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Abstract

Stamp duty is a core part of the Australian tax system, but large components of its effect on the economy are unknown. In particular, the distribution of stamp duty's costs are not well understood. This has been hampered by a lack of quantitative studies of stamp duty's costs, and by limited discussion of stamp duty's effect on rental markets. This paper addresses this gap by establishing a theoretical framework for understanding stamp duty's incidence, and then by estimating the distribution of its costs. We find that stamp duty is a regressive tax, and that this regressiveness is predominantly due to the fact that housing costs are a significantly higher share of household income in low income households. We also find that the economic incidence of stamp duty is not particularly relevant to interrogations of how costs are distributed, because (unlike in many other markets), most people who sell housing tend to purchase houses of a similar value within a short time period of selling. We also provide some thoughts on current reform proposals and then discuss how land taxes could be designed in light of political barriers.

JEL classification: D23, H22, H23, H27, R21, R31, R38

Keywords: Transfer taxes, stamp duty, equity, tax incidence, transaction costs

1 Introduction

The vertical and horizontal equity effects of stamp duty are important for understanding and critiquing stamp duty, and any related reforms. Despite this, there has been limited analysis of the distribution of stamp duty's costs among different groups of society. This poses a problem for policy makers as they aim to both reform stamp duty, and understand the overall progressiveness of Australia's tax system.

Stamp duty is paid by the buyer at the time of purchase, and no payment is made while maintaining ownership. The sale value, or improved property value, is the tax base. Stamp duty has an increasing rate schedule which varies across the states (and territories). Rather than statutory or legal tax incidence, our interest is on the economic incidence of taxes once the market adjusts prices of property and rents for the tax.

This analysis focuses on owner occupied residential property and on rental properties. About 70% of the current Australian population live in owner occupied homes and the rest rent. For owner occupied homes, the variables of interest are the tax incidence on the buyer (the statutory taxpayer) as the demand side and on the seller as the supply side. First-home buyers are just a buyer, while those who change their property owned are both a buyer and seller. For rental property, the interest in tax incidence is on the landlord as supplier and statutory taxpayer on the supply side, and on the tenant as the buyer on the demand side.

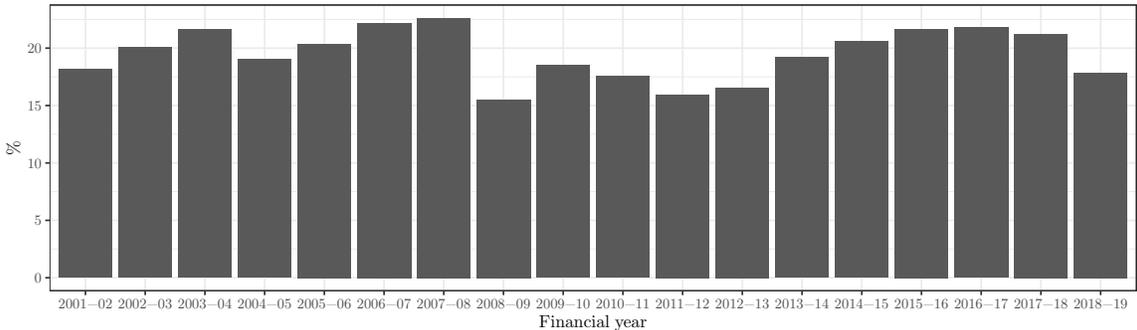
Horizontal inequity arises because over time those who buy and sell more frequently pay a larger stamp duty sum than the average, and those who hold property for longer than the average pay a lower average tax rate. Vertical equity can be assessed in terms of the average tax rate paid for households (or individuals) classified by income, wealth, age, education and other. Both these forms of inequity may vary depending on the extent to which stamp duty is paid by renters and property investors. The tax incidence of stamp duty on the transfer of residential property is the main focus of this paper, but it makes additional contributions to understanding the impacts on the rental market.

The paper proceeds as follows. Section two outlines the institutional context and the existing literature. Section three outlines our theoretical foundations and contributes to the

theory of stamp duty’s effects on renters. Section four outlines our empirical approach and results. Section five discusses the implications of these results. Section six concludes.

2 Literature review and institutional context

Stamp duty plays a major role in the Australian tax system. It accounts for around a third of state government’s own source revenue (see figure 2.1). In the past twelve months, several governments across Australia have announced changes to the way that stamp duty is administered in their states. The New South Wales government have begun a consultation process aimed at replacing stamp duty with a land tax, while the Victorian government has recently introduced temporary discounted rates of stamp duty, while also announcing intended changes to the bracket structure of stamp duty and land tax. These policy decisions follow a 2012 move by the Australian Capital Territory government to embark on a 20 year transition from stamp duty to land tax.



Source: Author derived, using state government budget data from the ABS (2003-2020).

Figure 2.1: Stamp duty as a share of states’ own source revenue

There is a large body of literature on stamp duty’s effects on the housing market, but limited analysis of equity considerations. Empirical analysis of stamp duty tends to focus on either mobility effects or price effects. Theoretical papers aim to explain the price response of owner-occupied housing to stamp duty. Applied policy discussions make the case for stamp duty reform, but generally appeal to efficiency arguments.

Many studies of mobility effects aim to measure how the rate of transactions of housing

changes due to the presence of the transaction tax. Empirical analyses that test these hypotheses have occurred in the United Kingdom (Best and Kleven, 2018; Hilber and Lyytikäinen, 2017), Europe (Bérard and Trannoy, 2018; Petkova and Weichenrieder, 2018), the United States (Slemrod et al., 2017; Kopczuk and Munroe, 2015), Canada (Dachis et al., 2012) and Australia (Davidoff and Leigh, 2013). They find a negative mobility response to stamp duty. While the efficiency effects of stamp duty are well studied, they are outside of the scope of this paper.

Another strand of investigation is the price effect of stamp duty on housing that is owned. Most empirical work, including Davidoff and Leigh (2013), Best and Kleven (2018), Dachis et al. (2012), and Kopczuk and Munroe (2015), and papers which focus on it especially such as Benjamin et al. (1993) and Besley et al. (2014), find a large price response, of equal to or greater than the size of the tax charged on the property.

Stamp duty reform has long been touted as an avenue for improving Australia's tax system. Stamp duty was called for abolition by a Commonwealth Productivity Commission working paper by Gabbitas and Eldridge (1998). In 2009, a government commissioned review of Australia's tax system called for the abolition of stamp duty in favour of a broad based land tax due to stamp duty's purported inefficiencies (Henry et al., 2009). Since then, a large collection of public sector and private sector reports have echoed these calls. These include reports by the Grattan Institute (Daley et al., 2018), Deloitte Access Economics (2015), the McKell Institute (Bentley and D'Cruz, 2016), Australian Treasury (Cao et al., 2015), the Melbourne School of Government (Freebairn et al., 2015) and the NSW Productivity Commission (2020).

Some papers have focussed on the transition options of stamp duty. In particular, Freebairn (2020), Coates and Nolan (2019) and Helm (2019) discuss both the political difficulties and fairness considerations of moving from stamp duty to a land tax. There have been various models proposed for switching, including a cold turkey approach, refunds for those who have recently paid stamp duty and an ACT style gradual transition. We discuss these in detail in section 5.2.

In general, these reports focus predominantly on the efficiency aspects of reform, citing the fact that estimates of the excess burden of stamp duty place it among the most socially costly taxes in Australia. To the extent that equity is discussed in these proposals, the analysis is limited. Daley et al. (2018) raise high level concerns about the fairness of different transition options to recent buyers. Bentley and D’Cruz (2016) use an illustrative example, comparing two households with different mobility rates, to highlight the horizontal inequity issues associated with stamp duty. Recently, a working paper by Cho et al. (2020) used a structural model to understand how the transition for stamp duty would impact different cohorts, focussing on the dynamic response of households to changes in incentives. While they find differences in the welfare effects of reforms to property taxes across age and tenant groups, they do not explicitly address how mobility rates vary or account for the non-linearity of the stamp duty schedule.

Equity considerations are a key factor for policy makers when designing (and reforming) a tax system. This has been recognised by several government commissioned tax reviews in both Australia (see Henry et al. (2009)) and abroad (Mirrlees et al., 2011). Investigations of the equity consequences (or progressiveness) of Australia’s tax system have previously focussed on income tax and GST, alongside broader features of the transfer system (The Productivity Commission, 2015; Davis et al., 2019). While these papers tend to find that the Australian tax system is progressive when compared to other countries, they ignore the effects of state taxes on the fairness of the tax system.

