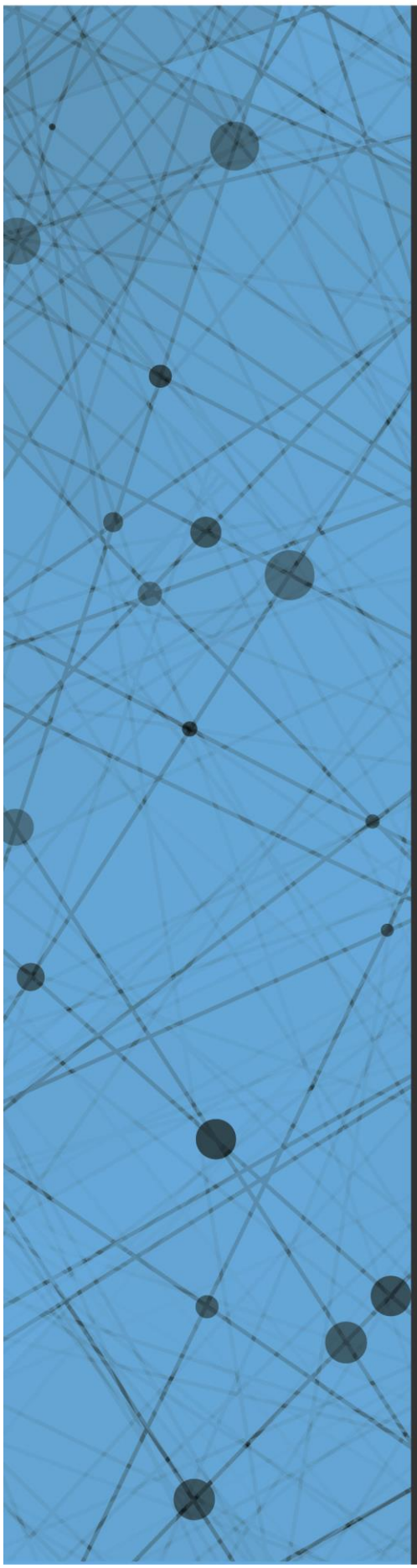

Do housing allowances increase rents? Evidence from a discrete policy change

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Abstract

A major concern with demand side housing subsidies to low-income tenants is the extent to which they may be captured by landlords in the form of higher rents. The Accommodation Supplement (AS) benefit is the largest housing subsidy policy in New Zealand. A 2005 policy change created a new AS-area around central Auckland that resulted in an increase in AS entitlement for residents within the area compared to those outside. In this paper we exploit the natural experiment created by this policy change to evaluate whether the increase in accommodation support for recipients in the new area led to relatively higher rents than paid by recipients outside the boundary. We use administrative data for a sample of AS recipients on either side of the new area boundary over the four-year period spanning the policy change. Our analysis shows that as a result of the policy change, recipients on the inside of the boundary received around $6.81 per week more in total accommodation support in the second year after the policy was implemented. We estimate that weekly rents increased on average about $2.44 more inside the boundary (36 percent of the increase in AS) and, as expected, the impacts were stronger at higher quantiles of the rent distribution. We also find that the rent increases were concentrated among families with children, and present some evidence that this reflected increased spending on housing (which may have reduced over-crowding), rather than a wider increase in rental prices.

JEL codes

H22, H53, R21

Keywords

Accommodation supplement, housing subsidy, rents

Summary haiku

Centre of Auckland
had higher housing support
some gains for tenants.

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1 Introduction

Housing is a substantial component of family budgets and plays a central role in the welfare of individuals and families. Housing is also a major focus of regulation and intervention policies by government aimed at achieving both efficiency and re-distributional objectives (Rosen 1985). Most OECD countries have a diverse portfolio of housing interventions including supply-side regulation to improve the quantity and quality of private housing; and demand-side subsidised public housing, subsidies to home buyers, and housing allowances to low income individuals and families in private housing (Salvi Del Pero et al. 2016).[1]

The design of demand-side housing allowance programmes varies across time and place, although their overall objective is to ensure that low income people are able to afford suitable housing without significant financial hardship.[2] A major concern with such programmes is the extent to which the subsidy is captured by landlords through higher rents or capitalised into house prices, leading to the deadweight loss of the subsidy with little improvement in the welfare of the recipients.[3] Although most research concludes that housing subsidies increase rents, the results are less conclusive in studies with more compelling experimental or innovative research designs (Kennedy 1980; Eriksen and Ross 2015; Eerola and Lyytikainen 2017)

In this paper we exploit a natural experiment created by a policy change in housing support in New Zealand to assess the extent to which an increase in housing subsidies led to higher market rents. In New Zealand the Accommodation Supplement (AS) benefit has been the government's largest direct investment in private sector housing subsidies for over two decades, and is a key element of the overall approach to housing for low income families.[4] The AS is a cash income payment to low income individuals and families, which depends on their housing costs, family size and income, housing tenure, and location. Currently, AS provides assistance with housing costs for 11% of the population, with about two-thirds of recipients being renters, and

[1] The level of such demand side expenditures ranges from about 0.1% of GDP in the US to over 0.8% in France (Eriksen and Ross 2015; Brewer et al. 2015; Grislain-Letrémy and Trevien 2016; Viren 2013). In New Zealand, public expenditure on state and private sector housing subsidies represents over 0.7% of GDP, similar to levels of housing subsidies in the UK and Finland.

[2] Evidence from the US shows that housing allowances improve the housing conditions of low income individuals and families by reducing homelessness, overcrowding, and living with relatives or friends (Mills et al. 2006; Wood, Turnham, and Mills 2008); improve the quality of housing and neighbourhood characteristics (Kennedy 1980; Mills et al. 2006; Orr et al. 2003); and reduce involvement with child protection and reduce exposure to intimate partner violence as a result of providing housing for homeless families (Gubits et al. 2016). The US research also finds that means tested housing subsidies can improve other aspects of living standards apart from housing, such as relaxing the family budget available for food and clothing (Jacob and Ludwig 2012; Mills et al. 2006).

[3] There may also be other unintended impacts. As with other components of a means tested income support system the abatement of housing subsidies may affect employment and hours of work choices. Recent US research finds that income related rent subsidies cause recipients to earn less (Carlson et al. 2012; Jacob and Ludwig 2012; Wood, Turnham, and Mills 2008).

[4] Since 2000, the AS has only been available to non-state tenants. The second major demand-side housing support is the Income Related Rent Subsidy (IRRS) programme, which has been available to state housing tenants since 2000, and provides support to over 90% of state tenants (covering over 200,000 individuals), and costs nearly 0.3% of GDP.

costs just over 0.4% of GDP, comparable to a number of other OECD countries (Salvi Del Pero et al. 2016).

A policy change in 2005 subdivided the single Auckland area into two distinct areas with higher maximum AS payment rates available in the central and northern urban area. This change reflected high and rising housing costs in Auckland, and led to a substantial increase in the level of AS available to residents within this area compared to those outside: depending on family size, the AS maxima for recipients inside the new area increased 28–45% relative to those outside.[5] By comparing changes in accommodation support and rental costs of recipients living either side of, but close to, the new area boundary, we examine whether the increase in support available in the new higher-AS area led to increases in housing rental costs relative to the adjacent area.

Our analysis uses data derived from Ministry of Social Development administrative records of all Accommodation Supplement claimants since 2003. The data contain information on the characteristics of the primary claimant, including details of their family and income. It also contains information on their physical address, which has been geocoded to identify recipients close to the new Auckland area boundary. Our analytical sample focusses on dwellings within 1km either side of this boundary and, to minimise possibly confounding effects of other secular changes, we focus on the four-year period around the 2005 policy change, over which this policy change was the dominant factor.[6]

We first document changes in AS and other housing-related payment over the study period. As a result of the policy change, the fraction of recipients receiving the AS-maximum fell 15 percentage points more for those inside. This led to a modest relative increase (about 5%) in the combined value of AS and other housing related payments for recipients on the inside of the boundary. The number of people receiving AS increased by roughly the same rate on either side of the boundary over the following two years. On average rents on the inside increased about 1% more on the inside compared to the outside.

We then use regression adjusted difference-in-differences approaches to analyse the nature and impact of the policy change. We find no effect on rents in the year following the policy change, perhaps reflecting that it takes time for tenancy rents to adjust. Focussing on the second year after the policy change, we estimate that, on average, accommodation related support payments increased by $6.81 more for those on the inside compared to the outside, and that rental payments increased by $2.44 per week. Not surprisingly, given the policy change

[5] There were also modest increases in the AS maxima in other areas, as a result of general increases in accommodation costs. For example, while the AS-maxima increased between 40–50% depending on family size for those within the new area, the AS-maxima increased 0–10% for recipients outside the new area boundary. The effective relative difference was also moderated by additional hardship payments which increased relatively more for recipients outside the new area boundary.

[6] To check the robustness of our results, we also identify and include dwellings which lie a further 1km from the boundary. These facilitate a pair of placebo analyses that compare the outcomes of recipients within 1km and between 1km and 2km of the boundary on either side of the area boundary.

increased the maximum amount of AS payable on the inside, we find larger increases in both subsidies and rents for recipients at the higher end of both distributions. Repeating the analysis by subgroup shows the effects as primarily concentrated among AS-recipients around the Southern boundary, and among families with children (particularly sole parent families). We also find that most of the increases in rental payments were associated with changes in tenancy, which may be because that is when rent changes mostly occur. Finally, we present some weak evidence of a reduction in the numbers of people in dwellings inside the boundary, consistent with the idea that increasing rent payments may reflect families' ability to afford better accommodation and reduce crowding.

The paper proceeds as follows. In section 2, we briefly discuss the nature of the Accommodation Supplement policy, and detail the 2005 policy change that we exploit in our analysis. We then review the literature on the impacts of demand-side housing subsidies on subsequent rent and housing costs in section 3. Section 4 describes the administrative data, and how we construct the data extract used. Section 0 then presents the analysis and results, and the paper concludes with a discussion in section 6.

2 The Accommodation Supplement in New Zealand

New Zealand's Accommodation Supplement (AS) is a non-taxable cash income supplement to low income individuals or families with high housing costs relative to their income.
The payment was first created in July 1993 and the appendix Table A1 provides a detailed chronology of the Accommodation Supplement and related housing policy changes since 1993 (McKenzie 2017; Johnson 2016).

Any resident 16 years of age or older is eligible to receive accommodation supplement payments if they have sufficiently high accommodation costs, and meet an income and cash assets test. The payment subsidises accommodation costs in the form of rent, board, and also costs associated with home ownership. Importantly, eligibility is not tied to being in receipt of a means-tested main benefit or New Zealand Superannuation, so that low paid non-beneficiary individuals and families are also eligible. Those in social housing are not eligible for the accommodation supplement, but are instead eligible for the Income Related Rent Subsidy (IRRS).[7]

[7] Under IRRS, tenants' rent is capped at between 25% of their net income up to the level of the New Zealand Superannuation pension rate (the single rate for single tenants, and the couple rate for other tenants), and 50% of income over that amount. The Housing New Zealand Corporation (HNZC) then receives a government subsidy equal to the difference between this rent and the market rent for the property.

The level of supplement payment is determined by the following formula:

$$AS = \min\{\max\{0, subsidy\ rate * (Acc\ costs - entry\ threshold)\}, AS\ max\} - abatement.$$

The formula has four elements. First, the entry threshold of accommodation costs, below which AS is zero. The AS entry threshold depends on the type of accommodation cost (rent and board, versus ownership costs), benefit status and whether there are dependent children.[8] Since the introduction of AS in 1993, annual inflation adjustments of the AS entry thresholds occur in April in each year.

The second element is an AS subsidy rate for accommodation costs above the entry threshold. The subsidy rate was set at 65% when the AS policy was introduced in 1993, and increased to 70% in 1997. This means that marginal increases in housing costs are only partially subsidised up to the maximum entitlement level, and the recipient will co-pay the remaining.[9]

Third, the maximum AS entitlement (*AS max*), which corresponds to a maximum accommodation cost beyond which AS entitlement is fixed. The maximum level varies by household size (1, 2, 3 or more), and by geographic location. At the time of introduction, the maximum level varied across three geographic areas (Auckland, Wellington, and rest of New Zealand), broadly according to relative cost of housing. Subsequent changes in 1996 resulted in several other cities being included in the Wellington-area that qualified for the intermediate AS maximum level.

The final element is an abatement term that depends on a claimant's income and assets. The abatement regime varies by benefit status. Claimants receiving a means tested main benefit do not face any abatement. [10] Superannuitants are not eligible for an accommodation supplement if their income (excluding NZS) exceeds a specified limit. For those not on a main benefit, the AS is abated by 25 cents for every dollar of additional income over the relevant threshold.

Many other countries operate housing allowance programs that are similar in design to the Accommodation Supplement. The Commonwealth Rent Assistance programme in Australia has a very similar structure with a minimum-rent threshold, a subsidy rate (of 75 cents in the dollar) above this minimum, up to a maximum subsidy. However, the payment is restricted to persons who receive (some) other social security payments and live in non-government rental accommodation (Martin, Pawson, and van den Nouwelant 2016). In other countries, allowances differ by eligibility criteria, payment formulae, the type of housing costs subsidised, and the

[8] For beneficiaries and superannuitants the entry thresholds are set at 25% (renters or boarders) or 30% (homeowners) of the applicable net benefit plus, where there are dependent children, the first child rate of the Family Tax Credit. For non-beneficiaries the entry thresholds are set in the same manner but use the relevant net rate of unemployment benefit.
[9] For boarders only 62% of their board costs are considered accommodation costs.
[10] Prior to October 2004 the payment could also be abated for recipients who were receiving a means tested main benefit.

extent to which overall government spending on the allowance is capped or demand driven (Salvi del Pero et., al, 2016).

2.1 The 2005 policy changes

The AS policy changes that our analysis focuses on were announced in the 2004 budget, and took effect in April 2005. These changes involved two components. First, the maximum levels of AS payment were increased across many areas. Second, and foremost for our analysis, a new AS-area was created by providing a higher level of maximum AS support for individuals living in the Central and North Auckland Urban Areas.[11] Throughout the paper, we will refer to the post-2005 Auckland areas, *Area 1* and *Area 2*, as "Inside" and "Outside" the boundary respectively. The changes to the maximum payment rates for the two Auckland areas are summarised in Table 1 for the three different household sizes.

Figure 1 maps the broad Auckland region, and shows the boundary line between the two Auckland areas after 1 April 2005. The boundary follows the edge of urban development in the north and Waitemata harbour in the north-west, and coincides with the Manukau harbour and industrial and greenspace areas in the south. However, it also transects an urban area through New Lynn in West Auckland. The western and southern boundary areas lie fully inside the area zoned for residential development described by the Auckland Metropolitan Urban Limit; in contrast, the northern areas lie outside this limit. Given research showing the impact of the limit on house prices (e.g. Grimes and Liang 2009; Zheng 2013), we estimate separate impacts for each of the areas.

Our focus is on the impact of the 2005 policy change on rental payments, so we will restrict our attention to rental related AS payments. Because of formal tenancy agreements and other factors, we expect rents are likely to take some time to fully adjust to policy changes. However, other factors will potentially affect areas differently over time, and thus contaminate the policy change treatment of interest and confound the ability to identify its impacts. Recognising this trade-off between a tightly focussed time-frame in which the April 2005 policy change is the dominant difference between the areas, while allowing sufficient time for possible impacts to occur, our analysis will focus on the four-year period around the date of the policy change (1 April 2005), allowing symmetric two-year periods before and after the change.

