

Property Tax Reform and Home Ownership

Technical Research Paper

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Acknowledgement of Country

The NSW Treasury acknowledges that Aboriginal and Torres Strait Islander peoples are the First Peoples and Traditional Custodians of Australia, and the oldest continuing culture in human history.

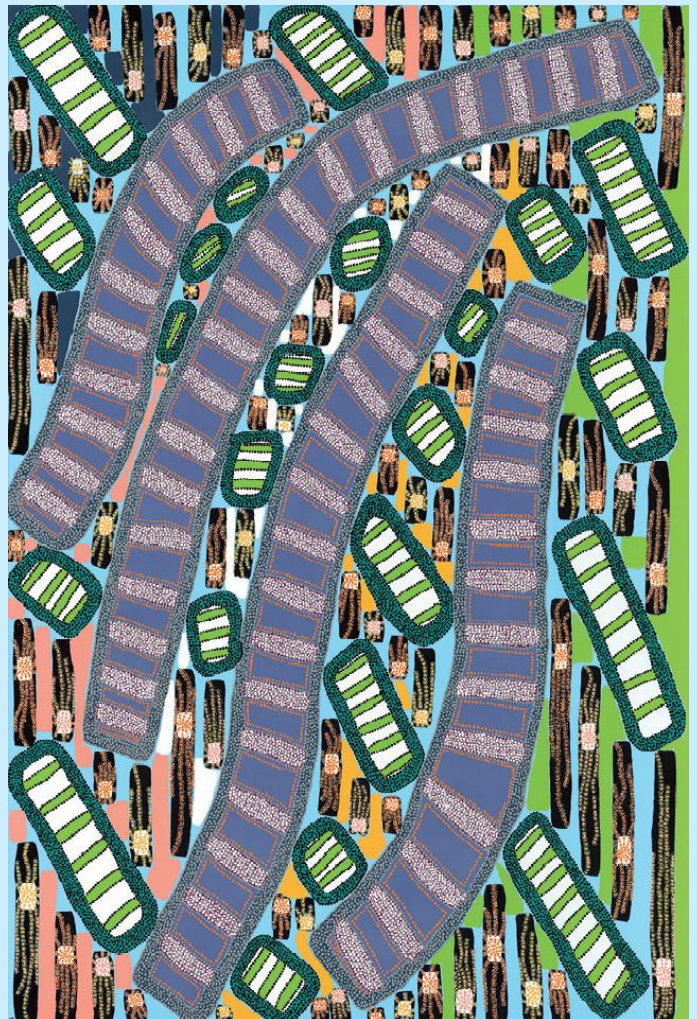
We pay respect to Elders past and present and commit to respecting the lands we walk on, and the communities we walk with.

We celebrate the deep and enduring connection of Aboriginal and Torres Strait Islander peoples to Country and acknowledge their continuing custodianship of the land, seas, and sky.

We acknowledge the ongoing stewardship of Aboriginal and Torres Strait Islander peoples, and the important contribution they make to our communities and economies.

We reflect on the continuing impact of government policies and practices and recognise our responsibility to work together with and for Aboriginal and Torres Strait Islander peoples, families, and communities, towards improved economic, social and cultural outcomes.

Artwork: 'Regeneration' by Josie Rose



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1. Introduction

This paper examines the potential increase in home ownership that could arise if the NSW Government replaced stamp duty and the existing land tax with a broad-based property tax levied on unimproved land values, as proposed in a Consultation Paper issued in November 2020 and updated in a Progress Paper issued in June 2021. Under this proposal, the property tax would replace transfer duty and land tax, over time, using a choice-based transition.

In June 2022, the NSW Government announced that it would implement a property tax that applies only to properties that have been purchased by a first home buyer for up to \$1.5 million if the purchaser chooses to pay property tax instead of stamp duty. This paper examines what would happen to home ownership if all properties became subject to the property tax as set out in the Progress Paper. Home ownership here refers to the share of private dwellings that are owner-occupied.

The paper models the expected long-run effects of the following annual property tax rates, which were set out in the Progress Paper, under the assumption that these tax rates replace stamp duty and land tax for all properties.

Property class	Tax rates
Owner-occupied residential property	\$400 per property + 0.3% of land value
Investor-owned residential property	\$1,500 per property + 1.1% of land value
Primary production land	0.3% of land value
Commercial property	2.6% of land value
Portfolio surcharge on aggregate land value (excluding principal place of residence and farmland)	0.3% of land value above \$1.5 million

Currently, owner-occupiers hold around 67.1 per cent of the private dwelling stock in NSW (i.e., ignoring government-owned dwellings). The paper estimates that the property tax would increase home ownership by about 6.6 per cent in the long run (i.e., rising to around 71.5 per cent of the private dwelling stock). Measured in current population terms, this is equivalent to about 340,000 people moving out of rental accommodation into their own homes. The reform would influence home ownership through four main channels:

1. Replacing transfer duty with an annual land tax would increase the frequency of dwelling sales. Sales of investor-owned properties are likely to increase by more than owner-occupier sales, so that the stock of owner-occupied homes would gradually increase.
2. The proposed property tax rates are structured in favour of owner-occupiers, so that owner-occupiers would purchase an increased share of the properties that are placed on the market.
3. The property tax portfolio surcharge provides a disincentive to amass large holdings of residential land, helping to preserving the existing balance between 'Mum and Dad' and institutional investors. If the institutional share of investors increased, the average holding period of investors is likely to increase, which would lower home ownership.
4. The reform would eliminate duty and lower average dwelling prices, which would lower the savings required to purchase a dwelling and increase the share of homes bought by first home buyers.

The following sections of the paper explore each of these effects individually, and in combination.

2. Shorter holding periods

The abolition of duty is expected to increase the number of dwelling transactions, shortening the average time that dwellings are owned. When investors sell their homes more frequently, home ownership is expected to increase. When owner-occupiers sell their homes more frequently, home ownership is expected to fall.

