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Australia's Growth in Households and House Prices

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Real house prices rise in Australia amid growing concern of an impending correction. This paper explains why the household formation rate has risen with strong population growth due to higher net immigration and average household size levelling due to population ageing. An intertemporal model is developed to analyse the effect of an increase in the household formation rate on the housing market. We find that real house prices rise over time if the rate of household formation outstrips the rate of housing supply. Under forward looking expectations, a rising household formation rate could explain rising real house prices relative to the present discounted value of future wages. The results explain why real house prices may exhibit an upward trend despite population ageing and how government planning could have an impact.

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Australia's growth in households and house prices

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Abstract

Real house prices rise in Australia amid growing concern of an impending correction. This paper explains why the household formation rate has risen with strong population growth due to higher net immigration and average household size levelling off due to population ageing. An intertemporal model is developed to analyse the effect of an increase in the household formation rate on the housing market. We find that real house prices rise over time if the rate of household formation outstrips the rate of housing supply. Under forward looking expectations, a rising household formation rate could explain rising real house prices relative to the present discounted value of future wages. The results explain why real house prices may exhibit an upward trend despite population ageing and how government planning could have an impact.

1. Introduction

This paper explores how and why changing population has contributed to Australia's housing price boom. A baby is born every one minute and forty-five seconds and somebody dies every three minutes and twenty seconds, on average, in Australia. There is a net gain from overseas of one migrant every two and a half minutes. As a result, the overall population increases by one person every one and a half minutes, and recently surpassed 24.5 million (ABS, 2017). Australia's population resides in approximately 9.24 million households (ABS, 2015). While housing has become an

increasingly important source of wealth[1] for elderly households seeking to exit the market, home ownership rates among young adults have fallen.

The OECD recently warned that house prices appear overvalued but continue to rise in Australia, New Zealand and the United Kingdom, posing a risk of impending sharp corrections (OECD, 2015). Figure 1 depicts the rise in real house prices since the mid-2000s in these countries and the United States. Australia has witnessed a marked, long-lasting boom. While Figure 2 shows that Australia's rate of population growth increased over the same period, it is the number of new households not population per se which contributes to aggregate demand for housing.

[Figures 1 and 2 about here]

This paper explains how changing population has translated to higher rates of household formation in Australia. An optimising two-period model of housing market demand and land supply is developed to explain why higher rates of household formation can contribute to rising house prices over time. In doing so, we shed light on recent concern that Australia faces a correction in housing prices and the role for government planning.

Housing is an intrinsically useful asset, serving a dual role as an investment vehicle and a durable good which households consume (de Silva et al, 2016, Freebairn, 2016). The usefulness of housing as a consumer durable implies a user cost which falls as future prices increase relative to current prices. This paper formalises the intuition for the roles of household formation and user cost of housing within a framework where households live for two periods. In the first period, households work, save, purchase and consume real estate. In the second period, elderly households sell housing and use the capital gains on housing and interest on savings to fund consumption, including residence in non-private dwellings, such as aged-care facilities. House prices are endogenously determined by a market where demand grows relative to supply as new households form over time.

An existing literature examines the theoretical link between population and real house prices. One branch of the literature predicts that population affects real house prices via age structure. Mankiw and Weil (1989) (hereafter, M-W) develop an intertemporal model of the housing market

[1] Residential land and dwellings are the single largest component of household net worth, 68 per cent (ABS, 2016a).

to predict a significant decline in real house prices due to population ageing over the twenty years to 2007 in the United States which, as shown in Figure 1, did not eventuate. The main premise of their theoretical model is that housing demand is driven by young adults. They argue that, to the extent that real house prices rose when the baby-boom generation hit young adulthood in the 1970s, young adulthood of the baby-bust generation should have led to falling prices in the 1990s.

M-W is criticised in a special edition of the journal that published the seminal paper (Regional Science and Urban Economics, 1991, vol 21). Various sources of misspecification are identified with the real house price equation estimated for 1947 to 1987. The inclusion of a negative time trend in the regression equation, not the weighted sum of population with young adults receiving the highest weight, generates the forecast price decline for 1988 to 2007 (Hamilton, 1991; Hendershott, 1991). Failure to account for non-stationarity overstates the estimated coefficient on the weighted sum of population variable (Holland, 1991). The weighted sum of population variable and the real house price series, although correlated for the United States, are uncorrelated for Canada during the same period (Engelhardt and Poterba, 1991).

