Individual Investors' Housing Income and Interest Rates Fluctuations*

Antonio Gargano†
University of Houston and
University of Melbourne

Marco Giacoletti‡
USC Marshall

March, 2023

Abstract

Little is known about the participation of small individual landlords in the rental market, and about rental income earned by households. Using unique tax filing data from Australia, we show that rental market participation is common. One in five retirement-age individuals, in both the middle and high-income group, is a landlord. We then show that declines in interest rates over the last two decades are associated with increases in individuals' participation to the rental market, driven by the retirement age-group. Using both time-series and cross-sectional tests, we explore different mechanisms, and find evidence consistent with *reaching for income*. Older individuals have a preference for income-paying assets, and as rates decline, substitute interest income with rental income. Finally, we show that our findings have implications for individual income exposure to local shocks and house prices.

Keywords: Household Income, Interest Rates, Landlords, House Prices, Rents
JEL Classification: D1, R21, E43

*We are grateful to Aditya Aladangady (discussant), Matteo Benetton, Alessio Galluzzi (discussant), Umit Gurun (discussant), Maggie Hu, Matthijs Korevaar (discussant), Alessandro Rebucci, and Steven Xiao for comments and suggestions. The paper has also benefited from comments made by participants at the 2023 Midwest Financial Association Meeting, 2023 Southwestern Finance Association Meeting, 2023 Workshop on Non-conventional Monetary Policy and Bank and Household Portfolio Rebalancing, 2023 ITAM Finance Conference, 2022 New Zealand Finance Meeting, 2022 Business Financing Annual Workshop at the University of Sydney, 2022 Academic Research Colloquium for Financial Planning (CFP), and the 2022 Lone Star Conference. We thank the Australian Taxation Office (ATO) for providing access to individual tax records, the Rozetta Institute Limited (formerly SIRCA) for providing access to the Corelogic and the Share Price and Price Relative (SPPR) data.

†Email: agargano@bauer.uh.edu and antonio.gargano@unimelb.edu.au
‡Email: marco.giacoletti@marshall.usc.edu

1 Introduction

A growing literature explores the role of institutional and professional investors in housing markets. However, still relatively little is known about individuals' direct ownership of rental properties, even though rentals are, at least anecdotally, a popular form of investment in many countries.[1] This may appear surprising, since while investments in rentals frequently enjoy tax advantages, they are also lumpy and illiquid. An interesting aspect that sets apart rentals from other assets, in terms of investment returns, is the large contribution of periodic income (rental yields) to total returns.[2] This aspect should not influence investment decisions as long as investors treat investment income and capital gains as fungible, but it may instead make rentals attractive if investors favor being compensated with income.

In this paper, using Australian tax filings data, we provide evidence that ownership of rental properties is indeed common, and document a substantial increase in the fraction of individuals who are landlords over the last 20 years. The increase is tied to declines in interest rates, and is driven by retirement-age individuals, for which the fraction of landlords has increased, in relative terms, by 80%.

We argue that the mechanism driving the increase in participation to the rental market is *reaching for income*. As discussed by Daniel, Garlappi, and Xiao (2021), retirement-age individuals are more dependent on investment income to balance their budget than younger-age individuals. This is because the retirement-age group has typically higher wealth, but lower earnings than the younger groups. Declining interest rates will reduce investment income from money market accounts, and from roll-overs of bond investments. Retirement-age individuals may respond to this drop in investment income in three ways: by cutting consumption, by progressively consuming capital gains (their asset portfolio will have likely appreciated after interest rates declines), or by reallocating part of their portfolio to securities that still offer high

[1] Total households' wealth invested in non-owner-occupied properties is larger than investments in financial assets outside of retirement plans, and is approximately equal to one quarter of the wealth held in retirement and insurance plans (Badarinza, Campbell, and Ramadorai, 2016).

[2] See Demers and Eisfeldt (2021) for evidence from the United States.

income payments. The third response is *reaching for income* behavior, which will take place if retirement-age individuals do not consider capital gains and investment income as fungible. This could be because of frictions, because of the attention costs involved in progressively liquidating capital gains, or because of bequest or behavioral motives that make retirees unwilling to liquidate their asset portfolios.

Consistent with a reaching for income explanation, we find that the increase in investment in rental properties is not accompanied by an increase in speculative trading or asset flipping, that landlords have bought more properties in areas offering higher rental yields, and that retirement-age individuals have purchased their properties with little leverage, have typically earned positive net income on these properties, and have progressively substituted dwindling interest income with real estate income.

Australia presents an ideal context for our study, and is, in some respects, even better suited than the United States. First, like the United States and other major industrial and developed countries, Australia has experienced a substantial decline in interest rates over the last two decades. However, unlike the United States,[3] Australia has not experienced a housing bust at the same time. The growth of house prices in the country has been largely unaffected by the Great Recession (see Figure 1), and thus declines in interest rates have not been driven by a local housing crisis.

Second, Australian individual tax filings offer detailed information on rental income. In Australia, income losses from directly owned real estate properties can be subtracted from taxable income. Thus, most individual investors directly own rental properties and 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, which makes the measurement of rental income challenging.[4] In addition, there is no joint tax filing in Australia, and the data

[3]But similar to other countries, such as Canada in North America, Germany in Europe, and Chile in South America.

[4]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.

contain details on individuals' demographics and locations of residence.

As a first step, we establish empirical facts about the magnitude and evolution of direct rental investments by individuals, and about the contribution of rental income to total income. From 2017 to 2019, the last three years of our sample, the fraction of landlords 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. However, even among middle- 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. Rental properties also represent an important source of income for landlords. For instance, rental income is on average 50% of total income for a median income retirement-age landlord.

Moreover, investments in the rental market have increased over time. From 2002, the first year in our sample, to 2019, the fraction of landlords has increased, in relative terms, by 30% (from 13% to 17%). A large part of this increase has taken place in 2009, and then from 2010 to 2014. This pattern is closely negatively correlated with the decline in interest rates (see Figure 1). Retirement-age individuals with median income within their age group have the largest increase in the fraction of landlords: 80% in relative terms (9% in absolute terms).

We then study the mechanisms that could explain these time-series patterns. Besides the already mentioned reaching for income channel, there are at least two important alternative explanations that should be considered. First, individuals might be responding to increases in house prices, likely also driven by declines in interest rates. For instance, individuals' beliefs on real estate returns might change due to extrapolation or fear-of-missing-out (Agarwal, Hu, and Huang, 2016, Armona, Fuster, and Zafar, 2019, and Kuchler and Zafar, 2019). Indeed, over-extrapolation from recent price trends has been a driver of speculative investment in housing before the Great Recession in the United States (Chinco and Mayer, 2016, and Bayer et al., 2020). Alternatively, even if there is no effect on beliefs, price growth may facilitate investment because individuals owning a primary residence may use their increasing home equity to fund

the purchase of rental properties.[5]

Second, cuts in interest rates may coincide with declines in credit spreads, and the relaxation of mortgage underwriting standards. Lower cost of debt and broader credit access may stimulate investors' activity in the market (Haughwout et al., 2011).

Finally, a channel which is somewhat different from reaching for income, but closely related, is *reaching for yield*, in which investors increase allocations to risky assets when the risk-free rate declines, to maintain the expected rate of return on their portfolio unchanged.[6] While reaching for yield could explain an increase in real estate investments (Korevaar, 2021), the fact that retirement-age individuals drive our results, combined with the additional empirical evidence we discuss below, points to investors specifically seeking real estate income, rather than just higher returns.

We design several empirical tests aimed at disentangling the competing mechanisms from reaching for income. 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% decline in the rate on 6-month Australian certificates of deposit, induced by surprises around announcements, corresponds to 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. Moreover, the relationship between rental market participation and the mortgage rate spread over the 10-year yield is not statistically significant, which is consistent with the fact that changes in credit market conditions are dominated by the effect of the overall level of interest rates in the economy.

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

[6] 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.

Second, we compare the sensitivity to interest rates of buy-to-let and speculative, or house-flipping, investment activity. If investors behavior was driven by extrapolation, relaxation of collateral constraints, or fluctuations in the cost of debt, we should witness an increase in all types of investment activities. If behavior is instead driven by reaching for income, then the effect will be limited to rental investments. We construct measures of investment in rentals and house-flips for small landlords, using micro-data on individual sales and rental listings collected by Corelogic. We define properties bought-to-let as properties that were bought and relisted for rent within 9 months, and properties bought-to-resell as properties bought and resold over the same time horizon.[7] Over the period of our study, we find a large increase in the volume of properties bought-to-lease, associated with concurring declines in interest rates. We find no change, and no association with changes in rates, for the volume of properties bought-to-resell.

Third, we study cross-sectional differences across locations. To attenuate endogeneity concerns we use conditioning variables measured before the beginning of the cycle of interest rate declines. We show that the increase in the fraction of resident landlords is larger in postcodes that in 2005 had a higher fraction of retirement-age and middle-age residents, who would have reached retirement-age during the time period of our study. If the effects were driven purely by a relaxation of credit constraints, we would have expected the response to be stronger in areas with younger residents, who tend to be more constrained due to lower wealth. If the effects were driven by over-extrapolation of price growth, to match the data we would need to assume that retirement-age individuals are the most prone to over-extrapolation. This is in contrasts with the results in Armona, Fuster, and Zafar (2019), who show that younger individuals extrapolate the most.

Using information on the locations where buy-to-let investors invest, we also show that the increase in rental investments is largest in areas that have offered higher rental yields, measured as the average yields between 2000 and 2005. This evidence is also consistent with reaching for

[7]While properties might be resold quickly also because of unforeseen circumstances or life events, previous research has shown that resales with such short holding periods are in large part speculative investments (Bayer et al., 2020).

income, since it shows that investors are seeking high yields from real estate.

Fourth, we turn to individual tax records. We use these data to show that retirement-age individuals are the group that is most likely to extract positive net income (rent net of interest, capital, and other expenses) from their properties. Moreover, these individuals have low interest expenses compared to the younger groups (the majority of retirement-age landlords have zero interest expenses), which suggests that retirement-age landlords are not taking advantage of lower credit spreads or laxer underwriting standards. Finally, we show that, as rates decline, retirement-age individuals substitute income from interest rates payments with real estate income. These findings are all consistent with the reaching for income channel.

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. To assess the potential impact on income risk, we study differences in exposure to local economic shocks for landlords and non-landlords. We focus on Western Australia, where local economic conditions are heavily dependent on iron ore price fluctuations, which are in turn driven by foreign demand. We show that the income of middle-age landlords is twice more sensitive to commodity price fluctuations than that of non-landlords. Moreover, 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. Thus, an increase in the fraction of landlords largely increase exposure to local economic shocks.

Then, we turn to the effects that higher investment in rental properties, induced by interest rate cuts, has on the housing market. We use micro-data on individual house sales and rental listings to measure investment volume by postcode and month, using bought-to-let properties. We instrument the investment volume in bought-to-let properties with shocks to rates, interacted with indicators for high rental yield areas. At the postcode-level, a 1% increase in investment in rental properties leads to 0.4% excess price growth over the following year across all postcodes, and to 0.7% excess growth in postcodes with low land supply elasticity.

Our study contributes to the literature on investors in the housing market. The investment decisions that we analyze in this study differ from those considered by the literature on house-

flipping, which focuses on investors seeking returns from market timing and price appreciation (see Chinco and Mayer, 2016, Badarinza and Ramadorai, 2018, Bayer et al., 2020, Favilukis and Van Nieuwerburgh, 2021, and Deng et al., 2021). Our analysis is instead more closely 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 findings are also distinct from the ones in this second set of works, since our focus is specifically on the role of individuals, and on reaching for income.

We also contribute to the literature studying how declines in interest rates trigger portfolio reallocation towards assets with higher expected returns, or higher income yields (Hau and Lai, 2016, Lian, Ma, and Wang, 2019, Jiang and Sun, 2019, Daniel, Garlappi, and Xiao, 2021, and Korevaar, 2021). Daniel, Garlappi, and Xiao (2021) provide evidence of reaching for income behavior in financial markets, showing that retirement-age individuals respond to rate declines by increasing investments in high-dividend yield funds and stocks. We provide novel evidence for real estate. Housing produces, in general, higher income yields than most segments of the stock market, but direct investment in real estate is lumpy and illiquid. Thus, it is perhaps surprising that the desire for income leads some investors into this asset class. Moreover, the implications for income risk and the housing market are potentially far reaching, and interesting in their own regard. Korevaar (2021), using data from the 18th century Netherlands, presents evidence of capital flows away from (into) government bonds and into (away from) real estate in response to rate declines (increases), and of the related price effects. We provide a complementary contribution, showing that fluctuations in interest rates, even today, with developed financial markets, have an impact on housing investments. Moreover, thanks to the granularity of our data, we are able to disentangle the specific role of the reaching for income channel.

Finally, we contribute to a growing literature studying income composition across households, and how it is affected by interest rates declines and monetary policy.[8]

[8]Kuhn, Schularick, and Steins (2020) and Smith, Zidar, and Zwick (2020) highlight the role of business income while Fagereng et al. (2021) focuses on heterogeneity driven by financial income. Coibion et al. (2017) show that expansionary monetary policy systematically decreases heterogeneity in total income, while Peydro

The rest of the paper proceeds as follows. Section 2 describes the data used in our study and presents summary statistics. Section 3 provides raw evidence on rental market participation and rental income. Section 4 discusses fluctuations in interest rates and house prices over the period of our study, and the contemporaneous increase in the fraction of landlords. Section 5 provides several tests aimed at disentangling competing explanations and mechanisms. The implications for income dynamics and housing markets are presented in Section 6. Finally, Section 7 concludes.

2 Data and Summary Statistics

The analysis of rental income and of its evolution over time requires detailed income data for a broad cross-section of the population, as well as information on other income sources, demographic characteristics and locations of residence. Moreover, to study the real effects of rental property investors on house prices and rents, we need to collect data on listings and transactions from the sales and rentals 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

Our analysis is based on two detailed fiscal data sets. The first is a postcode-level data set 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 June 30th). The dataset covers the entire population and, for each income component, contains information on aggregate postcode income and on the number of individuals in the postcode declaring income (or losses) for that component. We can track net rental income over the entire sample period, and can calculate the fraction of individuals with rental income (or losses) residing in each

et al. (2021) show that the gains from a lower monetary policy rate are increasing monotonically over the income distribution.

postcode, and its evolution over time.

The second is an anonymized representative 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 between 2% of Australian taxpayers.[9] Note that the sample consists only of individual filings since the Australian system does not allow for joint filing. The data 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.[10]

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, 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).[11] Some of these details are also available in the postcode-level data, but only after 2011.

Moreover, the individual-level data include information on important characteristics like

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

[10]Estimates 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

[11]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.

age,[12] gender, partner status, location of residence,[13] and occupation.[14] Figure B.1 in the Appendix displays the composition of our sample in terms of these characteristics, while Figure B.2 displays the age composition across deciles of taxable income.

An issue we face when analyzing the tax filing data is that they might be plagued by misreporting (understatement of income and overstatement of deductions). However, we believe this is likely a minor concern in Australia. Tax fraud is punished harshly, with administrative fees and penalties for serious offenses equal to 75% of the payment shortfall or evasion. Tax evasion can also be punished with jail sentences, with a maximum of 10 years. Moreover, for each fiscal year, the ATO reports statistics on the tax gap,[15] which is the difference between the amount collected, and an estimate of what should have been collected if taxpayers were fully compliant with the law (based on misreporting detections and ATO estimates). For salary income, dividends, interest payments, and rents the gap is, on average, only 5.6%.