In addition to the main AS policy change of interest, there were some related policy changes over our period of analysis. These included changes to the abatement rules for

[11] There was also some reorganisation of towns and cities across the other three AS-areas. The new area structure for the Accommodation Supplement was based on a ranking of urban areas based on the lower quartile of rents for 2 and three-bedroom houses recorded in the bond dataset in 2004. Also as a result of this analysis, Wellington, Tauranga, Nelson, Queenstown, Wanaka and Arrowtown were re-designated with South and West Auckland as *Area 2* 'high-cost living areas'. Other cities and main provincial centres were designated as *Area 3*, and the rest of the country as *Area 4*.

beneficiaries, and the entry and income thresholds for non-beneficiaries in October 2004; and extending eligibility of AS to include residents in Retirement Villages in July 2005. An important change was the introduction of a Temporary Additional Support (TAS) hardship benefit, which replaced the discretionary Special Benefit in April 2006 with more formal payment rules than applied previously. As we will show below, TAS (and previously the Special Benefit) acted to reduce the differences in the combined value of all accommodation-related payments received on either side of the new Auckland boundary, thus weakening the empirical effect of the policy change of interest. Lastly, and importantly, there were also increases in assistance for families with children through the wider 'Working for Families' reforms. These changes increased the level of financial support through the tax system for low income families.

To provide a sense of the relationship between AS and rental payments, and how the 2005 changes affected AS entitlement by family size across the new AS-area boundary, Figure 2 shows AS entitlement for single adult recipients with no children, 1 child, and 2 or more children.[12] For single adults, shown in panel (a), AS was payable for those with rent above $44 per week up to a maximum support of $100 per week (for rent over $187 per week) for those outside the boundary, and $145 (for rent over $252 per week) for those inside the new area. Similarly, for sole parents with 1 child, the maximum AS received was $125 (for rent over $257 per week) if they lived outside the new area, and $165 (for rent over $314 per week) if they lived inside the area; and for sole parents with 2 or more children, the maximum AS entitlements were $165 (for rent over $314 per week) outside the area, and $225 (for rent over $400 per week) inside the area. The maximum fraction of rent covered by the AS payments is between 50-60 percent in each case, so that recipients will always have a substantial rental co-payment of at least 40 percent.

2.2 Theoretical predictions of the impact of a housing subsidy on rents

The simple neo-classical comparative static market model provides a useful framework to understand how an increase in a housing subsidy might influence the rental market. The theoretical predictions of the impacts of a stylised AS policy, as well as an increase in the maximum entitlement under that policy, are described graphically in Figure 3.

Assuming neither housing demand nor supply are perfectly price (in)elastic, the lines DD and SS represent the demand and supply schedules respectively for homogeneous rental housing. The equilibrium rent and quantity of housing in this case is (P*,Q*). Next, entitlement to accommodation support makes recipients less rent-sensitive, and the demand curve, DD0, tilts up at rent=Mn, which corresponds to the entry threshold for accommodation support, and down at rent=Mx0, the rent associated with the maximum-AS support level. Assuming the unsubsidised equilibrium price is above the entry threshold (P*>Mn), the equilibrium in the

[12] Figure 2 describes the potential AS received for any rental amount, abstracting from any abatement effects.

presence of an AS subsidy will be at the higher rent and quantity (P0,Q0). Finally, a policy change that increases the maximum AS support level to (rent-equivalent) Mx1 has the effect of extending the lower rent-sensitive region of demand beyond Mx0 to Mx1, and the demand curve becomes DD1. Again, assuming that P0>Mx0, the equilibrium after such a policy change will occur at still higher rent and quantity (P1,Q1). Both the absolute and relative demand and supply side elasticities within these regions will determine whether the incidence of the subsidy goes to tenants versus landlords, and the extent to which equilibrium rent versus quantity increases.

In our context, the lines DD0 and DD1 represent the post-2005 demand on the Outside and Inside the boundary respectively. In section 5.1, we show that about one third of recipients receive the maximum AS before the 2005 policy change. Given the discussion here, this suggests any policy impacts on rent should be concentrated in the top third of the rent distribution. This stylised comparative static framework implies that, so long as supply is not perfectly inelastic and sufficient tenants receive the maximum AS, the policy change will increase demand and bid up rent. For example, if housing supply is relatively inelastic, the incidence of a subsidy increase will fall mostly on landlords, resulting in an increase in rent and little change in the equilibrium quantity of housing.

Given the geographic proximity of the Inside and Outside areas, it is important to note that the policy change provides an incentive for AS recipient tenants to move inside the boundary, thus increasing demand inside and reducing demand outside the boundary. To the extent this happened, we expect to find greater relative rent increases on the Inside. We document the (lack of) evidence for such demand shifts below. It is also important to emphasise that the rental *price* in this theoretical context is the price for a homogeneous quality adjusted unit of housing. In the context of low income households, an increase in housing demand as a result of a housing subsidy may mean individuals are able to afford more or better quality housing. This may involve households moving out of physically substandard housing or to neighbourhoods with more amenities, and possibly alleviating homelessness or overcrowding. Such spending increases on housing would normally be considered a positive outcome of the subsidy increase. The concern with unintended consequences relates to these welfare gains for recipients being eroded by a wider market increase in rents, with landlords capturing a substantial fraction of the benefits of the subsidy.

Finally, it is useful to consider the impact of subsidies using alternative economic approaches to understanding the housing market. One approach includes search models that recognise that individuals looking for housing face search costs. In this framework, housing subsidies may change the payoff from continuing search, and are predicted to increase the price of new rental agreements because there is less value in continuing to look for better value tenancy (Collinson, Ellen, and Ludwig 2015). A second approach includes bargaining models that

focus on long term tenancy agreements and the differential costs of contract termination. If rent is determined by bargaining, and the costs of finding and moving house are greater for tenants than landlords, then the value of a rent subsidy over a tenancy agreement will also be subject to bargaining. In this framework housing subsidy increases may increase rents for both new and existing tenancy agreements as a result of bargaining and renegotiation (Susin 2002).

3 Literature review

In this section we review the salient international and New Zealand literature on the relationship between demand-side housing subsidies and the market price of rental housing. Although the research generally finds positive effects of subsidies on housing rents, such a conclusion is not universal and the magnitude of the impacts is variable. This is particularly the case with recent literature that uses innovative and more compelling research designs to identify the impacts of interest.

The US ran two large scale housing support experiments in the 1970s: the Housing Allowance Demand Experiment (HADE), and the Housing Assistance Supply Experiment (HASE). The HADE programme administered a variety of different types of allowance plans to 2,400 households with 1,000 control households in two cities (Pittsburgh, Pennsylvania and Phoenix, Arizona) in the mid-1970s. The experiment studied over 40 different options in total, which generally offered eligible households similar levels of assistance either through direct cash payments or reduced rents. Two main types of allowance plans were examined: Housing Gap (HG) plans, which paid eligible households the difference between a local average cost of modest housing and a fraction of household income, subject to finding adequate quality housing; and Percent of Rent (PR) plans, which paid eligible households a fraction of their rent, and was not subject to housing requirements.

Kennedy (1980) reviews and summarises the results of the HADE. The results imply that the HG housing quality requirement is substantially constraining, in that the HG plans have much lower participation rates (45%) than in the unconstrained PR plans (84%). They also imply that households are much more likely to participate in the HG plans if they would normally occupy housing that meets the requirement (78% versus 19% for those that would not normally meet requirements). The impacts on housing rents also appear to vary by type of plan. There is evidence of rent increases under the PR plans, which is attributed to the plan incentives making participating households less price-sensitive. In contrast, there is little evidence of rent increases under the HG plans, which is attributed to a variety of factors, including potentially open supply of minimum standard housing, price-elastic demand for such housing, and that a substantial fraction of households induced to meet the minimum standards did so by upgrading their existing dwelling.

The HASE programme was a large-scale housing allowance scheme that operated in two counties for five years in the late 1970s.[13] The HASE programme was quasi-experimental in nature, because it was an open-enrolment programme for all eligible low-income households in the two counties (including both renters and home owners), and had no control group. The HASE provided lump-sum monthly cash payments to low income households, which depended on their household size and income, the cost of housing in the community, and were subject to specified housing quality standards. The lump sum allowance was calculated so that a household in suitable housing at the estimated "standard" rent would have housing expenses net of the allowance of 25% of adjusted gross household income.

Lowry (1982) summarises the results of the HASE. The housing allowances were substantial, amounting to about a quarter of recipient households' income for renters, and a sixth for home owners. Of the extra income, only about 20% was spent on housing, suggesting the income elasticity of demand for such low-income households was about 0.2.[14] There was little effect on overall rents, and only minimal increases in households' rent (<2%) when they joined the programme, which may partly reflect additional maintenance required to bring dwellings up to standard. Lowry predicted that a national rollout of such a programme would likely only affect (i.e. benefit) participants, and not cause significant rent increases for either participants or other households.

In the US the main demand-side housing support is provided by a housing voucher programme.[15] The US housing voucher programme works more like NZ's IRRS for public housing, albeit without requiring public housing, and differs in several potentially important ways from New Zealand's AS policy. First, household eligibility is based on its current income compared to 50% of the household size-adjusted metropolitan area median income. Second, the local area supply of housing vouchers is fixed, and results in excess demand for vouchers in almost all areas. Third, receipt of a voucher requires the household to apply through the local Public Housing Authority (PHA), be waitlisted, and once they receive a voucher, have 2-4 months to find housing that meets minimum quality standards (set by the Department of Housing and Urban Development, HUD). The voucher subsidy is determined by the area's Fair Market Rent (FMR) for the house size chosen, and the household's current adjusted income.[16] Finally, the government housing subsidy is calculated so that households pay no more than 30% of their

[13] The two counties were both in the US Midwest, but selected to have somewhat contrasting housing markets. The first, Brown County, Wisconsin, had a growing urban centre with a relatively tight housing market, with little racial segregation; while the second, St Joseph County, Indiana, had a declining urban centre with weaker housing demand and a segregated minority population. To limit the overall cost of the experiment, the selected counties were smaller than average with populations of about 200,000 roughly equally split between the main city (Green Bay and South Bend respectively) in each and surrounding areas.

[14] Note also that this is a gross elasticity, which includes necessary expenditure to satisfy the housing quality requirement as well as more discretionary expenditure on housing.

[15] See Olsen (2003) for a review of US housing assistance programmes. Housing vouchers were first allocated under Section 8 of the 1974 Housing and Community Development Act. The Section 8 voucher programme was renamed Housing Choice Vouchers (HCV) in 1988.

[16] The FMR is calculated as 45th percentile of the rents paid by recent movers in the Metropolitan area.

income in rent, and is paid directly to the landlord, rather than as a cash benefit to the household.

Susin (2002) uses metropolitan area data to estimate the impact on local rents from expansions in the voucher program between 1974 and 1993, focusing on the incidence of housing vouchers per household on rents across the lower, middle and upper rent terciles. Susin finds that growth in housing vouchers in an area had a substantial positive effect on lower tercile rents, while not affecting middle and upper tercile rents. In particular, the estimates from his preferred (1974–93 long-difference) specification imply that a 1% increase in vouchers per household in an area led to a 1.3% increase in the area's lower tercile rent. However, this specification is susceptible to possible endogeneity bias associated with areas with secularly rising lower tercile rents receiving relatively more housing vouchers.

Eriksen and Ross (2015) used data from the American Housing Survey to construct a panel of rental properties over the period 1997–2003, to analyse the effects of changes in voucher availability in an area on rental prices in the area. Controlling for area-specific fixed effects, they find no impact of vouchers on rent in the full sample of rental properties, nor in subsamples stratified by whether the property's (1997) rent was less than or greater than 120% of the area's FMR. However, given the voucher system targets low income households and encourages recipients to vacate low quality rental properties in favour of those with rents around the FMR, Eriksen and Ross further subdivided the sample with rent less than 120% of FMR. This shows that an increase in vouchers led to higher rental prices among properties near the 1997 FMR value; and lower rental prices among lower-quality rental properties.[17]

In the UK, the Housing Benefit (HB) programme is available to both private and public sector tenants and can pay up to 100% of their rent. Public sector tenants receive it as a rent rebate and private sector tenants as a rent allowance. The HB parameters have changed over time, with significant restrictions introduced in 1996, and further reductions in generosity in 2011 as part of the government's fiscal tightening following the GFC. Currently, the HB is available to low income renters, with entitlement determined as the minimum of their actual rent and a Local Housing Allowance cap, which varies by location and family structure, set at the 30th percentile of local private sector rents of non-HB recipients, and abated at 65% as household income increases.[18]

Gibbons and Manning (2006) analyse the impacts of the 1996 policy changes, that resulted in less generous HB support for new claims, on private sector rents. They find that the changes led to lower rents, but only for tenants who were directly affected by the policy changes and

[17] In particular, they estimate the elasticity of rent with respect to vouchers at -0.1 among low-rent properties (those with 1997 rent below 80% of FMR), and at 0.04 among higher-rent properties (those with rent between 80% and 120% of FMR).

[18] The 2011 policy change involved several dimensions, including removal of a £15 per week bonus to low-renters (i.e. those with rent less than the Local Housing Allowance cap), and reducing the cap from the 50th percentile (median) of local rents to the 30th percentile, and introducing other caps on rent.

moving into new private sector accommodation after the policy reform. They also find that such rent reductions accounted for the majority (85–100%) of the reduction in HB received. Brewer et al. (2015) exploit natural experiment elements in the 2011 policy changes to analyse the effect of the decline in generosity of HB on rent. In contrast to Gibbons and Manning, Brewer et al. find that the changes had little overall effect on rents, with HB recipients bearing about 90% of the incidence of the fall in subsidy. However, they find greater impacts on the subgroup of HB tenants occupying higher rent properties, who were most likely to be affected by the policy changes.

In other literature, Laferrère and Le Blanc (2004), and Fack (2006) analyse the effects of increases in housing benefits to low income tenants in France in the early 1990s. They each find substantial relative increases in rents paid by benefit-assisted compared to unassisted tenants. For example, Falk concludes that, due to inelastic housing supply, the incidence of the subsidy falls largely on the supply-side of the market, with rents increasing by 78% of the increase in housing support received by tenants.

In Finland, housing demand subsidies depend discontinuously on the floor area of a dwelling, with jumps in the maximum support available at various points. Kangasharju (2010) and Viren (2013) analyse the effects of changes in the maximum support on rents over 1994–2003, and 2000–2008 respectively. They each find substantial effects of the subsidy on rents, on the order of 57% (Kangasharju) and 30–50% (Viren). In contrast, Eerola and Lyytikainen (2017) use a regression discontinuity analysis to exploit the discontinuities in the maximum subsidy by floor area to assess the link between housing subsidies and rent. They document economically and statistically significant discontinuities in housing assistance by the floor area, but find no jumps in rent at corresponding points, implying that the incidence of the housing support changes associated with the discontinuity points falls on tenants rather than landlords.

