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The relationship between public housing wait lists, public housing tenure and labour market outcomes

National Research Venture 1: Housing assistance and economic participation

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authored by

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PEER REVIEW STATEMENT

An objective assessment of the report by carefully selected experts in the field ensures that material of the highest quality is published. It employs a double-blind peer review of the full report – where anonymity is strictly observed between authors and referees.

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1 INTRODUCTION

Public housing has long been an important component of the social welfare safety net in Australia. The provision of adequate housing to low-income individuals who otherwise could not access it is seen as important to ensuring that such individuals can participate and function adequately in society. As at 30 June 2006, there were around 334,000 occupied public housing properties in Australia (SCRCSSP, 2006). However, very little is known about how participation in public housing actually impacts upon the socio-economic outcomes of the individuals and families who become public housing tenants. This is in contrast to most other assistance measures, such as labour market programs for the unemployed, for which there have been numerous attempts to identify 'causal' relationships between program participation and socio-economic outcomes.

In part this lack of evidence is because public housing is not a program targeted at addressing specific disadvantages or to achieving specific outcomes for its participants. Rather, it is designed to offer a broad safety net to people facing social marginalisation through any of a wide range of adverse circumstances, from low income to physical and mental disabilities, to risks such as domestic violence. In greater part, the paucity of evaluation studies reflects the considerable methodological challenges in the empirical identification of the impact of public housing on social and economic outcomes, and that data required to support such analyses have not been available to Australian researchers. In recent years there has been a growing overseas literature that explores whether public housing impacts on employment outcomes. Studies have put forth opposing arguments as to whether the provision of public housing has positive or negative employment effects on tenants, but here too the empirical evidence remains inconclusive.

This report provides an important and novel contribution to our understanding of the relationship between public housing participation and employment outcomes in Australia. It has been made possible through the availability of a unique dataset. The State Department of Housing and Works (DHW) manages public housing programs in Western Australia through their public housing agency. For the purpose of this project, DHW extracted a confidentialised data set from its administrative records of all people who entered the wait list for public housing from January 1999 onwards, including records on their subsequent public housing tenancies until November 2005.[1] The wide array of socio-demographic and income variables in the data allows the construction of income and employment profiles from the date of first appearance on wait lists, through entry into public housing to the most current recorded income and employment situation.

To the best of our knowledge, this is the first time longitudinal data on a large sample of public housing tenants have been available to researchers in Australia, and it is the first time data of any form on persons on public housing wait lists have been available to independent researchers. A feature of public housing programs in Australia is that the demand for public housing exceeds the supply, such that participation in the program must be rationed, unlike other forms of assistance, such as Commonwealth Rent Assistance of Family Payment, that are universally available to all persons who

[1] The authors are grateful to the Western Australia Department of Housing and Works (DHW) for providing confidentialised unit records of their tenants and applicants. The authors would especially like to thank Ian Hafekost for providing public housing policy advice and facilitating data extraction, and Roger Holding and Cameron Searle for facilitating and undertaking data extraction and providing advice on data interpretation. The views expressed in this report are the authors', and do not necessarily reflect the views of DHW.

meet the eligibility criteria. Because this rationing may have significant behavioural effects on applicants, it is important to have data on both applicants and tenants in order to fully assess the effects of public housing programs. It is also the case that the public housing schemes in place in each of the States and Territories are broadly similar in their operation, meaning that the results of this research relate not only to Western Australia, but have implications nationally.

1.1 Key research and policy questions

One of the main objectives of the most recently concluded Commonwealth State Housing Agreement (CSHA) is to increase the economic participation of disadvantaged Australians. The agreement requires state and territory governments to reform the management of public housing in ways consistent with the promotion of economic participation among public housing tenants (Commonwealth of Australia, 2003). This report provides important information for the formulation and design of public housing policies that aim to improve economic participation among tenants. Each of the empirical chapters provides information on one of two broad areas of enquiry: the nature and dynamics of participation in public housing (including time on the wait list); and the relationship between participation in public housing programs and employment outcomes. More specifically, we seek to address the following key research and policy questions:

1. How does the length of public housing tenure vary across socio-demographic groups and what are the main causes of exits from public housing?
2. How are the labour market outcomes of actual and potential public housing tenants affected by the rationing of public housing stock – that is, how are labour market outcomes influenced by the presence of a public housing wait list?
3. How does the labour market activity of those on the wait list change following transition into public housing?
4. For those in public housing, do public housing rental rebates depress labour market outcomes?

1.2 Report outline

Section 2 provides a background to the issues and analyses. This includes a review of recent studies that have analysed the impact of public housing on employment, an overview of public housing arrangements in Australia and a discussion of the theoretical grounds for expecting labour supply decisions to be affected by public housing assistance.

The DHW dataset is described in detail in section 3. This section also contains a brief introduction to the methodologies employed to demonstrate how we have attempted to exploit the unique properties of the data to circumvent methodological issues that commonly afflict analyses of the relationships between public housing and employment.

Sections 4 and 5 offer a rich picture of the nature of participation in public housing. Section 4 provides a description of the characteristics of public housing tenants and applicants in Western Australia. This includes an examination of their employment status at three important points in time: the date of entry onto the wait list, the date of entry into public housing and the most recent date available for each tenant. Section 5 looks at the dynamics of public housing tenure by examining how the length of public housing tenure varies across socio-demographic groups, and what factors determine the length of public tenancies for different socio-demographic groups. This

begins with a brief review of the limited Australian and international literature on this topic

Sections 6 to 8 employ a variety of econometric techniques to try to identify the presence and extent of 'casual' links between participation in public housing and employment outcomes. Section 6 analyses how the probability of exiting non-employment into work varies as individuals make a transition from the wait list into public housing. This section gives an indication of how the employment outcomes of actual and potential public housing tenants are affected by the rationing of public housing.

Section 7 extends the analysis in section 6 by estimating the direction and magnitude of the impact of transitions into public housing on employment probabilities. In this section we conduct exercises to gauge the extent to which public housing affects employment through a welfare lock effect and a housing stability effect.

Section 8 estimates the impact of the size of rental rebates on the employment outcomes of families in public housing. Here we attempt to address the question of whether public housing rental rebates depress labour market outcomes.

A final section outlines key findings, policy implications and directions for future research.

2 BACKGROUND

2.1 Public housing arrangements in Australia

The development of public housing in Australia was initiated after World War II, to alleviate a shortage in housing. Over time, the aim of the program changed so as to provide a more secure and desirable tenancy to the private rental market for those individuals who could not otherwise afford to purchase a property. More generally, the expansion of the public housing stock was seen as a way to improve the supply of affordable housing at the low end of the market. As the program matured, it became more closely associated with the welfare sector and was seen as a form of income support.

Public housing is provided and managed by state and territory housing authorities. The Commonwealth State Housing Agreement (CSHA) is the main funding source for public housing. The CSHA is an agreement made between the federal, state and territory governments to provide funding for housing assistance targeted at persons in need. The 2003 CSHA runs from 1 July 2003 to 30 June 2008. The majority of funding under the 2003 CSHA is provided by the federal government, with the state and territory governments contributing additional funding to partly 'match' federal government funding. In 2003/04, the federal, state and territory governments provided funding of approximately $1.3 billion for housing programs, with the federal government contributing just under three-quarters of the total funding amount and the states and territories contributing the rest. The majority of the funding was spent on public and community housing (SCRCSSP, 2006).

Although much of the focus of housing assistance measures has shifted to demand subsidies in the form of Commonwealth Rent Assistance over the past decade, a large number of individuals remain resident in public housing in Australia. As of 2005, the public housing stock exceeds 343,000 dwellings (SCRCSSP, 2006). In general, public housing applicants must be Australian citizens or permanent residents and must not own residential property. All applicants must be living in the respective state or territory where the application is made (SCRCSSP, 2006). To initially qualify for public housing, the applicant household's income must be below an income limit threshold, which again differs by state and territory. State housing authorities typically have more than one wait list, with applicants sorted into different segments of need according to household type, preference for housing type and location. A priority wait list is operated in most states and territories for categories of acute housing need[2].

Typically, tenants pay rents that are a fixed percentage of their assessable income up to a maximum equal to the market rent and state housing authorities employ slightly different definitions of household assessable income. Rents in public housing are set at levels that are in the vast majority of cases below market rents[3]. Therefore, the rent paid generally increases as tenants' assessable income increases or, put another way, the level of the rental subsidy falls as income increases. In each state and territory the withdrawal rate is 25 cents in every dollar of assessable income until the maximum rent is reached. Assessable incomes generally include the government benefit entitlements of the principal earner and their partner, but practice varies with

[2] For a description of the public housing wait list allocations system by state and territory, refer to Wood, Ong and Dockery (2007).

[3] According to the SCRCSSP (2006), 87.8 per cent of public housing tenants paid rent below the market level as at 30 June 2005.

respect to the fraction of income of other household members that is included in assessable income[4].

2.2 Incentive and disincentive effects – the theory

Evidence of the existence and magnitude of the impact of public housing on employment should play an important role in the shaping of public housing and welfare reform policies. Studies have put forth opposing arguments as to whether the provision of public housing has positive or negative employment effects on tenants.

The enabling hypothesis argues that by providing security of tenure in affordable housing, public housing programs can assist employment prospects because of the responsibility and reliability implied by a permanent address, and avoidance of the disruptive effects of not having a permanent place to live. Furthermore, the reduced housing rent of public housing allows tenants to commit more of their resources to job searches and work-related expenses such as transportation and clothes (Van Ryzin, Kaestner and Main, 2003).

Work incentives can be blunted by the provision of a public housing subsidy in ways that increase effective marginal tax rates and reduce labour supply as a result of substitution effects. The standard approach is to assume that the subsidy shifts the labour supply–income locus as if it were like any other income support payment that is withdrawn as private earnings increase. Because the public housing subsidy is withdrawn at 25 cents in every dollar of income earned (see Figure 2.1), the 'price' of leisure is reduced and if leisure is a normal good, the supply of labour falls. Public housing subsidies will also create income effects, given that households receiving subsidies are more likely to be able to collect sufficient resources to survive without supplying additional work hours than those who do not. Furthermore, the eligibility criteria and rationing of public housing can be responsible for welfare locks and income notches created by 'up and out' rules that determine the continued eligibility of public housing tenants, or those on wait lists (Stiglitz, 2000; Yelowitz, 2001).

Note that public housing subsidies are closer to a 'pure' in-kind transfer, where assistance is provided in the form of a 'take-it-or-leave-it' bundle of shelter services, than to a 'pure' cash transfer in which support is received in the form of a cash sum that is spent on the recipient's preferred bundle of goods and services (Whelan, 2004). The distinction is important because an in-kind transfer in the form of a housing subsidy may effectively 'force' an individual to consume too much of the transferred bundle relative to what he or she would consume if unconstrained by the housing subsidy program.

The impact on labour supply will depend on the extent to which the in-kind transfer changes consumption choices and on the relationship between the transferred bundle and leisure. If the in-kind transfer is generally consumed in conjunction with leisure, the increased consumption of the in-kind transfer will be associated with an increase in leisure consumption. Such in-kind transfers may be associated with greater reductions in labour supply than would be the case for equivalent cash transfers. If an increase in the consumption of the in-kind transfer is generally associated with a decrease in the consumption of the leisure, the net outcome of the transfer may hence be to increase labour supply (Whelan, 2004). Murray (1980) and Schone (1992) point out that since in-kind transfers typically impose more of the subsidised good than would be chosen at market prices and an equivalent cash transfer, increases in earnings raise the value of the in-kind transfer, and drive real income up by more than

[4] For a description of assessable income sources and rent calculation rules by state and territory, refer to Wood et al (2007).

the dollar value of the boost to earnings. The incentive to increase labour supply is then greater under the in-kind subsidy than with an equivalent cash transfer. Evidence of the existence and magnitude of the impact of an in-kind housing subsidy on labour supply is clearly of great policy significance.

A key characteristic of public housing subsidies is that demand for assistance exceeds supply, with only a limited number of dwellings being available for eligible applicants. Hence, it is rationed according to eligibility criteria, and all state and territory housing authorities operate wait lists in order to prioritise access to public housing. As of 2005, for example, over 200,000 applicants remain on public housing wait lists in Australia (SCRCSSP, 2006). Rationing is potentially significant in respect of employment outcomes for two reasons. First, applicants might reject offers of employment for fear of losing eligibility (particularly when those offers are casual, fixed-term contracts), or even reduce labour supply if this would help advancement on the wait list (Fischer, 2000). Second, the transition into a public housing tenancy may mean a move that can disrupt family and working arrangements, with negative consequences for employment.