Housing costs are an important factor in understanding the changes in the standard of living of many Australians. As has been noted by Daley et al. (2018), housing costs as a share of income are both higher for low income Australians and is becoming an increasing share of their income. This has increased inequality in the effective purchasing power of the disposable income of the richest and poorest Australians when compared to considering the rate of inequality if just looking purely at income.

There are three major gaps in the literature. First, the equity considerations of stamp duty are poorly understood beyond illustrative examples of horizontal inequity. Second, there

are limited frameworks for understanding the effect of stamp duty on rental markets, which is central to understanding the vertical equity of stamp duty. Third, the relative fairness and viability of alternative transition options is still broadly uncertain.

3 Theoretical foundations

The distribution of costs will depend on how the incidence of stamp duty on homeowners falls on buyers and sellers and, for the rental market, how much is passed through to tenants in the form of higher rents.

3.1 Statutory framework

In Australia, the statutory or legal incidence of stamp duty is on the buyer and is charged at a rate which is increasing in the sale price of the property. These rates are shown in figure 3.1. For rental properties, the landlord pays stamp duty at time of purchase, with the tenant exempt.

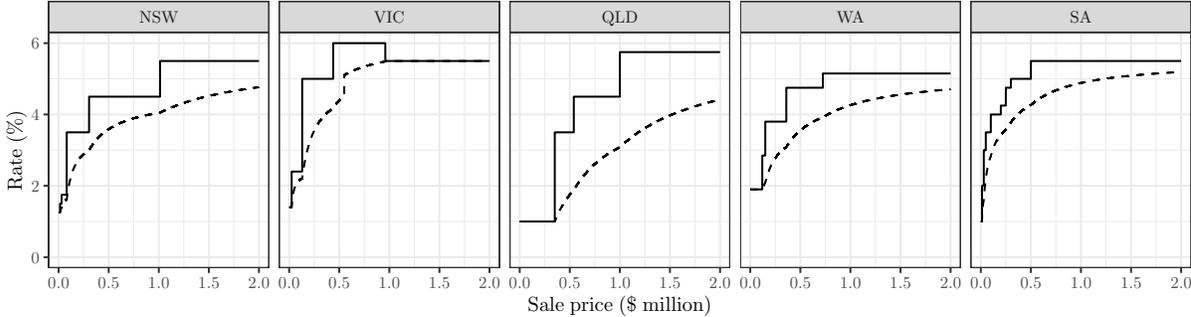


Figure 3.1: Marginal and effective or average stamp duty rates by state

Note: Solid line is marginal rate; dashed line is the effective or average rate.

Source: Author derived, using data outlined in appendix A.

Those who buy and sell more frequently than the average over time and pay more statutory stamp duty than the average, while those who hold onto property for more years than the average pay less stamp duty over time. This is horizontal inequity.

3.2 Simple market model

In this section, we propose a simple market model with two components to understand the effects of stamp duty on the housing market. The first component is an analysis of the effects on the aggregate housing stock, and the second component is an analysis of the effects on the rental market. This analysis is complemented by an alternative linear model, which is more prescriptive, which is outlined in appendix B.

3.2.1 Aggregate property model

The aim of this model is to use aggregate supply and demand functions to assess the effects of stamp duty initially paid by the property buyer on aggregate property quantities and average prices. The functions aggregate across many buyers and sellers competing for similar properties and they average over time the infrequent and lumpy stamp duty. A long run comparative static focus is taken, with the time dynamics and adjustment paths ignored.

Buyers are motivated by the purchase of a consumer good, namely accommodation, as part of a wider consumer choice problem for food, entertainment and other options, and by the purchase of an asset or wealth with alternatives of unincorporated businesses, shares, financial deposits and superannuation. Owner occupiers are the direct consumers and wealth accumulators, and often also sellers. Landlords are an intermediate buyer and on-seller of accommodation to tenants, but they also buy property for a wealth option, and often they also are sellers of property.

The aggregate property market can be represented by the demand and supply functions::

$$D = F(P, Z_1) \tag{3.1}$$

$$S = F(P, Z_2) \tag{3.2}$$

where, D and S are aggregate quantity demanded and supplied, P is the average property price, and the Z_i are other explanatory variables assumed to be held constant for the tax analysis. The price variable P can be represented by the stock or asset value, A , or by the

present value of future annual rent flows (actual or imputed), R_t , with an efficient competitive market the asset price equals the discounted value of the future stream of returns across the asset lifetime \mathcal{T} , namely:

$$A = \sum_{t \in \mathcal{T}} \frac{R_t}{(1+d)^t} \quad (3.3)$$

where d is the discount rate.

Without stamp duty, the market price, P is determined by equating (3.1) and (3.2). The economic incidence of the tax τ on the buyer (ΔP) and the seller ($\Delta P - \tau$) depends on the relative elasticities of demand, ED and supply, ES . That is:

$$\text{Buyer incidence:} \quad \Delta P = \frac{ES}{ES + ED} \cdot \tau \quad (3.4)$$

$$\text{Seller incidence:} \quad \Delta P - \tau = \frac{ED}{ES + ED} \cdot \tau \quad (3.5)$$

We posit that neither the demand or the supply own price elasticity in (3.4) and (3.5) is perfectly elastic or inelastic. Hence, the economic incidence of stamp duty tax is shared between the buyer and seller, with some of the statutory incidence on the buyer is passed back to the seller as a lower market price. For the large share of those changing property, they are both a buyer and a seller, the statutory and economic incidence is approximately the stamp duty. Depending on whether a property transferrer moves up (or down) market, they will bear more (less) of the economic incidence. Economic incidence of owner occupiers differs from statutory incidence for first home buyers and for those selling own homes; first time buyers pay less than the tax and final sellers bear some of the tax.

The view that sellers bear all of the economic incidence of stamp duty (for example Davidoff and Leigh, 2013) implies an unrealistic assumption of a perfectly inelastic supply of property. There are several reasons for an elastic supply of residential property over the long run. There are alternative uses of land, including commercial property, primary production and environment amenity. Associated, government regulations on the availability of land and other property supply considerations play key roles in supply and they are sensitive to both

market and political pressures, including price. The supply of buildings has some elasticity, with buildings being in part a complement and in part a substitute for land in the supply of residential property.

Vertical equity of stamp duty expressed as an average annual economic incidence relative to household income (or wealth) across the different income, wealth, age and other household category attributes will depend on two key factors. These are: the tax base given by the average value of property traded and the frequency of trade; and the progressive tax rate schedule.

Horizontal equity effects of stamp duty can be assessed as follows. For each category of households assessed by the above aggregate property model, (3.4) and (3.5) provides the economic incidence for the average household, with average in the sense of the average number of years of continued ownership or frequency of property transfer. Those who transfer property more frequently experience the same average market price response, and they pay more stamp duty at the statutory rate on the above average number of transfers. By contrast, those who transfer property less frequently than the category average experience the average property price response, and they pay less stamp duty at the statutory rate on the below average number of property transfers. The more disperse the distribution of frequency of property transfer, or length of continued property ownership, the greater the degree of horizontal inequity of stamp duty.

3.2.2 Rental property market

The market for rental property can be represented by a tenant demand function for rent accommodation, with options of owner occupied and other consumer products, and a landlord supply function, with options of placing savings in unincorporated businesses, shares, financial deposits, superannuation and other wealth assets. A simplified rental property market model

has demand and supply functions:

$$D_R = F(P_R, Z_3) \tag{3.6}$$

$$S_R = F(P_R, P, Z_4) \tag{3.7}$$

where, D_R is quantity demanded for rental accommodation, S_R is landlord provided supply, as above P_R is rental prices with the options of (3.3), Z_3 is a set of other explanatory variables such as income, interest rates, and prices of other consumption options, and Z_4 is a set of other landlord supply variables such as returns on non-property investment options and regulations.

The market equilibria comes from equating (3.6) and (3.7). Now consider the effect of stamp duty on the rental property market. Following the analysis of the aggregate property market above, stamp duty is in part passed forward as a higher property price, ΔP from (3.5). As discussed above, $0 < \Delta P < \tau$, and perhaps about a half of the stamp duty based on the WTP and WTS model. A direct effect of stamp duty is to push upwards the supply curve for rent accommodation, (3.7).

The share of the higher property price, ΔP , passed forward to tenants as a higher rent price, P_R , depends on the relative elasticities of rent demand in (3.6) and rent supply in (3.7). With both elasticities falling within the extremes of perfectly elastic and inelastic, only some of the higher property price would be passed forward to tenants as a higher rent, ΔP_R .

4 Empirical analysis

We use a longitudinal panel of Australian homeowners, combined with a dataset of Australia states' stamp duty rates, to understand the distribution of stamp duty's costs across different groups.