The only New Zealand research on the effects of the AS on rent are two aggregate analyses. Grimes et al. (2013) developed an aggregate housing market model to analyse responses to exogenous shocks and policy changes. Simulations of the impact of increasing AS find, in the short run, higher rents that result directly from assistance to renters, which persist in the long run because of higher house prices from AS assistance to home-owners. Stroombergen (2004) models the aggregate historical relationship between market rents and AS. In contrast to the findings of Grimes et al. (2013), Stroombergen finds very small and statistically insignificant effects of AS on average rent, little evidence of an effect on lower-quartile rents, and also minimal effect on Auckland rent.

Finally, it is worth noting that the design of the AS programme ensures that recipients make both a fixed contribution (from the minimum-rent threshold) and a marginal contribution (from the 30% co-payment up to the maximum supplement level) to rent payments. These

design features represent potentially important differences with the US and UK housing subsidy programmes.

4 Data description

The data used in the analysis are derived from the Ministry of Social Development (MSD) administrative records of all AS claimants since January 2003. The data contain snapshots of all current payments on a specific day each *month* from MSD's Social Welfare Information for Tomorrow Today (SWIFTT) payment information system.[19] The underlying data form the basis for payment of AS. For each primary claimant for AS, identified by their Social Welfare Number (SWN), this snapshot contains information on their physical address, partnership status, the number of dependent children, their weekly earnings and other income declared to MSD, the type of housing arrangement (rent, board or ownership), whether or not the landlord is private, the weekly cost of housing, the amount of the AS subsidy received, the value of other housing related payments (Temporary Additional Support or Special Benefit), and the value of all other benefits paid (excluding tax credits).[20]

In addition to the payment information, the dataset also contains geographical covariates based on the geocode of the place of residence. The use of a geocode is a particularly strong feature of this study as it allows us to precisely identify the location in relation to the new Auckland AS-area boundary, and thus formulate treatment and control groups on either side of this boundary.[21] In addition, the geocode location identifies whether the residence was likely affected by the Metropolitan Urban Limit, and also helps identify the recipient's local area unit. However, it is important to note that the dataset does not contain any physical information about the size or nature of the dwelling. This means that it is not possible to identify if adjustment along quantity or quality dimensions occurred. The main variables used in the analysis are listed in Table A2.

As noted, our analysis is restricted to AS recipients with an address within 1km either side of the new Auckland area boundary during the two years before and after the policy change date (1 April 2005). We also restrict attention to renters, who make up 57% of all AS recipients in the wider dataset, and exclude boarders and homeowners.[22] The resulting analytical dataset

[19] The sampling date is typically the Friday around the turn of the month (i.e. either the last or first Friday), but may occur on the last Thursday or Wednesday (typically in December). We will refer to the data frequency as "monthly".
[20] Note that the SWIFTT data are continually updated to reflect any retrospective changes or back-dating of payments, so the payments etc. observed do not necessarily correspond exactly to that received at the time by recipients.
[21] Across all records, 92% had an address that could be geocoded. About 0.7% of records have AS payments that are inconsistent with the area they are assigned to. We suspect this reflects a combination of payment errors and geocoding errors. Because our ability to identify payment errors is asymmetric across the boundary and the low incidence of errors we have not dropped such observations.
[22] This includes snapshots from 28 March 2003 to 02 March 2007. We also dropped 60 observations where there was either no AS paid, no recorded rent or a weekly rent payment greater than $1,000, and 240 duplicate observations.

contains 377,916 monthly records relating to 28,369 distinct AS claimants receiving rent-related payments over the period.

Table 2 contains summary statistics of the characteristics of the analytical sample. The first column contains the characteristics of the full sample, and the next four columns for the subsamples of the Inside versus Outside and Pre- versus Post-2005. In the full sample, Females, and non-Europeans are over represented among AS claimants. Single adults form the most common family type, accounting for about one third of all AS claimants. About three quarters of AS recipients receive some form of working age benefit support, with about one-third being sole parent families on the Domestic Purposes Benefit. A further 5% are NZ Superannuitants. The average AS receipt is $97 per week which, together with an average of $15.70 in other hardship-related support (such as TAS or Special Benefit), covers just about one-half of the average rental cost of $227.50.[23] Average total reported income is $346, meaning that accommodation costs (net of support) account for about one third of income. Most AS recipients live in the South area (about 60%), 38% live in the West, and only 2% in the North.

There are some apparent differences in both the demographic and financial characteristics across the Inside and Outside area samples, implying that the Outside area is not a perfect control for the Inside policy change area. For example, AS recipients are on average slightly more likely to be female, Maori and European, and have more children in the Outside area. The latter is also reflected in about 5-6 percentage points more sole parent families and about 4 percentage points more Domestic Purposes Beneficiaries in the Outside area than Inside. In addition, the distribution of recipients across the South and West varied across the Inside and Outside: with about two-thirds of Inside recipients living in the South and 30% in the West, compared to less than 60% and 40% respectively for Outside recipients. Consistent with having larger families, or for other reasons, AS claimants in the Outside area have about $8 (4%) per week higher rental payments on average, received higher AS support before the policy change, and also report about $15 (5%) higher incomes.[24] Finally, while the fractions receiving the maximum AS payment were similar across the two areas before the policy (28% in the Outside and 26% in the Inside), there was a large difference afterwards (30% in the Outside versus 9% in the Inside). Thus, the larger increase in AS maxima for claimants in the Inside area led to a large reduction in this fraction on the Inside, while the smaller increases in the maxima on the Outside did little to stem the rise in the fraction of claimants receiving the maximum support.

[23] Using the Ministry of Business Innovation and Employment (MBIE) Tenancy Bond rents data for the Auckland Territorial Authority as a benchmark, AS recipient rents in our sample typically correspond to the lower-quartile of the rent distribution.

[24] Results in Table 4 imply that differences in the observed characteristics account for about two thirds of the $8 higher rental payments in the Outside, with the regression-adjusted difference being about $2.70. Before the 2005 policy change, on average claimants in the Outside received $4 (4%) per week more Accommodation Supplement, and $7 (7%) per week more total accommodation support than those in the Inside area. After the policy change, those on the Outside received $4.40 less AS, and only $1.40 more total accommodation support than those on the Inside.

5 Analysis and results

We now turn to the analysis of the effect of the 2005 policy change to introduce the higher support zone around central Auckland on rental prices paid inside compared to outside the boundary. We first present some descriptive trends around accommodation support and rent payments, before turning to a variety of regression based analyses of the effects of the 2005 policy change on rents.

5.1 Descriptive analysis

We begin by presenting trends in accommodation supplement and rent payments over the four-year analytic period around the policy change, presented in Figure 4 and Figure 5. Figure 4 displays the monthly trends in the average AS payment received (panel (a)), the fraction of recipients receiving the maximum AS payments (panel (b)), the average total accommodation support (including other hardship-related housing assistance) (panel (c)), and the average rent payments (panel (d)), in the Inside and Outside areas.

First, as seen in Table 2, both accommodation support and rent payments were higher on the Outside before the policy change, while the fractions receiving the maximum AS were more similar although trending higher on the Outside in the year before the policy change (around 35% in early 2005). Second, consistent with the expected policy effects, panels (a) and (b) show steep increases in average AS payments and a large decrease in the fraction at the maximum respectively after April 2005 for those Inside relative to Outside the boundary.[25] Average payments in the Inside area increased about $8 per week in April 2005, and the fraction receiving the maximum fell about 25 percentage points as the maximum increased. Although there is no noticeable change in average payments in the Outside area, the fraction receiving the maximum fell about 10 percentage points at this time. These changes suggest the policy's direct treatment was concentrated in the top quartile of the distribution of recipients. Third, including other hardship-related housing assistance, panel (c) shows the average total accommodation support payments also increased Inside relative to Outside at the time of the policy. Finally, changes in the average rent payments are less obvious in panel (d), although some convergence does appear to occur following the policy change.

Because the main component of interest is the increase in the maximum AS payment for recipients on the Inside relative to the Outside, in Figure 5 we plot the comparative trends in the higher percentiles (75th, 90th and 95th) of total AS payments (panel (a)) and rent payments (panel (b)). Although somewhat variable, these indicate the relative increase in AS payments was stronger higher up the distribution, while changes in rent are less clear.

[25] The late 2004 jump in the fraction of recipients receiving the maximum AS for both groups in panel (b) are due to the changes to the abatement rules for beneficiaries, and to the entry and income thresholds for non-beneficiaries in October 2004.

Raw difference-in-differences estimates for the changes in accommodation supplement and rent associated with the policy change are presented in Table 3 for: weekly AS payments, total accommodation support payments, weekly rent (in levels), and log(rent). The first panel shows the average AS received was about $4 less for the Inside relative to the Outside over the 2 years before the policy change. The Inside average increased by nearly $15 per week, and was over $4 higher during the 2 years after the change, giving a relative difference-in-differences increase of $8.30. The second panel shows the value of total accommodation support (which includes other housing related payments. Total accommodation support received on the Inside was relatively lower both before and after the change, and there was a smaller difference-in-differences estimate of the policy change of $5.50.

Turning to the difference-in-difference estimates of changes in rent, consistent with lower AS-receipt before and after the policy change, panels 3 and 4 show that average rents were 3-4% lower on the Inside. Also, there was some convergence over time, with a difference-in-difference estimate of $1.90 per week (about 0.9%) relative increase in rents of recipients Inside the boundary, although not statistically significant. The estimates based on both levels and log(rent) are comparable. Also, comparing the estimated rent increase with the estimated Total-AS increase suggests that about one-third (i.e. $1.90/$5.54) of the increased AS passed through to higher rental costs on average.

We have also calculated raw "quantile" difference-in-difference estimates of total-AS and rent payments for various percentiles in the top half of the distribution.[26] Consistent with expectations, the raw treatments are $0 at the median, and monotonically increasing at higher quantiles, from $9.50 at the 75th percentile to $15.61 at the 95th percentile. The corresponding raw difference-in-difference estimates are less systematic for rental payments but show broadly similar patterns ($0, $4.09, $0.76 and $5.00 at the median, 75th, 90th, and 95th percentiles respectively).

Finally, given the relative incentives to locate Inside the boundary,[27] we document the change in AS caseloads Inside and Outside the boundary over the period in panel 5 of Table 3. The numbers of AS recipients Outside was about 50% higher than Inside the boundary in the two years before the policy change, but increased almost the same in relative terms (11.6% Outside compared to 12.0% Inside). We have also examined cross-boundary transition patterns of recipients, between their first and last observed locations. First, over the full four-year period, we estimate the transition rate from Outside to Inside is 3.7%, and from Inside to Outside is 5.8%. Second, within the two years before and after the policy change, we estimate slightly

[26] We report quantile regression-adjusted difference-in-difference estimates of rent impacts in Table 7, and of total-AS payment changes in Table 9.

[27] The incentive to locate Inside associated with the 2005 policy change only applies to high-AS recipients, in particular those receiving the maximum AS on the Outside. In fact, to the extent that rents increase relatively inside the boundary, low-AS recipients potentially have an incentive to locate Outside. If this occurs, we would see a sorting of high-AS recipients moving Inside and low-AS recipients moving Outside.

higher transition rates in both directions post-change (4.1% versus 3.9% outward transitions, and 2.6% versus 2.5% inward transitions). Third, we estimated transition rates for subsample stratified by whether or not the AS-claimant received the maximum AS when first observed. The estimated patterns are similar for those below the AS-maximum (4.2% versus 3.9% outward transitions, and 2.8% versus 2.7% inward transitions). For those at the AS-maximum, the inward transition rates are similar (1.9% after versus 1.8% before), while there is a somewhat larger drop in the outward transition rate in the period after the policy change (2.7% versus 4.0% before).[28] Although this last result is consistent with a response to the incentives in the policy changes, overall we conclude there is little evidence of cross-boundary effects to affect the analysis.

5.2 Full sample regression analysis

Differences in the average AS-received and rental costs likely reflect some heterogeneity in characteristics across recipients Inside and Outside the boundary. Because of this, we next consider various regression-adjusted estimates of the effect of the AS policy change.

Table 4 shows the results for rents. Panel A contains results from four regressions for the dependent variable outcome of rent in $-values. Panel B contains results for analogous regressions of log(rent). The first specification controls for common time-effects, using dummy variables for each year to April. Doing this, the estimated impact is slightly lower ($1.81, and 0.010 on log(rent)) than the $1.90 (0.011 log(rent)) difference-in-difference estimate. The second specification includes controls for the demographic characteristics of the AS-recipients.[29] Controlling for demographic characteristics lowers the estimated impact further to $1.56 (and 0.009 on log(rent)). The third specification also allows for constant differences between the North, West and South areas using area fixed effects. The estimated impacts are unchanged ($1.56, and 0.009 on log(rent)) from the previous specification. Each of these estimates have relatively low statistical significance, with the t-statistics on the Rent-levels and log(rent) estimates about 1.5 and 1.75 respectively.

Recognising that rent may take some time to adjust in response to the policy change, the fourth specifications in Table 4 includes separate impacts in the first and second years following the policy change. This shows small and statistically insignificant estimates of the first-year

[28] The relative transition rate patterns described here are robust to including the two adjacent Inner and Outer areas. For example, the full-period transition rates across the boundary are 4.9% Inwards and 7.7% Outwards.
[29] These include claimant's gender, age (dummy variables for age<30, 30-49, and >49), ethnicity (European, Maori, Pacific, and other), family-type (Single adult, Sole parent with 1 child, Sole parent with at least 2 children, Couple, Couple with 1 child, and Couple with at least 2 children), the number of children, welfare benefit receipt (NZ Superannuation, Unemployment benefit, Sickness benefit, Invalid's benefit, Youth benefit, Emergency benefit, Domestic Purposes benefit, Disability allowance, and No benefit receipt), whether the tenancy had a private landlord, and the reported additional incomes of the primary claimant and their partner.

impact ($0.62, and 0.005 on log(rent)), and larger and statistically significant estimates for the second-year effect of $2.44 (or 0.013 on log(rent)).[30]

The final specification we consider allows the rent difference between the Inside and Outside areas to vary over the two years prior to the policy change. This facilitates a test of the so-called common trends assumption of the difference-in-differences approach although, as the policy change was announced in the 2004 budget in May 2004, any difference may reflect an announcement effect of the policy, as well as other confounding effects. The estimates from this regression show a small and insignificant coefficient on the interaction between the Inside and 2004/5 dummy variables, implying the common trends assumption is sound. The resulting policy impact estimates in this specification are similar to the previous specification. Given these results, we will use the previous specification, which allows for separate impacts in the first and second year following the policy change, as the baseline specification for subsequent regressions in the analysis.

5.3 Subsample analysis

We next examine whether the policy change had different impacts across sub-populations, by estimating the baseline regression using subsamples stratified first by geography (defined by the North, West and South sub-areas), and then by family structure (stratified by Single adults, Sole parents with 1 child, Sole parents with 2+ children, Couples, Couples with 1 child, and Couples with 2+ children). As well as allowing different policy impacts across the subgroups, this also relaxes the relationship between rent and the control variables across the subgroups.