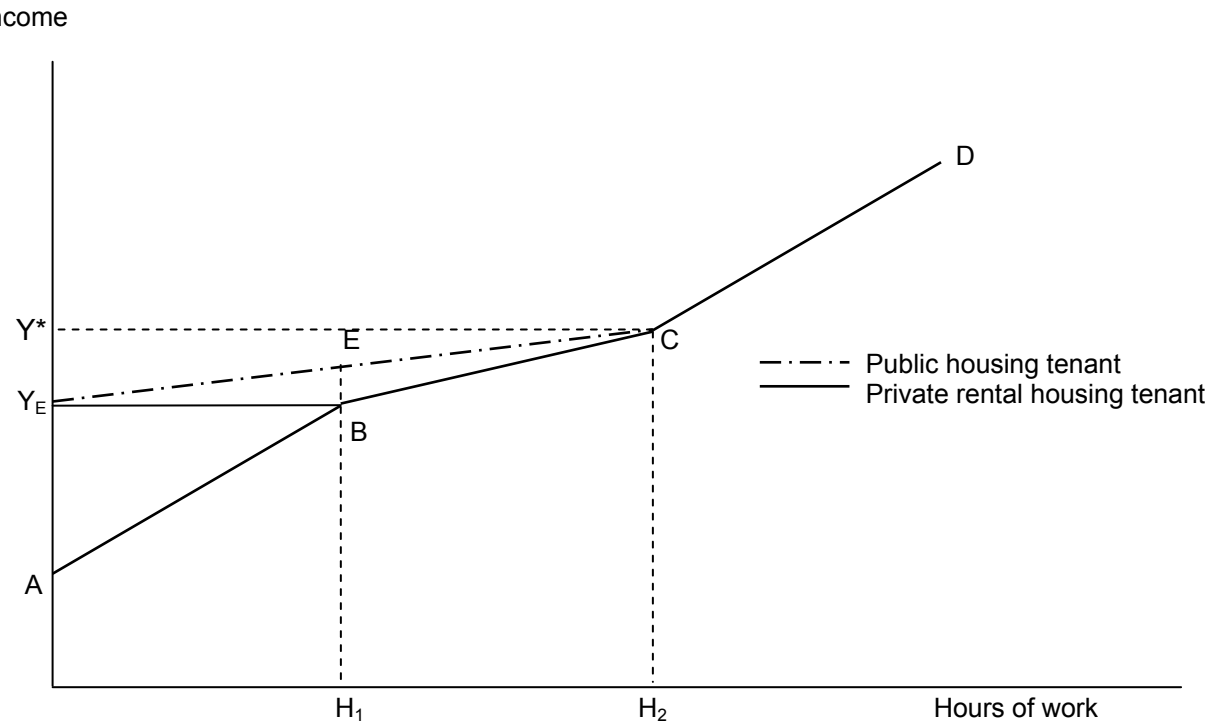
The theory behind the 'lock-in' effects is illustrated in Figure 2.1. To become eligible for public housing an applicant must have income less than or equal to Y_E which corresponds to H_1 hours of work given a uniform wage rate, w. A private rental tenant who secures offers of employment $H \leq H_1$ is eligible for federal income support programs that give cash transfers 0A. It is assumed these are gradually withdrawn at incomes $Y > Y_E$, and the labour supply–income locus is ABCD, with all income support withdrawn when income reaches Y.

The private rental tenant with $H \leq H_1$ will also be admitted on to public housing wait lists, and this is a potentially appealing prospect given a public housing subsidy of monetary value AY_E that would place successful applicants on the opportunity locus Y_EECD[5]. But the applicant must wait before an offer of public housing is made, an offer that can be on a 'take-it-or-leave-it' basis, and the longer this wait time the lower the discounted value of public housing assistance. There can then be selection effects, if those who can adjust their labour supply so as to purchase preferred quantities and qualities of the 'tagged' good screen themselves out of the program[6].

[5] For convenience the public housing subsidy is assumed to be withdrawn once income reaches Y_e and becomes zero at H_2Y, and the sum of the cash transfer and public housing subsidy is assumed equal to $0Y_E$. Private renters can be eligible for CRA and this program has been ignored in Figure 2.1. Since it is typically less generous than public housing assistance (see Table 5.2.2), its inclusion would not alter propositions based on Figure 2.1.

[6] Rationing can then ensure targeting of the neediest (Blackorby and Donaldson, 1988), though Newman and Harkness (2002) cite evidence that admission into public housing is unrelated to its expected benefits to the household.

Figure 2.1: Public housing and work incentives



Source: Wood et al. (2007)

Eligible households willing to wait are admitted onto public housing wait lists and are subject to 'up and out' rules that are the source of a 'welfare lock' (Stiglitz, 2000). Public housing authorities enforce income eligibility rules to ensure that progression to the top of wait lists is targeted at households with $Y \leq Y_E$. Applicants accepting offers of work yielding $Y > Y_E$ will become ineligible and lose their place on the wait list. The application of such up and out rules creates a 'notch' at H_1 (equal to EB in Figure 2.1) that deters acceptance of offers of work at $H > H_1$, and is then the source of welfare locks. This aspect of public housing and its implications for the labour market outcomes of those on the wait list is an important research and policy question that has not been explored in Australia before.

The relationship between public housing subsidies and the supply of labour is not straightforward enough to be analysed in a standard neo-classical economics choice framework that ignores selection effects and welfare locks. On the other hand, there are sound reasons for expecting employment effects that are grounded in choice theory. This makes public housing subsidies and their relationship to employment challenging and interesting to study.

2.3 Existing evidence

In recent years there has been a growing overseas literature that explores whether public housing impacts on employment outcomes. Public housing programs in the United States commonly have family self-sufficiency programs that encourage employment through financial incentives (Rohe and Kleit, 1999). Many public housing authorities also support programs that encourage economic participation among public housing tenants, such as the Jobs-Plus Community Revitalization Initiative (Riccio, 1999). In Australia, state housing authorities commonly insert a tenant employment clause into contracts requiring successful tenderers to engage tenants. An example is the Public Tenant Employment Program in Victoria, which requires

successful cleaning and gardening contractors to employ tenants. Economic participation is also encouraged through community initiatives, including support for community development programs, local business engagement and community jobs programs. Key initiatives that have been introduced to overcome the digital divide[7] between tenants and those not residing in public housing include the establishment of neighbourhood technology centres in New South Wales and the Reach or the Clouds project in Victoria (Dalton and Ong, 2005).

In the United Kingdom, Hughes and McCormick (1987) suggest that public housing allocation policies are an impediment to labour mobility, restricting the ability of workers to move between regions in response to regional unemployment differentials, and hence raising the natural rate of unemployment[8]. An emphasis in the United States literature has been on the location of public housing in inner city areas that make suburban job opportunities inaccessible (Ong, 1998; Allard and Danziger, 2003). These concerns have prompted policy initiatives that offer portable housing assistance designed to encourage suburban relocation, as in the federal government's Moving To Opportunity program (McClure, 2004). The location issue also arises with respect to fears that concentrating the disadvantaged in public housing estates erodes work ethics, exacerbates social problems and stigmatise tenants, with negative impacts on employment outcomes.

Evidence on housing assistance and employment outcomes in the United States is provided in Ong (1998), Fischer (2000), Painter (2001) and Shroder (2002). In the United Kingdom, empirical estimates of the contribution of housing assistance to effective marginal tax rates and replacement rates are presented in Giles, Johnson and McCrae (1997), and Pryce (1999) examines the link between work incentives and social housing. Norwegian evidence is offered in Nordvik and Ahren (2005). Consistent with public housing subsidies creating disincentives to employment participation, there is evidence in both the Australian and overseas literature that public housing tenants exhibit inferior labour market outcomes relative to persons in other housing tenures (see Agrawal, 1988; Wadsworth, 1998; Barrett, 2002; Whelan, 2004; Wood, Ong and Dockery, 2007).

Agrawal (1988) used data from the Survey of Income and Housing Costs to examine the effect of the program on the consumption pattern of participants and the distribution of benefits among participants. In general, the analysis indicates that households in receipt of public housing consume more housing than they would in the absence of the program. Barrett (2002) found that sole parent pensioners who are public housing tenants in New South Wales and the Australian Capital Territory have a 32 per cent lower exit rate from periods on the Sole Parent Pension, and this is attributed to the higher public housing assistance in these regions. Hunter (1995) found a negative correlation between the proportion of males employed in census collection districts and the proportion of the population living in public housing. Whelan (2004) modelled labour supply decisions using microdata and found some evidence that public housing subsidies limit labour force participation. Wood et al (2007) found a strong correlation between high work disincentives and low employment participation among female public housing tenants. Australian Housing and Urban Research Institute (2005) tracked the changes in the lives of 178 households in their first six months or so as public housing tenants and found a mixed effect on

[7] Public housing tenants typically have less access to information technology such as computers and internet than persons not living in public housing, resulting in a 'digital divide' between these two groups.

[8] These are not the only housing-related impediments to mobility. Oswald (1997) argues that high transaction costs and widening regional house price differentials impede the mobility of home owners and increase the natural rate of unemployment.

employment outcomes, with some tenants feeling more able to look for work because housing issues had been resolved and others reporting a reduced need to work because of lower housing costs, and the opportunities this created for training, child care or voluntary work.

The fact that those in receipt of housing subsidies display inferior employment outcomes does not necessarily imply causality, and it must also be noted that the provision of housing subsidies is correlated with other impediments to labour market participation, which may include neighbourhood effects and any stigma associated with participation in welfare schemes. Empirical identification is difficult because of the range of potential observable and unobservable factors which may also contribute to inferior outcomes for those who find themselves in need of housing subsidies. In chapter 8 we utilise a 'natural experiments' approach to tackle this identification problem.

To the best of our knowledge, aside from our ongoing work with the DHW dataset used in this report, no other Australian studies have attempted to estimate 'lock-in' or disincentive effects for persons on the wait list that arise from the rationing of public housing.

3 DATA AND METHODOLOGY

3.1 Data attributes

The primary aim of our analysis is to investigate the relationship between public housing wait lists, public housing tenure and labour market outcomes. Hence, the ability to observe and compare employment outcomes before and after entry into public housing is a crucial requirement in order to identify the impacts of rationing of public housing stock on employment outcomes prior to public housing entry and changes in employment trends after public housing tenure has been secured.

The strength of the dataset employed for analysis is that it is a panel or longitudinal dataset that tracks individuals from the date they first appear on wait lists, through to entry into public housing and to either the point of exit for those who have left public housing or to the most current point in time for those who remain in public housing. The dataset is derived from public housing administrative records from the Western Australian DHW and provides detailed socio-demographic and income information on Western Australia's public housing applicants and tenants during their wait list and public housing tenures.

The DHW public housing dataset, while state-based, possesses several distinct advantages over nationally representative panel datasets such as the Household, Income and Labour Dynamics in Australia (HILDA) Survey. First, panel studies are generally vulnerable to attrition bias because initial respondents who later cannot be traced or refuse to be interviewed are not representative of the sample population. Analysis based on the DHW dataset is not vulnerable to these sources of attrition because public housing applicants and tenants are required to respond to questions from the DHW pertaining to their socio-demographic and economic status in order to maintain their position on the wait list or in public housing. Second, one of the limitations of national datasets is that they usually contain only a small number of public housing tenants and this limits the robustness of estimates derived from such datasets. The only previous Australian study that examined the impacts of transitions into public housing on economic participation was conducted by Whelan (2004) using the HILDA Survey and he noted that a small sample size was a limitation. The DHW dataset presents an opportunity to revisit this relationship with an enormous dataset. Third, the DHW dataset allows accurate identification of public housing applicants, a crucial requirement to examine the impacts of rationing of public housing stock on employment. This is not possible in national datasets. Spong and Ong (2005) conducted an audit of panel datasets potentially suitable for analysis of the causal relationship between housing assistance and economic participation and concluded that the DHW dataset has superior attributes that make it more suitable for analysis than other panel datasets currently available in Australia[9]. On the downside, however, the DHW dataset does not contain data on persons who are not public housing tenants (or on the wait list) with whom comparisons can be made.

3.2 Data variables

The DHW data timeframe is from 1 January 1999 to 30 November 2005. That is, it contains information on applicants and tenants who entered the wait list between 1 January 1999 and 30 November 2005. For tenants (applicants) still in public housing (on the wait list) at the end of the data timeframe, the observation as at 30 November

[9] Other panel datasets surveyed include the Survey of Employment and Unemployment Patterns, General Customer Survey, Jobseeker Data Set, HILDA Survey and the Labour Force Survey. See Spong and Ong (2005) for details.

2005 represents the last data point on their ongoing spell. For tenants (applicants) who exited public housing (the wait list) before the end of the timeframe, the last observation will be as of their exit date from public housing (application withdrawal date).

3.2.1 Income and employment variables

Reliable analysis of employment outcomes requires either that employment status be directly observable from the data, or that the data contain sufficient income source information to allow us to accurately identify individuals who are employed. While employment status is not directly observable from the data, the data contains information on over 100 income sources, enabling accurate identification of individuals receiving a wage or salary. Specifically, individuals in the data receiving a wage or salary, Community Development Employment Project wage or Disability Wage Supplement are treated as employed[10]. As hours worked are not observable, the data unfortunately do not allow accurate distinction between full-time and part-time workers.

The Department undertakes an income eligibility check of applicants at application and at property allocation, to ensure that public housing is only occupied by eligible persons. After property occupation, Departmental policy is to review their tenants annually but this has more to do with setting rebated rents rather than enforcing eligibility tests[11]. Tenants whose income has changed are also required to report their new income details to the Department (WA DHW, 2006). The data thus contain an abundance of income history variables that allow us to track the employment outcomes of applicants and tenants through time.

The Department has in place rigorous income verification procedures that ensure that the income data collected on applicants and tenants are accurate. Income details must be accompanied by documentary proof, such as wage slips from employers and benefit confirmation statements from Centrelink (WA DHW, 2006). Such procedures minimise the risk of both intentional and unintended reporting errors on the part of applicants and tenants, hence ensuring that the income data are sufficiently reliable for analysis.

3.2.2 Socio-demographic variables

The data are confidentialised unit records, in which each individual is tracked by a unique customer identification number and each household is tracked by a unique household number. Variables readily observable from the data include gender, position in the household, date of birth, disability types, Aboriginality and region. Various variables that are pertinent to analysis of public housing eligible persons are available at a more detailed level than in nationally representative datasets, in which public housing tenants generally comprise a small proportion of the sample.

The disability variables available in nationally representative panel datasets are typically very general and do not allow researchers and policy makers to determine

[10] Disability Wage Supplement was introduced in 1994 to encourage disabled people to undertake paid work. The supplement is an additional payment made to the disabled individual who receives less than the award wage provided the disabled individual is unable to perform job duties at the appropriate level warranting payment of full award wages (Parliamentary Library, 1997).

[11] The data show that once a wait list applicant has successfully made the transition into public housing, income eligibility limits are not strictly enforced. In November 2005, 17 per cent of Western Australian public housing households (who have entered since January 1999) technically breached income eligibility limits.

the type or extent of disability that an individual suffers from in any great detail[12]. For example, the HILDA Survey contains an indicator equal to 1 if a respondent reports a long-term health condition or disability and 0 otherwise, and another indicator that asks the respondent to assess whether his/her condition is work-limiting. The Survey of Income and Housing Costs (SIHC), another nationally representative dataset, does not contain any disability indicators. It is possible to identify disabled persons only by looking at whether the person receives Disability Support Pension, and even this will be reported only if the person also has low income. The present data contain detailed disability categories, including physical, cognitive, intellectual, neurological, psychological and sensory disabilities. The disability information is not wholly self-assessed information as it has to be verified by the disabled individual's doctor.

