is negatively correlated with local postcode growth. This relationship goes in the opposite direction of what predicted by the local price growth extrapolation channel and the home equity channel described in the previous section.

For what concerns the effect of rates, Δy_t in columns 1, 2, and 3 is the change, respectively, in the rate on CDs issued by Australian banks, with maturity of 6 months, or in the yield of Australian 2-year and 10-year government bonds. The point estimate of the coefficient γ from equation 2 are negative across the board, consistent with the predictions of the reaching for income and reaching for yield channels. While the effects of short term rates are not significant, the effect of the 10-year bond yield is.[19] A 1% drop in the 10-year bond yield is associated with a 1.1% increase in the fraction of landlords across postcodes. An issue when interpreting estimates of the coefficient γ is that changes in yields taking place over the fiscal year, even after controlling for other financial time series, and for postcode-specific factors, might still be

[19] In this context double-clustering produces large standard errors, and is thus conservative approach. Other clustering choices produce significant results also for the short-term yields.

driven by responses to changes in the housing market, or by other factors, not included in our regressions, driving at the same time yields and the fraction of landlords. These confounding factors may amplify, or attenuate, our estimates.

To make progress on measuring the effect of yield changes on the fraction of landlords, we use an approach similar to Amberg et al. (2022), and replace Δy_t measured over the full fiscal year with a measure based on CDs rates and yields changes taking place around policy announcements (between the two weeks before and the two weeks after rate announcements). The intuition is that, if there are factors inducing rate changes that make policy decisions predictable ahead of time, rates and yields should also have already adjusted. Changes in rates and yields that instead take place around policy announcements are likely to be determined by the response of fixed income markets to surprise changes in policy rates. To construct a measure at the fiscal-year level, we compute the cumulative "shocks" of rates over the year.

Our results are reported in columns 4, 5 and 6 of Table 2. We obtain point estimates of the coefficient γ which are large, negative, and significant across all yields. A 1% surprise drop in the 6 months CDs rate translates into a 1.8% increase in participation in the rental market. For the 2-year bond, the same shock translates into a 2.1% increase, and for the 10-year bond, it translates into a 0.95% increase.

4.4 Cross-Sectional Differences and Reaching for Income

Our findings are broadly consistent with investors increasing participation directly in response to falling rates. However, it is still unclear whether investors were reaching for higher income or yields, or responding to lower cost of debt. Moreover, there may still be some concern that house price fluctuations might be influencing our findings, even though we control in our regressions for local price growth.

To dig deeper into the mechanism, we exploit cross-sectional differences across local housing markets within Australia. If reaching for income is the mechanism at play in the data, the responses of investors to drops in rates should be stronger in areas that offer higher yields. Indeed, these are the areas were rental housing constitutes a more attractive source of investment income. On the other hand, effects driven by changes in the cost of debt *per se* have no clear reason to be associated with higher local yields. Thus, we estimate the following regression equation:

$$FracLL_{i,t} = \gamma_{y,High} \left(\Delta y_t \times I_{High,i}\right) + \mathcal{B}_X X_{i,t} + \alpha_t + \alpha_i + u_{i,t}, \tag{3}$$

where Δy_t is either the change in rates, or the cumulative "shock" around monetary policy announcements over fiscal year t, and $I_{High,i}$ is a dummy equal to one for postcodes that are in the top 20% of rental yields (roughly 6% and above), based on the average yield over our entire sample. While, in the fiscal data, we cannot observe the location of the acquired properties, and the related prices and rental yields, it is reasonable to assume that most landlords will purchase properties in their local market, and since both yields and prices are correlated within metropolitan areas, investors residing in high-yield (high-prices) areas will also be investing in high-yield (high-prices) properties. Note that equation 3 also includes postcode fixed effects (α_i), and fiscal year fixed effects (α_t), which absorb any time-varying effects which are common across Australia. $X_{i,t}$ contains time-varying postcode-level controls, which consist of postcode house price and population growth.

Estimates are reported in Table 3. The coefficient $\gamma_{y,High}$ is negative for all yields and shocks, and statistically significant for the 10-year yield, and for all policy shocks. This implies that, when there is a drop in rates, the increase in rental market participation is larger in the high rental yield postcodes. The magnitude of this incremental effect is large. For the cumulative rates shocks, a 1% drop in yields leads to an additional 0.2-0.3% increase in participation in high-yield postcodes. Since the baseline effect from Table 2 is roughly 1%, high-yield postcodes have a 20-30% larger response in relative terms. Moreover, it is interesting to note that postcode-level house price growth again has a negative and significant coefficient, in line with what found in Table 2, and not consistent with the price growth mechanisms described earlier.

A concern when interpreting our results is that high rental yields might be correlated with other local characteristics, which may spuriously induce more rental investment in response to lower rates. Thus, we take a further step, and try to directly measure local rental market competition. Our conjecture is that markets with stronger supply of rental space, and especially with the presence of buildings specifically designed for rental (large multifamily), will have (all things equal) lower rents, and lower yields, and thus will be less attractive for individual investors interested in the income component of housing returns.

To measure rental market competition, we use information on local zoning. For each local government area[20] (LGA) in the country, we obtain micro information on zoning maps from Geoscape Australia. We then measure the fraction of the LGA that is covered by high-density residential zones, in which the development of high-density rental buildings is allowed (details of our approach are discussed in Appendix A). Individuals living in these areas face a more competitive rental market. Moreover, they likely face the competition of large multifamily housing investors, driving down rents and yields. A weakness of our approach is that we rely on current zoning maps (from 2021); unfortunately, historical information on zoning has been overwritten and our data provider is not currently able to recover it.

The fraction of land allocated to high-density zoning is highly skewed, the average fraction is 2.6% across LGAs, with a standard deviation of 7.6%. The top 10% of LGAs based on high-density residential zoning have fractions above 6%. In Table 4, we explore the relationship between our measure of rental market competition and rental yields, at the LGA level. First, we regress average LGA rental yields from our sample period on the fraction of high-density residential zoning in the LGA. We find, as conjectured, a negative and statistically significant relationship (column 1). This result is robust to controlling for LGA average annual price

[20] Local government areas are a type of Census areas defined by the Australian Bureau of Statistics. There are a total of 566 local government areas in Australia, and they represent areas with local government bodies. Outside of large metropolitan areas, local government areas coincide with the territory of smaller cities or towns. Large metropolitan areas are split into multiple local government areas. For more information see: https://www.abs.gov.au/statistics/standards/australian-statistical-geography-standard-asgs-edition-3/jul2021-jun2026/non-abs-structures/local-government-areas

growth, and to including state fixed effects (columns 2, 5, and 6). Based on the coefficients, a one standard deviation higher fraction of high-density residential zoning translates into roughly a 0.40% lower yield. Then, we use as independent variable a dummy equal to one for LGAs that have a fraction of high-density zoning greater than 0. We find that in these LGAs, yields are lower on average by approximately 1%, and the results are robust to controlling for price growth and state fixed effects (columns 3, 4, 7, and 8). Since the average rental yield in the country is around 5%, these differences are economically significant.

We also explore the relationship between the high-density residential zoning measure and traditional measures of housing supply elasticity based on natural constraints and bodies of water (similar to the one developed by Saiz, 2010). We find the correlation to be weak and negative. A 1% increase in the fraction of naturally constrained land within the LGA translates into roughly a 0.05% lower fraction of high-density residential zoning. Most interestingly, Table A.2 in the Appendix shows that the measure of supply (in)elasticity based on natural constraints is not correlated with rental yields across LGAs.[21]

Then, we turn to the relationship between changes in rental market participation, interest rates, and local rental market competition. To this end, we estimate a specification analogous to the one in equation 3, including both postcode and fiscal year fixed effect, as well as postcode-level time varying controls. However, here we focus on the interaction between rate changes, or rate shocks, and the fraction of high-density residential zoning within the LGA in which a postcode is located. We have less power in this test, due to the fact that the independent variable only varies in the cross-section at the LGA level. Thus, we cluster our standard errors by fiscal year $\times$ LGA. Estimates are reported in Table 5, and show that the interaction term is positive, and statistically significant for all yields and shocks. This is consistent with our conjecture, that higher rental market competition, by lowering yields, makes reaching for income behavior by local individual investors less likely. A one standard deviation higher fraction of

[21]The natural constraints measure is constructed using 0.5 squared Km land features from files made available by the Australian Department of Agriculture, see Appendix A.

high-density zoning (0.075) can lead up to a 0.1% weaker increase in participation when rates drop.

5 Heterogeneity and Individual Characteristics

In this section, we focus on heterogeneity across age groups, gaining some further insights into the mechanism. Section 5.1 focuses on participation in the rental market, while Section 5.2 focuses on the overall composition of financial income.

5.1 Participation

The evidence in Figure 4 already highlights that retirement age individuals, with median income in their age group, are the ones who experience the largest increases in rental market participation. Increases in participation are also large for middle age individuals across the entire income spectrum. On the other hand, individuals younger than 40 experience a drop in participation.

To dig deeper into these patterns, we use information on individual tax filings, and estimate the following regression equation:

$$\begin{aligned} y_j = & \sum_{\tau=2005}^{2019} \delta_{\tau \times Young} \Big(I_\tau \times I_{20\ to\ 39} \Big) + \sum_{\tau=2005}^{2019} \delta_{\tau \times Mid} \Big(I_\tau \times I_{40\ to\ 59} \Big) \\ & + \sum_{\tau=2005}^{2019} \delta_{\tau \times Old} \Big(I_\tau \times I_{60+} \Big) + \alpha I_{20\ to\ 39} + \beta I_{40\ to\ 59} + \mathcal{B} X_i + \eta_l + e_j \end{aligned} \quad (4)$$

where y_i is a characteristic of individual i's income (for example, a dummy equal to one for landlords, or the log of individual rental income), I_τ is a fiscal year dummy, $I_{20\ to\ 39}$, $I_{40\ to\ 59}$, I_{60+} are age-group dummies and X_i is a vector of controls, including gender, partner status (married or single), and occupation category; η_l is a location fixed effect, based on the area of residence of individual j (for individual tax filings, we only observe location information at the level of large areas within state; see Section 2 for more details).

Figure 6 reports estimates of the parameters δ from equation 4. In the left panel, the dependent variable is a dummy equal to one if the individual is a landlord. The fraction of retirement age landlords (age of 60 or above) – denoted by green squares – increases during the fiscal year ending in June 2009, and then further grows in the following years, reaching a maximum of 8% over the 2003 level in the last years of the sample. This is roughly a 60% relative increase, consistent with what shown in Figure 4. Changes are less stark for the middle-aged group (red squares). However, we can still detect a clear increase in 2009, followed by a persistently higher participation level in the following years. The patterns for middle age and retirement age individuals mimic the time series evolution observed in the postcode-level data in Figure 3. The younger group (blue squares) sees a drop in participation, first visible in 2009-2010, and then even larger in the last years of the sample.

The patterns are mirrored by the evolution over time of rental income across all individuals in each age group (including non-landlords), depicted in the right panel. In the last few years of the sample, rental income is almost 80% above its 2004 level for the retirement age group, 30% above for the middle age group, and 15% below for the young group.

5.2 Composition of Investment Income

In Figure 7, we show how the composition of gross financial income, defined as the sum of gross income from all interest-paying securities, dividends, and rents, has changed over the period of our study. More specifically, we re-estimate Equation 4 using the fraction of income from interest-paying securities (top-left plot), dividend (top-right) and rent (bottom-left) as the dependent variable. Mechanically, in each year the estimates reported for each group need to add up to zero across the three panels. We construct our estimates using all individuals, including non-landlords.

For the retirement age group (blue squares), the relative contribution of rental income increased by close to 10%. This coincided with a 10% drop in the contribution of interest-paying securities, while the contribution of dividends is roughly unchanged. This pattern is strikingly consistent with the reaching for income mechanism, since it appears that retirement-age individuals have been shifting the composition of their financial income, away from interest flows and into rental payments.

The picture is more complex for middle age individuals (red squares), who see an increase of roughly 2.5% in the contribution of rental income, a drop in dividend income of roughly 12%, and an increase in the contribution of interest income of 10%. For the youngest group (blue squares), we find a 10% and 20% drop, respectively for rental and dividend income and a 30% increase in interest income. While the effects on the contribution of rents to total financial income for both young and middle age individuals line up with our previous results, the effects for dividend income and interest income are less obvious to interpret. A possibility is that both young and middle age individuals have been shifting their financial portfolios towards high-growth stocks and other financial investments that pay low yields, thus increasing the relative contribution of interest income to total financial income.