4.1 Data

The major data source used in this analysis is from the Household, Income and Labour Dynamics in Australia (HILDA) survey (DSS, 2020). This annually compiled longitudinal survey

contains detailed information on approximately 17,000 Australians, who are interviewed each year across 18 waves starting in 2000. We limit the data to Australia’s mainland states from 2010 onwards.

The data was modified to gain information about household mobility status. HILDA provides information about household’s length of occupancy at their current address, as well as their occupancy status. Individuals were flagged as having moved in the past 12 months if they reported occupancy of less than a year in one sample. This information was back-linked to previous waves to mark when households would move in the *next* 12 months.

HILDA data was also supplemented by two additional sources: First, we use information about rental yields from SQM Research¹. This provides information on rental yields for houses across the states of interest. Second, information on the annual turnover and mean prices of Australian residential properties was sourced from the Australian Bureau of Statistics (Cat No. 6416.0). Details on the variables included in these data, alongside HILDA, are outlined in table 4.1. Some variables are only available at a state level. For these variables, which are denoted by a subscripts i, s, w , the variable was matched to each individual i in wave w for their state of residence s .

Table 4.1: Variables used in the process of the analysis

Variable	Description	Source
Move $_{i,w}$	Did the household move in the next year	HILDA
House value $_{i,w}$	Value of the households current house	HILDA
Rent payments $_{i,w}$	Weekly rental expenditure	HILDA
Gross investments $_{s,i,w}$	Value of the households’ property investment portfolio	HILDA
Weekly income $_{i,w}$	Gross household weekly income	HILDA
Gross debt $_{i,w}$	Gross household debt	HILDA
Number in household $_{i,w}$	Total number of household members	HILDA
Number of transfers $_{s,w}$	Number of total residential transfers, quarterly	ABS
Property stock $_{s,w}$	Total number of residential properties	ABS
Mean property price $_{s,w}$	Mean price of transferred property, quarterly	ABS
Unit rental yield $_{i,w}$	Gross yield on a rental unit investment	SQM
House rental yield $_{i,w}$	Gross yield on a rental house investment	SQM
Investment properties $_{i,w}$	Total number of investment properties	Derived
Investment value $_{i,w}$	Value of each investment property	Derived

¹SQM Research is an Australian housing investment research company

The income variable is for income received over the sample period, or current income. An important fact is that current income for many is more variable relative to average or permanent income, or a proxy for life-cycle income. The measure of wealth is less variable, but with a larger upward trend by age. Vertical equity effects of stamp duty as a share of income reported in this paper use current income. To the extent that current income is more variable than measures of permanent income or life-cycle income, the regressive vertical equity effects of stamp duty reported below are larger in magnitude compared with a measure relative to permanent income or life-cycle income.

Finally, in addition to these data sources, an author compiled dataset on historical rates of stamp duty chargeable on a principal places of residence in Australia's five mainland states: New South Wales, Victoria, Queensland, South Australia and Western Australia.² These are used to calculate the stamp duty payable on each property transaction.

Table 4.2: Mobility rates by household group, including both renters and homeowners

Group	% of group				n obs
	Did not move in year	Moved in year	Not in next wave	Share homeowners	
Occupancy status					
Renter	63.61	29.28	7.11	0	29146
Homeowner	89.57	6.84	3.59	100	60022
Weekly household income					
\$500 or less	78.6	15.64	5.76	50.42	7999
\$500 to \$1000	80.93	14.23	4.85	58.87	15387
\$1000 to \$1500	77.85	17.04	5.11	54.63	13790
\$1500 to \$2000	79.81	15.47	4.72	62.62	13199
\$2000 to \$2500	82.35	13.43	4.22	72.11	11343
\$2500 or more	83.6	11.97	4.43	83.62	27450
Gross debt					
No debt	76.45	17.95	5.61	47.61	55636
\$50k or less	91.14	5.82	3.04	100	3454
\$50k to \$250k	89.12	7.52	3.37	100	13955
\$250k to \$500k	88.02	8.7	3.28	100	12195
\$500k or more	87.75	8.78	3.46	100	3928
Number in household					
1 person	76.54	18.95	4.51	49.44	13686
2 people	82.68	12.62	4.69	71.25	31123
3 to 5 people	81.54	13.69	4.77	71	39950
6 or more people	79.72	14.67	5.6	61.58	4409

Note: Aggregate across waves from 2010 onwards. Includes renters and homeowners

²Details of the sources used are provided in appendix A. These rates have been cross-checked with data used in Davidoff and Leigh (2013).

Table 4.3: Mobility rates by household group, including only homeowners

Group	% of group				n obs
	Did not move in year	Moved in year	Not in next wave	Share homeowners	
Weekly household income					
\$500 or less	90.33	5.11	4.56	100	4033
\$500 to \$1000	91.31	4.86	3.83	100	9058
\$1000 to \$1500	90.89	5.52	3.58	100	7533
\$1500 to \$2000	89.32	7.43	3.25	100	8265
\$2000 to \$2500	89.66	7.31	3.03	100	8179
\$2500 or more	88.36	7.98	3.66	100	22954
Gross debt					
No debt	90.58	5.47	3.95	100	26490
\$50k or less	91.14	5.82	3.04	100	3454
\$50k to \$250k	89.12	7.52	3.37	100	13955
\$250k to \$500k	88.02	8.7	3.28	100	12195
\$500k or more	87.75	8.78	3.46	100	3928
Number in household					
1 person	89.66	6.41	3.93	100	6767
2 people	90.54	5.92	3.54	100	22176
3 to 5 people	88.94	7.56	3.5	100	28364
6 or more people	87.92	7.96	4.13	100	2715

Note: Aggregate across waves from 2010 onwards. Homeowners only

4.2 Core margins

Central to understanding stamp duty's horizontal and vertical equity is the distribution of occupancy lengths and the value of homes across household groups. As mentioned, households who move more often between owner-occupied properties will pay stamp duty more often and, all else equal, pay more stamp duty than other households. Households whose housing costs are a higher share of their income will, compared to other similar households, pay more stamp duty.

4.2.1 Occupancy lengths

Our preferred method is to observe how long homeowners lived in their house at the point of movement ³ This has the advantage of observing the direct outcome of interest (time between moves), but suffers from sampling bias. This sampling bias originates because households who

³An alternative method observes the occupancy length reported by each household in a given wave. This measure will capture all households, so it will not suffer sampling bias. However, it will not truly report the occupancy rate, because households' reported value is a partially complete view of their total occupancy length. Given this, it will underestimate the occupancy length (or overestimate household mobility).

move more often in the sample period will be over-represented, as probability of appearing in a given year's sample is a linear function of move frequency. To address this, we re-weight the sample according to the extent to strip away the sampling bias above. Our results are shown in figure 4.1 and in table 4.4.

Table 4.4: Occupancy rates across different groups

Group	Average occupancy length (years)	% moving less than every				n obs
		10 years	20 years	30 years		
Weekly household income						
\$500 or less	29.35	83.3%	54.7%	38.9%	138	
\$500 to \$1000	25.57	83.8%	58.3%	37.5%	271	
\$1000 to \$1500	18.27	71.2%	37.4%	15.8%	263	
\$1500 to \$2000	16.07	67.8%	33.8%	10.3%	379	
\$2000 to \$2500	14.49	62.1%	34%	6.8%	358	
\$2500 or more	15.93	68.7%	31.5%	6.1%	1044	
Gross debt						
No debt	24.01	83%	54.7%	26.5%	874	
\$50k or less	18.17	83.9%	40.2%	8%	123	
\$50k to \$250k	13.09	60.5%	20.3%	4.3%	646	
\$250k to \$500k	11.88	52%	21.7%	2.3%	619	
\$500k or more	13.37	55.5%	22.1%	9.5%	191	
Number in household						
1 person	24.83	78.2%	51.7%	32.2%	371	
2 people	21.68	73.2%	49.4%	27.4%	724	
3 to 5 people	14.67	68.4%	28.4%	2.5%	1246	
6 or more people	14.71	67.9%	26.7%	3.2%	112	

Note: Aggregate across waves from 2010 onwards. Homeowners only

These plots show significant variance in the general population. It is not immediately intuitive as to why households who move more frequently should pay more towards state government revenue than households who move less frequently. This, therefore, is a form of horizontal inequity which may not be justified.

These plots are duplicated in figures 4.2 and 4.3, but cut across age and income groups respectively. These plots are more revealing. They show that young people move significantly more frequently than people who are older. It also shows that people in low income groups move *less* frequently than those in higher income groups, with greater variance in their mobility rates also. This implies that the mobility rate margin of stamp duty disadvantages young people, but advantages people who are in low income groups.