Two criticisms indicate the problem with the logic that onset of population ageing in the United States should have caused real house prices to decline in the 1990s. First, Woodward (1991) points to changed patterns of living underpinning overall growth in the number of households, with the greatest growth in single-person households, as the baby boom generation moved through adulthood from 1990 to 2000. Second, the user cost of housing that includes future prices relative to current prices is excluded from the M-W regression equation (Hendershott, 1991). The user cost of housing falls (rises) with expected price appreciation (depreciation), thereby causing housing demand and real house prices to rise (fall), all else equal. Poterba (1991) finds inconclusive evidence that population age structure explains the failure of real house prices to fall in the 1980s, as the user cost of housing suggests they should have. These are two themes that this paper incorporates to analyse Australia's housing price boom.

In the Australian context, Guest and Swift (2010) predict population ageing may cause real house prices to be 3 per cent and 27 per cent lower than they otherwise would be from 2008 to

2050, based on a life cycle optimisation[2] and econometric model, respectively. Their prediction is consistent with the empirical studies criticising M-W which found either a much smaller effect than M-W or no effect of ageing on house prices. Furthermore, Coleman (2014) develops an overlapping generations (OLG) model where the duration of a retired household increases with longevity to show that more people aged over 65 years increases total demand for housing.

Another branch of the literature examines how size rather than age structure of the population affects real house prices. Kulish et al (2012) predicts the impact of increasing population on house prices in Australian cities using a calibrated model based on Alonso (1964), Muth (1967) and Mills (1969) (hereafter, A-M-M). The standard A-M-M model[3] assumes a city with a fixed population and given income level where households choose, all else equal, to reside closer to the central business district (CBD) because the cost of commuting increases with distance from the CBD. To simulate the effect of population growth in a static framework, Kulish et al (2012) compare two cities with populations of 2 million and 4 million but otherwise similar characteristics. They predict that a larger population results in a larger increase in equilibrium house prices with zoning restrictions than would be the case in an unconstrained city. The impact of population growth via the household formation rate and government planning via the housing land release rate on housing demand relative to supply is incorporated in the intertemporal model of house prices developed here.

The analysis in this paper complements the existing literature by exploring how population affects house prices over time via the rate of household formation. The focus here is motivated by emerging evidence that the main reason for not selling the family home is a desire to age in place (Productivity Commission, 2015). Current retirees, who are healthier and wealthier than their predecessors, tend not to liquidate housing wealth for general consumption because they prefer to remain in their own home as long as possible (de Silva et al, 2016).

This paper contributes to the literature in two respects. First, we explain how the rate of household formation is increasing in population growth due to immigration and decreasing in average

[2] Guest and Swift (2010) allow for degrees of trading down house size in old age in a life cycle optimising model (Guest, 2005).

[3] See Brueckner (1987) for a review of the related literature.

household size, which in turn has flattened out with population ageing. We then develop a model using a two-period OLG framework to analyse the influence of the household formation rate, real wages, real interest rate, preferences and housing land release rate on real house prices over time.

2. Observations on changing population and the rate of household formation

Private dwelling completion rates suggest that Australia's supply of new houses has been slow to respond over much of the past decade to significant increases in demand (ABS, 2016b). Market demand for housing depends on several factors, including real household wages, real interest rates, current and expected future house prices, and the number of households seeking to buy. Underlying market pressure arises as the number of households seeking to enter the market outstrips the number exiting. In this section, we explain the sources of recent increases in the rate of household formation. The role of market fundamentals, including household formation rates, in determining house prices is modelled in the following section.

The number of households equals the number of occupied dwellings. Adjusting for population growth and changes in age structure, an additional 284,000 dwellings would have been needed in 2011 to maintain Australia's rate of housing consumption in 2001 (National Housing Supply Council, 2013). How population growth and ageing affect demand for dwellings and average household size, respectively, over time is discussed herein.