In Figure A.4 in the Appendix, we repeat the analysis in Figure 7, but restrict the sample to landlords only. Due to the strong performance of the Australian housing market, the contribution of rents has increased for all groups. However, the largest increase is for retirement-age landlords (10%) and the smallest is for the youngest landlords (3%). Retirement-age landlords also see the largest drop in the contribution of income from interest-paying securities (-8%), while the youngest landlords see the smallest drop (-1%). Interestingly, the contribution of dividend income drops by approximately 2% over the period of our study for all landlords.

The evidence on retirement age individuals tilting the composition of their financial income away from interest-paying securities, and into rentals, provides further support for reaching for income as the mechanism driving the increase in rental market participation. Individuals 60 and above, especially within the middle-income range, are among the most reliant on investment income, and, in particular, rental income, when they are landlords (see Figure 2). In fact, they appear to almost always extract positive income from their properties, even after accounting for non-cash expenses, such as depreciation (see Figure A.3 in the Appendix).

6 Effects on Income Dynamics, House Prices and Rents

We now turn to the implications of the higher direct participation of individual investors in the rental market. We first explore the effects on the riskiness of investment income, and then turn to the impact on house prices and rents.

6.1 Exposure of Investment Income to Local Economic Shocks

As shown in Figure 2, rental income accounts for a large fraction of income for both middle age and retirement age landlords. Moreover, as shown in Figure 7, over time retirement age landlords have reduced their reliance on interest income. Then, what are the implications of the increase in rental market participation for the volatility of income and its exposure to economic shocks?

In general, investment income from a diversified portfolio of financial asset will have low exposure to economic shocks idiosyncratic to the region in which an individual lives. This is desirable, since local economic shocks may already affect labor income, and thus a local downturn will be a period in which marginal utility from consumption for local households is high.

However, rental income will instead be highly correlated with local economic shocks. Most landlords in our data are likely holding a small portfolio of properties (only one or two dwellings), which might be located within the same region or metropolitan area in which the landlords live. Indeed, Tables 3 and 5 have shown that investment behavior is sensitive to local rental market conditions. The increased participation in rental markets between 2004 and 2019 might then have resulted in higher exposure of the income of middle age and retirement age individuals to local shocks, and thus to an increase in the riskiness of financial income.

To explore this effect, we turn again to the data on individual tax filings and focus in particular on Perth, the capital city of Western Australia. A large part of the economy of this state is directly or indirectly tied to mining, with iron ore being one of the main exports of the region. Thus, local economic activity is strongly influenced by the price of iron ore, which in turn is determined by international demand, in particular from steel mills located in China.[22] In general, fluctuations in iron ore prices are poorly correlated with fluctuations in stock prices and other macroeconomic factors. Figure 8 reports year-over-year price changes in iron ore spot prices in the main Chinese import hub (the port of Tianjin), over the period from 2003 to 2019. Price growth is large and steady in the first part of the sample, even through the Great Recession. However, it then drops and becomes negative over the period of the following recovery, from 2012 to 2016.

Then, in Table 6 we explore how fluctuations in iron ore prices affect individual income in Western Australia, and how these effects differ when comparing individuals who are, and are not, landlords. We focus on middle age and retirement age individuals, and report separate estimates for these two groups, respectively in panel A and panel B of Table 6. We estimate the following regression equation:

$$y_{i,t} = b \log(P_{IronOre,t-1}) + \alpha_t + e_i, \tag{5}$$

where $y_{i,t}$ is the log of total income, or one of the components of income, for individual i in fiscal year t, $log(P_{IronOre,t-1})$ is the log of the average iron ore price over a 12 months period, lagged by one year, and α_t is a fiscal year fixed effect.

In column 1 of both panels in Table 6, we set the dependent variable in equation 5 equal to the log gross rental income earned by the individual over the year. As conjectured, we find a strong and positive relationship, for both middle age and retirement age individuals. Point estimates are similar across the two groups, and suggest that a 10% change in iron ore prices

[22] See for example the evidence and discussion in Kalouptsidi (2014).

coincides with a 2.5% change in individual rental income. There is no relationship between fluctuations in iron ore prices and dividend (column 2), or interest (column 3), income.

The sensitivity of income from salary and pensions (column 4) to iron ore price, is different for middle age and retirement-age individuals. There is a positive relationship for the former group, but no effect for the latter. This seems sensible, since retirement age individuals receive pensions that are likely independent of current local economic conditions. On the other hand, middle age individuals are part of the local workforce, and see their labor income, on average, reduced in a downturn induced by lower iron ore prices. A 10% change in iron ore prices results in a change of the salary income earned by middle age individuals of 0.65%.

Finally, in column 5, we set the dependent variable equal to the log of the individual's total income, and expand the specification in equation 5 to also include an interaction term between the log price of iron ore and a dummy equal to one if the individual is a landlord. The interaction captures the incremental effect on total income for landlords, with respect to non-landlords. The term has a large and positive coefficient for both middle age and retirement age individuals.

For middle age individuals, the baseline effect for non-landlords is that a 10% change in iron ore prices changes the total income earned by 0.65%, consistent with our previous estimates. However, for landlords, total income decreases by an additional 0.63%. Thus, the sensitivity to iron ore prices for middle age individuals who are landlords is twice as large as for non-landlords in the same age group. For retirement-age individuals, the baseline effect of fluctuations in iron ore prices on total income is not significant, again consistent with the previous results. However, for landlords, there is a positive and significant sensitivity. For retirement-age landlords, a 10% change in iron ore prices leads to a 1.1% change in total income.

The incremental effects for both middle age, and, in particular, retirement age landlords are large and highlight how rental real estate investments increase income sensitivity to local economic shocks. By investing in local real estate, these individuals are giving up the diversification benefits of financial investments, and increasing the riskiness of their income streams.

6.2 House Prices and Rental Yields

We now turn to the effects on prices and rents of the increase in individual investors' participation in the rental market. Our results here expand the existing evidence on the impact of investors (Chinco and Mayer, 2016, Bayer et al., 2020, and Garriga, Gete, and Tsouderou, 2021), by studying the effects of individual investors in rental properties. The role of investors in housing markets and the implications for affordability have been at the heart of policy debates in the United States, Australia, and many other countries.

Moreover, we contribute to the literature on reaching for income, by exploring the real effects of this behavior in the housing market. Previous work has shown that reaching for income can impact prices and yields of high-income paying assets (Daniel, Garlappi, and Xiao, 2021, Jiang and Sun, 2019, Hartzmark and Solomon, 2019). Real estate is an asset class in which these effects can be large, due to the illiquid and segmented nature of the market, and can be measured convincingly, since we directly observe investment in individual rental properties, and spillovers on the surrounding houses.

To identify purchases of rental properties carried out by individual and small investors, we rely on listing data for single properties (single family residence, townhouses or condos/apartments) in the sales and rental market. Individual investors are the most likely to purchase individual properties listed by real estate agents, and then re-list them as individual rentals. Thus, we identify a property as *bought-to-let* if the property is listed for rent within 9 months from the last purchase (similar to the horizon used for house flips by Bayer et al., 2020). We then calculate median sales prices by postcode and month, as well as the volume of properties bought-to-let in each postcode and month. Finally, we estimate the following regression equation:

$$\log(y_{p,t+h}) - \log(y_{p,t}) = \beta \log(Inv)_{p,t} + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \tag{6}$$

where $y_{p,t}$ is either the median sale price or the rental yield (ratio of median rent over median price) in postcode p at time t, Inv is the number of properties *bought-to-let*, C is a vector of controls, including total sales volume in postcode p and month t, and price growth over the 12 months ending with month t.[23] Finally, α_p and τ_t are postcode and time fixed-effects. We set the horizon h equal to 12 months, and double cluster standard errors by year-month and postcode.

The specification in equation 6 is potentially plagued by several problems. First, the decision to invest in rental properties might be spuriously driven by other factors, which also jointly influence future postcode price growth. Second, future expected growth might *per se* induce higher investment in *bought-to-let* properties. To address these issues, and to directly link the impact of changes in interest rates and reaching for income to investment decisions, we estimate the two-stage-least-squares (2SLS) below:

$$\log(Inv)_{p,t} = \phi\,(s_t \times I_{HighRY,p}) + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \tag{7}$$

$$\log(y_{p,t+h}) - \log(y_{p,t}) = \psi \log(\widehat{Inv}_{p,t}) + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \tag{8}$$

where $\log(\widehat{Inv}_{p,t})$ is the fitted log number of properties *bought-to-let* from equation 7, and $s_t \times I_{HighRY,p}$ is, as in equation 3, the interaction between the cumulative shock to rates around monetary policy announcements in the year preceding month t (specifically, the shock to the 6 months CD), times a dummy equal to 1 in postcodes with average rental yield in the highest 20% across Australia.

In other words, in equations 7 and 8, we instrument the volume of properties purchased to be put on the rental market, using the interaction between rate shocks around monetary policy announcements, and a dummy equal to one for postcodes with high rental yields. These are the locations more likely to attract investment from landlords reaching for income, as discussed in the previous sections. This approach better identifies the real effects of landlords investments on prices and rental yields, and also pins down the real effects that are induced by the reaching

[23] Since we include lagged price growth among the controls, our specification is a dynamic panel regression. As such, it might be affected by bias in coefficient estimates (see Nickell, 1981). However, due to the large size of the dataset (with a time dimension of roughly 170 months, and a cross-sectional size of approximately 1,000 postcodes), the effects of the bias are likely to be small.

for income channel.

Estimates of the coefficients in equations 6, 7, and 8 are reported in Table 7. Columns 1, 2 and 3 show results based on specifications not including the vector of controls C, while columns 4, 5, and 6 include controls for lagged price growth and total transaction volume. Columns 1 and 4 report estimates for the specification in equation 6, while the other columns are devoted to the 2SLS approach. In particular, columns 2 and 5 report the first stage regression, equation 7, while columns 3 and 6 report the instrumental variable regression, equation 8. In panel A of the table, the dependent variable is the log postcode-level price change over the following 12 months. In panel B, it is the log rental yield change.

In the OLS regressions, we find a positive and statistically significant effect on prices, and a negative and significant effect on yields, even though these effects are economically small. Once we instrument investment with rate changes and the high-yield postcode dummy, we obtain substantially larger magnitudes, which is consistent with attenuation bias in OLS. A 1% increase in investment in rental properties would result in a 0.4% increase in prices, and a 0.8% (relative) decrease in rental yields. Thus, reaching for income behavior increases local house prices, and lowers yields. The effects on prices are even stronger in areas of the country in which the supply of housing is highly inelastic. In Table A.3, we restrict the sample to postcodes in which the fraction of land constrained by water bodies or other natural barriers is in the top 25% across the country.[24] We find that price sensitivities to investment are roughly twice as large as in the full sample. On the other hand, the effects on rental yields are roughly in line with the full sample estimates.

7 Conclusions

We study the evolution of direct rental market participation by individual investors over the last two decades, how it has been influenced by fluctuations in interest rates, and the real effects

[24]See Appendix A for details on how the fraction of local constrained land is measured.

on income risk and the housing market.

Using fiscal data from Australia, we document that up to 20% of middle age and retirement age individuals with median income are landlords, and show that this fraction has substantially increased over the last 20 years. We link this pattern to surprise drops in interest rates, and to the preference of older individuals for assets paying high recurring yields.

Consistent with the effect being driven by changes in rates and demand for high yields, rather than local house price growth, we show that the increase in participation in the rental market is stronger in areas where rental properties offer higher yields, and is weaker in areas where the presence of high-density zoning and tighter competition from large landlords lowers rental yields. We also show that the increase in participation in the rental market is highly heterogeneous across age-groups. The largest increase is for retirement age individuals, with age of 60 years old or above, and with middle income within their age group. Large increases are also present for middle age individuals (age 40 to 59), while the participation of younger individuals (age below 40) in rental investments has dropped over time. When looking at the composition of gross financial income, as interest rates drop, individuals in retirement age appear to shift away from fixed income and interest-paying investments, and into real estate, which has instead maintained its yield roughly unchanged over the period of our analysis.

Changes in rental market participation and rental income have two important implications, which we test in the data. First, higher dependence on rental income makes the income flows of middle age and retirement age landlords more exposed to local economic shocks. Second, investment in rental properties induced by surprise policy rate drops increases house prices and reduces rental yields, especially in the most supply-constrained areas of the country.

