Analysis of the Impacts and Outcomes of the ACT Tax Reform

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1. Introduction

In 2012, the ACT Government began a 20-year program to modernise the Territory's taxation system. This reform program has broadened the tax base by moving towards replacing inefficient taxes, such as stamp duty and insurance duty, with a broad-based land tax through the general rates system. Importantly, the program was designed not to raise the overall tax burden on the ACT community, with the forgone revenues resulting from reductions in stamp duty being replaced by an efficient and more equitable rates system.

Since 2012, the ACT Government has significantly cut conveyance duties. Decreases in residential conveyance duties every year have led the ACT to be among states with the lowest stamp duty rates in Australia. The first stage of this reform program includes: (i) abolishing duty on insurance policies over five years; (ii) phasing out conveyance duty over 20 years; (iii) abolishing commercial land tax, with a portion of the commercial general rate settings providing revenue replacement for commercial land tax; (iv) increasing the tax-free threshold for payroll tax; and (v) making residential land tax and the general rate system more progressive.

This report examines the distributional, economic and affordability impacts of the ACT Government tax reform.

1.1 – Part 1: Distributional impacts of the ACT Government tax reform

To support the ACT government in its process of reviewing this tax modernisation program, in this first part of the analysis, we will answer two research questions:

1. What has been the impact of tax reform on different household types and cohorts, taking into account available concessions and deferral programs? This analysis is undertaken with respect to household income and wealth levels and takes into account the wealth effects of property.

2. What has been the impact of tax reform on the progressivity and equity of the ACT tax system, considering the incidence of property purchases by households with different levels of income and wealth? How has tax reform affected the alignment of residential property taxation with respect to ability to pay, taking account of relevant related factors including changes in land values and land use by household income level and household wealth level? Is there any evidence that higher annual general rates (in place of higher stamp duty) have impacted welfare or behaviour?

To answer these questions, we have adopted a microsimulation model to create a baseline, where the current and complex ACT rules are applied, to compare with a counterfactual case where the regulations without the tax reform are employed. We use the 2009-10 and 2011-12 Surveys of Income and Housing (SIHs) and the 2011 Census to generate a synthetic population for the ACT before the reform and then use data from the ACT government to determine what the ACT would have looked like now without the reforms. We also use other data from the Australian Bureau of Statistics (ABS) and other sources to derive these projections of what the ACT would have looked like if reform hadn't happened.

1.2 – Part 2: Economic and affordability impacts of the ACT Government tax reform

In this second part of the analysis, we will answer three research questions:

3. Are the impacts of tax reform on the ACT economy to date able to be measured? Are the marginal impacts from each dollar of stamp duty reduction expected to increase or decrease as tax reform progresses? Is there any evidence that ACT residential property prices are higher or lower than they would have been in the absence of tax reform? Is residential property turnover in the ACT higher or lower than it would have been in the absence of tax reform?

4. To what extent is the upfront cost of residential property in the ACT (i.e. purchase price and stamp duty) less than it would have been in the absence of tax reform? As a result of paying lower stamp duty than they would have in the absence of tax reform, are home buyers spending less overall on property purchases or buying higher priced properties (i.e. adding the stamp duty saved to their purchasing budget)?

5. Is rental housing more or less affordable than it would have been in the absence of tax reform? Is the increased rates charge being passed through to renters? If so, how much? Are the impacts different at different rental price levels (i.e. rent quintiles)? Has tax reform impacted the supply of rental properties?

To answer these questions, we use a data-intensive econometric approach, where we employ nationwide suburb level data, in order to identify the effects of the ACT tax reform by using the other states and the Northern Territory as control group. For this difference-in difference analysis we use Corelogic monthly suburb level data from 2009-2019. We also use data from the ABS and the Australian Public Service Commission to control for time varying state specific effects. In a separate analysis we use property price data sourced directly from the ACT and NSW governments as an alternative source of information.

1.3 – Structure of this report

This report is structured as followed. In chapter 2, the different methods applied to the first and second part of the report are described in greater detail. Chapter 3 describes and discusses the results from part 1 of the report, which considers the distributional impacts of the ACT Government tax reform. Chapter 4 presents the results and discussed the second part of the report, which focuses on the economic and affordability impacts of the reform. Chapter 5 discusses the overall conclusions from the entire report.

2. Methods

2.1 - Distributional impacts of the ACT Government tax reform (Part 1): A microsimulation model

A full description of the method is in our technical paper, so this paper only outlines the method, data and assumptions; those requiring the technical details are referred to the associated technical paper.

In our analysis, we separate families[1] into low, middle and high-income groups based on the family income per capita. Low-income families have an income in the lowest 40% of incomes in the ACT. Middle-income families are families with incomes in the middle 41-60% income group in the ACT.

Pensioners and fixed-income retirees are families who have at least one person aged from 65 years old or receiving an age pension. Female-headed income units include those where the reference person (or the oldest person in the income unit) is female.

We also classify income units by net wealth level, and use net wealth for the deposit constraint in our model (10% of the value of the property is available in liquid assets or net property value for homeowners). In our model, wealth includes financial assets (savings, offset, and superannuation accounts; value of shares and trusts; business value, loans to other people), non-financial assets (property values, value of vehicles) net of liabilities (mortgage, investment, personal and study loans; loan from other people; credit card debt).

For calculating stamp duty, we need to identify families that can buy a property based on their savings and income. We then allocate a suitable property to them based on the family characteristics, and affordability, from the ACT Government's list of sales each year.

We assume that renters will decide to buy an appropriate dwelling instead of renting if all borrowing constraints are met. We assume that all renters purchasing are first home buyers, and that some of these will be purchasing new properties and will be eligible for reduced stamp duty and the First Home Owners Grant (FHOG)[2]. To identify those who may buy a new property, we randomly assign a probability to them based on their age and the probabilities in SIH.

Testing this assumption, we found that about 39% of buyers in our model are first home buyers. This proportion is similar to the proportion of first home buyers amongst recent buyers found in the ABS Survey of Income and Housing (SIH).

For homeowners, we model those who can afford to buy properties for investment (again based on wealth and income levels) or change their residential home (downsizing or upsizing). We randomly assign a probability on the decision of purchasing a property to all eligible homeowners based on the borrowing constraints until the total number of residential properties purchased in each year is reached, and the proportion of homebuyers who are investors across the territory is reached. This is a complex process, and is described further with a flowchart in the technical paper.

Not all home buyers purchase a newly constructed home. The chances of buying a new property are randomly assigned to the group of potential home buyers based on the probability of recent home buyers buying a new property.

[1] The technical term on the survey we use is "income units". More than one family can form a household.

[2] Other requirements for reduced stamp duty and FHOG were also applied, including income, house value, etc. Stamp duty concession and FHOG for first home buyers was also only available for new houses from 2013 to June 2019, and this has also been incorporated into our modelling.These criteria are described in the technical paper.

Home buyers who meet the borrowing constraints may also benefit from the home buyer concession scheme (HBCS) or pensioner duty concession scheme (PDCS) if they meet eligibility requirements, and these are incorporated in our modelling. There is also a pensioner duty deferral scheme, which we have not taken into account in our modelling due to the fact that it was introduced on the 1 July 2019, so wasn't available under the old policy.

For any expenditure data, we have inflated the values using the Consumer Price Index (CPI); and for incomes we have inflated the values using average weekly earnings. We have also inflated property prices for the new policy scenario by using the residential property price index (RPPI) from the Australian Bureau of Statistics.

Three cases were considered for the old policy scenario. The difference between these three cases was how property prices were inflated in comparison to the new policy scenario, where property prices were inflated by RPPI every year. The three cases for the old policy scenario were:

1. assume tax reform has had no significant impact on property prices, and therefore, property prices are inflated by RPPI every year in the old policy scenario;
2. assume that the reduction in stamp duty has been fully absorbed by higher property prices in the new policy scenario. The average reduction in stamp duty as a ratio of the average property price varies from 0.35% in 2012 to 0.50% in 2013, 0.61% in 2014, 0.77% in 2015, 0.98% in 2016, 1.15% in 2017, and 1.30% in 2018. These resulted in property prices for the old policy being inflated by between 99.65% (2012) and 98.7% (2018) of the RPPI, or an average of 0.8% per year. ; and
3. take the findings from the Tax and Transfer Policy Institute analysis, where tax reform is estimated to have increased property prices (both houses and units) by 1.7% per year under the alternative/preferred specification and assumes that the gradual change in property prices in this case is similar to the change in the second case (i.e. 1.24% in 2012, 1.39% in 2013, 1.50% in 2014, 1.66% in 2015, 1.87% in 2016, 2.04% in 2017, 2.19% in 2018), and therefore, property prices from the initial year are inflated by between 98.76% and 97.81% of the RPPI for the relevant year in the old policy scenario.

Rates are easier to calculate compared to stamp duty, where we had to identify purchasers. Everyone who owns a property pays rates, and they are based on the land value. To compute the land value for different years under the new tax policies, we merged the ACT government rates data with their stamp duty data and calculated the average land-to-value ratios by year, which range between 46.2% and 56.5%. These ratios are then used to estimate the land value for properties expected to be purchased in each year. We keep land value unchanged between the old and new tax policies. It is worth noting that if tax reform has resulted in increased property prices, as two of our scenarios assume, tax reform could theoretically result in increased Unimproved Value of Land. In our model, having the same land values for the new and old tax policies means that if the Unimproved Value of Land is lower under the old tax policy (higher under the new tax policy), then the rates payments would be lower; and we may have had more families satisfying the income constraint under the old tax policy. We expect this would have a small impact as the reduced rates goes through the income constraint to get a loan, and the main barrier to getting a loan is the deposit constraint.

We have also calculated land tax for those with an investment property, based on the land value.

The steps followed for the model were:

Step 1: Create the synthetic population for the ACT from 2012-13 to 2018-19.

Step 2: Calculate rates, stamp duties and land taxes, including FHOG, HBCS, PDCS and rebates, for the baseline (the tax reform) and the counterfactual (no-tax reform);

Step 3: Identify whether renters and/or homeowners can afford to purchase a property and assign them to home buyers if they can meet borrowing requirements or can afford to buy without a loan. The Federal government regulations on income tax, medicare levy, low-income tax offset (LITO) and low- and middle-income tax offset (LMITO) are also incorporated into our model.

Step 4: Inflate income, savings, land and property values to the next year and repeat Steps 1 to 3 until the financial year of 2018-19 is reached.

Step 5: Calculate what would have happened without tax reform using stamp duty and rates settings that would have prevailed without tax reform.

2.2 - Economic and affordability impacts of the ACT Government tax reform (Part 2): A difference-in-difference econometric analysis

This main report outlines the method, data and assumptions, but is intentionally kept brief. Those requiring more detail on the data or the assumptions and our attempts to verify the validity of the assumptions are referred to the associated technical appendix.

The main challenge when empirically evaluating a given policy is to establish what the outcomes would have looked like in the absence of the new policy. In other words, we would like to observe a counterfactual to measure changes caused by the reform. A parallel universe where we observe the evolution of the housing market in the ACT without the reform, but keeping everything else the same would be perfect. Obviously, we have no such parallel universe that we can observe.

Another option would be another urban area exactly like the ACT where the housing market evolves similarly to the market in the ACT. Unfortunately this is also not available. The large government presence in the ACT and its geographic position make it unlike any other city in Australia. A cursory glance at the housing market over the past 20 years suggests that the ACT does not really behave like other jurisdictions. It has lower volatility in house prices and a noticeably different cycle in property price increases and decreases.

It is thus quite difficult to find a convincing counter-factual/comparison group for the analysis which we undertake. As we are not sure about the best counterfactual for the ACT we use a number of different subsets of the rest of Australia as controls.

Conditional on finding a reasonable counter-factual, a well established method to overcome the issue of not observing a world without the reform is the difference-in-difference estimation approach. The idea behind difference-in-difference estimation is to use another

group or geographical area which is not affected by the policy change as the counterfactual to identify the causal impact. The method compares the outcomes for a treatment group (affected by the policy) to the outcomes for a control group (the counterfactual, not affected by the policy).

The difference-in-difference methodology can only be implemented using data where we observe both the treatment and control groups for some time before the policy is implemented, as well as after. The estimation method will then be able to control for specific, persistent differences in the treatment and control groups and any external events that affect both groups over time.

Difference-in-difference estimation works well when the trend over time in the outcomes of the control group would have applied to the treatment group in the absence of the policy.[3] Any deviation from that expected outcome is attributed to the policy. Therefore, the second identifying assumption of the difference-in-difference method, is that there are no other policy changes that affect outcomes differently for the treatment and control groups. We will verify in our analysis if these assumptions hold. See the technical appendix.

Applying this methodology to the evaluation of the ACT tax reform we will use the general regression model shown in the following equation:

Equation 1

$$log(Y)_{s,t} = \beta(reform\ dummy)_{s,t} + a_s + b_t + log(X)_{s,t}\,\delta + \varepsilon_{s,t}$$

Where Y is the outcome variable of interest. In our analysis Y will be total sales value, property price, property turnover or rental price. On the left hand side, we capture the effect of the ACT reform as β, the coefficient on the treatment dummy. A suburb fixed effect a_s, captures all time-invariant characteristics in a given suburb. The fixed effect variable is 1 for a specific suburb s over all periods and zero otherwise. A time-specific effect, b_t, controls for common shocks to the across jurisdictions affecting both treated and untreated groups. This could be business cycle effects or common changes to federal regulation. The time fixed effects variable is 1 for a specific month t across all suburbs and zero otherwise.

While this generalised difference-in-difference specification can control for group specific effects and common effects over time, it does not control for group specific effect which vary over time. For example, if the ACT experienced disproportionally large immigration, compared to all other states, this might in turn affect the housing market. In order to control for such effects, we might want to use extra state level controls. The variables X_{st} represent such extra controls in the specification.

We use quarterly population data from the ABS[4] as well as data on States' average annual disposable income from the ABS[5]. We also source annual federal public service employee data

[3] This is the so called "common trends" assumption and key to the identification strategy.

[4] The population data are taken from ABS Table 3101, accessed via the ABS.Stat Metadata, and contain quarterly estimates of residential population by States. For monthly data analysis, we use the estimated population for a quarter for the three months covering that quarter.

[5] The disposable income data are taken from ABS Tables 6523.0, which contains annual State level data for the Financial Years 1994-95 through 2018-19 (latest release), although with some gaps. The gaps in the disposable income data are linearly interpolated using the Stata command *ipolate*.

by location from the Australian Public Service (APS).[6] The advantage of adding extra control variables into the regression is two-fold. First, we explain more of the variation in house prices which leads to a more precise estimate of the policy effect. Secondly, if there are differences in the housing markets in different areas which are captured by the control variables, we are less likely to erroneously attribute other changes to the policy. Of course, this would not be true if the evolution of those control variables happened in coincidence with the policy changes. In this latter case, we would not be able to separate the effects of the policy from the effects of the changes in the control variables.

We check for this problem of co-movement between the reform and important control variables with a post-regression analysis of the correlation matrix. The more correlation between the reform variable and any of the added controls, the more difficult it will be to estimate the impact of the reform. Correlation values in excess of 0.55 should give great concern. In the results section we therefore report, for each specification, a measure of the severity of multicollinearity. Since reporting the whole correlation matrix is impractical, we report the largest correlation value from the correlation matrix as an indicator for each regression.

To verify the first assumption of the difference-in-difference specification, the common trends assumption, we test if the pre-treatment trends in the treatment and control groups are similar. A typical way to test this assumption is to estimate a regression for the period before the policy implementation with a time trend specific to the treatment group. If the coefficient on the trend variable is significant it means that there is significant variation between treatment and control groups. In this case, the common trends assumption fails. If we fail to reject that the time trend coefficient is significantly different from zero, we take this as support for our assumption of common trends. We discuss test results and limitations in the technical appendix.

Data

The main data we use for the analysis are monthly, suburb-level property sales data from Corelogic. The data capture 3 years before the ACT reform and 7 years after the reform from 2009-2019 thus allowing us to implement a difference-in-difference methodology.

We observe over 10,000 suburbs[7] across all states and territories in the data for a total of 770,000 suburb-month observations where there was at least one sold property.[8] The Corelogic data contain, for each property type (Houses or Units), the number of properties sold in the suburb each month and the median sale price for the suburb. The data also contain the median value of advertised weekly rent in each suburb. More details on the Corelogic data and visualizations of the outcome variables over time can be found in the technical appendix.

All suburbs in the ACT belong to the treatment group, which had the tax reform introduced in 2012, all other states and territories are part of the control group. While this approach uses the maximum quantity of available data, it is not clear if the entirety of suburbs Australia-

[6] This data taken from the APS webpage: https://www.apsc.gov.au/aps-data-release-and-statistical-bulletins

[7] Suburb is the smallest geography region in the Australian Standard Geographical Classification (ASGC) geography hierarchy.

[8] About 2/3 of these are observations on housing sales and 1/3 are unit sales.

wide outside of the ACT is the appropriate control group. Recall that the control group should be formed from those areas whose property markets evolve similarly to that in the ACT.

Therefore, we also use different subsets of the rest of Australia as alternative control groups in our robustness tests. We use three regional subgroups to form alternative control groups: Australian States and Territories capital cities only; suburbs in the states of New South Wales (NSW) and Victoria (VIC) only; Melbourne and Sydney only. Each of these sets of counterfactuals has fewer and fewer observations, which reduces the precision of the estimates and may negatively impact on our ability to find an effect. Smaller samples also have the potential to worsen the problem of collinearity from the inclusion of other control variables.

We find that the alternative of only including capital city suburbs as a control group is probably best from an a priori, intuitive point of view. The ACT has more in common with these important urban centres than with regional areas in some of Australia's vast states. In the main report we thus present specifications using two control groups: all of Australia and the capital city suburbs only. The technical appendix presents the full set of results for all of the alternative counterfactuals mentioned above.

We also present an overview of the test results of the common trends assumption for the Corelogic data in the technical appendix. Using a statistical test, we are unable to reject common trends. This holds true when we constrain the control group to only capital cities, to only NSW & VIC or a combination of the two and when we include population and income controls. We test this for total sales value, property price, property turnover or rental price. We cannot reject common trends for all three variables.

There is one further policy change we have to take into account when analysing the data. In September 2017, the ACT Government introduced a new "Barrier Free model", making the purchase of a home faster and simpler. Prior to the change in policy, stamp duty for off-the-plan and land only transactions was payable 12 months after the execution/transaction date. For off-the-plan and land-only transactions, this new policy allowed individuals to defer payment of stamp duty until construction is completed. This has resulted in some property transactions not yet being included in the current extract of stamp duty data. These transactions will only appear in the data once stamp duty is paid.

Because sales are recorded in the official data upon payment of stamp duty, this administrative change produces a one-time drop in the number of currently observed transactions. Readers should keep this in mind when interpreting the results. We also estimate models using only the pre-September 2017 data to check whether this administrative change impacts our estimates. For details see the discussion on differences in data and the extended result tables in the technical appendix.

To answer the question of the effect of the reforms on the supply of rental property, we undertake a time series analysis of ACT rental bond records. While we will not have a control group to identify changes, this approach allows us to look at how the reform affected the number of new rental contracts in the ACT. This type of Before-After (BA) analysis is valid to estimate a treatment effect under certain circumstances. The most important of these is that the trend in rental contracts would have been unchanged in the absence of the change to

stamp duty—in othe words, there is no other confounding effect on the outcome over the course of the treatment period. More detail can be found in the technical appendix.

We find some inconsistencies in the CoreLogic data which we were unable to resolve after exploration of the data and communication with the CoreLogic team. The ACT administrative data show an increase in sales during the first five years of the reform. The Corelogic data show no change in sales for the five years after 2012.[9] This has the potential to impact our results. In particular, we would expect to find a smaller impact on both the number of property sales and the overall sales value using the CoreLogic data.

We thus undertook additional analysis using property price data sourced directly from the ACT and NSW governments. The results is that we find similar results with the administrative data and the Corelogic data. Hence, we do not think the reported differences in the data are driving the results presented below.

3. Results for distributional impacts of the ACT Government tax reform (Part 1)

This section shows the results from the modelling of the tax reform package. The microsimulation method used means that we can simulate the expected impact of the reforms on different groups in the ACT, for example, low and high income families; first home buyers; etc.

Table 1 shows the impact of the reform on the number of properties purchased excluding the impact of any price changes (which would impact on the number of properties purchased). It can be seen that the impact is an additional 2,304 properties purchased over the period 2012 – 2018.

Table 1 - The impact of tax reform on the number of residential properties purchased with no price increase, 2012 - 2018

	2012	2013	2014	2015	2016	2017	2018	Total
New tax policy								
Meet income and deposit constraints	11,494	12,569	13,317	14,509	15,822	12,423	9,634	89,768
Old tax policy								
Meet income and deposit constraints	11,472	12,408	13,039	13,964	15,279	12,098	9,204	87,464
Difference (impact of new policy)	22	161	278	545	543	325	430	2,304

Source: Calculations from NATSEM microsimulation model.

However, tax reform may also have increased property prices in the ACT. As outlined in the method section above, our analysis also takes into account that property prices may have increased. Therefore, price increases should be lower without tax reform. After taking these lower prices increases into account under the old tax policy, more families will meet the income and deposit constraints, and more properties will be purchased under the old tax policy. This is can be seen in table 1 and table 2, where the number of purchases under the

[9] See Figure 6 in the technical appendix.

old policy is higher when tax reform is assumed to have increased property prices by on average 0.8 and 1.7% per year.

Incorporating property prices into the model changes the impact of tax reform on the number of residential properties purchased during 2012-2018. If property prices had increased by on average 0.8% per cent per year due to tax reform, tax reform would still have resulted in an increase in the number of residential properties purchased during 2012-2018 by 2,042 properties, while if prices had increased by on average 1.7% per cent per year due to tax reform the number of residential properties purchased during 2012-2018 would have increased by 1,363 properties.

Table 2 The impact of tax reform on the number of residential properties purchased, 2012 – 2018

0.35 – 1.30% price effect (0.8% average)	2012	2013	2014	2015	2016	2017	2018	Total
New tax policy								
Meet income and deposit constraints	11,494	12,569	13,317	14,509	15,822	12,423	9,634	89,768
Old tax policy								
Meet income and deposit constraints	11,484	12,410	13,073	14,054	15,327	12,131	9,247	87,726
Difference (impact of new policy)	10	159	244	455	495	292	387	2,042
1.24 – 2.19% price effect (1.7% average)	2012	2013	2014	2015	2016	2017	2018	Total
New tax policy								
Meet income and deposit constraints	11,494	12,569	13,317	14,509	15,822	12,423	9,634	89,768
Old tax policy								
Meet income and deposit constraints	11,601	12,550	13,166	14,281	15,367	12,176	9,264	88,405
Difference (impact of new policy)	-107	19	151	228	455	247	370	1,363

Source: Calculations from NATSEM microsimulation model.

Results for sub-groups of the population

This section shows the results for some sub-groups of the population: first home buyers; low income families; middle income families; pensioners; and families with a female head of household. Other groups are considered in the technical paper, including results for high income groups.

All the groups are not exclusive – ie, a low income renter can also be a pensioner renter. Further, in the tables, a renter is a renter to whom a purchase of a new property has been assigned in the modelling sometime over the period 2012 – 2018.

In our analysis, there was a large difference between the impact on renters who become purchasers; and homeowners who were upsizing or downsizing, or buying an investment property. We have therefore separated these two groups of families.

The results in Table 3 show that the number of residential properties purchased by first home buyers increased by 5.78 per cent due to the new tax system without the price effect, and more detailed results produced in the technical report show that this was mainly due to the stamp duty changes. Reducing stamp duty has worked in terms of a policy to increase purchases for first home buyers. However, this doesn't take into account any price increases modelled, as outlined in the method section.

For the groups assessed in this report, before the price increase, the group that gained the most in absolute terms over the period 2012 – 2018 was first home buyers, with an increase of 1,599 properties purchased. In terms of percentages, the group that gained the most were renters where a woman was the head of the household (as reported in the survey) at 6.35%. These are usually single parent families, a group with lower incomes, who would benefit from the reduced stamp duty.

The group that gained the least (besides pensioner-renters where there was no change between the old and new policy) were low income homeowners. With a low income, this group will be less likely to purchase a property as they already own one. This means they wouldn't benefit from the lower stamp duty as they aren't purchasing another property; but as homeowners, would be paying higher rates. Low-income renters were in a different situation, as if they can afford to purchase a property (which some of them will), the model assumes they will. This means they will benefit from the lower stamp duty.

Once the price changes are taken into account, assuming on average a 0.8% price increase over the period, the number of purchases under the new tax policy doesn't change (as the RPPI is used), and the number of purchases under the old policy increases (as the price increase under the old policy is lower). For the 0.8% average price increase scenario, the increase in number of purchases under the new tax policy goes down from 5.78% to 5.35% for first home buyers.

Under the 1.7% average price increase assumption, the number of purchases under the new policy is still greater than the number of purchases under the old policy. For most sub-groups, this means the price increase has not offset the overall increase in purchases as a result of reduced stamp duty. The only exception to this is those who already own property (homeowners in the table). This may be because the benefit of having another property will be less with the higher price.

Table 3 - The impact of tax reform on the number of residential properties purchased by sub-groups, 2012 – 2018

Sub-group	New Tax Policy – Number of purchases	Old tax policy – Number of purchases	Difference	Difference %
First home buyers	29,281	27,682	1,599	5.78

Low-income homeowner	11,621	11,534	87	0.75
Low-income renter	3,925	3,727	198	5.31
Middle-income homeowner	12,883	12,740	143	1.12
Middle-income renter	10,231	9,816	415	4.23
Pensioner homeowner	7,340	7,218	122	1.69
Pensioner renter	2,397	2,397	0	0.00
Female-headed homeowner	22,553	22,337	216	0.97
Female-headed renter	11,321	10,645	676	6.35
Subgroup	New Tax Policy – Number of purchases	Old tax policy – Number of purchases	Difference	Difference %
		0.35 – 1.30% price effect (0.8% average)		
First home buyers	29,281	27,795	1,486	5.35
Low-income homeowner	11,621	11,596	25	0.22
Low-income renter	3,925	3,782	143	3.78
Middle-income homeowner	12,883	12,785	98	0.77
Middle-income renter	10,231	9,816	415	4.23
Pensioner homeowner	7,340	7,280	60	0.82
Pensioner renter	2,397	2,397	0	0.00
Female-headed homeowner	22,553	22,420	133	0.59
Female-headed renter	11,321	10,656	665	6.24
Subgroup	New Tax Policy – Number of purchases	Old tax policy – Number of purchases	Difference	Difference %
		1.24 – 2.19% price effect (1.7% average)		
First home buyers	29,281	28,228	1,053	3.73
Low-income homeowner	11,621	11,671	-50	-0.43
Low-income renter	3,925	3,872	53	1.37
Middle-income homeowner	12,883	12,859	24	0.19
Middle-income renter	10,231	9,897	334	3.37
Pensioner homeowner	7,340	7,367	-27	-0.37
Pensioner renter	2,397	2,397	0	0.00
Female-headed homeowner	22,553	22,508	45	0.20
Female-headed renter	11,321	10,812	509	4.71

Source: Calculations from NATSEM microsimulation model.

Note: The numbers shown in column 2 and column 3 are the total number of residential properties purchased over the whole period. The sub-groups are not mutually exclusive – a first home buyer can also be a female headed renter.

In terms of the change in income, the first 2 columns in Table 4 show, for a number of population cohorts, the average amount paid by property owners (rates) and purchasers (stamp duty) in a year over the time period analysed under the new and old policies. So under the new tax policy, a first home buyer will pay on average $14,498 per year on rates and stamp duty; whereas under the old tax policy without the price increase they were paying

$19,075. For a first home buyer, this difference will be dominated by the reduction in stamp duty under the new policy.

The final 3 columns in Table 4 show the proportion of income spent on stamp duty and rates. For first home buyers, this is 17.07% for the new tax policy, and 22.70% for the old tax policy, so this has decreased under the new tax policy by 5.63 percentage points, mainly due to the reduction in stamp duty.

The "Difference" column is the difference between the old and new tax system. If this is negative, then on average families are better off (they are paying less in stamp duty and rates under the new policy). If it is positive, they are worse off.

For homeowners in the table, the number includes any stamp duty if they have purchased a new property; and rates. However, these homeowners are affected more by the increase in rates in both current and new properties. Therefore, the average homeowners may still be worse off due to the policy. The impact of stamp duty and rates separately on these sub-groups can be seen in the technical report.

Introducing price increases means that the stamp duty and rates under the old tax policy decrease, as the property prices are lower compared to the assumption that the property price increases matched the RPPI of the new policy. All of the gains and losses are in the same direction, and first home buyers still benefit the most under all the property price increase assumptions. The different property price increase assumptions had little impact on the percentage of income spent on stamp duty and rates.

What we see from Table 4 is that, on average, middle income renters gain the most under the new policy, paying an average $4,578 less in combined stamp duty and rates. Additional analysis shown in the Technical Report, which splits the gains into rates and stamp duty separately, shows that this is due to a large reduction in stamp duty; and the fact that for some of the years in the study, these renters aren't paying rates, so the average rates paid is lower than homeowners. First home buyers also benefit from the reform, due to lower stamp duty, and not paying rates until they have purchased a property.

Generally, homeowners are worse off under the reform, because they are paying higher rates; but generally not benefitting from lower stamp duty. Upgraders would benefit from the lower stamp duty, which is possibly why middle income homeowners do benefit slightly from the reform, as they are the group most likely to be upsizing.

Note that in Table 4, for the same policy (eg, Old Tax Policy) and a higher price, generally we see lower rates and stamp duty because the number of houses purchased has decreased. However, because all the modelling is done at the household level, in some cases, there may be higher stamp duty and rates paid by the same cohort. An example of this is low income renters, which went for paying an average $10,578 with no price increase to $10,692 for the highest house price increase. This is due to a combination of the complex modelling of house purchases which changes as the house prices increase, the random element introduced in choosing a purchaser, and the averaging.

Table 4 - The impact of tax reform on rates and stamp duty paid by sub-group, average 2012 - 2018

Sub-group	New Tax Policy $	Old tax policy $	Difference $	New tax policy - % of income spent	Old tax policy - % of income spent	Difference % points
First home buyers	14,498	19,075	-4,578	17.07	22.70	-5.63
Low-income homeowner	2,051	1,937	115	4.84	4.57	0.27
Low-income renter	8,598	10,578	-1,981	17.82	22.73	-4.91
Middle-income homeowner	3,546	3,660	-113	4.34	4.47	-0.14
Middle-income renter	12,831	17,412	-4,581	19.29	26.10	-6.81
Pensioner homeowner	2,346	1,988	359	4.04	3.42	0.62
Pensioner renter	9,987	12,701	-2,714	20.32	25.85	-5.52
Female-head homeowner	3,365	3,283	82	4.18	4.08	0.10
Female head renter	14,415	19,316	-4,900	17.28	23.38	-6.10

0.35 – 1.30% price effect (0.8% average)

Sub-group	New Tax Policy $	Old tax policy $	Difference $	New tax policy - % of income spent	Old tax policy - % of income spent	Difference % points
First home buyers	14,498	18,847	-4,349	17.07	22.44	-5.37
Low-income homeowner	2,051	1,932	119	4.84	4.56	0.28
Low-income renter	8,598	10,522	-1,925	17.82	22.54	-4.71
Middle-income homeowner	3,546	3,645	-99	4.34	4.46	-0.12
Middle-income renter	12,831	17,212	-4,381	19.29	25.80	-6.51
Pensioner homeowner	2,346	1,988	358	4.04	3.42	0.62
Pensioner renter	9,987	12,572	-2,585	20.32	25.58	-5.26
Female-head homeowner	3,365	3,271	94	4.18	4.06	0.12
Female head renter	14,415	19,105	-4,690	17.28	23.08	-5.80

1.24 – 2.19% price effect (1.7% average)

Sub-group	New Tax Policy $	Old tax policy$	Difference $	New tax policy - % of income spent	Old tax policy - % of income spent	Difference % points
First home buyers	14,498	18,664	-4,166	17.07	22.11	-5.04
Low-income homeowner	2,051	1,930	121	4.84	4.55	0.29
Low-income renter	8,598	10,692	-2,094	17.82	22.65	-4.82
Middle-income homeowner	3,546	3,635	-89	4.34	4.45	-0.11
Middle-income renter	12,831	16,972	-4,141	19.29	25.46	-6.17
Pensioner homeowner	2,346	1,993	354	4.04	3.43	0.61
Pensioner renter	9,987	12,432	-2,446	20.32	25.30	-4.98
Female-head homeowner	3,365	3,260	105	4.18	4.05	0.13
Female head renter	14,415	18,855	-4,440	17.28	22.60	-5.32

Source: Calculations from NATSEM microsimulation model.

Results by income quintile

This section provides the results from our modelling by income quintile. The results for the impact on the distribution of rates are shown in Table 5; the stamp duty distribution in Table 6; the number of properties purchased in Table 7; the and for the change in terms of incomes is shown in Table 8.

Table 5 shows the distribution of the total rates paid by each income quintile. The figure of 8.73% means that income quintile 1 pays 8.73 per cent of the total rates collected by the ACT Government. This will partly be because rates are only paid by owners, and many families in quintile 1 will be renters, either public or private. In addition, those families in Q1 who do own properties are more likely to live in properties with lower unimproved values, or be receiving rate assistance, and therefore, their rates bills and the proportion of rates raised from them would be lower. Despite this, those families in Q3 and Q4 experience the biggest percentage point decrease in the proportion of total rates paid after the new policy is introduced.

Assuming an equal distribution, the amount in each income quintile would be 20%. It can be seen that the rates are progressive – as incomes increase, the proportion of the total rates paid by each income quintile increases. The new tax policy is more progressive – Q5 has increased their proportion by 2.42 percentage points, while all the other income quintiles have reduced their contribution.

There is also not much difference between the results without the property price increases; and the results with the property price increases.