The DHW data contain a variable that indicates Aboriginality. Such a variable is not available from a survey such as the SIHC. Given the large numbers of Aboriginal persons living in public housing in Western Australia and in Australia, the existence of an Aboriginal indicator is crucial for public housing analysis. It also means that the DHW dataset is one of the few that contains a sufficiently large sample of Indigenous persons to support separate multivariate empirical analyses of Indigenous outcomes.

Western Australian public housing is scattered throughout ten regions. The metropolitan regions are the north, south and south-east metropolitan regions[13]. The non-metropolitan or country regions are Great Southern, South-west, Goldfields, Midwest-Gascoyne, Pilbara, Kimberley and Wheatbelt regions[14]. Each region is in turn divided into districts, resulting in over 380 district categories that can be identified from the dataset. The location data can be further disaggregated to postcode level. District and postcode level data are generally not available from nationally representative datasets. In fact, the latter generally provide only a capital city/rest of state or a major city/regional area breakdown, and this is less specific than the ten-region breakdown provided by the present data.

Given the panel nature of the dataset, it is possible to identify the size and structure of each applicant and tenant household at any point during the data timeframe. Hence, it is possible to observe changes in household size and structure through time.

The Western Australian DHW operates a wait list plus priority system. An applicant's position on the wait list is generally determined by the date of application, and these are termed 'wait-turn applicants'. However, some applicants are given priority assistance because of their urgent housing needs (WA DHW, 2006). Priority reasons include a medical condition, domestic violence and homelessness. An applicant's priority level and priority reasons in the present data potentially provide an insight into factors that are likely to act as barriers to employment participation.

Other potentially important socio-demographic information, such as level of education, is not available. Details on some other variables, such as country of birth, may be reported by applicants for public housing. However, as this information is not fundamental to the administration of the program, not all applicants respond to this question.

[12] This excludes surveys that are wholly focused on disabilities such as the Disability, Ageing and Carers Survey from the Australian Bureau of Statistics.

[13] These are also known as the Mirrabooka, Fremantle and Cannington regions respectively.

[14] These are also known as the Albany, Bunbury, Kalgoorlie, Geraldton, Port Hedland, Broome and Northam regions respectively.

3.3 Methodology

A key methodological issue affecting analysis of the impact of public housing on employment is the issue of identification. Empirical identification refers to whether one can validly infer that the differences in an outcome variable are caused by differences in the relevant explanatory variables. In analysis such as this, empirical identification is often hindered by the following problems. First, an omitted variable problem arises if factors unrelated to public housing contribute to inferior employment outcomes for those who find themselves in need of public housing, but the impact of such factors cannot be observed (that is, they cannot be accurately measured) with the available data. Secondly, the public housing variable in a labour supply equation is often correlated with labour supply outcomes. Eligibility for public housing is determined by income, which is expected to correlate closely with labour market participation. As a result, it is very difficult to determine whether labour supply changes are the cause or the effect of residence in public housing.

In attempting to overcome these difficulties, this report uses a variety of econometric techniques made possible by the nature of the data. These approaches are briefly described below.

3.3.1 Panel data analysis

Panel datasets offer advantages in disentangling cause from effect when compared to cross-section data because individual-specific traits that are not observable to the researcher can still be controlled for by observing outcomes for the same person at different points in time. In our case, employment outcomes can be compared for the same person both in and out of public housing. To the extent that unobservable factors that impact upon employment prospects (that is, omitted variables) are fixed for any one person, correlations between public housing status and employment status cannot be attributable to unobserved differences in the characteristics of public housing tenants, as might be the case in cross-sectional data, because the public renters and non-public renters in the sample are precisely the same people, only observed at different points in time. This reduces the risk of endogeneity and the impact of public housing, net of the influence of an individual's other characteristics, can be more readily identified. Hence, the panel nature of the Western Australian DHW public housing dataset is particularly suitable for the present analyses.

3.3.2 Hazard analysis

Hazard analysis, also known as survival or duration analysis, refers to the modelling of time until a specified event occurs across a sample of spells. The survival function measures the probability that a given event has not occurred by time *t*. The hazard function is a measure of the risk of an event occurring at time *t*, given that the event has not yet occurred by time *t*. The larger the hazard value at time *t*, the greater the risk of the event occurring at that time. The survival function and the hazard function are just different ways of representing the same distribution of events – the survival function determines the hazard function and vice versa. In the social sciences, survival/hazard models have been used to study life expectancy, the 'survival' of marriages, the tenure of jobs, the 'hazard' or risk of dropping out from high school, gaining a promotion or leaving unemployment. A commonly used hazard model, which we utilise here, is the Cox proportional hazard model.

In addressing key research questions 1, 2 and 3 (see page 2) we apply survival/hazard analysis to investigate the duration of two types of spells – public housing tenancies and time in non-employment. Key research question 1 asks how the duration of public housing tenure varies across socio-demographic groups and

what the main causes of exits from public housing are. The analysis in this case models time until exit from public housing as a function of covariates, which are socio-demographic and economic characteristics that can potentially affect exit from public housing. By the end of the data timeframe, some individuals will still be in public housing. Such observations are called 'censored' observations. Although the eventual duration of a censored spell is not known, such spells still contribute to the analysis as the estimation technique can make use of the fact that the spell has lasted at least to that point in time.

Key research questions 2 and 3 relate to how transitions from the wait list into public housing affect the duration of non-employment periods. In this case, the survival/hazard analysis is of time until exit from non-employment as a function of covariates which include housing status, socio-demographic and economic characteristics that can potentially affect the length of non-employment periods. The 'hazard' refers to the process of exit from non-employment while the 'survival' process reflects the continued maintenance of a non-employed state. By the end of the data timeframe, individuals who are still non-employed constitute censored observations.

3.3.3 Quasi-experimental approach

The problem of identification can be further overcome if a study utilises a randomised experiment study design, in which individuals are randomly assigned to either a treatment group or a comparable control group. Interaction effects with omitted variables that might differentially affect treatment and control groups are minimised because both groups are very likely similar.

The Moving to Opportunity program is a prime example of a randomised experiment being implemented in the evaluation of a social policy. Under the program, public housing households in high poverty neighbourhoods are moved to low-poverty neighbourhoods by providing tenant-based housing subsidies that can be used in the private rental market. Participating families in the experiment are randomly assigned to one of three groups:

- an experimental group who receive tenant-based housing assistance and were required to move to low-poverty neighbourhoods;
- a comparison group who received vouchers and were allowed to live in any neighbourhood; and
- a control group who continued to receive public housing assistance in high-poverty areas (Goering, Feins and Richardson, 2002).

In Australia the only known randomised control experiment in the context of housing programs is the smaller-scale new Young People-Purpose-Place-Personal Support-Proof (YP^4) experiment which seeks to examine whether joining up programs and services in a client-centred manner results in more sustainable housing and employment outcomes for young homeless jobseekers. In this three-year trial, 480 young homeless jobseekers aged 18–35 are randomly assigned to the treatment or control groups. The treatment group will be given a single contact point to address employment, housing, educational and personal support goals in an integrated manner over two years. In contrast, the control group will receive assistance in the standard way, which has been recognised as being fragmented and ineffective for homeless jobseekers (Coventry, 2005).

However, true randomised experiments are rare in Australia. An alternative approach is to search for 'natural experiments' that arise where an exogenous change in legislation creates a treatment group and a control group from a homogeneous subgroup in the population, allowing the differential policy application across the group

to be exploited to evaluate the impact of policy on outcomes. The natural experiment approach is also called an instrumental variable approach, in that it seeks to utilise an exogenous source of variation in the explanatory variable (the 'instrument') which can safely be assumed to be random with respect to the outcome variable. In recent years, various studies have exploited naturally random events as instrumental variables in natural experiments. Random events that have been used as instruments include twin births, birth date, gender, and weather events (Rosenzweig and Wolpin, 2000). A natural experiment approach is employed in section 8 to answer key research question 4: do public housing rental rebates depress labour market outcomes? To date we know of no other Australian study that has employed this approach in secondary datasets to analyse the impacts of public housing on outcome variables.

3.3.4 Difference-in-difference analysis

The difference-in-difference analysis is an extension of the quasi-experimental approach. In the United States, housing policy evaluations are commonly carried out using a before-and-after-treatment methodology, which enables before-and-after effects to be examined for the same population. Again, the Moving to Opportunity demonstration program is a prime example of this approach, where before-and-after outcomes can be compared for the treatment and control groups. Where one has observations on a control group and a treatment group over the same time period and that data is available for the time period before and after the treatment is implemented for both of the groups, a difference-in-difference approach can be adopted. The difference-in-difference model compares treatment group outcomes on a before-and-after basis relative to outcomes in the control group over the same timeframe. The change in outcomes of the treatment group is adjusted for the change in outcomes of the control group, and hence the average effect of the treatment is calculated as a difference of differences.

Difference-in-difference modelling is adopted in section 7 to answer key research questions 2 and 3 that ask how employment outcomes change following transitions into public housing. Public housing tenants form the treatment group with the treatment being entry into public housing. Applicants, being public housing eligible persons who are not in public housing, constitute an appropriate control group for the analysis.

4 PROFILING PUBLIC HOUSING TENANTS AND APPLICANTS THROUGH TIME

In this section we present a descriptive picture of the socio-demographic and economic characteristics of public housing tenants and applicants through time and exploit the panel nature of the DHW public housing dataset to estimate the average duration spent on the wait list and in public housing. The first aim of this exercise is to unearth changes in the composition of individuals eligible for public housing from 1999 onwards. The second aim is to provide estimates not only of the typical time spent on the wait list and in a public housing property, but also how this varies across individual characteristics of applicants and tenants and across regions. The focus group of our analysis are working-age public housing tenants and applicants. Working-age persons are defined as non-dependent persons aged 15 to under 65.

4.1 Tenant and applicant profiles, 1999–2005

Table 4.1 shows the socio-demographic characteristics of working-age tenants by year and we are able to observe how the profile of individuals residing in public housing has changed from year to year since 1999. The observations are taken from 1 July of each year from 1999 to 2005. The table shows that the typical public housing tenant in 2005 is 41 years old, female, single with or without children, and living in the metropolitan region. The average age of public tenants has increased by 6 years since 1999, from 35 years to 41 years in 2005. A comparison with the overall working-age population of Western Australia – average age of 37.5 years in 1999 and 38.4 years in 2005 – shows that in this period public housing tenants aged more rapidly and are now older than the state average. Public housing has become gradually more feminised over time and increasingly dominated by individuals with no children. The proportion of public housing tenants who are of Indigenous origin has increased noticeably from just over a quarter to one-third of public housing tenants. By comparison, Indigenous persons represent only around 3 per cent of the Western Australian population[15]. Public housing programs are also increasingly targeted at those with priority needs, such as homelessness, domestic violence etc. The extent of physical disability within public housing has increased by 50 per cent (from 4 per cent to 6 per cent) since 1999. The tripling of tenants with a psychiatric disability is noticeable. The regional variable indicates that public housing tenants are now more likely to be living in metropolitan regions than in country regions.

Table 4.2 shows how the profile of working-age public housing applicants has changed through time. The sample comprises all working-age applicants, regardless of whether they are the main applicants on the application form. Not surprisingly, the profile of applicants is similar to that of tenants. Any differences would have to relate to differential success rates in entering public housing between different groups on the wait list. The typical public housing applicant in 2005 is in her late thirties, female, single with or without children, and living in the metropolitan region. The average age of applicants has increased by 4 years since 1999. Females have consistently made up about two-thirds of all applicants. Public housing applications are increasingly individuals with no children. The proportion of applicants who are Indigenous has increased slightly from 19 per cent to 21 per cent. The incidence of disability in public housing wait lists has increased by more than 50 per cent (from 8 per cent to 13 per cent) since 1999, while applicants with a psychiatric disability have doubled since

[15] Comparative population statistics for Western Australia by age and Indigenous status are taken from Ausstats on-line spreadsheets, Australian Bureau of Statistics Catalogue 3105.0, Australian Historical Population Statistics.

1999. The proportion of tenants with a psychiatric disability has increased even more rapidly, having tripled between 1999 and 2005. The regional variable indicates that public housing applicants are now more likely to be applying for housing in metropolitan regions than in country regions.

In contrast to tenants, the proportion of applicants that are priority cases fell between 1999 and 2005, from 9 per cent to 5.5 per cent. Moreover, a comparison of Table 4.1 and 4.2 shows that the proportion of applicants that are priority cases appears to be significantly lower than the proportion of tenants that are priority cases. This is because a significant proportion of applicants actually enter the wait list as wait-turn cases, but are later transferred to a priority status while they are on the wait list due to changes in circumstances while on the wait list. Among the priority tenants in Table 4.1, approximately two-thirds were initially listed as wait-turn cases but later became priority cases.