Taken together, our findings provide novel evidence on the importance of rental income for individuals and households, and on the effects of rate fluctuations on individuals' rental investments and, ultimately, on house prices.

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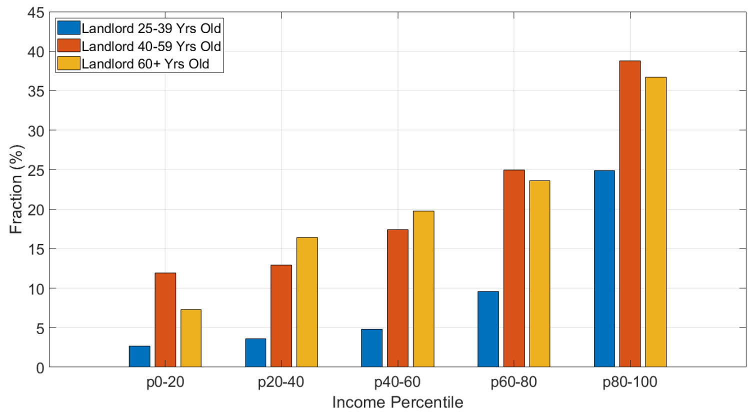
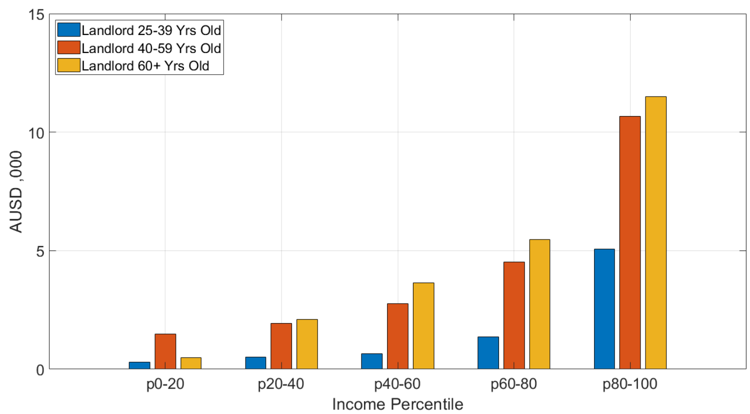
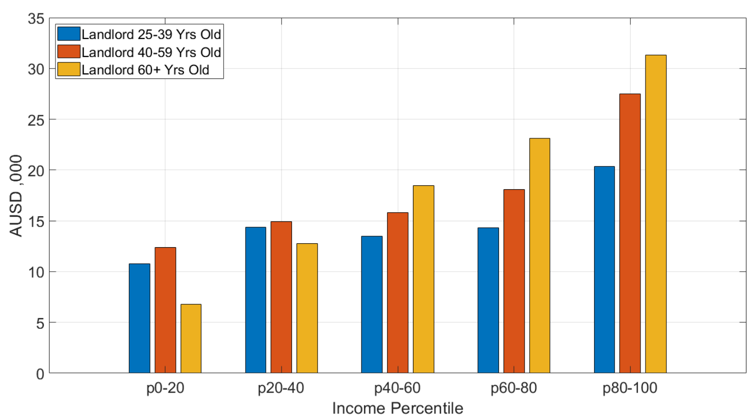


(a) Fraction of Landlords, by Income within Age Groups (2017:2019)

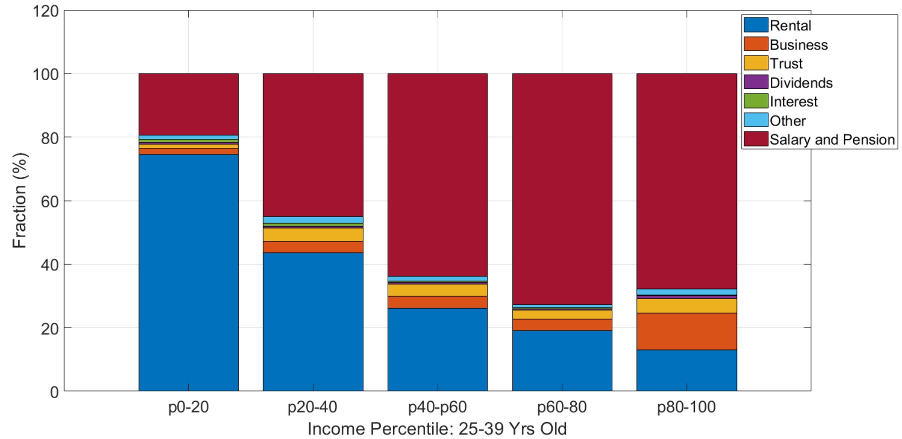


(b) Rental Income, by Income within Age Groups (2017:2019)

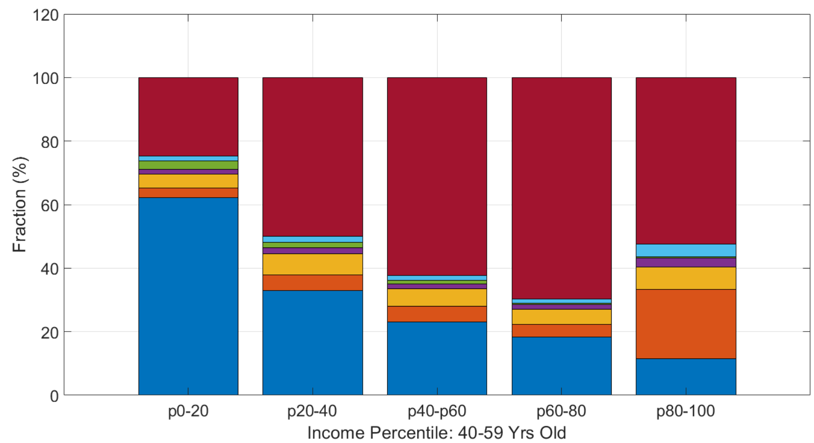


(c) Rental Income (for Landlords), by Income within Age Groups (2017:2019)

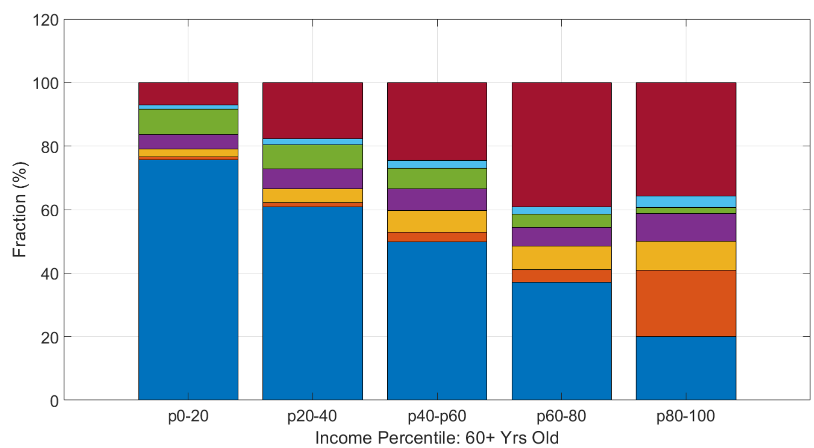
Figure 1: The figure shows the fraction of landlords (panel a), average rental income across all individuals (panel b), and average rental income for landlords (panel c), across income quintiles for three age groups: 25 to 39 (young), 40 to 59 (middle age), and 60 and older (retirement age). The results are based on the ATO individual 1% sample for the years from 2017 to 2019. All calculations are based on income expressed in terms of 2019 Australian Dollars.



(a) Income Composition, for Young Landlords (2017:2019)

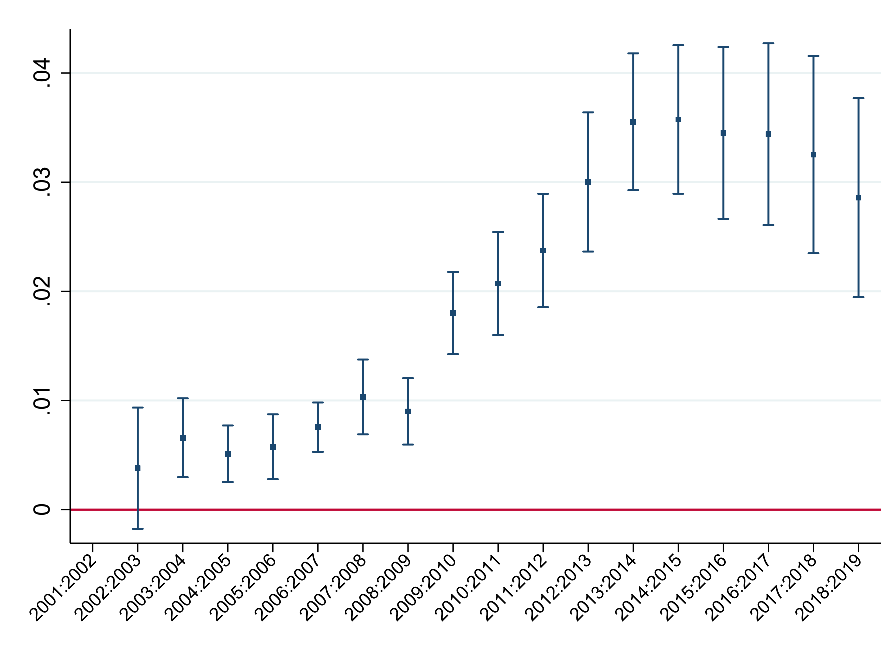


(b) Income Composition, for Middle Age Landlords (2017:2019)

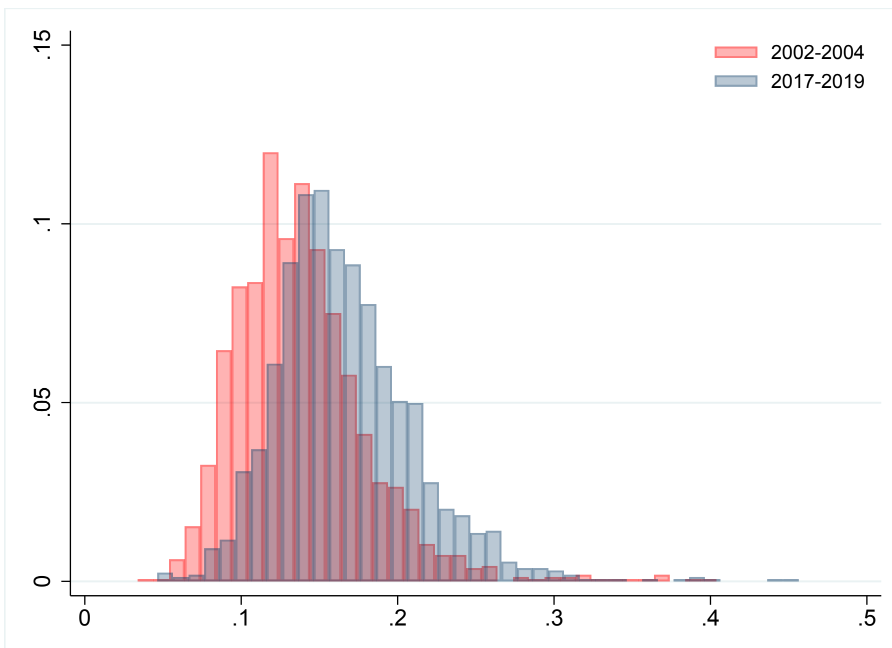


(c) Income Composition, for Retirement Age Landlords (2017:2019)

Figure 2: The figure shows the composition of gross income for landlords, across income deciles for three age groups: 25 to 39 (panel a), 40 to 59 (panel b), and 60 and older (panel c). The results are based on the ATO individual 1% sample for the years from 2017 to 2019. All calculations are based on income expressed in terms of 2019 Australian Dollars.