Table 5 - The impact of tax reform on the general rate distribution (net of rebate) by income quintile, average 2012 – 2018

Quintile	New Tax Policy (%)	Old Tax Policy (%)	Difference (% points)
Q1	8.73	9.02	-0.29
Q2	12.03	12.51	-0.48
Q3	17.54	18.40	-0.87
Q4	21.93	22.71	-0.78
Q5	39.78	37.36	2.42
0.35 – 1.30% price effect (0.8% average)			
Quintile	New Tax Policy (%)	Old Tax Policy (%)	Difference (% points)
Q1	8.73	9.02	-0.29
Q2	12.03	12.51	-0.49
Q3	17.54	18.40	-0.87
Q4	21.93	22.71	-0.78
Q5	39.78	37.35	2.42
1.24 – 2.19% price effect (1.7% average)			
Quintile	New Tax Policy (%)	Old Tax Policy (%)	Difference (% points)
Q1	8.73	9.01	-0.29
Q2	12.03	12.52	-0.49
Q3	17.54	18.41	-0.87
Q4	21.93	22.71	-0.78
Q5	39.78	37.35	2.43

Source: Calculations from NATSEM microsimulation model.

Table 6 shows the impact of the stamp duty change on different income quintiles. Similar to rates, stamp duty is progressive – high income families pay proportionately more than low income families. Because stamp duty is only paid when a household sells, the impact on Q1 is very low – they pay only 2.28 per cent of the total stamp duty collected under the new policy, whereas Q5 pays nearly 40 per cent. The other possible reason is that those families in Q1 are more likely to purchase properties with lower property values and the stamp duty paid depends on property value. There is not much difference in the distribution between the old and the new tax policies, Q1 – Q3 pay a slightly lower proportion and Q4 and Q5 pay a slightly higher proportion of total stamp duty revenue; and increasing the property price did not have a large impact on the distribution.

Table 6 - The impact of tax reform on the stamp duty distribution (including concession) by income quintile, average 2012 – 2018

Quintile	New Tax Policy (%)	Old Tax Policy (%)	Difference (% points)
Q1	2.28	2.48	-0.19
Q2	8.31	8.48	-0.17
Q3	22.48	23.14	-0.66
Q4	27.66	27.38	0.28
Q5	39.28	38.53	0.74

0.35 – 1.30% price effect (0.8% average)

Quintile	New Tax Policy (%)	Old Tax Policy (%)	Difference (% points)
Q1	2.28	2.47	-0.19
Q2	8.31	8.54	-0.22
Q3	22.48	23.13	-0.66
Q4	27.66	27.36	0.30
Q5	39.28	38.51	0.77

1.24 – 2.19% price effect (1.7% average)

Quintile	New Tax Policy (%)	Old Tax Policy (%)	Difference (% points)
Q1	2.28	2.47	-0.19
Q2	8.31	8.62	-0.31
Q3	22.48	23.08	-0.60
Q4	27.66	27.32	0.34
Q5	39.28	38.50	0.77

Source: Calculations from NATSEM microsimulation model.

It can be seen from Table 7 that with no price increase, middle and high income earners increased their number of property purchases the most, although even low income families increased their purchases of housing by 0.34 per cent.

Looking at the combined impact of rates and stamp duty in Table 17 of the technical report, because of the way the two combine, low (quintiles 1 and 2) and high (quintile 5) income families pay slightly more of the combined rates and stamp duty under the new policy

compared to families in income quintiles 3 and 4. This is due to interactions between the changes in rates and stamp duty; the indicator used (proportion of total rates and stamp duty paid by each income quintile); and the fact that stamp duty for income quintiles one and two is much lower than rates payments.

Once price increases were taken into account, the group most affected were, not surprisingly, the low income groups. Property price increases mean that they are excluded from buying housing due to affordability issues, and not meeting the deposit and repayment tests in the model. An increase in property prices of an average 1.7% meant that the lowest income quintile group reduced their purchases by 0.36 per cent under the new policy rather than increasing them by 0.34%, a difference of 39 properties. Middle and high income earners still increased their number of properties purchased under the new policy.

Table 7 - The impact of tax reform on the number of residential properties purchased by income quintile, 2012 – 2018

Quintile	New Tax Policy – Number of purchases	Old Tax Policy – Number of purchases	Difference	Difference %
Q1	5,581	5,562	19	0.34
Q2	9,965	9,699	266	2.74
Q3	23,114	22,556	558	2.47
Q4	23,640	22,885	755	3.30
Q5	27,468	26,762	706	2.64
0.35 – 1.30% price effect (0.8% average)				
Quintile	New Tax Policy – Number of purchases	Old Tax Policy – Number of purchases	Difference	Difference %
Q1	5,581	5,578	3	0.05
Q2	9,965	9,800	165	1.68
Q3	23,114	22,601	513	2.27
Q4	23,640	22,940	700	3.05
Q5	27,468	26,807	661	2.47
1.24 – 2.19% price effect (1.7% average)				
Quintile	New Tax Policy – Number of purchases	Old Tax Policy – Number of purchases	Difference	Difference %
Q1	5,581	5,601	-20	-0.36
Q2	9,965	9,942	23	0.23
Q3	23,114	22,756	358	1.57
Q4	23,640	23,096	544	2.36
Q5	27,468	27,010	458	1.70

Source: Calculations from NATSEM microsimulation model.

The amount spent on duty and rates in absolute terms and as a percent of income, by income quintile, is shown in Table 8. It can be seen that low income families spend the least on stamp duty and rates, as identified in Table 5 and Table 6 above, and Table 8 reinforces the progressivity of stamp duty and rates – higher income families are paying more in absolute dollars. Note that the dollar value in columns 2 and 3 represent the average stamp duty and rates paid by all households in a year, over the time period analysed for each quintile, where

not every family in a quintile purchases a property during the time period analysed (2012-2018).

Table 8 also shows that lower income families are spending more on stamp duty and rates as a proportion of their income, and that this is higher under the new tax policy. Under the new tax policy, they are paying 5.91 per cent of their income on rates and stamp duty; whereas under the old system this was 5.32 per cent before including the price effect. For high income families in Q5, this is around 4%. The reason for this is that rates are based on unimproved value of land, not on income. This means a low income pensioner can be paying rates on a high value block of land. While subsidies based on income and pensioner status are applied, the rates and stamp duty for low income families as a proportion of their income after any subsidies is still higher than for high income families.

Those in income quintile Q3 and Q4 benefit from the new tax system, paying $324 (Q3) and $231 (Q4) less in rates and stamp duty before any price effect.

The impact of property price changes on the rates and stamp duty paid by income quintile is not large.

Table 8 - The impact of tax reform on rates and stamp duty paid by income quintile, average 2012 – 2018

Quintile	New Tax Policy $	Old Tax Policy $	Difference $	New Tax Policy - % of income spent	Old Tax Policy - % of income spent	Difference % points
Q1	1,532	1,378	153	5.91	5.32	0.59
Q2	2,768	2,738	31	4.70	4.65	0.05
Q3	4,096	4,420	-324	5.07	5.47	-0.40
Q4	5,019	5,250	-231	4.59	4.79	-0.21
Q5	6,511	6,325	186	4.13	4.01	0.12

0.35 – 1.30% price effect (0.8% average)

Quintile	New Tax Policy $	Old Tax Policy $	Difference $	New Tax Policy - % of income spent	Old Tax Policy - % of income spent	Difference % points
Q1	1,532	1,374	157	5.91	5.31	0.61
Q2	2,768	2,735	34	4.70	4.64	0.05
Q3	4,096	4,396	-299	5.07	5.44	-0.37
Q4	5,019	5,219	-200	4.59	4.77	-0.18
Q5	6,511	6,290	221	4.13	3.99	0.14

1.24 – 2.19% price effect (1.7% average)

Quintile	New Tax Policy $	Old Tax Policy $	Difference $	New Tax Policy - % of income spent	Old Tax Policy - % of income spent	Difference % points
Q1	1,532	1,374	158	5.91	5.30	0.61
Q2	2,768	2,743	26	4.70	4.65	0.04

Q3	4,096	4,375	-278	5.07	5.41	-0.34
Q4	5,019	5,195	-176	4.59	4.74	-0.16
Q5	6,511	6,267	244	4.13	3.98	0.15

Source: Calculations from NATSEM microsimulation model.

Results by wealth quintile

This section provides the results from our modelling by wealth quintile. The results for the change in the number of properties purchased is shown in Table 9; and the results on change in incomes by wealth quintile is shown in Table 10.

It can be seen that there are very few transactions for low wealth households, possibly due to the deposit and borrowing constraints applied in the model. Therefore, tax reform on it's own is not going to bring these low wealth households into buying a property – their lack of wealth means they cannot afford a deposit for a property. Most of the transactions are in wealth quintile 5, and the number of transactions under the new tax policy has increased for all wealth levels, due to the lower stamp duty.

The increase in property prices due to the new policy had a small impact on the number of properties purchased in all wealth quintiles.

Table 9 - The impact of tax reform on the number of residential properties purchased by wealth quintile, 2012 – 2018

Quintile	New Tax Policy – Number of purchases	Old tax policy – Number of purchases	Difference	Difference %
Q1	43	43	0	0
Q2	14,582	13,229	1,353	10.23
Q3	22,964	22,504	460	2.04
Q4	24,878	24,613	265	1.08
Q5	27,301	27,075	226	0.83
0.35 – 1.30% price effect (0.8% average)				
Quintile	New Tax Policy – Number of purchases	Old tax policy – Number of purchases	Difference	Difference %
Q1	43	43	0	0
Q2	14,582	13,351	1,231	9.22
Q3	22,964	22,523	441	1.96
Q4	24,878	24,657	221	0.90
Q5	27,301	27,152	149	0.55
1.24 – 2.19% price effect (1.7% average)				
Quintile	New Tax Policy – Number of purchases	Old tax policy – Number of purchases	Difference	Difference %
Q1	43	124	-81	-65.3
Q2	14,582	13,586	996	7.33
Q3	22,964	22,630	334	1.48
Q4	24,878	24,807	71	0.29
Q5	27,301	27,258	43	0.16

Source: Calculations from NATSEM microsimulation model.

Table 10 shows the impact of tax reform on rates and stamp duty paid by wealth quintile. The dollar figure represents the average stamp duty and rates paid by all households in a year, over the time period analysed for each quintile. Low wealth families are worse off by $132, possibly due to higher rates under the new system compared to the old, and minimal benefit from stamp duty (see Tables 21 and 23 in the Technical Paper). High wealth families are also worse off by $365 a year on average, due to higher rates paid on more expensive properties. The change in property prices had little impact on the amounts paid by wealth quintile.

Table 10 - The impact of tax reform on rates and stamp duty paid by wealth quintile, average 2012 – 2018

Quintile	New Tax Policy $	Old Tax Policy $	Difference $	New Tax Policy - % Change in income	Old Tax Policy - % Change in income	Difference
Q1	1,176	1,044	132	1.53	1.36	0.17
Q2	4,113	4,553	-440	5.11	5.66	-0.55
Q3	3,578	3,909	-331	3.86	4.22	-0.36
Q4	3,830	4,034	-204	4.22	4.44	-0.23
Q5	5,248	4,882	365	5.12	4.77	0.36

0.35 – 1.30% price effect (0.8% average)

Quintile	New Tax Policy $	Old Tax Policy $	Difference $	New Tax Policy - % Change in income	Old Tax Policy - % Change in income	Difference
Q1	1,176	1,043	132	1.53	1.36	0.17
Q2	4,113	4,543	-430	5.11	5.65	-0.54
Q3	3,578	3,880	-302	3.86	4.19	-0.33
Q4	3,830	4,011	-182	4.22	4.42	-0.20
Q5	5,248	4,863	385	5.12	4.75	0.38

1.24 – 2.19% price effect (1.7% average)

Quintile	New Tax Policy $	Old Tax Policy $	Difference $	New Tax Policy - % Change in income	Old Tax Policy - % Change in income	Difference
Q1	1,176	1,034	141	1.53	1.36	0.18
Q2	4,113	4,567	-454	5.11	5.67	-0.56
Q3	3,578	3,864	-286	3.86	4.17	-0.31
Q4	3,830	3,998	-168	4.22	4.40	-0.19
Q5	5,248	4,844	403	5.12	4.73	0.39

Source: Calculations from NATSEM microsimulation model.

Discussion

This work has shown that the new tax system in the ACT, before taking into account property price increases, can be expected to benefit all the groups we looked at by increasing the number of sales; and for most of the disadvantaged sub-groups of the population we looked at, a lower proportion of their income was being spent on stamp duty and rates over the period 2012 – 2018. Exceptions to this were some of the homeowners, who wouldn't benefit from the reduced stamp duty; but the increase in all cases was less than 0.65 percentage points of their income.

Both before and after taking into account property price increases, the new tax system shows that low income families were paying less on stamp duty and rates as a proportion of the total stamp duty and rates paid under the new system compared to the old system. For rates, the highest income quintile was the only quintile paying more as a proportion of the total rates paid (Table 5); and for stamp duty, the second two highest income quintiles were paying more as a proportion of the total stamp duty paid (Table 6). Generally under the new system and considering spending on rates and stamp duty combined, lower income (Q1 and Q2) families and high income families (Q5) are slightly worse off; while middle income families, who are probably benefitting from the stamp duty decreases, are better off.

When looking at wealth quintiles, the lowest wealth (Q1) and the highest wealth (Q5) spent a greater proportion of their income on rates and stamp duty after tax reform; and the middle three wealth quintiles spend a lower proportion of their income on stamp duty and rates. This is probably because the highest wealth households experience the greatest impact from the rates changes. Table 24 of the Technical Report shows the proportion of stamp duty and rates combined paid by each wealth quintile. This table shows that high wealth individuals (Q5) are paying a greater proportion of rates and stamp duty under the new system; while lower wealth individuals (Q2 – Q4) are paying a lower proportion. The difference for the lowest wealth quintile was very small (an increase of 0.01 percentage points). So the combined impact of rates and stamp duty in the new policy is positive for mid wealth families; and negative for high wealth families.

After taking into account property price increases due to the new tax system, a slightly different picture emerges. If property prices increase by an average of 0.8% due to the new policy, the number of additional purchases under the new policy falls by about 10% (from 2,304 to 2,042 in Table 2), while under an average 1.7% price increase the number of additional purchases falls by about 40% (2,304 to 1,363 in Table 2). In both cases, the impact of the new tax system is still more properties sold.

Table 7 shows that even with decreased properties purchased due to the modelled price increases, the number of properties purchased under tax reform is higher than without tax reform for all income quintiles except Q1 under the highest house price increase, which experienced a very small decrease in additional properties purchased of 20 properties.

For first home buyers, a group that has been a focus of Government policy and incentive schemes, our analysis finds that there are 1,599 additional first home buyers if there was no price increase as a result of the new policy and that this reduces to 1,053 under a 1.7% average price increase (Table 3). This result for first home buyers is mainly driven by the deposit and income requirements we have used in the model. While this group was the most affected by the modelled price increases, all other sub-groups also experienced decreased purchases

after the modelled price increases; and most of the income quintiles and wealth quintiles saw decreases.

In summary, the new policy increased sales of properties for most groups; however the modelled price increases then reduced the extent of this increase due to the new policy.

With the property price change, all homeowners have more spending on housing, possibly because of higher rates, and the stamp duty being paid on a more expensive property; and all renters who purchase in the period are better off, due to lower stamp duty, and not having to pay higher rates until they purchase..

4. Results for economic and affordability impacts of the ACT tax reform (Part 2)

This section provides the results from the econometric analysis of the effect of the tax reform on several different outcome variables. The difference-in-difference method used, if all assumptions hold, gives us an estimate of the impact of the reform on economic effects and housing affordability in the ACT, for example, how house prices change; if rental prices go up; etc.

Results for the effect on the economy

Here we provide our findings for the effects on the economy. We use the overall sales value, the sum of all property sales, as a measure for the part of the economy which is most likely going to be affected by the ACT reform. Table 11 shows the results for the overall sales of both houses and units. In Table 12 and Table 13 we explore whether there is any trend in the effects of the reform—we ask whether the effects are growing or shrinking over time.

Table 11 - Effect of the tax reform on the housing market - estimations in logs

Log(Sales Value)	(1)	(2)	(3)	(4)	(5)	(6)
		Houses			Units	
	Full Sample	Full Sample	Capital Cities	Full Sample	Full Sample	Capital Cities
Reform Dummy	-0.103	0.031	-0.055	-0.396	-0.222	-0.274
Standard error	[0.021]**	[0.022]	[0.022]*	[0.028]**	[0.031]**	[0.031]**
Log(Income)		3.102	3.053		3.414	3.351
Standard error		[0.080]**	[0.108]**		[0.160]**	[0.185]**
Log(Population)		3.129	3.961		2.479	3.216
Standard error		[0.128]**	[0.184]**		[0.222]**	[0.276]**
Time & Suburb FE	YES	YES	YES	YES	YES	YES
Observations	543,443	515,524	234,695	219,559	208,943	137,577
Number of Suburbs	10,116	10,045	2,806	3,799	3,781	2,112
Adj. R-squared	0.78	0.79	0.74	0.76	0.77	0.77
Max in Cor. Matrix	.	0.25	0.26	.	0.34	0.35

* $p<0.05$; ** $p<0.01$

Table 11 shows the effect on the ACT property market. The first 3 columns show the results for houses; the last 3 columns the results for units. In column 1 we see the results of a

regression of the sales value on time and suburb fixed effect and the reform dummy. We find a coefficient on the reform of -0.1 which is equivalent to a 10% decrease.

Once we add the controls for population and income in column 2 the effect becomes small and insignificant. Adding in extra controls for income and population lowers the reform dummy coefficient but leads only to moderate correlation between the covariates and the reform variable

In column 3 we reduced the sample to the states and territories capital cities, effectively using an alternative control group as a robustness check. The coefficient suggests a reform effect of -5%.

The results for units in the second half of Table 11 show a larger effect. Similar to the housing market, when we include controls in column 5 and 6 we see a reduction in the size of the effect. Columns 5 and 6 suggest a reduction of the unit sales value due to the reform of 20% to 24%[10].

Table 12 and Table 13 each contain two different approaches to see how the effect of the reform on the volume of sales changes over time. The first 3 columns are equivalent to Table 11 but with a time trend added to measure if there is a reform trend. In the second half of the tables we look at shorter reform periods to see how the effect treks over time.

Table 12 - Trend in the effect of the tax reform on the housing market - estimations in logs

Log(Sales Volume)	(1) Reform Trend	(2) Trend & Controls	(3) Trend & Capital Cities	(4) Sample till 2015	(5) Sample till 2017	(6) Full Sample
Reform Dummy	-0.125	-0.013	-0.078	0.013	0.019	0.031
Standard error	[0.025]**	[0.025]	[0.026]**	[0.020]	[0.021]	[0.022]
Reform Trend	0.005	0.010	0.005			
Standard error	[0.006]	[0.006]*	[0.006]			
Log(Income)		3.108	3.059	2.606	2.928	3.102
Standard error		[0.080]**	[0.108]**	[0.081]**	[0.080]**	[0.080]**
Log(Population)		3.115	3.945	1.022	2.878	3.129
Standard error		[0.129]**	[0.185]**	[0.174]**	[0.140]**	[0.128]**
Time & Suburb FE	YES	YES	YES	YES	YES	YES
Observations	543,443	515,524	234,695	339,387	457,063	515,524
Number of Suburbs	10,116	10,045	2,806	9,343	9,848	10,045
Adj. R-squared	0.78	0.79	0.74	0.79	0.79	0.79
Max in Cor. Matrix	0.64	0.63	0.63	0.41	0.26	0.25

* $p<0.05$; ** $p<0.01$

[10] The exact elasticity of a dummy variable coefficient in a log-log specification can be calculated as $e^{-0.274}$ -1 = -0.24 which for small coefficients is close to the original value but with larger absolute coefficients this the difference will not be negligible.

When introducing a reform time trend in Table 12 to the basic specifications from Table 11 we observe strong multicollinearity with the maximum of the correlation matrix going up to 0.64. This is expected as the dummy and time trend are very similar, both covering the reform period. This collinearaity is less of a concern since we are not interested in the magnitude of the reform dummy coefficient as much as in the direction of the trend. But it does mean that the trend coefficient and the reform impact coefficient cannot be interpreted individually. The results in Table 12 suggest a positive, and in column (2), a significant effect.

Supporting these findings, the second half of Table 12 shows an increasing reform dummy coefficient over time.

Table 13. Trend in the effect of the tax reform on the unit market - estimations in logs

Log(Sales Volume)	(1) Reform Trend	(2) Trend & Controls	(3) Trend & Capital Cities	(4) Sample till 2015	(5) Sample till 2017	(6) Full Sample
Reform Dummy	-0.333	-0.174	-0.245	-0.269	-0.270	-0.222
Standard error	[0.049]**	[0.050]**	[0.050]**	[0.036]**	[0.031]**	[0.031]**
Reform Trend	-0.014	-0.012	-0.007			
Standard error	[0.008]	[0.009]	[0.009]			
Log(Income)		3.399	3.337	2.369	3.181	3.414
Standard error		[0.161]**	[0.187]**	[0.171]**	[0.161]**	[0.160]**
Log(Population)		2.504	3.238	2.252	3.673	2.479
Standard error		[0.223]**	[0.278]**	[0.343]**	[0.258]**	[0.222]**
Time & Suburb FE	YES	YES	YES	YES	YES	.
Observations	219,559	208,943	137,577	139,698	186,907	208,943
Number of Suburbs	3,799	3,781	2,112	3,601	3,740	3,781
Adj. R-squared	0.76	0.77	0.77	0.77	0.77	0.77
Max in Cor. Matrix	0.81	0.78	0.77	0.41	0.33	0.34

* $p<0.05$; ** $p<0.01$

Table 13 shows no significance on the reform trend. The second half of the table shows a suggestive decrease in the negative reform coefficient over time.

Tables 12 and 13 use all of Australia as the control group. If instead we use capital cities as the control group we find results similar to columns (3) and (6) with a statistically insignificant trend varible. There is no clear trend over time when we estimate over shorter time periods.

Results for the effect on property prices

This section provides the results for the reform effects on property prices. Table 14 shows the results for both houses and unit prices.

There is no significant effect of the reform on house prices in column 1 of Table 14. When we add the population and income controls we find a 9% house price increase as a result of the reform. Moving to capital cities as our control group in column 3 the effect goes down to 2% and becomes just statistically insignificant. Multicollinearity is not a problem.

Table 14 - Effect of the tax reform on property prices - estimations in logs

Log(House Price)	(1)	(2)	(3)	(4)	(5)	(6)
		Houses			Units	
	Full Sample	Full Sample	Capital Cities	Full Sample	Full Sample	Capital Cities
Reform Dummy	-0.008	0.094	0.021	-0.110	0.044	0.002
Standard error	[0.013]	[0.013]**	[0.013]	[0.008]**	[0.010]**	[0.009]
Log(Population)		1.910	2.568		0.965	1.041
Standard error		[0.067]**	[0.086]**		[0.112]**	[0.143]**
Log(Income)		2.267	2.324		2.608	2.508
Standard error		[0.050]**	[0.047]**		[0.092]**	[0.076]**
Time & Suburb FE	YES	YES	YES	YES	YES	YES
Observations	543,443	515,524	234,695	219,559	208,943	137,577
Number of Suburbs	10,116	10,045	2,806	3,799	3,781	2,112
Adj. R-squared	0.75	0.76	0.81	0.67	0.68	0.69
Max in Cor. Matrix	.	0.21	0.11	.	0.19	0.44

* $p<0.05$; ** $p<0.01$

When looking at unit prices in the second half of Table 14, we observe in the most basic regression of column 1 a negative effect, this turns into a positive effect of 4% once we add controls to the specification. The effect is eliminated in column 6 when we restrict the sample to capital cities; we do however, observe an increase in our collinearity measure.

Results for the effect on the numbers of properties sold

This section presents the results for the sales volume for houses and units in Table 15.

Table 15 - Effect of the tax reform on the number of property sales - estimations in logs

Log(Number Sold)	(1)	(2)	(3)	(4)	(5)	(6)
		Houses			Units	
	Full Sample	Full Sample	Capital Cities	Full Sample	Full Sample	Capital Cities
Reform Dummy	-0.096	-0.062	-0.075	-0.285	-0.265	-0.275
Standard error	[0.029]**	[0.028]*	[0.028]**	[0.027]**	[0.029]**	[0.030]**
Log(Population)		1.225	1.414		1.516	2.174
Standard error		[0.108]**	[0.168]**		[0.185]**	[0.238]**
Log(Income)		0.854	0.769		0.810	0.848
Standard error		[0.069]**	[0.105]**		[0.138]**	[0.172]**
Time & Suburb FE	YES	YES	YES	YES	YES	YES
Observations	550,554	522,180	241,061	220,220	209,572	138,177
Number of Suburbs	10,117	10,046	2,806	3,799	3,781	2,112
Adj. R-squared	0.76	0.77	0.74	0.74	0.74	0.75
Max in Cor. Matrix	.	0.11	0.15	.	0.29	0.33

* $p<0.05$; ** $p<0.01$

We find a consistently negative and significant effect of the reform on the number of house sales in columns 1 through 3 of Table 15. Adding extra controls reduces the effect to -6% while

the control group of capital cities shows a treatment effect of -7%. Multicollinearity is not a problem.

The effect on unit sales is larger, with controls added in columns 5 and only capital cities as controls in column 6 the effect is between -23% and -24%.

Results for housing affordability

The section considers how affordable rental properties are after the reform. Table 16 shows the effect on rental prices; Table 17 and Table 18 look at the distributional effect on rental prices; Table 19 analyses the number of new rental contracts.

In the basic regression in column 1 of Table 16 we find an effect of the reform on rental prices of -7%. In column 2, after adding in population and income controls, the effect reduces to -1% and becomes statistically insignificant. In column 3 with the sample reduced to capital cities the we find an effect of -2.5%.

A similar picture emerges for unit rental prices. The reform reduces prices, by around 8% according to columns 5 and 6 of Table 16.

Table 16 - Tax reform effect on rental prices - estimations in logs

Log(Median Rent)	(1)	(2)	(3)	(4)	(5)	(6)
		Houses			Units	
	Full Sample	Full Sample	Capital Cities	Full Sample	Full Sample	Capital Cities
Reform Dummy	-0.077	-0.014	-0.026	-0.166	-0.082	-0.084
Standard error	[0.006]**	[0.008]	[0.007]**	[0.011]**	[0.013]**	[0.012]**
Log(Income)		1.505	1.471		1.516	1.464
Standard error		[0.057]**	[0.029]**		[0.074]**	[0.048]**
Log(Population)		1.121	1.344		1.231	1.227
Standard error		[0.061]**	[0.070]**		[0.099]**	[0.110]**
Time & Suburb FE	YES	YES	YES	YES	YES	YES
Observations	263,249	248,629	153,750	134,234	126,901	90,643
Number of Suburbs	3,435	3,420	1,988	2,012	1,998	1,297
Adj. R-squared	0.91	0.92	0.95	0.90	0.91	0.93
Max in Cor. Matrix	.	0.52	0.23	.	0.41	0.26

* $p<0.05$; ** $p<0.01$

For the regressions in Table 17 and Table 18 we have split the sample for each state and territory into quintiles according to the suburb's rental prices at the start of the reform. We then split the sample according to those quintiles and run individual regression for each rent quintile to see how the effects of the reform differ across the rental market.

The results suggest that the reform led to a reduction of up to 7% in house rental prices for the first 4 rental quintiles. By contrast, the reform led to an increase in house rental prices at the upper end of the distribution (the 5th quintile) by close to 9%.

Table 17 - Tax reform effect on house rental prices - quantile estimations in logs

Log(Median Rent)	(1) 1st Quintile	(2) 2nd Quintile	(3) 3rd Quintile	(4) 4th Quintile	(5) 5th Quintile
Reform Dummy	-0.060	-0.011	-0.039	-0.065	0.087
Standard error	[0.014]**	[0.013]	[0.010]**	[0.023]**	[0.021]**
Log(Income)	0.680	1.202	1.308	1.328	2.841
Standard error	[0.085]**	[0.061]**	[0.064]**	[0.073]**	[0.214]**
Log(Population)	0.782	0.855	1.011	1.365	1.022
Standard error	[0.147]**	[0.115]**	[0.118]**	[0.151]**	[0.161]**
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	40,308	42,221	42,534	41,947	45,438
Number of Suburbs	438	434	445	441	499
Adj. R-squared	0.82	0.81	0.82	0.87	0.87

* $p<0.05$; ** $p<0.01$

The unit rental prices distribution in Table 18 show a very similar picture. There is a large reduction in rental prices at the lower end of the distribution (13%), narrowing to about 5% in the 4th quintile. However, there is no significant effect of the reform on unit rental prices in the highest quintile.

Table 18. Tax reform effect on unit rental prices - quintile estimations in logs

Log(Median Rent)	(1) 1st Quintile	(2) 2nd Quintile	(3) 3rd Quintile	(4) 4th Quintile	(5) 5th Quintile
Reform Dummy	-0.130	-0.119	-0.118	-0.047	0.026
Standard error	[0.037]**	[0.023]**	[0.017]**	[0.018]**	[0.017]
Log(Income)	1.048	1.118	1.423	1.405	2.242
Standard error	[0.140]**	[0.105]**	[0.128]**	[0.126]**	[0.205]**
Log(Population)	1.289	1.222	0.741	0.766	1.117
Standard error	[0.237]**	[0.233]**	[0.236]**	[0.218]**	[0.241]**
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	18,335	21,124	19,485	20,262	21,355
Number of Suburbs	216	228	203	212	218
Adj. R-squared	0.85	0.80	0.86	0.89	0.85

* $p<0.05$; ** $p<0.01$

It may seem counter-intuitive that rental prices have gone down while rates have been going up. One might expect at least some of the rates increase to be passed on to tenants in the form of higher rents. One possible scenario relating to the reform is that people may have chosen to rent their properties rather than sell them in response to the stamp duty reform. They could, reasonably, believe that they will get a better price for their house once stamp duty is completely eliminated and while they wait for this, they may rent their property.

We think a more likely explanation is some other factor which is affecting supply in the ACT differently than elsewhere in Australia. While we can not reject the failure of common trends, Figure 3 in the Technical Appendix suggests that the patterns of unit rental prices in 2012-2016 was very different in the ACT than in other parts of Australia (with the possible exception of Tasmania). The difference-in-difference approach may not be well suited to this question.

Table 19 presents the results of a time series analysis with the number of registered rental bonds as the dependent variable. We use monthly fixed effects and a linear trend as basic controls for an existing trend and seasonality.

In column 1 we only include the reform dummy to measure the effect.[11] It will capture a general shift in the number of new rentals after the reform commenced. In column 2 and 3 we add a number of extra controls and in column 4 we introduce a reform trend.[12] It captures any change in trend after the reform.

Throughout the specifications, the reform dummy coefficient remains large and significant. The reform's variance inflation factor (VIF) indicates that we do not have to be overly concerned with multicollinearity. The reform coefficient suggests that more than 200 additional rental properties are available on the market each month due to the reform.

Note that this time series analysis is only looking at how the supply of rental properties changes over this time period and attributing any change in the trend to the stamp duty reform. Any other confounding factors could cause a spurious association and would lead to an erroneous conclusion. This methodology is subject to strong caveats than the difference-in-difference estimation used previously in this section of the report. See the discussion in the methods section above and in the technical appendix.

Table 19 - Effect of the tax reform on number of new rentals - time series analysis

VARIABLES	(1) Number of Bonds	(2) Number of Bonds	(3) Number of Bonds	(4) Number of Bonds
Reform Dummy	238.243***	208.141***	225.237***	223.037***
Standard error	[81.560]	[78.420]	[60.706]	[63.084]
Reform Trend				2.755
Standard error				[10.287]
APS Employment		0.010*	0.023**	0.032
Standard error		[0.006]	[0.009]	[0.038]
Income			-1.328	-1.570
Standard error			[1.986]	[2.510]
Population			-0.069	-0.074
Standard error			[0.052]	[0.047]
Linear Trend	0.184	0.771	39.659	41.008
Standard error	[1.318]	[1.231]	[31.580]	[29.857]
Month FX	YES	YES	YES	YES
Observations	143	143	132	132
R-squared	0.366	0.371	0.517	0.517

[11] The reform dummy is a variable which is one for all months after the start of the reform and zero before.

[12] The reform trend is a trend variable that starts with the introduction of the reform and is zero in the months prior to the reform.

Reform VIF	3.4	3.7	4.3	4.4

Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1, Constant not reported

Discussion

Taking these results at face value, they show that the new tax system in the ACT has modestly increased property prices and reduced overall sale numbers. Consequently, this has reduced the economic size of the housing market slightly. We will discuss the limitations and caveats of these results in this section. We start buy summarizing the findings of the previous section in more detail.

Looking at the economic effect of the reform on the housing market, we find evidence of a small reduction in the value of total sales (the sum of the value of all sales) ranging from no effect to about 5% (depending on the specification). In the unit market total sales decreased by about 20% to 24%. While the point estimates vary a lot for both house and unit regressions across specifications, we do get consistently negative results. This is true across specifications, data sets and a variety of counterfactuals. In particular the latter fact makes us confident that we are observing a non-spurious result in the weak conclusion that the effect of the tax reform is non-positive in nature.

These results on the overall property market are driven by the number of sales. The number of house sales declined by 6 to 7% and unit sales decreased by 23% to 24%. The factors driving the reduction in the number of sales then also affect the overall property market as it is the product of the number of sales and prices.

The finding that the number of sales decreases, or at least does not increase, with reduction in stamp duty does not support the theoretical argument that a reduction in transaction costs will eliminate inefficiencies in the market and lead to increased activity. It suggests that the tax might not play as big a role in the overall decision to buy/sell a house as previously thought. This finding warrants further investigation.

The Corelogic results suggest that property prices have not decreased due to the reform. House prices increased by up to 9% due to the reform, unit prices increased by up to 4%. This suggests that the increase in property prices has likely not improved housing affordability for prospective property owners, despite the reductions in stamp duty.

We would expect the elimination of stamp duty to lift prices for purely mechanical reasons. Pre-reform prices are not inclusive of stamp duty. When stamp duty is removed, the removal of the tax wedge would lead buyers to pay a higher ex-tax price and sellers to receive a higher ex-tax price. This mechanical effect is probably around 0.8 per cent at median house prices given the reduction in stamp duties for those houses and the fact that most, if not all, of the tax incidence in Australia lies with the seller[13].

[13] See Davidoff and Leigh (2013) Economic Record, 89(286): 396-410. For the purely mechanical effect, free of any behavioural adjustments, we assume that at least 80% of the tax incidence lies with the sellers.

We may expect additional house price increases if buyers take the entire savings from stamp duty and use it to spend more money on a property. This would have the effect of buyers purchasing more expensive houses and could also push prices up for all buyers.