2.2 Sales and Listing Data

We obtain data on sales and rental listings 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 in which each property is located, as well as property size, number of bedrooms, bathrooms, and

[12]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 remove from the sample individuals under 20 years of age.

[13]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), the data disclose 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.

[14]Individuals are divided into 9 categories, based on the first digit of the Australian and New Zealand Standard Classification of Occupations (ANZSCO): 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.

[15]The data are available at this link: https://www.ato.gov.au/About-ATO/Research-and-statistics/In-detail/Tax-gap/Inividuals-not-in-business-income-tax-gap/

car spaces. For both sales and rental listings, we observe the initial listing date, the original listing price, and each successive change in the listing price (along with the date on which each change took place). For sold properties, we observe the date and price of sale. Table B.1 displays summary statistics.

3 Housing Income and Rental Market Participation

As a first step, we explore differences in rental market participation across groups of households based on age and total income. We choose these characteristics since they are strongly associated with lifetime income, wealth, and asset composition (Fagereng et al., 2021, Gomes, Haliassos, and Ramadorai, 2021).

In Figure 2, 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 sub-group. 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. The fraction of landlords is 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 that the fraction of landlords is roughly 17.5% and 20%.

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 with middle-income, 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.

Figure 3 shows income composition for landlords in the years from 2017 to 2019, and provides stark evidence of the importance of rental income for landlords, especially 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 as large as 80% for landlords in the bottom quintile of total income, while high-total income landlords earn a higher fraction of income from salaries and pensions, and have substantial income from investment trusts.

4 Interest Rates and Individual Landlords

In this section, we discuss the economic environment in Australia during the period of our studies, with a particular focus on fluctuations in interest rates and house prices. We then use postcode-level tax data and panel regressions to establish the relationship between interest rates changes and the fraction of individual landlords.

4.1 The Economic Environment

In the United States, the Great Recession and the following slow recovery coincided both with a sharp decline in interest rates and with large fluctuations in real estate prices, which experienced a large boom-bust cycle.[16] Given these broad range of concurring factors, it is then challenging to tie the behavior of real estate investors, both institutions and individuals, to fluctuations in interest rates, or to monetary policy.

[16]Previous work has shown how this cycle was amplified by changes in lending standards (see Mian and Sufi, 2011, Keys, Seru, and Vig, 2012, and Keys et al., 2013), and by highly pro-cyclical beliefs on the future evolution of house prices (see Case, Shiller, and Thomson, 2015 and Kaplan, Mitman, and Voilante, 2020), and how it generated several large government interventions (Agarwal et al., 2017 and Gabriel, Iacoviello, and Lutz, 2020).

In Australia, trends in real estate markets have been substantially less hectic 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 across developed economies, the last decade has been characterized also in Australia by dovish monetary policy, and declining interest rates. Panel (a) of Figure 1 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.[17] The decline in rates and government bond yields over the sample of our study is striking. For instance, the 6-month CDs rate is above 7% in 2008, and then falls to 1% in 2019. Also quite striking is the fact that rental yields remain rather stable, and do not show the massive fluctuations that are instead present in the United States over the same period (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 decrease in house prices. Rather, across Australia, house prices, compared to 2006 levels, were 15% up in 2009 (35% up in Victoria), and more than 25% up in 2012 (58% up in Victoria). Thus, the decline in interest rates did not coincide with a housing crisis. In this sense, the Australian experience is similar to that of other major economies such as Canada in North America, Germany in Europe, and Chile in South America. However, 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 Section 5, we discuss in detail the competing mechanisms through which the economic environment of the last 20 years may have triggered higher investment in rental properties, and propose empirical tests to disentangle competing mechanisms.

[17] 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 indices.

4.2 Time-Series Evolution of Rental Market Participation

Given the high level of participation in the rental market for the years from 2017 to 2019, and the fluctuations interest rates and house prices discussed in the previous section, it is natural to ask how participation in the rental market has changed over time. We find that in the year from 2002 to 2004, approximately 13% of Australian individuals reported income or expenses related to an investment in real estate. Thus, while the fraction of landlords was already large two decades ago, it has increased, in relative terms, by 30%, to reach the level of 17% in the 2017-2019 period.

To better understand when this large increase in the fraction of landlords has taken 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 postcodes, with respect to the base level in 2002.

Estimates of the coefficients δ_t are reported in Panel (a) of Figure 4.[18] 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 4 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

[18] 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.

right: the 25th percentile moves from 10% to 13.5%, the median moves from 13% to 16%, and the 75th percentile moves from 16% to 19%; 90% of postcodes experience an increase in the fraction of landlords.

The increase in participation in the rental market across postcodes is not explained by mechanical effects, such as population aging (older individuals are more likely to be or become landlords, as also shown in the previous section), or the inflow of migrants. Figure B.3 in the Appendix shows that the postocode-level increase in participation from 2002-2004 to 2017-2019 has little association with the increase in the fraction of individuals of age 60 or older, and with the increase in the fraction of individuals who immigrated over the previous 5 years.[19]

Figure 5 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, retirement-age individuals with income between the 20th and the 60th percentile increase participation by 80% (roughly 9-10% in absolute 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 individuals with middle-income, who increase participation by 15% (2% in absolute terms), and increase rental income by 60%. The fraction of young landlords instead decreases. The largest contraction is for the lowest income group, and is equal to 40%.

5 Competing Mechanisms

Several mechanisms could explain the negative association between the fraction of landlords and changes in interest rates presented in the previous section.

First, higher investment in rental properties may coincide with a decline in interest rates, just because house prices are growing at the same time. In other words, investors' decision to

[19] These measures are constructed using postcode-level information from the Australian Bureau of Statistics, and by calculating percentage changes between 2006 and 2021.

purchase rental properties might have been driven by the sustained price growth over the years from 2002 to 2018. This might be because expectations of future price growth are influenced by recent price growth, as has been documented 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 are homeowners, are interested in making real estate investments, but are short of capital, may use their increasing home equity to fund the purchase of rental properties.

Second, 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 the cost of debt, and may also coincide with changes in credit spreads, mortgage underwriting standards, and lending constraints. To the extent that these effects ease borrowing for real estate investors, they may induce higher investment in rental properties.

Third, 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 occur is investors' *reaching for income behavior*. Previous evidence indicates that investors close to or in retirement age have a preference for high-income-generating assets (see e.g., Graham and Kumar, 2006 and Di Maggio, Kermani, and Majlesi, 2020) to finance their consumption needs. Financing consumption with investment income 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.[20]

When rates are high, investors can earn substantial income from money market accounts and bonds. Then, cuts in interest rates may push investors to look for other assets paying a substantial part of their return in income. 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, driven by older investors and retirees, who are most reliant on investment

[20]Indeed, Baker, Nagel, and Wurgler (2007) show that household consumption is significantly more responsive to dividend payouts than unrealized capital gains.

income for their consumption needs. On the one hand, rental real estate is an attractive asset for reaching for income, due to the monthly frequency of payments and the large contribution of the yield component to total returns. On the other hand, direct investment in real estate is lumpy and subject to several frictions.

A related channel is "reaching for yield", which instead entails shifting allocations towards higher risk, higher return assets when risk free rates decline.[21] Korevaar (2021) finds evidence consistent with reaching for yield using historical data from the 18th century. While this channel can explain higher investment in real estate in response to lower rates, in modern days reaching for yield can be achieved also with other financial assets, and the empirical evidence we discuss below appears instead consistent with investors specifically seeking real estate income.

In the following subsections, we propose several tests aimed at disentangling the competing mechanisms of price effects (operating either through beliefs, or relaxation of collateral constraints), declines in the credit spreads and credit standards, and reaching for income.

5.1 Time Series Evidence: Fraction of Landlords

We start our analysis of the mechanisms linking interest rates changes and the increase in the fraction of landlords, by estimating 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 rate (or bond 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, we include postcode-level house price growth over the year to capture the belief and the relaxation of collateral constraints channel,

[21] 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. For institutions, this behavior is driven by performance-related incentives, rather than biases.

and the change in the mortgage rate spread (equal to the mortgage rate minus the 10-year government bond yield) to capture the real estate lending conditions channel. 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 further control for local housing demand, we also include postcode-level population growth. Standard errors are double-clustered by year and postcode.

Our estimates are reported in Table 2. Price growth has a significant coefficient, but the point estimate is negative, which implies that the fraction of landlords is negatively correlated with local postcode price growth. This is the opposite sign of what predicted by the extrapolation channel and the home equity channel, described in the previous section. Against the prediction of the lower cost of debt and the relaxation of the underwriting standards, we find that the mortgage rate spread is insignificant.

For what concerns the effect of rates on the fraction of landlords, in columns 1, 2, and 3, Δy_t is the change in the rate on CDs issued by Australian banks with maturity of 6 months, in the yield of Australian 2-year government bonds, and in the yield of 10-year government bonds, respectively. The point estimates of the coefficient γ from equation 2 are negative across the board. While the coefficients for short term rates are not significant, the coefficient for the 10-year bond yield is.[22] A 1% decline in the 10-year bond yield is associated with a 1.1% increase in the fraction of landlords across postcodes. Thus, drops in rates are associated with higher participation in the rental market.

There are two important challenges that we face when interpreting estimates of the coefficient γ. First, changes in yields taking place over the fiscal year, even after controlling for a wide range of variables, might still be driven by responses to changes in the housing market. Second, there might be other factors, not included in our regressions, which drive at the same

[22]Double-clustering produces large standard errors, and is thus a conservative approach. Different clustering choices produce significant results also for the short-term yields.

time yields and the fraction of landlords. These confounding effects may amplify, or attenuate, our estimates.

To address the challenges just discussed, we use an approach similar to the one developed by Amberg et al. (2022), and replace Δy_t, measured as the change in the rates of yields over the entire fiscal year, with a measure based on rates and yields changes taking place around monetary policy announcements (between the two weeks before and the two weeks after rate announcements). The intuition is that, already ahead of the meetings, rates and yields would incorporate all forward looking information on economic trends. Changes in rates and yields that take place around policy announcements are likely to be determined by the response of fixed income markets to surprise changes in policy rates or monetary policy guidance. To construct a measure at the fiscal-year level, we compute the cumulative "shocks" to rates and yields over the year (s_t).

Our results from the regressions based on rates and yields shocks are reported in columns 4, 5, and 6 of Table 2. Point estimates of the coefficient γ are large, negative, and significant. A 1% surprise decline 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.

To make sure that the results are not driven by outliers, or areas with low population density, in Table B.2 of the Appendix we repeat the same analysis for a restricted sample of postcodes, which includes only urban and suburban areas. Point estimates are extremely close to the ones reported in Table 2.

5.2 Time Series Evidence: Investment Activity

Our next test is based on the intuition that extrapolative beliefs, the increase in home equity, and the decrease in the cost of debt, or the relaxation of mortgage lending standards, would stimulate both investment in rental properties and speculative housing investments (house-

flipping). While, the evidence from fiscal data cannot be used alone to track speculative investments in housing, progress can be made using the information from sales and rental listings available from Corelogic.

We use the listings data to identify properties bought-to-lease and properties bought-to-resell. The former are defined as properties that are re-listed as a rental within 9 months of the date of purchase, while the latter are properties relisted for sale within 9 months of purchase. We use these measures as proxies for rental investment activity and speculative, or house-flipping, activity. A shortcoming of the bougth-to-resell measure is that it captures speculative trading only imperfectly, and might also account for fast resales due to unexpected circumstances or life shock (such as death, or divorce). However, previous literatire has shown that resales with these short holding periods are mainly driven speculative traders (see Bayer et al., 2020, who also use a 9-months cutoff for bought-to-resell decisions).

Figure 6 reports the time series of the volume of houses bought-to-lease and bought-to-resell. We can draw two key insights from the figure. First, there is a large increase in the volume of properties bought-to-lease, with substantial increments in 2009 and in the period from 2011 to 2015. This path is consistent with the evidence from Figure 4, which shows the increase in the fraction of landlords, and with the two major drops in interest rates from Figure 1. Second, the pattern in the volume of properties bought-to-lease is disconnected from the pattern in the volume of properties bought-to-resell. In fact, the latter, appears to be pretty stable over the period of our analysis.

To formally test the sensitivity of the investment activity to changes in interest rates we estimate regression specifications analogous to equation (2), but with dependent variable equal either to fraction of properties bought-to-lease (Panel A of Table 3), or bought-to-resell (Panel B of Table 3) in the year. We find negative coefficients across the board for the association between houses bought-to-let and the different measures of interest rate changes, and shocks. The coefficients are statistically significant for the 10-year yield and the shocks, as is the case in Table 2, when the dependent variable is the fraction of landlords. We instead find small and

insignificant coefficients for the association between houses bought-to-resell and rates changes.

Thus, our results highlight that the decline in rates coincides with an increase in investment activity in rental properties, but not with an increase in speculative trading activity. If the key channels driving our results on rental market participation were contemporaneous house price growth, or lower cost of debt and laxer underwriting standards, we would have expected a spike in investment activity for both rentals and speculation. However, if the channel was reaching for income, then the increase in investment activity would be concentrated in the rental sector, as we observe in the data.

As in the previous section, we repeat the analysis for a limited sample of postcodes restricted to urban and suburban areas, and report the results in Table B.3 in the Appendix. The results are very close to those in Table 3.

5.3 Differences Across Locations

We now propose tests based on cross-sectional differences across postcodes to explore two predictions of the reaching for income channel. First, reaching for income is more likely to drive the investment decisions of individuals who are retired, or approaching retirement age. This is because these individuals are, or will soon be, the most reliant on financial income for their consumption needs. Second, if investors are reaching for income, they will be attracted by the assets offering the highest income yields. In our context, this means that investment activity in rentals shall increase the most in areas with high rental yields.

5.3.1 Location of Landlords' Residence

To test the first prediction, we use information from the postcode-level fiscal data, merged with information on local demographics as of 2005 (before the large declines in rates that took place starting from 2008). We then estimate the following regression equation:

$$FracLL_{i,t} = \gamma_{Senior} \left(s_t \times \phi_{Senior2005,i} \right) + \mathcal{B}_X X_{i,t} + \alpha_t + \alpha_i + u_{i,t}, \tag{3}$$

where $\phi_{Senior2005,i}$ is the fraction of households with a senior household head (of age greater or equal than 40) in 2005, before the beginning of the large interest rates declines in our period. While some of these residents are not yet retirees in 2005, they will become retirees, or get very close to retirement age, by 2019. Thus, $\phi_{Senior2005,i}$ is a proxy for retirement-age population over the period of our study. For what concerns the other variables, $X_{i,t}$ contains time-varying postcode-level controls, which consist of postcode house price growth and population growth, while α_i and α_t are families of postcode and year fixed effects, and s_t is one of the rates or yields shocks intrdouced in the previous sections.

The coefficient γ_{Senior} captures the incremental effect of interest rate changes on the fraction of landlords in the postcode, depending on how high was the local fraction of seniors in 2005. If reaching for income is the mechanism at play in the data, the increase in the fraction of landlords in response to a decline in rates should be stronger in areas that have larger fraction of seniors, and estimates of γ_{Senior} should be negative. We find that this is the case in the data, as shown by the estimates in the first three columns of Table 4. The interaction coefficients are negative and statistically significant for shocks to the 6-month CD, 2-year yield, and the 10-year yield. A 10% higher fraction of senior households in the postcodes translates into a 0.2% higher sensitivity of the fraction of landlords for a 1% rate shock.