(a) Fraction of Landlords Time-Series Pattens

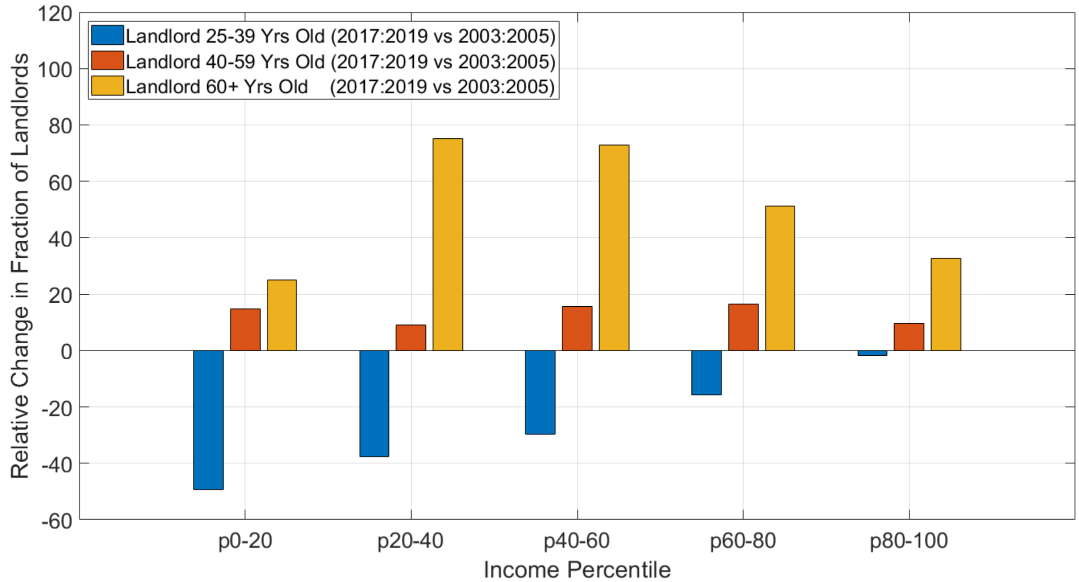


(b) Fraction of Landlords by Postcode (2015:2019 vs 2003:2007)

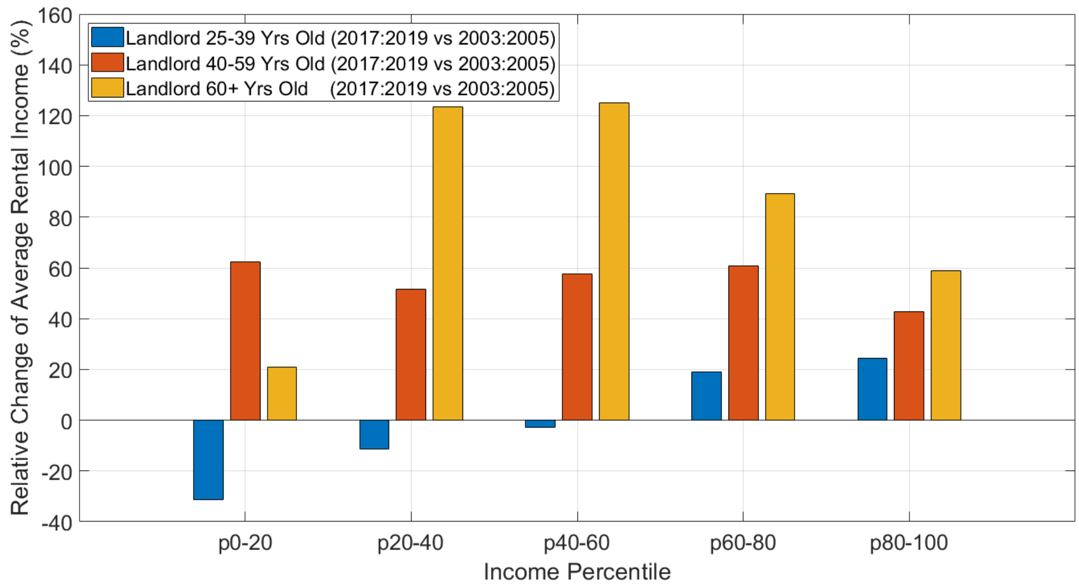
Figure 3: Panel (a) shows the coefficients δ_t from the following regression equation:

$$y_{j,t} = \sum_{t=2003}^{2019} \delta_t + \mathcal{B}X_{j,t} + \alpha_j + e_{j,t},$$

where $y_{j,t}$ is the fraction of landlords in postcode j and year t. Results are based on tax filings for the entire Australian population, aggregated at the postcode level. Panel (b) shows the distribution of the fraction of landlords across postcodes from 2002 to 2004 (red bars) and from 2017 to 2019 (blue bars).

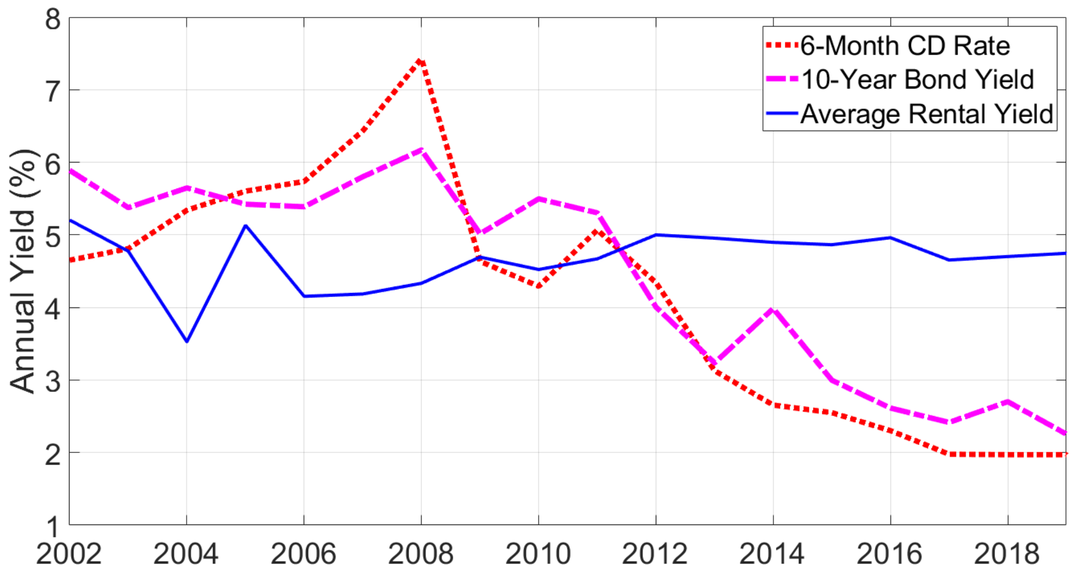


(a) Relative Change in Fraction of Landlords (2015:2019 vs 2003:2007)

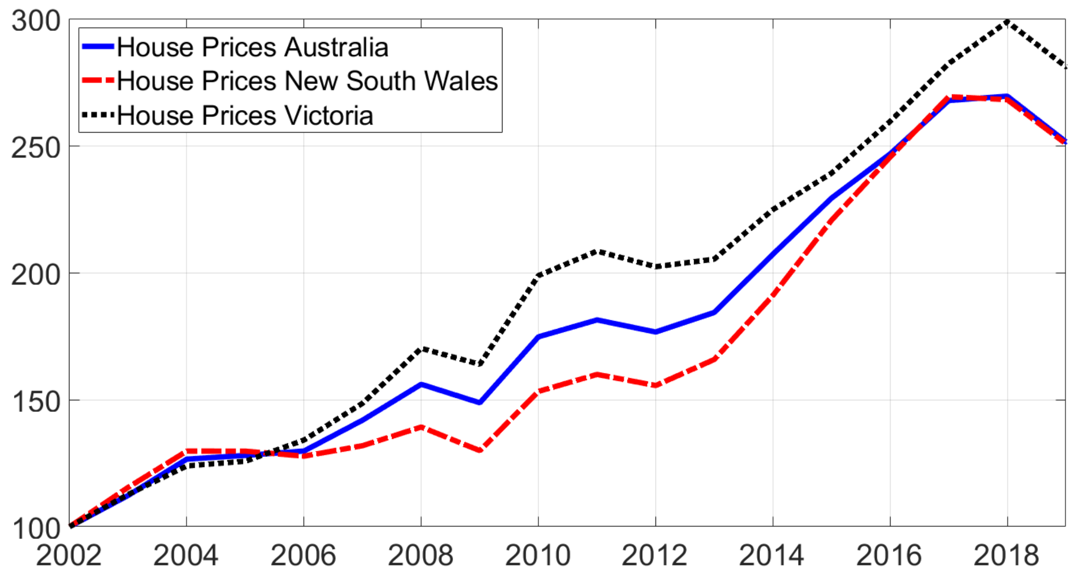


(b) Relative Change in Average Rental Income (2015:2019 vs 2003:2007)

Figure 4: The figure shows the relative change in the fraction of landlords (panel a) and average rental income (panel b) between the years from 2003 to 2005 and the years from 2017 to 2019, across income deciles and for three age groups: 25 to 39 (young), 40 to 59 (middle age), and 60 and older (retirement age).



(a) Annualized Yields



(b) House Price Indices

Figure 5: Panel (a) of the figure reports the time series of annualized 6-month certificates of deposit rates, 10-year government bond yields, and average rental yields over the period from 2002 to 2019. The average rental yield is calculated as the average rental yield across postcodes, and postcode yields are computed as the ratio of median annual rent and the price for the median house in the postcode, based on postcode-level indexes provided by CoreLogic. Panel (b) reports the trajectory of house prices in Australia, New South Wales, and Victoria (the latter two are the most populous states in Australia) over the period from 2002 to 2019. The Australia index is a value weighted mean of median house prices across all the main metropolitan areas in the country. All indices are normalized to be equal to 100 in 2002.

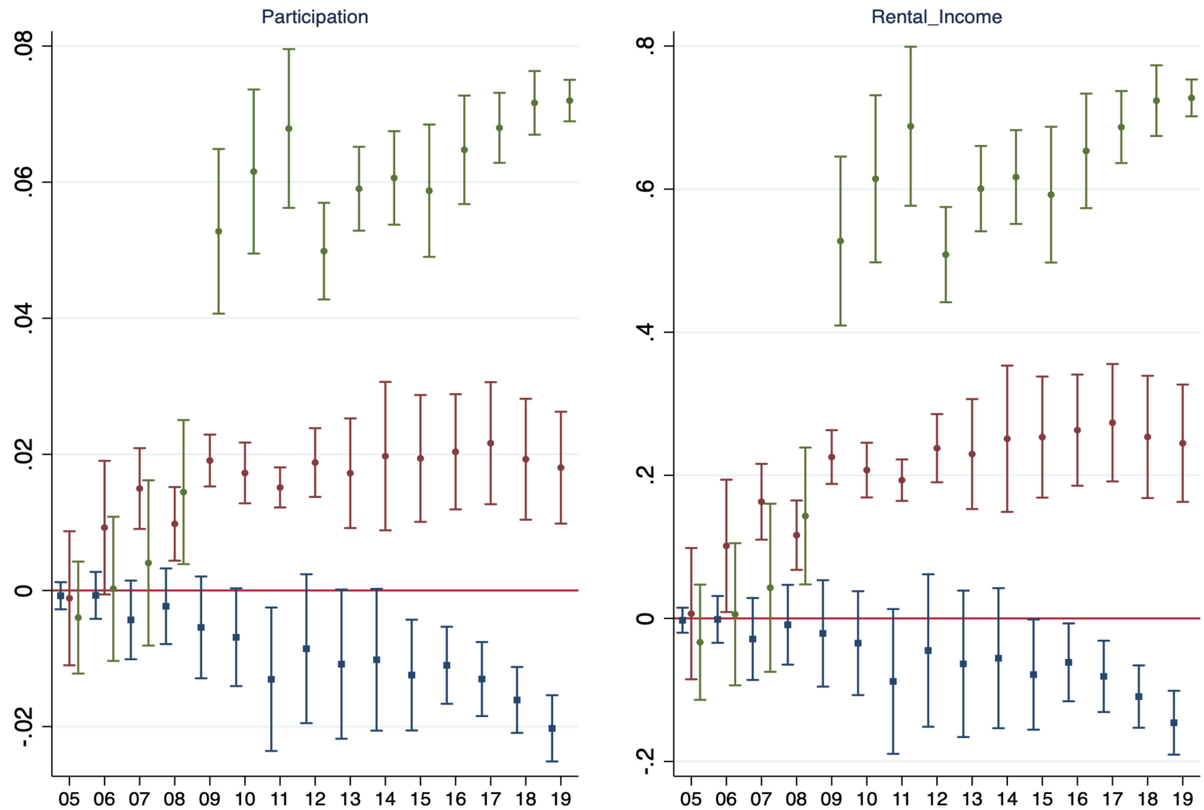


Figure 6: The figure displays estimates of the parameters $\delta_{\tau\times Young}$ (blue), $\delta_{\tau\times Mid}$ (red) and $\delta_{\tau\times Senior}$ (green) from the following regression equation, estimated on all individuals in our sample:

$$y_i = \sum_{\tau=2005}^{2019} \delta_{\tau\times Young}\Big(I_\tau \times I_{20\ to\ 39}\Big) + \sum_{\tau=2005}^{2019} \delta_{\tau\times Mid}\Big(I_\tau \times I_{40\ to\ 59}\Big) + \sum_{\tau=2005}^{2019} \delta_{\tau\times Senior}\Big(I_\tau \times I_{60+}\Big) + \alpha I_{20\ to\ 39} + \beta I_{40\ to\ 59} + \mathcal{B}X_i + \eta_{l(i)} + e_i$$

where y_i is either a dummy equal to one if the individual is a landlord (left figure) or the log of one plus rental income (right figure), I_τ is a fiscal year dummy, $I_{20\ to\ 39}$, $I_{41\ to\ 60}$ and I_{60+} denote dummies if the individual is between 20 and 39 years old, 40 to 59 years old or 60 years old or older, X_i is a vector of controls, including gender, partner status and occupation category, and $\eta_{l(i)}$ is a location fixed effect, based on the area of residence (see Section 2) of individual i. Standard errors are double-clustered by area of residence and fiscal year.