To help frame this discussion, it is useful to decompose the number of households, N, into three components

$$N = Pop \times \frac{Popr}{Pop} \div \frac{Popr}{N} \tag{1}$$

where Pop is the total population, $Popr$ is the population living in private residential dwellings and $Popr/N$ measures the average household size. Since $Popr/Pop$ remains steady over time, the rate at which new households form depends on the interaction between rates of change in population and average household size.

From (1), the rate of household formation, n, is given by

$$n = g\left(Pop\right) - g\left(\frac{Popr}{N}\right) \tag{2}$$

where $g\left(Pop\right) = f - d + m$ decomposes the growth rate in population, where $f - d$ is (crude birth rate - crude death rate)/10, which gives the rate of natural increase in percentage form, and m is the rate of net overseas migration in percentage form, and $g\left(Popr/N\right)$ is the rate of change in average household size.

[Figure 3 about here]

Figure 3 shows the two components of population increase in Australia, natural increase and net overseas migration. Since the mid 2000s, slightly higher natural increase has contributed to increasing population. However, significant increases in net immigration account for most of the recent rise in population.

Observation 1. *Significantly higher net immigration has driven recent population growth.*

The slightly higher rate of natural increase is attributed to a rise in the birth rate. All else equal, demand for housing may increase with the birth rate to the extent that larger families require larger housing. However, in the context of increases in the household formation rate and thus number of houses over time, there would be a significant lag before children reach adulthood and form new households.

Australia's recent population growth closely mirrors the net migration component which places upward pressure on housing demand. Most migrants are working age, with approximately 88 percent aged under 40 years (ABS, 2016c). A significant rise in net overseas migration increases the working age population seeking to enter the housing market.

Equation (2) says that the household formation rate is increasing in the population growth rate and decreasing in the rate of change in average household size. In other words, an increasing population combined with a trend towards smaller average household size increases the total number

of households. As the total fertility rate began to decline in the 1960s, so did average household size. Referring to Figure 4, average household size continued to fall in the 1980s. However, average household size levelled off between 2001 and 2011.

Reasons for the decades-long decline in household size flattening out include demographic trends and deficient housing supply. Some of the recent changes among older Australians reflect increased longevity for both members of a couple, which reduced the proportion of older people living alone (National Housing Supply Council, 2011). Rigidities in government planning have exacerbated lags in housing supply response to the level and location of population growth, which have contributed to rising house prices and in turn stifled the underlying propensity of Australia's rising population to form households (National Housing Supply Council, 2013).

[Figure 4 about here]

Observation 2. *The decline in average household size flattened out during 2001 to 2011.*

Thus, increased population growth due to higher net immigration and the flattening out of decline in average household size have fuelled higher growth in the number of households since the mid 2000s. Elevated rates of household formation are expected to continue through to 2021. The projected average annual household growth rate of 1.84 per cent for Australia is almost 50 per cent higher than the projected rate for New Zealand and double that for the United Kingdom (ABS, 2015).

Moreover, growth in the number of households is expected to outstrip population growth in coming decades. Lone person households are projected to show the greatest percentage increase over the next twenty years (ABS, 2015). Referring to Figure 4, average household size is expected to decline as a result. The growth in single-person households primarily reflects further ageing of the population and the fact that older women are more inclined to live alone.

People are not only living longer, they are choosing to live in their own home as long as practicable. The vast majority of older Australians reside in private dwellings. In 1991, approximately 40 per cent of people aged 85 years or older lived in non-private dwellings. By 2011, this ratio had

fallen to around 25 per cent (ABS, 2013). Decline in average household size, all else equal, generates an increase in housing demand for a given level of population. Thus, population ageing need not translate to an increase in housing supply relative to demand and declining real house prices.

3. Model of housing demand and market price

Consider an economy where, for a representative household which is young in period t, lifetime utility is

$$U = (1-\gamma)\ln c_{1t} + \gamma \ln h_t + \beta \ln c_{2t+1} \tag{3}$$

where c_{1t} is consumption when young in period t, c_{2t+1} is consumption when old in period $t+1$, h_t is amount of housing purchased in period t and $\beta = 1/(1+\rho)$ is the discount rate with a constant time preference parameter, ρ. Each household is endowed with a unit of time that is supplied inelastically for paid work when young. The first period budget constraint is