The even higher increase in prices, observed in some specifications, might make sense when we think about credit constraints in the property market. If some banks treat the cost for the house differently and separately to the cost of the stamp duty, then these amounts are not fully fungible. A prospective property buyer will only need to come up with the minimum deposit proportion of a higher house price and therefore, with the stamp duty reductions, has now the opportunity to use the saved tax amount to buy a proportionally much more expensive house. While this could lead to house price increases of 9 per cent, that number seems to be at the very upper limit of what is conceivable. In the modeling of Part I above, scenario 2 uses a 1.7 per cent increase for properties, which wasis a weighted everage of the 2.1 per cent increase for housing which we estimate when comparing Canberra to the control group of capital cities; and the 0.2% price increase for units. These cities have more in common with Canberra than regional Australia. We also model the effect of the 0.8 per cent mechanical effect. calculated by TTPI for all properties (units and houses), as the base data used in the NATSEM analysis could not differentiate these two types of housing. Rental affordability however, has improved with the reform. For both units and houses, rental prices have decreased with the introduction of the reform. The effect is smaller for houses than for units, but the overall results suggests that increased rates (due to the reform) are not being passed through to renters. Furthermore, we find evidence for a progressive reduction in rental prices across the rental market distribution. There is a larger reduction in rental property prices in the lower quintiles relative to the upper end of the rental market. While we cannot full dismiss the possibility that this result is driven by other confounding factors related to changing supply of rental properties, we have done our best to address this on our empirical analysis.

We also checked to see whether the reforms created a large, one-off Impact that has gradually diminished over time or whether the impact of the reforms is increasing over time. For the time period that we can observe, it appears that the effect of the reform has been gradually increasing over time.

These results should be interpreted with caution. Whenever a difference–in-difference analysis is applied to the real world, as opposed to an experimental setting, we have to question the validity of our two assumptions.

While we test for the common trends assumption in our data, failing to reject the parallel trends test in the pre-treatment period is not the same as confirming parallel trends in the counterfactual. In this case, we merely fail to reject the null hypothesis of parallel trends. In other words, while we check the assumption, it is still possible that neither of our four proposed controls groups is suitable. This is a possible limitation for all empirical analyses of this kind.

Of equal importance is the second assumption of our methodology: that no other changes or policies were introduced which would affect the outcomes of the treatment and control groups differently. There are many ways this could be violated in the seven-year treatment period. We control for some likely candidates specific to the ACT : a special immigration trend, a unique income development, or changes in federal government employment. However,

other ACT specific factors, which vary over time, but have nothing to do with the reform, could also influence the outcome variables. If such factors exist, they are not accounted for in the results. As such, we cannot exclude the possibility that the reform dummy is also capturing some other omitted factors which would influence the results. This is a typical limitation for any kind of empirical analysis.

A further concern were differences in the trends of property sale data available through Corelogic and the ACT's administrative data. The ACT unit record data shows a gradual increase in sales following the first 5 years of the reform, before the introduction of the "Barrier Free" administrative changes discussed in the data section above leads to a one time drop in recorded sales numbers. By contrast to the administrative data, our Corelogic data does not show an increase in sales after 2012 but rather a flat trend over the same period. This could have contributed to our finding of a reduction effect in number of sales and overall sales value[14]. As a consequence, in additional analysis, we use ACT administrative data and similar administrative data from NSW and re-estimate the effect of the reforms on sales values, sales volumes and prices separately for houses and units.

The results from the NSW and ACT administrative data show that observed difference in the Corelogic data are not driving the results. In particular we find similar negative effects on sales value and sales volume, with even larger coefficient estimates. Similar to the Corelogic regressions above, the results are not stable and the impact estimate changes substantially as we add additional control variables. These results are thus unreliable for identifying the exact effect. However, we can make similar broad conclusions with respect to the number of sales and sales value, which have not gone up as a result of the reform. For prices we either get implausibly large negative values or values close to zero, depending upon the specification. The fact that the results vary so extremely from one specification to another could be caused by multicollinearity between the reform variable and the added controls. This confirms and strengthens our concern about the reliability of our price effect estimates we have found with the Corelogic data. We can only conclude that our estimates vary too much to be reliable. See the technical appendix for all details on the administrative data estimates.

Finally, when looking at new rental contracts we find that the reform led to a large increase of available rental properties, but relying on a time series analysis means we no longer have a counterfactual and cannot control for common shocks the way we have done in the rest of the analysis. Specifically, any changes to the trend in the supply of rental properties caused by any other factors that changed since 2012/13 will be incorporated in this estimate. The change in the number of rental properties may well have been driven by some other factor and not by the reform of stamp duty. This should caution us from relying too heavily on these results.

Overall, the difference-in-difference approach to estimate the effect of the reform was problematic. The difficulty in finding a convincing control group appears to be a substantial one. The fact that the impact estimates change substantially when we use different control groups or different sets of covariates hint that the estimates are not robust to alternative control groups or alternative data source. The estimates seem to be driven more by the

[14] The overall sales value is calculated on the basis of number of sales times price.

control group choice than by the territory's tax reform. We thus strongly encourage readers to interpret and apply these results cautiously.

5. Conclusions

The questions that we set out to answer were:

1. **What has been the impact of tax reform on different household types and cohorts, taking into account available concessions and deferral programs?**

After taking into account all concessions and deferral programs available, and ignoring the estimated price increase due to the reform, tax reform can be expected to increase property turnover; and reduce the amounts paid for stamp duty and rates for most groups of vulnerable families in the ACT. Both the rates and stamp duty have been shown to be more progressive under the new tax system, in that low income families are paying slightly less of the total rates and stamp duty; and high income families are paying slightly more (Table 5 and Table 6).

In terms of income groups, before the modelled property price increases were incorporated, low income families can be expected to pay slightly more of their incomes on rates and stamp duty, while middle income groups are paying less, possibly because these groups are benefitting from the lower stamp duty, which the lower income groups aren't. Similarly, low wealth families experience slightly lower incomes under the new tax system, possibly because they aren't benefitting from the lower stamp duty as they can't purchase property due to the income and deposit constraints, while middle wealth families benefit from it.

Once the modelled property price increases are incorporated into the model, first home buyers and renters can still be expected to benefit from the new tax system. The progressivity of the new rates and stamp duty is still apparent with the property price increase.

2. **What has been the impact of tax reform on the progressivity and equity of the ACT tax system, considering the incidence of property purchases by households at different income and wealth?**

Looking at the results by income quintiles, we show that both the rates and stamp duty in the new tax system are more progressive (Table 5 and Table 6), with lower income families paying less of the tax take under the new system compared to the old. This was the same before and after the property price increases were incorporated.

Interestingly, when looking at the combined impact of the stamp duty and rates together, lower income families are paying a slightly higher proportion of the combined rates and stamp duty compared to middle income families. This is discussed further in the body of the report.

In terms of access to housing, the new tax system has meant greater access and increased sales for all income and wealth quintiles except the lowest income quintile with the highest average price increase, where the impact was slightly negative (Table 7).

3. **How has tax reform affected the alignment of residential property taxation with ability to pay, taking account relevant related factors including changes in land values and land use by household income level and household wealth level?**

This question can be answered in expectation through the model because the ability to pay for a property (both the income and wealth test) is modelled. The overall results suggest that tax reform can be expected to result in improved ability to pay for all families, as a greater number of them have been modelled as being able to buy. This is the same under all the price increases modelled.

4. Is there any evidence that higher annual general rates (in place of higher stamp duty) have impacted welfare or behaviour?

When considering welfare, the impact of rates on the incomes of low income families is higher under the new tax system, suggesting a decrease in welfare of these families. This impact was less than the impact of the reduction in stamp duty on low income families. So if a low income family purchases a property, they will be on average $2,435 better off due to the lower stamp duty; but will be paying $266 per year more in rates (see Tables 14 and 16 in the technical appendix). However, there are fewer low income families purchasing properties, so the impact of rates affects all owners; whereas the benefit of lower stamp duty only affects those who buy.

Reducing stamp duty under the new tax policy has meant that some of the stamp duty paid under the original tax system can now be used for a deposit. Our modelling showed that this has had a positive impact on purchasing ability, particularly for first home buyers. This was before the property price increase was incorporated.

It is difficult to identify an impact on behavior, and the simulation model used to address this question does not include behavioural effects, but we can say that the different property price increases were associated with a reduction in the number of households who could no longer purchase a higher priced property due to the income and deposit requirements. So the income and deposit rules applied by banks to provide loans are highly sensitive to property prices, and this may impact behavior in terms of families not purchasing; or purchasing elsewhere.

While the lower stamp duty has increased the number of properties purchased by 2,304 properties, there was also an impact of increasing property prices by a minimum of 0.8% and 1.7% averaged over five years. The 0.8% price increase meant that rather than 2,304 new sales, there were 2,042 new sales, a drop of 262 sales; and the 1.7% average price increase was associated with 1,363 sales, a reduction of 941 sales compared to no price increase. So one of the factors affecting behavior is property prices, and higher property prices can somewhat offset the benefit of lower stamp duty in terms of the number of properties sold.

5. Are the impacts of tax reform on the ACT economy to date able to be measured?

We measure the effects on the economy by studying the overall value of the house and unit markets. We find that the effects of the reform on the economy in the market for houses are small or non-existent; the findings range from statistically insignificant to -5 per cent (and even larger negative effects using the administrative data). The findings are not robust across variations in counterfactuals and the point estimates are unreliable. While we mostly find negative estimates, suggesting that the reform did not lead to an increase in the overall value of the house market economy, this is not consistently the case across the different specifications and we therefore cannot draw conclusions from the results.

When looking at the market for units we find a strong decrease of 20% to 24% (and negative but insignificant for the administrative data). This is a sizable amount and raises questions about whether the identifying assumptions have been met or if some other factors contribute to the unusual trend in the ACT. The point estimates are not robust to changes in control group or specification (or data) and should be used cautiously. While we mostly find negative estimates, suggesting that the reform did not lead to an increase in the overall value of the unit market economy, this is not consistently the case across the different specifications and we therefore cannot draw conclusions from the results.

6. Are the marginal impacts from each dollar of stamp duty reduction expected to increase or decrease as tax reform progresses?

Studying the trend of reform on the economy over time, we find a number of weak indications that the effect of the reform increases over the short time period observed. These measures are small and taking into account the limitations of the data and identifying assumptions discussed above, we would not draw any conclusion on the basis of these results. We can rule out the effect of the reform declining over time.

7. Is there any evidence that ACT residential property prices are higher or lower than they would have been in the absence of tax reform?

Studying the effect of the reform on house prices, we find a wide range of estimated house prices increases from zero up to 9 per cent and even significantly negative house price effects in the administrative data. Estimates are not robust across variations in the control group or data set. The results should be treated as unreliable. As a scenario input for the microsimulation study above, we suggest the use of a two per cent house price increase due to the stamp duty reforms. This was the estimate we found when using the CoreLogic data and other capital cities as the counterfactual. Notwithstanding the variability of results discussed above, this seems like a reasonable control group and a plausible estimate.

Estimates of the effect of the reform on unit prices are also mixed, from increases up to 4% to no effect and even, in some cases, significant negative effects. These estimates are not robust across variations in the control group or data set. The results are sensitive and should be treated as unreliable.

8. Is residential property turnover in the ACT higher or lower than it would have been in the absence of tax reform?

When looking at property turnover we find a wide range of estimates, many suggesting a reduction in sales. The estimates vary considerably across specifications and control groups from insignificant effects to over 10% reduction in the number of house sales (and even bigger for the administrative data). These results are not robust to changes in control group or specification (or data) and should be used very cautiously. While we mostly find negative estimates, suggesting that the reform did not lead to an increase in the overall numbers of house sales, this is not consistently the case across the different specifications and we therefore cannot draw conclusions from the results.

The effect on the number of unit sales also varies across specification. They are typically three times as strong as house sale declines (but we find even positive effects in one case with the administrative data). These results are not robust to changes in control group or specification

(or data) and should be used very cautiously. While we mostly find non-positive estimates, suggesting that the reform did not lead to an increase in the overall numbers of unit sales, this is not consistently the case across the different specifications and we therefore cannot draw conclusions from the results.

9. To what extent is the upfront cost of residential property in the ACT (i.e. purchase price + stamp duty) less than it would have been in the absence of tax reform?

Our analysis provides some evidence that it is likely that prices have not gone down due to the ACT tax reform. While this increase is hard to measure and likely to be small it can be up to 9 per cent for the housing market and up to 4 per cent on the market for units, but we note that we also found significant price decreases in some specifications.

The overall reduction in stamp duty since the start of the reform, when expressed relative to the price of the house is naturally small, on average 1.5% of the house price. A house price increase of only two per cent would outweigh the tax reduction. Therefore, the results in this report suggest that the upfront cost of housing has likely not gone down with the introduction of the reform. Again, the exact numbers are not robust to changes in control group and control variables and we can therefore not exclude the possibility that prices have gone up by less than 1.5%, in which case the upfront cost for ACT properties would have reduced under the tax reform.

10. As a result of paying lower stamp duty than they would have in the absence of tax reform, are home buyers spending less overall on property purchases; or buying higher priced properties (i.e. adding the stamp duty saved to their purchasing budget)?

Continuing on from the last question we find evidence in this study that families don't spend less on properties and are possibly buying higher priced properties. Prices have likely gone up with the introduction of the reform, and if so, by more than the equivalent of the reduction in stamp duty.

One reason for the higher spending on property purchases we observe might be that buyers use the saved tax to raise the maximum deposit they can afford. They are then able to buy a more expensive house given the same credit constraints.

11. Is tax reform making it easier for families to move to properties more suited to their needs, such as downsizing?

The tax reform makes it easier for families to move to different properties, as long as prices do not increase. Holding prices constant, the reduction of stamp duty means that it is more affordable for families to buy a different property because they spend less on stamp duty.

We show that when property prices increase by an amount greater than the stamp duty savings (the 1.7% average price increase scenario), the number of houses purchased decreases compared to the lower price increase modelled, but compared to the old policy, there is still an increase in properties purchased of 1,363 properties over the 7 years since tax reform started (Table 2).

12. Is rental housing more or less affordable than it would have been in the absence of tax reform?

In our analysis we find evidence that rental property prices have decreased with the introduction of the ACT tax reform.

For rental house prices, we find evidence of a small reduction of about 2 per cent, though point estimates vary between a reduction of 7 per cent and no changes across different specifications and data sets. The point estimates are thus unreliable. However, we find consistently non-positive estimates, which leads us to conclude that rental prices for houses have not increased due to the reform.

Rental prices for units show a decrease from 5 per cent to 16 per cent (depending upon specification and data) due to the reform. These negative effects are statistically significant and robust across specifications and control groups. While the point estimates are unreliable, the results suggest that rental prices for units have decreased due to the reform. The same limitations discussed above have to be taken into account.

13. Is the increased rates charge is being passed through to renters? If so, how much?

Following on from the last question, since we find that rental prices have likely decreased and not increased we can conclude that the increase in rates charges are not being passed onto renters. This is true for both house and unit rentals.

14. Are the impacts different at different rental price levels (i.e. rent quintiles)?

Our evidence suggests that the reform led to bigger (percentage) decreases in the lower quintiles of the rental market than in the more expensive part of the market. We find significant decreases in house rental prices for three of the four lower quintiles but a positive effect for the highest quintile.

The unit rental prices show similar results. The strongest effect is estimated for the lowest quintile. Effects becomes smaller as we move up the income distribution from lower incomes to higher incomes until it is no longer significant for the top income quintile.

15. Has tax reform impacted the supply of rental properties?

Considering the flow of new properties being rented out, we find a significant increase in the numbers of new rentals resulting from the reform. While we don't want to rely too heavily on the time series analysis in this part of the study, we take these findings as evidence that the tax reform has not reduced the availability of rental properties in the ACT, but likely increased the number of properties available for rent by 200 per month.

Technical Report

Distributional impacts of the ACT Government tax reform

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15th June 2020

Table of Contents

I. Introduction

In 2012, the ACT Government began a 20-year program to broaden the tax base by replacing stamp duty with a general rates system. To support the ACT government in its process of reviewing this program, this technical paper is a companion to our main report to answer two main research questions:

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6. What has been the impact of tax reform on different household types and cohorts?

7. What has been the impact of tax reform on the progressivity and equity of the ACT tax system? How has tax reform affected the alignment of residential property taxation with ability to pay? Is there any evidence that higher annual general rates (in place of higher stamp duty) have impacted welfare or behaviour?

To answer these questions, we have adopted a microsimulation model to create the new tax policy scenario, where the current and complex ACT rules are applied, to compare with the old tax policy scenario where the regulations without the tax reform are employed. We use the 2009-10 and 2011-12 Surveys of Income and Housing (SIHs) to generate the synthetic population for the ACT before the reform. We then use data from the ACT government, the Australian Bureau of Statistics (ABS), and other sources to derive the projections of what the ACT would have looked like if reform had not happened.

As a companion to our main report, this technical paper provides full information on the method; shows all the parameters and assumptions used in the model; and provides tables of distributional results at a greater level of detail compared to our main report, but no interpretation of these results. A discussion on main results can be found in the final report.

II. Methodology

1. Definitions

Our analysis uses data at the *income unit* level. According to the ABS, the standard classification of 'Income unit composition' includes (i) Couple only; (ii) Couple with dependent children; (iii) One parent with dependent children; (iv) One person, which can include independent children of any age. One or more income units that have a blood relationship (such as parents with independent children or relatives) can form a family. One or more families who live together in a dwelling is called a household.

In our analysis, *homeowners* are defined as income units who own at least one residential property. *Renters* are defined as income units who do not own property but rent or share a dwelling with homeowners or other renters.[16] From our definition, independent children, who are identified as non-homeowner and living in their parents' home, are considered as renters, even though they may not pay any rent. We use such a definition because any of them can become potential home buyers in our model.

Potential home buyers are defined as a group that includes:

- renters; and
- homeowners who may want to buy investment properties or change their residential home.

Home buyers will be a subset of this group, being those who can afford to buy a property without a loan, or meet the borrowing constraints (income and assets) to get a loan.

[16] A small proportion of these renters may own a property, which can not be identified in our sample due to lack of information.

We separate income units into quintiles or low- and middle-income groups based on the equivalised disposable income per capita. This variable is calculated based on the OECD-modified equivalence scale which assigns a value of one to the first adult in the income unit, 0.5 to the second and each subsequent person aged 15 and over, and 0.3 to each child aged 14 or below. With this variable, *low-income homeowners* and *low-income renters* are defined as income units in the lowest 40% income group in the ACT. *Middle-income homeowners* and *middle-income renters* are units with incomes in the middle 41-60% income group in the ACT.

We also classify income units by *net wealth level*. According to the ABS definition, the net wealth includes financial assets (savings, offset, superannuation accounts, value of shares and trusts, business value, loans to other people), non-financial assets (property values, value of vehicles) and net of liabilities (mortgage, investment, personal and study loans, loan from other people, credit card debt). While financial asset variables are available to be aggregated at the income unit level, the information on financial assets and liabilities are only available at the household level. For households that have more than one income unit, except for property values and mortgage loans assigned to homeowners, other variables are allocated to each income unit, weighted by the ratio of the number of adults in the income unit to the number of adults in the household. Similar to income groups, we then separate income units into quintiles based on the equivalised net wealth per capita using the OECD-modified scale.

Pensioners and fixed-income retirees are defined as income units who have at least one person aged from 65 years old or receiving age pension. *Female-headed income units* include those where the reference person (or the oldest person in the income unit) is female.

2. Assumptions

Our model is implemented based on the following assumptions:

8. Renters will decide to buy an appropriate dwelling for their families instead of renting if all borrowing constraints are met based on their savings and income. We assume that all renters purchasing are first home buyers. Although this assumption increases the probability of receiving the First Home Owner Grant (FHOG) among renters and the chance of benefiting from the concession, it is rebalanced by our random assignment of newly constructed homes to home buyers and by the fact that it tends to be harder for renters, who rely solely on their savings, to meet the deposit requirement. As a result, only some renters will be purchasing new properties and will be eligible for FHOG and reduced stamp duty. Testing this assumption, we found that about 39% of buyers in our model are first home buyers. This proportion is similar to the proportion of first home buyers amongst recent buyers found in the SIH.

9. Homeowners, who may decide to purchase an investment property or change their residential home (downsizing or upsizing), can also become home buyers if they want and can afford to buy a property without a loan or meet the borrowing requirements. We randomly assign a probability on the decision of purchasing a property to all eligible homeowners based on the borrowing constraints until the ACT Government's list of sales in each year is reached, and the proportion of homebuyers who are investors across the territory is met.

10. Not all home buyers (i.e. those mentioned in the first two assumptions) purchase a new property. The chances of buying a new property are randomly assigned to the group of

potential home buyers based on their age and the probability of recent home buyers buying a new home in SIH.

11. Home buyers who meet the borrowing constraints may benefit from first home owner grant (FHOG), home buyer concession scheme (HBCS) or pensioner duty concession scheme (PDCS)[17] if they meet eligibility requirements (e.g. property value, income, etc). They can also receive rate rebates if they are eligible. We have not taken into account the pensioner duty deferral scheme in our model due to the fact that it was introduced on 1 July 2019, so wasn't operating under the old policy.

12. There are no differences in the current and new tax policies regarding:

    – Consumer price index (CPI), wage price index (WPI), and average weekly earnings (AWE) index

    – Lender mortgage insurance (LMI) premium, annual home loan package fee and interest rate

13. Under the new tax policy, the base property price increase was the ABS Residental Property Price Index (RPPI). To model what would have happened under the old tax policy, we consider three scenarios for the effect of the reform on property prices:

    – (i) assumes tax reform has had no significant impact on property prices, and therefore, property prices are inflated by RPPI every year in the old policy scenario;
    – (ii) assume that the reduction in stamp duty has been fully absorbed by higher property prices in the new policy scenario. The average reduction in stamp duty as a ratio of the average property price is 0.35% in 2012, 0.50% in 2013, 0.61% in 2014, 0.77% in 2015, 0.98% in 2016, 1.15% in 2017, and 1.30% in 2018. These resulted in property prices for the old policy being inflated by between 99.65% (2012) and 98.7% (2018) of the RPPI, an average of 0.8% over the 5 years; and
    – (iii) takes the findings from section 4 "Results for economic and affordability impacts of the ACT tax reform (Part 2)" of the report, where tax reform is estimated to have increased property prices by 1.7% overall under the alternative/preferred specification and assumes that the gradual change in property prices in this case is similar to the change in the second case (i.e. 1.24% in 2012, 1.39% in 2013, 1.50% in 2014, 1.66% in 2015, 1.87% in 2016, 2.04% in 2017, 2.19% in 2018), and therefore, property prices from the initial year are inflated by between 98.76% and 97.81% of the RPPI for the relevant year in the old policy scenario. This scenario is called a 1.7% average increase scenario.

Taking into account all these assumptions, our model is conducted with the following steps:

14. *Step 1:* Create the synthetic population for the ACT. We allow the ACT population to change by age-sex groups over the period from 2012-13 to 2018-19.

[17] Stamp duty concession and FHOG for first home buyers was only available for new properties from 2013 to June 2019, and this has also been incorporated into our modelling.

15. *Step 2:* Calculate the rates and rate rebates, stamp duties and their concession (HBCS, PDCS) for the new tax policy (the tax reform) and the old tax policy (no-tax reform). We also calculate the land tax and FHOG where they are needed.

16. *Step 3:* Identify whether renters and/or homeowners can afford to purchase an appropriate property (with or without a loan) and assign them as home buyers. When checking whether an income unit meets the income requirement, we take into account the Federal government regulations on income tax, medicare levy, low-income tax offset (LITO) and low- and middle-income tax offset (LAMITO) to calculation the loan repayment capacity in our model.

17. *Step 4:* Inflate income, savings, land and property values to the next year and repeat Steps 1 to 3 until the financial year of 2018-19 is reached.

18. *Step 5:* Calculate what would have happened without tax reform using stamp duty and rates settings that would have prevailed without tax reform.

These complex steps can be described using a flowchart below.

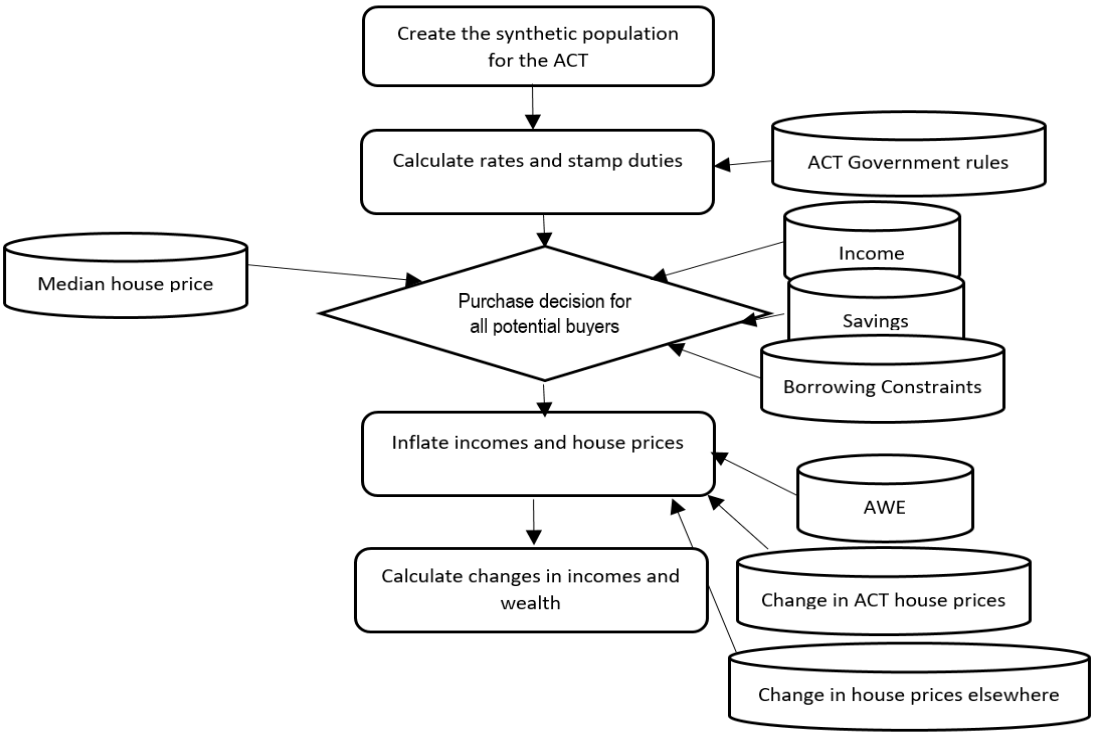


Figure 1 - A flowchart of NATSEM microsimulation model

3. The synthetic population for the ACT

The synthetic ACT population in our model is constructed based on a spatial microsimulation method (Tanton *et al.* 2011). Because the ACT tax reform started in 2012, we collect a pre-tax reform sample of all households living in the ACT and Northern Territory (NT) from the 2009-10 and 2011-12 SIHs. The choice of two years of SIH is to have enough observations (a total of 3,213 income units) to do our analysis. We cannot separate income units in the ACT from income units in the NT because of the lack of information in the survey. This, however, does

not cause a major problem because our reweighting technique ensures that the sample is representative of the ACT population.

In 2011-12, out of 193,495 income units in the ACT, nearly one half were renters, of whom 50% shared their dwellings with other income units (see Table A1 in the Appendix for more details). Our groups of interest are then constructed from this population, including (not exclusively): renters, first homeowners, low-income homeowners, middle-income homeowners, pensioners and fixed-income retirees, and female-headed income units. It is worth noting that there is crossover between these sub-groups. For example, a half of low-income homeowners and a third of middle-income homeowners were headed by females. Pensioners accounted for nearly 20% and above 40% of low- and middle-income homeowners, respectively, but only 8% among renters. One fifth of females who headed the income units were pensioners and 76% of pensioners owned properties.

4. Rates and stamp duties for the new and old policies

The next step is to apply the rates and stamp duty rules for the old and new tax policies to the synthetic population. This means getting an in depth understanding of all the rates and stamp duty rules, as well as any concessions.

4.1. Rate rules

a. The new policy

General rates are levied on property owners to provide funding for various services in the ACT. According to the ACT government's Rates Act 2004, rates are imposed for a parcel of rateable land using the following formula:

$$FC + AUV \times P \quad (1)$$

where

19. FC is the fixed charge;

20. P is the percentage rate.

21. AUV is the latest 3-year average of unimproved value of the parcel for a house (unit) owner. It is worth noting that from 1st July 2017, the Government changed the general rates calculation for residential units to base it on the AUV of the parcel proportionate to the number of residential units in the parcel (AUVRP) rather than the individual AUV of the unit. It means that before 1 July 2017, rates for residential units are calculated using the following formula: $FC + [(AUVRP \times UE) \times P]$ where UE is the unit entitlement of the property relative to the total unit entitlement of all the residential units in the units plan. From 1 July 2017 onwards, rates for residential units are calculated using the following formula: $FC + [(AUVRP \times P) \times UE]$. However, because the data does not have information on the AUVRP and UE, and they cannot be imputed from the data available, we assume there was no change in the general rates calculation for residential units from this year onwards. This assumption can make the rates under the new tax policy lower than they should be for the households that are purchasing units. So, we have some households satisfying the income constraint under the new tax policy, when they should not be. Therefore, the increase in number of purchases due to new tax policy may be lower.

In 2011-12, under the old policy, general rates for residential properties were a combination of (i) a fixed charge (FC) of $555; and (ii) a valuation-based charge (or variable charge) calculated based on the AUV of 2009, 2010 and 2011 unimproved values, a rate-free AUV threshold of $16,500 and the rate ($P$) of 0.2727%. The equation (1) is, therefore, rewritten as:

$$FC + \max[(AUV - \$16{,}500), 0] \times P \quad (2)$$

From 2012, under the new policy, general rates become more progressive with the introduction of a number of tax brackets and increasing marginal tax rates. In 2012-13, the fixed charge (FC) remained unchanged ($555). The AUV threshold of $16,500 was abolished. Instead of one, four tax brackets, along with increasing rates (P) were implemented. Table 1 lists residential general rate rules that are applied under the new policy over the period 2012-2018.

Table 1 - Residential general rate rules under the new policy in the ACT, 2012-18

Category	AUV threshold ($)	2012	2013	2014	2015	2016	2017	2018
Fixed charge		555	626	675	730	765	765	815
Rate 1 (%)	0 - 150,000	0.2236	0.2306	0.2547	0.2746	0.2746	0.2960	0.3130
Rate 2 (%)	150,001 - 300,000	0.3136	0.3241	0.3571	0.3857	0.3900	0.4088	0.4088
Rate 3 (%)	300,001 - 450,000	0.3736	0.3876	0.4287	0.4629	0.4800	0.5130	0.5130
Rate 4 (%)	450,001 - 600,000	0.4136	0.4312	0.4873	0.5339	0.5400	0.5603	0.5603
Rate 5 (%)	From 600,001	0.4136	0.4312	0.4873	0.5339	0.5750	0.6013	0.5700

Source: The ACT government Budget Papers No. 3 from 2012/13 to 2018/19.

b. The old policy

To construct residential property rate rules for the old tax policy in 2012-13, we implement the following steps:

Step 1: Under the old policy, the 2012-13 general rates revenue is calculated based on the revenue target for that year in the absence of tax reform. The revenue target uses 2012-13 residential rateable properties, which includes existing and new properties.

Step 2: Previous AUVs (2011 AUVs) and previous rating factors (2011-12 rating factors) are then used to calculate 'hypothetical' 2011-12 revenue for this new stock of properties.

Step 3: This 'hypothetical' 2011-12 revenue is then increased by WPI (December 2011 WPI) to obtain the revenue target (the general rates revenue under the old tax policy) for 2012-13.[18]

Step 4: The residential rates revenue target is then used to calculate the fixed charge and rating factor that would have applied in 2012-13 for residential properties in the absence of tax reform, assuming a 50/50 revenue split between the fixed charge and rating factor elements. To calculate the old rate policy (P^c) in equation (2) under the condition that the rate-free threshold of $16,500 is applied[19], the following formula is used:

[18] As is the convention, the WPI measure, which is collected from the ABS data, is December quarter percentage change from the corresponding quarter of the previous year, for total hourly rates of pay excluding bonuses for all industries in the ACT.

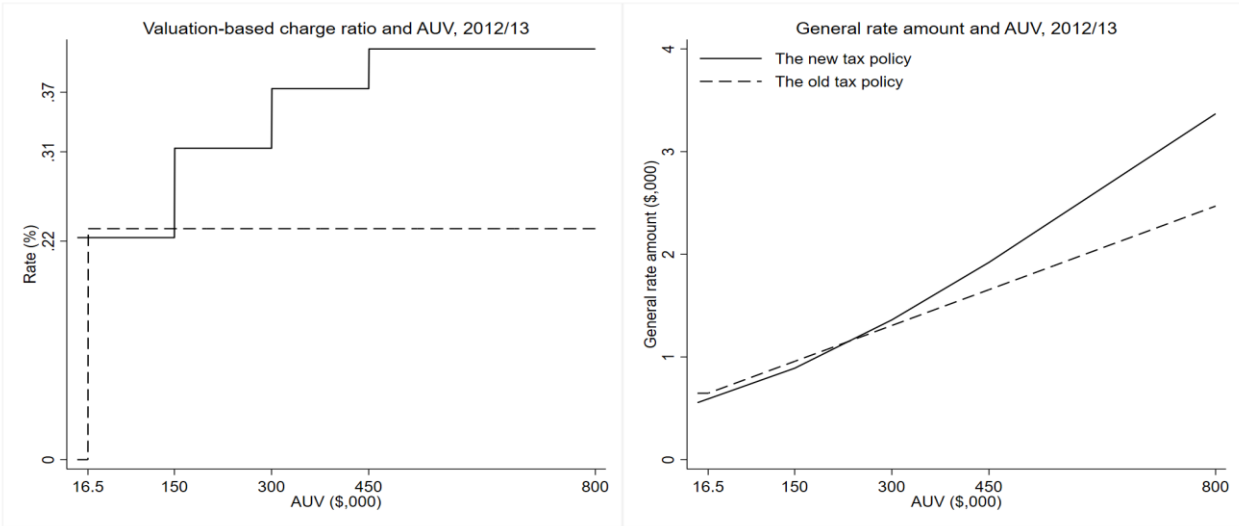
[19] This threshold remained unchanged since 2007-08.

$$P^c = (R^T - R^{FC^c})/\sum \max(0, AUV - \$16{,}500) \quad (3)$$

where

22. R^T: total residential rate revenue target for 2012-13;
23. R^{FC^c}: the fixed charge revenue for 2012-13 under the old tax policy, which is 0.5 × revenue target for residential properties for 2012-13;
24. AUV: the 2012-13 AUV;
25. $\sum$: cover all existing and new blocks for 2012-13.