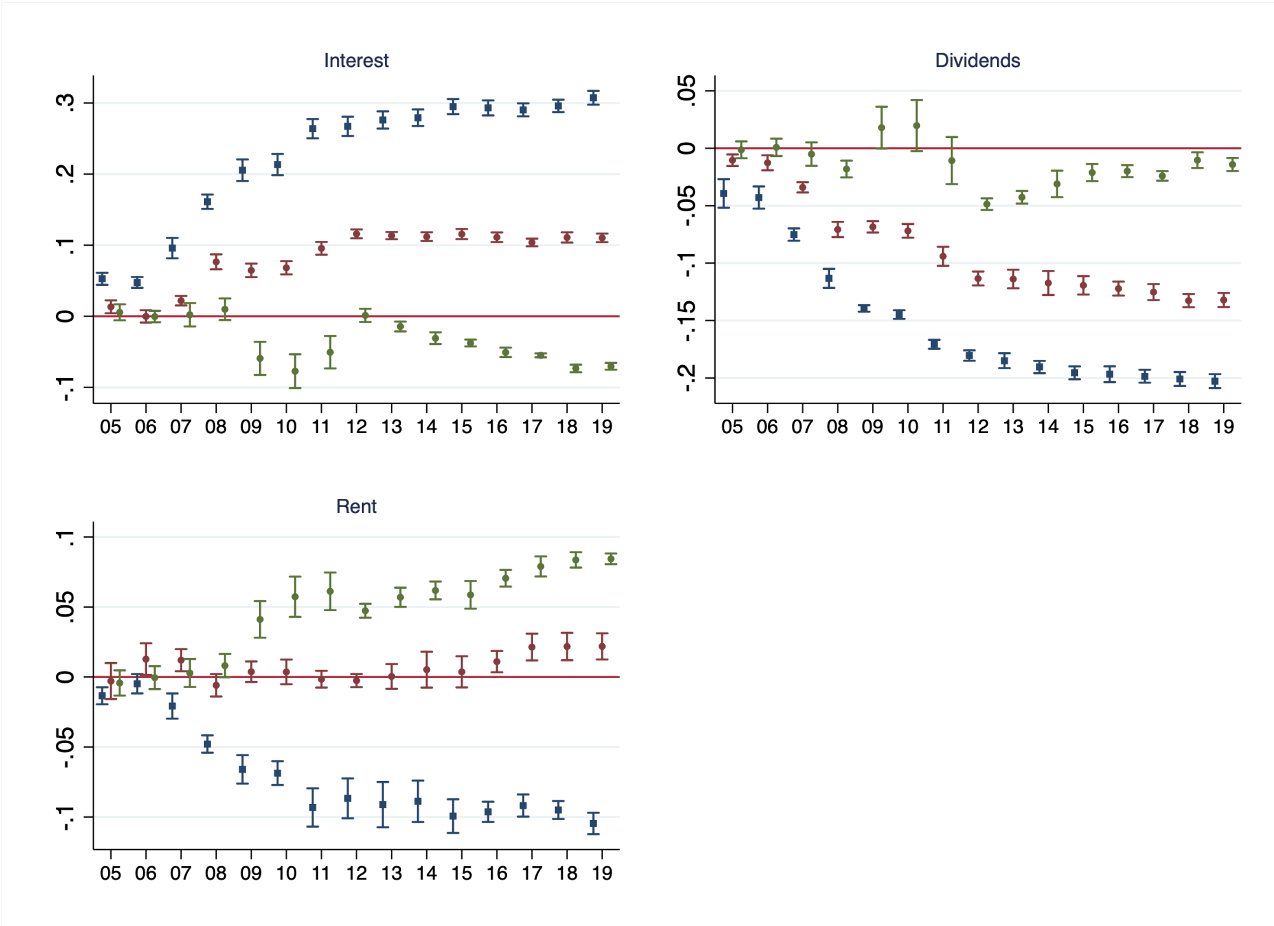


Figure 7: The figure displays estimates of the parameters $\delta_{\tau\times Young}$ (blue), $\delta_{\tau\times Mid}$ (red) and $\delta_{\tau\times Old}$ (green) from the following regression equation, estimated on all individuals in our sample:

$$y_i = \sum_{\tau=2005}^{2019} \delta_{\tau\times Young}\Big(I_\tau \times I_{20\ to\ 39}\Big) + \sum_{\tau=2005}^{2019} \delta_{\tau\times Mid}\Big(I_\tau \times I_{40\ to\ 59}\Big) + \sum_{\tau=2005}^{2019} \delta_{\tau\times Senior}\Big(I_\tau \times I_{60+}\Big) + \\ + \alpha I_{20\ to\ 39} + \beta I_{41\ to\ 60} + \mathcal{B}X_i + \eta_{l(i)} + e_i$$

where y_i is either the interest (top left), dividend (top right) or rental (bottom left) fraction of gross financial income (defined as the sum of interst, dividend, and rental income) of individual i, I_τ is a fiscal year dummy, $I_{20\ to\ 39}$, $I_{40\ to\ 59}$ and I_{60+} denote dummies if the individual is between 20 and 39 years old, 40 to 59 years old or 60 years old or older, X_i is a vector of controls, including gender, partner status and occupation category, and $\eta_{l(i)}$ is a location fixed effect, based on the area of residence (see Section 2) of individual i. Standard errors are double-clustered by area of residence and fiscal year.

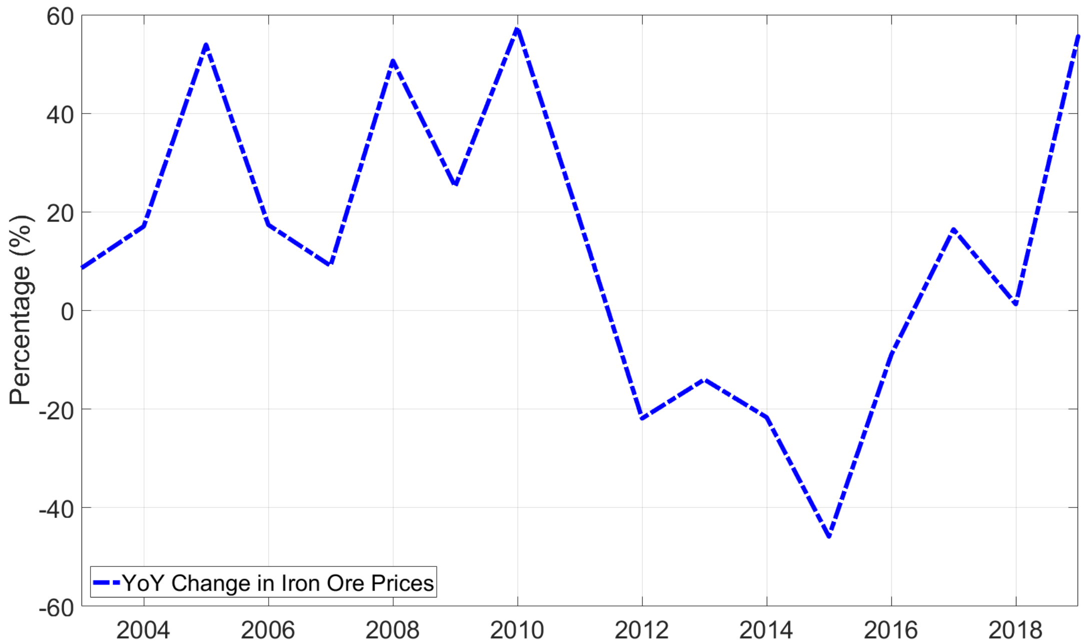


Figure 8: The figure reports year-over-year changes in iron ore prices (in year t, this is the change between year t-1 and t). Years are aligned with Australian fiscal years, and so begin in July and end in June. Iron ore prices are spot prices for imports in Chinese ports (specifically, the CFR Tianjin port), and for 62% Fe content. They are measured as US Dollars per metric ton.

Table 1: **Summary Statistics**

	Panel A: Non Financial Income								
	Avg	Std	1st	10th	25th	50th	75th	90th	99th
Salary	49.26	57.04	0	0	5.67	40.12	71.44	107.31	239.40
Pension	1.86	7.56	0	0	0	0	0	4.85	35.48
Business	9.79	688.62	0	0	0	0	0	0	169.45
Trust	4.68	36.07	0	0	0	0	0	1.03	102.95
Other	2.19	22.95	0	0	0	0	0	1.05	45.84

	Panel B: Financial Income								
	Avg	Std	1st	10th	25th	50th	75th	90th	99th
Rental	3.13	12.79	0	0	0	0	0	10.03	50.69
Dividends	1.88	24.65	0	0	0	0	0	0.82	37.44
Interest	1.08	5.49	0	0	0	0	0.22	1.90	20.40
Capital Gains	3.50	67.35	0	0	0	0	0	0	56.81
Total	77.36	697.54	0.04	13.84	29.32	53.59	87.91	137.68	412.36

This table reports summary statistics for the individuals in our sample. We express all figures in terms of 2019 Australian Dollar (in thousands). We report the mean, standard deviation, as well as the $1st$, $10th$, $25th$, $50th$, $75th$, $90th$ and $99th$ percentiles. *Salary* includes salary or wages (income item 1 of tax form) plus allowances (item 2) and employment termination payments (item 3); *Pension* includes government pensions and allowances (item 6 of tax form), plus annuities and superannuation income streams (item 7); *Business* includes the sum of income from primary (item P8, sum of labels C, E, N, G and I) and non-primary production (item P8, sum of labels D, B, F, O, H and J); *Trust* represents the sum of income from partnerships and trusts (item 13); *Other* represents the sum of foreign income (item 20, label M) and other sources of income; *Rental* represents gross rental income (item 21, label P); *Dividends* represents total dividends received, including unfranked (item 11, label S) and franked amounts (item 11, label T); *Interest* represents gross interest amount earned (item 10); *Capital Gains* represents total capital gains (item 18, label H).