Table 4.1: Characteristics of working-age tenants, by year

Characteristics	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Age (years)	35.0	37.7	38.7	39.3	39.7	40.4	40.8
Gender (%)							
Male	41.2	39.3	38.2	37.9	38.5	38.2	38.0
Female	58.8	60.7	61.8	62.1	61.5	61.8	62.0
Income unit type (%)							
Partnered with children aged <15	17.0	18.3	18.4	17.3	16.5	15.8	16.1
Partnered, no children aged <15	7.1	9.1	9.0	9.0	9.2	9.4	9.4
Single with children aged <15	33.6	30.5	30.9	31.6	30.9	31.1	30.3
Single, no children aged <15	42.3	42.1	41.7	42.2	43.4	43.7	44.3
Number of children aged <15							
Zero	49.4	51.1	50.7	51.2	52.6	53.1	53.7
One	19.3	19.5	19.6	19.1	17.7	17.9	17.8
Two	14.8	14.9	14.5	14.3	14.4	14.3	13.7
Three	7.5	8.3	8.5	8.2	8.0	7.8	7.7
Four or more	8.9	6.1	6.7	7.3	7.3	7.0	7.2
Aboriginal (%)	25.4	28.9	30.1	32.3	33.7	33.4	33.6
Priority case (%)	36.7	43.8	41.8	41.2	42.0	41.7	42.2
Disabled (%)							
Physical	4.1	4.3	4.4	4.3	4.9	5.8	6.2
Cognitive	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Intellectual	0.7	0.9	1.0	0.8	0.8	0.9	1.0
Neurological	0.0	0.1	0.1	0.0	0.0	0.1	0.1
Psychiatric	0.7	1.1	1.5	1.5	1.8	2.0	2.3
Sensory	0.4	0.3	0.4	0.5	0.6	0.7	0.8
Other	4.1	3.9	3.8	3.6	3.7	3.6	3.5
All disabled	7.9	8.2	8.6	8.5	9.4	10.2	11.0
Metropolitan region (%)							
North Metro	23.4	22.1	23.0	24.1	25.2	25.8	26.2
South Metro	12.0	12.6	13.0	14.1	15.2	14.9	15.2
South East Metro	19.9	21.1	21.4	20.9	20.5	20.4	20.5
All metropolitan regions	55.3	55.8	57.5	59.1	60.8	61.2	62.0

Characteristics	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Country region (%)							
Great Southern	6.1	3.5	3.0	2.9	3.2	3.3	3.4
South West	3.1	5.2	5.7	5.9	5.8	6.1	6.1
Goldfields	4.1	6.1	6.2	6.0	5.3	4.8	4.7
Midwest-Gascoyne	12.0	8.4	8.3	8.0	7.3	6.9	6.4
Pilbara	5.9	9.0	8.0	7.3	7.2	7.6	7.1
Kimberley	5.7	6.0	5.7	5.9	5.9	5.9	6.1
Wheatbelt	7.7	6.0	5.6	5.0	4.5	4.2	4.1
All country regions	44.7	44.2	42.5	40.9	39.2	38.8	38.0
Sample	997	4,338	7,771	10,819	13,557	15,717	17,408

Source: Authors' calculations from DHW public housing data 1999–2005

Table 4.2: Characteristics of working-age applicants, by year

Characteristics	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Age (years)	33.4	35.8	35.8	36.2	36.5	36.7	36.9
Gender (%)							
Male	37.3	37.7	38.3	38.5	38.3	37.6	37.1
Female	62.7	62.3	61.7	61.5	61.7	62.4	62.9
Income unit type (%)							
Partnered with children aged <15	11.1	12.2	11.2	10.8	10.7	10.6	10.9
Partnered, no children aged <15	5.0	6.2	6.0	6.5	6.2	6.3	5.9
Single with children aged <15	41.3	38.1	37.4	34.5	35.3	35.0	36.4
Single, no children aged <15	42.6	43.4	45.4	48.1	47.6	48.0	46.6
Number of children aged <15							
Zero	47.6	49.7	51.4	54.7	53.9	54.3	52.6
One	22.6	22.6	23.0	21.7	21.1	21.0	21.5
Two	17.0	15.8	15.0	13.5	14.0	13.1	14.1
Three	7.7	7.2	6.6	6.1	6.9	6.8	6.7
Four or more	5.0	4.7	4.0	4.0	4.2	4.8	5.1
Aboriginal (%)	18.6	18.4	16.9	20.1	21.6	21.4	21.4
Priority case (%)	9.0	6.8	4.3	4.8	5.1	6.2	5.5
Disabled (%)							
Physical	4.3	4.9	4.7	5.5	6.6	7.0	7.4
Cognitive	0.0	0.0	0.0	0.1	0.1	0.1	0.2
Intellectual	0.7	0.7	0.7	0.9	1.1	1.2	1.2
Neurological	0.1	0.0	0.1	0.1	0.1	0.2	0.3
Psychiatric	1.8	1.8	2.0	2.4	3.2	3.5	3.6
Sensory	0.3	0.6	0.6	0.8	0.9	1.0	0.9
Other	2.6	2.4	2.4	2.7	3.0	2.8	2.6
All disabled	7.8	8.3	8.6	9.8	11.7	12.3	12.7
Metropolitan region (%)							
North Metro	30.8	32.0	34.0	34.3	33.9	33.8	33.6
South Metro	18.2	19.1	19.8	19.5	19.1	18.8	17.9

Characteristics	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
South East Metro	19.2	18.7	18.7	18.7	18.3	18.0	17.8
All metropolitan regions	68.2	69.9	72.5	72.4	71.2	70.6	69.2
Country region (%)							
Great Southern	3.0	3.2	3.2	3.1	3.0	3.2	3.0
South West	6.4	6.5	6.3	6.1	6.5	6.8	6.7
Goldfields	5.7	4.2	3.9	3.4	3.3	2.9	3.0
Midwest-Gascoyne	4.9	5.5	4.0	3.7	4.2	4.2	4.2
Pilbara	5.4	3.8	3.9	4.4	3.8	3.9	4.9
Kimberley	5.0	5.7	5.2	5.8	6.6	6.4	6.6
Wheatbelt	1.1	1.1	0.9	0.9	1.2	1.9	2.1
All country regions	31.8	30.1	27.5	27.6	28.8	29.4	30.8
Sample	5,070	12,103	16,966	17,967	17,559	17,358	17,134

Source: Authors' calculations from DHW public housing data 1999–2005

4.2 Wait list time and duration of tenancies

Using the sample of working-age tenants who have spent time on the wait list, we estimated the average length of time spent on the wait list and in public housing. The wait list spells are estimated for successful applicants only, that is, individuals who successfully entered public housing within the data timeframe. The public housing spells are completed spells for those who left public housing within the data timeframe, but are censored at 30 November 2005, for those who were still in public housing at the end of the data timeframe. Table 4.3 shows that the average wait time is 9.8 months, and the average length of tenure is almost 2 years. Recall that the dataset only includes individuals who applied for public housing from 1999 onwards. As would be anticipated, priority individuals spend significantly shorter lengths of time on the wait list than wait-turn individuals. They also spend markedly longer periods in public housing once they are granted a property, which is likely to reflect their greater level of housing need.

Other noteworthy observations are that females, the disabled and metropolitan applicants tend to spend longer periods on the wait list than males, the non-disabled and non-metropolitan applicants respectively. The longer typical wait facing persons with disabilities before a property is allocated may be the result of persons with disabilities having special requirements, such that some properties that do become available are not suitable to their needs. Country applicants have both a shorter expected wait and a shorter expected tenancy, consistent with a more transient population in non-metropolitan Western Australia. The Wheatbelt, in particular, displays a very low average wait time of just 4.3 months.

Table 4.3: Mean wait time and length of tenure, by socio-demographic characteristics, working-age tenants, years and months[a]

Characteristics	*Mean wait time*	*Mean length of tenure*	*Sample*
All	9.8 months	1 year and 10.0 months	26,880
Priority level during wait list period			
Wait-turn	11.8 months	1 year and 8.0 months	16,569
Priority	2.7 months	2 years and 6.1 months	2,717
Wait-turn, then priority	8.0 months	1 year and 11.6 months	7,594
Gender			
Male	8.8 months	1 year and 8.7 months	10,288
Female	10.4 months	1 year and 10.8 months	16,591
Aboriginality			
Non-Aboriginal	10.0 months	1 year and 11.0 months	17,716
Aboriginal	9.5 months	1 year and 8.1 months	9,164
Disability status			
Not disabled	9.6 months	1 year and 10.1 months	24,097
Disabled	11.4 months	1 year and 9.2 months	2,783
Metropolitan regions			
North Metro	11.4 months	1 year and 11.6 months	6,508
South Metro	12.1 months	1 year and 11.6 months	3,771
South East Metro	9.9 months	1 year and 11.5 months	5,045
All metropolitan regions	11.1 months	1 year and 11.6 months	15,324
Country regions			
Great Southern	9.6 months	1 year and 9.2 months	893
South West	11.9 months	1 year and 10.5 months	1,551
Goldfields	6.7 months	1 year and 5.9 months	1,719
Midwest-Gascoyne	7.0 months	1 year and 9.3 months	1,864
Pilbara	6.6 months	1 year and 8.2 months	2,216
Kimberley	12.7 months	1 year and 9.2 months	1,607
Wheatbelt	4.3 months	1 year and 3.9 months	1,706
All country regions	8.1 months	1 year and 7.9 months	11,556

Source: Authors' calculations from DHW public housing data 1999–2005

a. The sample consists of individuals who entered public housing during the data timeframe and who were of working age from entry onto the wait list till their most recent observation. For tenants still in public housing at the end of the data timeframe, the most current observation is 30 November 2005. For tenants who left public housing before the end of the timeframe, the most current observation is the date of exit from public housing. Persons who did not spend any time on the wait list are excluded. For persons who have entered public housing more than once within the analysis period, wait time and length of tenure in their most recent tenure is analysed.

4.3 Summary

Like the Western Australian population as a whole, the population of public housing applicants and tenants is aging and increasingly likely to live in family units with no children. There is clear evidence that public housing is increasingly targeted to persons in need. Persons who are priority cases, Indigenous and with disabilities, notably psychiatric disabilities, have increased their share of tenancies and of wait list places. Each of these traits can be associated with disadvantages in the labour

market, and hence this changing profile of applicants and tenants will contribute to deteriorating employment outcomes for those in public housing. This is explored more fully in section 6.

In terms of the time spent on the waitlist and in public housing tenancies, we also find that persons with disabilities face longer waits before being allocated a property. Moreover, the circumstances of a significant number of wait-turn persons change while they are on the wait list in such a way that they then become priority cases. There is significant regional variation; country regions as a whole have shorter wait list times and tenancy durations, suggesting a more mobile population and possibly a greater supply of public housing properties relative to demand in the non-metropolitan regions.

5 DYNAMICS OF PUBLIC HOUSING TENURE

5.1 Introduction

The role of public housing as a key component of the income support network focuses attention on the behaviour of individuals in receipt of this form of assistance. Public housing, unlike other forms of income support in Australia, is not an entitlement. The limited number of available tenures is rationed and although some provision is made for priority cases or households in urgent need of shelter, in general individuals who wish to reside in public housing are placed on a wait list until a place becomes available. The need to allocate the limited number of tenures relative to the number of individuals desiring public housing highlights the need to understand the behaviour of individuals in receipt of the program.

The aim of this chapter is to explore the dynamics of participation in public housing in Australia. Understanding the determinants of length of stay is important if public housing is seen as a component of the income support system and as a pathway to achieving economic independence. Of relevance to this is identifying how long individuals spend in public housing and how this differs across groups of individuals. For example, understanding which groups are likely to spend longer in public housing may be important for the targeting of programs across public housing tenants that are designed to encourage economic independence. Moreover, understanding the behaviour of public housing tenants may be of use in formulating policies such as rent setting, the allocation of public housing tenancies and the overall need for public housing.

In this chapter we explore the behaviour of public housing tenants using a variety of techniques. Initially, we estimate a series of hazard models that depict graphically the likelihood that individuals residing in public housing exit from this form of tenancy. The hazard rate describes the likelihood that a spell in public housing will end. Hence, a lower hazard rate can be interpreted as a lower probability that an individual (or family) in public housing will exit this particular form of tenure. Following this, we estimate a series of models that identify the determinants of the length of spells in public housing. This multivariate analysis estimates the impact of observable characteristics, such as age and household structure, on the likelihood that a tenancy will be terminated at any given elapsed duration. It is also possible to identify how the maximum level of subsidy the tenant receives, as measured by the market rent for the tenancy, affects the duration of public housing spells.

The remainder of this section is structured as follows. In section 5.1 we discuss the literature that has examined the behaviour of public housing tenants. Following this, we set out some descriptive statistics and describe the methodology used. The underlying theoretical model used to characterise behaviour is also described. In sections 5.3 and 5.4 we set out the results from the empirical analysis. Section 5.5 concludes.

5.2 Previous literature

Despite the significant size of the public housing program in Australia, there has been little analysis of the economic impact of the program in terms of the dynamics of spells of housing assistance. There is also only limited international information. Generally, such studies examine the hazard rate out of public housing. That is, the likelihood that an individual (or household) residing in public housing leaves this form of tenure. In most cases, the studies examine the behaviour of tenants in public housing in the United States. For example, Hungerford (1996) uses the Survey of Income and

Program Participation to examine the behaviour of recipients of public housing in the United States. Like Australia, public housing in the United States is rationed and is an integral part of the welfare safety net. Hungerford (1996) estimates a series of duration models and finds that various factors affect the likelihood that an individual (and his or her family) exits public housing. For example, females, the elderly and the less educated are less likely to exit the program. Simultaneous receipt of other forms of in-kind assistance, such as food stamps, is also associated with a lower probability of exit. Interestingly, though, Hungerford (1996) also finds some evidence that those receiving cash transfers are more likely to leave public housing. Although the hazard out of public housing is continuously declining, there is no evidence of negative duration dependence among public housing tenants. That is, the hazard observed for the sample declines simply because, as duration increases, those remaining in public housing increasingly comprise those who initially had the lowest probability of exiting. There is no evidence that the time an individual spends in public housing 'causes' the individual's probability of exiting the program to decline.

Freeman (1998) uses the Panel Study of Income Dynamics to identify how quickly non-elderly household heads leave public housing between 1986 and 1992. He finds that the availability of other housing options is the most important determinant of when a spell ends. Family structure and human capital play a more limited role. Freeman's (1998) evidence suggests that public housing is not a trap from which it is difficult to escape. The analysis also finds that the majority of public housing spells are short. Only 28 per cent of respondents had been living in public housing for more than five years and the probability of exiting this form of tenure declines over time. That is, duration dependence cannot be ruled out. Freeman (1998) also reports the results of a series of logistic regressions to identify determinants of moves out of public housing. The analysis indicates that repeat spells in public housing are associated with a lower hazard; total time spent on welfare has only a marginal impact on the hazard out of public housing; parents' education and growing up in a two-parent household has a positive effect on exiting public housing; and being Latino and growing up outside the United States have a negative and significant effect on the hazard. In general variables representing human capital do not affect the likelihood that a spell in public housing ends. Conversely, variables indicating local economic conditions do perform as expected. For example, the local unemployment rate has a negative but insignificant effect on the hazard rate; higher prices for owner-occupied housing are associated with a lower hazard; and housing vacancy rates are associated with higher hazard rate. Further, the amount of low-income housing available in the area has a positive effect on the probability of moving out of public housing.