The linkage between holding periods and home ownership can be illustrated with a stylised example:

- Suppose in a hypothetical world, that investors and owner-occupiers each hold their properties for four years, and when a property is available for purchase there is a 50 per cent probability that it will be bought by an investor. Over the long-run, a representative property would be held by an investor for four out of every eight years. Collectively, owner-occupiers would hold 50 per cent of the stock.
- Next, suppose the investor holding period falls to two years, the owner-occupier holding period falls to three years, and when a property is available for purchase there is an unchanged 50 per cent probability that it will be bought by an investor. Over the long-run, a representative property will now be held by investors for two out of every five years.
- The change in holding periods increases the owner-occupier share to 60 per cent of the stock. The important driver is the relative changes in holding periods between investors and owner-occupiers.

For several reasons, it is likely that the volume of investor sales will increase by proportionately more than the volume of owner-occupier sales in response to the abolition of stamp duty. Annualised transaction costs are larger when holding periods are shorter, and investors have shorter average holding periods than owner-occupiers. House price fluctuations provide a motivation for investors to engage in relatively short-term trading, which is impeded by duty. Owner-occupiers benefit less than investors from such price fluctuations because a higher price for their existing home is likely to have a strong positive correlation with the price of a replacement home. Existing transaction costs are also lower for investors than for owner-occupiers – investors do not have to pay removalist costs when they sell a property and they have lower social connections with the community where the property is located. The removal of transfer duty thus represents a greater proportional reduction in transaction costs for investors than for owner-occupiers.

It is difficult to be precise regarding the magnitudes by which investor and owner-occupier sale volumes will increase. We have assumed that the share of owner-occupied properties sold each year would increase by 45 per cent, while the share of investor-owned properties sold would increase by 65 per cent. With investors currently holding 32.9 per cent of the private dwelling stock, these two figures combine to suggest a 51.6 per cent increase in the share of established properties sold, close to the share suggested by the literature review of Malakellis and Warlters (2021).

The impact of reduced holding periods and greater sales volumes is examined in a model set out in Annex A. All else equal, the model predicts these changes in transaction volumes would increase home ownership by about 4.5 per cent. This estimate does not take account of interactions with other influences on home ownership.

3. Relative tax burdens of investors vs owner-occupiers

The rate of home ownership can also be shifted by changing the relative prices faced by owner-occupiers versus investors. Subsidies for owner-occupiers (e.g., first home-owner grants) or taxes for investors (e.g., land tax) both shift relative prices in a way that supports higher home ownership. Tax policy can thus shift the relative demand of owner-occupiers and investors, thereby altering the shares of properties that each group buys from the set of properties marketed each year.

To examine the changes in demand arising from the property tax reform, we start by estimating the amount of property tax that would be generated annually by investors and owner-occupiers if all properties were subject to the property tax and there were no change in their current property holdings. We compare this revenue with the annual tax paid by each group under existing taxes. We treat each year's purchases and taxes as instances of a repeated game, allowing us to solve for the effect of a change in total taxes paid in an individual year on the shares of properties bought by investors and owner-occupiers.

Abstracting from the property market cycle, owner-occupiers currently spend around \$95,360 billion as consideration for residential property each year and pay around \$3.946 billion in stamp duty.¹ This amounts to an average tax rate of 4.14 per cent on annual property purchases by owner-occupiers.

Investors currently spend around \$64,640 billion on residential property and pay around \$2.466 billion in stamp duty and \$1.736 billion in land tax on residential property each year. For the State Government, this represents an average tax rate of 6.50 per cent on annual property purchases. For investors, however, the cost of State taxes is reduced by the effects of Commonwealth income tax. Allowing for this deductibility, State taxes paid by investors amount to 5.17 per cent of the annual amount spent on property purchases.²

Applying the property tax rates to the existing landholdings of owner-occupiers would generate revenue of \$3.773 billion. Applying the property tax rates to the existing residential landholdings of investors would generate revenue of \$5.516 billion for the State. After income tax deductibility, the cost of the property tax for residential investors would be \$3.751 billion. After income tax, property taxes would represent 3.96 per cent of the value of annual owner-occupier property purchases, and 5.80 per cent of the value of annual investor property purchases if existing patterns of purchases remained unchanged.

But the pattern of property purchases would change with the shift in tax rates. The property tax would lower average taxes paid by owner-occupiers and increase taxes paid by investors, expressed as shares of annual consideration paid for properties. We thus expect owner-occupiers will purchase a greater share of the properties that are placed on the market each year, as a result of the reform.

Annex B presents a model that examines how the share of properties purchased by investors shifts when the willingness to pay of investors and owner-occupiers change. The model supposes that all properties are subject to an auction between a representative owner-occupier and a representative investor, each of whom has a normal distribution of possible bids. The outcome of the auction is thus random, but owner-occupiers are more likely to win the auction when the mean bid of the owner-occupier increases, or the mean bid of the investor decreases. The likelihood that an owner-occupier wins the auction translates to the share of properties that is purchased by owner-occupiers

¹ To estimate the current trend level of consideration for residential properties, we estimate the long run average of transaction volumes per capita, multiply this by the current NSW population, and then multiply this by current average property consideration. This is then divided between investors and owner-occupiers based on their shares of transaction values (estimated using ABS finance commitment data).

² On average, the marginal rate of tax paid by owners of residential investment properties in NSW is 32 per cent. When capital gains are paid the average marginal rate is 43 per cent. Stamp duty is tax deductible at the time of sale, so with an assumed holding period of 14 years, a 4 per cent discount rate and with the 50 per cent capital gains discount, the present value of stamp duty paid by investors, after-income tax deductions, is \$2.163 billion. Land tax is deductible in the year of payment, so its after income tax cost to investors is \$1.18 billion.

each year from among the properties that are marketed.

Using the change in tax rates calculated above, a transition to the property tax would increase the mean owner-occupier bid by 0.17% and lower the mean investor bid by 0.61%. As a result of these revised bid distributions, owner-occupiers would be the successful bidders more frequently. The Annex B model predicts this would lower the investor share of annual purchases from 42.6% to 41.28%. Using this parameter in the Annex A model, the reduced share of investor purchases would, all else equal, cause the owner-occupied share of the housing stock to increase by 1.8%.