$$c_{1t} + p_t h_t + s_t = w_t \tag{4}$$

where p_t is the price of housing purchased in period t and s_t is savings which is stored in the other asset of the economy, say physical capital, and w_t is the real wage in period t. The second period budget constraint is

$$c_{2t+1} = (1+r_{t+1})\, s_t + p_{t+1} h_t \tag{5}$$

where p_{t+1} is the price of housing sold and r_{t+1} is the rate of return on physical capital in period $t+1$. Equations (4) and (5) give the lifetime budget constraint

$$w_t = c_{1t} + \frac{c_{2t+1}}{(1+r_{t+1})} + \pi_t h_t \tag{6}$$

where $\pi_t = p_t - p_{t+1}/(1+r_{t+1})$ is the user cost of housing.

Taking the lead of Deaton and Laroque (2001), the user cost of housing is the difference between the price of housing purchased at time t and the discounted price at which housing is sold at time $t+1$. For a given real rate of return, the user cost of housing falls with expected growth in house

prices, which is driven by rising wages and underlying rate of household formation relative to the housing land release in equilibrium in the market for housing, shown herein.

Poterba (1991) considers a broader definition of the user cost of housing where rent on owner-occupied homes relative to current house prices is increasing in the real interest rate, depreciation rate on housing capital, maintenance cost and decreasing in the expected rate of house price appreciation. For a given real interest rate, expected growth in house prices is related to expected growth in rents, which in turn, is a function of growth in population and wages. Thus, the simplified user cost of housing defined by Deaton and Laroque (2001) abstracts from rent as the means whereby growth in population and wages affects house prices, while retaining the positive effect of these two influences on house prices.

The maximisation of (3) subject to (6) gives

$$c_{1t}^{*} = (1-\gamma)\frac{(1+\rho)}{(2+\rho)}w_t \tag{7a}$$

$$c_{2t+1}^{*} = \frac{(1+r_{t+1})}{(2+\rho)}w_t \tag{7b}$$

$$h_t^{*} = \frac{\gamma}{\pi_t}\frac{(1+\rho)}{(2+\rho)}w_t \tag{7c}$$

which is the household's optimal consumption when young, optimal consumption when old and demand for housing, respectively. The user cost of real estate, π_t, is endogenous as the price of housing is determined by the market for housing so that market demand coincides with supply.

At time t, households purchase housing from the elderly at the market price, p_t. Thus, market demand is

$$h_t^{D} = \frac{\gamma}{\pi_t}\frac{(1+\rho)}{(2+\rho)}w_t L_t \tag{8}$$

where L_t is the population of households at time t. The stock of housing available for purchase may grow over time at the rate of government land release, g, from an initial amount of $\bar{h}$. Thus, market supply is

$$h_t^{S} = \bar{h}(1+g)L_{t-1} \tag{9}$$

where L_{t-1} is the elderly population at time t, who were young at time $t-1$. The number of households grows over time at the rate n, so that $L_t = (1+n)L_{t-1}$.

Thus, the market price for housing is

$$p_t = \frac{p_{t+1}}{(1+r_{t+1})} + \gamma \frac{(1+\rho)}{(2+\rho)} \frac{(1+n)}{\bar{h}(1+g)} w_t \tag{10}$$

which is increasing in the rate of household formation because there are $(1+n)$ as many buyers as there are sellers and decreasing in rate of land release because there is $(1+g)$ more housing land available. The market price is also increasing in the discounted future price and real wages. This is summarised in the following two remarks.

Remark 1 *The market price of housing rises if the rate of household formation increases relative to housing supply, all else equal.*

Intuitively, the stock of housing is depleted by an increase in the number of households seeking to buy relative to the number of elderly persons seeking to sell, putting pressure on the market price to rise. However, government land release replenishes the stock of housing land, relieving upward pressure on the market price.

Remark 2 *The market price of housing is also increasing in the future price and real wages, and decreasing in real interest rate.*

Intuitively, household demand for housing is downward sloping or decreasing in the user cost of housing, which in turn is increasing in the current price and decreasing in the discounted future price. As a result, housing demand is boosted by higher expected future prices and lower real interest rates. Increasing wages also boost household demand because housing is a normal good.