Bahchieva and Hosier (2001) analyse the determinants of duration of spells in public housing in New York City. They find that characteristics associated with a higher probability of exiting from public housing include high income, single status, being young or very old, and being a white resident and a non-Latino immigrant. There is also evidence that tenants are more likely to leave less desirable properties and neighbourhoods, such as those characterised by high crime rates and smaller properties. It should be noted that the tenure patterns reported in Bahchieva and Hosier (2001) reflect, in part, the relatively tight rental market in New York and may not apply to public housing in the United States in general. One interesting pattern identified is that of an increasing hazard rate over the first five to seven years in public housing tenure, followed by a declining or flat hazard rate (p. 319).

Lubell, Shroder and Steffen (2003) set out some descriptive statistics of American housing assistance programs including public housing. Focusing on current tenants, they find that the median length of stay for public housing tenants is 4.7 years, with a mean of 8.5 years. That is, they identify a large proportion of households with short

tenancies and fewer with longer tenancies. Longer spells are generally associated with characteristics such as the presence of a disability or being elderly.

5.3 Method

For the purposes of this analysis, the key benefit of the DHW public housing data is that it contains information on the date when an application for public housing was made and the dates on which a tenancy commenced and ended. Hence, it is possible to consider the duration of spells in public housing and identify the determinants of the duration of those spells. The data also provide detailed socio-demographic and income information on Western Australia's public housing applicants and tenants during their wait list and public housing tenures. Additionally, information on the characteristics of the tenancy that the individual or household was placed in, such as location, number of bedrooms, and market rent level for the dwelling, is available. This information facilitates the identification of the effect of these observable characteristics on public housing spells using appropriate multi-variate analysis techniques.

The analysis in this chapter is conducted separately for three groups of public housing tenants, namely, single, lone parent and couple (with or without dependent children) households. Table 5.1 provides some descriptive statistics for each of these groups. The sample used is confined to individuals aged between 17 and 65[16] and the figures in Table 5.1 relate to the characteristics of individuals (or couples) who resided in public housing between January 1999 and November 2005.

Table 5.1: Mean socio-demographic and economic characteristics, by household type, 1999–2005, proportion out of 1 unless stated otherwise

Characteristics	*Singles*	*Sole parents*	*Couples*
Male (household head)	0.54	0.08	0.71
Age (household head) (years)	43.03	32.54	38.51
Indigenous (household head)	0.22	0.46	0.43
Number children aged 0–4	–	0.75	0.73
Number children aged 5–9	–	0.75	0.64
Number children aged 10–14	–	0.62	0.53
Disability	0.18	0.04	0.07
Region			
North Metro	0.27	0.21	0.19
South Metro	0.17	0.11	0.11
South East Metro	0.21	0.17	0.17
Great Southern	0.03	0.04	0.04
South West	0.05	0.05	0.06
Goldfields	0.05	0.08	0.07
Midwest-Gascoyne	0.06	0.09	0.09
Pilbara	0.06	0.10	0.09
Kimberley	0.05	0.07	0.08
Wheatbelt	0.05	0.08	0.08
Market rent ($ per week)	115.13	151.50	150.74
Priority case	0.30	0.40	0.36

[16] For couples, the age of the individual and other personal characteristics refers to those of the household head, defined as the older of the couple.

Characteristics	*Singles*	*Sole parents*	*Couples*
Duration of spell (months)	23.99	24.12	23.24
Censored	0.53	0.54	0.48
Sample size	11,652	12,804	5,728

Source: Authors' calculations from DHW public housing data 1999–2005

A number of patterns are clear from the figures in Table 5.1. Singles (43 years) are generally older than both sole parent and couple groups (32.5 and 38.5 years respectively). Further, singles are also far more likely to have some form of disability than the other groups. Such a pattern is observed in other datasets such as HILDA and reflects an allocation policy whereby public housing is seen increasingly as a component of the income support framework. The age structure of children in couple and sole parent households is similar. One characteristic of all groups that is particularly noticeable is the high proportion of individuals who identify themselves as Indigenous. The proportion is greatly in excess of the proportion of Indigenous persons in the Western Australian population, which was estimated in the 2001 Census to be 3.1 per cent.

In terms of location, in all cases the majority of clients are placed in tenures located in the Perth metropolitan area. For singles, around 65 per cent of all cases are located in Perth, and around 50 per cent for the other groups. The higher proportion of singles located in Perth may be associated with the significantly higher rates of disability reported among this group. The other characteristic of interest is that associated with priority cases. Priority cases are those that, as the name suggests, have priority due to an extreme need for shelter services. Between 30 per cent (singles) and 40 per cent (sole parents) of all spells in public housing are associated with a priority case.

To gain insight into the behaviour of individuals while residing in public housing, two types of analysis are presented. The first component of the analysis presents the hazard functions and survival probability functions for spells in public housing for each of the family (or household) types of interest. This type of analysis involves the modelling of time until exit from public housing. The 'hazard' refers to the probability that at a given point during a spell, the spell is observed to end. Consider a hazard rate equal to 0.05 at 12 months. This implies that among those spells in public housing that have lasted at least 12 months, the probability that the spell ends at exactly 12 months is 0.05. Hazard rates can be calculated for any length of time, up to the maximum length of time spanned by the data. In the DHW data, public housing tenancies last for a maximum of 83 months and hazard rates can be calculated for a maximum of 83 periods. The survivor function is related to the hazard rate and captures the probability that spells last a certain length of time. Hence, the estimate of the survival probability at any given month (T) is simply the proportion of spells that are at least T months in duration. The survivor function provides a ready means by which to summarise the distribution of spells in public housing and a measure of the proportion of spells which are short or long.

A limitation of the non-parametric approaches associated with the hazard and survivor functions is that the population examined is essentially treated as homogenous. Clearly, however, it is likely that spells in public housing vary according to the characteristics of the individual or household. A second component of the analysis takes account of the observed heterogeneity among the population in public housing by estimating a series of proportional hazard models. In particular, the time until exit from public housing is modelled as a function of covariates, such as socio-demographic and economic characteristics, which potentially affect the likelihood that

a spell in public housing is observed to end. The hazard function has the following specification:

$$h_n(\tau) = h_0(\tau)\ \exp\{z_n(\tau)'\beta\} \qquad (1)$$

where $h_n(\tau)$ is the hazard rate for person (or household) n, $h_0(\tau)$ is the 'baseline' hazard common to all individuals (households), $z_n(\tau)$ is a vector of observable characteristics that may vary with time, and β is a vector of parameters to be estimated.

This analysis is presented in section 5.4 and allows us to identify factors that make the probability of exiting from public housing higher or lower. This analysis helps answer questions such as how, if at all, does the market rent of the public housing tenure affect the likelihood that an individual exits from public housing? A priori we might believe that a higher market rent means that it is less likely that an individual (or household) leaves public housing.

5.4 Hazard and survivor functions

As noted above, the survivor function provides a ready means by which to summarise the distribution of spells in public housing and a measure of the proportion of spells which are short or long. The hazard functions and survivor functions are defined over spells in public housing measured in months and are presented below for singles, lone parents and couple households.

Figures 5.1(a) and 5.1(b) present the results for single individuals. Following a 'spike' in the hazard rate in the first month, the hazard increases for approximately the next 8 months. After around 12 months, the hazard rate begins to decline so that by around 30 months, approximately 1 per cent of spells in public housing that are at risk of ending, actually finish. For spells that are particularly long, in excess of 60 months, the hazard rate tends to jump around significantly. Moreover, in a number of cases it is equal to zero. This pattern reflects the limited number of lengthy spells and the small number of observations ending at these durations. As noted above, an alternative characterisation of duration data is the survivor function. The survivor function for singles (Figure 5.1(b)) indicates that the median spell length is around 36 months. That is, approximately 50 per cent of spells last at least 36 months. Moreover, even after 5 years, approximately 35 per cent of spells in public housing are ongoing.

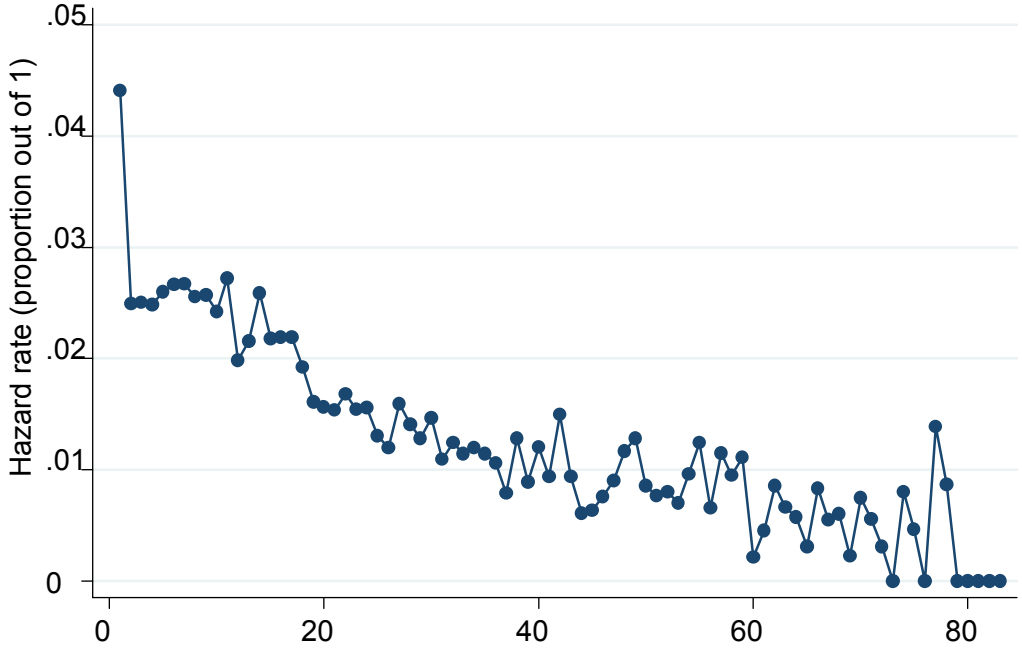
The hazard functions for lone parents (Figure 5.2a) and couples (Figure 5.3a) are similar – that is, a steadily declining hazard rate over the period of time captured by the data. A closer inspection of the hazard functions for all three groups indicates that the hazard rates tend to be higher for couples. As a consequence of this, the survivor function for singles and lone parents lies above that of couples. That is, in general couple households are likely to exit from public housing more quickly. Hence, whereas singles and lone parents have spells in public housing which have a similar length (a median spell length of around 36 months), it is substantially shorter for couple households at around 28 months. It is also true that for each of the three groups considered, even after 5 years, between 30 and 35 per cent of spells in public housing are ongoing. This suggests that although many spells in public housing are short, a significant proportion, around one-third, are relatively long.

Despite this difference in the median length of spells, the mean length of spells is similar for singles (24 months), lone parents (24 months) and couples (23 months). The higher median spell length for singles and sole parents reflects the higher probability that those spells are censored (Table 5.1). Censoring refers to a situation

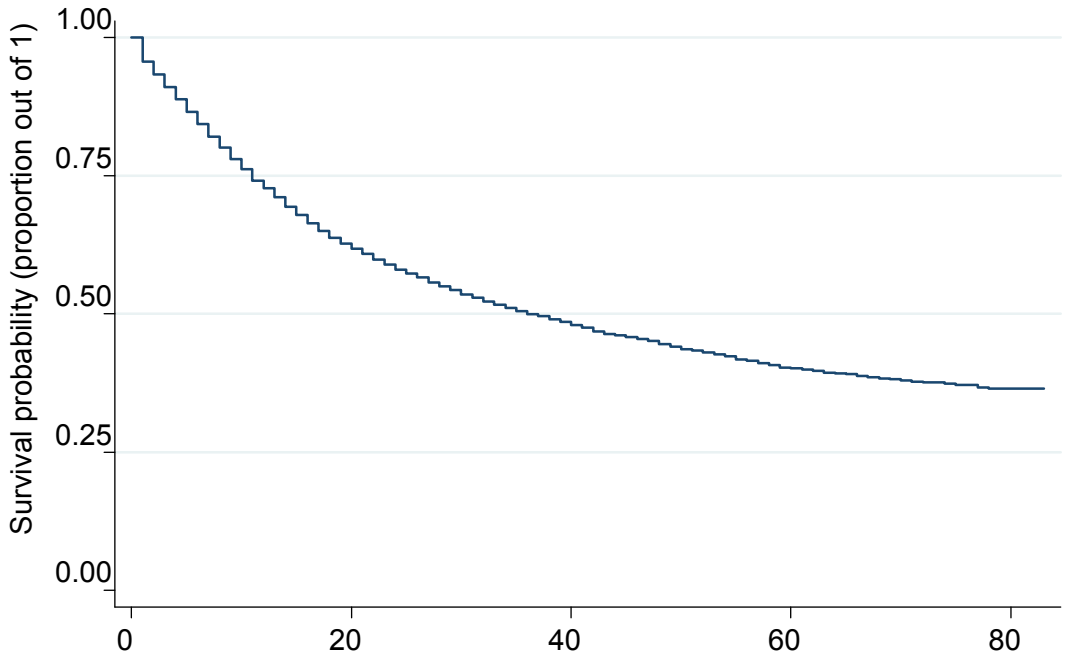
in which the completion of the spell is not observed at the end of the data collection period. That is, as at November 2005, proportionately more public housing spells for singles and sole parents are ongoing. The survivor probability, and hence the calculation of the median length of the spell, takes account of whether the spell has ended or is ongoing (censored). The median measure reflects the fact that a greater proportion of spells for singles and sole parents are ongoing at the time when data collection ceases.