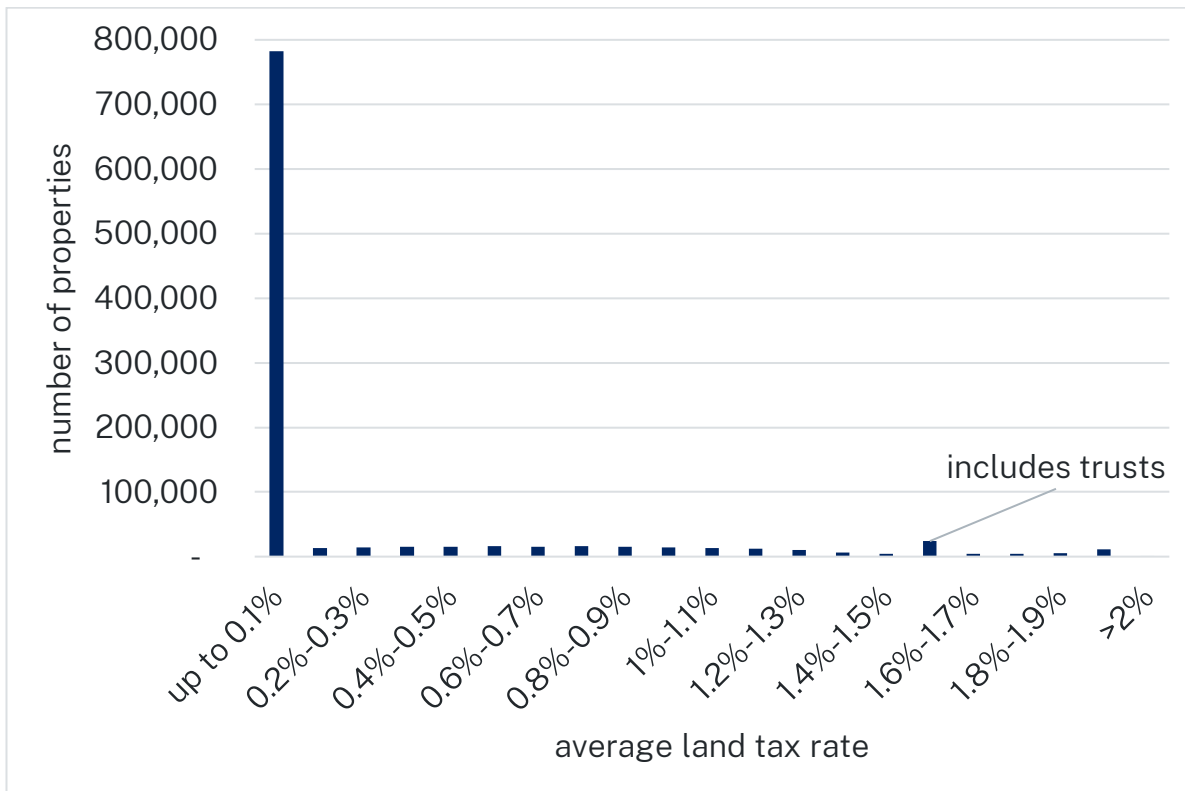
4. The property tax portfolio surcharge

At present, residential investment properties are predominantly owned by so-called ‘Mum and Dad’ investors, who typically hold one or two investment properties. There are few ‘institutional’ investors: companies with large aggregate holdings of residential properties. The main exceptions are developers, who do not typically intend to hold rental properties for the long-term.

Land tax is a significant deterrent to institutional holdings of residential rental properties. In 2021, the NSW land tax has a tax-free threshold of \$755,000, above which a marginal rate of 1.6 per cent of the unimproved land value is applied. Above \$4,616,000, a marginal rate of 2.0 per cent applies. Suppose investors buy apartments each with a market value of \$1 million, a 30 per cent ratio of land value to market value, and a gross rental yield of 3 per cent of market value. An institutional investor with a \$100 million portfolio of such apartments (i.e., \$30 million of land value) would pay annual land tax of \$569,556, reducing the rental return (before income tax and other expenses) to 2.43 per cent. In contrast, if the same group of apartments were held individually by Mum and Dad investors, each apartment would be free from land tax, with a rental return of 3 per cent before income tax. In this example, after land tax, the present value of expected rents from each unit would be 23 per cent higher for Mum and Dad investors than institutional investors. Mum and Dad investors are the most tax-efficient ownership structures for most residential investment properties.

This finding can be observed in the patterns of ownership of residential investment properties. Around 75 per cent of residential investment properties are subject to no land tax (that is, they are owned as part of small property portfolios that are below the tax-free threshold). Figure 1 illustrates the distribution of residential properties that incur some land tax. More than half of these properties pay land tax amounting to less than 0.1 per cent of the land value. In total, almost 90 per cent of rental properties are parts of portfolios that are either below the tax-free threshold, or only just exceed the tax-free threshold.

Figure 1: Distribution of residential investment properties that incur land tax



This excursion into the effects of land tax on patterns of ownership of rental properties is important because it is likely that Mum and Dad investors have shorter holding periods than institutional investors. The model set out in Annex A indicates that holding periods are an important determinant of home ownership rates.

Given the existing patterns of ownership, there is little information about the length of time institutional investors would hold properties, but in principle, a corporate landlord could hold property indefinitely. In contrast, there is a natural life cycle to the holding period of Mum and Dad investors: they typically purchase an investment property after they have already bought their owner-occupied home, they frequently sell their investment properties to help fund their retirement, and they have a natural maximum holding period. As set out in Annex C, around 6.99 per cent of investor-owned properties are sold each year under current tax settings, which suggests an average holding period of about 14 years for Mum and Dad investors.

Without a portfolio surcharge, the property tax would be neutral between Mum and Dad investors and institutional investors. It is likely that institutional ownership of rental properties would then expand considerably. Supposing those institutional investors come to hold 30 per cent of rental properties, with an average holding period of 40 years, the average holding period for all investment properties could rise to $14 \times 0.7 + 40 \times 0.3 = 21.8$ years. Combining increased institutional holdings with the other reform elements, the Annex A model suggests home ownership could decrease by around 20 per cent.

The inclusion of the property tax portfolio surcharge within the structure of the property tax proposal is expected to avoid a significant extension of the average holding period of residential investors, which could otherwise diminish the rate of home ownership. As with land tax, it is expected that the incentives the surcharge creates would result in relatively few landlords paying the surcharge – most investment properties would continue to be owned by Mum and Dad investors holding portfolios below the threshold.