5.3.2 Location of Landlords' Investment

We then turn to testing the second prediction, which is that, if the effects in the data are driven by reaching for income, investment activity in rental properties should be higher in postcodes offering higher yields. We estimate the regression equation:

$$FracBuyToLet_{i,t} = \gamma_{RY} \left(s_t \times RY_{2005,i} \right) + \mathcal{B}_X X_{i,t} + \alpha_t + \alpha_i + e_{i,t}, \tag{4}$$

where $FracBuyToLet_{i,t}$ is, out of all properties purchased in year t and postcode i, the fraction that was re-listed for rental within 9-months of purchase, while $RY_{2005,i}$ is the average

rental yield for postcode i between 2000 and 2005 (before the period of interest rate declines), and all other variables are the same as in equation (3). Also in this case, the coefficient of interest is the one for the interaction term, γ_{RY}, which captures differences in the response to rate changes across postcodes. The prediction of the reaching for income channel is that higher local rental yield should lead to higher investment when rates fall, and thus that the interaction coefficient should be negative. This is again consistent with what we find in the data, as shown in columns 4, 5, and 6 of Table 4. A 1% higher rental yield translates into a 1% to 1.5% higher sensitivity of the volume of rental investments to a 1% shock in rates. Since the average effect across postcodes, as shown in Table 3 is in between 2.5% and 5.5%, the economic magnitude of the coefficient is substantial.

5.4 Differences Across Demographic Groups

In this section, we use the individual-level fiscal micro-data to provide further support on the reaching for income channel based on heterogeneity across age groups.

5.4.1 Rental Income and Expenses

In this section we focus on testing two predictions. First, if retirement-age individuals are reaching for income in real estate, then they must be earning positive net-income flows (net of expense) from their rental properties. Second, if retirement-age individuals were instead motivated by the low cost of debt or by lax underwriting standards, we should find that they were using substantial leverage to purchase their rental properties.

To explore the first prediction, we construct two measures of net rental income using the micro-data from individual tax filings. The first measure subtracts from gross rental income both interest expenses and capital expenditures (capex). The second measure also subtracts "other" deductions, which include non-cash expenses such as depreciation. Panel a of Figure 7 shows, for the last three years of the sample, the fraction of individuals within each age

group (retirement-age, middle-age, and young) who report positive net income after interest and capex (red bars) and after all expenses (blue bars). The differences across age groups are striking. Approximately 90% of retirement-age individuals earn positive positive income after interest and capex, and 65% earn positive income even after accounting for all expenses, including non-cash expenses. The same fractions are equal to 70% and 25% for individuals in the youngest age group. Thus, retirement age landlords are indeed more likely to extract income from their properties.

We then turn to testing the second prediction. Panel b of Figure 7 shows the distribution of interest expenses, as a fraction of total expenses, and across the three age groups. Almost 50% of retirement-age individuals have no interest expenses, while for the median landlord in the middle-age and youngest group, interest expenses represent 50% of total expenses. Thus, retirement-age landlords have not taken advantage of lax credit market conditions to finance the purchase of rentals, or to lever-up on their second homes and turn them into rentals.

In panel c, we dig deeper into the analysis of expenses, by showing the fraction of total expenses driven by capex. We find that retirement-age individuals also have the lowest level of capital expenditures, with more than 60% of them declaring zero. While also a large fraction of middle-age and young landlords declare no capex, the fraction for the retirement-age group is the largest. This is consistent with retirement-age landlords focusing on rental income extraction, rather than remodeling or capital improvements. Finally, in panel d we focus on the residual component, consisting of other expenses, including non-cash expenses such as depreciation. We find that this component is the most important for retirement-age individuals.

Summing up, retirement-age individuals are the most likely to extract positive net income for their properties, appear to have the lowest leverage, in spite of the stark increase in rental market participation in their ranks, and are the least likely to incur capex on their properties. All these findings line up with the conjecture that retirement-age individuals are reaching for income.

5.4.2 Participation in the Rental Market

A key prediction of the reaching for income channel is that retirement-age individuals should respond more to cuts in interest rates. If investors' response to declining rates was driven purely by a relaxation of credit constraints, the effect should have been stronger for low-income and younger individuals, who tend to be more constrained due to lower wealth. If it was driven by over-extrapolation of price growth, it should also have been stronger for younger individuals who, based on the results in Armona, Fuster, and Zafar (2019), are more prone to extrapolation.

We already used these data, at an aggregate level, to produce the preliminary evidence in Figure 5. To dig deeper into the time-series patterns, we estimate the following regression equation:

$$y_i = \sum_{\tau=2005}^{2019} \delta_{\tau \times Young} \Big(I_\tau \times I_{20 \ to \ 39} \Big) + \sum_{\tau=2005}^{2019} \delta_{\tau \times Mid} \Big(I_\tau \times I_{40 \ to \ 59} \Big) + \sum_{\tau=2005}^{2019} \delta_{\tau \times Old} \Big(I_\tau \times I_{60+} \Big) + \alpha I_{20 \ to \ 39} + \beta I_{40 \ to \ 59} + \mathcal{B} X_i + \eta_l + e_i, \tag{5}$$

where y_i is a feature 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 i (for individual tax filings, we only observe location information at the level of large areas within state; see Section 2 for more details).

Figure 8 reports estimates of the parameters δ from equation (5). 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% above the 2004 level in the last years of the sample. This is roughly a 60% relative increase, consistent with what shown in Figure 5. Changes are less stark for the

middle-age 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 and retirement-age individuals mimic the time series evolution observed in the postcode-level data in Figure 4. The younger group (blue squares) sees a decrease 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 of rental income over time across all individuals in each age group (including non-landlords), which are depicted in the right panel of Figure 8. 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.

5.4.3 Composition of Investment Income

We then re-estimate equation (5) using, respectively, the fraction of income from interest-paying securities (top-left plot), dividends (top-right) and rents (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 and report estimates in Figure 9.

For the retirement-age group (green-squares), the relative contribution of rental income increases by roughly 10%. This coincides with a 10% decrease 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. Retirement-age individuals have been shifting the composition of their financial income away from declining interest payments and into rental income flows.

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 decrease 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% reduction for rental and dividend income, respectively,

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 interpretation of the effects for dividend and interest income are less clear. It is possible 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 reducing dividend income and increasing the relative contribution of interest income to total financial income. This also suggests that young and middle-age individuals have not increased their participation in the real estate market through public stocks, such as Real Estate Investment Trusts (REITs), since these stocks tend to pay high dividends. Moreover, the Australian REITs market is still quite small, even though it has grown significantly over the last decade. Even in the last few years, REITs acquisitions across all real estate asset classes have been limited to about AUD 30 Billion per year. Acquisitions for REITs specializing in multifamily and residential real estate have been just a small fraction of this total amount.

In Figure B.4 in the Appendix, we repeat the analysis of Figure 9, but restrict the sample to landlords only.[23]

6 Effects on Income Dynamics, House Prices and Rents

We now turn to the implications of the increase in direct participation to the rental market for the riskiness of individual income, and for house prices.

6.1 Exposure of Investment Income to Local Economic Shocks

While a large literature investigates the risks households face with respect to labor income (see Meghir and Pistaferri, 2011 for a review of the literature) much less is known about rental

[23]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 reduction in the contribution of income from interest-paying securities (-8%), while the youngest landlords see the smallest decrease (-1%). Interestingly, the contribution of dividend income falls by approximately 2% over the period of our study for all landlords.

income. As shown in Figure 3, rental income accounts for a large fraction of income for both middle-age and retirement-age landlords. Moreover, as shown in Figure 9, 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 individual income risk?

Investment income from a diversified portfolio of financial assets has low exposure to economic shocks specific to the region in which an individual lives. This is desirable, since local economic shocks may already affect labor income, and a local downturn will in general be a period in which local households' marginal utility from consumption is high.

Rental income is instead likely highly correlated with local economic shocks, and individual landlords are unlikely to hold multiple properties and to diversify their real estate assets across locations. Every two years, the Australian Bureau of Statistics runs the Survey of Income and Housing, which contains questions on the number of rental properties owned. For the 2018 fiscal year, the survey indicates that 71% of landlords own one rental unit, and 18% own two units. Moreover, rental properties tend to be located close to the primary residence of the landlord. Even though this is not directly observable in our tax filings data, we can provide supporting evidence based on the Rental Investors Surveys, run by the Australian Bureau of Statistics in the 90s (until 1997). Based on the surveys, for 71% of landlords, primary residence and rental properties were located in the same city. Only 18% of landlords owned properties located in the same state but in a different city than their residence. Finally, only 11% of landlords owned properties in a different state than the one of their primary residence.

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 provide some insights on the magnitude of this effect, we turn again to the data on individual tax filings, and construct an empirical exercise showing the extent to which landlords are more exposed to local economic conditions. For this exercise, we focus on Perth, the capital city of Western Australia. Most business activities in this area are directly or indirectly tied

to mining, with iron ore being one of the region's main exports. 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.[24] In general, fluctuations in iron ore prices are poorly correlated with fluctuations in stock prices and other macroeconomic factors. Figure B.5 in the Appendix 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 falls and becomes negative over the period of the following recovery, from 2012 to 2016.

For our test, 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 5. We estimate the following regression equation:

$$\log(Inc_{i,t}) = b \log(P_{IronOre,t-1}) + BX_i + \alpha_t + e_i, \tag{6}$$

where $\log(Inc_{i,t})$ is the log of total income, or of 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, α_t is a fiscal year fixed effect, and X_i is a vector of individual controls, including age, partner status, occupation code, and gender.

In column 1, across both panels of Table 5, we set the dependent variable in equation (6) 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 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.

[24] See for example the evidence presented by Kalouptsidi (2014).

The sensitivity of income from salary and pensions (column 4) to the 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 is as expected, since retirement-age individuals receive pensions that are likely independent of current local economic conditions, while, middle-age individuals are part of the local workforce, and see their labor income, on average, reduced in a downturn, when iron ore prices are low. A 10% change in iron ore prices results in a change in 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 (6) 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, when compared against non-landlords. The term has a large and positive coefficient for both middle-age and retirement-age individuals.

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

These effects are large, and highlight how rental real estate investments increase income sensitivity to local economic shocks. By investing in local real estate, individuals are giving up the diversification benefits of financial investments, and increasing the riskiness of their income streams.

6.2 House Prices and Rents

We now turn to the effects of the increase in rental market participation on property prices and rents. Our results here expand the existing evidence in the literature (Chinco and Mayer, 2016, Bayer et al., 2020, and Garriga, Gete, and Tsouderou, 2021), by studying the effects of individual investors in the rental market.

We also 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). Real estate is an asset class in which these effects can be large, due to the illiquid and segmented nature of the market.

To track investments in rental properties by individual investors, we again rely on the buy-to-lease measure developed in Section 5. We then calculate median sales prices by postcode and month, as well as the volume of bought-to-lease properties in each postcode and month. Finally, we estimate the following regression equation:

$$\log(y_{p,t+h}) - \log(y_{p,t}) = \beta \log(Inv_{p,t}) + \Gamma C_{p,t} + \alpha_p + \tau_t + \epsilon_{p,t+h} \tag{7}$$

where $y_{p,t}$ is either the median sales 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-lease*, 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.[25] 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 7 is potentially plagued by identification problems. First, the

[25]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.

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-lease 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) regression below:

$$\log(Inv_{p,t}) = \phi\left(s_t \times I_{HighRY,p}\right) + \Gamma C_{p,t} + \alpha_p + \tau_t + u_{p,t+h} \tag{8}$$

$$\log(y_{p,t+h}) - \log(y_{p,t}) = \psi \log(\widehat{Inv}_{p,t}) + \Gamma C_{p,t} + \alpha_p + \tau_t + v_{p,t+h} \tag{9}$$

where $\log(\widehat{Inv}_{p,t})$ is the fitted log number of properties bought-to-lease from equation (8), and $s_t \times I_{HighRY,p}$ is 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 CDs rate), times a dummy equal to 1 in postcodes with average rental yield in the highest 20% across Australia.

In other words, in equations (8) and (9), we instrument the volume of properties purchased to be turned over in 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. High-yield locations are more likely to attract investment from landlords reaching for income, as discussed in Section 5.3.

Estimates of the coefficients in equations (7), (8), and (9) are reported in Table 6. 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 OLS specification in equation (7), while the other columns are devoted to the 2SLS regression equations. In particular, columns 2 and 5 report the first stage regression, equation (8), while columns 3 and 6 report the instrumental variable regression, equation (9). 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 shocks times the high-yield postcode dummy, we obtain larger magnitudes, 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 0.7% (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 B.4, 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.[26] 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

There is limited evidence in the literature on individuals' direct investments in rental properties. Using fiscal data from Australia, we document that more than one in five retirement-age individuals with median and high income are landlords, and show that this fraction has substantially increased over the last 20 years. In particular, in relative terms, the fraction of retirement-age individuals who are landlords has increased by 80%. We argue that this pattern has been driven by declines in interest rates, and by *reaching for income*. This mechanism can be characterized as a preference for consuming investment income, rather than capital gains. This makes assets paying high recurring income attractive for individuals, such as retirees, who rely on investment income to finance consumption, and especially when income from money

[26] 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 Local Government Area-level (Local Government Areas are comparable to Public Use Micro-data Areas in the U.S. Census), and for each area we calculate the fraction of land for which housing supply is constrained. We identify two land features leading to supply constraints: (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. We then obtain postcode-level supply constraints by mapping postcodes into Local Government Areas.

market and bond investments declines.

We conduct several empirical tests to show that the increase in the fraction of landlords is unlikely to be driven by house price growth or the relaxation of mortgage lending constraints. While there is an increase in rental investments, there is no effect on speculative investments (house flips) in response to interest rates declines. Moreover, the increase in rental investments in response to surprise rates cuts is larger in areas that offer higher rental yields.

Finally, as already mentioned, the increase in the fraction of landlords is highly heterogeneous across age groups. The largest increase is for retirement-age individuals, with age of 60 years old or above, and who have 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) to the rental market declines. Retirement-age individuals are the most likely to earn positive net income, after expenses, from their properties. Moreover, when looking at the composition of gross financial income, we find that, as interest rates drop, retirement-age individuals substitute dwindling interest rates payments with real estate income.

Changes in rental market participation and in the exposure of retirees to rental income have two important implications, which we test in the data. First, higher dependence on rental income makes income flows more exposed to local economic shocks. Second, higher investment in rental properties increases house prices, especially in the most supply-constrained areas of the country.

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

References

Agarwal, S., G. Amormin, I. Ben-David, S. Chomsisengphet, T. Piskorski, and A. Seru. 2017. Policy intervention in debt renegotiation: Evidence from the home affordable modification program. *Journal of Political Economy* 125:654–712.

Agarwal, S., L. Hu, and X. Huang. 2016. Rushing into the American dream? House price growth and the timing of homeownership. *Review of Finance* 13:2183–218.

Amberg, N., T. Jansson, M. Klein, and A. Rogantini Picco. 2022. Five facts about the distributional income effects of monetary policy. American Economic Review: Insights, Forthcoming.

Armona, L., A. Fuster, and B. Zafar. 2019. Home price expectations and behavior: Evidence from a randomized information experiment. *Review of Economic Studies* 86:1371–410.

Badarinza, C., J. Y. Campbell, and T. Ramadorai. 2016. International comparative household finance. *Annual Review of Economics* 8:111–44.

Badarinza, C., and T. Ramadorai. 2018. Home away from home? Foreign demand and London house prices. *Journal of Financial Economics* 130:532–55.

Baker, M., S. Nagel, and J. Wurgler. 2007. The effect of dividends on consumption. *Brookings Papers on Economic Activity* 231–92.

Bayer, P., C. Geissler, K. Mangum, and J. W. Roberts. 2020. Speculators and middlemen: The strategy and performance of investors in the housing market. *Review of Financial Studies* 33:5212–47.

Becker, B., and V. Ivashina. 2015. Reaching for yield in the bond market. *Journal of Finance* 70(5).