Table 2: **Fraction of Landlords and Rates**

	(1)	(2)	(3)	(4)	(5)	(6)
ΔYld CD6m	-0.570					
	(-1.46)					
ΔYld Bond2yr		-0.586				
		(-1.35)				
ΔYld Bond10yr			-1.108^{**}			
			(-2.30)			
Shock CD6m				-1.826^{***}		
				(-3.01)		
Shock Bond2yr					-2.139^{***}	
					(-6.50)	
Shock Bond10yr						-0.950^{**}
						(-2.32)
Pop Growth	0.024	0.017	0.027	0.027	-0.015	-0.022
	(1.13)	(0.76)	(1.21)	(1.14)	(-0.58)	(-0.93)
Δ House Price	-0.022^{***}	-0.023^{***}	-0.022^{***}	-0.018^{***}	-0.017^{***}	-0.021^{***}
	(-5.61)	(-5.38)	(-6.09)	(-3.25)	(-4.52)	(-5.14)
Δ Mtg Credit Spread	0.059	-0.232	-0.705	-0.524	-1.108^{***}	-0.550
	(0.10)	(-0.51)	(-1.63)	(-1.46)	(-3.16)	(-1.44)
Δ Div Yld	-0.839	-0.824	-0.791	-1.099	-0.371	-0.263
	(-0.99)	(-0.98)	(-1.01)	(-1.44)	(-0.57)	(-0.36)
Stock Mkt Ret	-0.003	0.001	-0.001	-0.014	-0.011	-0.007
	(-0.12)	(0.04)	(-0.03)	(-0.69)	(-0.49)	(-0.26)
Bus Cond Index	-0.015	-0.015	-0.018	-0.002	0.035	-0.004
	(-0.46)	(-0.44)	(-0.61)	(-0.08)	(1.04)	(-0.11)
Postcode FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.848	0.847	0.853	0.865	0.868	0.856
N	30673	30673	30673	30673	30673	30673

This table reports estimates of the coefficients from regression equation:

$$FracLL_{i,t} = \gamma \Delta y_t + \mathcal{B} X_{i,t} + \alpha_i + e_{i,t}$$

where $FracLL_{i,t}$ is the fraction of landlords (out of all residents) in postcode i in fiscal year t; Δy_t is the change, between year $t-1$ and t, of either the rate on 6-month CDs issued by Australian banks, the yield on the 2-year or the 10-year Australian Government Bonds, or the shock to rates around policy announcements for the 6-month CDs, for the the 2-year bond or for the 10-year bond; α_i is a postcode fixed effect and $X_{i,t}$ is a vector of controls, including Δ Div Yield, the change in the average dividend yield between year $t-1$ and year t; *Stock Market Ret*, the average daily stock market return over year t; *BusinessCond.* the average value in year t of the Business Conditions Index published by the Australian Bureau of Statistics; Δ Mtg Credit Spread, the change in the mortgage credit spread between year $t-1$ and t; Pop Growth, the log number of residents in postcode i, between year $t-1$ and t and Δ House Price, the change in the log house price in postcode i, between year $t-1$ and t. Standard errors are double clustered by fiscal year and postcode.

Table 3: **Fraction of Landlords and Rates: High Rental Yields**

	(1)	(2)	(3)	(4)	(5)	(6)
ΔYld CD6m $\times I(HighRY)$	-0.062					
	(-1.08)					
ΔYld Bond2yr $\times I(HighRY)$		-0.115				
		(-1.40)				
ΔYld Bond10yr $\times I(HighRY)$			-0.196^{**}			
			(-2.75)			
Shock CD6m $\times I(HighRY)$				-0.314^{**}		
				(-2.66)		
Shock Bond2yr $\times I(HighRY)$					-0.294^{***}	
					(-3.06)	
Shock Bond10yr $\times I(HighRY)$						-0.203^{*}
						(-2.08)
Pop Growth	-0.019^{***}	-0.019^{***}	-0.019^{***}	-0.019^{***}	-0.019^{***}	-0.019^{***}
	(-4.13)	(-4.17)	(-4.18)	(-4.28)	(-4.34)	(-4.26)
Δ House Price	-0.022^{***}	-0.023^{***}	-0.022^{***}	-0.018^{***}	-0.017^{***}	-0.021^{***}
	(-5.61)	(-5.38)	(-6.09)	(-3.25)	(-4.52)	(-5.14)
Postcode FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.912	0.912	0.912	0.912	0.912	0.912
N	30673	30673	30673	30690	30690	30690

This table reports estimates of the coefficients from regression equation:

$$FracLL_{i,t} = \gamma_{y,HighRY} \left(\Delta y \times I_{HighRY,i}\right) + \mathcal{B}_X X_{i,t} + \alpha_t + \alpha_i + u_{i,t}$$

where $FracLL_{i,t}$ is the fraction of landlords (out of all residents) in postcode i in fiscal year t; Δy_t is the change, between year $t-1$ and t, of either the rate on 6-month CDs issued by Australian banks, the yield on the 2-year or the 10-year Australian Government Bonds, or the shock to rates around policy announcements for the 6-month CDs, for the the 2-year bond or for the 10-year bond; α_i is a postcode fixed-effect, α_t is a year fixed-effect; $I_{HighRY,i}$ is a dummy equal to 1 if the average rental yield over the entire sample period for postcode i is in the top 20% across Australian postcodes. $X_{i,t}$ is a vector of controls, including the change in the log number of residents in postcode i, between year $t-1$ and t and the change in the log house price in postcode i, between year $t-1$ and t. Standard errors are double clustered by fiscal year and postcode.

Table 4: **Rental Market Competition and Rental Yields**

	Dependent Variable: Average Rental Yield							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$HDres$	-0.052***	-0.054***			-0.048***	-0.050***		
	(-4.60)	(-4.91)			(-4.14)	(-4.45)		
$I(HDres > 0)$			-1.095***	-0.977***			-1.088***	-0.944***
			(-5.37)	(-4.79)			(-4.63)	(-3.99)
$\mu(\Delta HP)$		0.202***		0.157***		0.203***		0.157***
		(4.58)		(3.50)		(4.35)		(3.30)
STATE FE	NO	NO	NO	NO	YES	YES	YES	YES
R-Square adj	0.045	0.088	0.062	0.086	0.049	0.089	0.059	0.081
N	425	425	425	425	424	424	424	424

This table reports estimates of the coefficients from regression equation:

$$\mu(RentalYld)_j = \phi Z_j + \beta\mu(\Delta HP)_j + \alpha_s + u_j$$

where $\mu(RentalYld)$ is the average historical rental yield for local government area (LGA) j. Z_j is either equal to $HDres_j$, which is the fraction of high-density residential zoning in LGA j, or $I(HDres > 0)_j$, which is a dummy equal to one for LGAs that have a fraction of high-density residential zoning greater than 0. $\mu(\Delta HP)$ is the average annual house price growth in LGA j, and α_s is a state fixed effect.

Table 5: **Fraction of Landlords and Rates: Rental Market Competition**

	(1)	(2)	(3)	(4)	(5)	(6)
ΔYld CD6m $\times HDres$	0.703***					
	(4.37)					
ΔYld Bond2yr $\times HDres$		0.850***				
		(4.78)				
ΔYld Bond10yr $\times HDres$			1.074***			
			(4.45)			
Shock CD6m $\times HDres$				1.432***		
				(3.93)		
Shock Bond2yr $\times HDres$					1.232***	
					(3.75)	
Shock Bond10yr $\times HDres$						0.713**
						(2.53)
Pop Growth	-0.019***	-0.019***	-0.018***	-0.018***	-0.018***	-0.018***
	(-6.34)	(-6.34)	(-6.32)	(-6.30)	(-6.22)	(-6.28)
Δ House Price	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***
	(-6.41)	(-6.49)	(-6.52)	(-6.53)	(-6.51)	(-6.48)
R-Square adj	0.912	0.912	0.912	0.912	0.912	0.912
N	30667	30667	30667	30684	30684	30684

This table reports estimates of the coefficients from regression equation:

$$FracLL_{i,t} = \gamma_{y,HDres} \left(\Delta y_t \times HDres_i\right) + \mathcal{B}_X X_{i,t} + \alpha_t + \alpha_i + u_{i,t}$$

where $FracLL_{i,t}$ is the fraction of landlords (out of all residents) in postcode i in fiscal year t; Δy_t is the change, between year $t-1$ and t, of either the rate on 6-month CDs issued by Australian banks, the yield on the 2-year or the 10-year Australian Government Bonds, or the shock to rates around policy announcements for the 6-month CDs, for the the 2-year bond or for the 10-year bond; α_i is a postcode fixed-effect, α_t is a year fixed-effect; $HDres_i$ is the fraction of high-density residential zoning in the local government area (LGA) in which postcode i is located. $X_{i,t}$ is a vector of controls, including the change in the log number of residents in postcode i, between year $t-1$ and t and the change in the log house price in postcode i, between year $t-1$ and t. Standard errors are clustered by fiscal year times local government area.

Table 6: **Effects of Local Shocks: Evidence from Western Australia**

	(1)	(2)	(3)	(4)	(5)
	Panel A: Middle Age (40-59)				
	Rent	Dividend	Interest	Salary/Pension	Total
Iron Ore	0.226***	0.011	0.011	0.065***	0.065***
	(6.14)	(0.24)	(0.07)	(3.23)	(4.84)
Iron Ore $\times I(Landlord)$					0.063***
					(4.66)
$I(Landlord)$					0.214***
					(3.57)
Controls	YES	YES	YES	YES	YES
R-Square adj	0.057	0.032	0.045	0.213	0.224
N	18110	19858	42604	68735	81428

	(1)	(2)	(3)	(4)	(5)
	Panel B: Retirement Age (60+)				
	Rent	Dividend	Interest	Salary/Pension	Total
Iron Ore	0.269***	-0.036	0.179	-0.016	-0.082
	(5.87)	(-0.80)	(1.08)	(-0.54)	(-1.58)
Iron Ore $\times I(Landlord)$					0.173***
					(5.32)
$I(Landlord)$					-0.046
					(-0.31)
Controls	YES	YES	YES	YES	YES
R-Square adj	0.044	0.055	0.089	0.216	0.183
N	6580	15763	24521	22521	33678

This table reports estimates of the coefficients from the following two regression equations:

$$y_{i,t} = b_1 log(P_{IronOre,t-1}) + \alpha_t + e_i \quad (Columns\ from\ 1\ to\ 4)$$

$$y_{i,t} = b_1 log(P_{IronOre,t-1}) + b_2 \left(log(P_{IronOre}) \times I(Landlord_i)\right) + b_3 I(Landlord_i) + \alpha_t + u_i \quad (Column\ 5)$$

where $y_{i,t}$ is either log gross rental income, log dividend, log interest income, log salary or pension, or log total income for individual i in fiscal year t, $P_{IronOre,t-1}$ is the price of iron ore in fiscal year $t-1$, $I(Landlord_i)$ is a dummy equal to one if individual i in fiscal year t is a landlord, and α_t is a fiscal year fixed effect. The vector of controls includes age, partner status, occupation codes, and gender (see Section 2). The sample is restricted to individuals with residence in Perth, the capital of the state of Western Australia, and to the sample period from fiscal year 2003 to fiscal year 2019. Standard errors are clustered by year.

Table 7: **Real Effects on Prices and Rents**

	Panel A: Prices					
	$\Delta p_{t,t+12m}$ OLS	$\log(Inv_{p,t})$ OLS	$\Delta p_{t,t+12m}$ IV	$\Delta p_{t,t+12m}$ OLS	$\log(Inv_{p,t})$ OLS	$\Delta p_{t,t+12m}$ IV
$\log(Inv_{p,t})$	0.020***		0.433***	0.014***		0.401***
	(9.66)		(3.27)	(9.82)		(3.39)
$Shock_{CD6m,t} \times I(HighRY)_p$		5.973*			5.775**	
		(1.94)			(2.26)	
$\Delta p_{t-12m,t}$				-0.199***	0.256***	-0.269***
				(-10.93)	(8.39)	(-7.91)
$\log(Volume_{p,t})$				0.118***	0.360***	-0.021
				(13.22)	(15.93)	(-0.48)
Postcode FE	YES	YES	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.136	0.711	-	0.213	0.712	-
N	185423	173977	162852	182640	165876	161717

	Panel B: Rental Yield					
	$\Delta ry_{t,t+12m}$ OLS	$\log(Inv_{p,t})$ OLS	$\Delta ry_{t,t+12m}$ IV	$\Delta ry_{t,t+12m}$ OLS	$\log(Inv_{p,t})$ OLS	$\Delta ry_{t,t+12m}$ IV
$\log(Inv_{p,t})$	-0.014***		-0.913	-0.011***		-0.808**
	(-8.82)		(-1.53)	(-8.99)		(-2.03)
$Shock_{CD6m,t} \times I(HighRY)_p$		5.972*			5.770**	
		(1.94)			(2.26)	
$\Delta p_{t-12m,t}$				0.204***	0.256***	0.468***
				(11.48)	(8.40)	(3.43)
$\log(Volume_{p,t})$				-0.076***	0.360***	0.285
				(-10.88)	(15.93)	(1.58)
Postcode FE	YES	YES	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.211	0.711	-	0.244	0.712	-
N	154954	173985	142399	154557	165884	142205

This table reports estimates of the coefficients from the following regression equations:

$$\log(y_{p,t+h}) - \log(y_{p,t}) = \beta \log(Inv_{p,t}) + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \qquad (Columns\ 1\ and\ 4)$$

$$\log(Inv)_{p,t} = \phi Z_{p,t} + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \qquad (Columns\ 2\ and\ 5)$$

$$\log(y_{p,t+h}) - \log(y_{p,t}) = \psi \log(\widehat{Inv}_{p,t}) + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \qquad (Columns\ 3\ and\ 6)$$

where $y_{p,t}$ is either the median price (panel A), or the ratio of median rent over median price, in postcode p and month t (panel B), $Inv_{p,t}$ is our measure of investment in rental properties, equal to the number of properties purchased in month t and postcode p that were then re-listed as rental within 9 months; $C_{p,t}$ is a vector of controls for postcode p, including price growth in postcode p between time t - 12 months and time t, and the log sales volume in the postcode in month t; α_p is a postcode fixed effect, and τ_t is a month fixed effect; $Z_{p,t}$ is our instrument for investment in rental properties, equal to the interaction between the cumulative shock to the 6 month CD rate over the previous year, times a dummy equal to one for the top 20% of postcodes by rental yield in Australia; $\log(\widehat{Inv}_{p,t})$ is the instrumented log investment in rental properties. Standard errors are double clustered by year-month and postcode.