5. Relaxation of the savings constraint

Most people looking to purchase a dwelling borrow a large part of the purchase price and are thus constrained by either their incomes or their savings. The maximum loan size is constrained by the income required to repay the loan. But even when a borrower has enough income to support loan repayments, they may not have built up enough savings to pay the deposit. Banks frequently require sufficient savings to make a 20 per cent deposit before any loan will be advanced. This requirement provides a degree of protection for banks, against the risk that adverse market movements could reduce the value of the loan security. Because they lack existing home equity and have typically had less time to accumulate savings, first home buyers are the group most likely to be refused loans because of the savings constraint.

The property tax reform will mean that purchasers no longer need to pay transfer duty as an up-front cost at the time of purchase. In the long-run, the reform is also expected to lower average dwelling prices by around 3 per cent, relative to a no-reform scenario. Both of these effects will reduce the savings required to purchase a home, allowing people to bring forward the time when they purchase a dwelling.

It is difficult to be precise about the magnitude of this effect, but it is possible to get a general sense through some rough estimates of the time required for a first home buyer to save for an average NSW dwelling:

The average NSW dwelling in December 2020 cost \$939,700, on which a 20 per cent deposit was \$188,000 and duty was \$37,622. With an average annual household income of \$120,380 for Australians aged 25-34, and assuming 20 per cent of this income can be saved each year (i.e., \$24,076 saved per year), the deposit would take 7.8 years to save, and duty would take 1.6 years to save. A 3 per cent reduction in dwelling prices would lower the required deposit by \$5,640, or around 0.2 years of saving.

Around one third of people buying their first homes in NSW purchase at prices above the \$800,000 threshold for duty concessions. For these purchasers, the elimination of duty could bring forward the purchase date by around 1.5 years (recognising that property tax would still need to be paid in the first year), and lower-long run prices could lower the time required to save the deposit by around 0.2 years. All up, for this group of first home buyers, the time needed to save for a first home might be reduced by around 1.7 years.

For first home buyers who currently qualify for duty concessions, the property tax reform would not greatly change the time required to save for duty, but lower average prices would still bring forward the purchase date by around 0.2 years.

Weighting these two groups (i.e., those who receive duty concessions and those who do not) by their respective transaction volumes, in the long run, people will be able to buy their first home on average $(1.7 \times 1/3) + (0.2 \times 2/3) = 0.7$ years earlier than at present.

The estimate of 0.7 years earlier purchase can be converted into an impact on home ownership with further broadly indicative estimates. Suppose all age cohorts are equal sized, everyone buys their first home at age 32 and dies at age 82 (i.e., 50 years of home ownership), and owns an investment property between the ages of 40 and 65 (i.e., 25 years of owning a rental property, which is then sold to fund retirement). In this world, the owner-occupied share of dwellings is two-thirds (i.e., $50/(50+25) = 66.7$ per cent). As a result of property market reform, owner-occupiers can accumulate enough savings to purchase their first home 0.7 years earlier, at age 31.3 years. Now, the owner-occupied share is $50.7/(50.7+25) = 66.97$ per cent. This is an increase of $(66.97 - 66.7)/66.7 = 0.4$ per cent.

Overall, an increase in home ownership of around 0.4 per cent appears plausible as a result of a lower savings constraint.

6. Conclusion

Combining all the effects discussed above, the proposed property tax is estimated to increase the owner-occupied share of the NSW private dwelling stock from 67.1 per cent to 71.25 per cent, a long-run increase in home ownership of 6.6 per cent.³ In terms of today's economy, this is about 130,000 households (345,000 people) shifting from rental accommodation into their own homes.

The paper has identified several channels by which property tax reform could influence the rate of home ownership. Much popular commentary identifies the up-front costs of stamp duty and the overall price level as significant barriers to home ownership. Annex A introduces a model that indicates the length of time owners hold properties, and the relative prices faced by investors and owner-occupiers are also key determinants of home ownership.

All else equal, the more frequently investors sell their properties the higher is the equilibrium rate of home ownership. The more frequently owner-occupiers sell, the lower is home ownership. Removing transfer duty will increase sales frequency for both investors and owner-occupiers, but it is likely that sales volumes will increase relatively more for investors. The main driver of the estimated increase in home ownership is a change in the holding periods of investors and owner-occupiers, which increases the investor share of annual sales.

Because lower prices benefit both investors and owner-occupiers, improved affordability (i.e., lower prices) is not completely synonymous with greater home ownership. While the reform is expected to slightly lower average prices, the main home ownership influence through home prices is a shift in relative tax rates in favour of owner-occupiers. This results in owner-occupiers being the successful purchasers more frequently when properties are offered for sale, delivering about a quarter of the estimated increase in home ownership.

Lower up-front costs would benefit both investors and owner-occupiers. It is likely, however, that first home buyers are particularly sensitive to the up-front costs, because they lack existing equity in the property market and require several years to save for a deposit. By eliminating the requirement to pay up-front transfer duty, the reform would lower this savings constraint, with particular benefit for those first home buyers who do not currently receive transfer duty concessions. For those who do currently receive duty concessions, lower average prices will also help to lower the savings constraint and bring forward the date of first purchase. The relaxed savings constraint accounts for a small part of the increase in home ownership.

Beyond the economic framework for analysis of home ownership, the paper's further contribution to the Australian policy debate is calibration of the model to identify empirical magnitudes. The models set out in Annex A and Annex B provide useful tools for this quantification.

Care should, however, be taken in interpreting the results. The model is sensitive to the assumptions used, and different experts could reasonably use different assumptions, resulting in different conclusions on the magnitudes of the reform's effects. Alternative assumptions about the changes in transaction volumes could result in estimates of home ownership increases between 3.0 per cent and 8.3 per cent (see Annex C). Variance assumptions used in Annex B, affecting sensitivity to changes in relative tax rates, give rise to a range of possible home ownership increases between 6.1 per cent and 8.4 per cent. Finally, the model is sensitive to the rate of population growth. If future population growth is lower than that observed over the past decade, the increase in home ownership could be greater than modelled in this paper.

While there is an element of doubt over the precise number, the direction of change is clear and the reform would, over time, make a significant contribution to increased home ownership. On balance, the preferred estimate is that the proposed reform would increase home ownership by 6.6 per cent, more than reversing the last twenty years of declining home ownership.