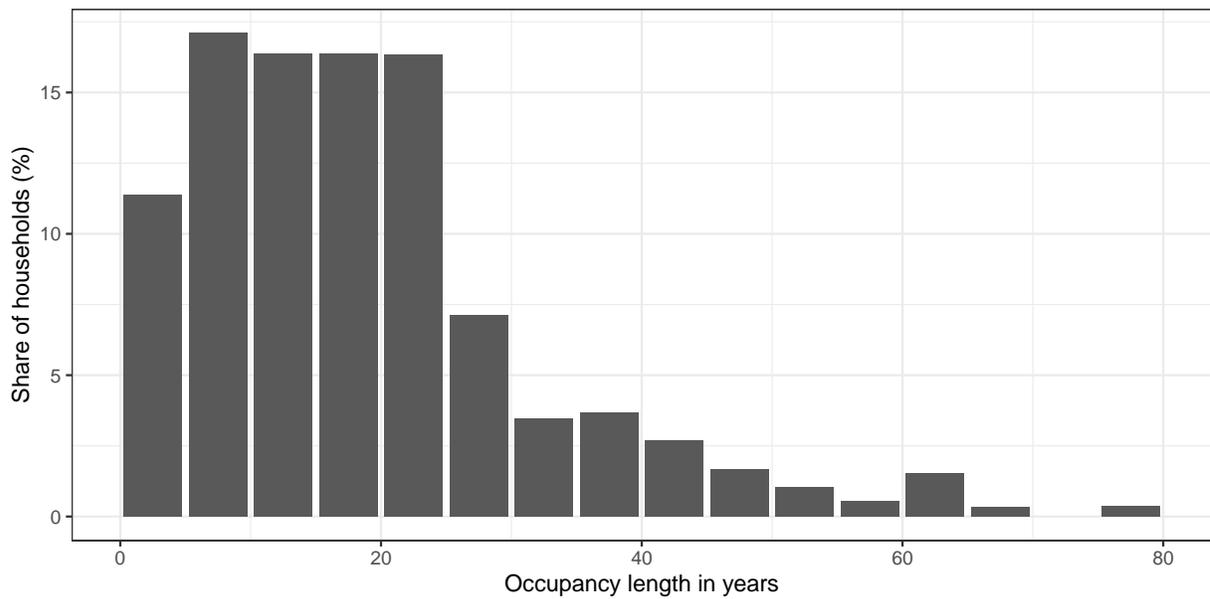


Figure 4.1: Distribution of household occupancy length

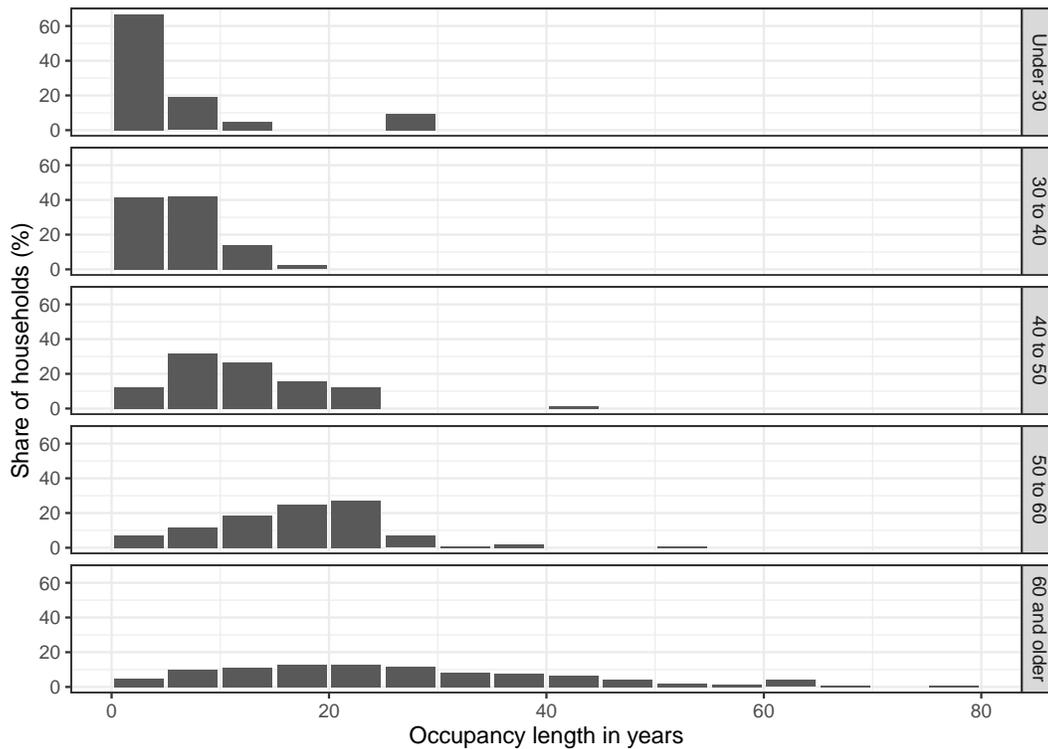
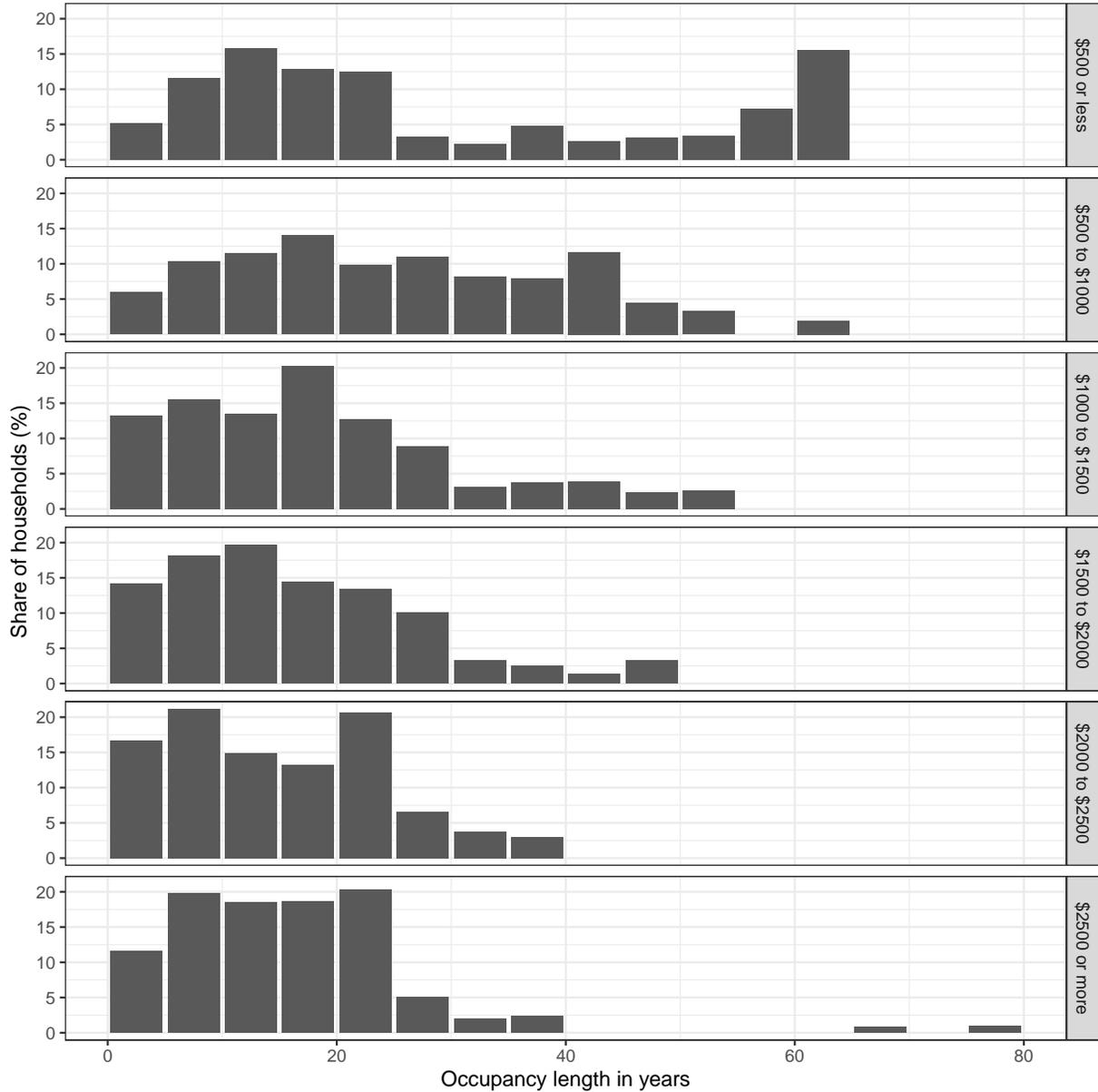


Figure 4.2: Distribution of household occupancy length, by age group

Figure 4.3: Distribution of household occupancy length, by income group



4.2.2 House values

House values are another core margin through which the costs of stamp duty should be felt. Households whose house values are a higher share of their income will, all other things constant, pay more stamp duty than other similar households. Stamp duty costs expressed

as a share of income will depend on this distribution. However, it will also depend on the distribution of the raw value of houses owned by income groups. If higher income households tend to purchase more expensive houses, then they will pay more stamp duty as a percent of their house value as stamp duty effective rates are increasing on house price. This interaction – between house values as a share of income and the extent to which the stamp duty rate rises with house prices – is key to understanding the distribution of stamp duty’s costs.