Appendix for Online Publication:

Individual Investors' Housing Income and Interest Rates Fluctuations

A Rental Market Competition Measure

To construct the measure of rental market competition, we use information from Geoscape, based on detailed shapefiles showing individual areas of zoned land and their use as of 2021. This information covers all Australian states and municipalities. Within each state, we map the land zones into LGAs, and identify zone types that allow for the development of high-density residential buildings. The definitions of high-density residential zones are different in each state. For each state, we list below the zoning codes that allow for high-density residential development:

1. New South Wales: *R4, R5, MU*
2. Victoria: *RGZ, DZ, MUZ*
3. Queensland: *HDR, HIGH DENSITY RESIDENTIAL, MULTI UNIT RESIDENTIAL, RESIDENTIAL (HIGHER DENSITY), MIXED USE*
4. South Australia: *Z6306, Z6302, Z6304, Z6305, Z0908, Z0909*
5. Western Australia: *2, 4, 179, 587, 823, 837, 838, 1000, 1001, 2151, 2157, 2967*
6. Australian Capital Territory: *RZ5, CZ5*
7. Tasmania: *1, 9, 13, 15*
8. Northern Territory: *HR*

Finally, to calculate the rental market competition measure used in section 4.4, for each LGA, we calculate the fraction of zoned land that is available for high-density residential development.

In section 4.4, we also compare our measure of rental market competition against a measure of land supply (in)elasticity. For this second measure, we use an approach similar to Saiz (2010). We use data on land use provided by the Australian Department of Agriculture for fiscal year 2010-2011 (ESRI files are at http://www.agriculture.gov.au/abares/aclump/land-use/data-download), at the level of half-kilometer squares. We aggregate this information at the postcode-level and LGA-level, and for each postcode and LGA we calculate the fraction of land for which housing supply is constrained. We identify two land features leading to constraints on housing supply: (i) the presence of water, in the form of internal basins, lakes, rivers, swamps and coastal waters, (ii) the inclusion in a protected area or a natural conservation reserve.

B Additional Figures and Tables

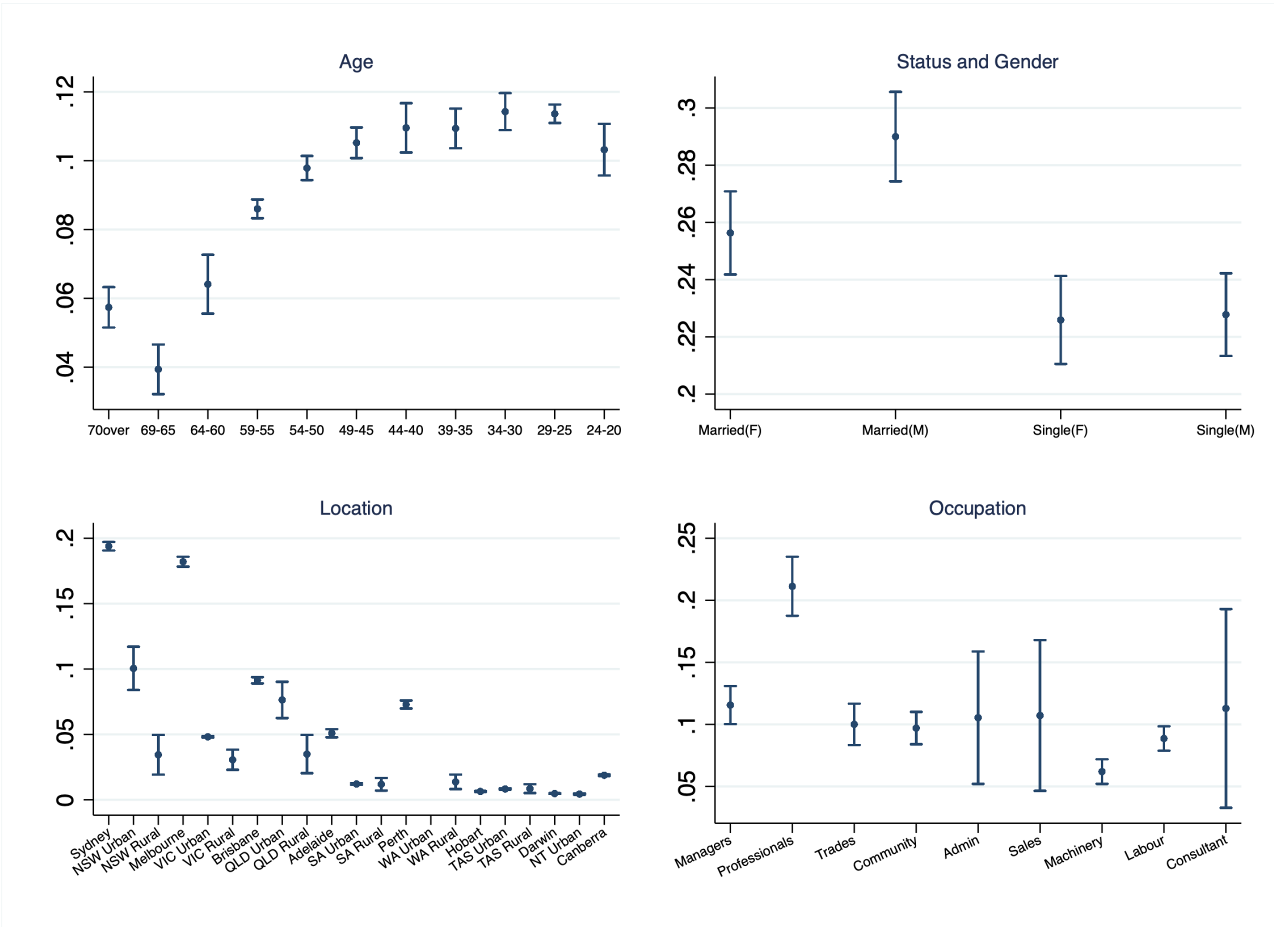


Figure A.1: This figure displays the composition of our sample from the ATO individual tax filings, in terms of age, status and gender, location and occupation. Each year we compute the fraction of individuals in a given age (top-left), status and gender (top-right), location (bottom-left) and occupation (bottom-right) group. We then the report means across years and standard error bars.

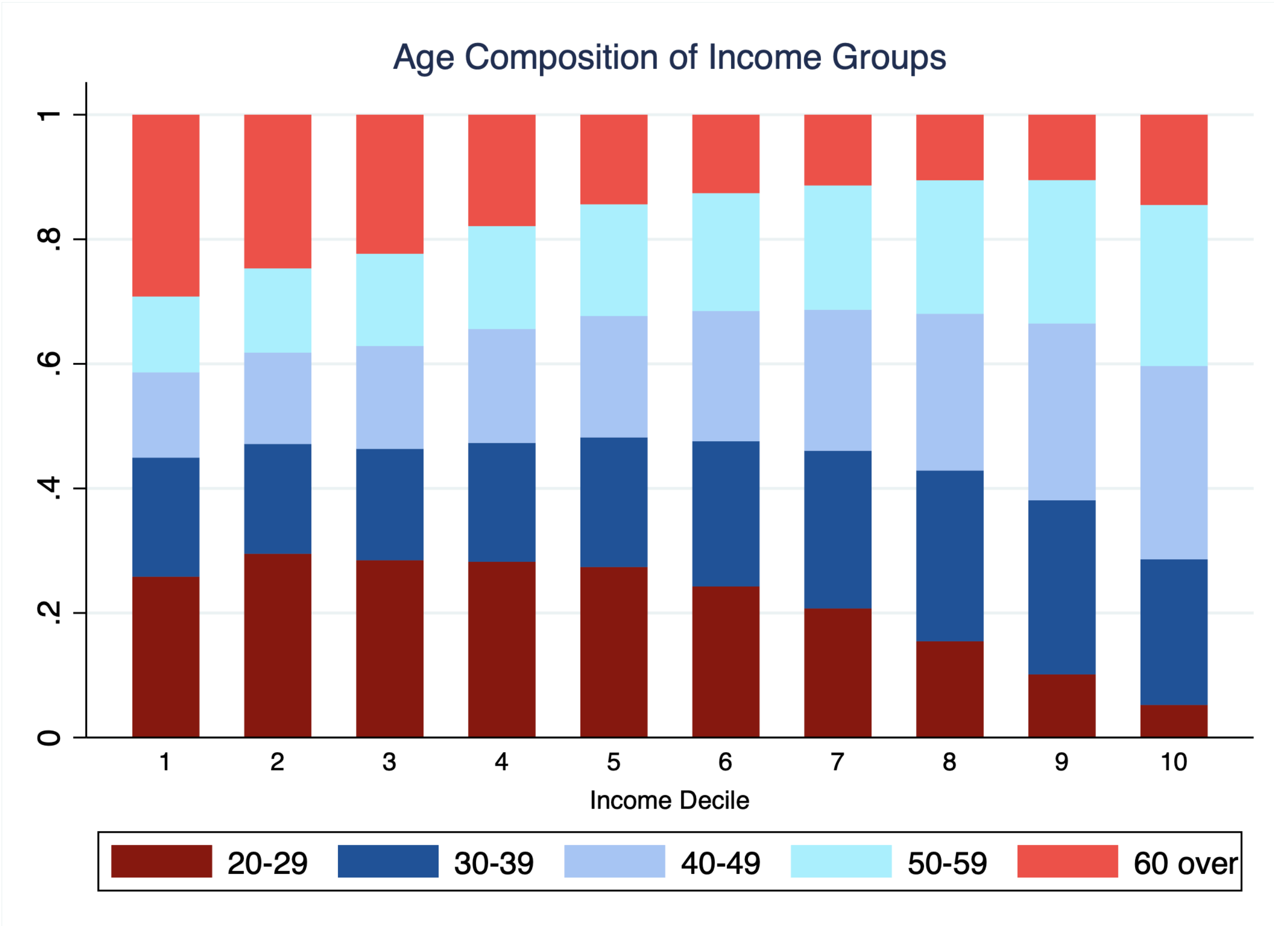


Figure A.2: This figure displays the age composition across income deciles for the sample of ATO individual tax filings.

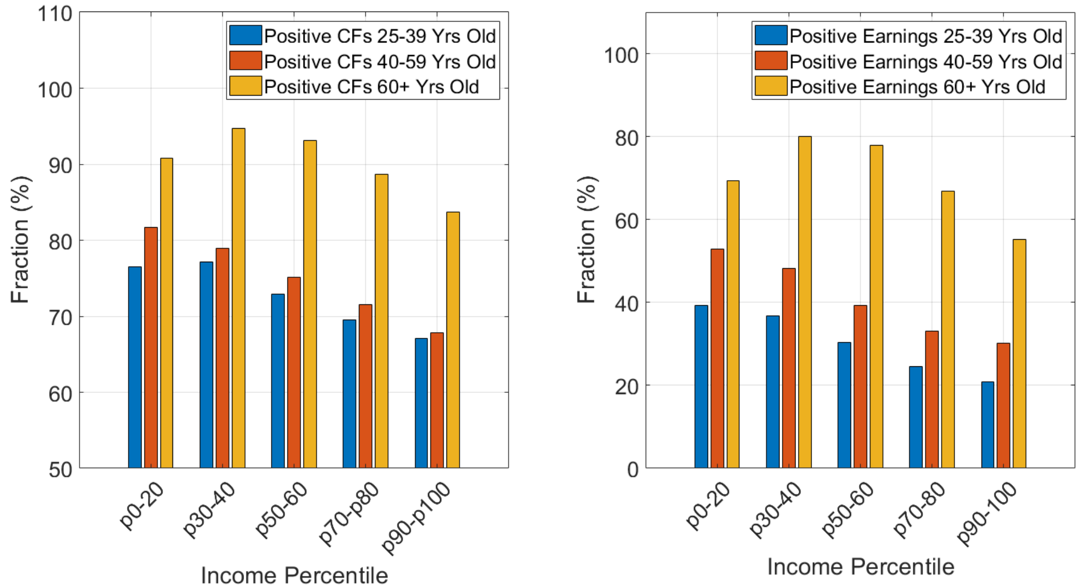


Figure A.3: The figure shows the fraction of landlords earning positive cash flows after interest and maintenance (left panel), and positive taxable income (right panel), across income deciles for three age groups: 25 to 39 (young), 40 to 59 (middle age), and 60 and above (retirement age). The results are based on the ATO individual 1% sample for the years from 2017 to 2019. All calculations are based on income expressed in terms of 2019 Australian Dollars.