We first estimate the full specification regression separately using each of the three areas, and present the results in Table 5. These results show larger estimated first and second year effects in the South of $1.81 and $3.50 respectively (0.013 and 0.023 log points), smaller and imprecisely estimated effects in the West, and large positive but imprecisely estimated impacts in the North area. The second-year rent estimate ($3.50) and both year log(Rent) estimates for the South are statistically significant at the 5% level, and imply rental payments increased about 1.5-2 percent on average Inside the boundary after the policy change.

In Table 6 we present separate estimates for six subsamples stratified by the AS claimant's family-type. These results show that rent increases that occurred were largely confined to families with children. In particular, in 2006/7 the rent paid by Sole parents with children Inside the boundary increased $6.13-$7.43 (2.3-3.1%) per week more than for comparable families Outside the boundary, and the rent for Couples with at least 2 children was $9.65 (3.1%) per week higher, and these estimates are statistically significant. In contrast, there was little (or

[30] We have also estimated regressions that control for Area Unit fixed effects. The results for the full sample, and subsamples stratified by area and family type, are presented in Appendix Table A3. These specifications find slightly larger impacts for the full sample and area subsamples, and slightly smaller impacts for the family type subsamples, than those presented in Table 4, Table 5, and Table 6.

negative) relative change in rent for Single persons, and Couples with at most 1 child. This pattern of results suggests potentially strong rent increases for families as a result of the increase in AS. Alternatively, however, the results may reflect such families being able to afford either larger or better quality rental accommodation. We return to this issue below, and attempt to test whether these patterns reflect pure price effects on rent, or at least partly quantity effects, perhaps associated with a reduction in over-crowding in such households.

5.4 Quantile regression analysis

As discussed above, recipients directly affected by the increase in the maximum AS associated with the new zone were those who might have received the maximum AS before the policy change. For example, Figure 4(b) implies about one-third of AS-recipients on each side of the boundary received the maximum at the time of the policy change, and that 15-20% more recipients Inside the boundary benefited from the maximum-increases compared to those Outside. As a consequence, estimating the mean effects in the regression analysis above may either be difficult to detect and/or not accurately reflect the effects of the policy change across the distribution.

In this section, we follow Bitler et al. (2006) who observe that estimates of mean impacts may miss important effects at different points across the distribution. To do this, we use quantile regression methods to assess whether the policy change had varying effects at different points of the distribution, conditional on client case characteristics. Given we expect the policy change is likely to affect AS-recipients with relatively high rent, we focus on the higher level conditional quantiles: specifically, the median (for some comparability with the mean), and the 0.75, 0.9, and 0.95 quantiles. Table 7 summarises the estimated policy effects from these quantile regressions, together with the mean regression estimates, for both rent and log(rent) outcomes, estimated using the full sample, and subsamples by area and by family-type.

Although the individual estimates are often relatively imprecise, the patterns of results are broadly in line with the expectations that the impact on rent was larger higher up the distribution where recipients were more likely to be directly affected by relaxing the maximum constraint. For example, taking the full sample, compared to the mean second year impact on weekly rent of $2.44, the estimates increase across the quantiles from small and insignificant -$0.06 and $2.28 at the 0.5 (median) and 0.75 quantiles, to larger and statistically significant $4.96 and $6.51 at the 0.9 and 0.95 quantiles. Broadly similar patterns of increasing effects are observed in the subgroups with significant mean regression effects in Table 5 and Table 6 (i.e. the South and families with children). In section 5.6 we interpret the magnitudes of these estimates.

5.5 Robustness analysis

To provide a test of whether the estimated impacts may reflect changes over time in the strength of any gravity effects associated with proximity to central Auckland, we extend the regression sample to include additional 1km ribbons that lie adjacent to the Inside and Outside areas. We refer to these additional ribbons as the *Inner* and *Outer* areas respectively. If any relative change in rent either side of the boundary is only due to the policy change, then there should be no difference in the rent changes in the Inside versus Inner, or in the Outside versus Outer, areas after April 2005. Conversely if rents increased more in areas closer to central Auckland, then we would expect to see an increase in rents in the Inner area (relative to Inside), and a fall in rents in the Outer area (relative to Outside) after April 2005.

Table 8 presents results from extended regressions that include the Inner and Outer ribbons, and allow rents to vary across these four areas both before and after the 2005 policy change. In particular, we test whether there was a change in rents in the Inner relative to Inside, or in the Outer relative to Outside areas after the policy change. First, for the full sample, the main impact estimates are similar to the baseline results in Table 4, and the interactions with the Inner and Outer dummy variables are individually and jointly insignificant. In addition, while the signs on the 2005/6 interaction coefficients are consistent with strengthening central Auckland gravity effects, the 2006/7 coefficients are not.[31] Second, the pattern of results across the three areas (North, South and West) is broadly similar, and consistent with the baseline results in Table 5.[32] From this we conclude that the baseline results are robust to including the additional area ribbons.

5.6 Interpretation

From the above analysis we conclude that the average impact of the policy change was to increase rental payments inside the boundary in the second year after the change by about $2.44 per week on average, and that this increase was concentrated among families with children. Also, as expected, the policy impact was concentrated in the higher quantiles of the distribution, with the weekly rental increases ranging from approximately $0 at the median, to $2.28 at the 0.75 quantile, and $4.96 and $6.51 at the 0.9 and 0.95 quantiles respectively. In this section, we first interpret these estimates in terms of recipients' implied marginal propensities to spend on housing out of income and their housing expenditure income elasticities. We then provide some additional analysis to try to understand how the impacts occur.

[31] The only statistically significant interaction coefficient is that on Inner*Inside, which suggests rent payments were significantly higher in the Inner area on average before the 2005 policy change.
[32] The patterns for the West area are suggestive of possibly strengthening Auckland-gravity effects.

First, Table 9 presents estimates of the marginal propensity to spend on rent out of income, and also the implied housing income elasticity. To do this we use estimates of the second-year increase in total accommodation support payments, and the corresponding estimated impacts of the policy change on rental payments.[33] We focus on the extent of these impacts at the mean, as well median, 75th, 90th and 95th percentiles. Above the mean of the distribution, the estimated impacts on rental payments translate into broadly similar marginal propensities to spend and income elasticities across the distribution. By the second year the average increase in accommodation support received inside the boundary was $6.81, while the average increase in rental payments was $2.44. This implies that recipients' marginal propensity to spend on housing is 0.36. Broadly similar magnitudes are found at higher percentiles. Similarly, the estimated housing expenditure income elasticity from the increase in accommodation support is 0.54 at the mean, and ranges from 0.41 at the 75th percentile, to 0.57 and 0.58 at the 90th and 95th percentiles. Although estimates of these parameters vary widely in the literature, the estimated marginal propensities to spend on housing are in line with estimates on the order of 0.3–0.4 for renters (Bentley 2018; NZ Productivity Commission 2012); similarly the estimated income elasticities are in the range of estimates for the US presented in Albouy et al. (2016).

Second, the analysis above has ignored the panel nature of the data and conducted analysis based on repeated cross-sections, although it calculates standard errors allowing for clustering at the SWN-claimant level as a result of repeated sampling. In order to shed some light on how the increase in rental payments occurs, we repeat the main analyses using panel regressions allowing for, in turn, SWN-claimant and tenancy fixed effects. We believe this analysis may help inform whether the estimated policy impacts on rent reflect pure rent-price effects or perhaps the effects of relaxing demand-side housing constraints.

Table 10 summarises the panel regression results for the baseline specification for the full sample, as well as separately for the geographic and family-type subsamples. First, controlling for SWN-claimant fixed effects, the full sample estimates are similar to those in Table 4, and more precisely estimated: the second-year impact on rent is slightly smaller ($2.17/week), and the same on log(rent) (0.013). However, controlling for tenancy fixed effects, the second-year impact estimates are approximately halved (to $1.15/week and 0.007 respectively). Similar patterns are observed for the South area: the SWN fixed effects results are similar to the baseline estimates, while the tenancy fixed effect estimates are substantially smaller. However, the patterns are somewhat different for the family-type subgroups in that controlling for SWN fixed effects substantially reduces the (second year) impacts for the sole parents with 1 child and

[33] To calculate elasticities, we compare these estimates to the respective average and quantile estimates of reported incomes and rental payments by recipients on the Inside over the same (2006/7) period. Also, because reported income does not include tax credits, estimated average income will understate effective income and the estimated income elasticities will tend to overstate the true elasticities. For this reason the elasticities should be interpreted as indicative.

couple with 2+ children families; controlling for tenancy fixed effects eliminates most of the size and all statistical significance from the impacts for each family type.

These results imply that at least half of the relative increase in rent for those on the Inside of the boundary after the policy change was associated with tenancy changes, rather than relative increases in rent for existing tenancies. This pattern is consistent with search theoretic model predictions of impacts associated with new tenancies. One interpretation might be that most rent increases occur at the start of new tenancies, and that such increases are on average larger Inside than Outside the boundary as a result of the 2005 policy change. However, an alternative possibility is that the stronger rent increases on the Inside may reflect the ability of otherwise constrained families to be able to afford to move to "better" (e.g. perhaps less constrained) housing as a result of the relative increase in the maximum AS available Inside the boundary.

The administrative data do not provide any details on the characteristics of the tenancy dwelling of claimants to facilitate a direct test of this hypothesis. However, we are able to observe both the number of distinct AS-claims, as well as the number of people who are covered by such rental claims within a dwelling. To provide a partial test of whether the relative increase in rent Inside the boundary reduced over-crowding in housing, we ran regressions of both the number of AS claims and the number of people covered by AS payments in a dwelling. The results from these regressions are presented in Table 11.[34] Although there is no evidence of any statistically significant policy impact on either the number of AS-claims or the number of people covered by claims in the Inside versus Outside areas, the coefficients are (almost) always negative, which is consistent with a fall in crowding on the Inside. For example, the second year dwelling fixed effects estimate on the number of people covered (-0.060, in the final column) suggests that the average number of people in a dwelling decreased by about 2 per cent on the Inside of the boundary after 2005.

6 Concluding discussion

The 2005 introduction of a higher accommodation support zone in Auckland provides an opportunity to analyse the effects of an exogenous change in housing allowances on rental payments by recipients. Our analysis is restricted to renters receiving the Accommodation Supplement in narrow ribbons either side of the boundary. We find that increases in allowances led to small increases in rental payments.

In the second year following the policy change total accommodation support was $6.81 per week higher inside the boundary for the new zone. The full sample estimates show that rental payments increased by $2.44 per week more as a result. Larger rent increases were also

[34] In Figure A2 we describe the trends in the average number of AS-claims and number of people covered by AS-claims within dwellings in the Inside and Outside areas over the sample period.

observed among those who received larger increases in accommodation payments. The impacts on rental payments were most clearly discernible along the southern area of the boundary, and were concentrated among recipients with children. Panel data analysis controlling for recipient and tenancy effects shows that much of the measured rent increase occurred with the formation of new tenancies.

Our analysis shows that just over one third of the increase in the Accommodation Supplement and related payments was absorbed by rent increases, implying that almost two thirds of the increase in housing subsidies benefited recipients in the form of higher after-housing costs incomes. Given our data, it is not possible to ascertain the extent to which these measured rent increases were the result of recipients being able to afford to spend more on housing (possibly leading to lower levels of crowding), or if the policy allowed landlords to increase rents (possibly as a result of increased housing demand).

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Figure 1: Auckland Accommodation Supplement area boundary from April 2005