³ This is slightly less than the sum of the individual effects, because of interactions between the changed holding periods and the changed investor share of purchases.

Annex A Home ownership model

This Annex sets out a model of how the dwelling stock is divided between investors and owner-occupiers, based on the frequency with which they buy and sell property.

Model

Let:

$S_t =$ stock of dwellings in year t

$I_t =$ number of investor – owned dwellings in year t

$O_t =$ number of owner – occupied dwellings in year t

$\gamma_t = \frac{I_t}{S_t} =$ investor share of the dwelling stock

$v =$ growth rate of dwelling stock

$\alpha =$ share of homes that are for sale that are purchased by investors

$\beta_I =$ share of investor – owned homes that are sold each year

$\beta_O =$ share of owner – occupied homes that are sold each year

We assume that α , β_I , β_O and v are parameters that do not vary unless policy is changed. They can be thought of as long-run averages observed across the property market cycle. We assume new dwelling stock is released at the beginning of each period, and is instantly sold, so that in all periods all dwellings are owned by either investors or owner-occupiers.

These definitions yield:

$$S_t = S_{t-1}(1 + v)$$

$$\frac{O_t}{S_t} = 1 - \gamma_t$$

The investor-owned stock evolves over time according to:

$$I_t = I_{t-1} + \alpha(\beta_I I_{t-1} + \beta_O O_{t-1} + v S_{t-1}) - \beta_I I_{t-1}$$

Dividing throughout by S_t we obtain:

$$\gamma_t = \frac{1}{(1 + v)} \{ \gamma_{t-1} + \alpha[\beta_I \gamma_{t-1} + \beta_O(1 - \gamma_{t-1}) + v] - \beta_I \gamma_{t-1} \}$$

Defining $\Delta\gamma = \gamma_t - \gamma_{t-1}$, we can thus see that:

$$\Delta\gamma = 0 \text{ when } \gamma_t = \gamma^*$$

$$\Delta\gamma > 0 \text{ when } \gamma_t < \gamma^*$$

$$\Delta\gamma < 0 \text{ when } \gamma_t > \gamma^*$$

where γ^* is a stable equilibrium investor share of the dwelling stock such that:

$$\gamma^* = \frac{\alpha(\beta_o + v)}{(1-\alpha)\beta_I + \alpha\beta_o + v} \quad (1)$$

Equilibrium transaction volumes as a share of the dwelling stock are:

$$\tau^* = \beta_I \gamma^* + \beta_o (1 - \gamma^*) + v \quad (2)$$

Increased property trading frequency

Holding all else constant when the share of investor-owned dwellings sold increases (i.e., investors' average holding period decreases), the equilibrium investor stock decreases as a share of total dwellings.

$$\frac{\partial \gamma^*}{\partial \beta_I} = \frac{-\alpha(1-\alpha)(\beta_o + v)}{[(1-\alpha)\beta_I + \alpha\beta_o + v]^2} < 0$$

Holding all else constant, when the share of owner-occupied dwellings sold increases (i.e., owner-occupiers' average holding period decreases), the equilibrium investor stock increases as a share of total dwellings.

$$\frac{\partial \gamma^*}{\partial \beta_o} = \frac{\alpha(1-\alpha)(\beta_I + v)}{[(1-\alpha)\beta_I + \alpha\beta_o + v]^2} > 0$$

Both investor and owner-occupier sales are likely to increase when transfer duty is abolished (i.e., the average duration of property holding will diminish for both investors and owner-occupiers). If the share of owner-occupier properties sold each year increases by $x\%$ (that is, $x = \frac{d\beta_o}{\beta_o}$) and the share of investor properties sold each year increases by $y\%$ (that is, $y = \frac{d\beta_I}{\beta_I}$), the combined effect on the investor share of the dwelling stock can be expressed as:

$$d\gamma^* = \frac{\partial \gamma^*}{\partial \beta_o} \beta_o x + \frac{\partial \gamma^*}{\partial \beta_I} \beta_I y = \frac{\alpha(1-\alpha)[\beta_o(\beta_I + v)x - \beta_I(\beta_o + v)y]}{[(1-\alpha)\beta_I + \alpha\beta_o + v]^2}$$

The owner-occupier share of the dwelling stock will increase if $d\gamma^* < 0$, which is true if and only if:

$$\frac{x}{y} < \frac{\beta_o \beta_I + \beta_I v}{\beta_o \beta_I + \beta_o v}$$

Investors sell more frequently than owner-occupiers, so $\beta_I > \beta_o$ and the expression on the right-hand side of the inequality is greater than one.

It is reasonable to suppose that $\frac{x}{y} < 1$, because investor purchases are likely to be more sensitive to transaction costs than owner-occupier transactions. Owner-occupier sales are more likely to be driven by life-cycle considerations, while pecuniary considerations are likely to play a larger part in investor sale decisions. Moreover, existing transaction costs are lower for investors (tenants pay any removalist costs; and landlords do not typically have the same sentimental attachment to their properties as owner-occupiers), so that a given reduction in stamp duty is likely to be a larger percentage reduction in transaction costs for investors (i.e., $y > x$).

Increased property trading is thus expected to increase the owner-occupier share of the dwelling stock.

Shifting relative prices between investors and owner-occupiers

Tax reform that shifts the relative prices paid between investors and owner-occupiers will change α , the share of properties for sale that is bought by investors each year.

Holding all else constant, when the share of total dwellings bought each year by investors increases, the equilibrium investor stock increases as a share of total dwellings.

$$\frac{\partial \gamma^*}{\partial \alpha} = \frac{(\beta_o + v)(\beta_I + v)}{[(1 - \alpha)\beta_I + \alpha\beta_o + v]^2} > 0$$

Private dwelling stock growth

Higher growth of the private dwelling stock influences the investor share of the stock as follows:

$$\frac{\partial \gamma^*}{\partial v} = \frac{((1 - \alpha)\beta_I + \alpha\beta_o + v)\alpha - \alpha(\beta_o + v)}{[(1 - \alpha)\beta_I + \alpha\beta_o + v]^2}$$

Thus, $\frac{\partial \gamma^*}{\partial v} > 0$ if and only if:

$$\alpha > \frac{\alpha(\beta_o + v)}{(1 - \alpha)\beta_I + \alpha\beta_o + v} = \gamma^*$$

Empirically, the investor share of transactions (α) is greater than the equilibrium investor share of the dwelling stock (γ^*) because investors trade more frequently than owner-occupiers.