Iterating equation (10) forward over the time horizon T gives

$$p_t = \prod_{i=0}^{T} \frac{p_{t+T}}{(1+r_{t+i})} + \gamma \frac{(1+\rho)}{(2+\rho)} \frac{(1+n)}{\bar{h}(1+g)} \sum_{i=0}^{T-1} \prod_{i=0}^{T-1} w_{t+i} \frac{(1+r_t)}{(1+r_{t+i})} \tag{11}$$

where

$$\prod_{i=0}^{T}\frac{p_{t+T}}{(1+r_{t+i})}=\frac{p_{t+T}}{(1+r_{t+1})(1+r_{t+2})...(1+r_{t+T})}$$

is the discounted future real house price at time $t+T$, and

$$\sum_{i=0}^{T-1}\prod_{i=0}^{T-1}w_{t+i}\frac{(1+r_t)}{(1+r_{t+i})}=w_t+\frac{w_{t+1}}{(1+r_{t+1})}+...+\frac{w_{t+T-1}}{(1+r_{t+1})(1+r_{t+2})...(1+r_{t+T-1})}$$

is the sum of current and present discounted value of future real wages.

The condition $\lim_{T\to\infty}\prod_{i=0}^{T}p_{t+T}/(1+r_{t+i})=0$ means that there is no bubble in the long run. As $T\to\infty$

$$p_t=\gamma\frac{(1+\rho)}{(2+\rho)}\frac{(1+n)}{\bar{h}(1+g)}\sum_{i=0}^{\infty}\prod_{i=0}^{\infty}w_{t+i}\frac{(1+r_t)}{(1+r_{t+i})} \tag{12}$$

which says that the current real house price is proportional to the present discounted value of real wages, where the rate of household formation n is a scaling factor. An increase in n magnifies real house prices proportional to the present discounted value of future real wages. This is summarised in the following remark.

Remark 3 *A rising household formation rate scales up a rise in real house prices proportional to the present discounted value of future real wages under forward looking expectations.*

Referring to (11) and (12), all else equal, if n rises relative to g then current real house prices will rise proportionately more than the present discounted value of future real wages. Some interesting implications arise for the impact of government planning on real house prices. If the government could set $g=n$, this would eliminate the effect of the household formation rate on house prices.

Although there would seem to be a limit in the long run to rising n, we could observe reasonably persistent upward trends in the underlying propensity of a growing population to form households as witnessed since 2001. It is worth noting that $n<0$ is possible for some economies, which would put downward pressure on house prices given the lower bound $g=0$.

4. Conclusion

Real house prices in Australia continue to rise amid growing concern of an impending sharp

correction in speculative demand. The theoretical model presented in this paper explains how higher rates of household formation, driven by strong population growth, can underpin rising real house prices.

The prediction in existing theoretical models that real house prices decline due to population ageing is contentious. This paper observes that Australia's rate of household formation has increased with strong population growth, due to higher net immigration, and decline in average household size flattening out. The latter is attributed in part to population ageing whereby the number of two-person households has risen with increased male and female longevity during the past decade. Declining average household size is projected to resume as the number of sole-person households rises with further population ageing.

As more elderly people remain in their own home longer, they remain households. Using a simple overlapping generations framework where the current old generation sell their housing when they cease to be households to the younger generation of households, this paper demonstrates the potential influence of the household formation rate on house prices. In reality, many of the current old generation are not selling their housing to the next generation until they die. This is likely to exacerbate the problem of rising prices, at least in the medium term, as shown by Coleman (2014) in an overlapping generation framework where longevity increases duration of retirement until death upon which housing is redistributed to the younger cohort.

This paper analyses the effects of growth in the number of households in an intertemporal model of household choice and the housing market. The analysis predicts that the market price of housing is increasing in the rate of household formation, real wages and discounted future price, and decreasing in the rate of housing land supply.

Under forward looking expectations, current real house prices rise proportional to the present discounted value of future real wages. The rate of household formation has a scaling effect, whereby real house prices rise proportionately more than the present discounted value of future real wages if the rate of household formation rises relative to the rate of housing land release.

The results in this paper explain how rising real house prices in Australia reflect market fundamentals. Some interesting implications arise. The elevated rate of household formation in Australia

since the 2000s has increased the number of potential entrants to the housing market, which has increased market demand for housing increases relative to supply. Ensuring that the rate of housing land release keeps pace with the rate of household formation may help relieve upward pressure on real house prices.