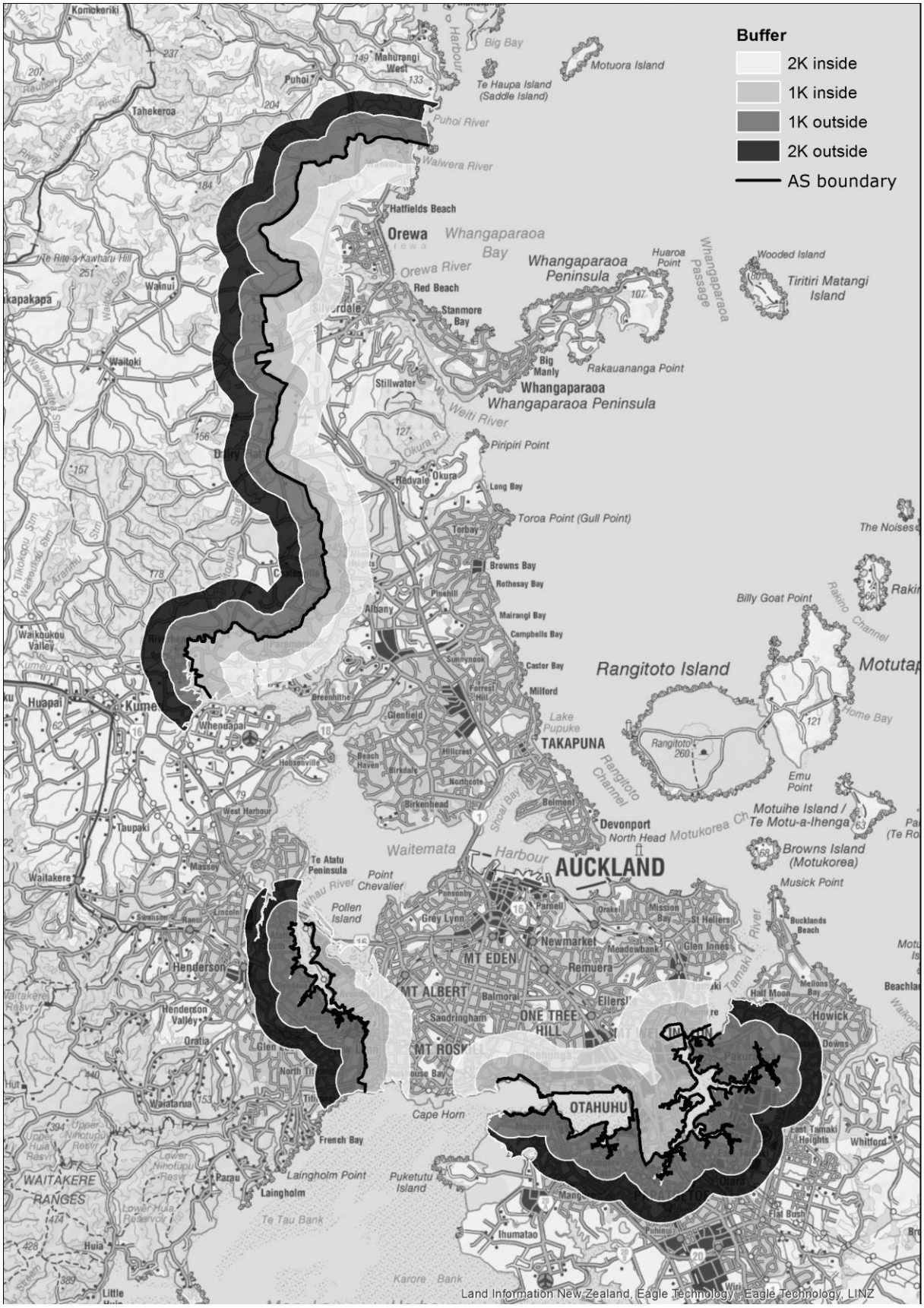


Figure 2: Relationship between Accommodation Supplement and rent, April 2005

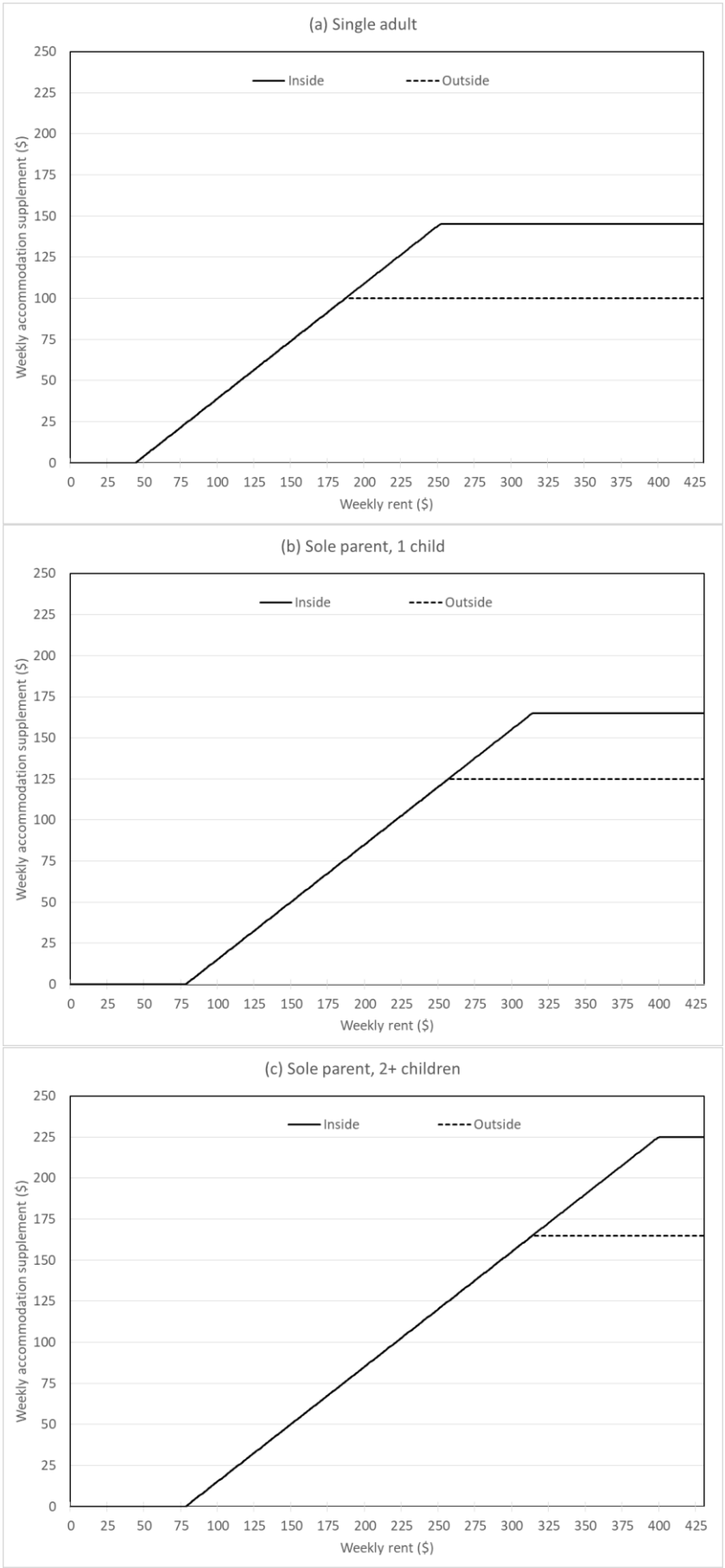


Figure 3: Stylised description of an increase in Accommodation Supplement on rental housing

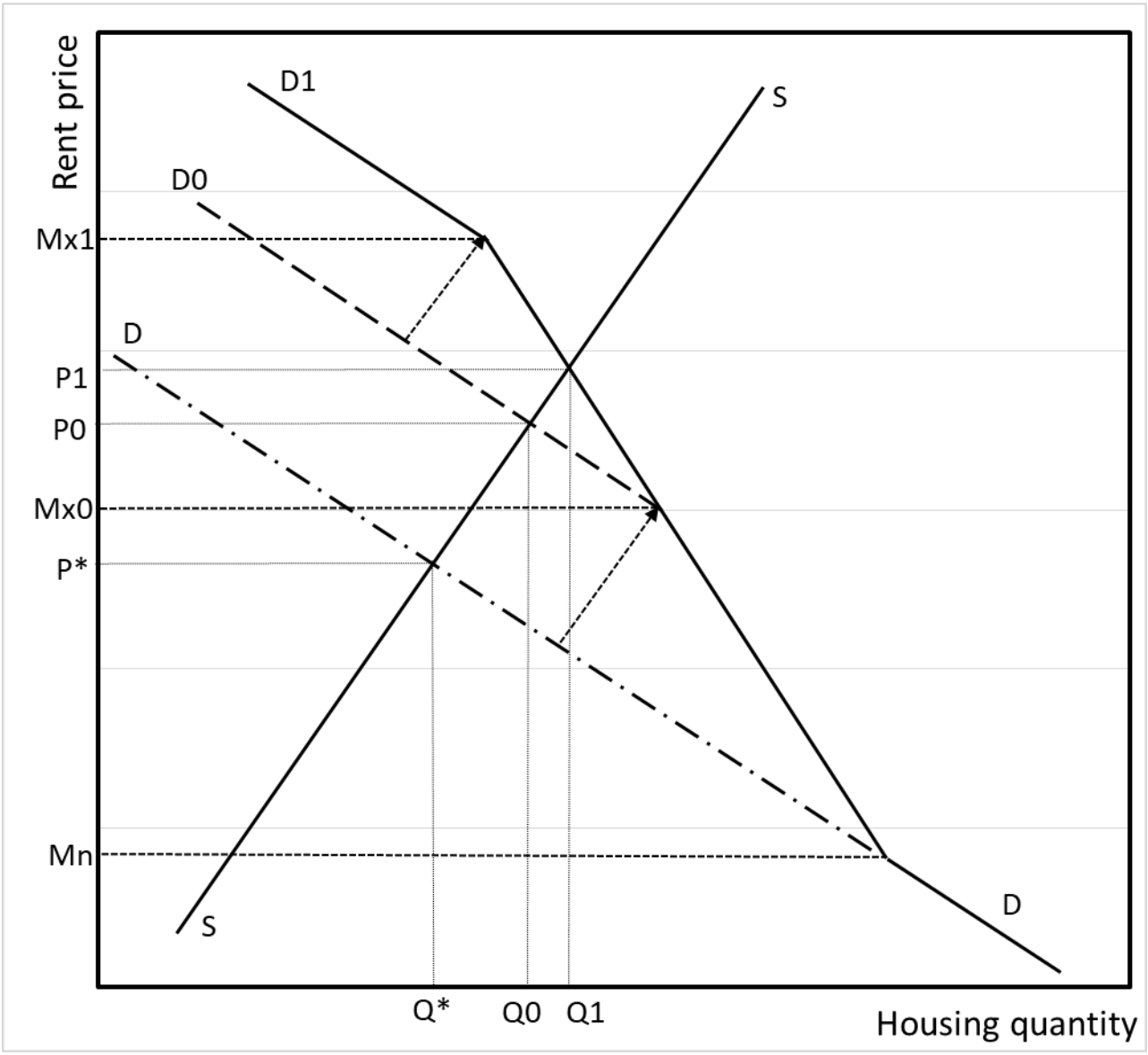


Figure 4: Trends in average Accommodation Supplement and rent

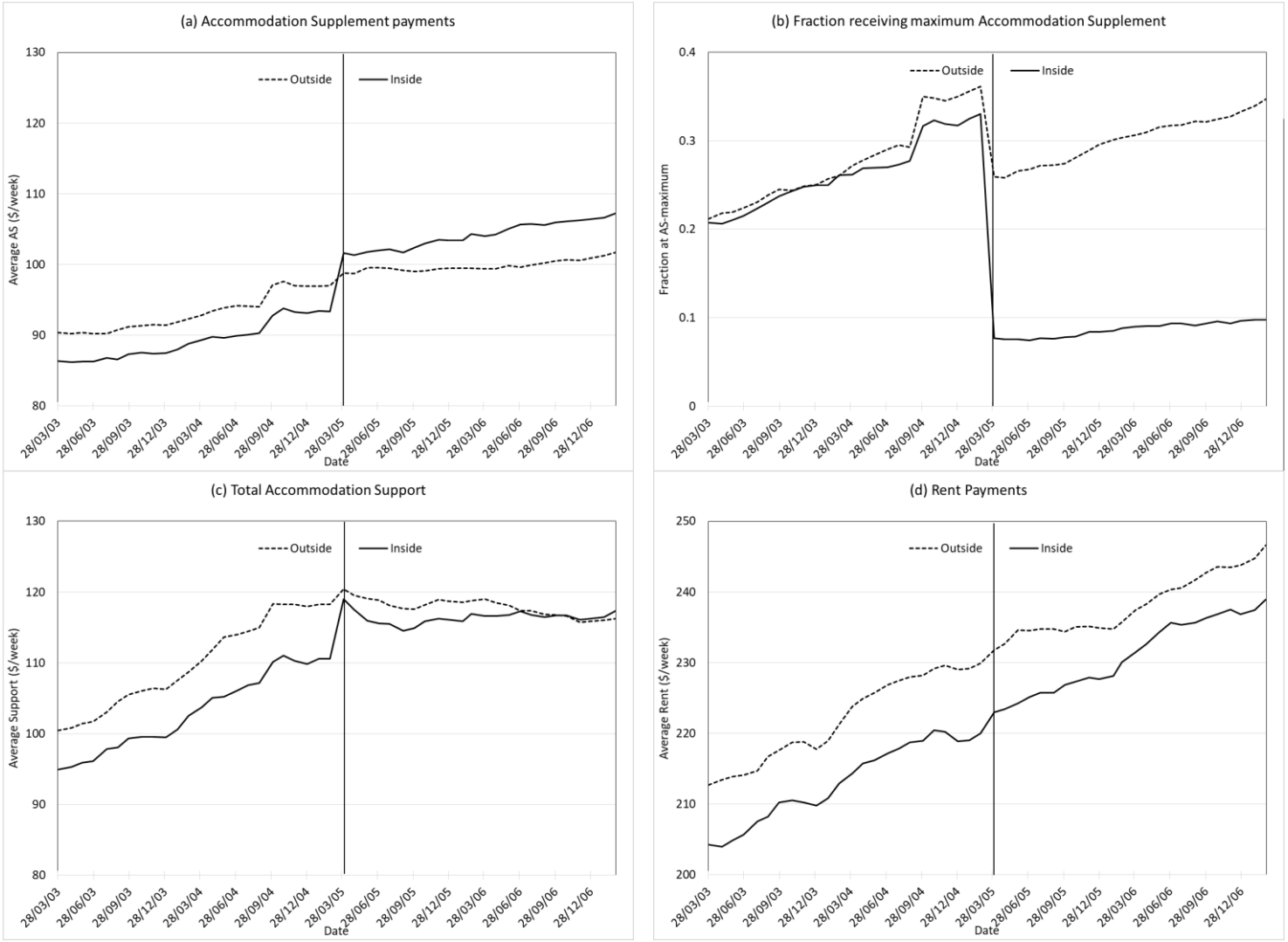


Figure 5: Trends in total accommodation support and rent percentiles

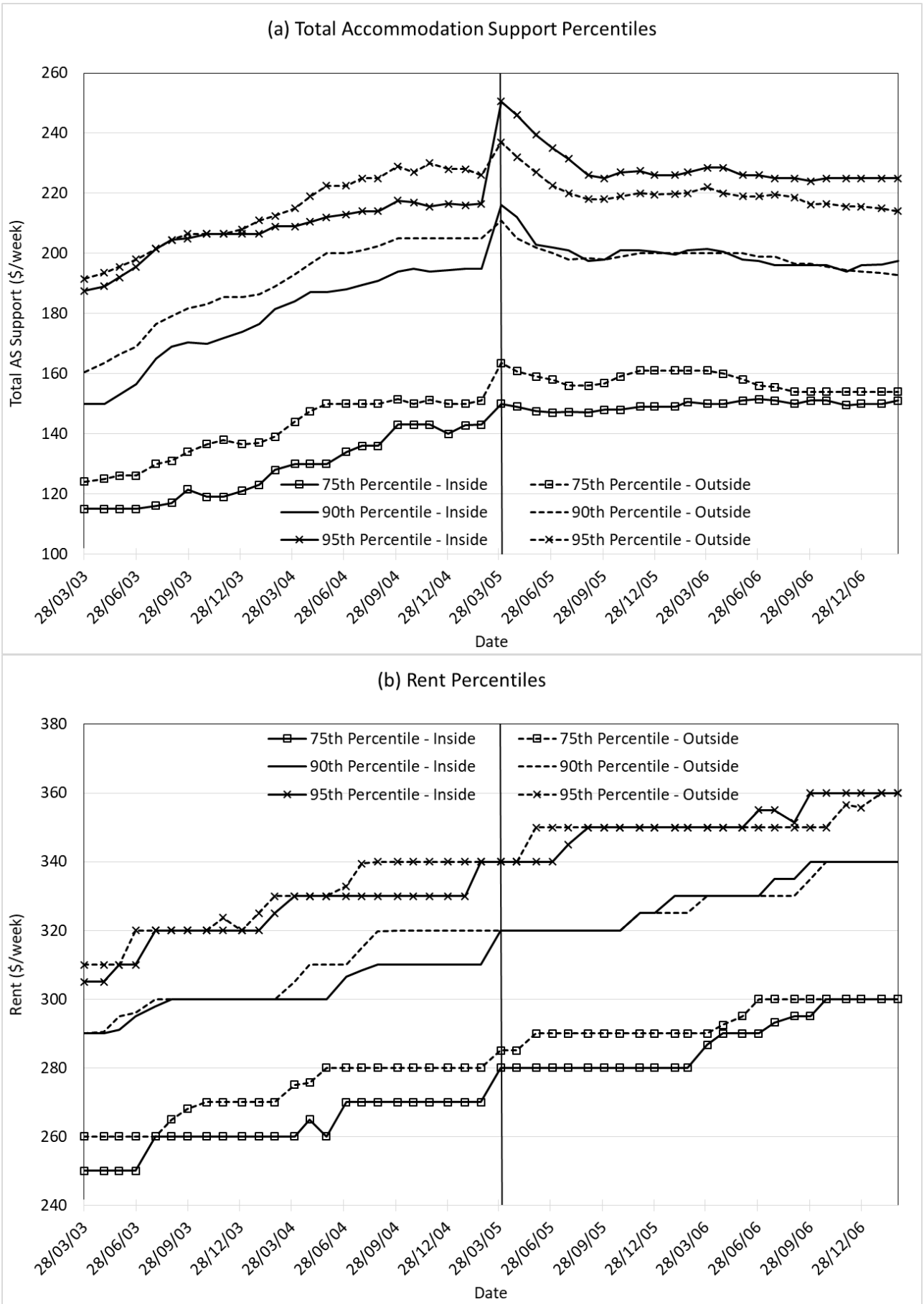


Table 1: 2005 changes to Accommodation Supplement maximum payments

Household size	Outside Auckland boundary	Inside Auckland boundary	Difference
Pre-April 2005:			
1	$100	$100	$0
2	$115	$115	$0
3+	$150	$150	$0
Post-1 April 2005:			
1	$100	$145	$45 (45%)
2	$125	$160	$35 (28%)
3+	$165	$225	$60 (36%)

Notes: For more detailed discussion, see appendix Table A1.