As a result, γ^* increases when v increases, implying that a higher growth rate of the private dwelling stock lowers the owner-occupier share of the private dwelling stock.

It follows that an increase in the population growth rate (e.g. higher fertility or higher immigration) is likely to lower home ownership.

A decline in government-owned social housing could also lower home ownership, through two channels. First, tenants moving from government housing and into private housing would directly increase the rental share of the private housing market. Second, a period of decreasing government social housing would increase the growth rate of the private dwelling stock, increasing the investor share during this period.

Model calibration and the effects of reform

The following table lists the variables used in the model, and their pre- and post-reform values.

Parameter	Symbol	Initial value	Post-reform value
Investor share of the private dwelling stock	γ^*	32.9%	28.79%
Investor share of annual purchases	α	42.6%	41.32%
New homes built each year as a share of the dwelling stock	v	1.19%	1.19%
Total transactions as a share of dwelling stock	τ^*	6.54%	9.20%
Share of owner-occupied properties sold each year	β_o	4.40%	6.39%
Share of investor-owned properties sold each year	β_I	7.28%	12.01%

The initial values are calibrated using the following data:

- γ^* – 2016 Census data, excluding government-owned dwellings and ‘tenure-type not stated’ and with adjustments for unoccupied private dwellings⁴
- α – Revenue NSW residential transactions data, average from 2004-05 to 2020-21; using RNSW data flag for investment properties
- ν – Assumed equal to annual NSW population growth, average since 2000/01, using ABS data
- τ^* – Average of Revenue NSW residential transactions 2000-01 to 2019-20/ Office of Local Government number of properties subject to residential rates
- β_0 – Identified by solving equations (1) and (2) simultaneously:

$$\beta_0 = \frac{(1 - \alpha)T^* - (1 - \gamma^*)\nu}{(1 - \gamma^*)}$$

- β_1 – Identified by solving equations (1) and (2) simultaneously:

$$\beta_1 = \frac{\alpha T^* - \gamma^* \nu}{\gamma^*}$$

The post-reform values of β_0 and β_1 are calibrated having regard to Warlters and Malakellis (2021) finding that abolishing transfer duty is likely to increase transaction volumes by between 40 per cent and 70 per cent, with 50 per cent the most likely outcome. We have assumed sales by owner-occupiers increase by 45 per cent and sales by investors increase by 65 per cent. The rationale for these assumptions, and variations in the assumptions are explored in Annex C.

The post-reform value of α (investor share of annual purchases) is calibrated using the model in Annex B.

The growth of the dwelling stock is assumed to be unchanged by the reform.

The post-reform value of γ^* (investor share of the stock) is calculated using equation (1) and the post-reform values of α , β_0 , β_1 and ν . The model predicts that the owner-occupied share of the private dwelling stock will increase from 67.1 per cent to 71.25 per cent, which is a 6.2 per cent increase. Outside the Annex A model, a further 0.4 per cent is added to home ownership associated with a relaxed savings constraint, giving a predicted 6.6 per cent total increase in home ownership as a long-run result of the property tax reform.

Finally, the post-reform value of τ^* (transaction volume as a share of the stock) is calculated using equation (2). The total share of the stock transferred each year increases to 8.44 per cent, which is a 40.6 per cent increase in total volumes (i.e., established plus new homes). The share of established homes sold each year increases by 49.6 per cent.

⁴ Adjustments for homes unoccupied on census night are made using reasons given in the 1981 and 1986 census for why dwellings were unoccupied. Rental and holiday homes are assumed not to be a principal place of residence. All other unoccupied dwellings are assumed to be split between investors and owner-occupiers in line with the shares for occupied dwellings. See SGS Economics, <https://www.sgsep.com.au/publications/insights/why-was-no-one-home-on-census-night> retrieved on 31 January 2022.

Annex B Investor shares of purchases

This Annex models how the investor share of annual purchases (i.e., α in the model of Annex A) would be affected if the balance of NSW property taxes changes.

Model

Suppose that all properties are purchased by either a representative investor (I) or a representative owner-occupier (O). The willingness to pay (W_i) of each buyer type is independent and normally distributed with mean μ_i and variance σ_i^2 , where $i \in \{I, O\}$. The investor and the owner-occupier compete in an auction to purchase each property placed on the market. Each party makes a single bid, equal to their randomly drawn willingness to pay.

Because $W_I \sim N(\mu_I, \sigma_I^2)$ and $W_O \sim N(\mu_O, \sigma_O^2)$ are independent,

$$\Pr(W_I > W_O) = \Pr(W_I - W_O > 0) = 1 - \Pr(W_I - W_O \leq 0)$$

Further, $W_I - W_O$ is normally distributed,

with mean:

$$\mu \equiv E[W_I - W_O] = \mu_I - \mu_O$$

and variance:

$$\sigma^2 \equiv \text{Var}[W_I - W_O] = \sigma_I^2 + \sigma_O^2$$

Thus,

$$\frac{W_I - W_O - \mu}{\sigma} \sim N(0,1)$$

and,

$$\Pr(W_I - W_O \leq 0) = \Pr\left(\frac{W_I - W_O - \mu}{\sigma} \leq \frac{0 - \mu}{\sigma}\right) = \Phi\left(\frac{-\mu}{\sigma}\right)$$

where Φ is the cumulative density function of the standard normal distribution.

Consequently, the probability that the investor wins the auction is given by:

$$\Pr(W_I > W_O) = 1 - \Phi\left(\frac{-\mu}{\sigma}\right)$$

The model further assumes that in the long run the number of dwellings matches the number of households (i.e., the supply of dwellings per household is fixed), so that prices are entirely determined by purchaser willingness to pay.