With this construction, there are differences between the new and old rate policies regarding the percentage rate and general rate amount along with changes in land value in 2012-13 (see Figure 2).



Source: The rules collected from the ACT Government Budget Papers No. 3 and our calculations from these rules.

Figure 2 - The new and old rate policies in the ACT, 2012-13

Then Steps 1 to 4 are repeated for the year of 2013-14 onwards to get general rate rules for the old tax policy over the period 2012-2018. See Table 2 for more details.

Table 2 - Residential general rate rules under the old policy in the ACT, 2012-18

Year	Fixed charge ($)	Rate (%)
2012	647	0.2326
2013	669	0.2351
2014	681	0.2407
2015	687	0.2437
2016	695	0.2437
2017	704	0.2405
2018	719	0.2372

In general, general rates increased and became more progressive over the period between 2012-13 and 2018-19. Except for the properties with AUV under $250,000 in the financial year 2012-13 (Figure 2) and those with AUV under $200,000 in the financial year 2013-14, general rates are always higher in the new tax policy compared to the old tax policy. General rates rules in the new tax policy is much more progressive than those in the old tax policy (see Figure A1 in the Appendix for more details).

4.2. Rate rebate rules

a. The new policy

The owner of a land parcel can apply to the commissioner for a rate rebate if they are receiving a Commonwealth Government pension with entitlement to a Pensioner Concession Card, a Department of Veterans' Affairs or a War Veteran's pension. Each eligible person who has his/her name on the property title will receive the lesser of the rebate cap or 50% rebate of their rate payment (see the ACT government's Rates Act 2004 - section 64). This means that if there are two property owners and they are both eligible for the pension, the family will receive the full rebate. If there is only one person eligible for the pension, 50 per cent of the rebate will be applied. The rebate cap was $481 in 2011/12 and increased to $565 in 2012/13 to cushion the impact of reform. This cap has continued increasing to $622 in 2013/14, $675 in 2014/15 and $700 from 2015-16 onwards. Note that the rate rebates are only applied to the principal place of residence.

b. The old policy

We have assumed that the same proportion of assistance would have applied with and without tax reform. To do this, for each rateable property, the ratio of rebate to general rates are kept constant between the actual and the old tax policy.[20]

4.3. Stamp duty rules

a. The new policy

Conveyance duty, which is commonly known as stamp duty, is a tax that people have to pay when they buy a property. Higher duty rates are applied to higher property values. The property value thresholds and duty rates were kept unchanged between July 2002 to June 2012. From July 2012, these thresholds and rates changed and reduced over time. Table 3 shows the stamp duty rules applied under the reform (new policy) over the period from 2012-13 to 2018-19.

Table 3 - The stamp duty rules under the new policy in the ACT, 2011-18 (Unit: %)

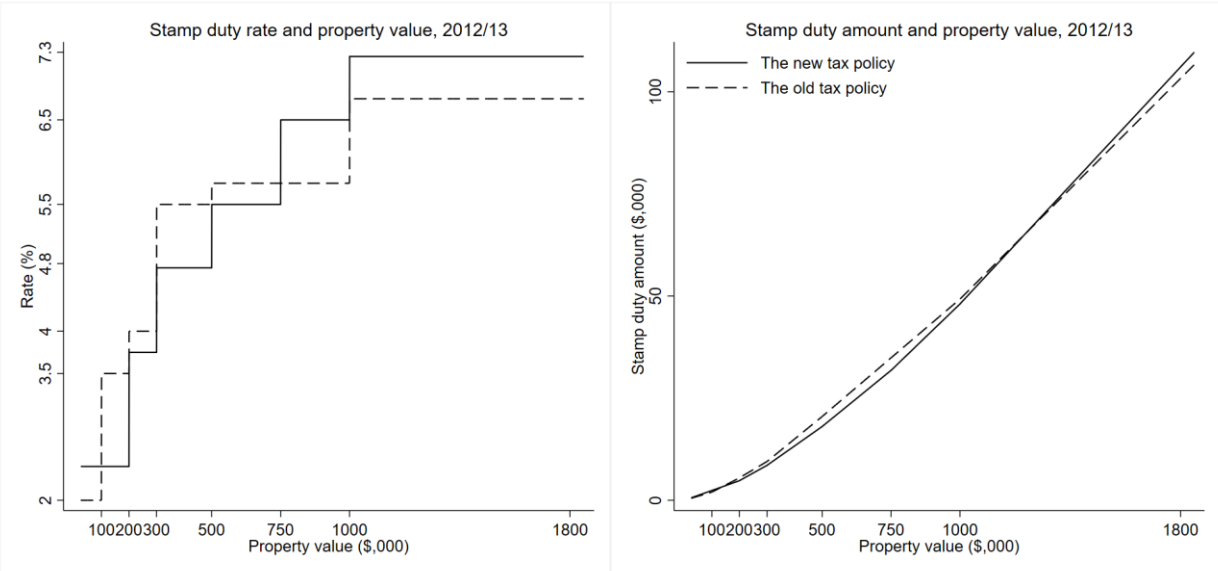
House value ($)	2011	2012	2013	2014	2015	2016	2017	2018
0 - 100,000	2	2.4	2.2	2	1.8	1.48	1.4	1.3
100,001 - 200,000	3.5	2.4	2.2	2	1.8	1.48	1.4	1.3
200,001 - 300,000	4	3.75	3.7	3.5	3	2.5	2.4	2.3
300,001 - 500,000	5.5	4.75	4.5	4.15	4	4	3.8	3.6
500,001 - 750,000	5.75	5.5	5	5	5	5	4.78	4.56
750,001 - 1,000,000	5.75	6.5	6.5	6.5	6.5	6.5	6.3	6.1
1,000,001 - 1,454,999	6.75	7.25	7	7	7	7	6.8	6.6
1,455,000 - 1,649,999	6.75	7.25	7	5.25*	5.17*	5.09*	4.91*	4.73*
From 1,650,000	6.75	7.25	5.50*	5.25*	5.17*	5.09*	4.91*	4.73*

[20] In 2017-18, to provide assistance with the higher increase in general rates for units as a result of changes in the calculation method (CCM), the Government provided a one-off $100 rates rebate to all units in this year. Because we assume that there is no change in the general rates calculation for residential units in this year due to lack of information, we do not take into account these changes in both the old and new tax policies.

Sources: The ACT government Budget Papers No. 3.
Note: (i) *A flat rate is applied; (ii) Stamp duty is identified as the greater of $20 or the amount imputed from the rates in the table.

b. The old policy

As mentioned before, because there were no changes in property value thresholds and duty rates since 2002 until the tax reform started, we use the 2011-12 stamp duty rules for the old tax policy over the period 2012-2018. Figure 3 shows the differences between the old and new tax policy in 2012-13 regarding changes in stamp duty rules and the stamp duty amount along with changes in property values. For the period between 2013-14 and 2018-19, Figure A2 in the Appendix gives more details. Generally, except for the financial year 2012-13 and the properties valued under $150,000 in 2013-14, stamp duties are higher under the old tax policy compared to the new tax policy at all property value levels.



Source: The rules collected from the ACT Government Budget Papers No. 3 and our calculations from these rules.

Figure 3 - The new and old stamp duty policies in the ACT, 2012-13

4.4. Home Buyers Concession Scheme (HBCS) rules

a. The new policy

Home buyers can pay lower stamp duty if they are eligible for the Home Buyers Concession Scheme (HBCS). The HBCS applies to purchasers of a new home which has not been previously occupied and sold as a place of residence. Before 2014-15, this concession was also available for an established home. To be eligible for the HBCS, the following conditions are required:

26. The home value must be less than the upper-value threshold.[21]

27. Total gross income of all buyers, including their partners (if any), must not be greater than:

$$\text{Income threshold} + \$3{,}330 \times \min(5, \text{Number of dependent children}) \quad (4)$$

[21] From 1 July 2019, there is no longer an upper value threshold.

28. Every buyer of the home must not have owned any other properties in the two years leading up to the transaction date.

29. At least one person who will own the home must live in the home continuously for at least one year from the settlement date.

In 2011-12, for home buyers who were eligible for the HBCS, they only had to pay $20 if the property value was lower than $375,000. If the property value was between $375,000 (the lower threshold) and $470,000 (the upper threshold), they had to pay the greater between $20 and the concessional duty amount which was calculated by:

$$\text{Concession duty rate} \times (\text{Property Value - Lower value threshold}) \quad (5)$$

where Concession duty rate = 0.1985 in 2011-12. If the property value was greater than the upper-value threshold, the home buyers had to pay the full duties.

In 2012-13, the property value thresholds were $385,000 (the lower threshold), and $450,000 (the upper threshold) and the concession duty rate was 0.2410. While the property value thresholds continued increasing to reach $470,000 and $607,000, respectively, in the last two years of the period of interest, the concession duty rate reduced year by year to 0.1235 in 2018-19. In addition, to be eligible for the HBCS, the buyers need to meet the income requirement in equation (4) of which the income thresholds were $120,000 in 2011-12, $150,000 in 2012-13, and $160,000 from 2013-14 onwards. Tables 4 depict these changes under the new tax policy in details over the period 2012-2018.

Table 4 - The HBCS rate rules under the new policy in the ACT, 2012-18 (Unit: %)

	Lower threshold	Upper threshold	Income threshold	Current rate
2012	385,000	450,000	150,000	0.2410
2013	435,000	535,000	160,000	0.1885
2014	446,000	550,000	160,000	0.1755
2015	442,500	562,000	160,000	0.1480
2016	468,000	590,000	160,000	0.1470
2017	470,000	607,000	160,000	0.1305
2018	470,000	607,000	160,000	0.1235

Source: Our calculations from the ACT government Budget Papers No. 3.

b. The old policy

In the old tax policy scenario, we have assumed that the same proportion of HBCS would have applied with and without tax reform, which allows the dollar amount of concessions and concessions policy to vary in the new and old tax policies, but keeps the proportion of assistance constant. To do this, for each property transaction, the concession in the actual is divided by the duty payable in the actual. This ratio is then multiplied by the duty payable in the old tax policy to infer the concession in the old tax policy.

4.5. Pensioner Duty Concession Scheme (PDCS) rules

a. The new policy

Home buyers can pay a lower stamp duty if they are eligible for the Pensioner Duty Concession Scheme (PDCS). The PDCS assists eligible pensioners who purchase a new or established home and meet the following requirements:

30. The home value must be less than the upper-value threshold.
31. At least one buyer of the home must be an eligible pensioner who receives an Australian age pension from Centrelink or the Department of Veterans' Affairs (DVA); or receive a disability support pension from Centrelink and are at least 50 years old.
32. The former property must be sold within one year before or after the registration date.
33. At least one person who will own the home must live in the home continuously for at least one year from the settlement date.

In 2011-12, for the home buyers who are eligible for the PDCS, they only had to pay $20 if the property value was lower than $470,000. If the property value was between $470,000 (the lower threshold) and $595,000 (the upper threshold), they had to pay the greater between $20 and the concessional duty amount which was calculated by equation (5) where the concession duty rate is 0.2075. In 2012-13, the property value thresholds were $560,000 (the lower threshold), and $705,000 (the upper threshold) and the concession duty rate was 0.202. In both years, if the property value is higher than the upper threshold, the home buyers have to pay the full duties. The trends of increases in property value thresholds and reductions in duty rates continued until the end of the period of interest (see Table 5 for details)

Table 5 - The PDCS rate rules under the new policy in the ACT, 2012-18 (Unit: %)

	Lower threshold	Upper threshold	Current rate
2012	560,000	705,000	0.2020
2013	580,900	742,000	0.1810
2014	610,000	780,000	0.1775
2015	625,000	807,000	0.1690
2016	661,000	860,000	0.1660
2017	680,500	895,000	0.1575
2018	680,500	895,000	0.1505

Source: Our calculations from the ACT government Budget Papers No. 3.

b. The old policy

Similar to HBCS, to construct the old tax policy scenario, we have also assumed that similar proportion of PDCS would have applied with and without tax reform. To do this, again, for each property transaction, the concession in the new policy is divided by the duty payable under this policy and then multiplied by the duty payable under the old tax policy to compute the concession amount for the case that the reform did not happen.

4.6. First Home Owner Grant (FHOG) and Land tax rules

Besides rates and stamp duties, another benefit (FHOG) and payment are also of our interest because they affect our identification of whether an income unit will meet the borrowing constraint or not. In this section, we review the FHOG rules and land tax rules which are incorporated in our model.

a. First Home Owner Grant (FHOG) rules

The First Home Owner Grant (FHOG) provides financial assistance to eligible people who are buying their first new or substantially renovated home. Before September 2013, this grant was available for established homes.

To be eligible for the FHOG, potential homeowners need to meet the following requirements:

34. The total value of the property (home plus land) must be $750,000 or less.

35. They need to move into the home within 12 months of the settlement date and live in the home as a principal place of residence for a continuous period of at least one year.

36. They must not received the FHOG anywhere in Australia.

According to the ACT government's FHOG Amendment Act 2009, 2013, 2016 and the ACT revenue office website, the amount of the FHOG reduced over the period of interest, with $21,000 in 2011-12 and 2012-13, $12,500 in 2013-14, 2014-15 and 2015-16, $10,000 in 2016-17 and $7,000 in 2017-18 for first homeowners who purchased a new home. Except for the recent abolition of the FHOG on 1 July 2019, changes that have been made to the FHOG before that are unrelated to the ACT Government's tax reform policy. Therefore, no change in FHOG is applied under the old tax policy. The FHOG cap of $750,000 is kept constant for both the new and old tax policies.

b. Land tax rules

Land tax is charged on the residential property, which is not the principal place of residence. Like the rate rules, the amount of land tax is made up of two components: a fixed charge (FV) and a valuation charge. According to the ACT government's Taxation Administration (Land Tax) Determination, the fixed charge was not applied until the financial year of 2014-15. For the valuation charge, the equation to calculate this charge is similar to the equation (1). The land tax rules were kept unchanged for the period from 2005-06 to 2011-12. Since 2012-13, the value thresholds (AUV) and ratios (P) change over time. The land tax rules for the new tax policy are shown in Table 6. Because residential land tax changes are not part of tax reform, residential land tax rules applied in the modelling are the same between the new and old tax policies.

Table 6 - The land tax rules under the new and old tax policies in the ACT, 2011-18

Category	AUV Threshold ($)	2011	2012	2013	2014	2015	2016	2017	2018
Fixed charge		0	0	0	900	945	1,090	1,145	1,203
Rate 1 (%)	0 - 75,000	0.6	0.6	0.6	0.41	0.41	0.41	0.5	0.5
Rate 2 (%)	75,001 - 150,000	0.89	0.7	0.7	0.48	0.48	0.48	0.5	0.5
Rate 3 (%)	150,001 - 275,000	1.15	0.89	0.89	0.61	0.61	0.61	0.6	0.6
Rate 4 (%)	275,001 - 2,000,000	1.4	1.8	1.8	1.23	1.23	1.23	1.08	1.08
Rate 5 (%)	From 2,000,001	1.4	1.8	1.8	1.23	1.23	1.23	1.1	1.1

Source: The ACT government's Taxation Administration (Land Tax) Determinants from 2011-12 to 2018-19.

5. Borrowing constraints - Home purchase assignment

For renters and those with rent-free housing (a very small proportion of the population) and homeowners who intend to buy properties for investment or moving purposes, both deposit and income requirements are applied to them.

37. *Deposit requirement*: Potential home buyers should have sufficient asset (cash in the bank, other equity in housing, etc) to pay for stamp duties (or duty concession), lender mortgage insurance premiums (if any) and at least 10% of their expected property prices. This amount takes into account any concessions or first home owners grant. In other

words, potential home buyers can borrow up to 90% of their expected property prices, and banks will allow a 10% deposit with lender mortgage insurance. This percentage is reasonable because while homeowners can be able to use the equity from their current property as a deposit, our analysis of the SIHs 2011-12 to 2017-18 shows that more than one fifth of homeowners in the ACT borrowed above 80% of their property values. This ratio was even higher for recent homeowners (more than 40%) and recent first home buyers (more than 50%) over this period. See Table A2 in the Appendix for more details.

38. *Income requirement*: Given their gross income, deposit and expected property prices, banks need to ensure that potential home buyers can afford to pay for their income taxes (net of offsets), medicare levies, minimum expenditures on costs like food and clothing, the government's general rates (net of rebates), loan interest, loan fees and principal repayments every year.

Among homeowners who intend to buy a rental property or change their home, they can become a purchaser if they can afford to buy without a loan (so the value of their assets is greater than the property value that we estimate for them) or they can meet both the deposit and income requirements.

These two requirements are implemented by following steps:

Step 1: Estimate property prices ($\hat{V}$) that potential home buyers expect to purchase.

To do this, we first run an OLS regression of a sample of all homeowners:

$$V = \alpha + X_1{}'\beta_1 + X_2{}'\beta_2 + F'\gamma + \epsilon \quad (6)$$

where

39. V: Ln(property value);

40. X_1: the characteristics of the income unit reference person (age, gender, education, employment status);

41. X_2: the characteristics of income unit (number of income earners, number of dependent children, ln(gross income));

42. F: a dummy = 1 if the first homeowner and 0 otherwise and another dummy = 1 if newly constructed property and 0 otherwise. Both dummies refer to recent homeowners.

We then use the estimated coefficients of α, β_1, β_2 and γ to predict the expected property values ($\hat{V}$) of all potential home buyers based on their characteristics, their income and their random assignment of purchasing a new property.

Step 2: Check whether potential home buyers meet the deposit requirement given their property prices ($\hat{V}$) predicted from equation (6) in Step 1. For those who need to borrow a loan to buy a property, they can borrow up to 90% of their property prices.

$$d + w \geq f_s + f_i - f_o + 0.1 \times (\hat{V} + V_0) \quad (7)$$

where

43. d: Deposit (or savings);

44. w: Total value of homeowner's current property, net of mortgage loans;

45. f_s: Stamp duty (with concession) on $\hat{V}$;

46. f_i: Lender mortgage insurance premium for the maximum loan-to-value ratio of 0.9

47. f_o: First homeowner grant

48. V_0: Total value of current properties if homeowners want to buy a rental property; or 0 if they intend to change their home.

From this step, if potential home buyers meet the deposit requirement, we can estimate the minimum loan amount (L_{min}) that they want to borrow: $L_{min} = \max(0, \hat{V} + V_0 - (d + w - f_s - f_i + f_o))$ where $f_i = 0$ if $L_{min}/(\hat{V} + V_0) \leq 0.8$.

Step 3: Check whether potential home buyers can afford to make regular repayment given their income and their minimum positive loan amount ($L_{min} > 0$) estimated in Step 2.

$$\frac{y - c_{min} - f_t - f_m - f_r - f_l}{12} \geq L_{min} \frac{r}{1 - (1 + r)^{-n}} \quad (8)$$

where

49. y: gross annual income and expected rental income (if any);

50. c_{min}: minimum annual expenditure;

51. f_t: annual income tax (net of offsets, including Low-income tax offset (LITO) and Low- and middle-income tax offset (LAMITO));

52. f_m: annual medicare levy;

53. f_r: general annual rate (net of rebate), which is calculated on all properties, and land tax (if any). Note that the rates rebate is not applied to investment properties;

54. f_l: annual loan fee;

55. $\rightarrow \frac{y - c_{min} - f_t - f_m - f_r - f_l}{12}$: maximum monthly repayment amount;

56. r: monthly home loan interest rate;

57. n: home loan duration (in months).

The renters will transit to homeownership, and the homeowners will buy a property if both conditions (7) and (8) are satisfied.

See Figure 4 for a better explanation of our borrowing constraint model.

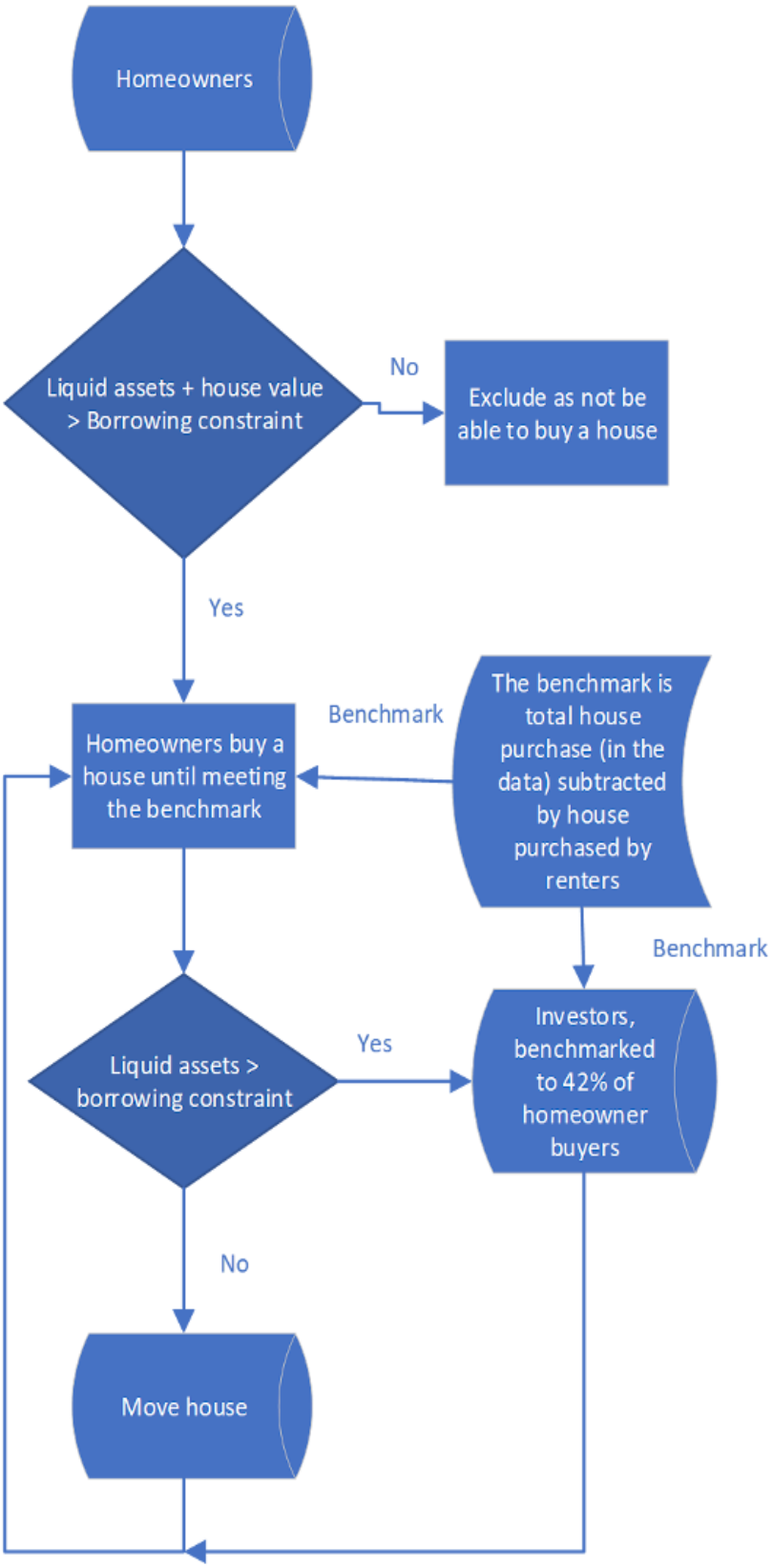


Figure 4 - A flowchart of our borrowing constraint model

5.1. Property price estimation

The first step in modelling borrowing constraints is to estimate the property prices that potential homebuyers expect to purchase. Before doing that, we randomly assign potential homebuyers to newly-constructed property purchasers.[22] This assignment helps to not only estimate more properly the property values but also allows a proportion of homebuyers can be eligible to receive FHOG or pay reduced stamp duties.

To do this, we calculate the proportion purchasing a new home among recent homeowners at different ages. These proportions are used as the probabilities to buy a new property among potential home buyers at similar ages.[23] Details of these proportions by age can be found in Table A3 in the Appendix. Among recent homeowners who purchased properties in the last three years before 2011-12, 39% bought their first home and 16% bought a new property, which suggests a proportion of first home owners did not eligible to meet the FHOG requirement.

With the assumption that home buyers tend to buy properties suitable to their family situations, we predict their expected property prices based on their family characteristics and the associated coefficients of the equation (6) estimated from a sample of homeowners. Because the information on the dwelling values among homeowners is only available at the household level and one dwelling can be shared by more than one income unit, to predict the property value that one income unit expects to purchase, we keep the sample of homeowners who have only one income units in their households. It is worth noting that in the equation (6), we do not add the dwelling characteristics because these characteristics are suitable for owners rather than renters, who are also potential home buyers, especially when these renters share residences with others.

Details of family characteristics by sub-groups and property value regression results among homeowners are shown in Tables A4 and A5 in the Appendix. Generally, younger people and first homeowners tend to live in properties with cheaper price. Income units headed by males or pensioners, who are mostly not in the labour force, or those with higher income tend to reside in more expensive dwellings. New homes are also shown to be more expensive in our model. From this regression outcome, we can predict the property values among potential home buyers for the year 2011-12. We then inflate these values using the median property price index (RPPI) which is computed from the ACT government's stamp duty data over the period of interest. See Table A8 in the Appendix for more details.

5.2. Deposit requirement

The expected property values of potential home buyers are used to construct their deposit constraints. As mentioned before, potential home buyers include all renters and some of homeowners who want to buy other properties. Not all homeowners want to purchase a property, therefore we randomly assign this housing demand to homeowners until the total residential property sales in the ACT are reached and a certain share of investors is met.

Identifying the housing investment rate is important because, as presented in equation (7), the deposit requirement is different between investor and non-investor groups. Based on the

[22] See Buis (2007)['Stata tip 48: Discrete uses for uniform', *The Stata Journal* 7(3), 434–435] for more details.

[23] We follow the method suggested by Wood and Ong (2008).

available data from SIHs, we find that among recent homebuyers who are not first homeowners and purchased properties in the ACT during the last three years, 42% of them had more than one property. Under the assumption that homeowners tend to live in one of their properties and rent out the other properties, the proportion of 42% implies the housing investment rate among homeowners.[24]

For homeowners, equity in their current home may allow them to buy a second property or change their home, even with no deposit. For renters, savings play an important role in meeting the deposit requirement. However, when looking at the amount of money that different sub-groups of potential home buyers are saving (Table A6 in the Appendix), renters tend to save less than homeowners, implying their much less opportunities to afford to buy a suitable property. Meanwhile, high-income eaners and pensioners tend to save more, which explain the higher expected prices of properties that these groups want to buy.

When potential home buyers have savings and equity in housing (net of other upfront costs) less than 20% but at least 10% of property values, we allow them to get home loans from banks with a charge on lender mortgage insurance. This is insurance for the possibility that borrowers will default on their loan. The lender mortgage insurance premium is higher for higher property values. See Table A7 in the Appendix for details. This insurance premium is usually a one-off charge and can be included either in upfront costs and paid immediately or added to the loan repayments so that it's spread out over the term of the loan. To simplify our model, we have assumed that this insurance has to be paid on the settlement date and needs to be part of their savings.

Lender mortgage insurance and stamp duty (net of FHOG, if any) are considered as upfront costs that potential home buyers need to afford to pay. These costs are also incorporated in our deposit constraint model. The stamp duty amount paid is different between the new and old policies, therefore whether a potential home buyer meets the deposit requirement is different under these two policies. Reducing stamp duty under the new tax policy means that some of the stamp duty paid under the old tax system can now be used for a deposit under the new policy. This then has a positive impact on purchasing ability.

5.3. Income requirement

As shown in the equation (8), if borrowers have enough regular after-tax income to pay regular expenditure, they meet the income requirement. Regular income includes employee income, profit/loss from business, net investment income and rental income (if any), government pensions and allowances, and private transfers. Rental income is the income that an investor can receive if they buy a property and rent it out. To estimate this income over the period 2012-18, we merge the ACT government rental bonds data with their stamp duty data and run a linear regression of rental income on property value by year. The rental income for the investment property is then obtained from fitted values of these regression results. This method allows the rental income varies based on investment property value.

For other income, we use the SIH baseline data and inflate this income using the average weekly earnings (AWE) index over the period of interest (also see Table A8). We also incorporate income tax, tax offset (including LITO, LAMITO) and Medicare levy rules in our

[24] To simplify our model, we assume that only homeowners who do not own any other property intend to buy a rental property or change their home.

calculations to estimate the regular after-tax income. These rules are demonstrated in Tables A9a, b, c and d in the Appendix. We allow these rules to change over time.

Regular expenditure in equation (8) includes essential family spending mostly on food and clothing; mortgage payment which includes principal, interest and annual loan fee; and general rate and land tax (if any). To measure essential family spending for different types of families, we use the Household Expenditure Measure (HEM) table which is adopted as a benchmark by lenders. This table was developed by the Melbourne Institute of Applied Economics and uses median spending on 'basic' expenses such as food purchased from a supermarket and children's clothing, combined with 25% of the expenditure on 'discretionary' spending. The HEM benchmark is income-adjusted and allows higher-income consumers to have higher living expenses (See Tables A10a and A10b in the Appendix for more details). Because these tables are only available at the time of doing this analysis, we adjust the figures in the tables by the CPI (Table A8).

Regarding mortgage payments, we use an annual package fee of $395 (which is currently used by Westpac and Commonwealth banks) for each home loan. This fee is assumed to be unchanged for the whole period of interest. Other mortgage payments are interest and principal repayments which are computed based on the loan amount, loan duration and interest rate. The loan amount is estimated from the deposit requirement equation. For loan duration, we assume that the maximum age of a borrower for a mortgage loan (i.e. the age at which the borrower needs to have paid it off) is 75 and the maximum loan duration is 30 years for borrowers aged 45 or below. Hence, the loan duration reduces when age increases. We select the age of the younger adult in the income unit to calculate this loan duration. For the interest rate, we use the median interest rates of the years 2011, 2013, 2015 and 2017, which are computed from SIHs, and extrapolate them for the other missing years (2012, 2014, 2016 and 2018). See Table A11 in the Appendix for more details.

The other regular expenditure is general rates and land tax (if any). Both general rate and land tax change when the tax policy changes, therefore affecting the income constraint. These fees are calculated based on the land value. In the SIHs, we do not have the land value information. To compute the land value for different years, we merge the ACT government rate data with their stamp duty data and calculate the average land-to-property value ratios by year, which range between 46.2% and 56.5%. Then these ratios are used to estimate the land value for properties expected to be purchased in each year. We keep land value to be unchanged between the old and new tax policies. It is worth noting that if tax reform has resulted in increased property prices, tax reform could theoretically result in increased UVs. In our model, having the same land value for the new and old tax policies when the prices increase in the new policies would mean that the land value in the old tax policies is overvalued, which means the rates is supposed to be lower in the old tax policy and this may allow more household to satisfy the income constraint in the old tax policies assumption.

III. Detailed Results

The tax reform package not only affects stamp duty and rate payments, and therefore the borrowing constraints, but also property prices. Four main criteria are used to measure the impact of tax reform in the ACT, including differences between the new and old tax policies in terms of the number of properties purchased, the stamp duty payment distribution, the

rate payment distribution and the rate and stamp duty payment distribution. We look at these differences as a whole and by sub-groups (including low- and middle-income homeowners or renters, first home buyers, pensioners and females), by income quintile and wealth quintile in particular. In addition, we examine these differences over income quintiles and wealth quintiles. Three scenarios of the old tax policies are considered: (i) no change in property prices relative to RPPI; (ii) an increase between 0.35% in 2012 and 1.30% in 2018 (or on average 0.8%) above RPPI; and (iii) an increase of between 1.24% in 2012 and 2.19% in 2018 (or on average 1.7%) above what it would have been under the old policy (RPPI).

This section only shows tables of distributional results from our model at a greater level of detail compared to our main report for information and use by the ACT Government in their analysis, but no interpretation or discussion of these tables. A discussion on main results can be found in the final report.

1. Total results

Table 7 - The impact of tax reform on the number of residential properties purchased by borrowing constraints, 2012 - 2018

	2012	2013	2014	2015	2016	2017	2018	Total
New tax policy								
Meet deposit constraint	23,261	19,476	20,574	22,270	24,376	19,391	15,029	144,377
(% of potential buyers)	21.7	17.4	17.8	18.7	19.7	16.2	13.1	17.8
Meet income constraint	47,464	54,425	56,185	57,270	58,338	53,297	55,047	382,026
(% of potential buyers)	44.3	48.6	48.7	48.2	47.2	44.6	48.0	47.1
Meet both constraints	11,494	12,569	13,317	14,509	15,822	12,423	9,634	89,768
(% of potential buyers)	10.7	11.2	11.5	12.2	12.8	10.4	8.39	11.1
No price change								
Old tax policy								
Meet both constraints	11,472	12,408	13,039	13,964	15,279	12,098	9,204	87,464
(% of potential buyers)	10.7	11.1	11.3	11.7	12.4	10.1	8.02	10.8
Diff								
Meet both constraints	22	161	278	545	543	325	430	2,304
(% of potential buyers)	0.021	0.14	0.24	0.46	0.44	0.27	0.37	0.28
0.35 – 1.30% price change								
Old tax policy								
Meet both constraints	11,484	12,410	13,073	14,054	15,327	12,131	9,247	87,726
(% of potential buyers)	10.7	11.1	11.3	11.8	12.4	10.1	8.06	10.8
Diff								
Meet both constraints	10	159	244	455	495	292	387	2,042
(% of potential buyers)	0.0093	0.14	0.21	0.38	0.40	0.24	0.34	0.25
1.24 – 2.19% price change								
Old tax policy								
Meet both constraints	11,601	12,550	13,166	14,281	15,367	12,176	9,264	88,405
(% of potential buyers)	10.8	11.2	11.4	12.0	12.4	10.2	8.07	10.9
Diff								
Meet both constraints	-107	19	151	228	455	247	370	1,363
(% of potential buyers)	-0.100	0.017	0.13	0.19	0.37	0.21	0.32	0.17

Source: Calculations from NATSEM microsimulation model.