Table 2: Sample characteristics

		Inside		Outside	
	Full sample	Pre-2005	Post-2005	Pre-2005	Post-2005
Age	41.93	42.22	42.55	41.32	41.92
	(15.2)	(14.9)	(15.2)	(15.0)	(15.5)
Female	0.629	0.600	0.616	0.632	0.652
	(0.48)	(0.49)	(0.49)	(0.48)	(0.48)
Maori	0.221	0.213	0.213	0.231	0.221
	(0.41)	(0.41)	(0.41)	(0.42)	(0.42)
European	0.245	0.219	0.221	0.263	0.260
	(0.43)	(0.41)	(0.42)	(0.44)	(0.44)
Pacific	0.193	0.185	0.209	0.178	0.201
	(0.39)	(0.39)	(0.41)	(0.38)	(0.40)
Other ethnicity	0.341	0.383	0.357	0.327	0.318
	(0.47)	(0.49)	(0.48)	(0.47)	(0.47)
No. adults	1.259	1.258	1.259	1.262	1.257
	(0.44)	(0.44)	(0.44)	(0.44)	(0.44)
No. children	1.009	0.924	0.913	1.073	1.064
	(1.22)	(1.19)	(1.19)	(1.24)	(1.25)
No. in family	2.269	2.183	2.173	2.336	2.321
	(1.32)	(1.30)	(1.30)	(1.33)	(1.34)
Single adult	0.345	0.375	0.384	0.317	0.326
	(0.48)	(0.48)	(0.49)	(0.47)	(0.47)
Single adult, 1 child	0.191	0.184	0.179	0.195	0.200
	(0.39)	(0.39)	(0.38)	(0.40)	(0.40)
Single adult, 2+ children	0.205	0.182	0.177	0.225	0.218
	(0.40)	(0.39)	(0.38)	(0.42)	(0.41)
Couple, no children	0.119	0.122	0.121	0.120	0.116
	(0.32)	(0.33)	(0.33)	(0.32)	(0.32)
Couple, 1 child	0.056	0.060	0.056	0.055	0.054
	(0.23)	(0.24)	(0.23)	(0.23)	(0.23)
Couple, 2+ children	0.084	0.077	0.083	0.088	0.087
	(0.28)	(0.27)	(0.28)	(0.28)	(0.28)
Private landlord	0.988	0.994	0.994	0.985	0.982
	(0.11)	(0.08)	(0.08)	(0.12)	(0.13)
North	0.018	0.017	0.022	0.015	0.018
	(0.13)	(0.13)	(0.15)	(0.12)	(0.13)
West	0.376	0.314	0.314	0.413	0.420
	(0.48)	(0.46)	(0.46)	(0.49)	(0.49)
South	0.606	0.670	0.664	0.572	0.562
	(0.49)	(0.47)	(0.47)	(0.49)	(0.50)

Table 2 (Continued)

		Inside		Outside	
	Full sample	Pre-2005	Post-2005	Pre-2005	Post-2005
Non-benefit recipient	0.190	0.157	0.217	0.165	0.216
	(0.39)	(0.36)	(0.41)	(0.37)	(0.41)
Main benefit recipient	0.810	0.843	0.783	0.835	0.784
	(0.39)	(0.36)	(0.41)	(0.37)	(0.41)
Domestic purposes	0.327	0.311	0.293	0.353	0.335
	(0.47)	(0.46)	(0.46)	(0.48)	(0.47)
Unemployment	0.134	0.184	0.104	0.169	0.093
	(0.34)	(0.39)	(0.31)	(0.37)	(0.29)
Sickness or Invalids	0.224	0.234	0.264	0.190	0.222
	(0.42)	(0.42)	(0.44)	(0.39)	(0.42)
NZ Superannuation	0.050	0.045	0.053	0.044	0.056
	(0.22)	(0.21)	(0.22)	(0.21)	(0.23)
Other benefit	0.075	0.070	0.069	0.079	0.079
	(0.26)	(0.26)	(0.25)	(0.27)	(0.27)
Disability Allowance	0.212	0.208	0.211	0.210	0.215
	(0.41)	(0.41)	(0.41)	(0.41)	(0.41)
Rental payment	227.51	213.14	231.21	222.12	238.29
($weekly)	(73.6)	(69.1)	(75.8)	(70.6)	(75.4)
Accommodation Supplement	96.91	89.32	104.23	93.23	99.84
($weekly)	(38.2)	(33.2)	(43.3)	(35.2)	(38.8)
Fraction receiving	0.243	0.264	0.087	0.278	0.302
maximum AS	(0.43)	(0.44)	(0.28)	(0.45)	(0.46)
Other hardship-related	15.67	13.78	12.18	16.82	17.99
support ($weekly)	(30.8)	(29.9)	(26.4)	(32.4)	(32.1)
Total accommodation	112.57	103.11	116.41	110.06	117.83
support ($weekly)	(56.6)	(52.3)	(58.5)	(55.7)	(57.8)
Total income	346.35	322.63	350.55	337.79	365.09
($weekly)	(147.8)	(136.5)	(150.6)	(142.6)	(154.1)
No. Observations	376,916	70,069	78,510	107,904	120,433

Notes: Samples consist of renter-AS recipients between April 2003 and April 2007. Estimates of total income are reported income and do not include tax credits.

Table 3: Simple difference-in-difference estimates of changes pre-/post-2005

	Pre-2005	Post-2005	Difference
1. Weekly AS amount ($)			
Outside	$93.23	$99.84	$6.60
	(0.40)	(0.43)	(0.42)
Inside	$89.32	$104.23	$14.91
	(0.47)	(0.59)	(0.57)
Difference	-$3.91	$4.39	**$8.31**
	(0.61)	(0.73)	**(0.71)**
2. Weekly Total accommodation support (AS+TAS+SPB; $)			
Outside	$110.03	$117.83	$7.77
	(0.62)	(0.64)	(0.64)
Inside	$103.11	$116.41	$13.31
	(0.72)	(0.80)	(0.78)
Difference	-$6.95	-$1.41	**$5.54**
	(0.95)	(1.02)	**(1.01)**
3. Weekly rent ($)			
Outside	$222.12	$238.29	$16.17
	(0.82)	(0.85)	(0.81)
Inside	$213.14	$231.21	$18.07
	(0.98)	(1.05)	(1.03)
Difference	-$8.98	-$7.08	**$1.90**
	(1.27)	(1.34)	**(1.32)**
4. log(rent)			
Outside	5.34	5.41	0.07
	(.004)	(.004)	(.004)
Inside	5.30	5.38	0.08
	(.005)	(.005)	(.005)
Difference	-0.04	-0.03	**0.011**
	(.007)	(.006)	**(.006)**
5. Numbers of AS Recipients			
Outside	107,904	120,433	12,529
Inside	70,069	78,510	8,441
Difference	-37,835	-41,923	**-4,088**

Notes: Estimates are based on the two years pre-April 2005, and 2 years post-April 2005. Estimated standard errors are in parentheses, adjusted for clustering at the SWN-claimant level. Estimates in **bold** are the difference-in-differences estimates.

Table 4: Regression estimates of 2005 AS policy change impact on rent

	(1)	(2)	(3)	(4)	(5)
	(a) Dependent variable = Rent (weekly $-values)				
AS Policy impact	1.81	1.56	1.56	---	---
	(1.32)	(1.04)	(1.04)		
2005/6 Impact	---	---	---	0.62	0.10
				(1.03)	(1.26)
2006/7 Impact	---	---	---	2.44**	1.92
				(1.24)	(1.38)
Intercept	216.80**	219.92**	225.22**	225.20**	224.99**
	(0.85)	(8.29)	(8.81)	(8.81)	(8.81)
Inside	-8.91**	-2.79**	-2.70**	-2.70**	-2.18**
	(1.27)	(0.99)	(1.00)	(1.00)	(1.09)
Inside*2004/5	---	---	---	---	-1.05
					(0.98)
Year-effects	Y	Y	Y	Y	Y
Characteristics	N	Y	Y	Y	Y
Area-effects	N	N	Y	Y	Y
R-sq	0.020	0.420	0.420	0.420	0.420
No. Observations	376,916	376,916	376,916	376,916	376,916
	(b) Dependent variable = log(rent)				
AS Policy impact	0.010	0.009*	0.009*	---	---
	(.006)	(.005)	(.005)		
2005/6 Impact	---	---	---	0.005	0.005
				(.005)	(.006)
2006/7 Impact	---	---	---	0.013**	0.012*
				(.006)	(.007)
Intercept	5.319**	5.235**	5.262**	5.262**	5.262**
	(.005)	(.049)	(.050)	(.050)	(.050)
Inside	-0.039**	-0.011**	-0.011**	-0.011**	-0.010*
	(.007)	(.005)	(.005)	(.005)	(.006)
Inside*2004/5	---	---	---	---	-0.001
					(.005)
Year-effects	Y	Y	Y	Y	Y
Characteristics	N	Y	Y	Y	Y
Area-effects	N	N	Y	Y	Y
R-sq	0.016	0.422	0.422	0.422	0.422
No. Observations	376,916	376,916	376,916	376,916	376,916

Notes: Standard errors are in parentheses, adjusted for clustering at the SWN-claimant level.
** p<0.05, * p<0.1.

Table 5: Regression estimates of 2005 AS policy change impact on rent –by Area

	All areas	North	West	South
	(a) Dependent variable = Rent (weekly $-values)			
2005/6 Impact	0.62	11.66	-2.04	1.81
	(1.03)	(7.90)	(1.72)	(1.32)
2006/7 Impact	2.44**	11.52	-0.08	3.50**
	(1.24)	(9.53)	(2.11)	(1.57)
Intercept	225.20**	290.22**	191.86**	239.00**
	(8.81)	(50.51)	(12.11)	(10.85)
Inside	-2.70**	-3.59	4.82**	-7.39**
	(1.00)	(7.35)	(1.66)	(1.27)
R-sq	0.420	0.492	0.476	0.392
No. Observations	376,916	6,706	141,764	228,446
	(b) Dependent variable = log(rent)			
2005/6 Impact	0.005	0.048	-0.011	0.013**
	(.005)	(.037)	(.009)	(.006)
2006/7 Impact	0.013**	0.055	-0.006	0.022**
	(.006)	(.042)	(.010)	(.008)
Intercept	5.262**	5.613**	5.051**	5.361**
	(.050)	(.238)	(.074)	(.061)
Inside	-0.011**	-0.003	0.014*	-0.027**
	(.005)	(.035)	(.009)	(.006)
R-sq	0.422	0.483	0.477	0.393
No. Observations	376,916	6,706	141,764	228,446

Notes: All regressions include controls for year-specific dummy variables and recipient characteristics. Standard errors in parentheses, adjusted for clustering at the SWN-claimant level.
** p<0.05, * p<0.1.

Table 6: Regression estimates of 2005 AS policy change impact on rent – by Family type

	Family-type (No. adults, No. children)					
	(1,0)	(1,1)	(1,2+)	(2,0)	(2,1)	(2,2+)
	(a) Dependent variable = Rent (weekly $-values)					
Impact*2005/5	-0.88	1.20	3.61*	0.86	1.56	-0.24
	(1.73)	(2.41)	(2.21)	(2.86)	(4.75)	(3.74)
Impact*2006/7	-1.04	6.13**	7.43**	-3.22	0.85	9.65**
	(1.99)	(2.94)	(2.71)	(3.43)	(5.46)	(4.65)
Intercept	122.06**	273.50**	228.96**	241.85**	239.48**	222.55**
	(11.41)	(21.14)	(17.24)	(32.91)	(23.62)	(25.47)
Inside	2.11	-4.61**	-7.00**	-3.95	-8.50**	-8.45**
	(1.70)	(2.21)	(2.06)	(2.91)	(3.89)	(3.19)
R-sq	0.132	0.107	0.166	0.102	0.099	0.134
N	129,933	72,012	77,256	44,867	21,021	31,827
	(b) Dependent variable = log(rent)					
Impact*2005/5	-0.004	0.004	0.015*	0.010	0.005	-0.003
	(.010)	(.011)	(.009)	(.014)	(.019)	(.013)
Impact*2006/7	-0.006	0.023*	0.031**	-0.005	0.000	0.031**
	(.012)	(.013)	(.011)	(.016)	(.021)	(.016)
Intercept	4.645**	5.585**	5.430**	5.401**	5.438**	5.400**
	(.074)	(.085)	(.071)	(.130)	(.092)	(.090)
Inside	0.020*	-0.021**	-0.033**	-0.023	-0.040**	-0.033**
	(.011)	(.010)	(.009)	(.015)	(.016)	(.012)
R-sq	0.138	0.103	0.150	0.099	0.102	0.138
N	129,933	72,012	77,256	44,867	21,021	31,827

Notes: All regressions include controls for year-specific dummy variables and recipient characteristics. Standard errors in parentheses, adjusted for clustering at the SWN-claimant level.
** p<0.05, * p<0.1.

Table 7a: Quantile regression estimates of 2005 AS policy change impact on rent

Mean / Quartile	Full Sample	By area			By family-type (No. adults; No. children)					
		North	West	South	(1,0)	(1,1)	(1,2+)	(2,0)	(2,1)	(2,2+)
Mean: 1st	0.62	11.66	-2.04	1.81	-0.88	1.20	3.61*	0.86	1.56	-0.24
	(1.03)	(7.90)	(1.72)	(1.32)	(1.73)	(2.41)	(2.21)	(2.86)	(4.75)	(3.74)
2nd	2.44**	11.52	-0.08	3.50**	-1.04	6.13**	7.43**	-3.22	0.85	9.65**
	(1.24)	(9.53)	(2.11)	(1.57)	(1.99)	(2.94)	(2.71)	(3.43)	(5.46)	(4.65)
Q0.5: 1st	0.66	14.47	-0.15	2.46	0.55	1.57	4.41	1.20	3.03	-0.58
	(1.28)	(11.54)	(2.43)	(1.83)	(1.81)	(3.45)	(3.42)	(4.84)	(5.90)	(3.91)
2nd	-0.06	23.06**	-1.56	1.28	-1.35	7.33*	4.41	-4.93	1.88	6.45
	(1.46)	(11.70)	(2.39)	(1.93)	(2.22)	(4.24)	(3.78)	(5.65)	(6.04)	(5.33)
Q0.75: 1st	0.49	20.00	-1.09	1.42	-3.29	3.17	6.12*	-0.54	-1.07	2.86
	(1.43)	(36.33)	(2.15)	(1.97)	(3.35)	(3.02)	(3.26)	(3.80)	(7.81)	(6.38)
2nd	2.28	7.50	2.50	2.27	-5.86*	8.82**	7.33*	-3.95	0.77	13.58**
	(1.78)	(33.17)	(2.96)	(2.44)	(3.41)	(3.46)	(4.03)	(4.88)	(8.50)	(6.46)
Q0.9: 1st	1.71	0.30	1.13	3.27	-0.76	3.75	4.58	0.00	8.63	2.51
	(2.03)	(16.68)	(4.16)	(2.98)	(5.51)	(5.24)	(4.15)	(5.80)	(8.70)	(7.66)
2nd	4.96*	3.03	4.40	3.59	-0.04	8.37**	17.44**	-6.03	5.33	11.08
	(2.64)	(39.70)	(4.77)	(3.49)	(4.88)	(4.22)	(4.41)	(6.14)	(8.97)	(15.95)
Q0.95: 1st	2.47	4.75	0.19	2.89	4.29	5.00	---	-2.88	-7.31	1.95
	(3.16)	(12.24)	(6.79)	(3.67)	(5.85)	(7.87)		(10.48)	(12.31)	(10.11)
2nd	6.51*	-2.62	2.78	8.13**	1.04	10.00	---	-10.06	12.69	27.15**
	(3.43)	(21.72)	(7.16)	(3.79)	(7.81)	(9.19)		(9.67)	(10.48)	(13.62)
No. Obs	376,916	6,706	141,764	228,446	129,933	72,012	77,256	44,867	21,021	31,827

Notes: "1st" estimate is the 2005/6 impact, and "2nd" estimate is the 2006/7 impact. All regressions include controls for year-specific dummy variables and recipient characteristics. Standard errors in parentheses, adjusted for clustering at the SWN-claimant level.
** p<0.05, * p<0.1.
--- indicates quantile regression did not converge.