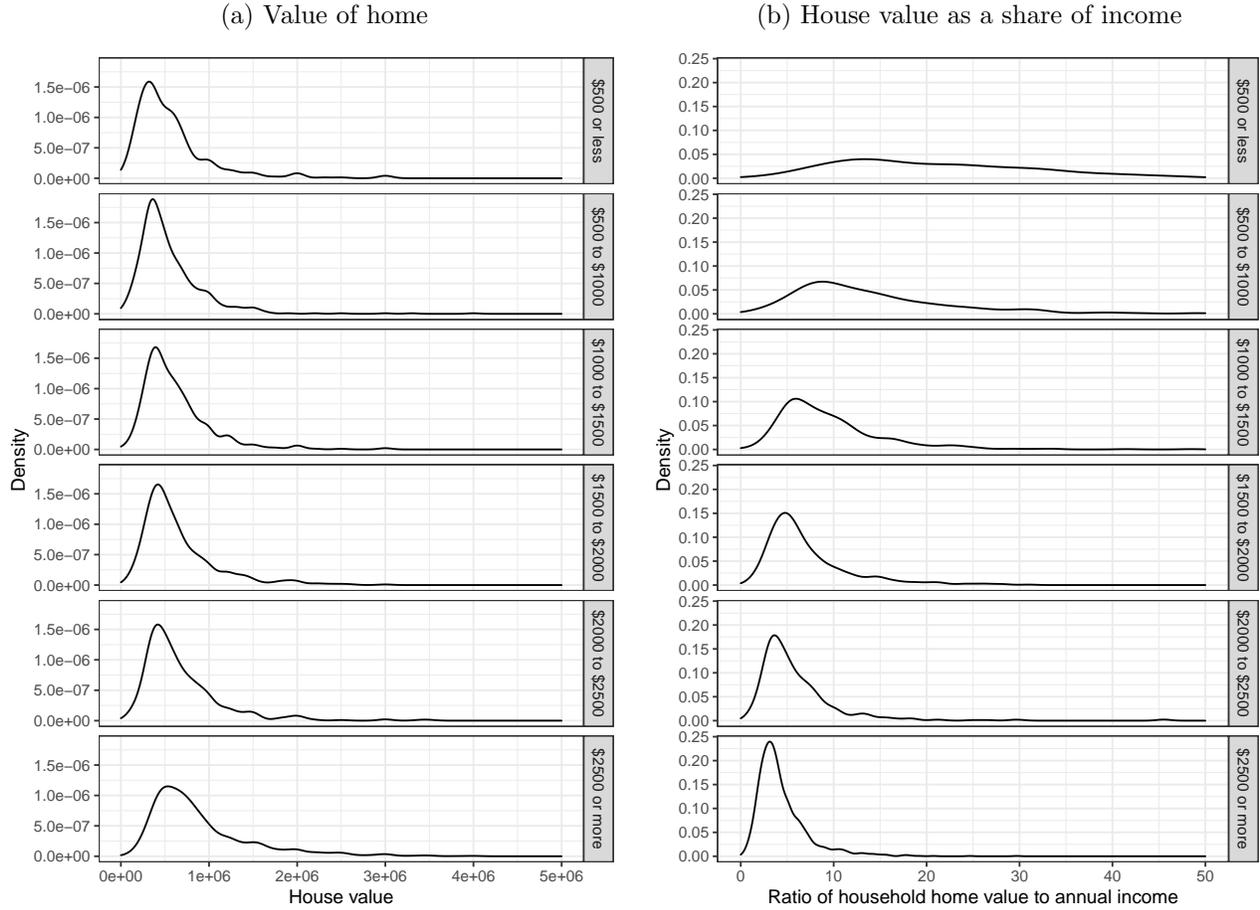
Our data reveals two core facts which suggest that stamp duty is likely to be regressive. First, house values are not significantly higher among high income households than low income households. The charts show that a large portion of low income households have houses worth more than a large portion of high income households. There is also a large variance in house values by income group at low incomes. To the extent that stamp duty aims to be progressive on income by being charged at an increasing rate on house value, it may be imperfectly targetting this margin. Second, housing values as a share of income are, on average, much higher among low income households. These facts are important in understanding the effects of stamp duty on horizontal⁴.

4.3 Analytical approach

We combine the HILDA dataset with information on stamp duty rates across Australian states. Specifically, we create a function which calculates the stamp duty payable for a given property in each wave, which specifies a state and year specific value based on underlying legislation, factoring in the increasing marginal rates. In some models, this data is supplemented with data on rental yields for different property types across time in Australian states’ capital cities. We make several assumptions that underpin our analysis (which we detail throughout), and report outputs according to several scenarios which vary those assumptions.

⁴Rather than the use of data for house value to current income, if vertical equity was measured as house value to permanent income or life-cycle income, the magnitude of regressivity of stamp duty would be lower. Given that the data is for averages across income groups rather than individuals, the magnitudes of regressivity for current income, and the regressivity found for wealth, it seems unlikely that the regressivity result would be over-turned with a permanent income measure.

Figure 4.4: Distribution of house values, by weekly income group



4.3.1 Owner Occupiers

At its most basic form, our model applies the prevailing stamp duty rate when a household in HILDA is observed to have either bought or sold their principal place of residence. We run models for different shares of the economic incidence of stamp duty between the buyer and seller. That is, we define:

$$\text{Stamp Duty Buyer}_{i,w} = \text{StampDuty}(\text{House value}_{i,w}) \cdot I[\text{Move}_{i,w}] \cdot \text{Share Buyer} \quad (4.1)$$

$$\text{Stamp Duty Seller}_{i,w} = \text{StampDuty}(\text{House value}_{i,w}) \cdot I[\text{Move}_{i,w+1}] \cdot \text{Share Seller} \quad (4.2)$$

$$\text{Subject to } 1 = \text{Share Seller} + \text{Share Buyer} \quad (4.3)$$

Stamp Duty is a function of the house value at the time of transaction which varies for each state, s , and wave, w , according to their stamp duty legislation. The indicator variable $I[\text{Move}_{i,w}]$ is a dummy variable which is equal to one if the household moved in wave w (or, in the case of equation (4.2), $w + 1$).

We show both the extremes of economic incidence of 100% on buyer and 100% on seller, and a medium scenario of a 50:50 split.

4.3.2 Renters

The rental portion of the market is more complicated to model. Because the value of rental properties is unobserved, we generate an approximate house value by combining data on rental payments with average property yields for different house types in the capital city of the households' state of residence for each year. That is:

$$\begin{aligned} \text{Rental yield}_{i,w} &= \frac{\text{Rental payments}_{i,w} \cdot 12}{\text{Rented house value}_{i,w}} \\ \implies \text{Rented house value}_{i,w} &= \frac{\text{Rental payments}_{i,w} \cdot 12}{\text{Rental yield}_{i,w}} \end{aligned}$$

We apply an estimate of the stamp duty which would be paid on the property by the investor to understand the extent to which stamp duty costs are passed through to renters. To estimate the annual stamp duty incidence for the renter, we divide the stamp duty which would be payable on the property if it were to be sold by the expected number of years the property would be held for.⁵ That is:

$$\text{Renter Stamp Duty}_{i,w} \approx \frac{\text{Stamp Duty}(\text{Rented house value}_{i,w})}{\text{Property holding length}_{i,w}} \cdot \text{Renter share} \quad (4.4)$$

⁵The investor is both a buyer (when they purchase the property) and a seller (when they sell it).