Case, K. E., R. J. Shiller, and A. K. Thomson. 2015. What have they been thinking? Home

buyer behavior in hot and cold markets - a 2014 update. Tech. Rep. 1876R, Cowles Foundation.

Chinco, A., and C. Mayer. 2016. Misinformed speculators and mispricing in the housing market. *Review of Financial Studies* 29:486–522.

Coibion, O., Y. Gorodnichenko, L. Kueng, and J. Slivia. 2017. Innocent bystanders? Monetary policy and inequality. *Journal of Monetary Economics* 88:70–89.

Daniel, K., L. Garlappi, and K. Xiao. 2021. Monetary policy and reaching for income. *Journal of Finance* 76:1145–167.

Demers, A., and A. L. Eisfeldt. 2021. Total returns to single family rentals. *Real Estate Economics* 50:7–32.

Deng, Y., L. Liao, J. Yu, and Y. Zhang. 2021. Capital spillover, house prices, and consumer spending: Quasi-experimental evidence from house purchase restrictions. *Review of Financial Studies (forthcoming)* .

Di Maggio, M., and M. Kacperczyk. 2017. The unintended consequences of the zero lower bound policy. *Journal of Financial Economics* 123.

Di Maggio, M., A. Kermani, and K. Majlesi. 2020. Stock market returns and consuption. *Journal of Finance* LXXV:3175–219.

Fagereng, A., L. Guiso, D. Malacrino, and L. Pistaferri. 2021. Heterogeneity and persistence in returns to wealth. *Econometrica (forthcoming)* .

Favilukis, J., and S. Van Nieuwerburgh. 2021. Out-of-town home buyers and city welfare. *Journal of Finance* 76:2577–638.

Gabriel, S., M. Iacoviello, and C. Lutz. 2020. A crisis of missed opportunities? Foreclosure

costs and mortgage modification during the great recession. *Review of Financial Studies* 34:864–906.

Gargano, A., M. Giacoletti, and E. Jarnecic. 2022. Local experiences, attention and spillovers in the housing market. Journal of Finance, forthcoming.

Garriga, C., P. Gete, and A. Tsouderou. 2021. Investors and housing affordability. Working Paper.

Gomes, F., M. Haliassos, and T. Ramadorai. 2021. Household finance. *Journal of Economic Literature* 59:919–1000.

Graham, J. R., and A. Kumar. 2006. Do dividend clienteles exist? evidence on dividend preferences of retail investors. *Journal of Finance* LXI:1305–36.

Gurun, U., J. Wu, S. C. Xiao, and S. W. Xiao. 2022. Do wall street landlords undermine renters' welfare? *Review of Financial Studies* .

Hau, H., and S. Lai. 2016. Asset allocation and monetary policy: Evidence from the eurozone. *Journal of Financial Economics* 12:309–29.

Haughwout, A., D. Lee, J. Tracy, and W. van der Klaauw. 2011. Real estate investors, the leverage cycle, and the housing market crisis. Working Paper.

Jiang, H., and Z. Sun. 2019. Reaching for dividends. *Journal of Monetary Economics* 115:321–38.

Kalouptsidi, M. 2014. Time to build and fluctuations in bulk shipping. *American Economic Review* 104:564–608.

Kaplan, G., K. Mitman, and G. L. Voilante. 2020. The housing boom and bust: Model meets evidence. *Journal of Political Economy* 128:3285–345.

Keys, B. J., T. Piskorski, A. Seru, and V. Vig. 2013. *Mortgage financing in the housing boom and bust*, 143–204. National Bureau of Economic Research.

Keys, B. J., A. Seru, and V. Vig. 2012. Lender screening and the role of securitization: Evidence from prime and subprime mortgage markets. *Review of Financial Studies* 25:2071–108.

Korevaar, M. 2021. Reaching for yield: How investors amplify housing booms and busts. Working Paper.

Kuchler, T., and B. Zafar. 2019. Personal experiences and expectations about aggregate outcomes. *Journal of Finance* 74:2491–542.

Kuhn, M., M. Schularick, and U. I. Steins. 2020. Income and wealth inequality in america, 1949–2016. *Journal of Political Economy* 128:3469–519.

Lian, C., Y. Ma, and C. Wang. 2019. Low interest rates and risk-taking: Evidence from individual investment decisions. *Review of Financial studies* 32:2107–48.

Meghir, C., and L. Pistaferri. 2011. *Handbook of labor economics*, chap. Chapter 9 - earnings, consumption and life cycle choices. Elsevier.

Mian, A., and A. Sufi. 2011. House prices, home equity-based borrowing, and the U.S. household leverage crisis. *The American Economic Review* 101:2132–56.

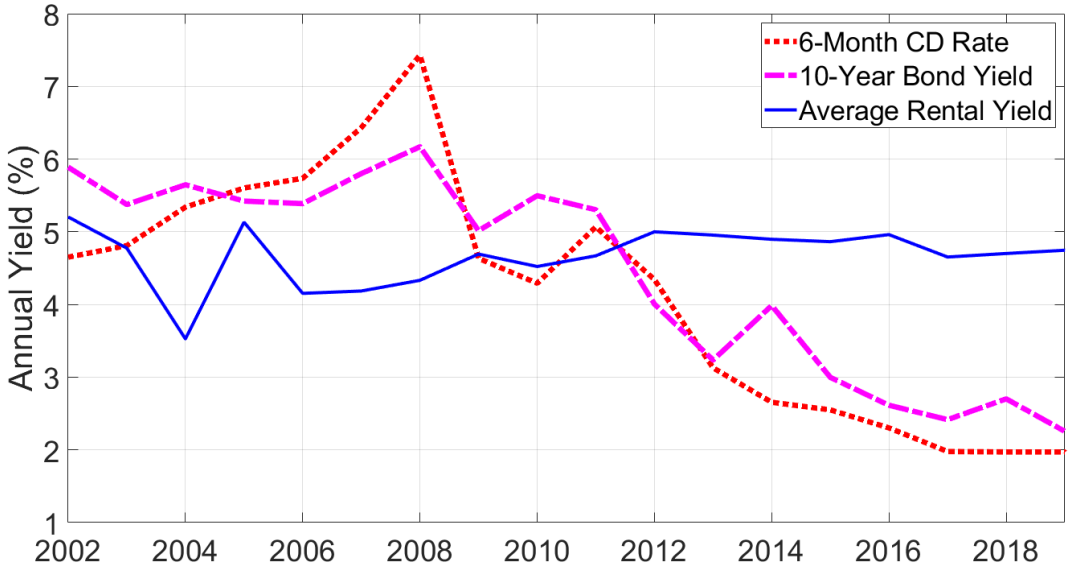
Nickell, S. 1981. Biases in dynamic models with fixed effects. *Econometrica* 49:1417–26.

Peydro, L. J., A. L. Andersen, N. Johannesen, and M. Jorgensen. 2021. Monetary policy and inequality. Working Paper.

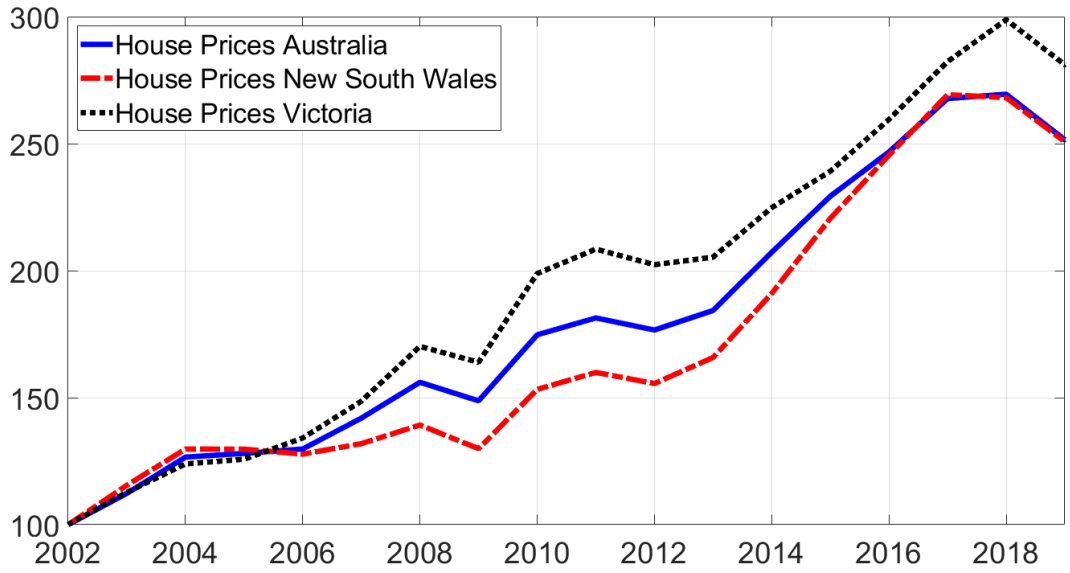
Piazzesi, M., and M. Schneider. 2016. Housing and macroeconomics. In J. Taylor and H. Uhlig, eds., *Handbook of Macroeconomics*, vol. 2, 1547–640. Elsevier.

Smith, M., O. Zidar, and E. Zwick. 2020. Top wealth in America: New estimates and implications for taxing the rich. Working Paper.

te Kaat, D. M., C. Ma, and A. Rebucci. 2021. Real effects of the ECB's quantitative easing: A housing portfolio channel. Working Paper.

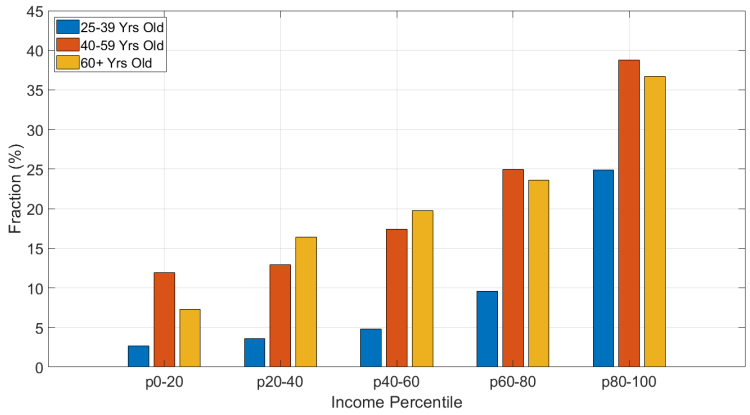


(a) Annualized Yields

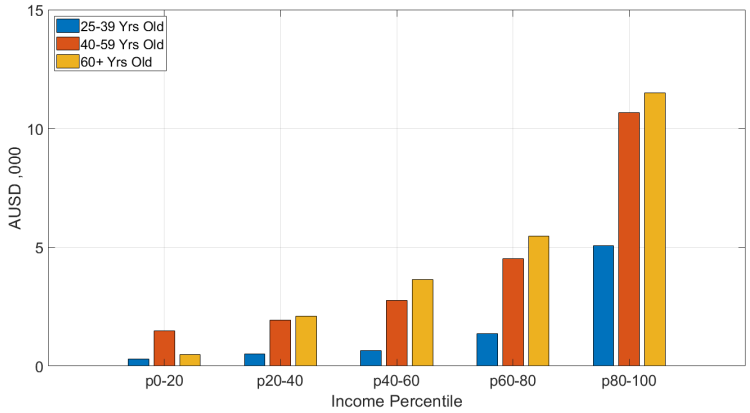


(b) House Price Indices

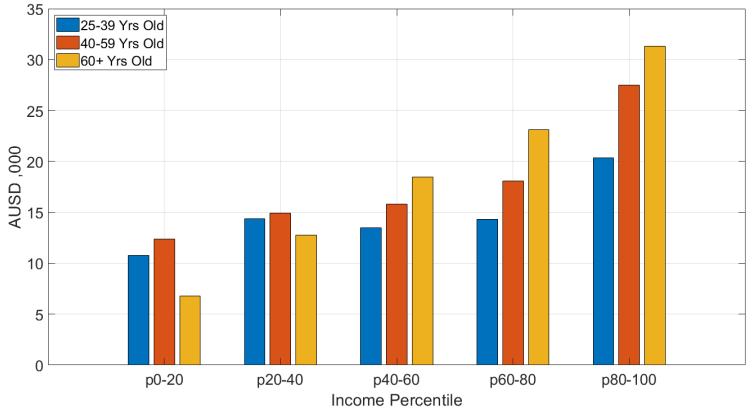
Figure 1: Panel (a) of the figure reports the time series of annualized 6-month certificates of deposit rates, 10-year government bond yields, and average rental yields, for the years from 2002 to 2019. Average rental yields are calculated as the average rental yields across postcodes, and postcode yields are computed as the ratio of median annual rent and the price for the median house in the postcode, based on indices provided by CoreLogic. Panel (b) reports the evolution 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.



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

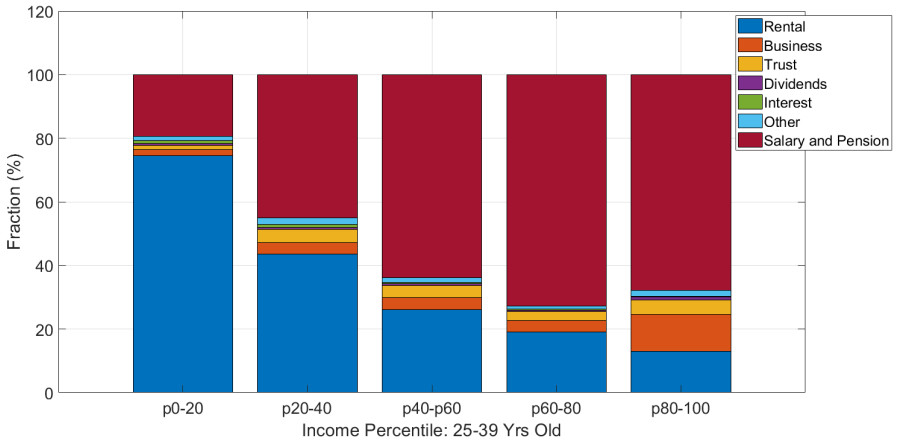


(b) Rental Income, by Income within Age Groups (2017:2019)

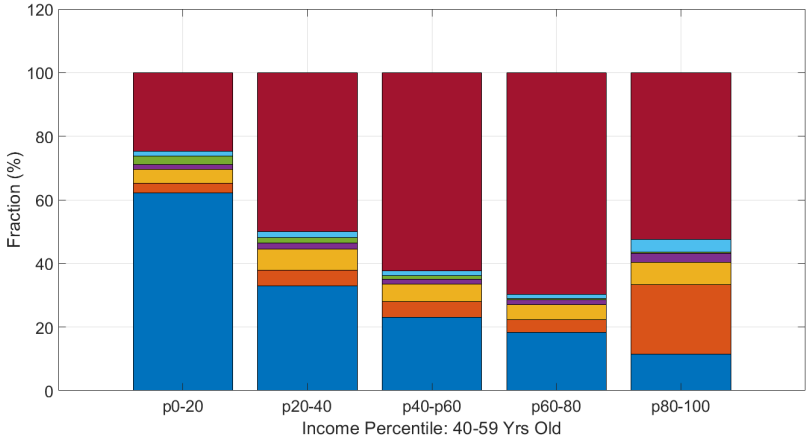


(c) Rental Income (for Landlords), by Income within Age Groups (2017:2019)

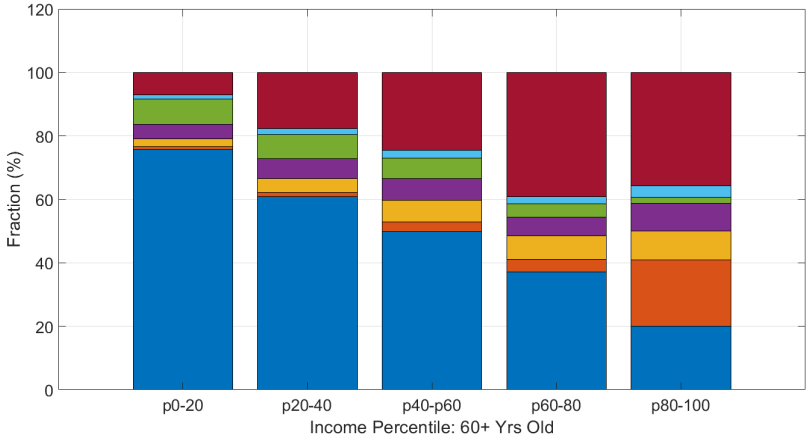
Figure 2: The figure shows the fraction of landlords (panel a), average rental income across all individuals, including non-landlords (panel b), and average rental income for landlords (panel c), across income quintiles for three age groups: 25 to 39 (young), 40 to 59 (middle age), and 60 and older (retirement age). The results are based on the ATO individual 1% sample for the years from 2017 to 2019. All income estimates are expressed in terms of 2019 Australian Dollars.