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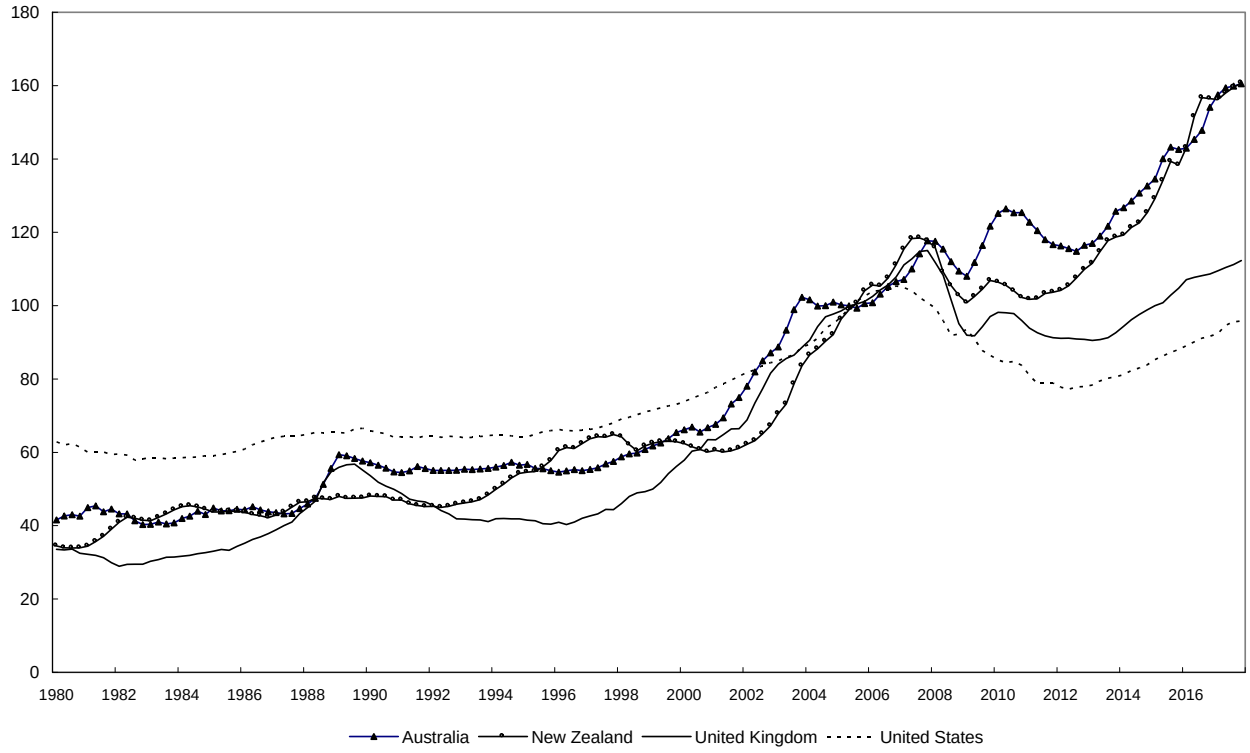

FIGURE 1

Real House Price Index, 1980-2017

Source: Federal Reserve Bank of Dallas (2018)