We disaggregate the average holding rate by state and year, using the ABS data.

$$\text{Transaction rate}_{s,w} = \frac{\text{Number of transfers}_{s,w}}{\text{Property stock}_{s,w}} \quad (4.5)$$

$$\text{Property holding length} = \text{Transaction rate}_{s,w}^{-1} \quad (4.6)$$

There may be heterogeneity in how stamp duty is passed through to renters by region and property type. We argue that due to competition in the rental market, this heterogeneity will be limited.

4.3.3 Investors

Because of limitations with the data, it is difficult to precisely estimate the amount of stamp duty paid by property investors. Specifically, because HILDA does not detail the number of investment properties (or the time of their sale), we are unable to precisely estimate the amount of stamp duty paid in the process of housing investment.

Nonetheless, for completeness, we make an approximation by again integrating HILDA data with ABS data on median prices and occupancy rates. The number of investment properties for a given household $J_{i,w}$ is allocated by a simple algorithm, which is a function of the median priced established dwelling in the homeowner's home city in the year of sale and the total property investment.⁶ Specifically, the number of properties owned is given by:

$$\text{Number of investment properties}_{i,w} = \text{ceiling} \left(\frac{\text{Gross investments}_{i,w}}{\text{Mean property price}_{s,w}} \right) \quad (4.7)$$

For simplicity, investment properties values are assumed to be split equally across the value of the household's total property portfolio. That is:

$$\text{Investment value}_{i,w,j} = \frac{\text{Gross investments}_{i,w}}{\text{Number of investment properties}_{i,w}} \quad (4.8)$$

⁶We use ceiling functions to perform these calculations, which round the value of the property up to the nearest possible number. For example, if the total property value owned by a household was 1.8 times the median property price, then this model would proscribe them two houses.

We then calculate the expected stamp duty liability each year for investors as:

$$\begin{aligned} \mathbb{E}(\text{Investor Stamp Duty}_{i,w}) &= \sum_{j_{i,w}}^{J_{i,w}} \text{Transaction rate}_{i,w} \cdot \text{StampDuty}(\text{Investment value}_{j_{i,w}}) \\ &\quad \cdot \text{Investor share} \end{aligned} \tag{4.9}$$

The consequence of using these implied averages, rather than household specific variation, is that we remove some heterogeneity among households originating from variation in the frequency of transactions of investment properties.

4.4 Results

As mentioned, the results will depend on assumptions about stamp duty's economic incidence on the economic agents involved in given transactions. This section outlined our major results, and shows they change as more complexity is added to the model, and as our assumptions about economic incidence are relaxed. We show both the extremes of economic incidence of 100% on buyer and 100% on seller, and a medium scenario of a 50:50 split. These highlight the limited effect of stamp duty's economic incidence on the distribution of the costs of stamp duty across society groups classified by income, gross debt, number of house members, and age of oldest member.

4.4.1 Owner occupiers

We begin by establishing the distribution of costs, only considering owner occupied properties. The implied stamp duty paid per year by each group is shown in table 4.5, which shows the mean annual stamp duty liability for each household group, alongside the mean stamp duty cost as a share of income (in percentage points). Our different scenarios highlight the limited effect of stamp duty's technical incidence on the distribution of costs across society's groups.

Table 4.5: Baseline model of average annual stamp duty liability (\$AUD), by group

Group	50 / 50 split		Seller incidence		Buyer incidence	
	Mean	Income share	Mean	Income share	Mean	Income share
Weekly household income (\$)						
\$500 or less	329.12 (2377)	3.89 (73)	357.48 (3029)	3.97 (76)	300.75 (2879)	3.81 (80)
\$500 to \$1000	411.6 (2385)	1.07 (6)	463.92 (3685)	1.21 (10)	359.29 (2866)	0.93 (8)
\$1000 to \$1500	579.07 (3460)	0.9 (6)	511.09 (5445)	0.81 (9)	647.06 (3966)	1 (6)
\$1500 to \$2000	814.69 (3596)	0.89 (4)	755.92 (4883)	0.83 (5)	873.47 (4905)	0.95 (5)
\$2000 to \$2500	1013.54 (3853)	0.87 (3)	815.13 (4382)	0.7 (4)	1211.95 (5996)	1.04 (5)
\$2500 or more	1939.75 (7994)	0.92 (3)	1603.04 (9305)	0.76 (4)	2276.46 (11487)	1.08 (5)
Gross debt (\$)						
No debt	473.8 (3536)	1.18 (33)	485.39 (4861)	1.25 (34)	462.22 (4695)	1.12 (36)
\$50k or less	628.36 (2936)	0.89 (5)	675.73 (4265)	1.04 (9)	580.99 (4094)	0.75 (5)
\$50k to \$250k	952.36 (3471)	1.06 (4)	985.37 (4948)	1.1 (6)	919.36 (4671)	1.02 (6)
\$250k to \$500k	2141.3 (6950)	1.91 (7)	1711.85 (7881)	1.48 (8)	2570.75 (9406)	2.35 (10)
\$500k or more	5248.02 (12906)	3.51 (12)	3337.73 (14714)	2.33 (13)	7158.32 (19886)	4.69 (18)
Number in house						
1 person	520.71 (3089)	2.13 (50)	539.16 (4205)	2.2 (52)	502.26 (3928)	2.05 (55)
2 people	988.9 (4641)	1.22 (8)	854.85 (6254)	1.17 (13)	1122.96 (6193)	1.26 (9)
3 to 5 people	1143.35 (5313)	0.88 (5)	965.87 (6237)	0.76 (6)	1320.83 (8123)	1.01 (7)
6 or more people	1444.76 (11005)	0.7 (3)	1229.02 (11595)	0.57 (4)	1660.51 (13369)	0.82 (5)
Age of oldest in household						
Under 30	617.93 (2658)	0.72 (4)	383.39 (2552)	0.47 (4)	852.48 (4162)	0.96 (6)
30 to 40	1298.68 (5144)	1.17 (7)	1004.43 (5952)	0.97 (8)	1592.93 (7425)	1.36 (9)
40 to 50	1152.73 (5843)	0.91 (5)	938.86 (6335)	0.74 (6)	1366.61 (9171)	1.08 (8)
50 to 60	893.95 (5427)	0.92 (5)	866.53 (6778)	0.9 (7)	921.37 (6901)	0.94 (7)
60 and older	782.51 (4441)	2.16 (46)	825.49 (6385)	2.33 (49)	739.53 (5606)	1.98 (51)

Note: Average annual stamp duty liability shown, with annual standard deviation shown in parentheses. Includes households in mainland Australian states only from 2010 onwards.

Assumes all houses sold as principal places of residence.

In this framework, the costs of stamp duty are regressive on income. In particular, households earning \$500 or less each week who own their own home pay, on average, around 3.8% of their annual income on stamp duty each year. This is around four times the share of their

income than those in the highest income group.

Further, clear trends emerge on age. In particular, those aged in their thirties pay a higher share of their income as stamp duty than any other group under sixty. Those in their sixties and older pay a high share of their income as stamp duty. This, however, is likely a function of the fact that many in this group have low incomes despite having large asset bases (due to the fact that many in this group are retirees). In terms of total amount payable, those in their thirties remain the group paying the most stamp duty.

This is – at least in some ways – a naive analysis of stamp duty because it ignores the fact those involved in renting are likely to pay stamp duty through changes in the rental rate. Specifically, it will understate the amount of stamp duty paid by those who predominantly rent, such as those who are in low income groups. We now move to incorporate changes in rental costs as a result of stamp duty increasing the costs for housing investors.

4.4.2 Incorporating renters and investors

As discussed above, the implied pass through to renters can be calculated by incorporating data on rental yields and turnover rates. The results when incorporating rental pass-through are shown in table 4.6. These results are broadly similar to the baseline approach, showing that stamp duty is regressive, and becomes more regressive when there is a larger degree of pass-through to renters. In particular, they show that a higher degree of rental pass through will increase the extent to which stamp duty is regressive on income.

The regressive effects of stamp duty passed forward to renters add to the regressive effects of income tax which provides larger concessions for owner operators than to landlords. All income earned on owner occupied property is exempt from income tax with no tax on imputed rent or on capital gains. By contrast, income earned on rental property is subject to concessional income tax in the form of rent paid less recurrent expenses as incurred plus a half rate on realised capital gains.