Figure 5.1: Hazard and survivor functions of singles

(a) Hazard function, all singles



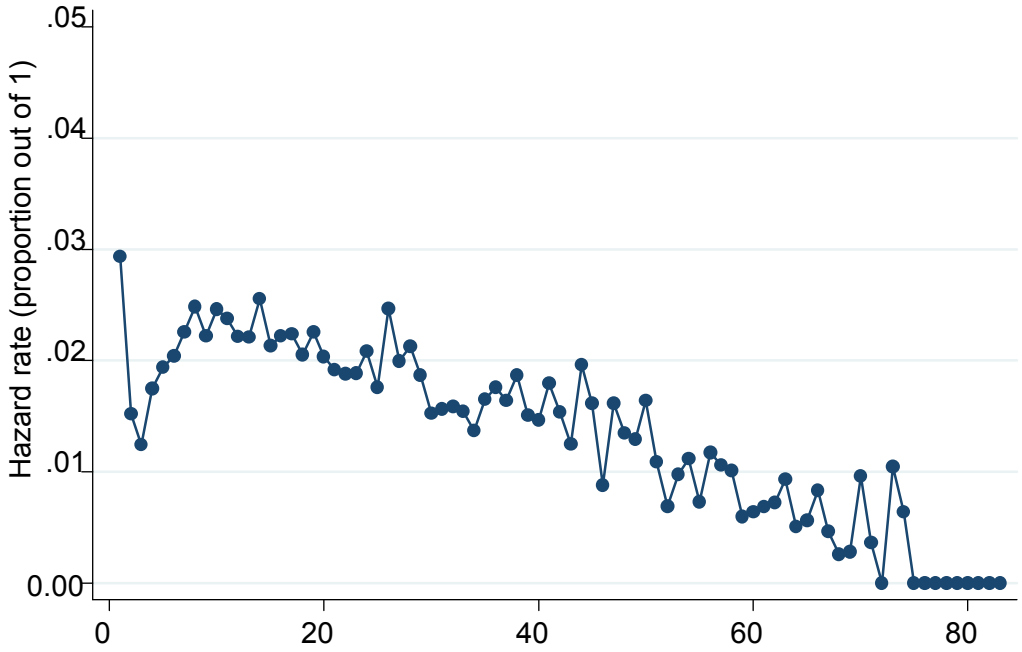
(b) Survivor function, all singles



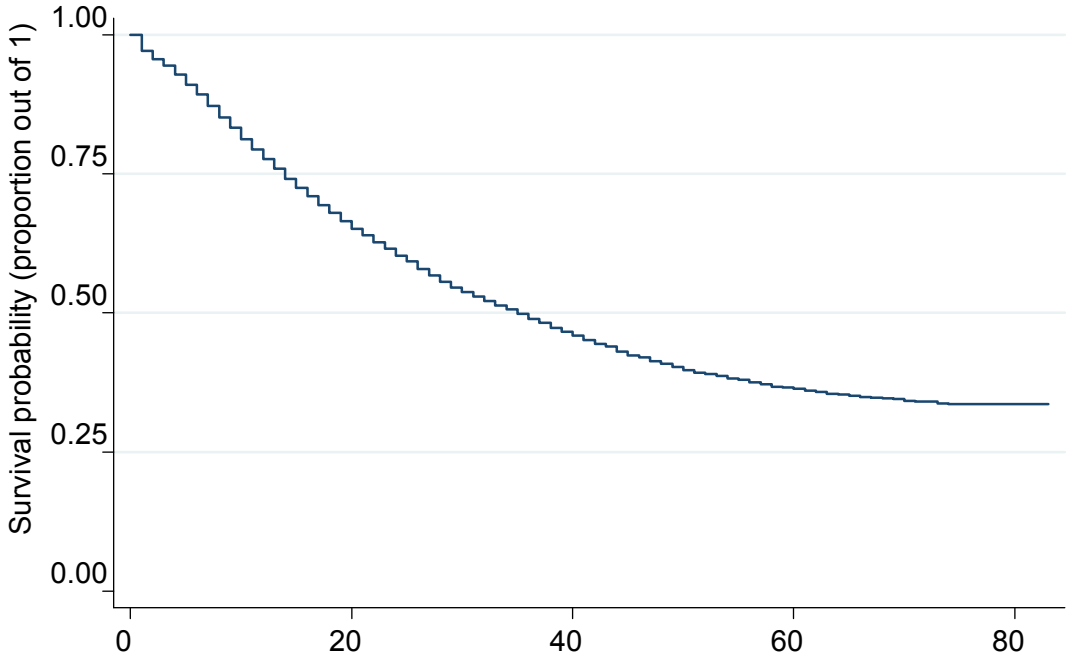
Source: Authors' calculations from DHW public housing data 1999–2005

Figure 5.2: Hazard and survivor functions of sole parents

(a) Hazard function, all sole parents



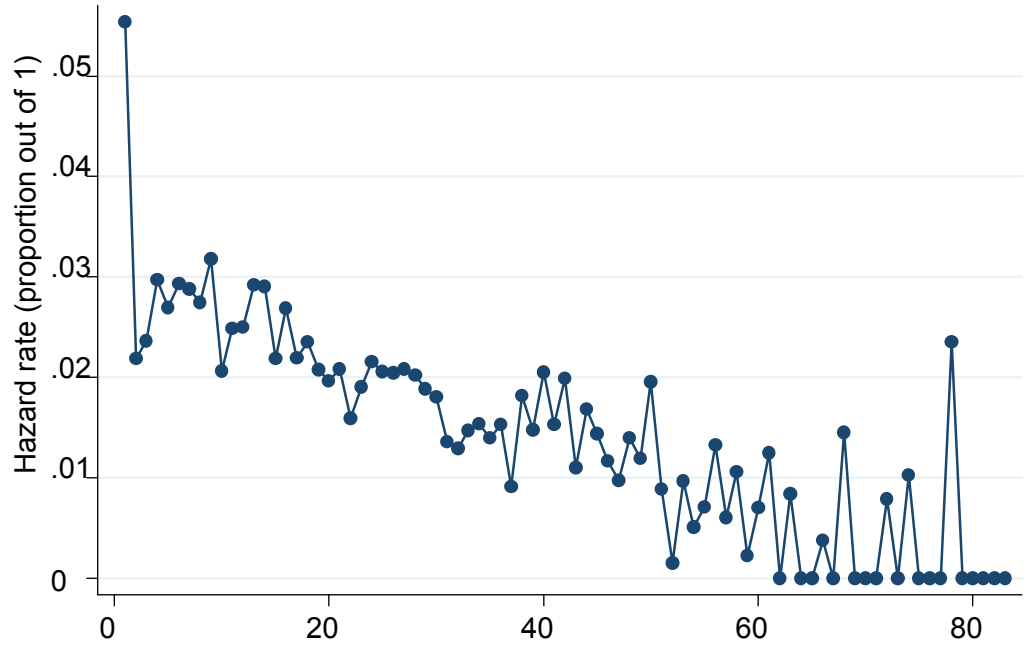
(b) Survivor function, all sole parents



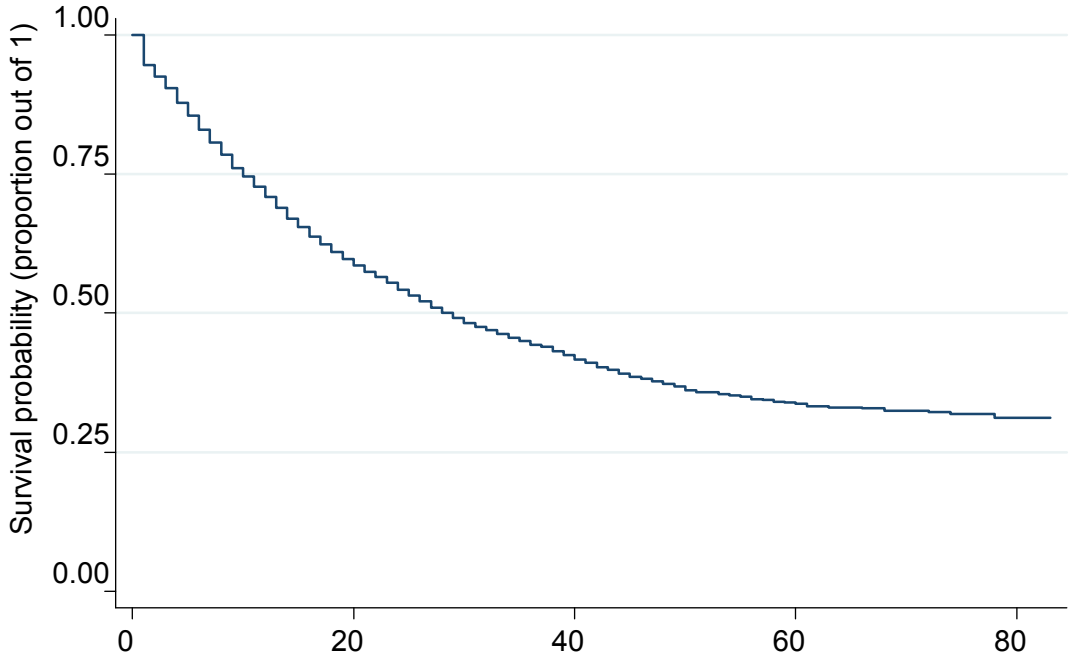
Source: Authors' calculations from DHW public housing data 1999–2005

Figure 5.3: Hazard and survivor functions of couples

(a) Hazard function, all couples



(b) Survivor function, all couples



Source: Authors' calculations from DHW public housing data 1999–2005

5.5 Hazard model estimates

Clearly, it is likely that spells in public housing vary according to the characteristics of the individual or the household. The second component of the analysis presented in this chapter takes account of the observed heterogeneity among the population in public housing by estimating a series of proportional hazard models. The proportional hazard model approach is a multivariate analysis technique that identifies the

determinants of the duration of spell lengths. The analysis attempts to identify which characteristics of individuals (or households) affect the likelihood that a spell in public housing ends. The approach estimates an 'underlying baseline hazard' similar in nature to the hazard function described (reported) in section 5.2 (5.3). The multivariate technique then allows observable characteristics to increase or decrease the value of the baseline hazard. If the coefficient on a variable is positive, this implies that the particular characteristic in question increases the hazard out of public housing (that is, makes exiting public housing more likely) and tends to make the spell in public housing shorter. Conversely, if the coefficient on a variable is negative, this implies that the particular characteristic in question decreases the hazard out of public housing (makes exiting public housing less likely) and tends to make the spell in public housing longer.

It is important to understand how to interpret the coefficients reported in Table 5.2. For each of the variables considered, the coefficient indicates how the hazard out of public housing is affected, if at all, by the particular covariate. Consider the coefficient of 0.225 on males for the sample of lone parents. This indicates that relative to females who are also lone parents, the hazard out of public housing for males is approximately 22.5 per cent higher. That is, on average male lone parents will have a shorter spell in public housing. In addition, the estimated effect applies to all time periods during the spell. That is, the covariates shift the entire hazard up or down proportionately.

The coefficients reported in Table 5.2 generally coincide with a priori expectations. For example, consider the variables on the number of children for lone parents and couples. In general, the coefficient on these is negative, indicating that a higher number of children is associated with a lower hazard out of public housing. For example, each additional child aged 0–4 years in a lone parent household reduces the hazard out of public housing by approximately 4.5 per cent. Such a result may reflect the higher cost of moving for households which have larger numbers of children. Similar patterns are evident for couple households.

The estimates also reveal that disability status is associated with a higher exit rate from public housing for both lone parents (13.2 per cent) and singles (9 per cent). Such a result is counter-intuitive, especially in light of the increasing tendency for public housing to be allocated to the least advantaged, especially the disabled[17]. Conversely, priority cases have a significantly lower probability of exiting public housing. Recall that priority cases generally have acute needs and it is likely that this need remains over time, hence the lower hazard out of public housing. Further, in all cases tenancies in Perth are associated with a significantly lower hazard out of public housing.

The key variables of interest from a policy perspective relate to the impact of income and the value of the public housing subsidy received. In the specifications reported in Table 5.2, three types of income are identified. These are government payments such as NewStart Allowance, earned income and other payments. In each case, the receipt of income is entered in two ways. For each period for which the individual (or household) reports receiving that type of income, a dummy variable is included, indicating receipt. In addition, a continuous variable is included that indicates the value of the particular type of payment received.

The results of the analysis point to an effect of income that varies with the amount of income received. For example, for single individuals, the receipt of a government payment is associated with a large positive effect on the likelihood that they are

[17] The higher exit rate of the disabled might reflect the difficulties that DHW confront in finding accommodation suitable to the particular requirements of this sub-group of tenants.

observed to exit from public housing (a coefficient of 0.62). The relatively smaller coefficient on the amount of government pay (–0.133) indicates that as the level of payments received from the government increases, the likelihood of exiting public housing decreases, given that the individual receives some government pay. The combined effect of these two coefficients indicates that when individuals receive only small amounts of government support, they are more likely to leave public housing. As the amount of government support or government income increases, they are less likely to be observed leaving public housing. The pattern for earned income is the opposite. Hence, the coefficient on the receipt of earnings is negative (–0.664) and the coefficient on the amount of earned income is positive (0.016).

These results are consistent with a priori expectations and the nature of income support programs in Australia. Individuals who receive higher amounts of government support will, given the means-tested nature of government transfers, tend to be earning less employment income. In general, we might expect such individuals to be less likely to leave public housing given the substantial benefit public housing tenure confers, both in terms of security of tenure and a rent below the market level of rent. As earned income increases, however, individuals will have a greater set of housing opportunities available to them in the private rental market. Moreover, they are more likely to be paying a level of rent to the public housing authority that is equal to the market rent. In this case, tenants may find it more advantageous to participate in the private rental market or pursue home ownership. Exits may also occur because tenants with higher income become subject to a review of their circumstances and are found to be ineligible for public housing, or anticipate such a review in the near future.