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

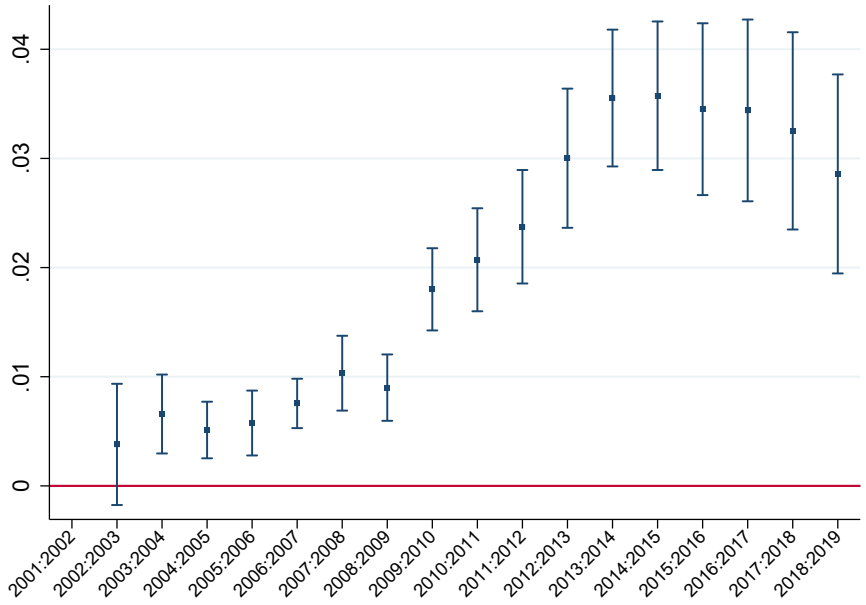


(b) Income Composition, for Middle Age Landlords (2017:2019)

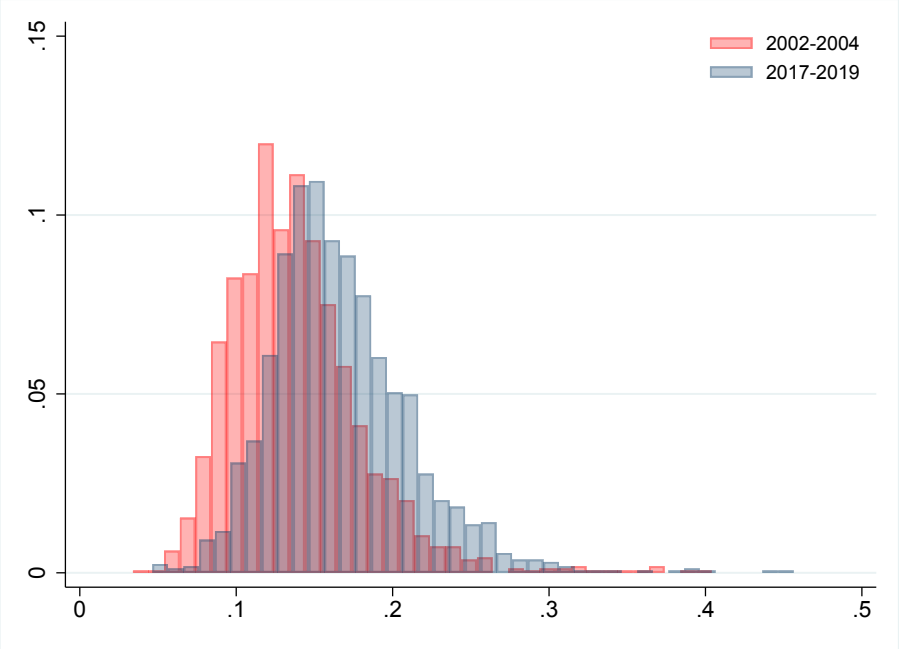


(c) Income Composition, for Retirement Age Landlords (2017:2019)

Figure 3: The figure shows the composition of gross income for landlords, across income quintiles 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 estimates are based on income expressed in terms of 2019 Australian Dollars.



(a) Fraction of Landlords Time-Series Pattens

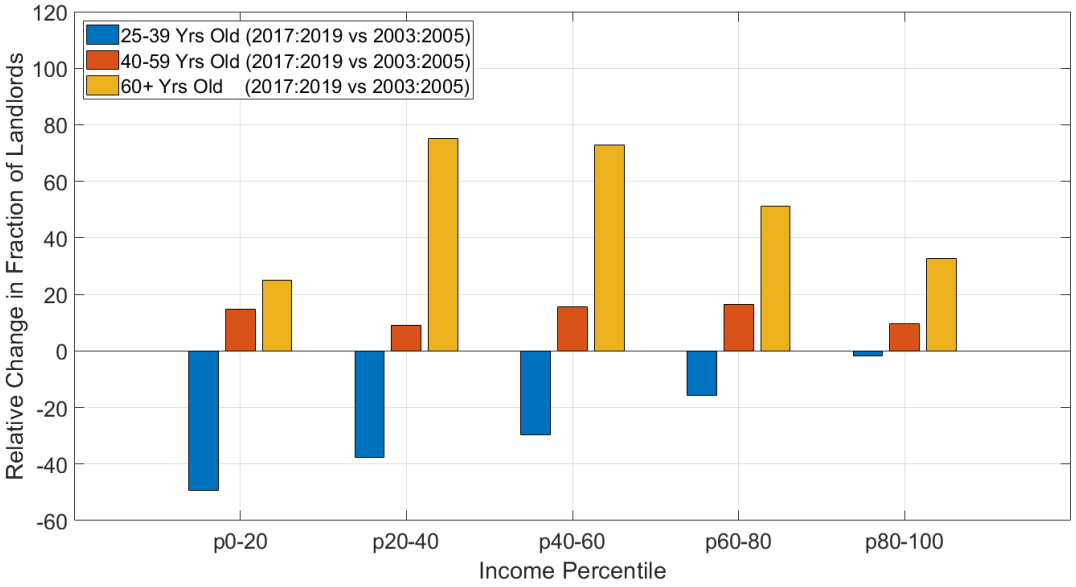


(b) Fraction of Landlords by Postcode (2015:2019 vs 2003:2007)

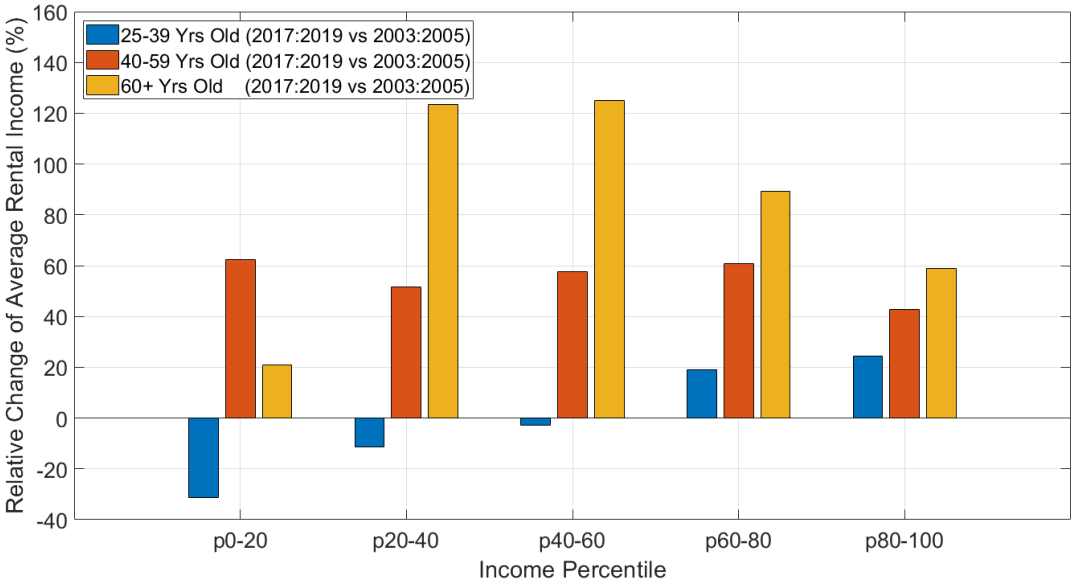
Figure 4: Panel (a) shows the coefficients δ_t from the following regression equation:

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

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 5: 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).

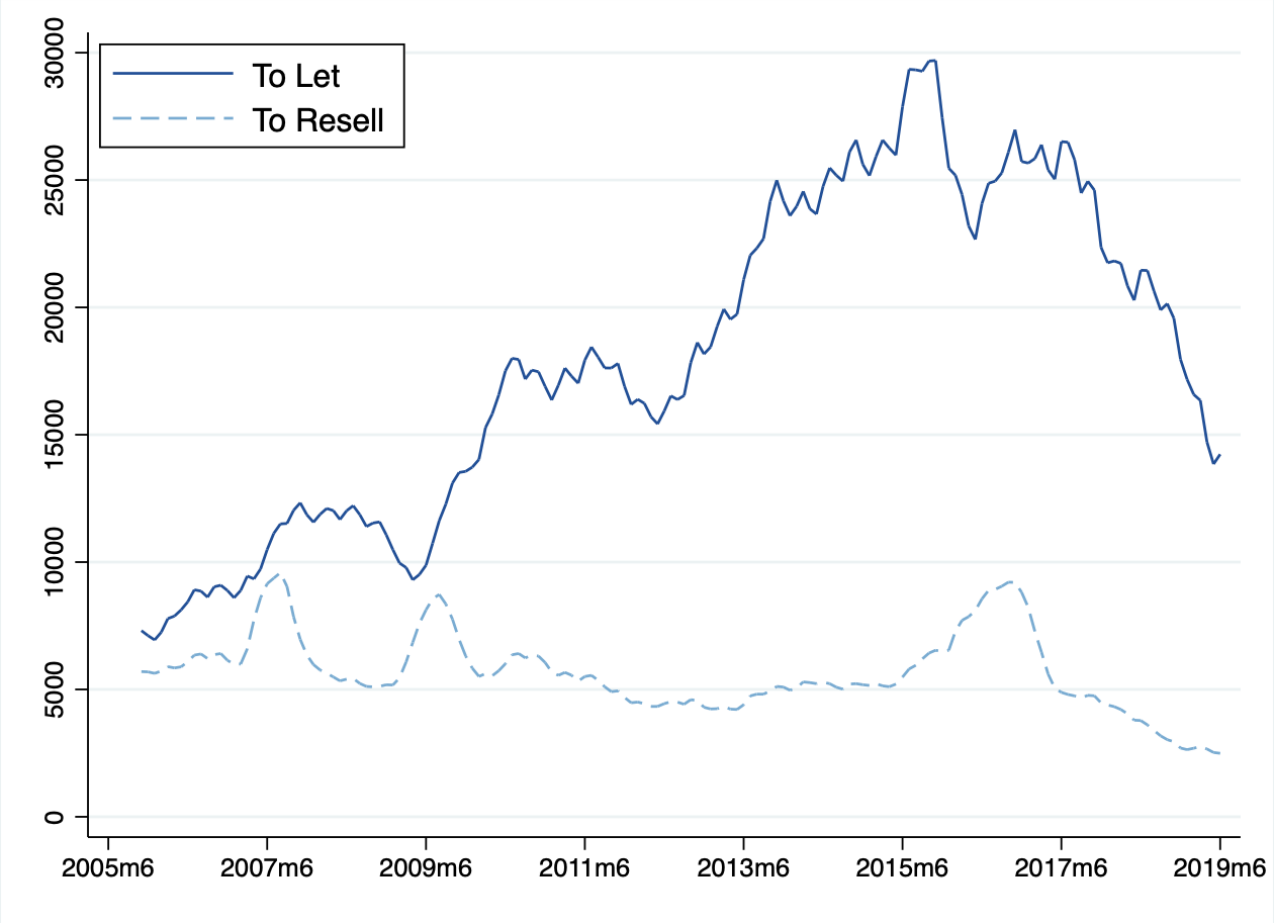
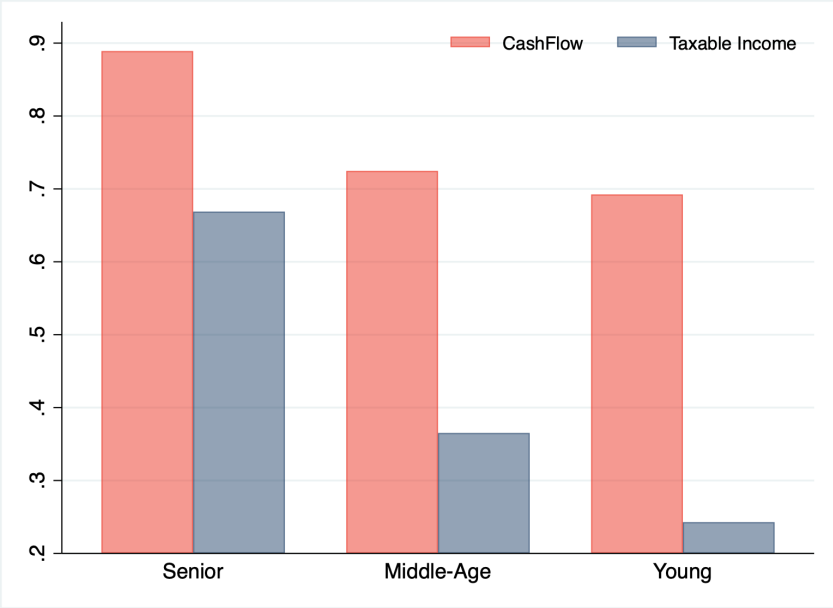
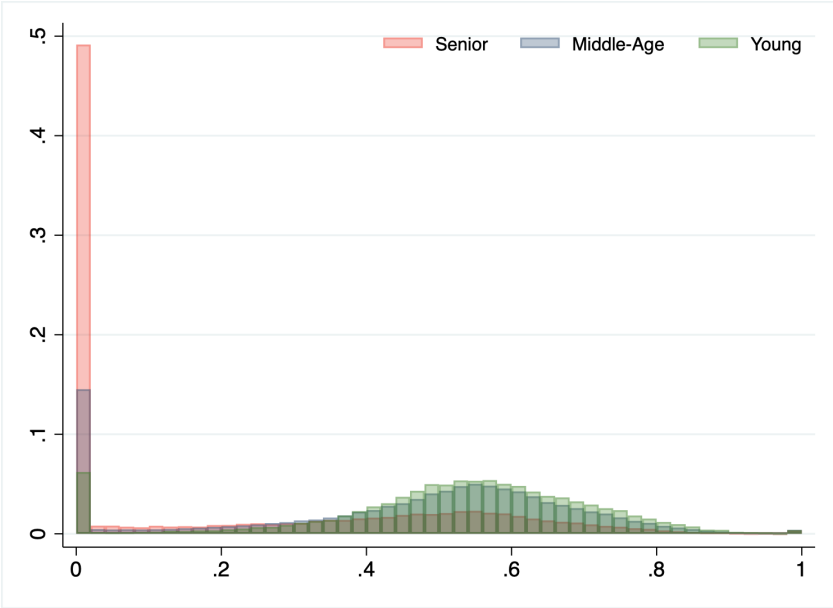