Table 4.6: Average annual stamp duty liability with renters and investors (\$AUD), by group

Group	Half pass-through		Full pass-through		No pass-through	
	Mean	Income share	Mean	Income share	Mean	Income share
Weekly household income (\$)						
\$500 or less	393.23 (2373)	4.95 (74)	450.73 (2372)	5.95 (79)	335.72 (2384)	3.94 (73)
\$500 to \$1000	495.59 (2376)	1.29 (6)	572.25 (2375)	1.49 (6)	418.94 (2388)	1.09 (6)
\$1000 to \$1500	696.63 (3449)	1.09 (6)	801.84 (3442)	1.25 (6)	591.42 (3466)	0.92 (6)
\$1500 to \$2000	938.22 (3581)	1.03 (4)	1045.81 (3569)	1.15 (4)	830.64 (3607)	0.91 (4)
\$2000 to \$2500	1126.69 (3834)	0.96 (3)	1208.77 (3825)	1.04 (3)	1044.61 (3861)	0.89 (3)
\$2500 or more	2059.1 (7988)	0.98 (3)	2111.8 (7969)	1.02 (3)	2006.4 (8022)	0.95 (3)
Gross debt (\$)						
No debt	621.3 (3531)	1.57 (33)	747.02 (3530)	1.93 (35)	495.59 (3552)	1.21 (33)
\$50k or less	638.7 (2939)	0.9 (5)	628.36 (2936)	0.89 (5)	649.04 (2945)	0.91 (5)
\$50k to \$250k	962.71 (3475)	1.08 (4)	952.36 (3471)	1.06 (4)	973.06 (3481)	1.09 (4)
\$250k to \$500k	2157.58 (6956)	1.93 (7)	2141.3 (6950)	1.91 (7)	2173.86 (6964)	1.94 (7)
\$500k or more	5307.21 (12918)	3.55 (12)	5248.02 (12906)	3.51 (12)	5366.4 (12937)	3.59 (12)
Number in house						
1 person	613.42 (3084)	2.7 (51)	692.2 (3077)	3.23 (54)	534.65 (3104)	2.16 (50)
2 people	1083.43 (4635)	1.37 (8)	1146.02 (4622)	1.49 (9)	1020.84 (4661)	1.25 (8)
3 to 5 people	1263.42 (5304)	1.02 (5)	1353.12 (5289)	1.15 (5)	1173.72 (5334)	0.9 (5)
6 or more people	1587.43 (10993)	0.82 (3)	1696.39 (10983)	0.94 (3)	1478.48 (11012)	0.71 (3)
Age of oldest in household						
Under 30	790.33 (2630)	1.16 (4)	955.59 (2613)	1.59 (5)	625.07 (2665)	0.73 (4)
30 to 40	1461.01 (5122)	1.58 (13)	1601.8 (5091)	1.98 (22)	1320.21 (5168)	1.18 (7)
40 to 50	1268.67 (5837)	1.07 (5)	1357.19 (5821)	1.22 (5)	1180.14 (5864)	0.93 (5)
50 to 60	982.29 (5424)	1.06 (5)	1033.85 (5417)	1.17 (5)	930.72 (5443)	0.94 (5)
60 and older	831.88 (4443)	2.39 (47)	850.2 (4436)	2.58 (48)	813.57 (4458)	2.2 (46)

Note: Average annual stamp duty liability shown, with annual standard deviation shown in parentheses. Includes households in mainland Australian states only from 2010 onwards. Assumes all houses sold as principal places of residence. Assumes 50/50 split of incidence between buyers and sellers

5 Discussion

These results are a first attempt at answering some key questions about the distribution of stamp duty's costs. In this section, we begin by flagging and then outlining the implications of our key results. We then make some brief comments about recent reform proposals, and make comments on future areas for work.

5.1 Key results

This paper has three key results, all of which are novel contributions to the admittedly limited body of work about the stamp duty's implications for equity.

First: there are large levels of heterogeneity in mobility rates both within and between cohorts, which culminates in large levels of variance in stamp duty's costs across income groups. This suggests that claims of the horizontal inequity of stamp duty are well founded. Interesting, there are lower levels of mobility among low income households.

Second: regardless of assumptions about the distribution of incidence, stamp duty is a regressive tax. This is predominantly because housing costs as a share of income tend to be concave on income: that is, people who are more wealthy generally spend a smaller proportion of their income on housing than people who are less wealthy. The implications of this for policy are complex. It could mean, for instance, that previous reports regarding the equity implications of Australia's tax system which do not consider stamp duty *overestimate* how progressive the entire suite of Australia's taxes are.

Third: Assumptions about the economic incidence of stamp duty on buyers and sellers, and the extent of pass-through to renters, have some impact on the distribution of stamp duty's costs. However, the broad trends observed in the data are robust to different assumptions about the economic incidence of stamp duty on both the owner-occupied and rental portions of the market.

5.2 Policy reflections

The horizontal and vertical equity effects of the current stamp duty reported in this paper add to the arguments for reform and they provide some guidelines for details of an approximate revenue neutral reform package, including the tax base, tax rate schedule and transition options.

Unintended and undesirable horizontal equity effects of the stamp duty add to the tax distortion and economic inefficiency effects which call for reform. The negatively skewed distribution function for frequency of property transfer means those who transfer property more frequently than the average contribute far more stamp duty tax revenue than those who transfer property less frequently than the average. At the same time, as taxpayers with similar income, wealth and other attributes affecting capacity to pay these taxpayers with different frequency of property turnover receive similar tax funded government provided education, health, policing and other services. The equity and efficiency arguments, plus greater stability and predictability of revenue, provide compelling arguments to replace stamp duty levied only at times of property transfer with an annual property tax.

The base for the replacement annual property tax could be land or improved value. While the two measures are highly correlated, the correlation is less than one. In principle, both the land and improved property base options could piggy-back the current local government rate base, although several states have data only for a land tax (Eccleston et al., 2017). A potential argument for the improved value is familiarity with this base for the current stamp duty to be replaced. There are more compelling arguments for a land base tax. A comprehensive land base is more efficient in the sense that the elasticity of supply is zero, while over the long run the supply of new buildings, renovations and repairs and maintenance respond to market prices, including taxation. Some have argued a land base, rather than an improved property base, will remove distortions to decisions on the timing as well as on the quantity of investments in buildings (Helm, 2019). Given the regressive incidence of the current stamp duty shown in earlier sections, available evidence indicates a land base generating similar aggregate revenue as a property base would be more progressive (Murray and Hermans, 2019).

In the case of rental property, the land tax of a reform package would replace the current land tax with its progressive tax rate schedule as well as stamp duty. The choice of tax rate schedule for the replacement annual property tax involves conflicting efficiency and equity effects. Efficiency points to a flat rate per dollar of land value to share the scarcity economic rent with minimal distortions to decisions on the use of the land. In terms of equity, the current stamp duty and land tax on rental property to be replaced have progressive rate schedules, but as shown in the above sections they are regressive because the tax base declines as a share of income and wealth. Political economy considerations point to an even more progressive rate schedule for the reform package which creates many more winners than losers as illustrated by the ACT reform package.

A wider property tax reform package could include replacing also current duty on insurance premiums, including for buildings and contents, and emergency services levies. These taxes on insurance lead to non- and under-insurance with relatively high tax efficiency costs. They are inequitable because those on lower incomes are more likely not to purchase appropriate insurance.

For the reform package to be approximately revenue neutral and to minimise redistribution relative to the current property taxes, different tax rate schedules should be chosen for owner occupied homes, for rental property, and for commercial and primary production property, and likely also across the states. A land tax applies now to rental property, but not to owner occupied property, and both bear stamp duty. Property turnover rates may vary across accommodation types. Current property taxes and property prices vary across the states.

The transition path for a reform policy package to replace stamp duty, the current narrow base land tax, and perhaps duty on insurance premiums, with an annual property tax will be important. There is a general held concern that a one-off switch to the reform would involve double taxation of those who recently paid stamp duty and now face the replacement annual property tax, and the reform package for some will introduce lack of liquidity problems. Transition options include: ACT gradual phase down of stamp duty and phase up the replacement annual property tax in a revenue neutral package; give credit for recent paid stamp duty

against replacement annual property tax, together with a higher future property tax rate to recapture the revenue shortfall over the transition period; and a voluntary opt-in to the annual property tax. These and other transition options have different implications for revenue, for the speed and magnitude of efficiency gains and for equity (Helm, 2019). Redistribution effects of the different transition options could be the next line of research using the methods and data of this paper.

Another part of the reform package could offer those considered liquidity constrained, including the asset rich and income poor, the option to carry forward the new annual replacement tax indexed by the government borrowing rate.

5.3 Limitations and potential areas of future work

The policy regime of housing in Australia – including stamp duty – is complex and has several competing and interacting policies. Key policies include the negative gearing of housing assets, capital gains tax (CGT) exemptions for principal places of residence, loose monetary policy and the land tax schedule. While we do not explicitly consider these effects in our analysis, we recognise the important role they play in the system, and outline below a few interesting questions they pose.