For all three groups – singles, lone parents and couples – the receipt of income from employment earnings has a negative effect on the hazard, while the amount of earnings has a positive effect on the hazard. That is, wage earners with low earned income have a lower likelihood of exiting public housing, but the likelihood of exiting increases with earnings. For government payments, however, the results are somewhat different between the groups. The coefficient on the receipt of government payments is consistently positive, but for singles only the amount of government payments reduces the hazard. For lone parents and couples, however, the results are contrary to a priori expectations, in that the amount of government pay has a positive effect on the hazard out of public housing (coefficients of 0.005 and 0.006 respectively).

These findings highlight the fact that individuals will be more likely to exit public housing when they achieve greater economic independence in the form of employment income. At the same time, the receipt and amount of employment income is likely to be closely related to the individual's receipt of government transfer payments, including public housing. Policies designed to encourage economic independence and which regard public housing as a stepping stone to greater economic independence need to be formulated with these behaviours in mind. Exits out of public housing are more likely to occur when individuals (and households) achieve higher levels of employment income.

The second policy variable of interest reported in Table 5.2 relates to the effect of the market rent level on the hazard out of public housing. The large negative coefficient on this variable for each of the three groups identified in Table 5.2 indicates that higher market rent levels are associated with a significantly lower likelihood that the individual (or household) exits public housing. Again, such a result is consistent with a priori expectations. Recall that the level of market rent is also the maximum level of subsidy provided by the tenure. In general, for income support programs such as this, a higher level of benefits is associated with a higher probability of participation in the

program and lower likelihood that those participating are observed to exit the program. This is the pattern observed in Table 5.2.

Consider the effect of a $100 increase in the monthly market rent for lone parents. This reduces the hazard out of public housing by approximately 17 per cent ceteris paribus. This may seem large; however, recall that the weekly market rent for lone parents is approximately $150 (Table 5.1) or $600 per month. An increase in the market rent of $100 corresponds to an increase of approximately 16.7 per cent. The results are similar for other groups considered in the analysis and consistently show that the greater the pecuniary benefit bestowed on tenants in public housing, the less likely they are to exit that particular form of tenancy.

Table 5.2: Hazard model estimates[a]

	Singles	***Sole parents***	***Couples***
Male	0.009	0.225*	0.370*
	(0.028)	(0.049)	(0.043)
Age	-0.054*	-0.016	0.029*
	(0.007)	(0.010)	(0.013)
$(Age)^2$	0.000*	0.000	-0.001*
	(0.000)	(0.000)	(0.000)
No. children aged 0–4	–	-0.046*	-0.053**
		(0.018)	(0.024)
No. children aged 5–9	–	-0.045*	-0.078*
		(0.017)	(0.023)
No. children aged 10–14	–	-0.052*	-0.050***
		(0.019)	(0.025)
Presence disability	0.090**	0.132***	-0.029
	(0.040)	(0.070)	(0.082)
Indigenous	0.179*	-0.114*	0.058
	(0.035)	(0.030)	(0.044)
Priority case	-0.334*	-0.092*	-0.122*
	(0.033)	(0.031)	(0.044)
Receipt govt. pay (person 1)	0.620*	0.099***	0.342*
	(0.107)	(0.051)	(0.067)
Receipt earnings (person 1)	-0.664*	-0.164*	-0.109**
	(0.075)	(0.062)	(0.055)
Other payment (person 1)	-0.293*	-0.170*	0.181*
	(0.078)	(0.030)	(0.065)
Amt govt. pay (person 1, $'00s per month)	-0.133*	0.005*	0.006*
	(0.015)	(0.002)	(0.002)
Amt earnings (person 1, $'00s per month)	0.016*	0.021*	0.012*
	(0.004)	(0.004)	(0.002)
Amt. other pay. (pers. 1, $'00s per month)	-0.032***	0.007*	-0.007
	(0.016)	(0.003)	(0.010)
North Metro	-0.355*	-0.459*	-0.325*
	(0.062)	(0.058)	(0.081)

	Singles	*Sole parents*	*Couples*
South Metro	-0.207*	-0.638*	-0.464*
	(0.064)	(0.068)	(0.097)
South East Metro	-0.388*	-0.596*	-0.391*
	(0.060)	(0.060)	(0.081)
Great Southern	-0.126	-0.533*	-0.514*
	(0.088)	(0.083)	(0.118)
South West	-0.320*	-0.577*	-0.374*
	(0.086)	(0.079)	(0.102)
Goldfields	0.136***	0.153**	0.008
	(0.078)	(0.063)	(0.094)
Midwest-Gascoyne	-0.220*	-0.210*	-0.117
	(0.076)	(0.058)	(0.080)
Pilbara	-0.031	0.065	-0.007
	(0.079)	(0.066)	(0.091)
Kimberley	0.051	0.205**	0.245**
	(0.093)	(0.085)	(0.107)
Market rent ($00s per month)	-0.135*	-0.171*	-0.105*
	(0.012)	(0.011)	(0.014)
Psuedo log likelihood	-24892.758	-27066.697	-13041.02

Source: Authors' calculations from DHW public housing data 1999–2005

Note: a. Standard errors in parenthesis.

5.6 Concluding comments

The analysis presented in this chapter is important on a number of levels. First, a number of state governments are contemplating changing the arrangements associated with public housing. For example, in New South Wales, tenants entering public housing from 1 July 2006 will be offered a short-term (up to two years), medium (two to ten years) or long-term (ten years) lease depending on how long they need to be in public housing. If the tenant meets the review criteria at the end of the lease, the lease will be renewed. Otherwise, no new lease will be offered and they will be asked to vacate. If such policies are instituted, it is important to understand which tenants are most likely to be adversely affected. If public housing is viewed simply as a stepping stone with which to achieve economic independence, then it is important to identify which groups may require additional support to do so. Other policies may also be considered. For example, in some US states, tenants in housing assistance schemes are required to contribute minimum amounts towards the rental cost of the property. Such a policy effectively reduces the maximum benefit available from a given dwelling.

On a more general level, management of the existing public housing stock requires that authorities be able to identify the behaviour of actual and potential tenants. Hence, which dwellings and types of dwellings are more likely to become vacant over time? Moreover, how might changes in the benefit conferred on tenants, such as the amount of market rent associated with the public housing tenancy, affect the period of time spent in public housing?

The analysis highlights a number of important findings. First, we identify that lone parents and single individuals tend to have longer spells in public housing than couple

households. Similarly, households with children are less likely to exit public housing and therefore tend to have longer spells. Among singles (lone parents), Indigenous individuals tend to have shorter (longer) spells in public housing. The relationship between income and public housing reflects the characteristics of the income support framework. It has been noted, for example, that many individuals combine the receipt of government income support with earnings from employment. For individuals in public housing, low employment earnings and high amounts of government payments are consistent with longer spells in public housing. Finally, tenants are more likely to remain in public housing for longer spells when the benefits associated with the tenancy (the market rent) are greater. We find that an increase in the market rent of a property in the order of $100 per month reduces the hazard out of public housing by 17 per cent (lone parents) and 10 per cent (couples).

The findings described above highlight the types of trade-offs policy makers face. Public housing provides benefits in the form of security of tenure and rent levels below market rates. An aim of the public housing program is to ensure that 'all Western Australians have access to affordable and secure housing'. Better housing outcomes will generally coincide with higher potential benefits for recipients, reflecting the need for larger tenancies possibly in areas which have better socio-economic outcomes. For example, housing located in areas with lower rates of unemployment may lead to better employment outcomes for tenants. At the same time, such areas are likely to be associated with higher market rent levels. The duration analysis suggests that this will in turn be associated with a lower probability that individuals or households exit public housing. Given a limited stock of public housing and the need for applicants to queue for public housing, providing adequate housing (which entails a higher benefit in the form of market rents), needs to be balanced against the constraint imposed by limited resources. If public housing is viewed as a component of the broader social safety net, this serves to highlight the need to provide appropriate incentives for individuals to exit public housing – that is, to use public housing as a stepping stone with which to achieve economic independence. Policies such as limits on tenure, minimum rents and rent holidays may, over time, provide opportunities for individuals to achieve that independence.

6 MOVEMENTS IN AND OUT OF EMPLOYMENT BY TENANTS AND APPLICANTS

6.1 Introduction

From this section onwards, we turn our focus to the impact of public housing on employment outcomes. We seek to identify any differences in the probability of entering employment while individuals are on the wait list and after they have entered public housing. The ABS Labour Force Survey classifies working-age persons into one of three mutually exclusive states: employed, unemployed and not in the labour force. The DHW public housing data does not contain the information necessary to allocate individuals to these conventional labour force states. Rather, information on whether persons received any earned income is used to classify people as being either employed or 'non-employed'.

The analysis of transitions between non-employment and employment provides insight into key research questions 2 and 3 of this report. Key research question 2 asks how the labour market outcomes of actual and potential public housing tenants are affected by the rationing of public housing stock or the presence of a public housing wait list. Key research question 3 asks how the labour market activities of those on the wait list change following transition into public housing. As discussed, the DHW public housing data are unique in providing observations on persons on the public housing wait list as well as observations on public housing tenants. If those on the wait list could be considered a valid control group, then a comparison of employment outcomes between the two groups could be taken to suggest something about the causal impact of being in public housing on tenants' employment outcomes. However, any differences in outcomes between the two groups will potentially be a result of both 'lock in' effects of being on the wait list, as well as any causal impact of being in public housing.

6.2 Method

Initially, descriptive data are presented on the employment rates for applicants when they first joined the wait list and upon entry to public housing, and for tenants at the most recent observation available since entering public housing. This provides a simple comparison of changes in employment outcomes for a cohort of people prior to, upon and after entry into public housing, but says nothing about people who leave the wait list without ever entering public housing. The second approach to comparing employment outcomes is to estimate separate hazard functions of the probability of exiting non-employment while on the wait list and while in public housing. Recall from sections 3 and 5 that the hazard function is a measure of the risk of an event occurring at time t, given that the event has not yet occurred by time t. In this section, the hazard function measures the 'risk' of exit from non-employment to employment occurring at time t, given that the exit from non-employment has not yet occurred by time t. The larger the hazard value, the greater the risk or probability of the exit from non-employment occurring. The same Cox proportional hazard model is used as was used in the previous section (see section 5.3). The only difference is that the hazard now represents the rate of exit from non-employment, rather than the rate of exit from public housing.

6.3 Employment outcomes – a cohort analysis

Using the same sample as in Table 4.3, Table 6.1 presents estimates derived from tracking the employment profile of working-age individuals in the data as they move

from the wait list into public housing until the current time. The table demonstrates the advantages of the panel nature of the data in that the same individual can be tracked across time. The table shows that the aggregate employment rate of persons in our sample is 14 per cent at entry onto the wait list, it increases slightly to 16 per cent at entry into public housing, but then rises to 20 per cent at the most current point time.

There are some noteworthy differences in the employment rates between subgroups within the sample. Females, persons with priority status on the wait list and persons with a disability all have lower employment rates than their respective counterparts. These results all align with expectations. Surprisingly, however, employment rates among Aboriginal persons, both on the wait list and as tenants, are higher than for non-Aboriginal persons. There are very large inter-regional differentials in employment rates, with higher employment rates observed for tenants in country regions such as the Pilbara and Kimberley regions than for metropolitan regions. This may in part explain the finding with respect to Aboriginal tenants, a higher proportion of whom are likely to live in these 'high-employment' regions.

Despite these significant variations in the employment rates between groups, there is a remarkable consistency in the way employment rates change across the three points in time. For every group, there is a small increase in the incidence of employment between joining the wait list and entering public housing, followed by a much larger increase between entry into public housing and the most recent available observation – for the sample as a whole the employment rate has increased by 1.9 percentage points by the time the individual enters public housing, and by 4.4 percentage points when observed during their tenancy.[18]

Table 6.1: Employment rate at entry onto the wait list, entry into public housing and most recent observation, by socio-demographic characteristics, working-age tenants, per cent[a]

	Employment rate (%)			*Sample (n)*
	Entry onto wait list	*Entry into public housing*	*Most recent observation*	
All regions	13.9	15.8	20.2	26,880
Priority level during wait list period				
Wait-turn	15.5	18.3	22.6	16,569
Priority	15.8	15.7	21.4	2,717
Wait-turn, then priority	10.0	10.4	14.7	7,594
Gender				
Male	16.6	19.8	25.1	10,288
Female	12.3	13.4	17.2	16,591
Aboriginality				
Non-Aboriginal	13.1	14.8	19.9	17,716
Aboriginal	15.5	17.8	20.9	9,164
Disability status				
Not disabled	14.7	16.7	21.4	24,097
Disabled	7.2	7.9	9.8	2,783

[18] The one exception to this pattern is the Kimberley region, which has the highest employment rate of all regions. Here, the employment rate increases by 3.8 percentage points between entry to the wait list and entry into public housing. It also increases further for those observed in public housing, but by a smaller 2.6 percentage points.

	Employment rate (%)			*Sample (n)*
	Entry onto wait list	*Entry into public housing*	*Most recent observation*	
Metropolitan regions				
North Metro	8.8	10.5	15.2	6,508
South Metro	9.7	10.6	15.2	3,771
South East Metro	11.0	12.4	18.5	5,045
All metropolitan regions	9.7	11.2	16.3	15,324
Country regions				
Great Southern	19.5	20.3	22.2	893
South West	15.1	16.8	20.4	1,551
Goldfields	14.9	16.2	20.9	1,719
Midwest-Gascoyne	14.2	17.4	21.4	1,864
Pilbara	22.6	25.3	29.6	2,216
Kimberley	32.2	36.0	38.6	1,607
Wheatbelt	18.3	20.7	22.8	1,706
All country regions	19.5	21.9	25.4	11,556

Source: Authors' calculations from DHW public housing data 1999–2005

a. See Note a., Table 4.3, for definition of the sample

6.4 Hazard functions: applicants and tenants

We estimate hazard functions separately for the wait list sample and the tenant sample. The wait list sample comprises working-age applicants who were not employed at the time of entry onto the wait list. The start of the non-employment spell is the point of entry onto the wait list. The end of the non-employment spell is the point of the first record of a wage or salary while on the wait list. The following observations are censored:

- Individuals who enter public housing before exiting non-employment;
- Individuals who drop off the wait list before exiting non-employment;
- Individuals still in non-employment at the end of the data timeframe.