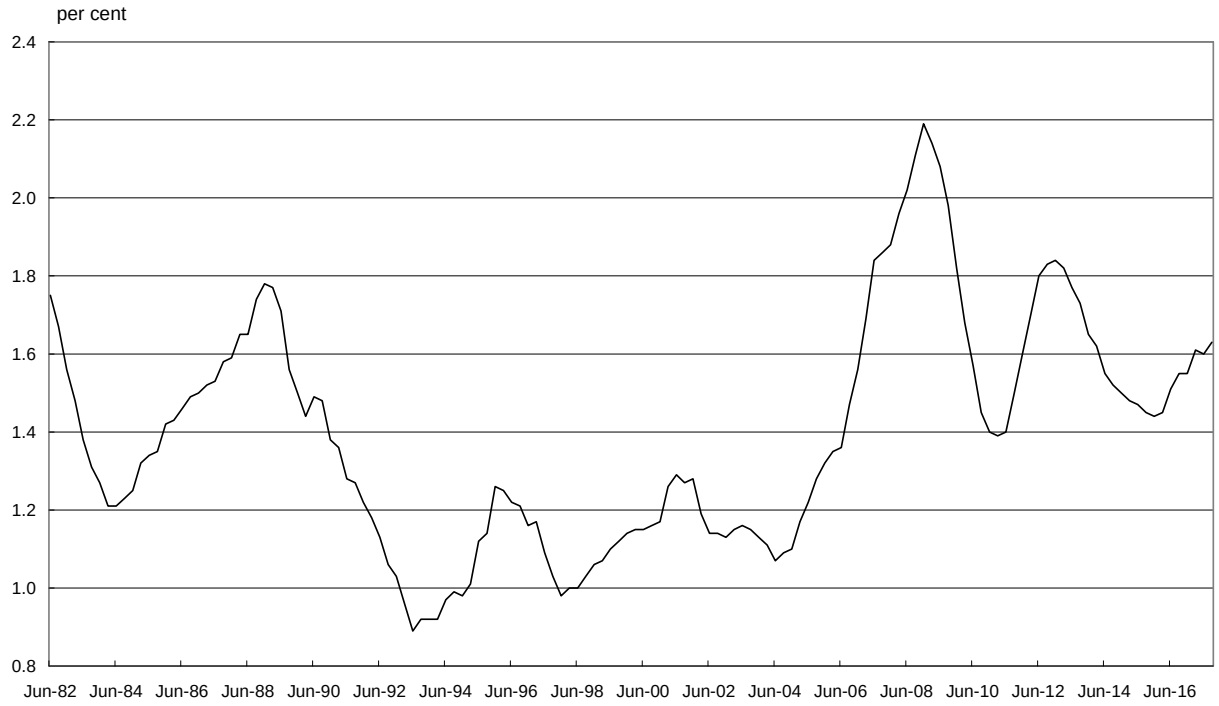

FIGURE 2

Growth in Estimated Residential Population, (% change over previous year), Australia, June 1982 - September 2017

Source: Australian Bureau of Statistics (2017)