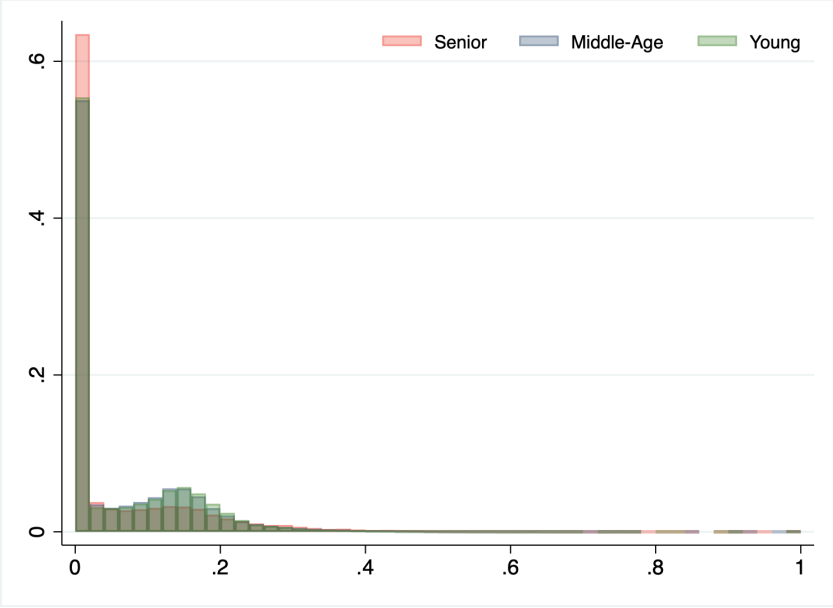
Figure 6: The figure shows the 6-month moving sum of the number of buy-to-let (blue solid line) and buy-to-resell (blue dashed line) properties. We identify a sale as *bought-to-let* if the property is listed for rent within 9 months from the sale, as *bought-to-resell* if the property is either listed for sale or sold within 9 months from the sale.



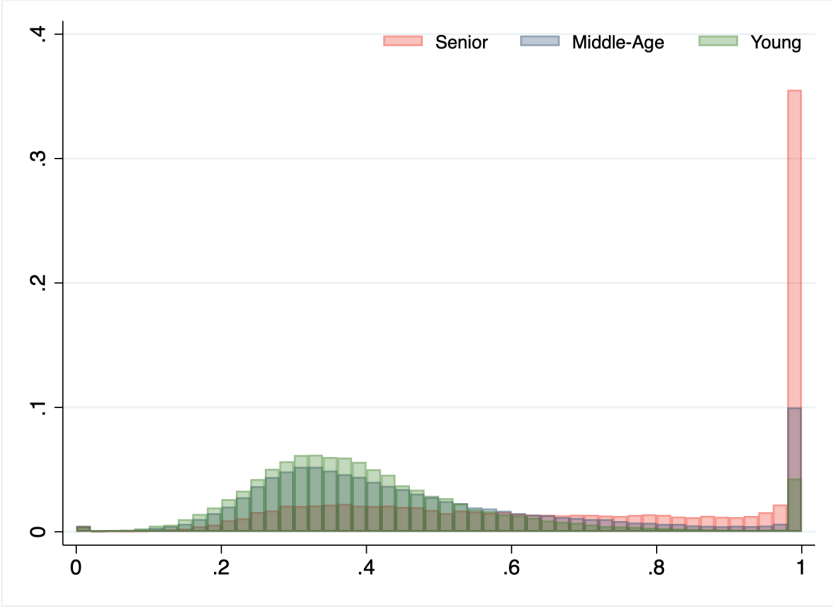
(a) Fraction of individuals declaring positive income



(b) Interest



(c) Capital Works



(d) Other

Figure 7: Panel a) displays the fraction of individuals declaring positive rental cash-flows (i.e., the difference between gross rental income and the sum of interest and capital works) and taxable income (i.e., the difference between gross rental income and the sum of interest, capital works and other deductions). Panels b), c) and d) displays the contribution of each component of total deductions: interest, capital works and other. All estimates are based on values expressed in terms of 2019 Australian Dollars and are based on the 2017-2019 period.

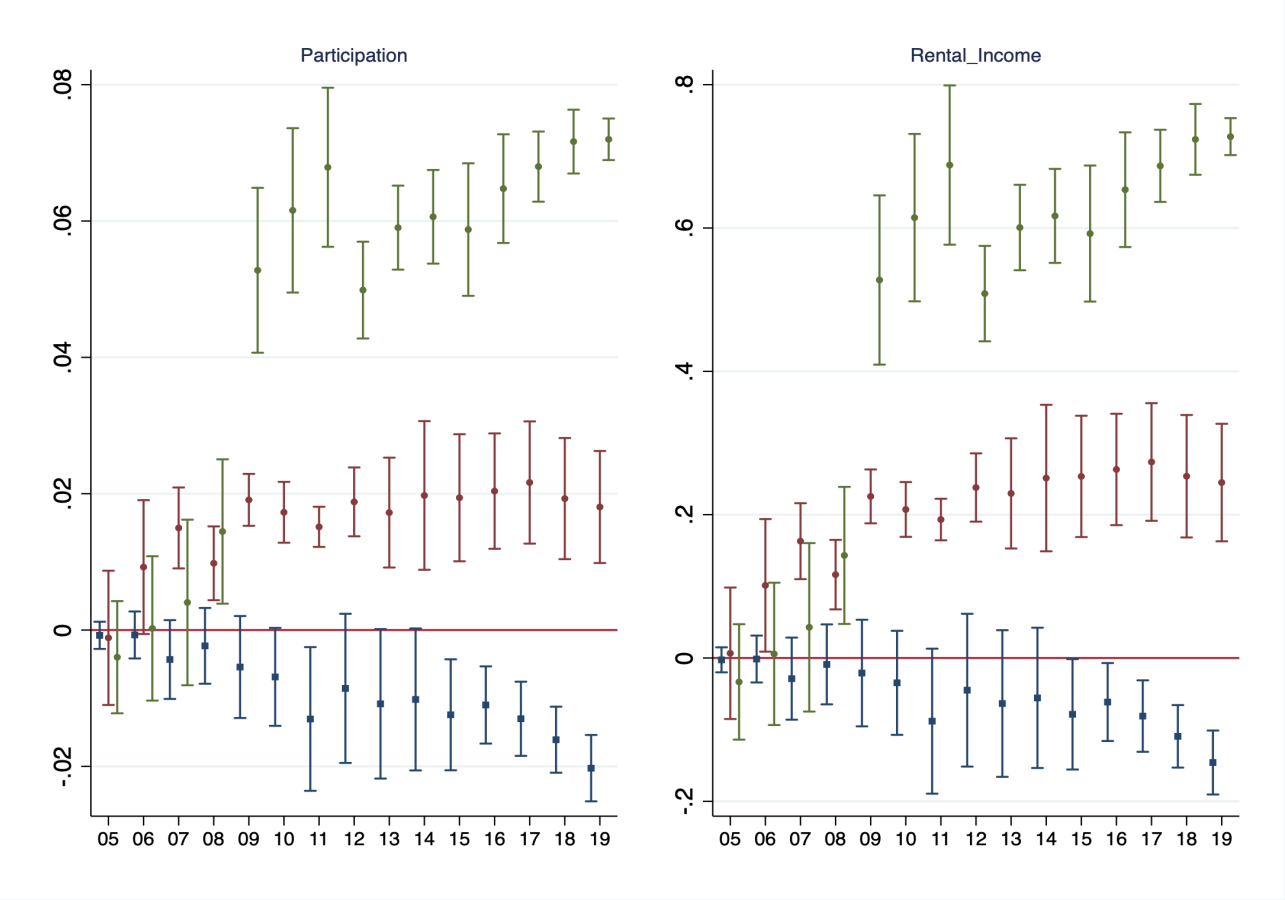


Figure 8: The figure displays estimates of the parameters $\delta_{\tau \times Young}$ (blue), $\delta_{\tau \times Mid}$ (red) and $\delta_{\tau \times Senior}$ (green) from the following regression equation, estimated on data from individual tax filings:

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

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 equal to one 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 η_l 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.

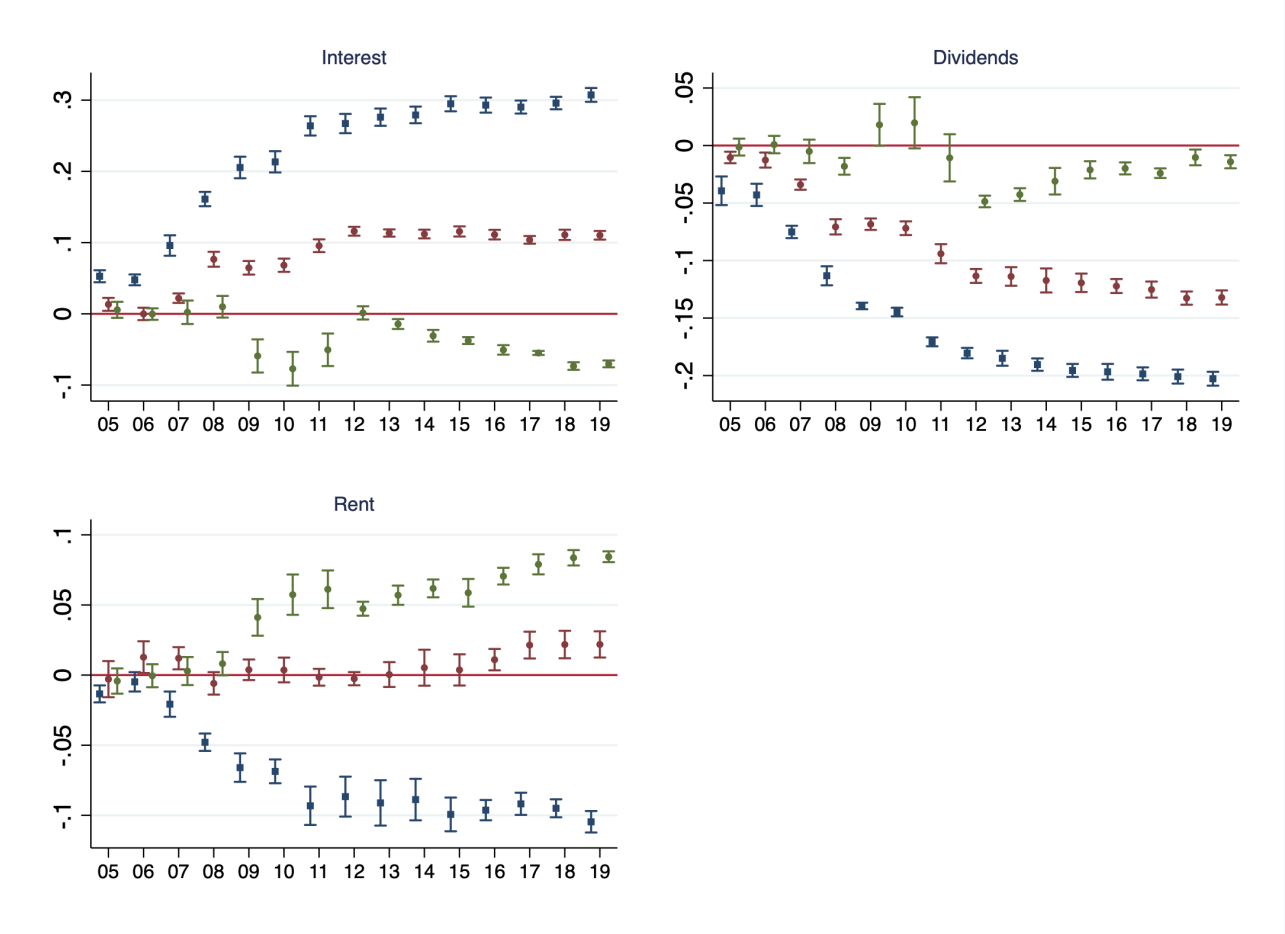


Figure 9: The figure displays estimates of the parameters $\delta_{\tau \times Young}$ (blue), $\delta_{\tau \times Mid}$ (red) and $\delta_{\tau \times Old}$ (green) from the following regression equation, estimated on data from individual tax filings:

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

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 equal to one 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 η_l 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.

Table 1: **Summary Statistics**

	Avg	Std	1st	10th	25th	50th	75th	90th	99th
Panel A: Non Financial Income									
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 individual tax filings in our sample. All variables are expressed in terms of 2019 Australian Dollar (in thousands). For each variable, we report the mean, standard deviation, and the $1st$, $10th$, $25th$, $50th$, $75th$, $90th$ and $99th$ percentiles. *Salary* includes salary or wages (income item 1 of the tax form) plus allowances (item 2) and employment termination payments (item 3); *Pension* includes government pensions and allowances (item 6 of the 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)
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)
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 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 Mkt Ret, the average daily stock market return over year t; Bus Cond Index, 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 change in 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: **Investment Activity and Rates**

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Buy to Lease					
ΔYld CD6m	-1.341					
	(-1.06)					
ΔYld Bond2yr		-1.028				
		(-0.67)				
ΔYld Bond10yr			-2.821*			
			(-1.89)			
ShockRate6mCD				-4.560**		
				(-2.03)		
ShockBond2Yr					-5.569***	
					(-3.96)	
ShockBond10Yr						-2.276*
						(-1.78)
Controls	YES	YES	YES	YES	YES	YES
Postcode FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.422	0.417	0.438	0.460	0.476	0.443
N	17916	17916	17916	17916	17916	17916
	Panel B: Buy to Resell (Flipping)					
ΔYld CD6m	0.178					
	(0.87)					
ΔYld Bond2yr		0.367				
		(1.48)				
ΔYld Bond10yr			0.395			
			(1.24)			
ShockRate6mCD				0.385		
				(0.92)		
ShockBond2Yr					-0.034	
					(-0.10)	
ShockBond10Yr						0.078
						(0.38)
Controls	YES	YES	YES	YES	YES	YES
Postcode FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.136	0.137	0.137	0.137	0.135	0.135
N	17916	17916	17916	17916	17916	17916

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 $FracInv_{i,t}$ is the fraction of buy-to-let (Panel A) or buy-to-resell (Panel B) sales out of all sales in postcode i in fiscal year t. We identify a property as *bought-to-let* if the property is listed for rent within 9 months from the sale, as *bought-to-resell* if the property is either listed for sale or sold within 9 months from the sale. 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 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 Mkt Ret, the average daily stock market return over year t; Bus Cond Index, 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 change in 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 4: **Differences Across Locations**

	(1)	(2)	(3)	(4)	(5)	(6)
	Fraction of Landlords			Fraction Buy-to-Lease		
Shock CD6m $\times Senior_{2005}$	-2.013*					
	(-1.65)					
Shock Bond2yr $\times Senior_{2005}$		-1.929**				
		(-2.23)				
Shock Bond10yr $\times Senior_{2005}$			−2.176**			
			(-2.50)			
Shock CD6m $\times RY_{2005}$				-0.994		
				(-1.45)		
Shock Bond2yr $\times RY_{2005}$					-1.548***	
					(-2.71)	
Shock Bond10yr $\times RY_{2005}$						-1.447***
						(-3.16)
Other Controls	YES	YES	YES	YES	YES	YES
R-Square adj	0.91	0.91	0.91	0.57	0.57	0.57
N	30507	30507	30507	17916	17916	17916

This table reports estimates of the coefficients from regression equations:

$$FracLL_{i,t} = \gamma_{y,Senior}\left(s_t \times \phi_{Senior2005,i}\right) + \mathcal{B}_X X_{i,t} + \alpha_t + \alpha_i + u_{i,t} \quad Columns\ 1\ to\ 3$$
$$FracBuyToLet_{i,t} = \gamma_{y,RY}\left(s_t \times RY_{2005,i}\right) + \mathcal{B}_X X_{i,t} + \alpha_t + \alpha_i + e_{i,t} \quad Columns\ 4\ to\ 6$$

where $FracLL_{i,t}$ is the fraction of landlords (out of all residents) in postcode i in fiscal year t; $FracBuyToLet_{i,t}$ is, our of all properties purchased in postcode i and year t, the fraction of properties re-listed as rentals within 9 months; s_t is the shock to rates around policy announcements for the 6-month CDs, for the the 2-year bond or for the 10-year bond; $\phi_{Senior2005,i}$ is the fraction of individual with age greater or equal than 40 in postcode i in 2005; $RY_{2005,i}$ is the average rental yield, in percentage, for postcode i between 2000 and 2005; α_i and α_t are postcode and year fixed effect and $X_{i,t}$ is a vector of controls, including Pop Growth, the change in 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 5: **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
	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:

$$\log(Inc_{i,t}) = b_1 log(P_{IO,t-1}) + BX_i + \alpha_t + e_i \qquad Columns\ 1\ to\ 4$$
$$\log(Inc_{i,t}) = b_1 log(P_{IO,t-1}) + b_2\left(log(P_{IO}) \times I(Landlord_i)\right) + b_3 I(Landlord_i) + BX_i + \alpha_t + u_i\ Column\ 5$$

where $\log(Inc_{i,t})$ is either log gross rental income, log dividends, log interest income, log salary or pension, or log total income for individual i in fiscal year t, $P_{IO,t-1}$ 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 X_i 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 2004 to fiscal year 2019. Standard errors are clustered by year.