Within Australia, there has been sustained and fast paced growth in the value of housing assets. Future research could consider how features of Australia’s tax system interact with this fast paced growth in asset values. Consider stamp duty’s interaction: because some Australians are more credit constrained, the down-payment constraints imposed by stamp duty may have prevented – or delayed – their entry into this appreciating asset class; the impacts of this on opportunities to realise capital gains on housing would be an interesting area of future work. Consider also the implications of CGT exemption on principal places of residence in the context of rising house prices: with a large share of realised and unrealised capital gains coming from rising house values, Australia’s tax system could be less progressive than it appears when only accounting for *taxable* income. Additionally, this exemption could also provide incentives for households *relocate more frequently*, to realise untaxed capital gains;

the interaction between these incentives and stamp duty would also be an interesting area of future research.

These policy decisions are core features of Australia’s tax system, but their impact on the housing market in Australia have not been investigated to any large degree. Any empirical or theoretical analysis of these (or other) complex and interrelated features of Australian housing policy would be useful for both understanding the dynamics of housing markets, and in assisting policy makers to deliver more evidence based housing policy.

6 Conclusion

This paper makes several contributions to the literature and aims to begin a more nuanced conversation about stamp duty, its effects and the implications of possible reform options. We show that stamp duty is regressive, because housing costs are a much higher share of low income households incomes than high income households. Because of high variation in both house values and mobility rates in different income groups, we also show that stamp duty has high levels of horizontal inequity. Because low income households move less frequently than high income households, transitioning to a land tax without rescaling the brackets would lead to the tax system to become *more* regressive.

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Appendices

A Data sources for stamp duty rates

The underlying data that forms the basis of our stamp duty dataset is from:

New South Wales: Data from Revenue New South Wales.

Victoria: Data from the *Duties Act 2000* via Legislation Victoria.

Queensland: Data from Queensland Treasury.

South Australia: Data from Revenue SA and the *Stamp Duties Act 1923*.

Western Australia: Data from Western Australia Department of Justice.

Note: All data was accessed on 15 July 2020; web location URLs are hyperlinked for each source.

These sources were cross-checked up to 2013 with data from Davidoff and Leigh (2013).

B Linear model

We can be more explicit about our assumed model, by projecting it into the constraints of a linear model of each form of supply and demand.

B.1 Owner occupied housing

For the owner occupied segment of the market, we have demand and supply as given by:

$$D_O = a_1 - b_1 P_O + c_1 P_R \tag{B.1}$$

$$S_O = a_2 + b_2 P_O - c_2 P_R \tag{B.2}$$

In the equations, a is a constant, b is responsiveness to owner occupied price changes and c is responsiveness to rental price changes. Demand for owner occupied property drops with an increase in owner occupied prices, but rises with an increase in rental prices. Supply of owner occupied property increases with prices increases in the owner occupied section of the market, and decreases with an increase in rental prices.

A competitive market equilibrium equates (B.1) and (B.2). In this, holding the other

variables constant, we get an analytical solution for the price of owner occupied P_O :

$$P_O = \frac{(a_1 - a_2) + (c_1 + c_2)P_R}{b_1 + b_2} \quad (\text{B.3})$$

When we introduce tax τ , the the price of owner occupied property elicits a price response, which weakly increases the demand price to P'_O and a fall in the supply price is given by $P_0 - \tau$. That is:

$$P'_O = P_O + \tau \cdot \frac{b_2}{b_1 + b_2} \quad (\text{B.4})$$

$$P'_O - \tau = P_O - \tau \cdot \frac{b_1}{b_1 + b_2} \quad (\text{B.5})$$

The share of economic tax incidence on the buyer and seller, therefore, depends on the *relative slopes* (or elasticities) of supply and demand, with quantity transacted unambiguously falling.

B.2 Property

Aggregate demand for property sums owner occupied of (B.1) plus landlord property demand D_L . That is, we have: $D = D_L + D_O$. We define the landlord demand for and supply or property respectively as:

$$D_L = a_5 + b_5P_O - c_5P_R \quad (\text{B.6})$$

$$S = a_6 + b_6P \quad (\text{B.7})$$

Setting $P_O = P_R = P$, we get the clearing of the property market with:

$$P = \frac{a_1 + a_5 - a_6}{b_1 - c_1 + c_5 - b_5 + b_6} \quad (\text{B.8})$$

Both the owner buyer and landlord buyer pay stamp duty, τ , resulting in an increase in the buyer property price ΔP . This solves for:

$$\Delta P = \tau \frac{b_6}{b_1 - c_1 + c_5 - b_5 + b_6} \quad (\text{B.9})$$

The more elastic property supply relative to aggregate property demand, the larger the share of the tax passed forward to the buyer as a higher price. Accepting that neither the supply or demand elasticities are either perfectly elastic or inelastic, the economic incidence of stamp duty is shared between buyer and seller with the buyer price increasing by less than the tax, τ . The willingness to pay and willingness to buy model for property transfers suggests similar demand and supply elasticities, with the economic incidence of stamp duty about 50:50 between buyer and seller.

B.3 Rental properties

A similar model can be used for rental properties, but this time the price increases of the landlord property supply function is ΔP from (B.9). In the rental market, we have supply and demand functions of:

$$D_R = a_3 + b_3 P_O - c_3 P_R \quad (\text{B.10})$$

$$S_R = a_4 - b_4 P_O + c_4 P_R \quad (\text{B.11})$$

A competitive market equates (B.10) and (B.11), which gives:

$$P_R = \frac{(a_3 - a_4) + (b_3 + b_4) P_O}{c_3 + c_4} \quad (\text{B.12})$$

Note. Demand equations (B.1) and (B.10) are derived from household utility choice model on allocation of consumption between own home accommodation, rent accommodation, and other goods and services. Supply equations (B.2) and (B.11) derive from a wealth accumulation and allocation model between owner occupied home, landlord and rental property, and other

wealth assets. The price terms P_O and P_R can refer to the annual flow rent fee or the stock asset price (with the asset price equal to the discounted value of future rent flows).

B.4 Effects of stamp duty on renter

The effects of stamp duty tax on rental property prices can be considered as involving three sets of effects; first-round direct effects on rental market; second-round effects of stamp duty induced changes in prices for alternative owner occupied property prices; and, a general equilibrium adjustment of the markets for owner occupied and rental accommodation and wealth.

(i) *Effect of τ on rental market; and hold P_O constant.*

Note, this would be the story for land tax on rental property, as well as stamp duty. Rent buyer faces a higher price, ΔP_R , and the landlord receives a lower price, $\Delta P - \Delta P_R$. In this context, the change in the rental rate is given by:

$$\Delta P_R = \frac{c_4}{c_3 + c_4} \Delta P \quad (\text{B.13})$$

Here, the share depends on the relative own price elasticities of supply and demand for rental accommodation.

(ii) *Effect of conveyance duty τ falling on both owner occupied and rental property*

There are two second round effects, namely:

(a) From the rent buyer, a higher P_O for owner occupied housing shifts rental demand outwards and pushes P_R even higher. Formally, for higher price for consumer of owner occupied property, additional price of rental property to renter equal to:

$$\Delta_1 P_R = \frac{b_3}{c_3 + c_4} (\Delta P_O - \tau) = \frac{b_3 b_2}{(c_3 + c_4)(b_1 + b_2)} \tau \quad (\text{B.14})$$

(b) From the landlord, the lower return from owner occupied property shift supply to rent in the portfolio choice of owners, and the outward rent supply function shift

pushes P_R lower, according to:

$$\Delta_2 P_R = \frac{b_4}{c_3 + c_4} (\Delta P_O - \tau) = -\frac{b_4 b_1}{(c_3 + c_4)(b_1 + b_2)} \tau \quad (\text{B.15})$$

The net effect on rental prices requires a comparison of these two effects. There is a positive price effect if, and only if, the absolute effect from (B.14) is greater than (B.15). That is:

$$\frac{b_2}{b_1} > \frac{b_4}{b_3} \quad (\text{B.16})$$

From (B.16), the intuition behind a large net price gain suggests that:

- (a) for owner occupied a larger left hand side (b_2/b_1) signals that own price supply is more elastic than own price demand, and most of the tax τ is passed forward to buyer, which drives a larger upward shift of rental demand
 - (b) for rental property a smaller right hand side (b_4/b_3) signals that cross price demand is more elastic than cross price supply, which drives a smaller buyer rental price response to outward shift of rent supply
- (iii) *General equilibrium*

The above effects iterate to find a new equilibrium, where the effective prices are equated across owner occupied and rental properties.