Table 7b: Quantile regression estimates of 2005 AS policy change impact on log(rent)

Mean / Quartile	Full Sample	By area			By family-type (No. adults; No. children)					
		North	West	South	(1,0)	(1,1)	(1,2+)	(2,0)	(2,1)	(2,2+)
Mean: 1st	0.005	0.048	-0.011	0.013**	-0.004	0.004	0.015*	0.010	0.005	-0.003
	(.005)	(.037)	(.009)	(.006)	(.010)	(.011)	(.009)	(.014)	(.019)	(.013)
2nd	0.013**	0.055	-0.006	0.022**	-0.006	0.023*	0.031**	-0.005	0.000	0.031**
	(.006)	(.042)	(.010)	(.008)	(.012)	(.013)	(.011)	(.016)	(.021)	(.016)
Q0.5: 1st	0.005	0.043	-0.007	0.016*	-0.003	0.009	---	0.011	0.013	0.000
	(.006)	(.048)	(.010)	(.008)	(.012)	(.014)		(.020)	(.023)	(.014)
2nd	0.005	0.089*	-0.012	0.012	-0.011	0.031*	---	-0.014	0.009	0.021
	(.007)	(.052)	(.010)	(.008)	(.014)	(.017)		(.024)	(.024)	(.018)
Q0.75: 1st	0.005	0.074	-0.009	0.007	-0.018	0.016	0.016*	-0.002	0.001	0.008
	(.006)	(.084)	(.009)	(.008)	(.015)	(.011)	(.009)	(.015)	(.026)	(.018)
2nd	0.013*	0.039	0.007	0.018**	-0.031*	0.030**	0.024**	-0.015	0.001	0.043**
	(.007)	(.065)	(.011)	(.009)	(.016)	(.012)	(.010)	(.019)	(.031)	(.017)
Q0.9: 1st	0.004	0.007	-0.002	0.013	-0.003	0.018	0.017	0.001	0.028	0.008
	(.007)	(.049)	(.012)	(.010)	(.020)	(.015)	(.012)	(.017)	(.025)	(.021)
2nd	0.015*	0.019	0.009	0.015	0.001	0.030**	0.051**	-0.023	0.015	0.046
	(.008)	(.088)	(.015)	(.013)	(.020)	(.014)	(.013)	(.020)	(.026)	(.039)
Q0.95: 1st	0.010	---	-0.007	0.017	0.012	0.021	0.046**	-0.015	-0.020	0.003
	(.011)		(.016)	(.011)	(.018)	(.020)	(.015)	(.030)	(.036)	(.027)
2nd	0.023**	---	0.003	0.030**	0.001	0.032	0.053**	-0.037	0.031	0.071**
	(.009)		(.019)	(.012)	(.025)	(.022)	(.016)	(.026)	(.028)	(.033)
No. Obs	376,916	6,706	141,764	228,446	129,933	72,012	77,256	44,867	21,021	31,827

Notes: "1st" estimate is the 2005/6 impact, and "2nd" estimate is the 2006/7 impact. All regressions include controls for year-specific dummy variables and recipient characteristics. Standard errors in parentheses, adjusted for clustering at the SWN-claimant level.

** p<0.05, * p<0.1.

--- indicates quantile regression did not converge.

Table 8: Regression estimates of 2005 AS policy change impact on rent, including Inner and Outer areas

	Rent (weekly $-values)				log(rent)			
	All areas	North	West	South	All areas	North	West	South
Impacts:								
2005/6	0.59	9.00	-1.97	1.79	0.005	0.035	-0.010	0.013**
	(1.0)	(8.1)	(1.7)	(1.3)	(.005)	(.038)	(.009)	(.006)
*Inner	1.81	-0.08	1.71	1.90	0.008	0.014	0.011	0.008
	(1.3)	(9.2)	(2.2)	(1.6)	(.006)	(.043)	(.011)	(.008)
*Outer	-0.51	-0.85	-2.99**	1.02	-0.003	-0.023	-0.017**	0.006
	(1.0)	(12.3)	(1.4)	(1.4)	(.005)	(.058)	(.007)	(.007)
2006/7	2.48**	10.39	0.03	3.55**	0.013**	0.052	-0.006	0.022**
	(1.2)	(9.6)	(2.1)	(1.6)	(.006)	(.042)	(.010)	(.008)
*Inner	0.34	-4.82	0.50	0.59	0.002	-0.009	0.006	0.002
	(1.5)	(10.5)	(2.7)	(1.9)	(.007)	(.046)	(.013)	(.009)
*Outer	1.15	-0.83	-0.77	2.55	0.002	0.005	-0.010	0.010
	(1.2)	(13.4)	(1.7)	(1.6)	(.006)	(.062)	(.008)	(.008)
Intercept	221.76**	368.11**	205.10**	217.13**	5.202**	5.946**	5.146**	5.184**
	(6.8)	(46.6)	(9.8)	(8.3)	(.039)	(.202)	(.057)	(.050)
*Outer	0.48	1.68	2.89**	-1.26	0.004	0.003	0.018**	-0.006
	(0.9)	(8.7)	(1.3)	(1.3)	(.005)	(.043)	(.007)	(.007)
Inside	-2.78**	-3.84	4.81**	-7.51**	-0.011**	-0.006	0.014	-0.028**
	(1.0)	(7.7)	(1.7)	(1.3)	(.005)	(.036)	(.009)	(.006)
*Inner	5.47**	14.05	-0.53	7.95**	0.018**	0.016	-0.005	0.029**
	(1.2)	(8.9)	(2.0)	(1.5)	(.006)	(.042)	(.010)	(.008)
R-Square	0.427	0.498	0.482	0.397	0.432	0.501	0.481	0.403
No. Clusters	45,508	1,052	17,854	27,819	45,508	1,052	17,854	27,819
No. Obs	656,089	10,595	251,920	393,574	656,089	10,595	251,920	393,574

Notes: Standard errors in parentheses, adjusted for clustering at the SWN Client level. All regressions include controls for recipient characteristics, and common year-specific effects; and All areas regressions include area-specific dummy variables.
** p<0.05, * p<0.1.

Table 9: Implied marginal propensities to spend and income elasticities

Mean or Quantile	Income:		Rental payments:		Implied:	
	Inside 2006/7 (1)	Total AS Change (2)	Inside 2006/7 (3)	Reg-adj Impact (4)	MPS on Rent (5)	Income Elasticity (6)
Mean	353.26	6.81	235.77	2.44	0.36	0.54
Median	339.00	4.22	236.15	-0.06	-0.01	-0.02
75th	463.73	8.78	295.00	2.28	0.26	0.41
90th	555.83	14.34	340.00	4.96	0.35	0.57
95th	600.60	18.79	360.00	6.51	0.35	0.58

Notes: The estimated Marginal Propensity to Spend (MPS) on housing is estimated using the column (4) estimated increase in second year rental payments on the Inside (presented in Table 4 and Table 7), relative to the column (2) difference-in-difference estimated increase in total accommodation support on the Inside in the second year. The income elasticities are estimated using the column (4) regression estimated second year impacts of the increase in rental payments relative to the column (3) 2006/7 Inside rental payments, and the column (2) increase in accommodation support, relative to the column (1) 2006/7 Inside income.

Table 10: Panel regression estimates of 2005 AS policy change impact on rent

	Full	By area			By Family-type (No. adults, No. children)					
	Sample	North	West	South	(1,0)	(1,1)	(1,2+)	(2,0)	(2,1)	(2,2+)
				(a) dependent variable=Rent (weekly $-values), SWN-fixed effects						
2005/6 Impact	0.73	8.22*	-1.90*	1.98**	0.71	1.36	3.38**	0.73	2.02	-2.76
	(0.68)	(5.00)	(1.10)	(0.86)	(1.04)	(1.74)	(1.52)	(1.76)	(2.36)	(1.98)
2006/7 Impact	2.17**	8.63	-0.86	3.54**	2.01	3.10	5.11**	1.55	0.83	1.13
	(0.92)	(7.01)	(1.48)	(1.17)	(1.37)	(2.46)	(2.03)	(2.39)	(3.27)	(2.84)
				(b) dependent variable=Rent (weekly $-values), Tenancy-fixed effects						
2005/6 Impact	0.81	8.23*	-0.07	1.10*	0.63	0.48	-0.38	1.05	2.64	2.35
	(0.51)	(4.78)	(0.84)	(0.65)	(0.86)	(1.15)	(0.98)	(1.59)	(1.77)	(1.62)
2006/7 Impact	1.15	11.67*	-0.56	1.74*	1.59	0.33	0.97	0.74	1.19	2.64
	(0.71)	(6.72)	(1.13)	(0.92)	(1.17)	(1.64)	(1.51)	(2.17)	(2.38)	(2.16)
				(c) dependent variable=log(rent), SWN-fixed effects						
2005/6 Impact	0.006*	0.037*	-0.009*	0.013**	0.006	0.006	0.015**	0.006	0.010	-0.009
	(.003)	(.022)	(.005)	(.004)	(.006)	(.008)	(.006)	(.009)	(.009)	(.007)
2006/7 Impact	0.013**	0.042	-0.005	0.022**	0.012	0.014	0.022**	0.013	0.008	0.006
	(.004)	(.028)	(.007)	(.006)	(.008)	(.011)	(.008)	(.011)	(.012)	(.010)
				(d) dependent variable=log(rent), Tenancy-fixed effects						
2005/6 Impact	0.005**	0.035*	-0.002	0.008**	0.005	0.001	-0.001	0.007	0.012	0.009
	(.002)	(.021)	(.004)	(.003)	(.005)	(.005)	(.004)	(.008)	(.007)	(.006)
2006/7 Impact	0.007**	0.051*	-0.004	0.012**	0.009	0.000	0.005	0.008	0.010	0.011
	(.003)	(.027)	(.005)	(.004)	(.006)	(.007)	(.006)	(.010)	(.009)	(.008)
No. SWN FEs	28,369	650	10,835	17,318	12,081	5,837	5,327	3,491	2,490	2,987
No. Ten FEs	35,420	687	13,181	21,552	14,624	7,193	6,618	4,043	2,795	3,419
No. Obs	376,916	6,706	141,764	228,446	129,933	72,012	77,256	44,867	21,021	31,827

Notes: All regressions include controls for year-specific dummy variables and recipient characteristics. Standard errors in parentheses, adjusted for clustering at the SWN-claimant level.
** p<0.05, * p<0.1.

Table 11: Regression estimates of the impact of the 2005 AS policy change on household crowding

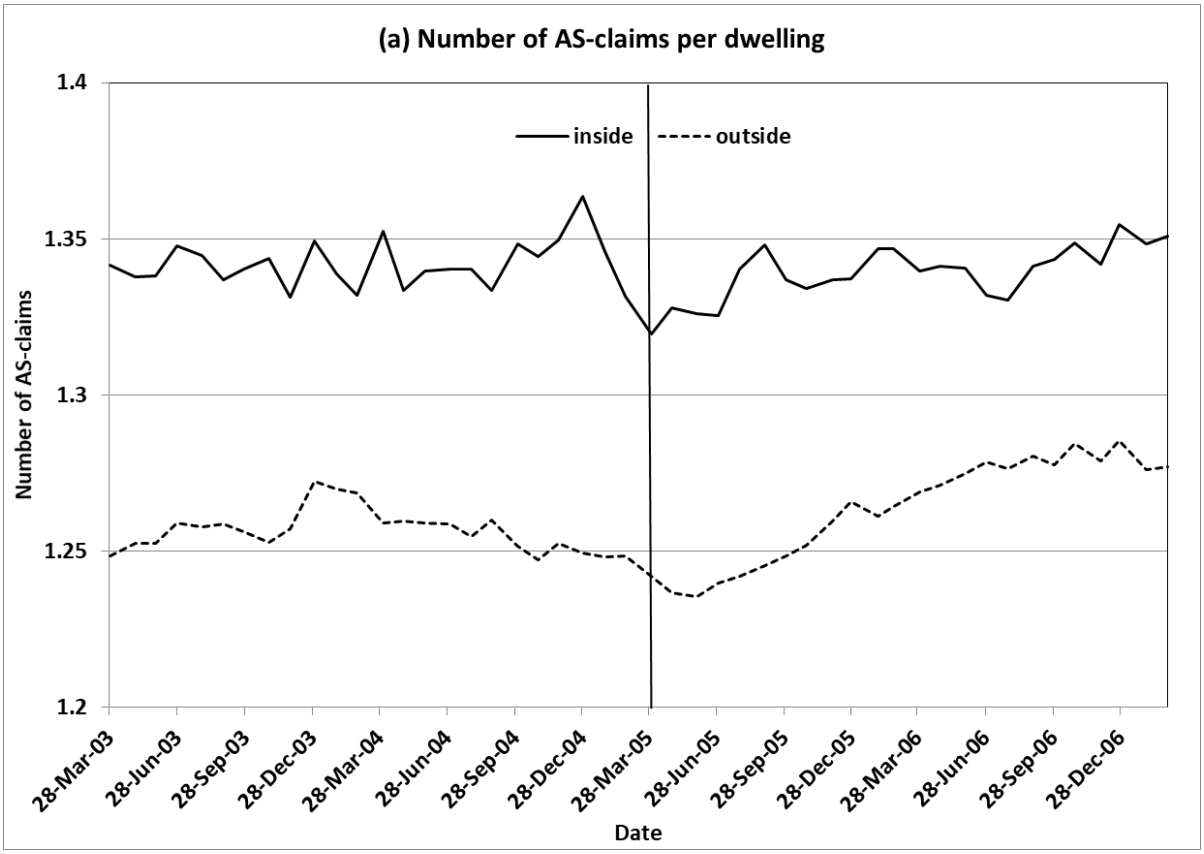
	Difference -in- Differences	With year controls	Separate year effects	Dwelling fixed effects
		(a) Number of AS-claims per dwelling		
Impact	-0.01	-0.01	---	---
	(0.02)	(0.02)		
*2005/6	---	---	0.00	0.01
			(0.02)	(0.02)
*2006/7	---	---	-0.02	-0.00
			(0.02)	(0.03)
Intercept	1.26**	1.26**	1.26**	0.99**
	(0.02)	(0.02)	(0.02)	(0.01)
inside	0.09**	0.09**	0.09**	0.10
	(0.03)	(0.03)	(0.03)	(0.19)
Post-2005	0.01	---	---	---
	(0.01)			
yr0405	---	0.00	0.00	-0.02
		(0.01)	(0.01)	(0.01)
yr0506	---	0.00	-0.01	-0.01
		(0.01)	(0.01)	(0.02)
yr0607	---	0.02	0.02	0.03
		(0.02)	(0.02)	(0.02)
		(b) Number of people per dwelling		
Impact	-0.017	-0.018	---	---
	(.046)	(.046)		
*2005/6	---	---	-0.005	-0.008
			(.044)	(.046)
*2006/7	---	---	-0.030	-0.060
			(.053)	(.058)
Intercept	2.935**	2.919**	2.919**	0.995**
	(.035)	(.036)	(.036)	(.033)
inside	-0.006	-0.006	-0.006	-1.099
	(.057)	(.057)	(.057)	(.686)
Post-2005	-0.001	---	---	---
	(.030)			
yr0405	---	0.031	0.031	-0.030
		(.019)	(.019)	(.019)
yr0506	---	-0.006	-0.011	-0.037
		(.033)	(.032)	(.033)
yr0607	---	0.035	0.039	0.053
		(.035)	(.037)	(.039)

Notes: Sample used consists of distinct dwellings with accommodation supplement claimants. The number of people in a dwelling is the total number across AS claims at the dwelling.
** p<0.05, * p<0.1.