Table 6: **Real Effects on Prices and Rents**

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Prices					
	$\Delta p_{t,t+12m}$	$\log(Inv_t)$	$\Delta p_{t,t+12m}$	$\Delta p_{t,t+12m}$	$\log(Inv_t)$	$\Delta p_{t,t+12m}$
	OLS	OLS	IV	OLS	OLS	IV
$\log(Inv_{p,t})$	0.020***		0.414***	0.014***		0.365***
	(9.66)		(3.26)	(9.82)		(3.37)
$Shock_{CD6m,t} \times I(HighRY)_p$		7.245**			5.966**	
		(2.33)			(2.35)	
$\Delta p_{t-12m,t}$				-0.199***	0.232***	-0.286***
				(-10.93)	(9.09)	(-9.66)
$\log(Volume_{p,t})$				0.118***	0.335***	0.002
				(13.22)	(16.73)	(0.04)
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	185411	213411	182929	182628	186436	180330
	Panel B: Rental Yields					
	$\Delta ry_{t,t+12m}$	$\log(Inv_t)$	$\Delta ry_{t,t+12m}$	$\Delta ry_{t,t+12m}$	$\log(Inv_t)$	$\Delta ry_{t,t+12m}$
	OLS	OLS	IV	OLS	OLS	IV
$\log(Inv_{p,t})$	-0.014***		-0.826	-0.011***		-0.699**
	(-8.83)		(-1.57)	(-9.00)		(-2.05)
$Shock_{CD6m,t} \times I(HighRY)_p$		7.245**			5.966**	
		(2.33)			(2.35)	
$\Delta p_{t-12m,t}$				0.203***	0.232***	0.429***
				(11.47)	(9.09)	(3.81)
$\log(Volume_{p,t})$				-0.076***	0.335***	0.218
				(-10.88)	(16.73)	(1.49)
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	154934	213411	153242	154537	186436	152888

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

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

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

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

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 month t - 12 and month 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 Additional Figures and Tables

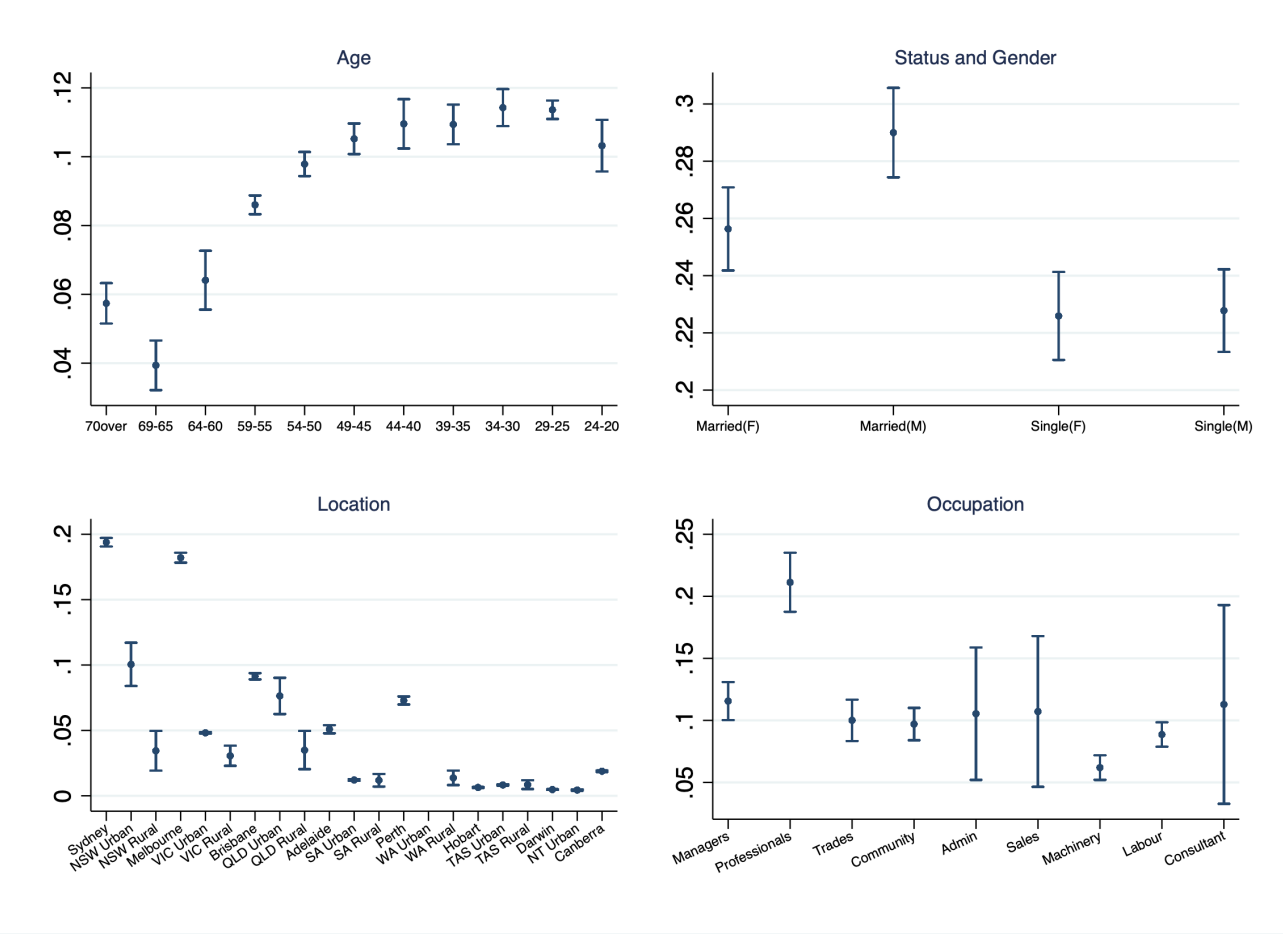


Figure B.1: This figure displays the composition of our sample from the ATO individual tax filings, in terms of age, status and gender, location and occupation. Each year we compute the fraction of individuals in a given age (top-left), status and gender (top-right), location (bottom-left) and occupation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

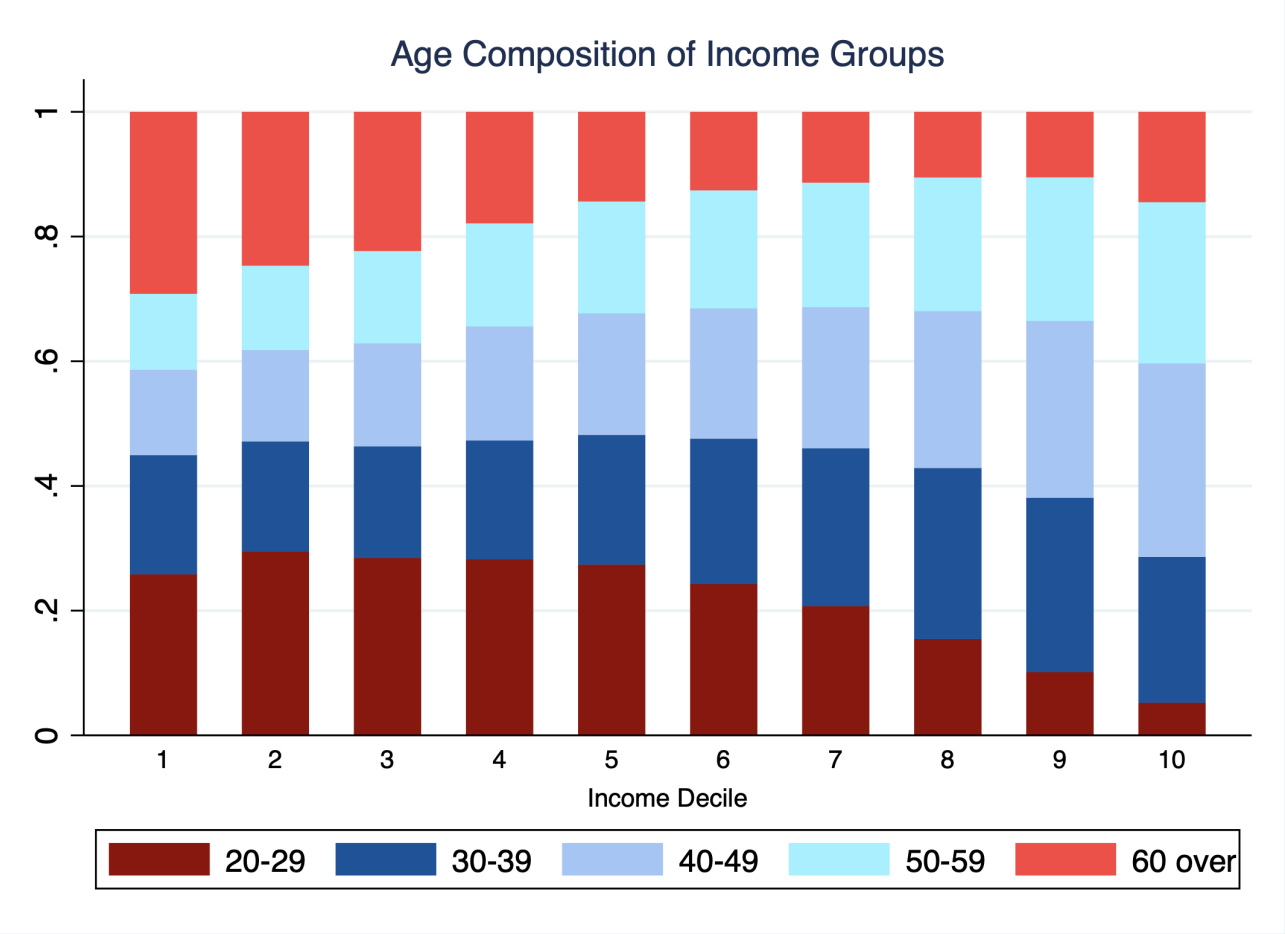
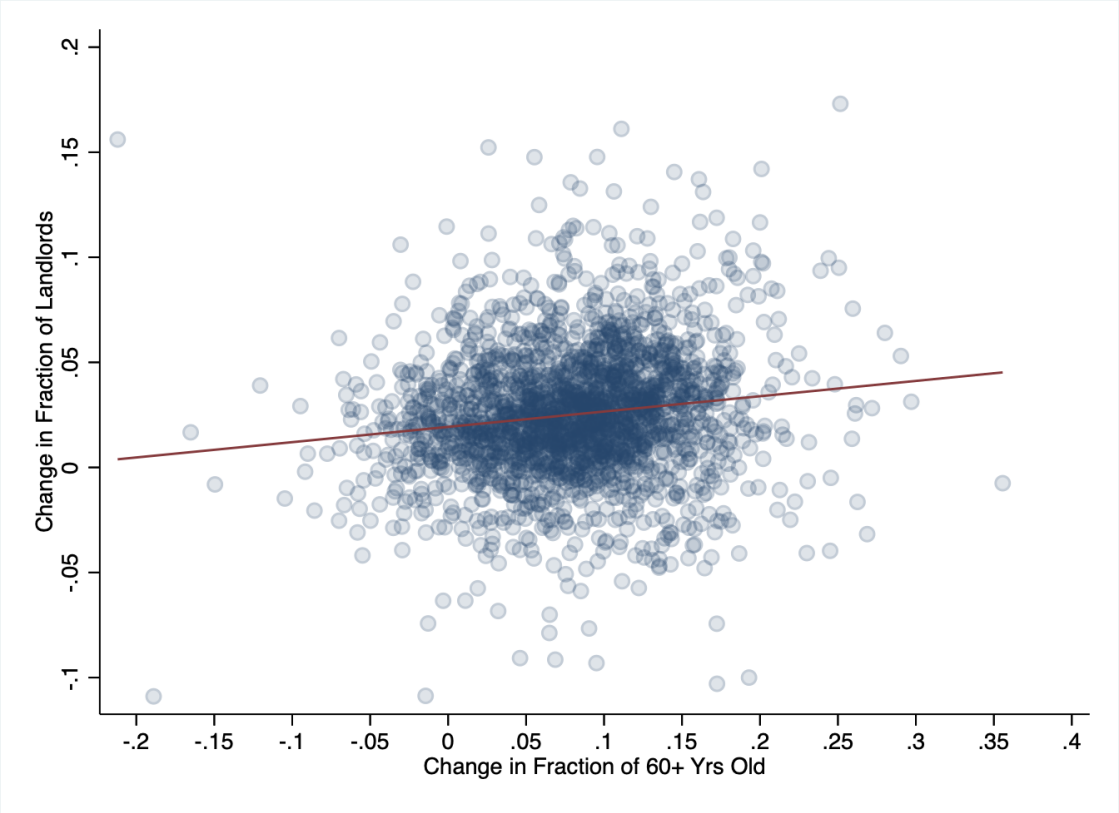
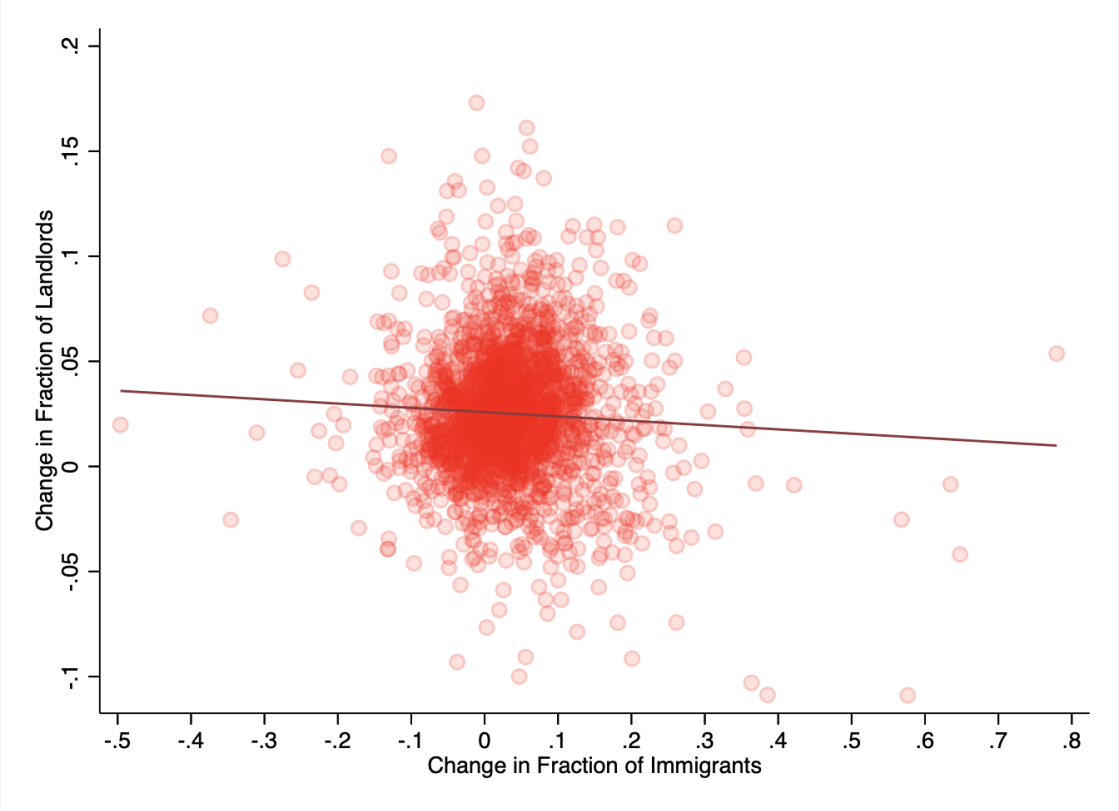