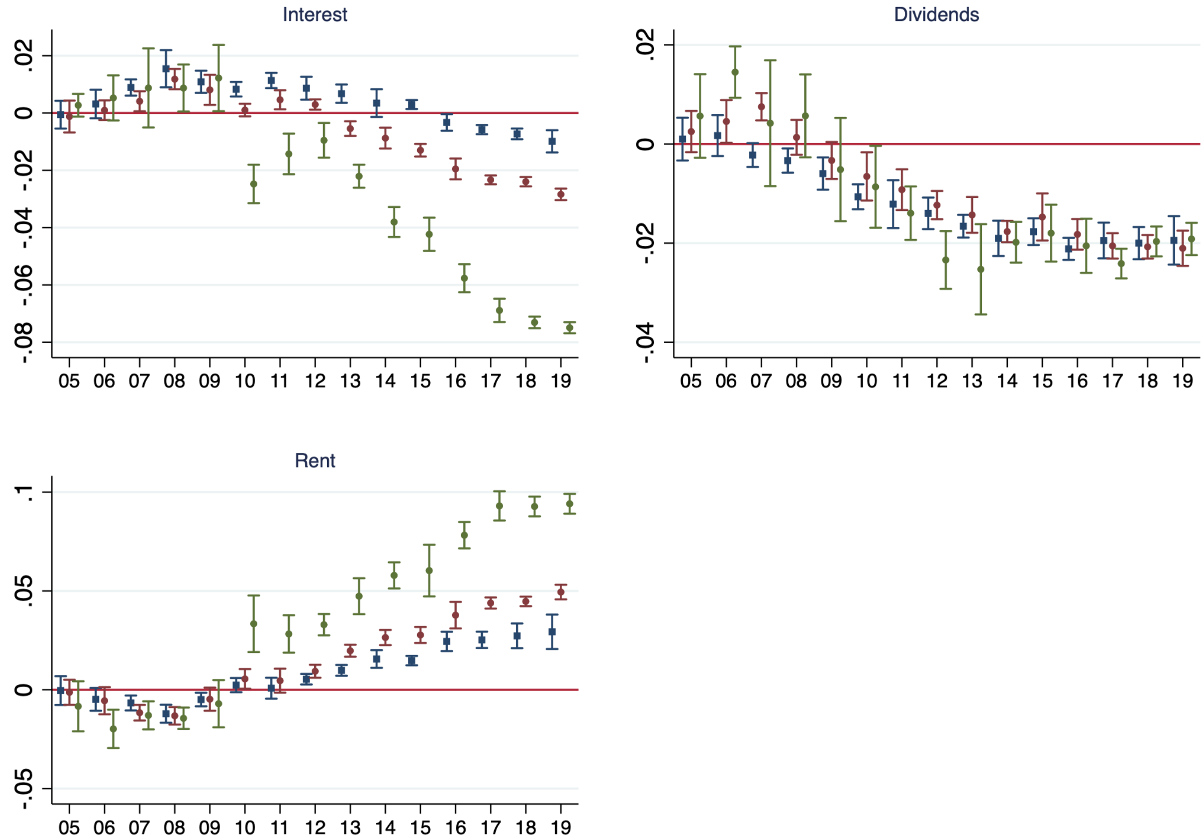


Figure A.4: This figure displays estimates of the parameters $\delta_{\tau\times Young}$ (blue), $\delta_{\tau\times Mid}$ (red) and $\delta_{\tau\times Senior}$ (green) from the following regression equation, estimated on the sample of individuals who are landlords:

$$y_i = \sum_{\tau=2005}^{2019} \delta_{\tau\times Young}\Big(I_\tau \times I_{20\ to\ 39}\Big) + \sum_{\tau=2005}^{2019} \delta_{\tau\times Mid}\Big(I_\tau \times I_{40\ to\ 60}\Big) + \sum_{\tau=2005}^{2019} \delta_{\tau\times Senior}\Big(I_\tau \times I_{60+}\Big) + \\ + \alpha I_{20\ to\ 39} + \beta I_{40\ to\ 60} + \mathcal{B}X_i + \eta_{l(i)} + e_i$$

where y_i is either the interest (top left), dividend (top right) or rental (bottom left) fraction of gross financial income (defined as the sum of interst, dividend, and rental income) of individual i, I_τ is a fiscal year dummy, $I_{20\ to\ 39}$, $I_{40\ to\ 59}$ and I_{60+} denote dummies if the individual is between 20 and 39 years old, 40 to 59 years old or 60 years old or older, X_i is a vector of controls, including gender, partner status and occupation category, and $\eta_{l(i)}$ is a location fixed effect, based on the area of residence (see Section 2) of individual i. Standard errors are double-clustered by postcode and year.

Table A.1: **Summary Statistics**

Panel A: New South Wales

	Avg	Std	1st	10th	25th	50th	75th	90th	99th
Price	612.26	798.11	0.00	185.00	300.00	460.00	710.00	1,120.00	3,000.00
Rent	2.07	1.16	0.65	1.08	1.43	1.82	2.38	3.20	6.49
Bedrooms	2.82	1.08	1.00	2.00	2.00	3.00	3.00	4.00	6.00
Bathrooms	1.51	0.70	1.00	1.00	1.00	1.00	2.00	2.00	4.00
Car spaces	1.58	1.01	1.00	1.00	1.00	1.00	2.00	2.00	5.00

Panel B: Victoria

	Avg	Std	1st	10th	25th	50th	75th	90th	99th
Price	448.65	586.64	0.00	0.00	200.00	355.00	559.80	850.00	2,260.00
Rent	1.67	0.84	0.63	0.97	1.21	1.52	1.91	2.47	4.76
Bedrooms	2.80	0.98	1.00	2.00	2.00	3.00	3.00	4.00	5.00
Bathrooms	1.49	0.62	1.00	1.00	1.00	1.00	2.00	2.00	3.00
Car spaces	1.69	1.00	1.00	1.00	1.00	2.00	2.00	2.00	5.00

Panel C: Western Australia

	Avg	Std	1st	10th	25th	50th	75th	90th	99th
Price	459.68	444.25	55.00	173.00	260.00	385.00	540.00	775.00	1,850.00
Rent	1.79	0.91	0.69	1.08	1.30	1.60	1.95	2.60	5.61
Bedrooms	2.79	1.33	0.00	0.00	2.00	3.00	4.00	4.00	5.00
Bathrooms	1.61	0.61	1.00	1.00	1.00	2.00	2.00	2.00	3.00
Car spaces	1.70	0.94	1.00	1.00	1.00	2.00	2.00	2.00	4.00

This table reports summary statistics for the dwellings in the sales and rental listings data provided by Corelogic. We report the mean, standard deviation, as well as the 1*st*, 10*th*, 25*th*, 50*th*, 75*th*, 90*th* and 99*th* percentiles. *Price* is the sale price (in thousands); *Rent* is the asked rent (in thousands)); *Bedrooms*, *Bathrooms* and *Car spaes* are the number of bedrooms, the number of bathrooms and car spaces.

Table A.2: **Land Supply Elasticity and Rental Yields**

Dependent Variable:	Average	Rental Yield
	(1)	(2)
Natural Constrains	0.008	0.008
$\mu(\Delta HP)$		0.198***
		(4.13)
R-Square adj	0.003	0.049
N	425	424

This table reports estimates of the coefficients from regression equation:

$$\mu(RentalYld)_j = \phi Z_j + \beta\mu(\Delta HP)_j + \alpha_s + u_j$$

where $\mu(RentalYld)$ is the average historical rental yield for local government area (LGA) j. Z_j is a measure of supply elasticity based on the fraction of land that cannot be developed due to natural constraints and the presence of water bodies. $\mu(\Delta HP)$ is the average annual house price growth in LGA j, and α_s is a state fixed effect.

Table A.3: **Real Effects on Prices and Rents: Low Supply Elasticity**

	Panel A					
	$\Delta p_{t,t+12m}$ OLS	$\log(Inv_{p,t})$ OLS	$\Delta p_{t,t+12m}$ IV	$\Delta p_{t,t+12m}$ OLS	$\log(Inv_{p,t})$ OLS	$\Delta p_{t,t+12m}$ IV
$\log(Inv_{p,t})$	0.024***		0.698***	0.015***		0.870**
	(7.93)		(3.29)	(7.37)		(2.41)
$Shock_{CD6m,t} \times I(HighRY)_p$		7.061**			4.535*	
		(2.60)			(1.94)	
$\Delta p_{t-12m,t}$				-0.213***	0.165***	-0.263***
				(-8.94)	(3.37)	(-3.92)
$\log(Volume_{p,t})$				0.131***	0.363***	-0.165
				(9.62)	(8.88)	(-1.22)
Postcode FE	YES	YES	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.116	0.679	-	0.203	0.687	-
N	59428	38847	36857	57569	37533	36646

	Panel B					
	$\Delta ry_{t,t+12m}$ OLS	$\log(Inv_{p,t})$ OLS	$\Delta ry_{t,t+12m}$ IV	$\Delta ry_{t,t+12m}$ OLS	$\log(Inv_{p,t})$ OLS	$\Delta ry_{t,t+12m}$ IV
$\log(Inv_{p,t})$	-0.014***		-0.542**	-0.010***		-0.738*
	(-6.39)		(-2.14)	(-5.81)		(-1.81)
$Shock_{CD6m,t} \times I(HighRY)_p$		7.061**			4.535*	
		(2.60)			(1.94)	
$\Delta p_{t-12m,t}$				0.219***	0.165***	0.363***
				(9.29)	(3.37)	(4.08)
$\log(Volume_{p,t})$				-0.086***	0.363***	0.245
				(-7.76)	(8.88)	(1.26)
Postcode FE	YES	YES	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.179	0.679	-	0.216	0.687	-
N	45173	38847	32618	44937	37533	32585

This table reports estimates of the coefficients from the following regression equations, estimated over the sample of postcodes with fraction of land constrained by bodies of water or natural barriers in the top 25% across Australia:

$$\log(y_{p,t+h}) - \log(y_{p,t}) = \beta \log(Inv_{p,t}) + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \qquad (Columns\ 1\ and\ 4)$$

$$\log(Inv)_{p,t} = \phi Z_{p,t} + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \qquad (Columns\ 2\ and\ 5)$$

$$\log(y_{p,t+h}) - \log(y_{p,t}) = \psi \log(\widehat{Inv}_{p,t}) + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \qquad (Columns\ 3\ and\ 6)$$

where $y_{p,t}$ is either the median price (panel A), or the ratio of median rent over median price, in postcode p and month t (panel B), $Inv_{p,t}$ is our measure of investment in rental properties, equal to the number of properties purchased in month t and postcode p that were then re-listed as rental within 9 months; $C_{p,t}$ is a vector of controls for postcode p, including price growth in postcode p between time t - 12 months and time t, and the log sales volume in the postcode in month t; α_p is a postcode fixed effect, and τ_t is a month fixed effect; $Z_{p,t}$ is our instrument for investment in rental properties, equal to the interaction between the cumulative shock to the 6 month CD rate over the previous year, times a dummy equal to one for the top 20% of postcodes by rental yield in Australia; $\log(\widehat{Inv}_{p,t})$ is the instrumented log investment in rental properties. Standard errors are double clustered by year and postcode.