2. Results by sub-groups

Number of residential properties purchased

Table 8 - The impact of tax reform on the number of residential properties purchased by sub-groups, 2012 - 2018

	New tax policy - # purchases	Old tax policy - # purchases	Diff - # purchases	Diff %
No price change				
First home buyers	29,281	27,682	1,599	5.78
Low-income homeowner	11,621	11,534	87	0.75
Low-income renter	3,925	3,727	198	5.31
Middle-income homeowner	12,883	12,740	143	1.12
Middle-income renter	10,231	9,816	415	4.23
Pensioner homeowner	7,340	7,218	122	1.69
Pensioner renter	2,397	2,397	0	0.00
Female-headed homeowner	22,553	22,337	216	0.97
Female-headed renter	11,321	10,645	676	6.35
0.35 – 1.30% price change				
First home buyers	29,281	27,795	1,486	5.35
Low-income homeowner	11,621	11,596	25	0.22
Low-income renter	3,925	3,782	143	3.78
Middle-income homeowner	12,883	12,785	98	0.77
Middle-income renter	10,231	9,816	415	4.23
Pensioner homeowner	7,340	7,280	60	0.82
Pensioner renter	2,397	2,397	0	0.00
Female-headed homeowner	22,553	22,420	133	0.59
Female-headed renter	11,321	10,656	665	6.24
1.24 – 2.19% price change				
First home buyers	29,281	28,228	1,053	3.73
Low-income homeowner	11,621	11,671	-50	-0.43
Low-income renter	3,925	3,872	53	1.37
Middle-income homeowner	12,883	12,859	24	0.19
Middle-income renter	10,231	9,897	334	3.37
Pensioner homeowner	7,340	7,367	-27	-0.37
Pensioner renter	2,397	2,397	0	0.00
Female-headed homeowner	22,553	22,508	45	0.20
Female-headed renter	11,321	10,812	509	4.71

Source: Calculations from NATSEM microsimulation model.
Note: The numbers shown in the table are the total number of residential properties purchased over the whole period. The sub-groups are not mutually exclusive and therefore, the total number in the column will not be the same as in Table 7.

Stamp duty distribution

Table 9 - The impact of tax reform on stamp duty paid by sub-group, average 2012 - 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg stamp duty $	Old tax policy - Avg stamp duty $	Diff - Avg stamp duty $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
First home buyers	4,183	3,955	228	13,080	17,901	-4,820	15.40	21.30	-5.90
Low-income homeowner	1,660	1,648	12	12,364	16,650	-4,286	22.70	30.54	-7.83
Low-income renter	561	532	28	7,608	9,765	-2,158	15.77	20.98	-5.21
Middle-income homeowner	1,840	1,820	20	19,661	26,022	-6,361	22.65	29.92	-7.27
Middle-income renter	1,462	1,402	59	11,418	16,219	-4,801	17.17	24.31	-7.14
Pensioner homeowner	1,049	1,031	17	15,047	18,920	-3,873	21.57	27.24	-5.67
Pensioner renter	342	342	0	9,078	11,966	-2,888	18.47	24.35	-5.88
Female-headed homeowner	3,222	3,191	31	17,621	23,222	-5,601	17.46	23.00	-5.54
Female-headed renter	1,617	1,521	97	12,935	18,074	-5,139	15.51	21.87	-6.37
0.35 – 1.30% price change									
First home buyers	4,183	3,971	212	13,080	17,673	-4,592	15.40	21.04	-5.64
Low-income homeowner	1,660	1,657	4	12,364	16,433	-4,070	22.70	30.17	-7.47
Low-income renter	561	540	20	7,608	9,705	-2,098	15.77	20.79	-5.02
Middle-income homeowner	1,840	1,826	14	19,661	25,735	-6,074	22.65	29.61	-6.97
Middle-income renter	1,462	1,402	59	11,418	16,019	-4,600	17.17	24.01	-6.84
Pensioner homeowner	1,049	1,040	9	15,047	18,748	-3,701	21.57	26.96	-5.39
Pensioner renter	342	342	0	9,078	11,837	-2,759	18.47	24.09	-5.62
Female-headed homeowner	3,222	3,203	19	17,621	22,957	-5,336	17.46	22.77	-5.31
Female-headed renter	1,617	1,522	95	12,935	17,864	-4,928	15.51	21.58	-6.07
1.24 – 2.19% price change									
First home buyers	4,183	4,033	150	13,080	17,488	-4,408	15.40	20.72	-5.32
Low-income homeowner	1,660	1,667	-7	12,364	16,265	-3,902	22.70	29.87	-7.17
Low-income renter	561	553	8	7,608	9,868	-2,261	15.77	20.90	-5.13
Middle-income homeowner	1,840	1,837	3	19,661	25,456	-5,795	22.65	29.31	-6.66
Middle-income renter	1,462	1,414	48	11,418	15,779	-4,361	17.17	23.67	-6.50
Pensioner homeowner	1,049	1,052	-4	15,047	18,599	-3,552	21.57	26.74	-5.17
Pensioner renter	342	342	0	9,078	11,698	-2,620	18.47	23.81	-5.33
Female-headed homeowner	3,222	3,215	6	17,621	22,698	-5,077	17.46	22.54	-5.08
Female-headed renter	1,617	1,545	73	12,935	17,613	-4,678	15.51	21.11	-5.60

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 9a - The impact of tax reform on stamp duty paid by sub-group, average 2012 – 2018 (keep only those purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg stamp duty $	Old tax policy - Avg stamp duty $	Diff - Avg stamp duty $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
First home buyers	3,955	13,042	17,901	-4,859	15.52	21.30	-5.78
Low-income homeowner	1,648	12,356	16,650	-4,293	22.66	30.54	-7.87
Low-income renter	532	7,007	9,765	-2,759	15.06	20.98	-5.93
Middle-income homeowner	1,820	19,734	26,022	-6,287	22.69	29.92	-7.23
Middle-income renter	1,402	11,501	16,219	-4,718	17.24	24.31	-7.07
Pensioner homeowner	1,031	14,918	18,920	-4,002	21.48	27.24	-5.76
Pensioner renter	342	9,078	11,966	-2,888	18.47	24.35	-5.88
Female-headed homeowner	3,191	17,611	23,222	-5,611	17.44	23.00	-5.56
Female-headed renter	1,521	13,065	18,074	-5,009	15.81	21.87	-6.06
0.35 – 1.30% price change							
First home buyers	3,968	13,041	17,689	-4,648	15.52	21.05	-5.53
Low-income homeowner	1,653	12,371	16,483	-4,112	22.69	30.22	-7.54
Low-income renter	538	7,093	9,766	-2,674	15.18	20.90	-5.72
Middle-income homeowner	1,823	19,734	25,737	-6,003	22.70	29.61	-6.91
Middle-income renter	1,402	11,501	16,019	-4,518	17.24	24.01	-6.77
Pensioner homeowner	1,038	14,959	18,780	-3,821	21.53	27.03	-5.50
Pensioner renter	342	9,078	11,837	-2,759	18.47	24.09	-5.62
Female-headed homeowner	3,198	17,615	22,974	-5,359	17.46	22.77	-5.31
Female-headed renter	1,522	13,069	17,864	-4,795	15.79	21.58	-5.79
1.24 – 2.19% price change							
First home buyers	4,016	13,087	17,533	-4,447	15.48	20.74	-5.26
Low-income homeowner	1,655	12,365	16,276	-3,911	22.68	29.86	-7.18
Low-income renter	548	7,337	9,933	-2,595	15.50	20.99	-5.48
Middle-income homeowner	1,823	19,734	25,437	-5,703	22.70	29.26	-6.56
Middle-income renter	1,402	11,501	15,822	-4,321	17.24	23.72	-6.48
Pensioner homeowner	1,045	14,999	18,613	-3,614	21.56	26.75	-5.19
Pensioner renter	342	9,078	11,698	-2,620	18.47	23.81	-5.33
Female-headed homeowner	3,204	17,623	22,714	-5,091	17.47	22.52	-5.05
Female-headed renter	1,533	13,094	17,678	-4,585	15.66	21.14	-5.48

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Rate payment distribution

Table 10 - The impact of tax reform on rate paid by sub-group, average 2012 - 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg rate $	Old tax policy - Avg rate $	Diff - Avg rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
First home buyers	4,183	3,955	228	1,418	1,175	243	1.67	1.40	0.27
Low-income homeowner	35,207	35,207	0	1,476	1,162	314	3.48	2.74	0.74
Low-income renter	561	532	28	990	813	177	2.05	1.75	0.31
Middle-income homeowner	22,098	22,098	0	1,919	1,525	394	2.35	1.86	0.48
Middle-income renter	1,462	1,402	59	1,413	1,193	220	2.12	1.79	0.34
Pensioner homeowner	27,667	27,667	0	1,796	1,302	493	3.09	2.24	0.85
Pensioner renter	342	342	0	909	735	174	1.85	1.49	0.35
Female-headed homeowner	43,208	43,208	0	2,062	1,577	485	2.56	1.96	0.60
Female-headed renter	1,617	1,521	97	1,480	1,241	239	1.77	1.50	0.27
0.35 – 1.30% price change									
First home buyers	4,183	3,971	212	1,418	1,174	243	1.67	1.40	0.27
Low-income homeowner	35,207	35,207	0	1,476	1,162	314	3.48	2.74	0.74
Low-income renter	561	540	20	990	817	173	2.05	1.75	0.30
Middle-income homeowner	22,098	22,098	0	1,919	1,526	394	2.35	1.87	0.48
Middle-income renter	1,462	1,402	59	1,413	1,193	220	2.12	1.79	0.34
Pensioner homeowner	27,667	27,667	0	1,796	1,303	493	3.09	2.24	0.85
Pensioner renter	342	342	0	909	735	174	1.85	1.49	0.35
Female-headed homeowner	43,208	43,208	0	2,062	1,577	484	2.56	1.96	0.60
Female-headed renter	1,617	1,522	95	1,480	1,242	238	1.77	1.50	0.27
1.24 – 2.19% price change									
First home buyers	4,183	4,033	150	1,418	1,176	242	1.67	1.39	0.28
Low-income homeowner	35,207	35,207	0	1,476	1,162	313	3.48	2.74	0.74
Low-income renter	561	553	8	990	823	167	2.05	1.74	0.31
Middle-income homeowner	22,098	22,098	0	1,919	1,526	393	2.35	1.87	0.48
Middle-income renter	1,462	1,414	48	1,413	1,193	220	2.12	1.79	0.33
Pensioner homeowner	27,667	27,667	0	1,796	1,304	492	3.09	2.25	0.85
Pensioner renter	342	342	0	909	735	174	1.85	1.49	0.35
Female-headed homeowner	43,208	43,208	0	2,062	1,578	484	2.56	1.96	0.60
Female-headed renter	1,617	1,545	73	1,480	1,242	238	1.77	1.49	0.29

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 10a - The impact of tax reform on rate paid by sub-group, average 2012 – 2018 (keep only those purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg rate	Old tax policy - Avg rate	Diff - Avg rate	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
First home buyers	3,955	1,412	1,175	237	1.68	1.40	0.28
Low-income homeowner	35,207	1,476	1,162	314	3.48	2.74	0.74
Low-income renter	532	959	813	146	2.06	1.75	0.31
Middle-income homeowner	22,098	1,919	1,525	394	2.35	1.86	0.48
Middle-income renter	1,402	1,415	1,193	222	2.12	1.79	0.33
Pensioner homeowner	27,667	1,796	1,302	493	3.09	2.24	0.85
Pensioner renter	342	909	735	174	1.85	1.49	0.35
Female-headed homeowner	43,208	2,062	1,577	485	2.56	1.96	0.60
Female-headed renter	1,521	1,486	1,241	245	1.80	1.50	0.30
0.35 – 1.30% price change							
First home buyers	3,968	1,412	1,174	237	1.68	1.40	0.28
Low-income homeowner	35,207	1,476	1,162	314	3.48	2.74	0.74
Low-income renter	538	963	816	147	2.06	1.75	0.31
Middle-income homeowner	22,098	1,919	1,526	394	2.35	1.87	0.48
Middle-income renter	1,402	1,415	1,193	222	2.12	1.79	0.33
Pensioner homeowner	27,667	1,796	1,303	493	3.09	2.24	0.85
Pensioner renter	342	909	735	174	1.85	1.49	0.35
Female-headed homeowner	43,208	2,062	1,577	484	2.56	1.96	0.60
Female-headed renter	1,522	1,486	1,242	245	1.80	1.50	0.30
1.24 – 2.19% price change							
First home buyers	4,016	1,414	1,176	238	1.67	1.39	0.28
Low-income homeowner	35,207	1,476	1,162	313	3.48	2.74	0.74
Low-income renter	548	972	824	148	2.05	1.74	0.31
Middle-income homeowner	22,098	1,919	1,526	393	2.35	1.87	0.48
Middle-income renter	1,402	1,415	1,193	222	2.12	1.79	0.33
Pensioner homeowner	27,667	1,796	1,304	492	3.09	2.25	0.85
Pensioner renter	342	909	735	174	1.85	1.49	0.35
Female-headed homeowner	43,208	2,062	1,578	484	2.56	1.96	0.60
Female-headed renter	1,533	1,487	1,242	245	1.78	1.49	0.29

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Stamp duty and rate payment distribution

Table 11 - The impact of tax reform on stamp duty and rate paid by sub-group, average 2012 - 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg duty & rate $	Old tax policy - Avg duty & rate $	Diff - Avg duty & rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
First home buyers	4,183	3,955	228	14,498	19,075	-4,578	17.07	22.70	-5.63
Low-income homeowner	35,207	35,207	0	2,051	1,937	115	4.84	4.57	0.27
Low-income renter	561	532	28	8,598	10,578	-1,981	17.82	22.73	-4.91
Middle-income homeowner	22,098	22,098	0	3,546	3,660	-113	4.34	4.47	-0.14
Middle-income renter	1,462	1,402	59	12,831	17,412	-4,581	19.29	26.10	-6.81
Pensioner homeowner	27,667	27,667	0	2,346	1,988	359	4.04	3.42	0.62
Pensioner renter	342	342	0	9,987	12,701	-2,714	20.32	25.85	-5.52
Female-headed homeowner	43,208	43,208	0	3,365	3,283	82	4.18	4.08	0.10
Female-headed renter	1,617	1,521	97	14,415	19,316	-4,900	17.28	23.38	-6.10
0.35 – 1.30% price change									
First home buyers	4,183	3,971	212	14,498	18,847	-4,349	17.07	22.44	-5.37
Low-income homeowner	35,207	35,207	0	2,051	1,932	119	4.84	4.56	0.28
Low-income renter	561	540	20	8,598	10,522	-1,925	17.82	22.54	-4.71
Middle-income homeowner	22,098	22,098	0	3,546	3,645	-99	4.34	4.46	-0.12
Middle-income renter	1,462	1,402	59	12,831	17,212	-4,381	19.29	25.80	-6.51
Pensioner homeowner	27,667	27,667	0	2,346	1,988	358	4.04	3.42	0.62
Pensioner renter	342	342	0	9,987	12,572	-2,585	20.32	25.58	-5.26
Female-headed homeowner	43,208	43,208	0	3,365	3,271	94	4.18	4.06	0.12
Female-headed renter	1,617	1,522	95	14,415	19,105	-4,690	17.28	23.08	-5.80
1.24 – 2.19% price change									
First home buyers	4,183	4,033	150	14,498	18,664	-4,166	17.07	22.11	-5.04
Low-income homeowner	35,207	35,207	0	2,051	1,930	121	4.84	4.55	0.29
Low-income renter	561	553	8	8,598	10,692	-2,094	17.82	22.65	-4.82
Middle-income homeowner	22,098	22,098	0	3,546	3,635	-89	4.34	4.45	-0.11
Middle-income renter	1,462	1,414	48	12,831	16,972	-4,141	19.29	25.46	-6.17
Pensioner homeowner	27,667	27,667	0	2,346	1,993	354	4.04	3.43	0.61
Pensioner renter	342	342	0	9,987	12,432	-2,446	20.32	25.30	-4.98
Female-headed homeowner	43,208	43,208	0	3,365	3,260	105	4.18	4.05	0.13
Female-headed renter	1,617	1,545	73	14,415	18,855	-4,440	17.28	22.60	-5.32

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 11a - The impact of tax reform on stamp duty and rate paid by sub-group, average 2012 – 2018 (keep only those purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg duty & rate	Old tax policy - Avg duty & rate	Diff - Avg duty & rate	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
First home buyers	3,955	14,453	19,075	-4,622	17.20	22.70	-5.50
Low-income homeowner	35,207	2,051	1,937	115	4.84	4.57	0.27
Low-income renter	532	7,966	10,578	-2,613	17.12	22.73	-5.61
Middle-income homeowner	22,098	3,546	3,660	-113	4.34	4.47	-0.14
Middle-income renter	1,402	12,916	17,412	-4,496	19.36	26.10	-6.74
Pensioner homeowner	27,667	2,346	1,988	359	4.04	3.42	0.62
Pensioner renter	342	9,987	12,701	-2,714	20.32	25.85	-5.52
Female-headed homeowner	43,208	3,365	3,283	82	4.18	4.08	0.10
Female-headed renter	1,521	14,551	19,316	-4,765	17.61	23.38	-5.77
0.35 – 1.30% price change							
First home buyers	3,968	14,452	18,863	-4,411	17.20	22.45	-5.25
Low-income homeowner	35,207	2,051	1,932	119	4.84	4.56	0.28
Low-income renter	538	8,055	10,582	-2,527	17.24	22.65	-5.41
Middle-income homeowner	22,098	3,546	3,645	-99	4.34	4.46	-0.12
Middle-income renter	1,402	12,916	17,212	-4,296	19.36	25.80	-6.44
Pensioner homeowner	27,667	2,346	1,988	358	4.04	3.42	0.62
Pensioner renter	342	9,987	12,572	-2,585	20.32	25.58	-5.26
Female-headed homeowner	43,208	3,365	3,271	94	4.18	4.06	0.12
Female-headed renter	1,522	14,555	19,105	-4,550	17.58	23.08	-5.50
1.24 – 2.19% price change							
First home buyers	4,016	14,501	18,710	-4,209	17.15	22.13	-4.98
Low-income homeowner	35,207	2,051	1,930	121	4.84	4.55	0.29
Low-income renter	548	8,309	10,756	-2,447	17.56	22.73	-5.17
Middle-income homeowner	22,098	3,546	3,635	-89	4.34	4.45	-0.11
Middle-income renter	1,402	12,916	17,015	-4,099	19.36	25.50	-6.14
Pensioner homeowner	27,667	2,346	1,993	354	4.04	3.43	0.61
Pensioner renter	342	9,987	12,432	-2,446	20.32	25.30	-4.98
Female-headed homeowner	43,208	3,365	3,260	105	4.18	4.05	0.13
Female-headed renter	1,533	14,581	18,921	-4,340	17.44	22.63	-5.19

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

3. Results by income quintiles

Number of residential properties purchased

Table 12 - The impact of tax reform on the number of residential properties purchased by income quintile, total 2012 - 2018

	New tax policy - # purchases	Old tax policy - # purchases	Diff - # purchases	Diff %
No price change				
Quint 1	5,581	5,562	19	0.34
Quint 2	9,965	9,699	266	2.74
Quint 3	23,114	22,556	558	2.47
Quint 4	23,640	22,885	755	3.30
Quint 5	27,468	26,762	706	2.64
0.35 – 1.30% price change				
Quint 1	5,581	5,578	3	0.05
Quint 2	9,965	9,800	165	1.68
Quint 3	23,114	22,601	513	2.27
Quint 4	23,640	22,940	700	3.05
Quint 5	27,468	26,807	661	2.47
1.24 – 2.19% price change				
Quint 1	5,581	5,601	-20	-0.36
Quint 2	9,965	9,942	23	0.23
Quint 3	23,114	22,756	358	1.57
Quint 4	23,640	23,096	544	2.36
Quint 5	27,468	27,010	458	1.70

Source: Calculations from NATSEM microsimulation model.
Note: The numbers shown in the table are the total number of residential properties purchased over the whole period.

Stamp duty distribution

Table 13 - The impact of tax reform on the stamp duty distribution (including concession) by income quintile, average 2012 - 2018

	New tax policy (%)	Old tax policy (%)	Diff (% point)
No price change			
Quint 1	2.28	2.48	-0.19
Quint 2	8.31	8.48	-0.17
Quint 3	22.48	23.14	-0.66
Quint 4	27.66	27.38	0.28
Quint 5	39.28	38.53	0.74
0.35 – 1.30% price change			
Quint 1	2.28	2.47	-0.19
Quint 2	8.31	8.54	-0.22
Quint 3	22.48	23.13	-0.66
Quint 4	27.66	27.36	0.30
Quint 5	39.28	38.51	0.77
1.24 – 2.19% price change			
Quint 1	2.28	2.47	-0.19
Quint 2	8.31	8.62	-0.31
Quint 3	22.48	23.08	-0.60
Quint 4	27.66	27.32	0.34
Quint 5	39.28	38.50	0.77

Source: Calculations from NATSEM microsimulation model.
Note: (i) The % is the percent of total stamp duty paid by all the income units who paid stamp duty in each income quintile. It will sum to 100 across all income quintiles; (ii) Diff means the difference between the new and old tax policies.

Table 14 - The impact of tax reform on stamp duty paid by income quintile, average 2012 – 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg stamp duty $	Old tax policy - Avg stamp duty $	Diff - Avg stamp duty $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
Quint 1	797	795	3	6,432	8,867	-2,435	20.95	28.88	-7.93
Quint 2	1,424	1,386	38	13,517	18,179	-4,662	20.90	28.20	-7.30
Quint 3	3,302	3,222	80	15,741	21,466	-5,726	20.33	27.60	-7.27
Quint 4	3,377	3,269	108	19,013	25,123	-6,109	18.07	23.85	-5.78
Quint 5	3,924	3,823	101	23,174	29,916	-6,742	15.95	20.58	-4.63
0.35 – 1.30% price change									
Quint 1	797	797	0	6,432	8,744	-2,313	20.95	28.48	-7.53
Quint 2	1,424	1,400	24	13,517	17,928	-4,412	20.90	27.87	-6.97
Quint 3	3,302	3,229	73	15,741	21,226	-5,485	20.33	27.29	-6.97
Quint 4	3,377	3,277	100	19,013	24,826	-5,813	18.07	23.59	-5.52
Quint 5	3,924	3,830	94	23,174	29,597	-6,423	15.95	20.36	-4.41
1.24 – 2.19% price change									
Quint 1	797	800	-3	6,432	8,693	-2,261	20.95	28.22	-7.27
Quint 2	1,424	1,420	3	13,517	17,814	-4,298	20.90	27.66	-6.76
Quint 3	3,302	3,251	51	15,741	20,953	-5,212	20.33	26.97	-6.64
Quint 4	3,377	3,299	78	19,013	24,518	-5,504	18.07	23.30	-5.23
Quint 5	3,924	3,859	65	23,174	29,230	-6,057	15.95	20.10	-4.16

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 14a - The impact of tax reform on stamp duty paid by income quintile, average 2012 – 2018 (keeping only those income units purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg stamp duty $	Old tax policy - Avg stamp duty $	Diff - Avg stamp duty $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
Quint 1	795	6,422	8,867	-2,445	20.92	28.88	-7.96
Quint 2	1,386	13,388	18,179	-4,790	20.77	28.20	-7.43
Quint 3	3,222	15,880	21,466	-5,586	20.41	27.60	-7.18
Quint 4	3,269	19,111	25,123	-6,012	18.14	23.85	-5.71
Quint 5	3,823	23,282	29,916	-6,634	16.01	20.58	-4.56
0.35 – 1.30% price change							
Quint 1	795	6,427	8,770	-2,343	20.93	28.56	-7.63
Quint 2	1,395	13,397	17,982	-4,585	20.80	27.92	-7.12
Quint 3	3,226	15,882	21,222	-5,340	20.42	27.29	-6.87
Quint 4	3,276	19,096	24,827	-5,731	18.14	23.58	-5.44
Quint 5	3,828	23,281	29,596	-6,314	16.01	20.36	-4.34
1.24 – 2.19% price change							
Quint 1	796	6,423	8,657	-2,234	20.91	28.19	-7.27
Quint 2	1,407	13,479	17,864	-4,385	20.88	27.67	-6.79
Quint 3	3,226	15,882	20,971	-5,088	20.42	26.96	-6.54
Quint 4	3,296	19,078	24,517	-5,439	18.12	23.29	-5.17
Quint 5	3,855	23,256	29,230	-5,974	15.99	20.10	-4.11

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Rate payment distribution

Table 15 - The impact of tax reform on the general rate distribution (net of rebate) by income quintile, average 2012 - 2018

	New tax policy (%)	Old tax policy (%)	Diff (% point)
No price change			
Quint 1	8.73	9.02	-0.29
Quint 2	12.03	12.51	-0.48
Quint 3	17.54	18.40	-0.87
Quint 4	21.93	22.71	-0.78
Quint 5	39.78	37.36	2.42
0.35 – 1.30% price change			
Quint 1	8.73	9.02	-0.29
Quint 2	12.03	12.51	-0.49
Quint 3	17.54	18.40	-0.87
Quint 4	21.93	22.71	-0.78
Quint 5	39.78	37.35	2.42
1.24 – 2.19% price change			
Quint 1	8.73	9.01	-0.29
Quint 2	12.03	12.52	-0.49
Quint 3	17.54	18.41	-0.87
Quint 4	21.93	22.71	-0.78
Quint 5	39.78	37.35	2.43

Source: Calculations from NATSEM microsimulation model.
Note: (i) The % is the percent of total rates paid by all the income units who paid rates in each income quintile. It will sum to 100 across all income quintiles; (ii) Diff means the difference between the new and old tax policies.

Table 16 - The impact of tax reform on rate paid by income quintile, average 2012 – 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg rate $	Old tax policy - Avg rate $	Diff - Avg rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
Quint 1	17,812	17,812	0	1,238	972	266	4.78	3.75	1.03
Quint 2	17,956	17,928	28	1,698	1,340	357	2.88	2.28	0.60
Quint 3	23,559	23,500	59	1,888	1,505	383	2.34	1.86	0.47
Quint 4	23,877	23,796	81	2,334	1,836	499	2.13	1.68	0.46
Quint 5	29,468	29,408	59	3,425	2,442	983	2.17	1.55	0.62
0.35 – 1.30% price change									
Quint 1	17,812	17,812	0	1,238	972	266	4.78	3.75	1.03
Quint 2	17,956	17,936	20	1,698	1,341	357	2.88	2.28	0.60
Quint 3	23,559	23,500	59	1,888	1,506	382	2.34	1.86	0.47
Quint 4	23,877	23,802	75	2,334	1,836	499	2.13	1.68	0.46
Quint 5	29,468	29,410	58	3,425	2,442	983	2.17	1.55	0.62
1.24 – 2.19% price change									
Quint 1	17,812	17,812	0	1,238	972	266	4.78	3.75	1.03
Quint 2	17,956	17,948	8	1,698	1,341	356	2.88	2.28	0.60
Quint 3	23,559	23,512	48	1,888	1,506	382	2.34	1.86	0.47
Quint 4	23,877	23,819	58	2,334	1,836	499	2.13	1.68	0.46
Quint 5	29,468	29,431	37	3,425	2,441	983	2.17	1.55	0.62

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 16a - The impact of tax reform on rate paid by income quintile, average 2012 – 2018 (keeping only those income units purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg rate $	Old tax policy - Avg rate $	Diff - Avg rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
Quint 1	17,812	1,238	972	266	4.78	3.75	1.03
Quint 2	17,928	1,698	1,340	357	2.88	2.28	0.61
Quint 3	23,500	1,890	1,505	384	2.34	1.86	0.48
Quint 4	23,796	2,337	1,836	502	2.13	1.68	0.46
Quint 5	29,408	3,429	2,442	987	2.17	1.55	0.63
0.35 – 1.30% price change							
Quint 1	17,812	1,238	972	266	4.78	3.75	1.03
Quint 2	17,933	1,697	1,341	357	2.88	2.28	0.61
Quint 3	23,500	1,890	1,506	384	2.34	1.86	0.47
Quint 4	23,802	2,337	1,836	502	2.13	1.68	0.46
Quint 5	29,410	3,428	2,442	987	2.17	1.55	0.63
1.24 – 2.19% price change							
Quint 1	17,812	1,238	972	266	4.78	3.75	1.03
Quint 2	17,943	1,697	1,341	356	2.88	2.28	0.60
Quint 3	23,500	1,890	1,506	383	2.34	1.86	0.47
Quint 4	23,819	2,337	1,836	501	2.13	1.68	0.46
Quint 5	29,431	3,427	2,441	986	2.17	1.55	0.63

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Stamp duty and rate payment distribution

Table 17 - The impact of tax reform on the stamp duty and general rate distribution by income quintile, average 2012 - 2018

	New tax policy (%)	Old tax policy (%)	Diff (% point)
No price change			
Quint 1	5.66	5.05	0.61
Quint 2	10.26	10.06	0.19
Quint 3	19.89	21.28	-1.39
Quint 4	24.66	25.54	-0.88
Quint 5	39.54	38.07	1.47
0.35 – 1.30% price change			
Quint 1	5.66	5.06	0.60
Quint 2	10.26	10.11	0.15
Quint 3	19.89	21.26	-1.37
Quint 4	24.66	25.52	-0.86
Quint 5	39.54	38.05	1.49
1.24 – 2.19% price change			
Quint 1	5.66	5.07	0.59
Quint 2	10.26	10.17	0.09
Quint 3	19.89	21.23	-1.34
Quint 4	24.66	25.49	-0.83
Quint 5	39.54	38.04	1.49

Source: Calculations from NATSEM microsimulation model.
Note: (i) The % is the percent of total stamp duty and rates paid by all the income units who paid stamp duty and/or rates in each income quintile. It will sum to 100 across all income quintiles; (ii) Diff means the difference between the new and old tax policies.

Table 18 - The impact of tax reform on stamp duty and rate paid by income quintile, average 2012 – 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg duty & rate $	Old tax policy - Avg duty & rate $	Diff - Avg duty & rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
Quint 1	17,812	17,812	0	1,532	1,378	153	5.91	5.32	0.59
Quint 2	17,956	17,928	28	2,768	2,738	31	4.70	4.65	0.05
Quint 3	23,559	23,500	59	4,096	4,420	-324	5.07	5.47	-0.40
Quint 4	23,877	23,796	81	5,019	5,250	-231	4.59	4.79	-0.21
Quint 5	29,468	29,408	59	6,511	6,325	186	4.13	4.01	0.12
0.35 – 1.30% price change									
Quint 1	17,812	17,812	0	1,532	1,374	157	5.91	5.31	0.61
Quint 2	17,956	17,936	20	2,768	2,735	34	4.70	4.64	0.05
Quint 3	23,559	23,500	59	4,096	4,396	-299	5.07	5.44	-0.37
Quint 4	23,877	23,802	75	5,019	5,219	-200	4.59	4.77	-0.18
Quint 5	29,468	29,410	58	6,511	6,290	221	4.13	3.99	0.14
1.24 – 2.19% price change									
Quint 1	17,812	17,812	0	1,532	1,374	158	5.91	5.30	0.61
Quint 2	17,956	17,948	8	2,768	2,743	26	4.70	4.65	0.04
Quint 3	23,559	23,512	48	4,096	4,375	-278	5.07	5.41	-0.34
Quint 4	23,877	23,819	58	5,019	5,195	-176	4.59	4.74	-0.16
Quint 5	29,468	29,431	37	6,511	6,267	244	4.13	3.98	0.15

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 18a - The impact of tax reform on stamp duty and rate paid by income quintile, average 2012 – 2018 (keeping only those income units purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg duty & rate $	Old tax policy - Avg duty & rate $	Diff - Avg duty & rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
Quint 1	17,812	1,532	1,378	153	5.91	5.32	0.59
Quint 2	17,928	2,740	2,738	2	4.65	4.65	0.00
Quint 3	23,500	4,074	4,420	-346	5.04	5.47	-0.43
Quint 4	23,796	4,987	5,250	-263	4.55	4.79	-0.24
Quint 5	29,408	6,486	6,325	161	4.11	4.01	0.10
0.35 – 1.30% price change							
Quint 1	17,812	1,532	1,374	157	5.91	5.31	0.61
Quint 2	17,933	2,744	2,735	9	4.66	4.64	0.01
Quint 3	23,500	4,074	4,396	-322	5.04	5.44	-0.40
Quint 4	23,802	4,989	5,219	-229	4.56	4.77	-0.21
Quint 5	29,410	6,487	6,290	196	4.11	3.99	0.12
1.24 – 2.19% price change							
Quint 1	17,812	1,532	1,374	158	5.91	5.30	0.61
Quint 2	17,943	2,755	2,742	14	4.68	4.65	0.02
Quint 3	23,500	4,074	4,376	-302	5.04	5.41	-0.37
Quint 4	23,819	4,995	5,195	-201	4.56	4.74	-0.18
Quint 5	29,431	6,495	6,267	228	4.12	3.98	0.14

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

4. Results by wealth quintiles

Number of residential properties purchased

Table 19 - The impact of tax reform on the number of residential properties purchased by wealth quintile, total 2012 - 2018

	New tax policy - # purchases	Old tax policy - # purchases	Diff - # purchases	Diff %
No price change				
Quint 1	43	43	0	0
Quint 2	14,582	13,229	1,353	10.23
Quint 3	22,964	22,504	460	2.04
Quint 4	24,878	24,613	265	1.08
Quint 5	27,301	27,075	226	0.83
0.35 – 1.30% price change				
Quint 1	43	43	0	0
Quint 2	14,582	13,351	1,231	9.22
Quint 3	22,964	22,523	441	1.96
Quint 4	24,878	24,657	221	0.90
Quint 5	27,301	27,152	149	0.55
1.24 – 2.19% price change				
Quint 1	43	124	-81	-65.3
Quint 2	14,582	13,586	996	7.33
Quint 3	22,964	22,630	334	1.48
Quint 4	24,878	24,807	71	0.29
Quint 5	27,301	27,258	43	0.16

Source: Calculations from NATSEM microsimulation model.
Note: The numbers shown in the table are the total number of residential properties purchased over the whole period.