Appendix

Figure A1: Detailed aerial view of Auckland Accommodation Supplement area boundary from April 2005

Figure A2: Trends in dwelling size



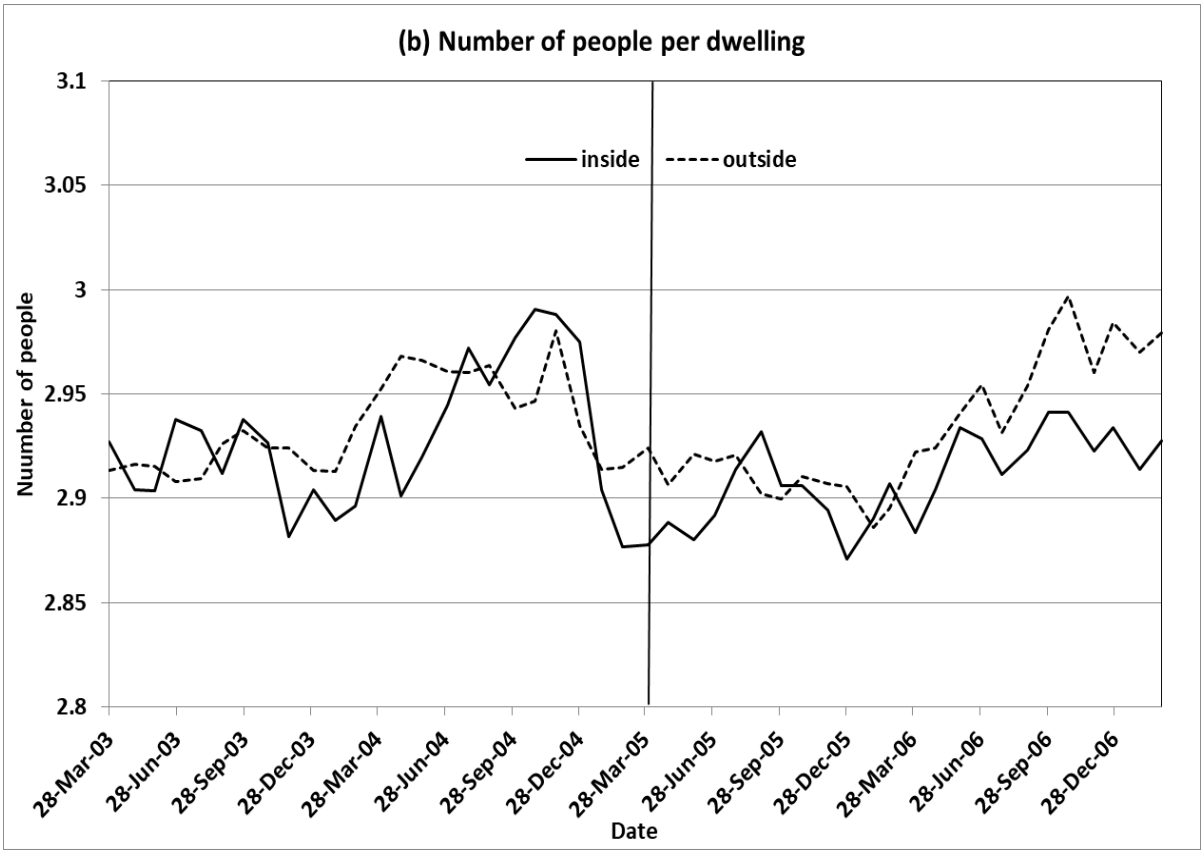


Table A1: Accommodation Supplement and related policy changes

Date	Change	Detail
1 July 1993	New Accommodation Supplement introduced	Prior to the creation of the Accommodation Supplement the housing assistance regime was a mixture of rents and mortgages subsidies provided by the Housing Corporation of New Zealand (HCNZ), and a cash accommodation grant (the Accommodation Benefit) provided by the Department of Social Welfare.
1 April 1994	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 April 1995	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 April 1996	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 October 1996	Accommodation Supplement changes	The number of cities in *Accommodation Supplement* Area 2 was expanded to include Hamilton, Tauranga, Napier, Hastings, Palmerston North, Rotorua, Nelson, and Christchurch. Prior to this only Wellington qualified for the intermediate maximum rate.
1 April 1997	Inflation adjustment of entry thresholds	Inflation adjustment of AS entry thresholds
1 July 1997	Accommodation Supplement changes to payment rates	The *Accommodation Supplement* subsidy rate was increased from 65 percent to 70 percent. The proportion of board costs regarded as accommodation costs was reduced from two thirds to 62 percent. Changes were made to the maximum rates of the *Accommodation Supplement*.
1 April 1998	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 April 1999	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 April 2000	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 December 2000	Income-Related Rents restored for state house tenants	Income-related rents for state housing tenants that had applied prior to 1991 were restored. For income up to the threshold the rent was set to reflect 25 percent of after tax income. Above the threshold, rent reflected 50 percent of after tax income. Income included the income of the tenant and his or her spouse. From this time state house tenants were ineligible to receive the *Accommodation Supplement* or the *Student Allowance Accommodation Benefit*. Payment to HNZC in the form of the Income Related Rent subsidy.
1 July 2001	Housing New Zealand Corporation established	*Housing New Zealand Corporation* (HNZC) was established as a Crown entity with a Board. The new Corporation combined into one organisation *Housing New Zealand Limited*, *Community Housing Limited*, *Housing Corporation of New Zealand* and the housing policy function of the *Ministry of Social Policy*.
1 April 2002	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 April 2003	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 July 2003	Housing Innovation Fund established	A $63 million *Housing Innovation Fund* (HIF) was established to increase the availability of rental housing and home ownership opportunities for low income households and people with special needs.
1 April 2004	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 October 2004	Changes to Accommodation Supplement abatement for beneficiaries, entry threshold for non-beneficiaries. and income threshold for non-beneficiaries	The abatement of the *Accommodation Supplement* for beneficiaries was removed to provide an additional incentive for beneficiaries to undertake part time employment. Abatement was also removed for recipients of *New Zealand Superannuation* or a *Veteran's Pension* who were eligible to receive the *Accommodation Supplement*, though income above the applicable *Invalids Benefit* cut-out point continued to preclude eligibility to the *Accommodation Supplement*. The *Entry Threshold* for non-beneficiaries was lowered to align with the entry thresholds applicable to people receiving the *Unemployment Benefit*. The income threshold for non-beneficiaries was increased to align with the cut-out points for the *Unemployment Benefit*.
1 April 2005	Annual general adjustment	Inflation adjustment of AS entry thresholds

Date	Change	Detail
1 April 2005	Accommodation Supplement area structure and maximum rates revised	The number of *Accommodation Supplement* areas was increased from three to four with Auckland divided into two areas. Some localities were moved into higher maxima areas and the maximum supplement payable was increased. The new maximum weekly rates of the *Accommodation Supplement* were: • (Area 1) $145 for a one person household, $160 for a two person household and $225 for a household of three or more people; • (Area 2) $100 for a one person household, $125 for a two person household and $165 for a household of three or more people; • (Area 3) $65 for a one person household, $75 for a two person household and $120 for a household of three or more people; and • (Area 4) $45 for a one person household, $55 for a two person household and $75 for a household of three or more people.
1 April 2005	Increased assistance for families with children	As part of the Working for Families program there was an increase in assistance for families with children. The child component was removed from the rates of Social Security Benefits and Student Allowances, and there was a larger increase in maximum rates of Family Support
1 July 2005	Accommodation Supplement: Residents of Retirement Villages	The *Accommodation Supplement* was extended to residents of Retirement Villages with "*Licence to Occupy*" tenure.
1 April 2006	Temporary Additional Support replaced Special Benefit	The discretionary *Special Benefit* was replaced with a new rules based hardship benefit called *Temporary Additional Support* (TAS). The purpose of TAS was to provide temporary last resort financial assistance to alleviate financial hardship for people whose essential financial costs could not be met from their chargeable income and other resources, while ensuring that applicants take reasonable steps to reduce their costs or increase their income. The housing loading in TAS was intended to prevent TAS undermining the AS (as special benefit had done), by ensuring that people had to pay a portion of their housing costs themselves, before being eligible for the AS or TAS. People receiving a Special Benefit on 31 March 2006, were grandparented until their circumstances changed.
1 April 2006	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 April 2006	In Work Payment Replaced the Child Tax Credit	The In Work Payment (IWP) replaced the Child Tax Credit (CTC) and provided increased financial support for low income working families with dependent children.
1 April 2007	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 April 2007	Rates of Family Tax Credit increased	Rates of the Family Tax Credit were increased by $10 per child per week.
1 April 2008	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 January 2009	Transitional package for redundant workers (RESTART)	A two-year package *Transitional Package for Redundant Workers* was implemented to help workers made redundant during the economic slowdown. The programme included an additional payment (called 'Replace') for those who qualified for the maximum amount of *Accommodation Supplement* after they have been made redundant. This provided up to $100 per week (in addition to the AS, based on their actual accommodation costs).
1 January 2009	Redundancy Payments exempt as cash assets for the Accommodation Supplement	From this time, part or all of a redundancy payment up to maximum exemption of $25,000 (after tax) were exempt from the definition of cash assets applicable to the *Accommodation Supplement*. The exemption was time-limited and set to expire at the same time as the *ReStart Transitional Package for Redundant Workers*.
1 April 2009	Annual general adjustment	Inflation adjustment of AS entry thresholds
1 April 2010	Annual general adjustment	Inflation adjustment of AS entry thresholds

Notes: Sourced from McKenzie (2017).

Table A2: Key variables in the study dataset

Variable(s)	Definition
SWN	Unique social welfare number
Mdate	Month extract date
Address_line_[number]	Text strings related to client address
Suburb	Suburb
City	City
Geocodes	X and Y coordinates
Ribbon	Dummy variables related to outside, inside and inside-inner
Distance	Distance from boundary (placebo=0, inside=1, outside=2)
MUL	Dummy variable indicating if in the north (outside the metropolitan urban limit=0) or south (inside metropolitan urban limit=1)
POST_CD	Post code
Sex	Male or Female
AGEEX	Age in years
NUMCHILD	Number of dependent children included in benefit
APORT	Benefit apportionment into '0' = 'Single client', '1' = 'Primary client', '2' = 'Partner', '9' = 'Not applicable
MainBenefit_[type]	Dummy variables for main benefit type (eg unemployment benefit etc). The dataset also contains a variable SERV which is detailed codes for benefit type.
AS_WKRT	Weekly rate of Accommodation Supplement
AS_WKCST	Weekly declared accommodation costs (ie rent, board home ownership costs)
AS_REGN	Accommodation supplement regions before and after policy change
AS_TENRE	Type of tenure including '1' = 'Renting', '2' = 'Boarding', '3' = 'Own Home', Other = 'Not Coded';
AS_LANDL	Type of landlord including private, council, HCNZ etc
SpecialTAS	Combined value of Special Benefit and TAS
DA_IND	Receiving disability allowance
PNETT	Net amount of main benefit paid per week
All_supps	Net amount of supplementary payments per week
Newincome	Other income declared to W&I
Total_net_income	Total net income (excluding tax credits)
WFF	Dummy variable for dates of policy change (1 April 2005 and afterwards)
Impact	Dummy variable to identify impact which is 1 if WFF=1 and inside/inside_1 = 1

Table A3: Regression estimates of 2005 AS policy change impact on rent – controlling for Area Units

	All	By area		
	Areas	North	West	South
	(a) Dependent variable = Rent (weekly $-values)			
2005/6 Impact	0.95	9.49	-1.90	2.44*
	(1.01)	(7.70)	(1.72)	(1.29)
2006/7 Impact	2.84**	9.32	0.01	4.30**
	(1.22)	(9.30)	(2.10)	(1.54)
R-sq	0.420	0.515	0.479	0.419
No. Observations	376,916	6,706	141,764	228,446
	(b) Dependent variable = log(rent)			
2005/6 Impact	0.006	0.036	-0.010	0.016**
	(0.005)	(0.036)	(0.009)	(0.006)
2006/7 Impact	0.014**	0.044	-0.006	0.025**
	(0.006)	(0.041)	(0.010)	(0.007)
R-sq	0.435	0.511	0.480	0.410
No. Observations	376,916	6,706	141,764	228,446

	Family-type (No. adults, No. children)					
	(1,0)	(1,1)	(1,2+)	(2,0)	(2,1)	(2,2+)
	(a) Dependent variable = Rent (weekly $-values)					
Impact*2005/5	-0.84	1.27	2.67	2.15	4.19	-0.48
	(1.71)	(2.35)	(2.11)	(2.79)	(4.47)	(3.45)
Impact*2006/7	-0.62	5.71**	6.58**	-1.40	3.55	8.91**
	(1.97)	(2.85)	(2.58)	(3.36)	(5.08)	(4.40)
R-sq	0.159	0.152	0.265	0.148	0.213	0.274
N	129,933	72,012	77,256	44,867	21,021	31,827
	(b) Dependent variable = log(rent)					
Impact*2005/5	-0.004	0.003	0.012	0.013	0.016	-0.003
	(0.010)	(0.011)	(0.009)	(0.013)	(0.018)	(0.012)
Impact*2006/7	-0.003	0.020	0.028**	0.000	0.012	0.027*
	(0.011)	(0.013)	(0.010)	(0.016)	(0.020)	(0.015)
R-sq	0.164	0.142	0.232	0.139	0.207	0.278
N	129,933	72,012	77,256	44,867	21,021	31,827

Notes: Standard errors in parentheses, adjusted for clustering at the SWN Client level.
** p<0.05, * p<0.1.

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