Figure B.2: This figure displays the age composition across income deciles for the sample of ATO individual tax filings.



(a) Δ 60+ Yrs Old and Δ Landlords ($R^2 = 2.12\%$)



(b) Δ Immigrants and Δ Landlords ($R^2 = 0.14\%$)

Figure B.3: The figure shows the postcode-level relationship between the change in the fraction of landlords from 2003-2005 to 2017-2019, and the change in the fraction of 60+ years old individuals (panel a) and the fraction of immigrants (panel b) between 2006 and 2019. Data on residents' age and immigration status are available from the Australian Bureau of Statistics.

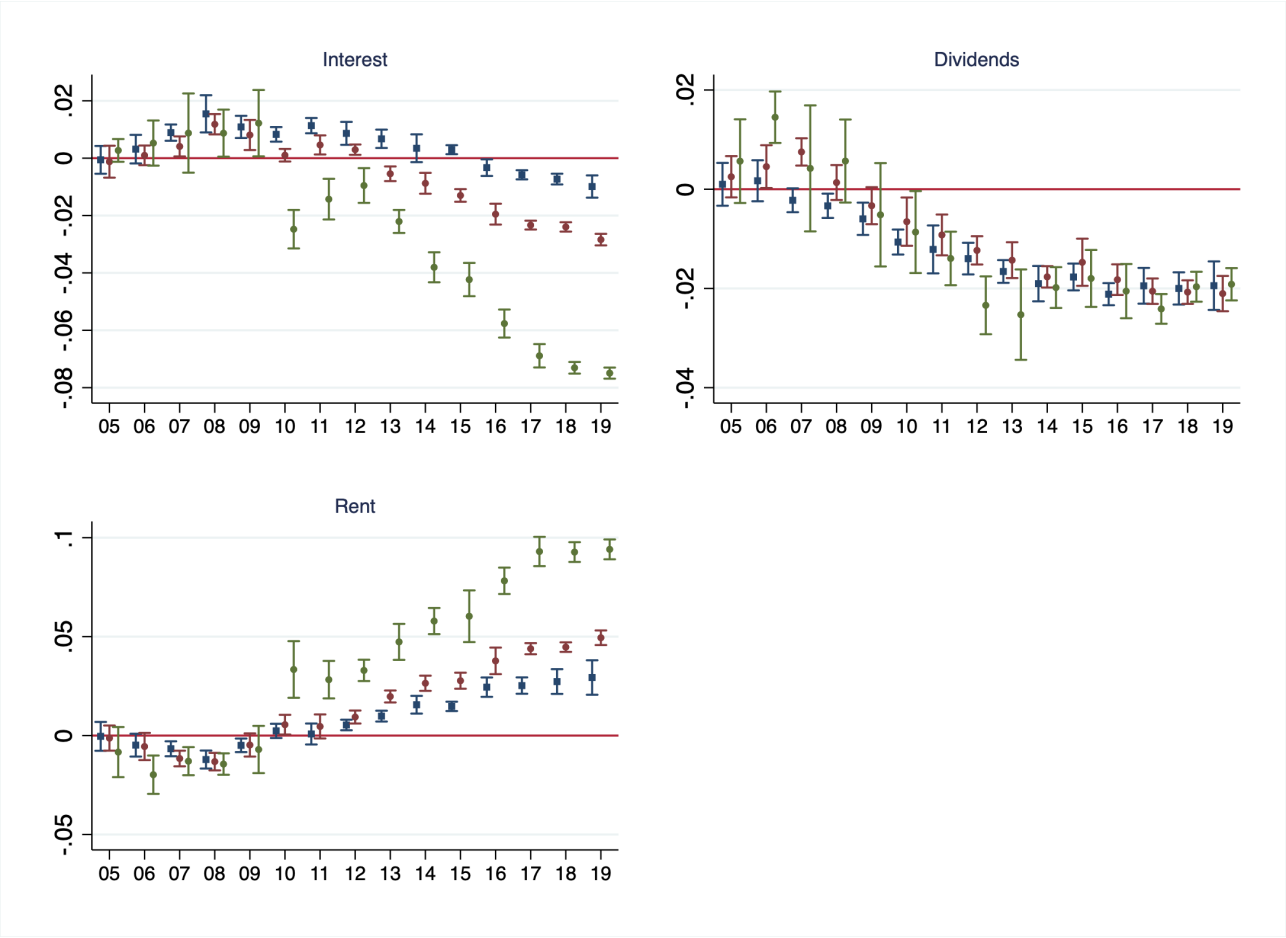


Figure B.4: This figure displays estimates of the parameters $\delta_{\tau \times Young}$ (blue), $\delta_{\tau \times Mid}$ (red) and $\delta_{\tau \times Senior}$ (green) from the following regression equation, estimated on data from individual tax filings for landlords:

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

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 equal to one 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 η_l 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.

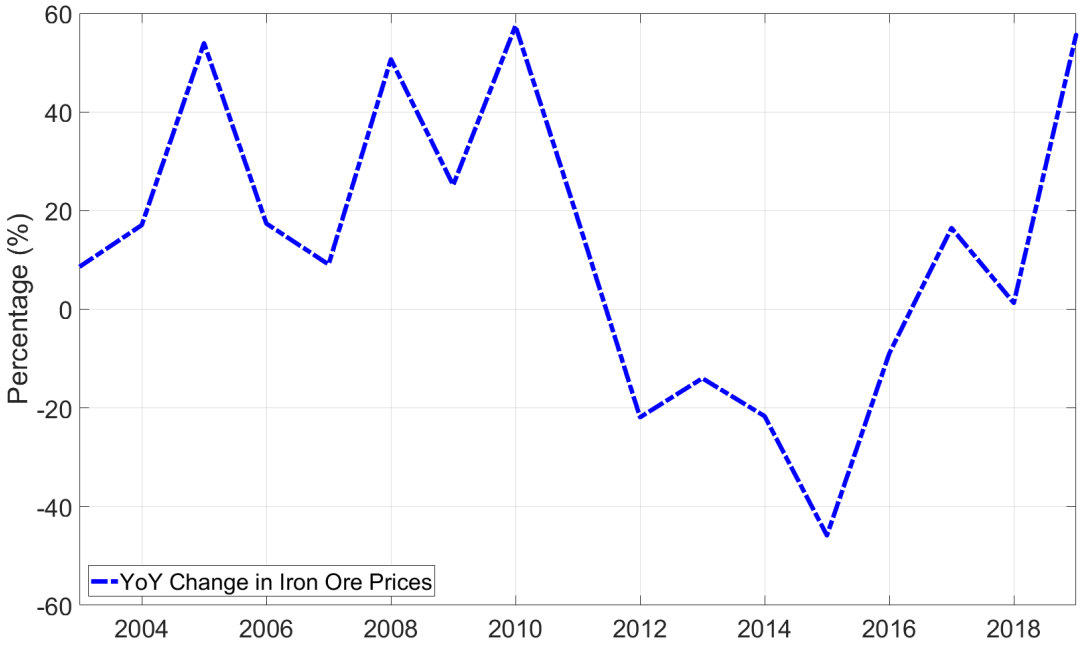


Figure B.5: The figure reports year-over-year percentage changes in iron ore prices (in year t, this is the change between year t-1 and t). Years are aligned with Australian fiscal years, and so begin in July and end in June. Iron ore prices are spot prices for shipments with 62% Fe content to Chinese ports (specifically, the CFR Tianjin port), and are quoted in terms of US Dollars per metric ton.

Table B.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 characteristics properties in the sales and rental listings data provided by Corelogic. For each characteristic, we report the mean, standard deviation, and the $1st$, $10th$, $25th$, $50th$, $75th$, $90th$ and $99th$ percentiles. *Price* is the sale price (in AUD thousands); *Rent* is the monthly asked rent (in AUD thousands); *Bedrooms*, *Bathrooms* and *Car spaes* are the number of bedrooms, the number of bathrooms and car spaces.

Table B.2: **Landlords and Rates: Urban Areas**

	(1)	(2)	(3)	(4)	(5)	(6)
ΔYld CD6m	-0.467					
	(-1.26)					
ΔYld Bond2yr		-0.472				
		(-1.14)				
ΔYld Bond10yr			-0.972**			
			(-2.12)			
ShockRate6mCD				-1.698***		
				(-2.93)		
ShockBond2Yr					-2.010***	
					(-6.50)	
ShockBond10Yr						-0.896***
						(-2.41)
Pop Growth	0.017	0.011	0.022	0.023	-0.021	-0.029
	(0.74)	(0.44)	(0.88)	(0.92)	(-0.79)	(-1.13)
Δ Mtg Credit Spread	0.006	-0.232	-0.643	-0.495	-1.030***	-0.504
	(0.01)	(-0.54)	(-1.60)	(-1.47)	(-3.11)	(-1.38)
Δ House Price	-0.030***	-0.030***	-0.029***	-0.024***	-0.024***	-0.028***
	(-4.87)	(-4.78)	(-5.04)	(-2.96)	(-4.52)	(-4.95)
Δ Div Yld	-0.834	-0.818	-0.812	-1.116	-0.457	-0.361
	(-1.04)	(-1.03)	(-1.10)	(-1.59)	(-0.76)	(-0.53)
Stock Mkt Ret	-0.005	-0.001	-0.002	-0.013	-0.011	-0.007
	(-0.19)	(-0.06)	(-0.09)	(-0.72)	(-0.52)	(-0.29)
Bus Cond Index	-0.009	-0.009	-0.011	0.003	0.038	0.002
	(-0.28)	(-0.27)	(-0.40)	(0.12)	(1.22)	(0.04)
R-Square adj	0.874	0.873	0.878	0.889	0.892	0.882
N	20,044	20,044	20,044	20,044	20,044	20,044

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 Mkt Ret, the average daily stock market return over year t; Bus Cond Index, 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 change in 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 B.3: **Investment Activity and Rates: Urban Areas**

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Buy to Lease					
ΔYld CD6m	-1.552					
	(-1.07)					
ΔYld Bond2yr		-1.156				
		(-0.66)				
ΔYld Bond10yr			-3.259*			
			(-1.91)			
ShockRate6mCD				-5.171**		
				(-1.99)		
ShockBond2Yr					-6.391***	
					(-3.90)	
ShockBond10Yr						-2.625*
						(-1.80)
Controls	YES	YES	YES	YES	YES	YES
Postcode FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.352	0.345	0.373	0.400	0.422	0.380
N	12019	12019	12019	12019	12019	12019
	Panel B: Buy to Resell					
ΔYld CD6m	0.156					
	(0.60)					
ΔYld Bond2yr		0.343				
		(1.15)				
ΔYld Bond10yr			0.438			
			(1.12)			
ShockRate6mCD				0.627		
				(1.28)		
ShockBond2Yr					0.321	
					(0.82)	
ShockBond10Yr						0.208
						(0.97)
Controls	YES	YES	YES	YES	YES	YES
Postcode FE	YES	YES	YES	YES	YES	YES
R-Square adj	0.150	0.152	0.153	0.154	0.151	0.151
N	12019	12019	12019	12019	12019	12019

This table reports estimates of the coefficients from regression equation:

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

where $FracInv_{i,t}$ is the fraction of buy-to-let (Panel A) or buy-to-resell (Panel B) sales out of all sales in postcode i in fiscal year t. We identify a property as *bought-to-let* if the property is listed for rent within 9 months from the sale, as *bought-to-resell* if the property is either listed for sale or sold within 9 months from the sale. 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 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 Mkt Ret, the average daily stock market return over year t; Bus Cond Index, 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 change in 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 B.4: **Real Effects on Prices and Rents: Low Supply Elasticity**

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Prices					
	$\Delta p_{t,t+12m}$ OLS	$\log(Inv_t)$ OLS	$\Delta p_{t,t+12m}$ IV	$\Delta p_{t,t+12m}$ OLS	$\log(Inv_t)$ OLS	$\Delta p_{t,t+12m}$ IV
$\log(Inv_{p,t})$	0.025***		0.631***	0.013***		0.735**
	(7.28)		(3.19)	(6.17)		(2.55)
$Shock_{CD6m,t} \times I(HighRY)_p$		7.758***			4.755**	
		(2.99)			(2.25)	
$\Delta p_{t-12m,t}$				-0.133***	0.186***	-0.277***
				(-4.63)	(4.47)	(-4.94)
$\log(Volume_{p,t})$				0.139***	0.335***	-0.092
				(8.87)	(9.68)	(-0.93)
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	44913	48132	42431	44239	43246	41941
	Panel B: Rental Yields					
	$\Delta ry_{t,t+12m}$ OLS	$\log(Inv_t)$ OLS	$\Delta ry_{t,t+12m}$ IV	$\Delta ry_{t,t+12m}$ OLS	$\log(Inv_t)$ OLS	$\Delta ry_{t,t+12m}$ IV
$\log(Inv_{p,t})$	-0.014***		-0.491*	-0.010***		-0.626*
	(-5.85)		(-1.96)	(-5.10)		(-1.73)
$Shock_{CD6m,t} \times I(HighRY)_p$		7.758***			4.755**	
		(2.99)			(2.25)	
$\Delta p_{t-12m,t}$				0.215***	0.186***	0.354***
				(8.47)	(4.47)	(4.60)
$\log(Volume_{p,t})$				-0.092***	0.335***	0.174
				(-6.96)	(9.68)	(1.06)
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	37764	48132	36072	37605	43246	35956

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:

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

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

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

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 month t - 12 and month 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.