Stamp duty distribution

Table 20 - The impact of tax reform on the stamp duty distribution (including concession) by wealth quintile, average 2012 - 2018

	New tax policy (%)	Old tax policy (%)	Diff (% point)
No price change			
Quint 1	0.02	0.02	0.00
Quint 2	9.83	9.07	0.77
Quint 3	24.58	24.99	-0.41
Quint 4	29.38	29.53	-0.15
Quint 5	36.20	36.40	-0.21
0.35 – 1.30% price change			
Quint 1	0.02	0.02	0.00
Quint 2	9.83	9.13	0.70
Quint 3	24.58	24.92	-0.35
Quint 4	29.38	29.51	-0.13
Quint 5	36.20	36.42	-0.22
1.24 – 2.19% price change			
Quint 1	0.02	0.02	0.00
Quint 2	9.83	9.27	0.56
Quint 3	24.58	24.90	-0.32
Quint 4	29.38	29.50	-0.12
Quint 5	36.20	36.32	-0.12

Source: Calculations from NATSEM microsimulation model.
Note: (i) The % is the percent of total stamp duty paid by all the income units who paid stamp duty in each wealth quintile. It will sum to 100 across all wealth quintiles; (ii) Diff means the difference between the new and old tax policies.

Table 21 - The impact of tax reform on stamp duty paid by wealth quintile, average 2012 – 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg stamp duty $	Old tax policy - Avg stamp duty $	Diff - Avg stamp duty $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
Quint 1	43	43	0	6,828	7,710	-882	11.85	13.38	-1.53
Quint 2	2,083	1,890	193	11,829	16,357	-4,528	14.51	20.02	-5.50
Quint 3	3,281	3,215	66	17,293	23,000	-5,707	16.81	22.51	-5.70
Quint 4	3,554	3,516	38	19,200	24,867	-5,667	17.52	22.76	-5.24
Quint 5	3,900	3,868	32	21,574	27,897	-6,323	20.77	26.87	-6.10
0.35 – 1.30% price change									
Quint 1	43	43	0	6,828	7,672	-844	11.85	13.32	-1.46
Quint 2	2,083	1,907	176	11,829	16,122	-4,293	14.51	19.78	-5.27
Quint 3	3,281	3,218	63	17,293	22,725	-5,433	16.81	22.26	-5.44
Quint 4	3,554	3,522	32	19,200	24,600	-5,400	17.52	22.53	-5.00
Quint 5	3,900	3,879	21	21,574	27,602	-6,028	20.77	26.60	-5.82
1.24 – 2.19% price change									
Quint 1	43	124	-81	6,828	2,640	4,188	11.85	5.04	6.81
Quint 2	2,083	1,941	142	11,829	16,021	-4,191	14.51	19.60	-5.09
Quint 3	3,281	3,233	48	17,293	22,474	-5,181	16.81	21.98	-5.16
Quint 4	3,554	3,544	10	19,200	24,314	-5,114	17.52	22.26	-4.73
Quint 5	3,900	3,894	6	21,574	27,285	-5,712	20.77	26.32	-5.54

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 21a - The impact of tax reform on stamp duty paid by wealth quintile, average 2012 – 2018 (keeping only those income units purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg stamp duty $	Old tax policy - Avg stamp duty $	Diff - Avg stamp duty $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
Quint 1	43	6,828	7,710	-882	11.85	13.38	-1.53
Quint 2	1,890	11,755	16,357	-4,602	14.38	20.02	-5.63
Quint 3	3,215	17,236	23,000	-5,764	16.87	22.51	-5.64
Quint 4	3,516	19,226	24,867	-5,640	17.60	22.76	-5.16
Quint 5	3,868	21,562	27,897	-6,335	20.77	26.87	-6.10
0.35 – 1.30% price change							
Quint 1	43	6,828	7,672	-844	11.85	13.32	-1.46
Quint 2	1,903	11,759	16,164	-4,405	14.41	19.81	-5.40
Quint 3	3,215	17,236	22,742	-5,506	16.87	22.26	-5.39
Quint 4	3,520	19,226	24,602	-5,376	17.60	22.52	-4.92
Quint 5	3,875	21,562	27,599	-6,037	20.78	26.60	-5.82
1.24 – 2.19% price change							
Quint 1	43	6,828	7,572	-744	11.85	13.15	-1.29
Quint 2	1,933	11,845	16,072	-4,227	14.46	19.62	-5.16
Quint 3	3,229	17,248	22,488	-5,240	16.86	21.98	-5.12
Quint 4	3,529	19,215	24,305	-5,090	17.57	22.22	-4.65
Quint 5	3,882	21,569	27,289	-5,720	20.79	26.30	-5.51

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Rate payment distribution

Table 22 - The impact of tax reform on the general rate distribution (net of rebate) by wealth quintile, average 2012 - 2018

	New tax policy (%)	Old tax policy (%)	Diff (% point)
No price change			
Quint 1	0.23	0.26	-0.04
Quint 2	3.66	4.04	-0.38
Quint 3	17.25	18.64	-1.39
Quint 4	24.80	26.22	-1.42
Quint 5	54.06	50.84	3.23
0.35 – 1.30% price change			
Quint 1	0.23	0.26	-0.03
Quint 2	3.66	4.05	-0.39
Quint 3	17.25	18.63	-1.39
Quint 4	24.80	26.22	-1.42
Quint 5	54.06	50.83	3.23
1.24 – 2.19% price change			
Quint 1	0.23	0.27	-0.04
Quint 2	3.66	4.07	-0.41
Quint 3	17.25	18.63	-1.38
Quint 4	24.80	26.22	-1.42
Quint 5	54.06	50.81	3.25

Source: Calculations from NATSEM microsimulation model.
Note: (i) The % is the percent of total general rates paid by all the income units who paid rates in each income quintile. It will sum to 100 across all income quintiles; (ii) Diff means the difference between the new and old tax policies.

Table 23 - The impact of tax reform on rate paid by wealth quintile, average 2012 – 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg rate $	Old tax policy - Avg rate $	Diff - Avg rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
Quint 1	528	528	0	1,100	958	142	1.43	1.25	0.18
Quint 2	7,822	7,648	174	1,198	1,018	180	1.49	1.26	0.22
Quint 3	28,107	28,071	37	1,556	1,276	280	1.68	1.38	0.30
Quint 4	34,163	34,145	18	1,840	1,476	364	2.03	1.63	0.40
Quint 5	42,052	42,052	0	3,256	2,323	933	3.18	2.27	0.91
0.35 – 1.30% price change									
Quint 1	528	528	0	1,100	958	142	1.43	1.25	0.18
Quint 2	7,822	7,662	159	1,198	1,018	180	1.49	1.27	0.22
Quint 3	28,107	28,071	37	1,556	1,276	280	1.68	1.38	0.30
Quint 4	34,163	34,147	17	1,840	1,476	364	2.03	1.63	0.40
Quint 5	42,052	42,052	0	3,256	2,323	933	3.18	2.27	0.91
1.24 – 2.19% price change									
Quint 1	528	540	-12	1,100	961	139	1.43	1.26	0.17
Quint 2	7,822	7,695	127	1,198	1,019	179	1.49	1.27	0.22
Quint 3	28,107	28,081	26	1,556	1,277	280	1.68	1.38	0.30
Quint 4	34,163	34,154	9	1,840	1,476	363	2.03	1.63	0.40
Quint 5	42,052	42,052	0	3,256	2,324	932	3.18	2.27	0.91

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 23a - The impact of tax reform on rate paid by wealth quintile, average 2012 – 2018 (keeping only those income units purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg rate $	Old tax policy - Avg rate $	Diff - Avg rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
Quint 1	528	1,100	958	142	1.43	1.25	0.18
Quint 2	7,648	1,191	1,018	174	1.48	1.26	0.22
Quint 3	28,071	1,556	1,276	280	1.68	1.38	0.30
Quint 4	34,145	1,840	1,476	364	2.03	1.63	0.40
Quint 5	42,052	3,256	2,323	933	3.18	2.27	0.91
0.35 – 1.30% price change							
Quint 1	528	1,100	958	142	1.43	1.25	0.18
Quint 2	7,660	1,192	1,018	173	1.48	1.27	0.22
Quint 3	28,071	1,556	1,276	280	1.68	1.38	0.30
Quint 4	34,147	1,840	1,476	364	2.03	1.63	0.40
Quint 5	42,052	3,256	2,323	933	3.18	2.27	0.91
1.24 – 2.19% price change							
Quint 1	528	1,100	958	142	1.43	1.25	0.18
Quint 2	7,690	1,193	1,020	173	1.48	1.27	0.22
Quint 3	28,081	1,556	1,277	280	1.68	1.38	0.30
Quint 4	34,154	1,840	1,476	363	2.03	1.63	0.40
Quint 5	42,052	3,256	2,324	932	3.18	2.27	0.91

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Stamp duty and rate payment distribution

Table 24 - The impact of tax reform on the stamp duty and general rate distribution by wealth quintile, average 2012 - 2018

	New tax policy (%)	Old tax policy (%)	Diff (% point)
No price change			
Quint 1	0.13	0.11	0.01
Quint 2	6.60	7.09	-0.49
Quint 3	20.74	22.49	-1.75
Quint 4	26.98	28.23	-1.24
Quint 5	45.55	42.08	3.47
0.35 – 1.30% price change			
Quint 1	0.13	0.11	0.01
Quint 2	6.60	7.13	-0.52
Quint 3	20.74	22.44	-1.70
Quint 4	26.98	28.21	-1.23
Quint 5	45.55	42.12	3.44
1.24 – 2.19% price change			
Quint 1	0.13	0.12	0.01
Quint 2	6.60	7.21	-0.61
Quint 3	20.74	22.41	-1.67
Quint 4	26.98	28.20	-1.21
Quint 5	45.55	42.07	3.48

Source: Calculations from NATSEM microsimulation model.
Note: (i) The % is the percent of total stamp duty and rates paid by all the income units who paid stamp duty and/or rates in each wealth quintile. It will sum to 100 across all wealth quintiles; (ii) Diff means the difference between the new and old tax policies.

Table 25 - The impact of tax reform on stamp duty and rate paid by wealth quintile, average 2012 – 2018

	New tax policy - # affected	Old tax policy - # affected	Diff - # affected	New tax policy - Avg duty & rate $	Old tax policy - Avg duty & rate $	Diff - Avg duty & rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change									
Quint 1	528	528	0	1,176	1,044	132	1.53	1.36	0.17
Quint 2	7,822	7,648	174	4,113	4,553	-440	5.11	5.66	-0.55
Quint 3	28,107	28,071	37	3,578	3,909	-331	3.86	4.22	-0.36
Quint 4	34,163	34,145	18	3,830	4,034	-204	4.22	4.44	-0.23
Quint 5	42,052	42,052	0	5,248	4,882	365	5.12	4.77	0.36
0.35 – 1.30% price change									
Quint 1	528	528	0	1,176	1,043	132	1.53	1.36	0.17
Quint 2	7,822	7,662	159	4,113	4,543	-430	5.11	5.65	-0.54
Quint 3	28,107	28,071	37	3,578	3,880	-302	3.86	4.19	-0.33
Quint 4	34,163	34,147	17	3,830	4,011	-182	4.22	4.42	-0.20
Quint 5	42,052	42,052	0	5,248	4,863	385	5.12	4.75	0.38
1.24 – 2.19% price change									
Quint 1	528	540	-12	1,176	1,034	141	1.53	1.36	0.18
Quint 2	7,822	7,695	127	4,113	4,567	-454	5.11	5.67	-0.56
Quint 3	28,107	28,081	26	3,578	3,864	-286	3.86	4.17	-0.31
Quint 4	34,163	34,154	9	3,830	3,998	-168	4.22	4.40	-0.19
Quint 5	42,052	42,052	0	5,248	4,844	403	5.12	4.73	0.39

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Table 25a - The impact of tax reform on stamp duty rate paid by wealth quintile, average 2012 – 2018 (keeping only those income units purchasing properties in both new and old policies)

	Both tax policies - # affected	New tax policy - Avg duty & rate $	Old tax policy - Avg duty & rate $	Diff - Avg duty & rate $	New tax policy - % income	Old tax policy - % income	Diff - % point change in income
No price change							
Quint 1	528	1,176	1,044	132	1.53	1.36	0.17
Quint 2	7,648	3,847	4,553	-705	4.78	5.66	-0.88
Quint 3	28,071	3,558	3,909	-351	3.84	4.22	-0.38
Quint 4	34,145	3,822	4,034	-212	4.21	4.44	-0.23
Quint 5	42,052	5,248	4,882	365	5.12	4.77	0.36
0.35 – 1.30% price change							
Quint 1	528	1,176	1,043	132	1.53	1.36	0.17
Quint 2	7,660	3,866	4,544	-679	4.80	5.65	-0.84
Quint 3	28,071	3,558	3,880	-323	3.84	4.19	-0.35
Quint 4	34,147	3,823	4,011	-188	4.21	4.42	-0.21
Quint 5	42,052	5,248	4,863	385	5.12	4.75	0.38
1.24 – 2.19% price change							
Quint 1	528	1,176	1,042	133	1.53	1.36	0.17
Quint 2	7,690	3,916	4,566	-650	4.86	5.67	-0.81
Quint 3	28,081	3,563	3,864	-300	3.85	4.17	-0.32
Quint 4	34,154	3,826	3,998	-172	4.21	4.40	-0.19
Quint 5	42,052	5,248	4,844	403	5.12	4.73	0.39

Source: Calculations from NATSEM microsimulation model.
Note: Diff means the difference between the new and old tax policies.

Appendix

Table A1 - Dwelling sharing among homeowners and renters in the ACT, 2011-12

	Homeowner (#)	Renter (#)	Total (#)	Homeowner (%)	Renter (%)	Total (%)
Single or main income unit (IU)	97,649	48,034	145,683	50.5	24.8	75.3
IU sharing with homeowner	2,155	25,360	27,515	1.1	13.1	14.2
IU sharing with renter	0	20,297	20,297	0.0	10.5	10.5
Total	99,804	93,691	193,495	51.6	48.4	100.0

Source: Our calculations from SIHs 2009-10 and 2011-12 with population weights collected from the ABS No. 3101 'Australian Demographic Statistics - June 2019' (Table 58 - Estimated resident population by single year of age in the ACT).
Notes: (i) Single or main income units (IUs) include both homeowners and renters who are mainly responsible for their dwellings and share or do not share their residences with other income units; (ii) IUs sharing with homeowner or renter include those who share their homes with main income units.

Table A2 - Home loan characteristics in the ACT, 2011-2017

	2011	2013	2015	2017	2015 (ACT only)	2017 (ACT only)
Among all homeowners						
% HHs with loans	56.0	54.8	55.1	56.9	53.5	53.6
Median interest rate (%)	7	5.39	4.75	4.30	4.76	4.30
Median months of loans	142	155	175	190	170	191
Median loan to value (LTV)	0.56	0.63	0.68	0.67	0.67	0.64
% of loans with LTV $\geq$ 0.8	19.2	23.0	29.5	26.8	26.0	22.8
Among recent homeowners						
% HHs with loans	86.2	87.2	81.9	86.5	83.7	85.0
Median interest rate (%)	6.94	5.20	4.65	4	4.60	4
Median months of loans	148	171	186	198	188	198
Median loan to value (LTV)	0.78	0.82	0.80	0.81	0.80	0.79
% of loans with LTV $\geq$ 0.8	43.0	56.4	53.0	50.5	48.5	44.4
Among first homeowners						
% HHs with loans	94.0	92.2	90.8	97.0	100	97.7
Median interest rate (%)	7.01	5.30	4.65	3.99	4.75	3.99
Median months of loans	147	168	179	198	186	199
Median loan to value (LTV)	0.80	0.83	0.84	0.84	0.81	0.83
% of loans with LTV $\geq$ 0.8	54.5	61.6	64.9	65.0	56.4	60.4

Source: Our calculations from SIHs 2011-12, 2013-14, 2015-16, 2017-18.
Notes: (i) The ACT population weights are applied; (ii) The first four columns include the ACT and NT while the last two ones, with the available information, include the ACT only; (iii) Only the first mortgage loans related to the current properties are included; (iv) Loan duration is calculated based on the weekly repayment and the loan amount information; (v) Recent homeowners include those whose dwelling were purchased/built in the last three years; (vi) The first homeowners are those whose dwelling purchased/built in last three years is their first home owned.

Table A3 - Probability of purchasing a new property in the ACT by the age of reference person, 2011-12 (Unit: %)

	FHB, % Recent homeowners	New home, % recent homeowners	New home, % potential buyers

Under 30 years old	85.2	12.1	12.0
30-34 years old	66.9	6.4	6.3
35-39 years old	29.1	18.5	18.4
40-49 years old	13.0	19.7	20.2
50+ years old	3.6	20.8	20.6
Total	38.7	15.7	14.7
No. recent owners/potential buyers	23534	23534	108403

Source: Our calculations from SIHs 2009-10 and 2011-12.
Notes: (i) The recent homeowners include income units whose dwellings were purchased/built in the last three years because the information on first homeowners and new home purchase are only available among this group; (ii) Potential buyers include all renters and homeowners who do not own any other properties and are randomly assigned; (iii) Column (3) shows the result of new home purchase status assigned randomly to all potential home buyers; (iv) The ACT population weights are applied.

Table A4 - Characteristics of sub-groups in the ACT, 2011-12 (Unit: %)

	Renter	First homeowner	Low-income homeowner	Middle-income homeowner	Female	Pensioner
Age of IU reference person:						
- Under 30 years old	53.8	46.6	4.7	7.6	30.5	0.0
- 30-34 years old	10.9	32.8	6.0	10.5	8.9	0.0
- 35-39 years old	8.0	10.7	7.5	10.3	7.2	0.0
- 40-44 years old	5.3	3.0	9.5	10.3	6.3	0.0
- 45-49 years old	5.4	4.9	8.5	12.1	8.5	0.0
- 50-54 years old	4.5	0.7	5.8	11.1	7.1	1.1
- 55-59 years old	2.8	1.0	6.9	12.7	8.1	1.4
- 60-64 years old	1.6	0.0	10.4	8.2	5.8	6.1
- 65+ years old	7.7	0.4	40.7	17.2	17.6	91.5
Education of IU reference person:						
- Year 11 or below	21.9	5.5	38.1	18.5	25.2	41.6
- Year 12 or Certificate I/II	29.4	13.6	17.2	12.5	21.8	15.5
- Diploma or Certificate III/IV	20.7	29.3	22.2	34.2	18.7	18.3
- Bachelor	21.1	36.2	15.1	20.8	23.2	13.5
- Postgraduate	6.9	15.4	7.3	14.0	11.0	11.2
Employment of IU reference person:						
- Unemployed or NILF	20.4	6.0	48.9	22.1	27.5	78.8
- Full time	61.3	85.7	35.0	69.0	53.8	9.2
- Part time	18.4	8.4	16.1	8.9	18.7	12.0
IU reference person is male	57.1	58.5	49.4	65.1	0.0	47.6
Number of dependent children in IU	0.3	0.5	0.6	0.7	0.4	0.0
Number of independent earners in IU	0.9	1.5	0.7	1.2	0.9	0.3
Weekly income ($)	1,141.9	2,155.4	864.2	1,790.1	1,413.4	1,084.4
Number of IUs	93,691	9,098	31,637	20,245	79,830	30,604

Source: Our calculations from SIHs 2009-10 and 2011-12 and the ABS No. 3101 'Australian Demographic Statistics - June 2019' (Table 58 - Estimated resident population by single year of age in the ACT).
Notes: (i) The population weights are applied; (ii) Except for the number of dependent children in IU, weekly IU income, the number of independent earners in IU, the unit of the table is percentage; (iii) For the first homeowner group, only recent home buyers who purchased properties within the last three years are available.

Table A5 - Property value regression for the ACT, 2011-12

	Coef.	Std. Error
Age of IU reference person (Base: Under 30 years old):		
- 30-34 years old	0.057***	(0.006)
- 35-39 years old	0.124***	(0.006)
- 40-44 years old	0.166***	(0.006)
- 45-49 years old	0.150***	(0.006)
- 50-54 years old	0.266***	(0.007)
- 55-59 years old	0.216***	(0.007)
- 60-64 years old	0.312***	(0.007)
- 65+ years old	0.354***	(0.007)
IU reference person is male	0.047***	(0.003)
Education of IU reference person (Base: Year 11 or lower):		
- Year 12 or Certificate I/II	0.051***	(0.004)
- Diploma or Certificate III/IV	0.107***	(0.004)
- Bachelor	0.106***	(0.004)
- Postgraduate	0.183***	(0.004)
Employment of IU reference person (Base: Unemployed or NILF):		
- Full time	-0.159***	(0.006)
- Part time	-0.101***	(0.006)
Number of dependent children in IU	0.053***	(0.002)
Ln(Total weekly IU income ($))	0.203***	(0.002)
Number of independent earners in IU	0.035***	(0.003)
First homeowner	-0.067***	(0.005)
New home	0.036***	(0.006)
Constant	11.368***	(0.016)
Sample	73,196	
F-statistics	1468.78***	
Adjusted R^2	0.286	

Source: Our calculations from SIHs 2009-10 and 2011-12.
Notes: (i) Only one-income unit households are kept in this sample; (ii) Total income in the SIH 2009-10 is inflated into the 2011-12 value (a growth rate of 8%) using the ABS No. 6302.0 - Average Weekly Earnings (Persons, Total earnings, November 2009 and November 2011); (iii) Dwelling values in the SIH 2009-10 are inflated into the 2011-12 values by a growth rate in the median dutiable value of properties collected from the ACT government's stamp duty data and the SIHs. Both give consistent growth rates of 8% in house values between 2009-10 and 2011-12; (iv) The ACT population weights are applied; (v) $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.10$.

Table A6 - Average amount of savings ($) among potential buyers in the ACT, 2011-12

	Obs	Average amount ($)	Std. Dev.	% IUs with positive savings
Low-income homeowner	5,082	24,826	50,802	90.63
Low-income renter	55,641	8,398	42,181	91.45
Middle-income homeowner	3,185	32,260	90,893	90.64
Middle-income renter	18,470	20,571	69,998	97.23
Renter	93,691	14,740	51,805	94.14
Pensioner homeowner	3,640	63,591	135,625	93.74
Pensioner renter	7,393	50,419	142,941	95.10
Female-headed homeowner	6,083	39,674	98,308	92.52
Female-headed renter	40,188	12,966	48,909	95.06

Source: Our calculations from SIHs 2009/10 and 2011/12.
Notes: (i) Only renters and homeowners who are assigned as potential buyers are included; (ii) The ACT population weights are applied.

Table A7 - Lender mortgage insurance premium for the LTV of 0.9

Property value ($)	Insurance rate (%)
< 334,000	1.224
334,000 -555,000	1.584
556,000 - 1,114,000	2.007
1,115,000 - 1,666,000	2.232
1,667,000 - 2,222,000	2.331
≥ 2,223,000	2.457

Source: Our calculation from *yourmortgage.com.au/calculators/mortgage_insurance*.
Notes: The current loan thresholds and ratios are collected for the financial year of 2019-20. We assume that there is no change in these criteria between 2012 and 2018.

Table A8 - Price indexes in the ACT, 2011-2018

	Residential Property price index (RPPI)	Wage price index (WPI)	Average weekly earnings (AWE)	Consumer price index (CPI)
2011-12	1.000	0.556	1.000	1.000
2012-13	1.009	0.565	1.043	1.046
2013-14	1.009	0.561	1.067	1.078
2014-15	1.034	0.541	1.085	1.092
2015-16	1.096	0.510	1.103	1.108
2016-17	1.157	0.493	1.124	1.126
2017-18	1.223	0.462	1.145	1.153
2018-19	1.245	0.475	1.168	1.185

Source: The ACT government's rate and stamp duty data and the ABS No. 6345 WPI (in Dec), No. 6302 AWE (in Nov), No. 6401 CPI (in Dec) for the ACT.
Notes: (i) The starting index (value = 1) is set at the financial year 2011-12; (ii) To calculate the median HPI, we use the dutiable values for residential properties collected from the ACT government's stamp duty data. The properties with dutiable values under $1,000 are excluded. Only the latest transactions for each property in a financial year are used; (iii) To calculate the median LPI, we use the unimproved values collected from the ACT government's rate data. The properties with zero unimproved values are excluded; (iv) Weekly rental payment is calculated from SIHs, at median values.

Table A9a - Tax rules in Australia, 2012-2018 (Unit: %)

Income range	2012	2013	2014	2015	2016	2017	2018
≤ 18,200	0	0	0	0	0	0	0
18,201 - 37,000	19	19	19	19	19	19	19
37,001 - 80,000	32.5	32.5	32.5	32.5	32.5	32.5	32.5
80,001 - 87,000	37	37	37	37	32.5	32.5	32.5
87,001 - 90,000	37	37	37	37	37	37	32.5
90,001 - 180,000	37	37	37	37	37	37	37
> 180,000	45	45	45*	45*	45*	45	45

Source: The ATO

Notes: * Addition tax or budget repair levy of 2%.

Table A9b - Low-Income Tax Offset (LITO) rules in Australia, 2012-2018

Income ($)	LITO amount ($)
≤ 37,000	445
37,001 - 66,667	445 - ((Taxable Income - 37,000) × 1.5%)
> 66,667	0

Source: The ATO.

Table A9c - Middle- and Low-Income Tax Offset (LAMITO) rules in Australia, starting from 2018

Taxable income ($)	LAMITO amount ($)
≤ 37,000	255
37,001 - 48,000	255 + 7.5% × (Taxable income - 37,000)
48,001 - 90,000	1,080
90,001 - 126,000	1,080 - 3% × (Taxable income - 90,000)

Source: The ATO.

Table A9d - Medicare levy rules in Australia, 2012-2018

Income ($)	2012	2013	2014	2015	2016	2017	2018
Lower income threshold	20,542	20,542	20,896	21,335	21,655	21,980	22,398
Upper income threshold	24,167	24,167	26,120	26,669	27,069	27,475	27,998

Source: The ATO.

Note: (i) Medicare levy = (Taxable income - Lower income threshold) × 10% if income > Lower income threshold; (ii) Medicare Levy = Taxable income × 2%.

Table A10a - HEM table for couples in the ACT and NT, 2019 Q2

Income ($)	No child	1 child	2 child	3 child	4 child	Each child above 4
21,000 - 32,000	2,197					
32,000 - 42,000	2,258	2,573	2,829			
42,000 - 53,000	2,343	2,658	2,913	3,179	3,444	265
53,000 - 63000	2,510	2,825	3,079	3,346	3,613	267
63,000 - 85,000	2,730	3,045	3,297	3,566	3,835	269
85,000 - 106,000	3,028	3,344	3,594	3,866	4,137	271
106,000 - 127,000	3,259	3,574	3,823	4,097	4,370	273
127,000 - 148,000	3,665	3,980	4,227	4,503	4,780	277
148,000 - 169,000	3,821	4,136	4,382	4,660	4,938	278
169,000 - 211,000	3,981	4,296	4,540	4,820	5,099	279
211,000 - 264,000	4,409	4,724	4,966	5,249	5,532	283
264,000 - 317,000	4,975	5,290	5,528	5,816	6,103	288
≥ 317,000	5,145	5,460	5,697	5,987	6,276	289

Sources: *The home loan expert website*.

Table A10b - HEM table for singles in the ACT and NT, 2019 Q2

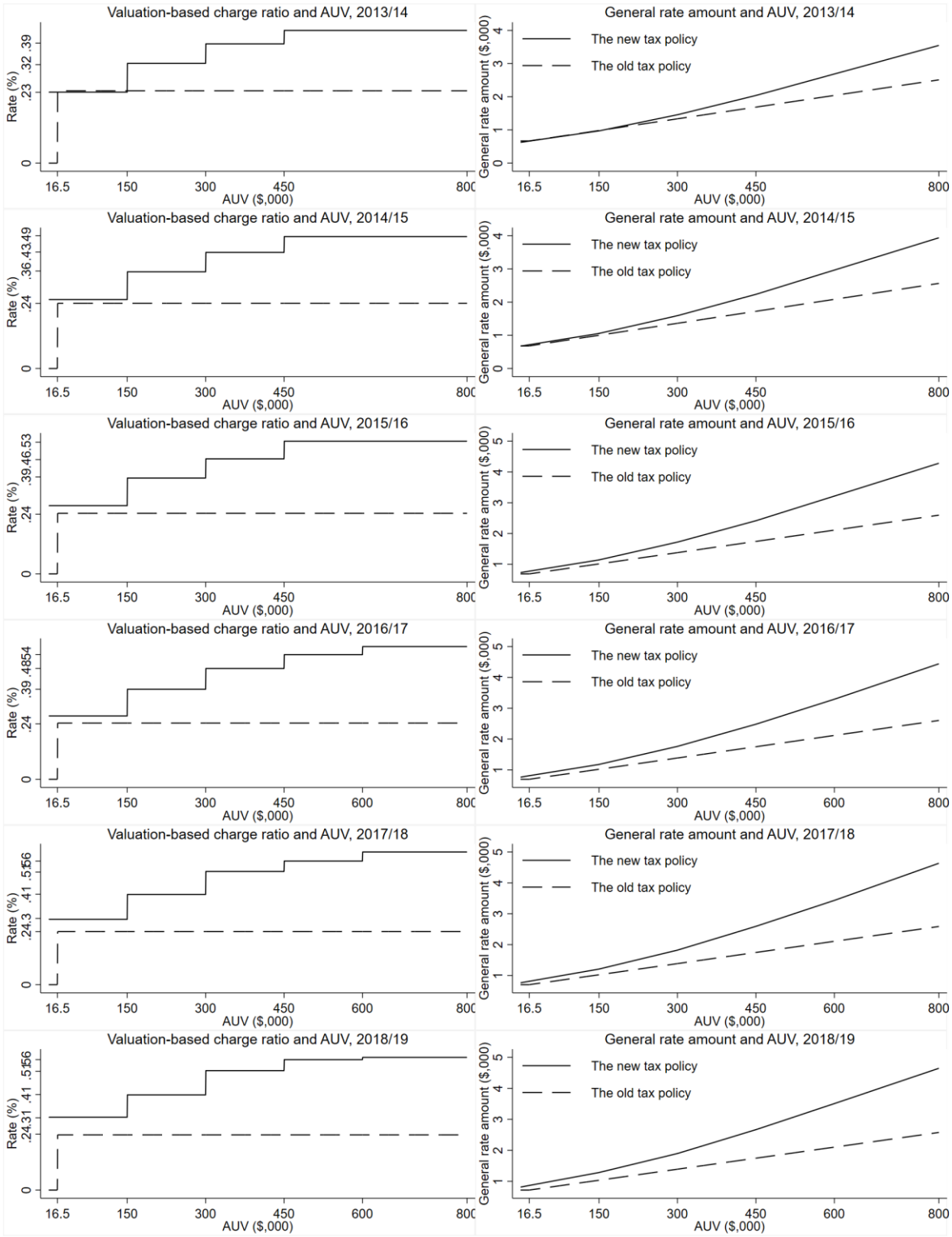
Income ($)	No child	1 child	2 child	3 child	4 child
21,000 - 32,000	1,244	1,648	2,025		
32,000 - 42,000	1,305	1,708	2,086	2,051	2,051
42,000 - 53,000	1,390	1,794	2,172	2,136	2,136
53,000 - 63000	1,557	1,962	2,339	2,303	2,303
63,000 - 85,000	1,777	2,183	2,559	2,522	2,522
85,000 - 106,000	2,075	2,484	2,858	2,820	2,820
106,000 - 127,000	2,306	2,716	3,090	3,050	3,050
127,000 - 148,000	2,712	3,125	3,497	3,455	3,455
148,000 - 169,000	2,868	3,281	3,653	3,610	3,610
169,000 - 211,000	3,028	3,442	3,813	3,770	3,770
211,000 - 264,000	3,457	3,873	4,242	4,197	4,197
264,000 - 317,000	4,022	4,442	4,809	4,761	4,761
≥ 317,000	4,193	4,614	4,980	4,931	4,931

Sources: The home loan expert website.

Table 11 - Interest rates in the ACT, 2012-2018

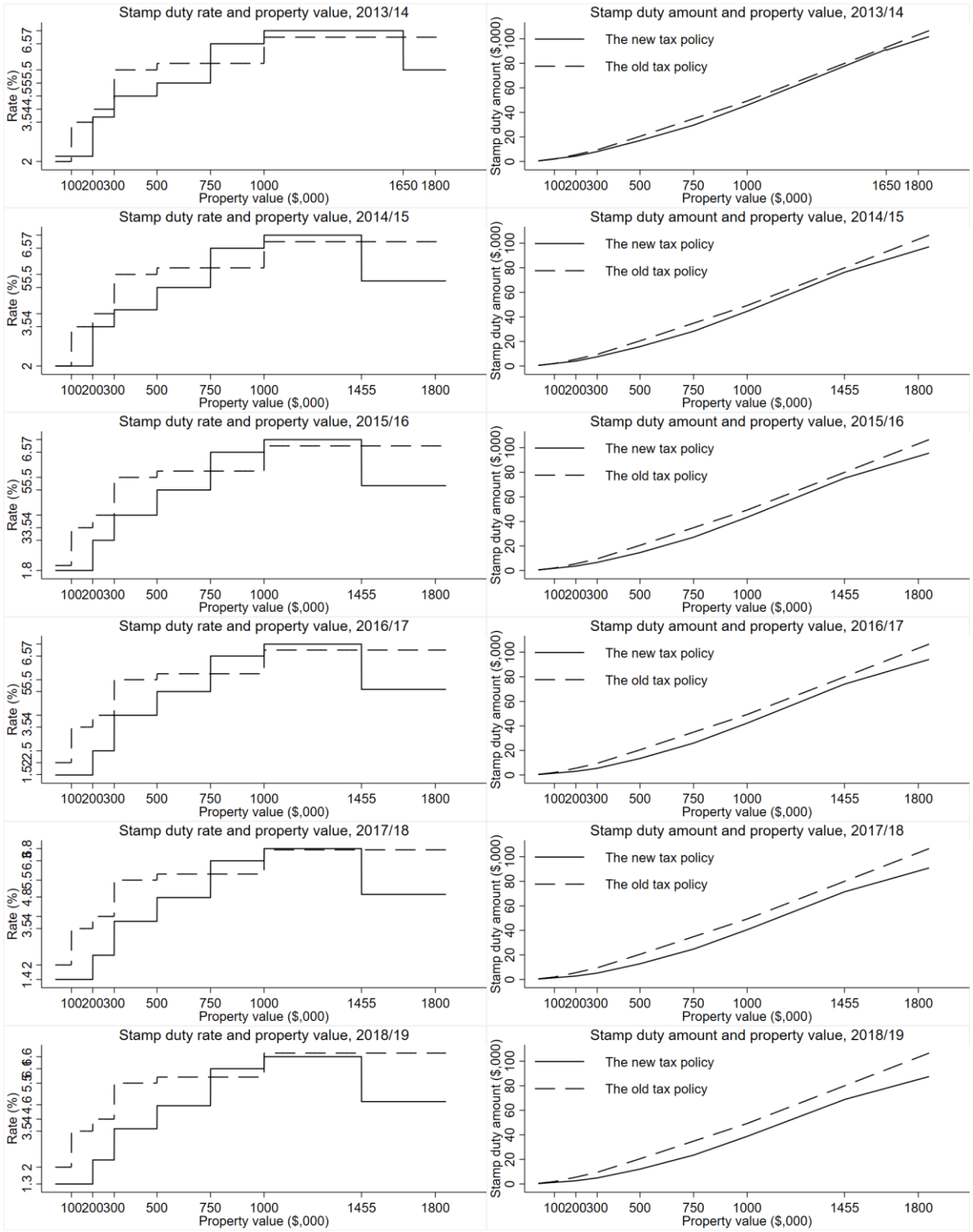
Year	Interest rate (%)
2011	7.00
2012	6.19
2013	5.39
2014	5.07
2015	4.75
2016	4.53
2017	4.30
2018	4.08

Source: Median interest rates calculated from SIHs 2011, 2013, 2015 and 2017.
Note: We extrapolate interest rates for the other years.