Calibration

We assume that for both bidders, 95 per cent of all bids are within 32 per cent of the mean, or equivalently that the standard deviation is 16.33 per cent of the mean. See below for the rationale for this assumption. For a normally distributed variable, 95 per cent of observations are within 1.96 standard deviations of the mean, implying

$$1.96\sigma_i = 0.32\mu_i \quad \forall i \in \{I, O\}.$$

The initial mean value bid by the investor for a property is normalised to $\mu_I = 1$. This implies the investor's bids have standard deviation

$$\sigma_I = \frac{0.32}{1.96} = 0.1633.$$

Calibration is completed by setting the investor’s probability of winning the auction at 42.6 per cent ($Pr(W_I > W_O) = 0.426$), consistent with the estimated investor share of purchases prior to any policy changes. This implies:

$$1 - \Phi\left(\frac{-\mu}{\sigma}\right) = 0.426$$

Inverting the cumulative density function, we have:

$$\frac{-\mu}{\sigma} = 0.18657$$

This gives a system of two equations in μ_o and σ_o , the two unknowns of the owner-occupier’s distribution:

$$0.18657 = \frac{-\mu}{\sigma} = \frac{\mu_o - \mu_I}{\sqrt{\sigma_I^2 + \sigma_o^2}} = \frac{\mu_o - 1}{\sqrt{0.02666 + \sigma_o^2}}$$

and

$$\sigma_o = \frac{0.32}{1.96}\mu_o$$

Solving for μ_o and σ_o , the calibrated distributions are:

$$W_I \sim N(1, 0.1633^2) \text{ and } W_O \sim N(1.044, 0.1705^2).$$

Policy shocks

Having calibrated the model, the mean bids are shocked, reflecting the policy changes to effective tax rates paid by owner-occupiers and investors.

The price bid by investors is affected by income tax deductibility. It is assumed the average investor pays a marginal tax rate of 32 per cent on regular income and 43 per cent when being assessed for capital gains. Land tax and property tax are immediately deductible in the year they are incurred. In contrast, transfer duty is deductible as part of the capital gains tax calculations at the time a property is sold, lowering the tax benefit of duty deductions. Capital gains and associated deductions are halved, and deferral of deductions further lowers the present value of the tax benefits of duty.

The effective property tax paid (i.e., after income tax) is measured as a share of annual consideration assuming current patterns of land ownership and transactions. The following table sets out the estimated revenue collected from owner-occupiers and investors if all properties are subject to existing taxes, or all are subject to the property tax. The table examines impacts after income tax deductions, assuming current patterns of land ownership and transactions.

	Owner-occupiers		Investors	
	Current taxes	Property tax	Current taxes	Property tax
State revenue	\$3.946b	\$3.773b	\$4.202b	\$5.516b
Impact after income tax deductions	\$3.946b	\$3.773b	\$3.344b	\$3.751b
Annual consideration for dwellings	\$95.36b		\$64.64b	
Effective tax rate	4.14%	3.96%	5.16%	5.80%

The price offered by a purchaser (p) reflects willingness to pay (w) and the tax rate paid on that purchase (t), where $p_0(1 + t_0) = w$. Holding w constant (i.e., assuming that the flow of benefits provided by a dwelling to a purchaser is unchanged), the change in tax rates gives rise to revised mean bids satisfying:

$$\frac{p_1}{p_0} = \frac{(1 + t_0)}{(1 + t_1)}$$

The changes in effective tax rates increase the owner-occupier mean bid by 0.17 per cent and lower the investor mean bid by 0.61 per cent. Using these new values for mean bids and preserving the assumed relationship between mean bids and the variance of bids (i.e., 95 per cent of bids are within 32 per cent of the mean bid), the model results in a revised outcome where investors win 41.28 per cent of auctions, instead of 42.6 per cent pre-reform.

This estimated parameter is used as an input into the model of Annex A to examine the effect on home ownership.

Assumption regarding variance of bids

The model assumes that 95 per cent of bids are within 32 per cent of the mean bid, for both owner-occupiers and investors (i.e., if bids follow a normal distribution, the standard deviation is 16.35 per cent of the mean). This assumption has been informed both by empirical evidence and by sensitivity testing.

Anundsen and Røed Larsen (2018) report Norwegian data regarding 469,127 owner-occupier transactions between 2002 and 2014. They examine the ratio between the observed selling price and the hedonic predicted price, finding a mean ratio of approximately 1, with the top and bottom deciles of observed selling prices observed at ratios of approximately 0.7 and 1.3. Assuming a normal distribution, this suggests 95 per cent of observed selling prices are within 46 per cent of the hedonic predicted price (i.e., if bids follow a normal distribution, the standard deviation is 23.4 per cent of the mean). The data reflect the joint distribution of the investor and owner-occupier bids, rather than independent distributions of each of the representative bidders.

An alternative specification of the distributions could be deduced from analogy with construction contracts. Ballesteros-Pérez and Skitmore (2017) present a database of 18,153 bids for 1,958 construction contracts in five countries, indicating that 95 per cent of bids are within 14.7 per cent of the mean bid (i.e., if bids follow a normal distribution, the standard deviation is 7.5 per cent of the mean). Their paper also suggests that a normal distribution is a reasonable approximation for the distribution of bids. The nature of sealed bid construction bidding permits observation of individual bidders' distributions, rather than observing the joint distribution of all the bidders. However, the strength of the analogy between construction bids and home purchase bids is unclear. Compared to home auction bids, construction contract bids could exhibit greater variance – because construction contracts might involve a wider range of risks; or lesser variance – because construction companies might be more informed bidders than home buyers, or because people bidding for a home might exhibit greater idiosyncratic variation in their valuation of homes.

Stevenson and Young (2015) examine auction sales in Ireland. On average opening bids are about 19 per cent below the vendor's reserve price, and the sale price is about 14 per cent above the reserve. Merlo and Ortalo-Magné (2014) examine private treaty sales in England: vendors issue a listing price, initial offers are made by a subset of a pool of searching buyers, and then a negotiation process ensues between offeror and vendor. On average, the first offer made is within about 8 per cent of the listing price, and the sale price is about 4 per cent below the listing price. Both of these studies suggest the variance of bids may be smaller than that suggested by Anundsen and Røed Larsen (2018), although the measures cannot be directly compared.

On balance, a distribution in which 95 per cent of bids are within 32 per cent of the mean appears reasonable, falling toward the middle of the range of values suggested by the data. As a sensitivity test, we have considered how the results would vary if we were to adopt alternative assumptions, as

shown in the following table. The variations in the assumptions used for this appendix imply home ownership increases ranging from 6.1% to 8.4%.