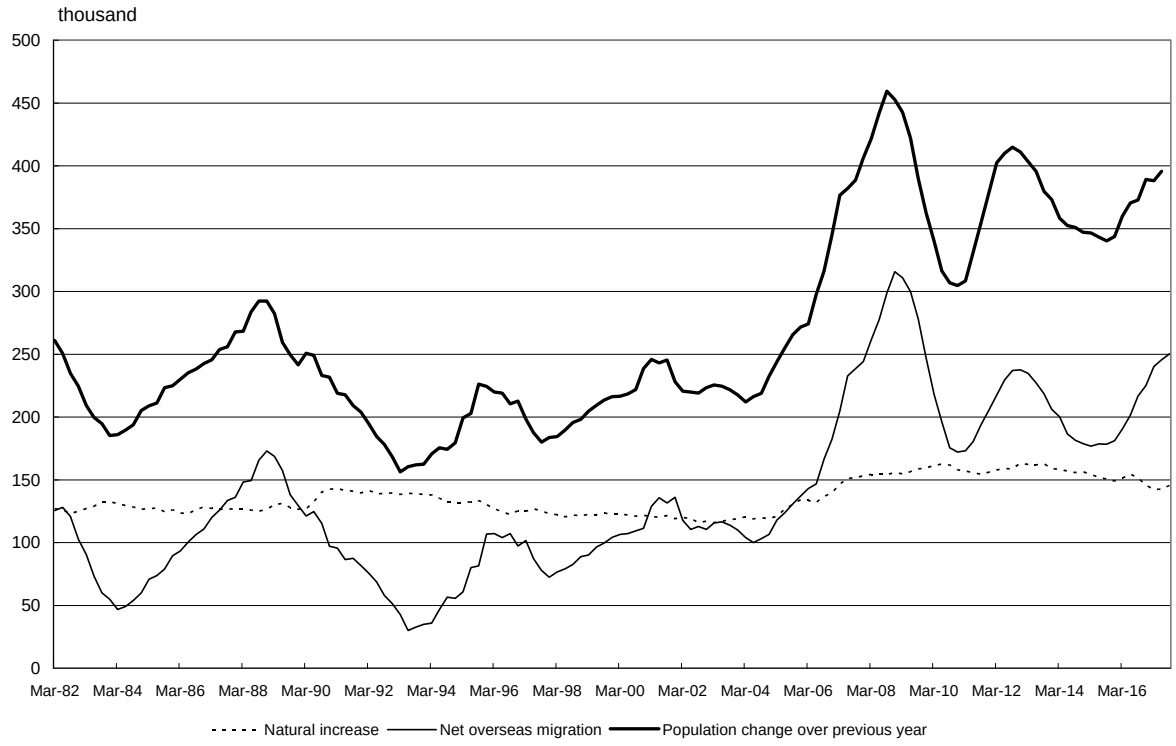

FIGURE 3

Contributions to Estimated Resident Population, change over previous year, Australia,

March 1982- September 2017

Source: Australian Bureau of Statistics (2017)

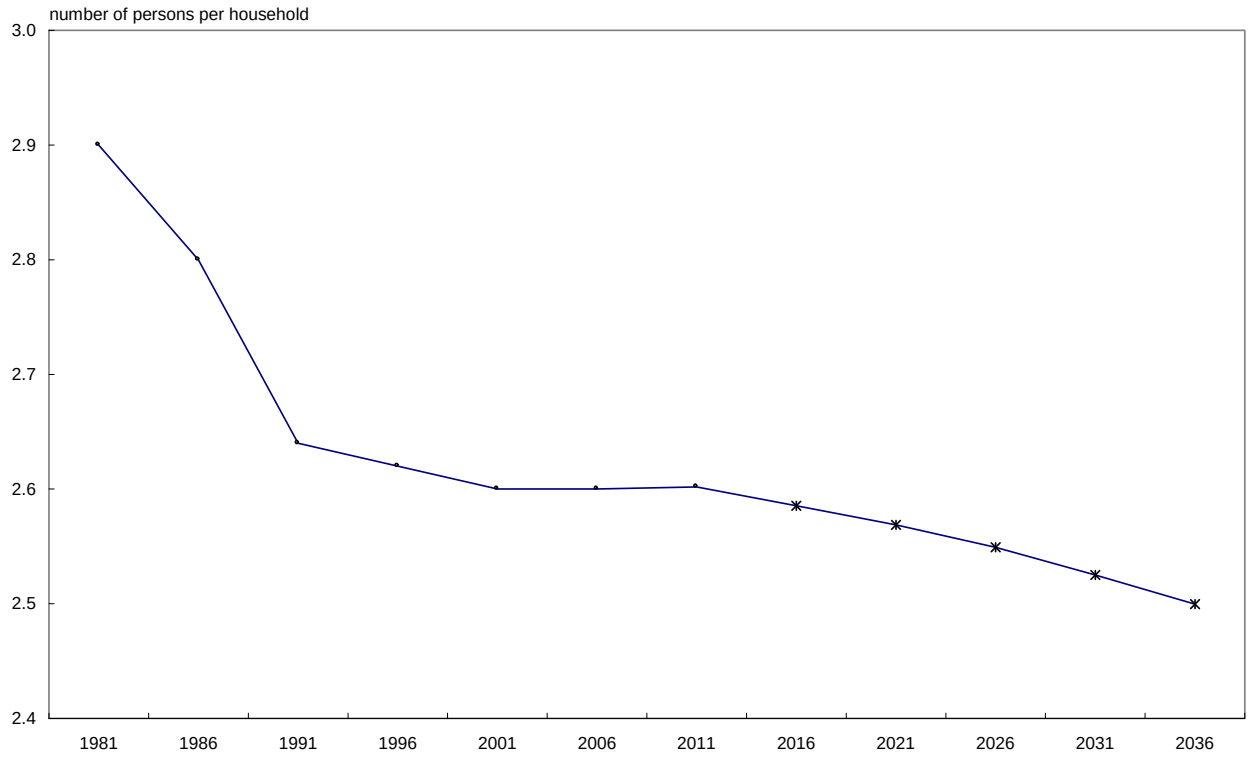

FIGURE 4

Average Household Size, Australia,1981-2011 (actual), 2016-2036 (projected)

Source: ABS Catalogue No. 3236.0, various issues