Source: The rules collected from the ACT Government Budget Papers No. 3 and our calculations from these rules.

Figure A1 - The ACT government's rate rules under the new and old policies, 2013-2018



Source: The rules collected from the ACT Government Budget Papers No. 3 and our calculations from these rules.

Note: From 2013-14, with the property value larger than a threshold, a flat rate is applied.

Figure A2 - The ACT government's stamp duty rules under the new and old policies, 2013-2018

Technical Appendix (for Part 2)

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24 March 2020

1. Introduction

This appendix is constructed as follows. First, more details are provided on the Corelogic data. Then differences between the Corelogic data and the ACT administrative data on the number of property sales are then discussed. Additional detail on the rental bonds data used is also provided. Finally, the four different control groups (counterfactuals) used in the analyses are described alongside the test results of the analysis of the common trends assumption. Extended results tables for all tables in the main report, including all control groups, are provided in the second to last section and results using administrative data from NSW and ACT in an alternative data approach are provided at the end of this appendix.

2. Corelogic data

CoreLogic is the largest provider of property information in Australia.[25] CoreLogic accesses a range of government data relating to property transactions, primarily through the Valuer Generals of each State and Territory. We have ten years of Corelogic property sales data available for our analysis. This includes three years before the ACT tax reform and seven years after the reform from late 2009 until late 2019. The data is a panel of suburb level, monthly statistics. We observe, for each property type (Houses or Units), the number of properties sold in the suburb, the median sale price for the suburb and the median value of advertised weekly rents in the suburb.

We observe over 10,000 suburbs[26] across all states and territories in the data. There are a total of 770,000 suburb-month observations where at least one property sold. Two thirds of these are observations on house sales and one third are observations on unit sales.

Figure 1 gives an overview of house price trends by State in the CoreLogic data. The price presented is a suburb-level median house price over 12 months. This allow us to focus on the longer term trend and minimise seasonal volatility. We observe a general upward trend in the

[25] https://www.corelogic.com.au/about-us

[26] Suburb is the smallest geography region in the ASGC geography hierarchy.

house price data. In nominal terms, in some States, the average median house price grew close to 40% over this short period.[27]

Figure 1. Average median house price trends by State and Territory 2010-2019

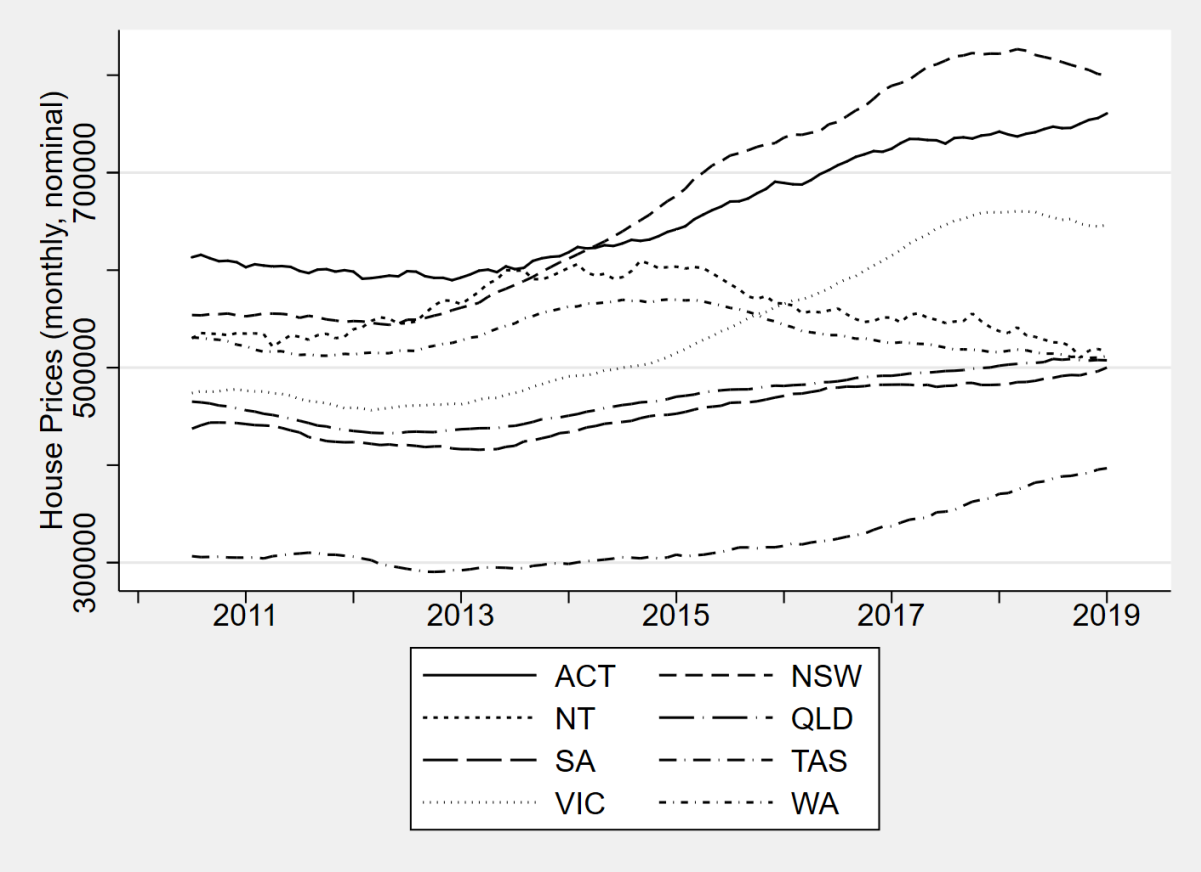
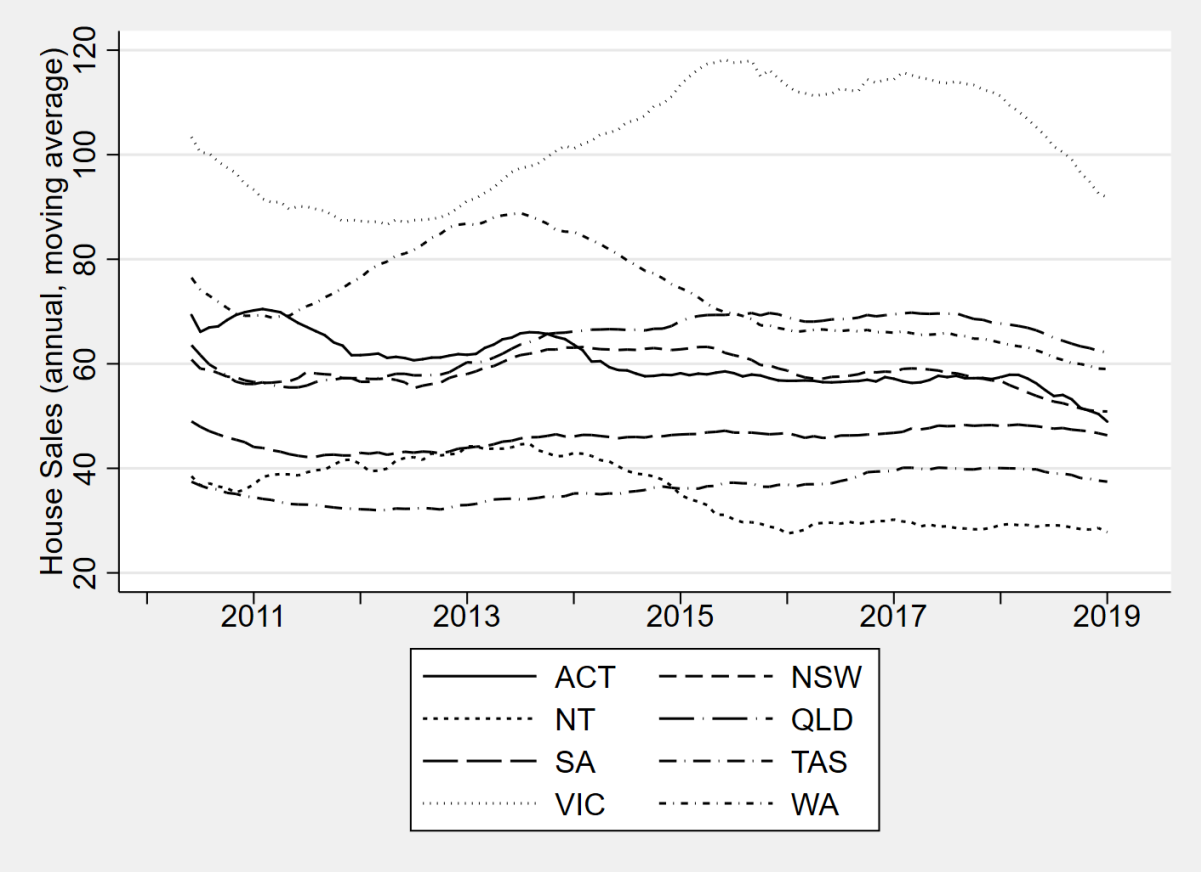


Figure 2 gives an overview of state and territories' average annual suburb sale numbers over time. A moving average is calculated to focus on the longer-term trend without seasonal fluctuations. We observe a largely sideways movement with some larger upturns and downturns in some states. Victoria and NSW have greater volatility in the number of sales over time.

According to the Corelogic data, the number of house sales per suburb in the ACT has largely moved sideways since 2012. This trend is also present for unit sales. These findings seem to be at odds with the administrative records from the ACT. We explore this further in the next subsection.

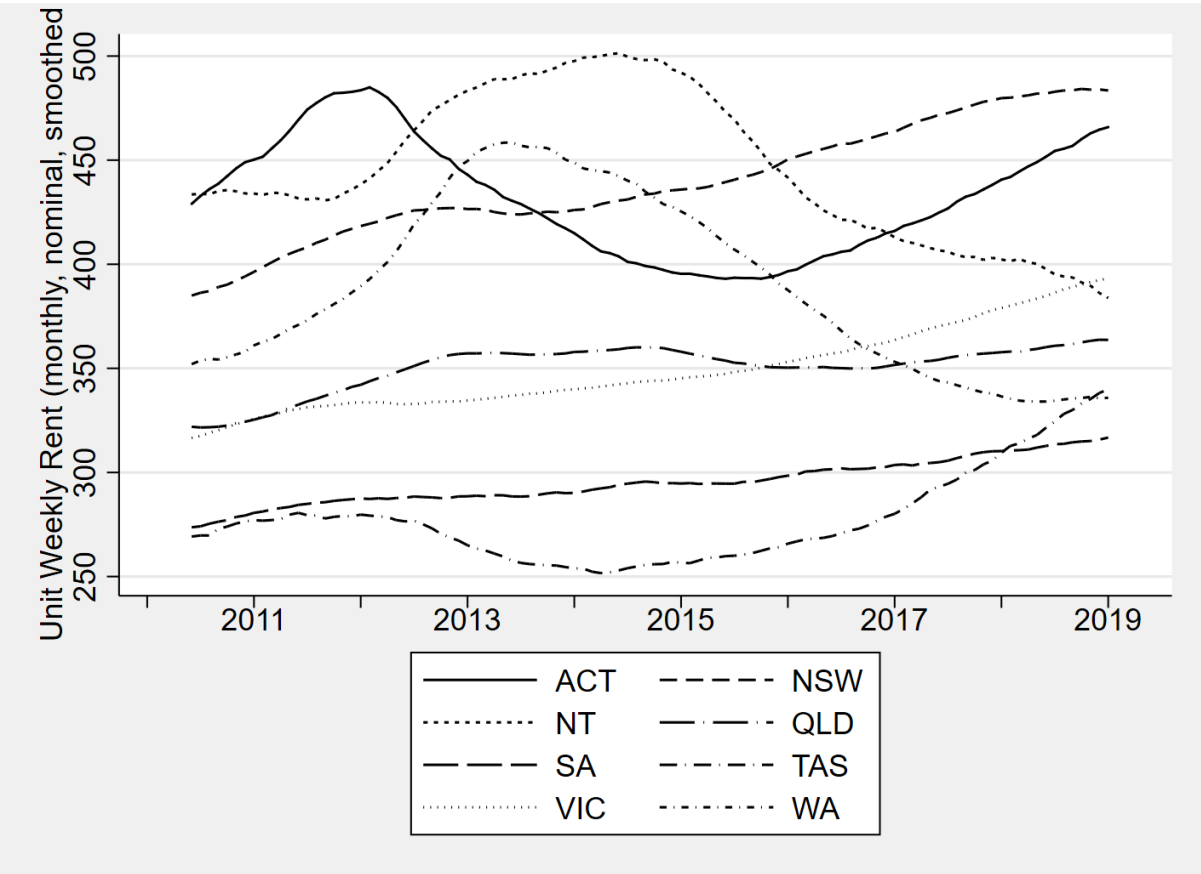
[27] Note we are not concerned with deflating sale prices for our econometric analysis as we employ time specific effects that will account for national inflation. The ABS does not provide State level inflation series. One other avenue we have not taken is to use a price index of capital cities.

Figure 2. Average number of houses sold, by State and Territory 2010-2019



As a final visualization of the Corelogic data we plot rental prices. Figure 3 presents the average unit's weekly rental price across the different states over time from 2010 to 2019. The price presented is an average over 12 months in order to minimise seasonal variation. We observe a general upward trend in nominal rental prices across most states. The notable exceptions are in TAS NT, WA and the ACT, where significant downturns arise within our sample period. Specifically, for the ACT we observe a downturn starting in 2012 which lasts for about 4 years. Rental prices in the ACT only return to pre-2012 levels in 2019. This broadly coincides with the property tax reform. It is likely that the underlying factors driving this change will have an effect on the reform estimates. This same trend is visible in the ACT's rental bond data.

Figure 3. Average weekly unit rental price, by State and Territory 2010-2019



3. Administrative Data for NSW and ACT

As a secondary data source to Corelogic we use administrative sales data from the ACT and NSW. This section gives a brief overview over the data.

We use fifteen years of administrative property sales data which were available for our analysis. This includes eight years before the ACT tax reform and seven years after the reform from 2004/05 until 2018/19. The data are individual sales in this period which we aggregate to a panel by postcode and month. The final panel has for each property type (Houses or Units), the number of properties sold in the postcode and the mean sale price in that postcode. There are no data on rental payments. Note that aggregating by postcode means that the data represent larger geographical areas than the suburb-level Corelogic data.

We observe over 674 postcodes across the ACT and NSW. There are a total of 171,000 postcode-month observations where at least one property was sold. Similar to the Corelogic data, two-thirds of the observations represent house sales and the remaining third are unit sales.

Figure 4 gives an overview of house price trends by state/territory in the administrative data. The price presented is an average house price over 12 months to focus on the longer term trend and minimise seasonal volatility. We observe a general upward trend in the house price

data. In nominal terms, the average house price grew close to 55% in the ACT and 130% in NSW over this period.

Figure 4 Average house price trends ACT and NSW 2005-2019

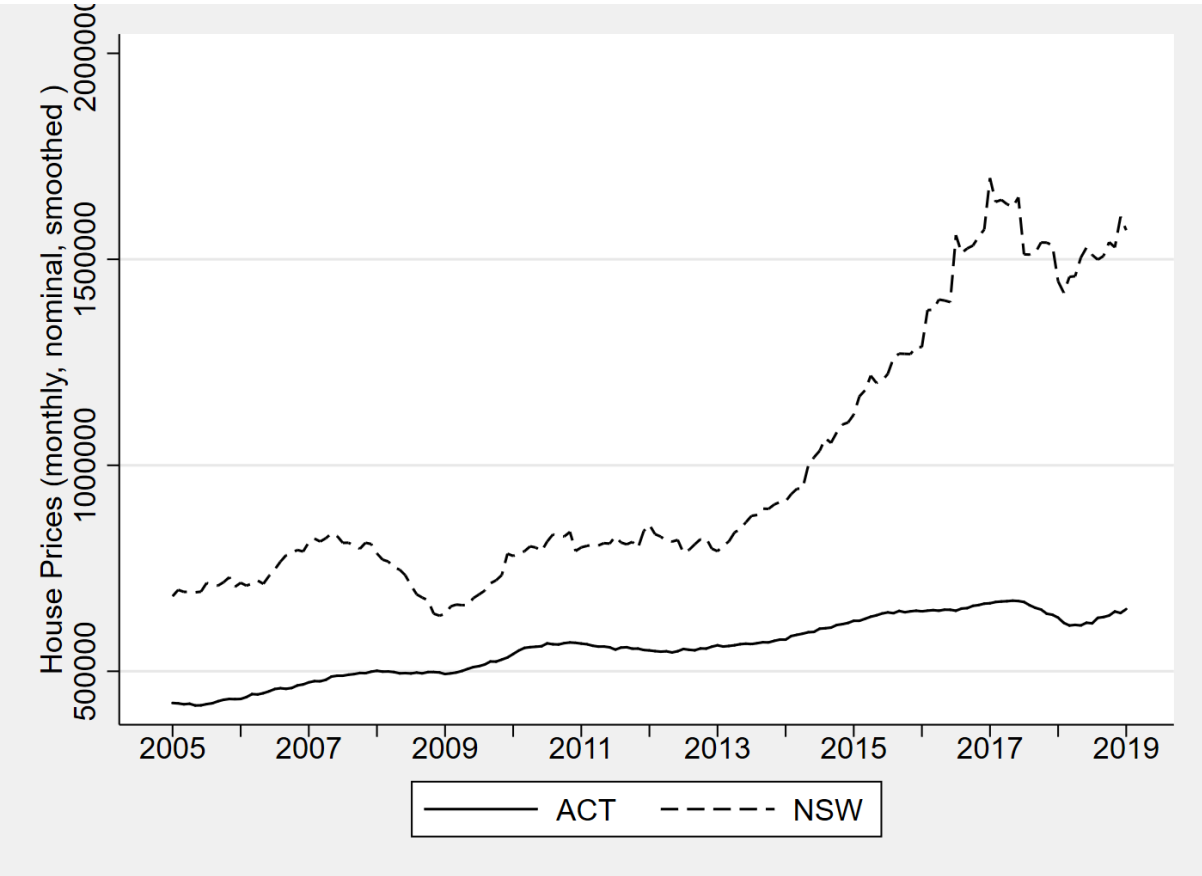
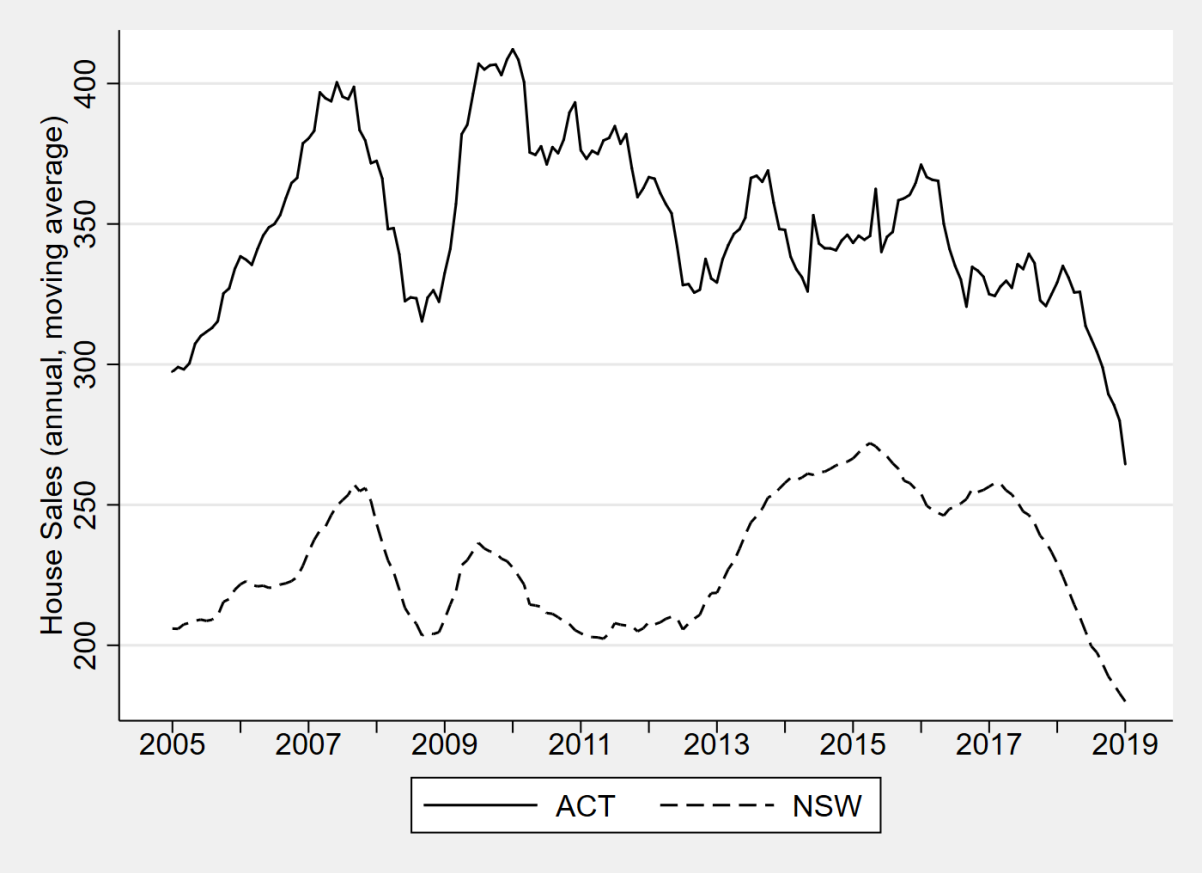


Figure 5 gives an overview of NSW and ACT average annual postcode level sale numbers over time. A moving, 12-monthaverage is calculated to focus on the longer-term trend without seasonal fluctuations. Even with the 12-month moving average, we observe large fluctuations in sales volumes over time.

Figure 5 Average number of houses sold in each postcode, ACT and NSW 2005-2019



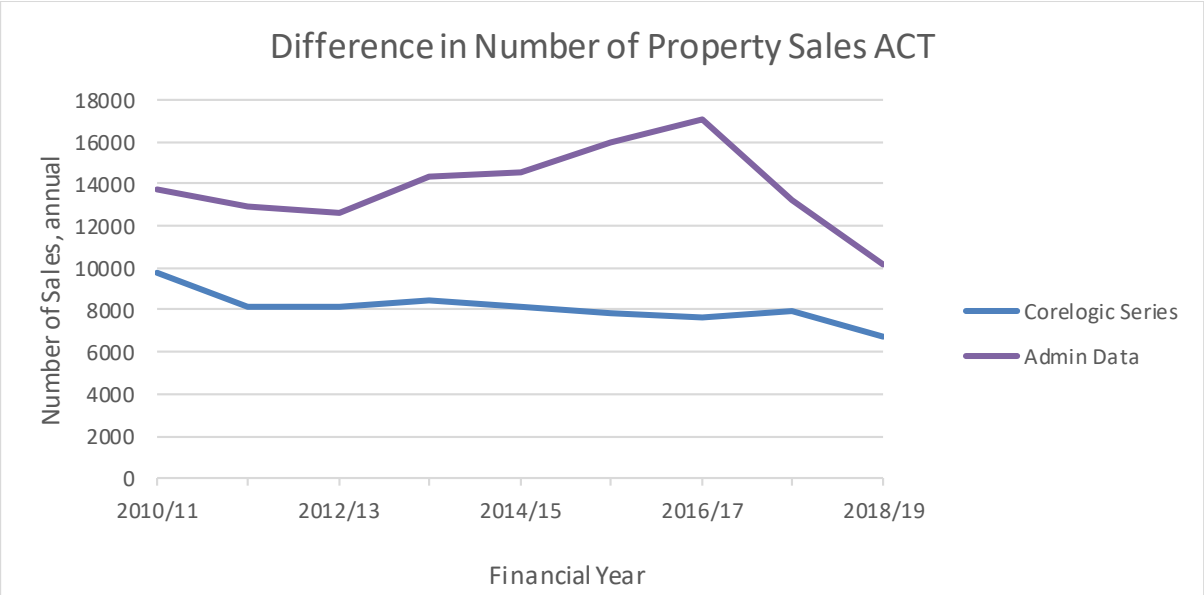
4. Differences in the Corelogic and administrative data on numbers of ACT sales

One concern, which was raised above and in the main report, is differences in the trend of property sale numbers observed between the Corelogic data and ACT's administrative data (see Figure 6). Specifically, the ACT unit record data show an increase in sales during the first five years of the reform. Sales numbers drop sharply from 2017/18, which is due to an administrative change (the introduction of the Barrier Free Model). In cases of off-the-plan and land only transactions, the Barrier Free Model allowed payment of stamp duty to be deferred until completion of construction as opposed to the previous requirement that stamp duty be paid 12 months after the transaction/execution date. This has resulted in some property transactions not yet being included in the current extraction of ACT stamp duty data, since these transactions will only be logged once stamp duty has been paid. Therefore, the count of transactions in 2017-18 and 2018-19 is 'artificially' low in the current data extract. We therefore also estimate models using only the pre-September 2017 data to check whether this administrative change impacts our estimates.

In contrast to the administrative data, our Corelogic data does not show an increase in sales for the years after 2012, but rather a sideways movement over the same period. This could have contributed to our finding that there was a reduction in both the number of property

sales and the overall sales value.[28] To address this concern we also use administrative data as a separate source of information to see if our results are affected in any way. The results from the NSW and ACT administrative data show that the observed differences in the Corelogic data are not driving our findings. These alternative estimates are presented at the end of the appendix.

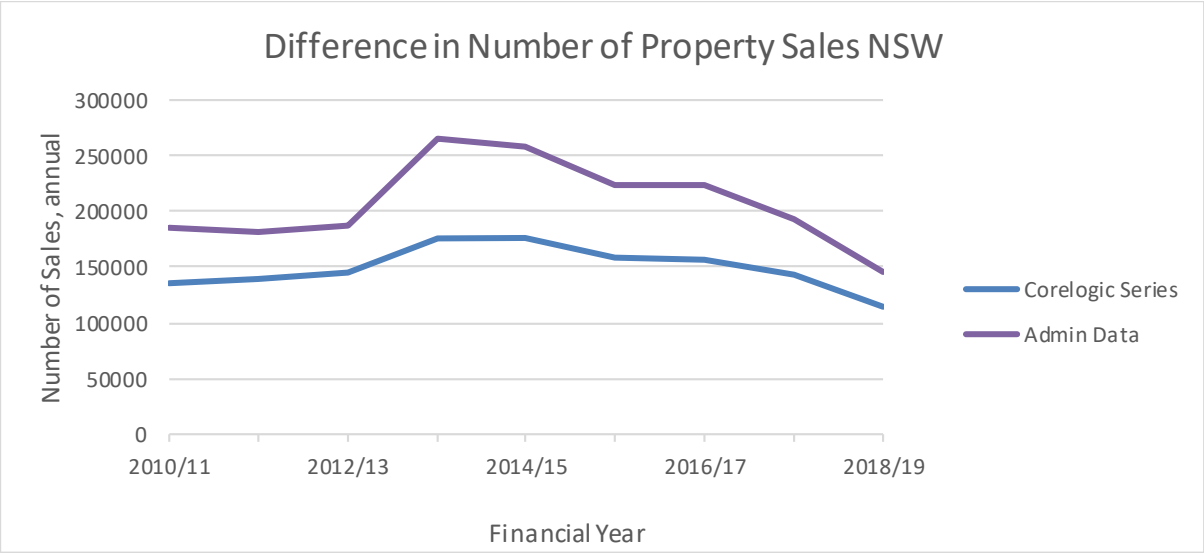
Figure 6 - Difference in number of property sales between the two data sources ACT



Similarly, when we compare the NSW administrative data to the Corelogic data, the overall differences appear to be similar in nature, with the number of salesin the administrative data consistently higher than the Corelogic numbers (see Figure 7). This provides more evidence that the Corelogic adjustments of raw numbers received from the state is consistent across states. These adjustments do not seem to be specific to the ACT. These anomalies are differenced out in our estimation methodology which explains why, despite the large apparent differences in the data, we obtain similar impact estiamtes from the two data sources

[28] The overall sales value is calculated on the basis of number sales times price.

Figure 7 - Difference in number of property sales between the two data sources NSW



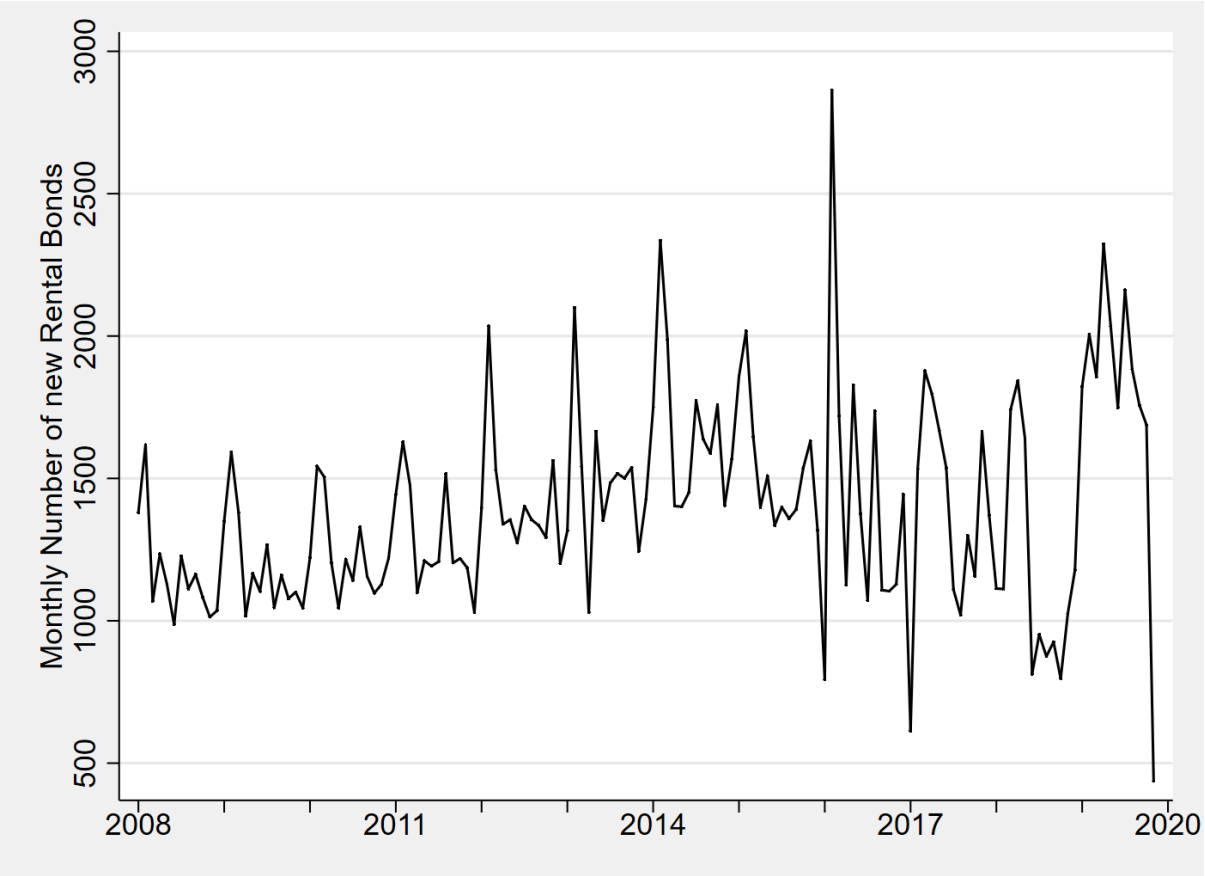
5. The rental bonds data

To answer questions about rental availability we cannot use Corelogic data, as it doesn't provide information on the number of advertised rental properties. Instead, we use administrative data on the number of rental bonds filed in the ACT. In lieu of observing the actual stock of rental properties, observing the flow of rental places is the next best alternative. Moreover, unless the rate of rental contracts concluding changes significantly over our sample period, the flow is a suitable proxy for rental availability in the ACT.

However, while the Corelogic data are available nationally, the ACT rental bond data are only available for ACT suburbs. As a result, we cannot control for common shocks over time as we have done in the difference-in difference approach in the cross-state sample. This presents implications for our results. For example, assume that at the same time as the ACT tax reform was introduced, a national trend emerged shifting preferences away from renting properties and towards buying one's own house or unit (this could happen if interest rates decreased). In the absence of data on the other states and territories, we could wrongly attribute this shift to the tax reform rather than to a change in national preferences.

With these caveats in mind, descriptive data on rental bonds from the ACT are provided below. Figure 5 shows the monthly amount of bonds registered with the ACT government. For each month we observe the number of rental bonds registered. Landlord are required to register a received rental bond, so unless they elect not to take a bond, new rental agreements will be counted in this data. It is common practice to collect a rental bond upon signing the lease.