Assumptions		Results from changed effective tax rates		
$X = 1.96 \frac{\sigma_O}{\mu_O}$	$Y = 1.96 \frac{\sigma_I}{\mu_I}$	Implied investor share of purchases after policy change ($\hat{\alpha}$)	Home ownership increase if only α changes	Home ownership increase when combined with other changes estimated in the paper
15%	15%	39.79%	3.7%	8.4%
15%	32%	40.87%	2.3%	7.1%
15%	45%	41.29%	1.8%	6.6%
32%	15%	40.95%	2.2%	7.0%
32%	32%	41.28%	1.8%	6.6%
32%	45%	41.50%	1.5%	6.3%
45%	15%	41.39%	2.1%	6.4%
45%	32%	41.54%	1.4%	6.3%
45%	45%	41.66%	1.3%	6.1%

Annex C Sensitivity Testing

The main body of the paper finds that the proposed property tax reform would increase home ownership by 6.6 per cent. This Annex explores the sensitivity of this finding to variations in certain assumptions.

Scenario 1 summarises the assumptions that feed into this estimate of a 6.6 per cent increase in home ownership:

The second and third columns relate to the frequency of sales by existing owners. It is assumed that the abolition of duty will increase the share of owner-occupied properties that are sold each year by 45 per cent, and that investor sales will increase by 65 per cent, resulting in a 51.6 per cent average increase in sales of established homes using the pre-reform weights of owner-occupiers and investors.

The fourth column relates to the frequency with which owner-occupiers rather than investors purchase the properties that are available for purchase each year. The shift from duty and land tax to an annual property tax will alter the relative prices faced by owner-occupiers and investors, increasing the average bid of owner-occupiers by 0.17 per cent and decreasing investors' average bids by 0.61 per cent.

The fifth column considers the effect of lower upfront costs, associated with the removal of duty and lower average dwelling prices. These effects of reform will reduce the time required to save for a deposit, with particular benefit for first home buyers, adding around 0.5 per cent to home ownership.

The sixth column reports the assumed rate of population growth. As identified in Annex A, lower population growth is expected to increase home ownership.

Scenarios 2, 3, and 4 isolate the three drivers of this increase: an increase in sales volumes; a decrease in the investor share of purchases, and a lower savings constraint. The increase in sales volumes appears to be the most important of the three drivers. However, the three drivers interact with each other, and the home ownership increase in Scenario 1 is less than the sum of the increases in Scenarios 2, 3 and 4.

Scenario	Owner-occupied sales increase	Investor sales increase	Changed relative prices	Lowered savings constraint	Population growth	Home ownership increase
1	+45%	+65%	✓	✓	1.19%	+6.6%
2	+45%	+65%			1.19%	+5.0%
3			✓		1.19%	+1.7%
4				✓	1.19%	+0.5%

Sensitivity testing of the changes in sales volumes for investors and owner-occupiers, combined with other aspects of the reform (scenarios 5, 6, 7 and 8 in the table below), indicates a potential range for the increase in home ownership between 3.5 per cent and 8.6 per cent.

International evidence reviewed by Malakellis and Warlters (2021) indicates that total transaction volumes are likely to increase by between 40 per cent and 70 per cent, with 50 per cent being the most likely outcome.

Scenario 5 suggests an upper limit for the impact on home ownership, reflecting the 40 per cent to 70 per cent range emerging from the literature review. If investor sales increase by relatively more than owner-occupier sales, home ownership will increase. Under the scenario 5 assumptions, home ownership would increase by 8.6 per cent.

Scenario 6 examines what would happen if both owner-occupier and investor sales increase by the same amount – a 50 per cent increase in annual sales. This scenario identifies a lower bound of 3.5 per cent increase in home ownership. As discussed in the body of the paper, however, there are important economic reasons for thinking that abolition of duty will increase sales by investors by relatively more than sales by owner-occupiers, so this scenario is not particularly likely.

Scenario 7 is calibrated to increase total transaction volumes after the reform by 50 per cent, while Scenario 8 is calibrated to increase sales of established homes after the reform by 50 per cent, in both cases keeping the increases in β_0 and β_1 within the 40 per cent to 70 per cent range suggested by the empirical literature.

The empirical evidence is based on relatively small changes in duty in multiple jurisdictions and can thus be considered as the marginal effect on volumes, “all else equal”. Since countries differ in their rates of population growth, it seems unlikely that the measured effect on transactions incorporates variations arising from higher volumes of new homes. Accordingly, scenario 8 should be preferred to scenario 7. Scenario 8 yields a higher home ownership outcome than scenario 1, reflecting a greater relative increase in investor sales volumes compared with owner-occupier sales volumes, closer to the extremes of the empirical evidence.

While noting the possible range of outcomes, scenario 1 (home ownership increases by 6.6 per cent) is preferred to any of scenarios 5, 6, 7 or 8, because: the ‘all else equal’ nature of the empirical evidence lends itself to an interpretation focused on the pre-reform change in volumes; economic reasoning points to relatively greater impact of lower transaction costs on investors; and it uses central assumptions rather than the extremes of the empirical evidence.

Scenario	Owner-occupied sales increase	Investor sales increase	Changed relative prices	Lowered savings constraint	Population growth	Home ownership increase
5	+40%	+70%	✓	✓	1.19%	+8.3%
6	+50%	+50%	✓	✓	1.19%	+3.0%
7	+59.3%	+70%	✓	✓	1.19%	+5.0%
8	+43.6%	+70%	✓	✓	1.19%	+7.7%

Scenarios 9 and 10 explore the consequences of population growth dropping from 1.19 per cent to its long-run average of 1.12 per cent annual growth or to the 0.8 per cent forecast by the NSW Intergenerational Report (NSW Treasury, 2021). It is assumed that growth of the dwelling stock matches growth of population (i.e., average household size remains unchanged). Given the IGR’s prediction for population growth, it is plausible that home ownership will increase by more than predicted in this paper, although the increment would not be caused by the tax policy change.

Scenario	Owner-occupied sales increase	Investor sales increase	Changed relative prices	Lowered savings constraint	Population growth	Home ownership increase
9	+45%	+65%	✓	✓	1.12%	+6.7%
10	+45%	+65%	✓	✓	0.8%	+7.3%

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