Figure 8 - Monthly rental bonds registered - ACT time series data 2008 - 2019



We observe a seasonally volatile series which seems to become more volatile in 2012. Eyeballing the effect of the tax reform is difficult with the descriptive statistics as there is no clear break observable in 2012. A regression analysis is required to detect a possible effect. However, the graphs demonstrate the need to control for seasonal variation in the regression. This is done by including month dummies in the regression.

Table 1 below is replicated from Table 19 of the main report. It presents the results of a time series analysis with the number of registered rental bonds as the dependent variable. We use month fixed effects and a linear trend as basic controls for an existing trend and seasonality. In column 1 we only include the reform dummy to measure the effect. The reform dummy is a variable which is one for all months after the start of the reform and zero before. It will capture a general shift in the number of new rentals after the reform. In column 2 and 3 we add a number of extra controls and in column 4 we introduce a reform trend. The reform trend is a trend variable that starts with the introduction of the reform and zero in months prior to the reform. It captures any change in the trend after the reform.

Throughout the specifications, the reform dummy coefficient remains large and significant. The reform's variance inflation factor (VIF) indicates that we do not have to be overly concerned with multicollinearity. The reform coefficient suggests that more than 200 additional rental properties are available on the market each month due to the reform.

Table 1 (Table 19 from main report) - Effect of the tax reform on new rentals – time series analysis

Table 19 - Effect of the tax reform on number of new rentals - time series analysis

VARIABLES	(1) Number of Bonds	(2) Number of Bonds	(3) Number of Bonds	(4) Number of Bonds
Reform Dummy	238.243***	208.141***	225.237***	223.037***
Standard error	[81.560]	[78.420]	[60.706]	[63.084]
Reform Trend				2.755
Standard error				[10.287]
Linear Trend	0.184	0.771	39.659	41.008
Standard error	[1.318]	[1.231]	[31.580]	[29.857]
APS Employment		0.010*	0.023**	0.032
Standard error		[0.006]	[0.009]	[0.038]
Income			-1.328	-1.570
Standard error			[1.986]	[2.510]
Population			-0.069	-0.074
Standard error			[0.052]	[0.047]
Month FX	YES	YES	YES	YES
Observations	143	143	132	132
R-squared	0.366	0.371	0.517	0.517
Reform VIF	3.4	3.7	4.3	4.4

Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

This type of Before-After (BA) analysis is valid to estimate a treatment effect under certain circumstances. Most importantly that there is no other confounding effect on the outcome over the course of the treatment period. We do not have a control group to identify common changes that affect the outcome in both the control and treatment group in order to control for such confounders. Any such changes, like a downturn in the economy which coincides with the treatment period, will impact our estimate in this time series analysis and lead to an erroneous conclusion about the policy impact.

6. Multicollinearity

Multicollinearity is a problem in some instances. We check for multicollinearity issues in our data with a post-regression analysis of the correlation matrix. This is an alternative the variance inflation factor, which in our case is prohibitive to calculate given the large number of dummy variables in our regressions.

In the correlation matrix we observe a complete set of correlations between pairs of variables. We are only concerned about the correlation with our variable of interest, the reform dummy. Correlation between the other covariates is not biasing our results. The higher the correlation between the reform variable and any of the added controls, the less likely our measure of the reform estimate will be consistent. Correlation values in excess of 0.55 should raise concern about issues of multicollinearity.

In the results section for each regression, we report the largest correlation measure between the reform dummy and any other included controls as a measure of the severity of multicollinearity. Reporting the whole correlation matrix is impractical because of size and the largest correlation value from the correlation matrix gives a good indicator of multicollinearity for each regression.

7. Alternative control groups as counterfactuals

All suburbs in the ACT belong to the treatment group, as they all experienced the tax reform introduced in 2012. All other states and territories are part of the control group since they were unaffected by the ACT's tax reform.

Taking all Australian suburbs as the counterfactual is advantageous since we can utilize all available data. However, it is by no means certain that this control group - the entirety of all suburbs outside of the ACT - is the best control group. We therefore use a number of different subsets of the rest of Australia as alternative control groups in our robustness tests.

First, we reduced the control group to include only Australian States and Territory's capital cities. A second control group was limited to suburbs in NSW & VIC; as the two neighbouring states to the ACT, they may possibly be the most similar property markets. A third control group limited the analysis to suburbs from the capital cities of the neighbouring states (Melbourne and Sydney).

All three additional control groups could prove suitable candidates for a counterfactual to ACT's suburbs. However, each of these sets of counterfactuals has fewer and fewer observations, which tends to reduce the significance of the results. Furthermore, fewer observations can worsen multicollinearity. While the results from all capital city suburbs are presented in the main report, alongside the results for all Australian suburbs, the Results for all of the additional control groups are included at the end of this appendix.

8. Testing the common trend assumption

To verify the first assumption of the difference-indifference method, the common trends assumption, we run tests to see if the pre-treatment trends in the treatment and control groups are similar. In this section we present the results for the common trends tests.

A typical way to test if this assumption holds is to run a regression for the period before the policy implementation. In such regression we include a time trend for the treatment group. If the coefficient on the time trend were to be significant it would mean that there is significant variation between treatment and control group which the added time trend picks up. In this case the common trends assumption fails. If the time trend coefficient is not significantly different from zero, we take this as support for the assumption of a common trend prior to the policy intervention.

This test has the null hypothesis of a common trend between treatment and control groups. Rejecting the null hypothesis would imply that the two groups do not have common trends. However, failing to reject the parallel trend test in the pre-treatment period is not the same as confirming parallel trends between control and treatment groups.

The following tables present test results of the common trends assumption for the Corelogic data. For each data series; total sales value, property price, property turnover and rental price we have tested the hypothesis for four control groups; all suburbs, only capital city suburbs, suburbs from a subset of states (NSW and Victoria), capital cities suburbs from a subset of states and with controls.

We find that we do not reject the hypothesis of common trends between the ACT and control group for almost all of the tests. When the control group is restricted to only the suburbs of some capital cities, we cannot always reject the null hypothesis.

The following tables present the coefficient for the tested trend for the different control groups (columns) and across the different dependent variables (tables).

Table 2 - Common trend assumption tests - property market sales value

Log(Sales Value)	(1) All Suburbs	(2) All City Suburbs	(3) Subset States Suburbs	(4) Subset City Suburbs	(5) Subset City Suburbs & Controls
Trend Test	0.002	0.003	0.002	0.003	0.005
Standard error	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]
Observations	136,707	65,467	98,425	43,964	43,964
R-squared	0.792	0.736	0.801	0.750	0.751

Robust standard errors in brackets; ** p<0.01, * p<0.05

Table 3 - Common trend assumption tests - property prices

Log(Property Price)	(1) All Suburbs	(2) All City Suburbs	(3) Subset States Suburbs	(4) Subset City Suburbs	(5) Subset City Suburbs & Controls
Trend Test	0.000	0.000	0.001	0.001*	0.002
Standard error	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	136,707	65,467	98,425	34,022	34,022
R-squared	0.776	0.806	0.785	0.816	0.817

Robust standard errors in brackets; ** p<0.01, * p<0.05

Table 4 - Common trend assumption tests - number of sales

Log(Number Sold)	(1) All Suburbs	(2) All City Suburbs	(3) Subset States Suburbs	(4) Subset City Suburbs	(5) Subset City Suburbs & Controls
Trend Test	0.002	0.003	0.002	0.004*	0.004
Standard error	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Observations	137,638	66,350	99,206	44,701	44,701
R-squared	0.771	0.747	0.783	0.762	0.762

Robust standard errors in brackets; ** p<0.01, * p<0.05

Table 5 - Common trend assumption tests - property prices

Log(Rental Price)	(1) All Suburbs	(2) All City Suburbs	(3) Subset States Suburbs	(4) Subset City Suburbs	(5) Subset City Suburbs & Controls
Trend Test	0.000	0.000	0.001	0.002**	0.000
Standard error	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	60,608	38,346	45,101	16,187	16,187
R-squared	0.964	0.962	0.964	0.959	0.960

Robust standard errors in brackets; ** p<0.01, * p<0.05

9. Extended results tables

The following pages include the extended result tables of our analysis of the economic and affordability effects of the ACT tax reform. In particular, you will find results for the full set of alternative control groups in the tables below.

Overview

The order of the tables is the same as in the main report. The table numbers are also the same as those in the main report for ease of reference. All tables are exclusive to either house or unit observations. The results tables typically include additional results using NSW and Victoria as the control group in column 4. Column 5 is a combination of reducing the control group to suburbs from capital cities and NSW or Victoria. In other words, suburbs in Sydney and Melbourne are the counterfactual to the ACT in those cases.

All regressions are estimated as log-log specification, as the price series are log-normally distributed. This log-log specification is typical in the property tax literature and has the nice side effect of allowing us to read the coefficients on the continuous variables as elasticities and easily covert coefficients on dummy variables, making the interpretation straight forward.

As indicated in the main report, restricting the control group to smaller subgroups reduces the number of observations, which in turn can decrease the power of the regression and could lead to greater issues of multicollinearity. The tables below show that in almost all cases, the restriction to NSW and Victoria or to just suburbs in Sydney and Melbourne leads to an increase in the error term and to an increase in the correlation of the reform variable with the controls.

As we have confirmed the common trends assumption for all four control groups, it remains a matter of judgement and involves considering the trade-off between choosing all Australian suburbs or a smaller subset of Australian suburbs, but with larger error terms and greater concerns about possible multicollinearity. While we only present the results of the full sample and the alternative of capital cities in the main report, the conclusion in the main reports refers to robustness checks across all four counterfactuals.

Results

The first two tables are present the results on the economic impact on overall value of the house and unit markets.

Table 11 (from main report)- Effect of the tax reform on the housing market - estimations in logs

Log(Sales Volume)	(1) Full Sample	(2) Full Sample	(3) Capital Cities	(4) NSW & VIC	(1) Capital Cities, NSW & VIC
Reform Dummy	-0.103	0.031	-0.055	-0.042	-0.071
Standard error	[0.021]**	[0.022]	[0.022]*	[0.025]	[0.025]**
Log(Income)		3.102	3.053	2.311	2.920
Standard error		[0.080]**	[0.108]**	[0.288]**	[0.311]**
Log(Population)		3.129	3.961	2.141	3.753
Standard error		[0.128]**	[0.184]**	[0.251]**	[0.385]**
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	543,443	515,524	234,695	261,777	120,366
Number of Suburbs	10,116	10,045	2,806	5,069	1,455
Adj. R-squared	0.78	0.79	0.74	0.80	0.75
Max in Cor. Matrix	.	0.25	0.26	0.59	0.61

* p<0.05; ** p<0.01

Table 11b (not in main report) - Effect of the tax reform on the unit market - estimations in logs

Log(Sales Volume)	(1) Full Sample	(2) Full Sample	(3) Capital Cities	(4) NSW & VIC	(1) Capital Cities, NSW & VIC
Reform Dummy	-0.396	-0.222	-0.274	-0.284	-0.297
Standard error	[0.028]**	[0.031]**	[0.031]**	[0.041]**	[0.042]**
Log(Income)		3.414	3.351	2.788	3.457
Standard error		[0.160]**	[0.185]**	[0.402]**	[0.418]**
Log(Population)		2.479	3.216	0.835	2.495
Standard error		[0.222]**	[0.276]**	[0.406]*	[0.505]**
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	219,559	208,943	137,577	118,309	81,139
Number of Suburbs	3,799	3,781	2,112	1,980	1,135
Adj. R-squared	0.76	0.77	0.77	0.80	0.78
Max in Cor. Matrix	.	0.34	0.35	0.70	0.70

* p<0.05; ** p<0.01

The next two tables present the results on trends in the overall value of the house and unit markets. They are a one to one replication from the main report, for completion to have all results in one place.

Table 12 (from main report)- Trend in the effect of the tax reform on the housing market - estimations in logs

Log(Sales Volume)	(1) Reform Trend	(2) Trend & Controls	(3) Trend & Capital Cities	(4) Sample till 2015	(5) Sample till 2017	(6) Full Sample

Reform Dummy	-0.125	-0.013	-0.078	0.013	0.019	0.031
Standard error	[0.025]**	[0.025]	[0.026]**	[0.020]	[0.021]	[0.022]
Reform Trend	0.005	0.010*	0.005			
Standard error	[0.006]	[0.006]	[0.006]			
Log(Income)		3.108	3.059	2.606	2.928	3.102
Standard error		[0.080]**	[0.108]**	[0.081]**	[0.080]**	[0.080]**
Log(Population)		3.115	3.945	1.022	2.878	3.129
Standard error		[0.129]**	[0.185]**	[0.174]**	[0.140]**	[0.128]**
Time & Suburb FE	YES	YES	YES	YES	YES	YES
Observations	543,443	515,524	234,695	339,387	457,063	515,524
Number of Suburbs	10,116	10,045	2,806	9,343	9,848	10,045
Adj. R-squared	0.78	0.79	0.74	0.79	0.79	0.79
Max in Cor. Matrix	0.64	0.63	0.63	0.41	0.26	0.25

* $p<0.05$; ** $p<0.01$

Table 13 (from main report) - Trend in the effect of the tax reform on the unit market - estimations in logs

Log(Sales Volume)	(1) Reform Trend	(2) Trend & Controls	(3) Trend & Capital Cities	(4) Sample till 2015	(5) Sample till 2017	(6) Full Sample
Reform Dummy	-0.333	-0.174	-0.245	-0.269	-0.270	-0.222
Standard error	[0.049]**	[0.050]**	[0.050]**	[0.036]**	[0.031]**	[0.031]**
Reform Trend	-0.014	-0.012	-0.007			
Standard error	[0.008]	[0.009]	[0.009]			
Log(Income)		3.399	3.337	2.369	3.181	3.414
Standard error		[0.161]**	[0.187]**	[0.171]**	[0.161]**	[0.160]**
Log(Population)		2.504	3.238	2.252	3.673	2.479
Standard error		[0.223]**	[0.278]**	[0.343]**	[0.258]**	[0.222]**
Time & Suburb FE	YES	YES	YES	YES	YES	.
Observations	219,559	208,943	137,577	139,698	186,907	208,943
Number of Suburbs	3,799	3,781	2,112	3,601	3,740	3,781
Adj. R-squared	0.76	0.77	0.77	0.77	0.77	0.77
Max in Cor. Matrix	0.81	0.78	0.77	0.41	0.33	0.34

* $p<0.05$; ** $p<0.01$

The next two tables present the results on the reform effect on prices in the house and unit markets.

Table 14 (from main report) - Effect of the tax reform on house prices - estimations in logs

Log(House Price)	(1) Full Sample	(2) Full Sample	(3) Capital Cities	(4) NSW & VIC	(5) Capital Cities, NSW & VIC
Reform Dummy	-0.008	0.094	0.021	0.045	0.048
Standard error	[0.013]	[0.013]**	[0.013]	[0.013]**	[0.013]**
Log(Population)		1.910	2.568	-0.885	-1.724

Standard error		[0.067]**	[0.086]**	[0.144]**	[0.141]**
Log(Income)		2.267	2.324	1.774	2.800
Standard error		[0.050]**	[0.047]**	[0.161]**	[0.166]**
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	543,443	515,524	234,695	261,777	120,366
Number of Suburbs	10,116	10,045	2,806	5,069	1,455
Adj. R-squared	0.75	0.76	0.81	0.77	0.81
Max in Cor. Matrix	.	0.21	0.11	0.46	0.47

* p<0.05; ** p<0.01

Table 14b (not in main report) - Effect of the tax reform on unit prices - estimations in logs

	(1) Full Sample	(2) Full Sample	(3) Capital Cities	(4) NSW & VIC	(5) Capital Cities, NSW & VIC
Reform Dummy	-0.110	0.044	0.002	0.001	0.017
Standard error	[0.008]**	[0.010]**	[0.009]	[0.011]	[0.011]
Log(Population)		0.965	1.041	-3.124	-3.960
Standard error		[0.112]**	[0.143]**	[0.180]**	[0.189]**
Log(Income)		2.608	2.508	2.175	2.808
Standard error		[0.092]**	[0.076]**	[0.118]**	[0.119]**
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	219,559	208,943	137,577	118,309	81,139
Number of Suburbs	3,799	3,781	2,112	1,980	1,135
Adj. R-squared	0.67	0.68	0.69	0.74	0.70
Max in Cor. Matrix	.	0.19	0.44	0.69	0.69

* p<0.05; ** p<0.01

As the introduction of the Barrier Free Model in 2017 led to deferred recordings of sales for off-the-plan and land only purchases, this engendered an artificial overall reduction in recorded sales numbers. As a result, we might be concerned about the last two years of our sample driving the results, in particular, for the unit market. While the CoreLogic data does not seem to exhibit the reduction in property sales in 2017-18 and 2018-19 years (see comparison above), we have checked that our results are not sensitive to excluding those two years by re-estimating the model for a subsample of the data excluding the last two years. The results are reported in Table 14b and are nearly identical to the full sample results.

Table 14c (not in main report) - Effect of the tax reform on unit prices- estimations in logs 2009-2017

Log(Number Sold)	(1) All Suburbs	(2) All Suburbs	(3) Capital Cities	(4) NSW & VIC	(5) Capital Cities, NSW & VIC
Reform Dummy	-0.092	0.051	0.021	0.012	0.026
Standard error	[0.008]**	[0.010]**	[0.009]*	[0.010]	[0.010]**
Log(Population)		0.015	-0.013	-4.004	-5.475
Standard error		[0.117]	[0.151]	[0.207]**	[0.205]**
Log(Income)		2.260	2.280	1.840	2.391

Standard error		[0.085]**	[0.074]**	[0.116]**	[0.115]**
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	175,288	175,288	115,643	98,872	68,080
Number of Suburbs	3,707	3,707	2,086	1,948	1,121
Adj. R-squared	0.67	0.68	0.69	0.74	0.71
Max Correlation Matrix	.	0.25	0.43	0.62	0.61

* *p*<0.05; ** *p*<0.01

The next two tables present the results on the effects on the number of sales in the house and unit markets.

Table 15 (from main report) - Effect of the tax reform on the number of house sales - estimations in logs

Log(Number Sold)	(1) Full Sample	(2) Full Sample	(3) Capital Cities	(4) NSW & VIC	(5) Capital Cities, NSW & VIC
Reform Dummy	-0.096	-0.062	-0.075	-0.084	-0.117
Standard error	[0.029]**	[0.028]*	[0.028]**	[0.023]**	[0.023]**
Log(Population)		1.225	1.414	3.000	5.217
Standard error		[0.108]**	[0.168]**	[0.245]**	[0.376]**
Log(Income)		0.854	0.769	0.598	0.215
Standard error		[0.069]**	[0.105]**	[0.298]*	[0.328]
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	550,554	522,180	241,061	267,468	125,920
Number of Suburbs	10,117	10,046	2,806	5,070	1,455
Adj. R-squared	0.76	0.77	0.74	0.78	0.76
Max in Cor. Matrix	.	0.11	0.15	0.24	0.30

* *p*<0.05; ** *p*<0.01

Table 15b (not in main report) - Effect of the tax reform on the number of unit sales - estimations in logs

Log(Number Sold)	(1) Full Sample	(2) Full Sample	(3) Capital Cities	(4) NSW & VIC	(5) Capital Cities, NSW & VIC
Reform Dummy	-0.285	-0.265	-0.275	-0.284	-0.313
Standard error	[0.027]**	[0.029]**	[0.030]**	[0.040]**	[0.041]**
Log(Population)		1.516	2.174	3.963	6.429
Standard error		[0.185]**	[0.238]**	[0.377]**	[0.473]**
Log(Income)		0.810	0.848	0.629	0.665

Standard error		[0.138]**	[0.172]**	[0.385]	[0.405]
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	220,220	209,572	138,177	118,877	81,686
Number of Suburbs	3,799	3,781	2,112	1,980	1,135
Adj. R-squared	0.74	0.74	0.75	0.76	0.77
Max in Cor. Matrix	.	0.29	0.33	0.71	0.71

* p<0.05; ** p<0.01

As the introduction of the Barrier Free Model in 2017 led to deferred recordings of sales for off-the-plan and land only purchases, this engendered an artificial overall reduction in recorded sales numbers. As a result, we might be concerned about the last two years of our sample driving the results, in particular, for the unit market. The specification is rerun in Table 15b (not in the main report) for a subsample of the data excluding the last two years of our sample. We find an even larger decrease for this subsample.

Table 15c (not in the main report) - Effect of the tax reform on number of unit sales - estimations in logs 2009-2017

Log(Number Sold)	(1) All Suburbs	(2) All Suburbs	(3) Capital Cities	(4) NSW & VIC	(5) Capital Cities, NSW & VIC
Reform Dummy	-0.329	-0.397	-0.440	-0.276	-0.323
Standard error	[0.029]**	[0.031]**	[0.032]**	[0.040]**	[0.042]**
Log(Population)		3.347	4.622	6.069	9.080
Standard error		[0.233]**	[0.297]**	[0.527]**	[0.646]**
Log(Income)		0.558	0.565	1.364	1.406
Standard error		[0.140]**	[0.171]**	[0.371]**	[0.392]**
Time & Suburb FE	.	.	.	.	.
Observations	175,724	175,724	116,061	99,258	68,452
Number of Suburbs	3,707	3,707	2,086	1,948	1,121
Adj. R-squared	0.74	0.74	0.75	0.77	0.77
Max in Cor. Matrix	.	.	.	.	.

* p<0.05; ** p<0.01

The next two tables present the results of the rental prices in the house and unit rental markets.

Table 16 (Columns (1)-(3) from main report; Columns (4) – (5) not in main report) - Tax reform effect on house rental prices - estimations in logs

Log(Median Rent)	(1) Full Sample	(2) Full Sample	(3) Capital Cities	(4) NSW & VIC	(5) Capital Cities, NSW & VIC
Reform Dummy	-0.077	-0.014	-0.026	-0.008	0.008
Standard error	[0.006]**	[0.008]	[0.007]**	[0.008]	[0.008]
Log(Income)		1.505	1.471	1.419	1.679
Standard error		[0.057]**	[0.029]**	[0.057]**	[0.054]**

Log(Population)		1.121	1.344	-0.071	0.064
Standard error		[0.061]**	[0.070]**	[0.082]	[0.088]
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	263,249	248,629	153,750	122,691	78,559
Number of Suburbs	3,435	3,420	1,988	1,734	1,032
Adj. R-squared	0.91	0.92	0.95	0.96	0.96
Max in Cor. Matrix	.	0.52	0.23	0.45	0.40

* *p*<0.05; ** *p*<0.01

Table 16b (not in main report) - Tax reform effect on unit rental prices - estimations in logs

Log(Median Rent)	(1) Full Sample	(2) Full Sample	(3) Capital Cities	(4) NSW & VIC	(5) Capital Cities, NSW & VIC
Reform Dummy	-0.166	-0.082	-0.084	-0.069	-0.054
Standard error	[0.011]**	[0.013]**	[0.012]**	[0.011]**	[0.011]**
Log(Income)		1.516	1.464	1.499	1.655
Standard error		[0.074]**	[0.048]**	[0.077]**	[0.074]**
Log(Population)		1.231	1.227	-0.187	-0.230
Standard error		[0.099]**	[0.110]**	[0.105]	[0.112]*
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	134,234	126,901	90,643	76,135	57,672
Number of Suburbs	2,012	1,998	1,297	1,086	733
Adj. R-squared	0.90	0.91	0.93	0.95	0.94
Max in Cor. Matrix	.	0.41	0.26	0.23	0.18

* *p*<0.05; ** *p*<0.01

The following two tables presents the results for a quintile analysis of the effects on rental prices for both house and unit rental markets. They are a one to one replication from the main report, for completion to have all results in one place.

Table 17 (from main report) - Tax reform effect on house rental prices - quantile estimations in logs

Log(Median Rent)	(1) 1st Quintile	(2) 2nd Quintile	(3) 3rd Quintile	(4) 4th Quintile	(5) 5th Quintile
Reform Dummy	-0.060	-0.011	-0.039	-0.065	0.087
Standard error	[0.014]**	[0.013]	[0.010]**	[0.023]**	[0.021]**
Log(Income)	0.680	1.202	1.308	1.328	2.841
Standard error	[0.085]**	[0.061]**	[0.064]**	[0.073]**	[0.214]**
Log(Population)	0.782	0.855	1.011	1.365	1.022
Standard error	[0.147]**	[0.115]**	[0.118]**	[0.151]**	[0.161]**

Time & Suburb FE	YES	YES	YES	YES	YES
Observations	40,308	42,221	42,534	41,947	45,438
Number of Suburbs	438	434	445	441	499
Adj. R-squared	0.82	0.81	0.82	0.87	0.87

* *p*<0.05; ** *p*<0.01

Table 18 (from main report)- Tax reform effect on unit rental prices - quintile estimations in logs

Log(Median Rent)	(1) 1st Quintile	(2) 2nd Quintile	(3) 3rd Quintile	(4) 4th Quintile	(5) 5th Quintile
Reform Dummy	-0.130	-0.119	-0.118	-0.047	0.026
Standard error	[0.037]**	[0.023]**	[0.017]**	[0.018]**	[0.017]
Log(Income)	1.048	1.118	1.423	1.405	2.242
Standard error	[0.140]**	[0.105]**	[0.128]**	[0.126]**	[0.205]**
Log(Population)	1.289	1.222	0.741	0.766	1.117
Standard error	[0.237]**	[0.233]**	[0.236]**	[0.218]**	[0.241]**
Time & Suburb FE	YES	YES	YES	YES	YES
Observations	18,335	21,124	19,485	20,262	21,355
Number of Suburbs	216	228	203	212	218
Adj. R-squared	0.85	0.80	0.86	0.89	0.85

* *p*<0.05; ** *p*<0.01

As an additional control variable, we merge Corelogic data with data from the Australian Public Service Commission on APS employment statistics and use it, in addition to the population and disposable income data, as an additional control variable. The results are qualitatively similar to those presented in the main report. In some cases, the inclusion of the APS employment data raises the likelihood of multicollinearity and doesn't add much explanatory power. Therefore, the APS employment variable is not included in the main result tables.

10.NSW and ACT admin data result tables

In this section we present results using administrative data of sales from the ACT and NSW. NSW data is a likely candidate for an appropriate counterfactual given the proximity to the ACT. We re-start table numbering at 20 to avoid any confusion with tables presented above.

The regression approach is identical in this section. The table builds up including more and more controls from the left to the right. We observe that the results vary substantially in magnitude and significance depending on which control variables are included. We thus strongly encourage readers to interpret and apply these results cautiously. The results for houses and unites are shown in separate tables.

Generally, the fourth column in the tables below would be our preferred specification as they control for the maximum number of elements. Controlling for time- and postcode-specific

effects should reduce bias in the impact estimate. When conducting difference-in-difference analysis, it is general practice to present results with no control variables and then progressively add control variables as we have done. One reason for this is to see whether or not the additional controls affect the impact estimate. If the estimate changes dramatically from the case of no control variables to a full set of control variables, this is generally viewed as evidence that confounding factors are having a strong impact on the estimate of the policy. This generally leads researchers to have less faith in the estimate, as if observable factors are impacting the estimate, then it is likely that unobservables, which can not be controlled for, are also having a large impact on the estimate. This would mean that even the 'best' estimate with a full set of observable control variables may still be biased.

Note that all the caveats about having an appropriately specified control group still hold.

Table 20 - Tax reform effect on housing market: Difference-in-difference estimates using 2004/05 – 2018/19 administrative data

	(1) Log(Sales Value) b/se	(2) Log(Sales Value) b/se	(3) Log(Sales Value) b/se	(4) Log(Sales Value) b/se
ACT tax reform	-0.233**	-0.058	-0.374**	-0.201**
Standard error	(0.045)	(0.072)	(0.050)	(0.048)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.751	0.752	0.751	0.752
Observations	106546	103103	106546	103103
Postcodes	651	651	651	651

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 21 - Tax reform effect on unit market: Difference-in-difference estimates using 2004/05 – 2018/19 administrative data

	(1) Log(Sales Value) b/se	(2) Log(Sales Value) b/se	(3) Log(Sales Value) b/se	(4) Log(Sales Value) b/se
ACT tax reform	0.100	0.099	-0.176	-0.185
Standard error	(0.115)	(0.128)	(0.159)	(0.166)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.818	0.819	0.819	0.820

Observations	64811	62692	64811	62692
Postcodes	494	493	494	493

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 22 - Tax reform effect on house prices: Difference-in-difference estimates using 2004/05 – 2018/19 administrative data

	(1) Log(Sales Price) b/se	(2) Log(Sales Price) b/se	(3) Log(Sales Price) b/se	(4) Log(Sales Price) b/se
ACT tax reform	-0.112**	0.036	-0.149**	-0.008
Standard error	(0.029)	(0.040)	(0.037)	(0.043)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.594	0.593	0.594	0.593
Observations	106546	103103	106546	103103
Postcodes	651	651	651	651

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 23 - Tax reform effect on unit prices: Difference-in-difference estimates using 2004/05 – 2018/19 administrative data

	(1) Log(Sales Price) b/se	(2) Log(Sales Price) b/se	(3) Log(Sales Price) b/se	(4) Log(Sales Price) b/se
ACT tax reform	-0.127*	0.046	-0.071	0.086
Standard error	(0.057)	(0.044)	(0.126)	(0.110)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.663	0.662	0.663	0.662
Observations	64811	62692	64811	62692

Postcodes	494	493	494	493

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 24 - Tax reform effect on number of house sales: Difference-in-difference estimates using 2004/05 – 2018/19 administrative data

	(1) Log(Sales Numbers) b/se	(2) Log(Sales Numbers) b/se	(3) Log(Sales Numbers) b/se	(4) Log(Sales Numbers) b/se
ACT tax reform	-0.121**	-0.094	-0.226**	-0.193**
Standard error	(0.043)	(0.056)	(0.071)	(0.047)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.835	0.836	0.835	0.836
Observations	106556	103112	106556	103112
Postcodes	651	651	651	651

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 25 - Tax reform effect on number of unit sales: Difference-in-difference estimates using 2004/05 – 2018/19 administrative data

	(1) Log(Sales Numbers) b/se	(2) Log(Sales Numbers) b/se	(3) Log(Sales Numbers) b/se	(4) Log(Sales Numbers) b/se
ACT tax reform	0.226*	0.052	-0.104	-0.271**
Standard error	(0.101)	(0.113)	(0.082)	(0.101)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.814	0.815	0.814	0.815
Observations	64814	62693	64814	62693
Postcodes	494	493	494	493

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

As discussed above, due to the introduction of the Barrier Free Model in 2017, we might be concerned about the last two years of our sample driving the results, in particular, for the unit market. Similar to the regression above for the CoreLogic data we now check that our results are not sensitive to excluding those years by re-estimating the model using a subsample of the data excluding the last two years. The results are reported in in the tables below (not in the main report) and are qualitatively and quantitatively similar to the full sample results.

Table 26 - Tax reform effect on housing market: Difference-in-difference estimates using 2004/05 – 2016/17 administrative data

	(1) Log(Sales Value) b/se	(2) Log(Sales Value) b/se	(3) Log(Sales Value) b/se	(4) Log(Sales Value) b/se
ACT tax reform	-0.221**	-0.050	-0.394**	-0.224**
Standard error	(0.047)	(0.074)	(0.057)	(0.048)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.753	0.753	0.753	0.753
Observations	92408	92408	92408	92408
Postcodes	651	651	651	651

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 27 - Tax reform effect on unit market: Difference-in-difference estimates using 2004/05 – 2016/17 administrative data

	(1) Log(Sales Value) b/se	(2) Log(Sales Value) b/se	(3) Log(Sales Value) b/se	(4) Log(Sales Value) b/se
ACT tax reform	0.103	0.101	-0.198	-0.201
Standard error	(0.130)	(0.137)	(0.164)	(0.169)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.819	0.819	0.819	0.819
Observations	56044	56044	56044	56044
Postcodes	492	492	492	492

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 28 - Tax reform effect on house prices: Difference-in-difference estimates using 2004/05 – 2016/17 administrative data

	(1) Log(Sales Price) b/se	(2) Log(Sales Price) b/se	(3) Log(Sales Price) b/se	(4) Log(Sales Price) b/se
ACT tax reform	-0.072*	0.064	-0.184**	-0.048
Standard error	(0.028)	(0.041)	(0.038)	(0.043)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.586	0.586	0.586	0.586
Observations	92408	92408	92408	92408
Postcodes	651	651	651	651

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 29 - Tax reform effect on unit prices: Difference-in-difference estimates using 2004/05 – 2016/17 administrative data

	(1) Log(Sales Price) b/se	(2) Log(Sales Price) b/se	(3) Log(Sales Price) b/se	(4) Log(Sales Price) b/se
ACT tax reform	-0.081	0.075	-0.095	0.062
Standard error	(0.060)	(0.046)	(0.136)	(0.121)

Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.643	0.644	0.643	0.644
Observations	56044	56044	56044	56044
Postcodes	492	492	492	492

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 30 - Tax reform effect on house sales: Difference-in-difference estimates using 2004/05 – 2016/17 administrative data

	(1) Log(Sales Numbers) b/se	(2) Log(Sales Numbers) b/se	(3) Log(Sales Numbers) b/se	(4) Log(Sales Numbers) b/se
ACT tax reform	-0.148**	-0.114	-0.210*	-0.175**
Standard error	(0.042)	(0.058)	(0.082)	(0.054)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.838	0.838	0.838	0.838
Observations	92408	92408	92408	92408
Postcodes	651	651	651	651

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01

Table 31 - Tax reform effect on unit sales: Difference-in-difference estimates using 2004/05 – 2016/17 administrative data

	(1) Log(Sales Numbers) b/se	(2) Log(Sales Numbers) b/se	(3) Log(Sales Numbers) b/se	(4) Log(Sales Numbers) b/se
ACT tax reform	0.184	0.025	-0.103	-0.263**
Standard error	(0.114)	(0.122)	(0.080)	(0.097)
Time Fixed Effect	Yes	Yes	Yes	Yes
Postcode Fixed Effects	Yes	Yes	Yes	Yes
Log(Income)	No	Yes	No	Yes
Log(Population)	No	No	Yes	Yes
adj.R-squared	0.817	0.817	0.817	0.817
Observations	56044	56044	56044	56044
Postcodes	492	492	492	492

Note: Standard error clusters at state-postcode level * p<0.05, ** p<0.01