Similarly, the public housing sample comprises working-age tenants who were not employed at the time of entry into public housing. Non-employment spells are analysed only for individuals who are non-employed at entry into public housing. The start of the non-employment spell is therefore the point of entry into public housing. The end of the non-employment spell is the point of the first record of a wage or salary while in public housing. The follow observations are censored:

- Individuals who leave public housing before exiting non-employment;
- Individuals still in non-employment at the end of the data timeframe.

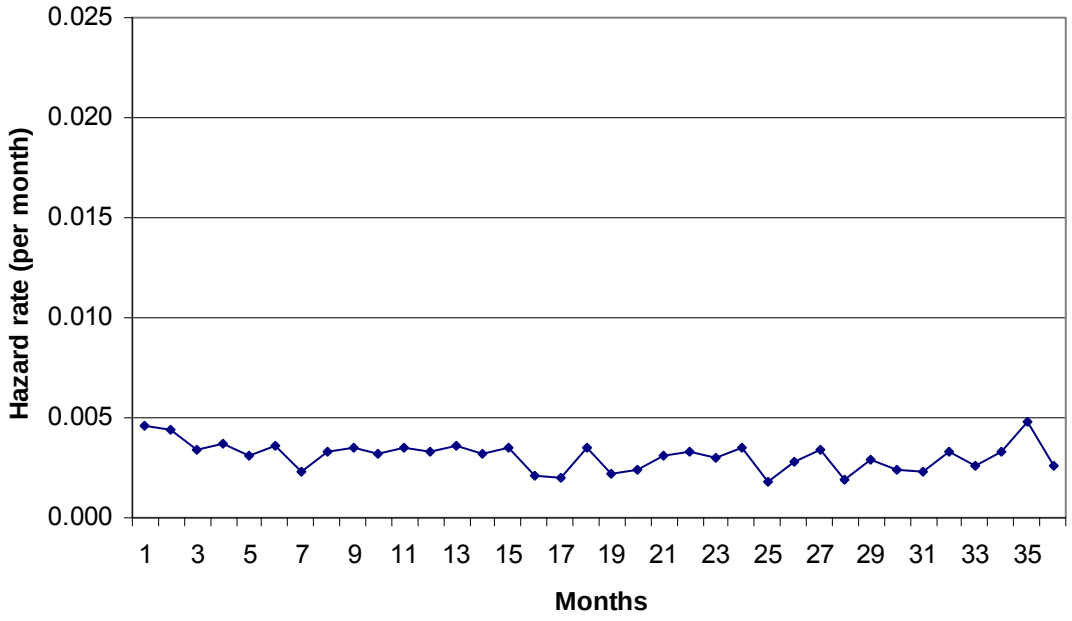
Note that if an individual leaves public housing due to a gain in employment, the data will show a record of a wage or salary before the exit from public housing.

We present hazard functions to illustrate the relationship between wait list spells and exits from non-employment, and public housing spells and exits from non-employment. Hazard rates can be calculated for any length of time, up to the maximum length of time spanned by the data, which is 81 periods. Essentially, what we are asking is: given that an individual is initially not working, do time spent on the wait list and time spent in public housing have different effects on the likelihood of entering employment?

In Figure 6.1, the hazard function for all working-age applicants up to a wait list duration of 36 months is presented. Most applicants spend less than or equal to 36 months on the wait list. Hence, the sample size of individuals spending more than 36 months on the wait list is too small for the estimates post 36 months to be reliable. The first apparent observation from Figure 6.1 is that the hazard rate remains extremely low regardless of length of time on the wait list. The figure shows that the probability of a person exiting from non-employment to employment in their first month on the wait list is around 0.005 – or one-half of 1 per cent. The hazard rate remains below this level as time on the wait list grows, but it is difficult to discern any clear rising or falling trend.[19]

A comparison of Figures 6.1 and 6.2 shows a striking distinction between the probability of exit from non-employment while on the wait list and that when a public housing property has been secured. Initially the hazards are similar, at around one-half of 1 per cent per month. However, around one year after entry into public housing and at annual intervals thereafter, the probability of exit from non-employment jumps markedly, to almost five times the probability of exit while on the wait list. The yearly spikes in Figure 6.2 reflect the annual income reviews that take place after entry into public housing, during which tenants who are employed report a positive wage or salary. When a smoothed hazard function is fitted to this data, the hazard appears to initially rise to almost 0.008 after around 20 months and then steadily fall, indicating that after around two years the probability of exits from non-employment declines over time for those not employed in each time period.

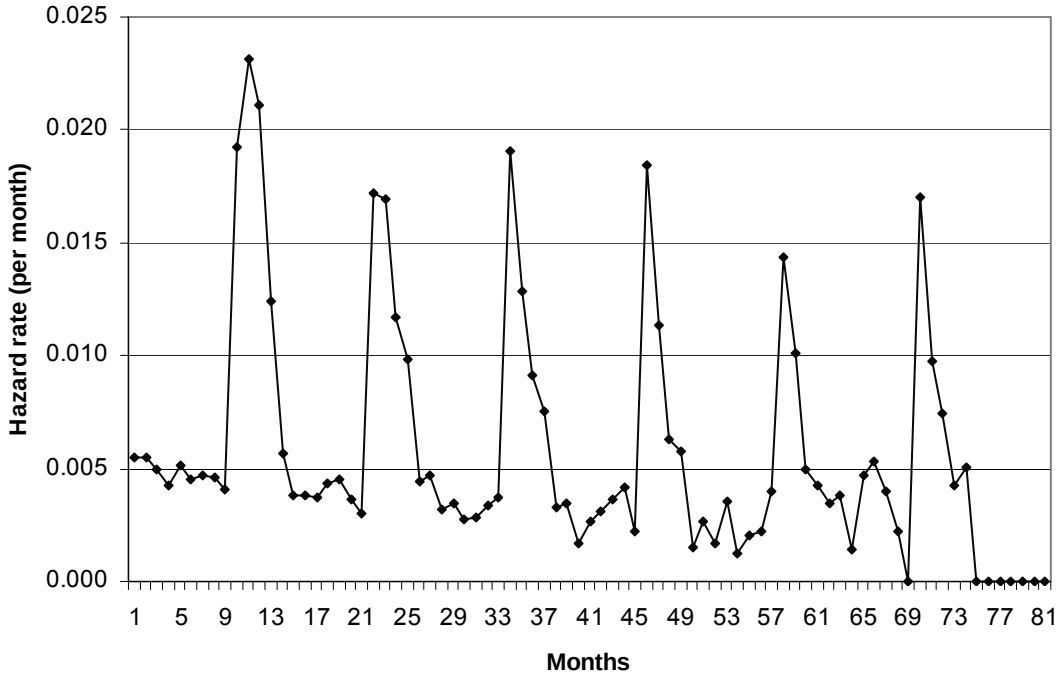
Figure 6.1: Hazard function for all working-age applicants, 1999–2005 (up to 36 months)



Source: Authors' calculations from DHW public housing data 1999–2005

[19] It is important to note that the hazard functions for applicants are subject to one important caveat. Applicants must have income below the eligibility limit at application and at the time a property becomes available. Hence, it is standard DHW procedure to review applicants at the point of entry onto the wait list, and then again when a property is allocated. Applicants are required to notify DHW of any changes in their circumstances while on the wait list (WA DHW, 2006). Note that if applicants who are not employed at entry onto the wait list become employed while on the wait list but fail to report this to DHW, the hazard function for applicants will not be a true reflection of their probability of exiting non-employment while on the wait list. Some applicants may then give up employment when a property becomes available so that at the eligibility check prior to property allocation, the applicants appear to have been not employed when in fact they had been employed while waiting for a property to become available.

Figure 6.2: Hazard function for all working-age public housing tenants, 1999–2005 (up to 81 months)



Source: Authors' calculations from DHW public housing data 1999–2005

6.5 Concluding comments

The dramatic difference between the probability of exit from non-employment between the two groups is worthy of further investigation. Both the simple cohort analysis and the hazard analysis suggest that moving from the wait list and into public housing is associated with enhanced employment prospects. This can be attributed to one, or a combination, of the following effects:

- A welfare lock or 'lock-in' effect: The rationing of public housing stock means that applicants must first join a public housing wait list. Individuals on the wait list have to maintain their income below certain income limits in order to remain on the wait list and eligible for a public housing property.
- A housing stability effect: The enabling hypothesis of public housing argues that by providing security of tenure in affordable housing, public housing programs can assist employment prospects because of the responsibility and reliability that is implied by a permanent address, and avoidance of the disruptive effects of not having a permanent place to live. Furthermore, the reduced housing rent offered by public housing allows tenants to commit more of their resources to job searches and work-related expenses such as transportation and clothes (Van Ryzin et al, 2003).

Section 7 uses a multivariate panel analysis to model the net impact of transition into public housing on employment outcomes and to unbundle this net impact into welfare lock and housing stability effects.

7 TRANSITIONS INTO PUBLIC HOUSING AND EMPLOYMENT OUTCOMES: A PANEL ANALYSIS

7.1 Introduction

The first aim of this section is to measure the net impact of public housing assistance on employment outcomes as measured by employment rates and earnings. The straightforward comparisons of pre- and post-public housing employment rates suggest that there is a net positive impact on employment outcomes from the transition into public housing (see Table 6.1). A second aim is to unbundle this net impact – is it due to welfare locks that deter applicants from accepting employment offers while on the wait list, or is it due to the positive impact that stability of housing has on labour market performance? These questions are important from a policy perspective; the welfare lock argument suggests that eligibility criteria should be relaxed once an applicant has been accepted onto wait lists, or public housing opportunities should be expanded so that waiting times are reduced and welfare locks eroded. If it is due to positive virtues of public housing then we have to be cautious about applying fixed-term tenures that might threaten the stability of tenants' housing circumstances.

7.2 Public housing transitions

The panel nature of the DHW public housing dataset allows us to compare employment outcomes before and after entry into public housing. The DHW data timeframe is 1 January 1999 to 30 November 2005, that is, it contains information on applicants and tenants who entered the wait list between 1 January 1999 and 30 November 2005. Individuals in the dataset undergo at least one of the following types of transitions within the data timeframe:

1. Entry into public housing and exit from public housing within the timeframe;
2. Entry into public housing within the timeframe, still in public housing at the end of the timeframe;
3. Entry onto the wait list and exit from the wait list within the timeframe without ever entering public housing;
4. Entry onto the wait list within the timeframe, still on the wait list at the end of the timeframe.

The sample numbers given in Table 7.1 include all individuals regardless of age, and exclude transfer cases, that is, individuals living in public housing who are on the wait list at the same time because they have applied for a transfer to another public housing property. For groups 1 and 3, the most recent observation is at the point of exit from public housing and the wait list respectively. For groups 2 and 4, the most recent observation is censored on 30 November 2005. The table reports the total number of wait list and public housing entries and exits in each year. At the end of the data timeframe, 37,175 wait list applicants remained on the wait list and 40,316 tenants were still in public housing. Over 32,000 entered and subsequently exited public housing in this timeframe.

Table 7.1: Number of wait list and public housing entries and exits, by year[a]

	1999	*2000*	*2001*	*2002*	*2003*	*2004*	*2005b*
Wait list entries	30,210	31,236	30,069	31,977	30,725	30,423	27,517
Wait list drop outs	7,092	12,404	16,486	20,379	19,491	19,000	18,272
Public housing entries[c]	6,025	10,151	12,780	14,283	14,941	14,547	11,671
Public housing exits	922	3,112	5,859	8,122	9,841	10,088	6,901
Still on wait list on 31 December[b]	19,244	30,400	34,568	35,587	35,569	36,242	37,175
Still in public housing on 31 December[b]	5,230	12,502	19,634	26,050	31,338	35,962	40,316

Source: Authors' calculations from DHW public housing data 1999–2005

a. Excludes transfer cases.

b. In the case of 2005, data is available only until 30 November.

c. This includes entries into existing public housing households without any time spent on the wait list.

The ability to observe individuals who dropped off the wait list and those still on the wait list at the end of the data timeframe (groups 3 and 4) is of critical advantage to the analysis because we are able to observe the full range of applicants within the data timeframe, including those who dropped off the wait list potentially because they have obtained employment. This minimises the risk of sample selection bias in our analysis.

7.3 Method

7.3.1 Defining employment status

As stated in section 3, while employment status is not directly observable from the data, tenancy records contain information on over 100 income sources, enabling accurate identification of individuals receiving a wage or salary from a conventional job, Community Development Employment Project or Disability Wage Supplement, and any individual receiving these earnings is treated as employed[20]. Unfortunately hours worked are not recorded, so the data does not allow identification of full-time and part-time employees.

The Department undertakes an income eligibility check of applicants at application and at property allocation, to ensure that public housing is only occupied by eligible persons. After property occupation, the Department reviews its tenants annually to ensure continuing eligibility. Tenants whose income has changed are also required to report their new income details to the Department (WA DHW, 2006). Given the income review procedures, we can observe each individual's employment status at the date of entry onto the wait list, the date of entry into public housing, at the annual income review date, or when tenants voluntarily report changes in income. These events occur at different points in time for each individual, so we cannot observe all individuals' employment status at the same point in time. To address this, we assume that there is no change in employment status between reviews or voluntary reports of changes in income, and record employment status on 1 July each year as determined by reference to their employment status at the review date preceding 1 July.

[20] Disability Wage Supplement was introduced in 1994 to encourage disabled people to undertake paid work. The supplement is an additional payment made to the disabled individual who receives less than the award wage provided the disabled individual is unable to perform job duties at the appropriate level warranting payment of full award wages (Parliamentary Library, 1997).

7.3.2 Panel model

A key methodological issue affecting analysis of the impact of public housing on employment is identification. Empirical identification refers to whether one can validly infer that the differences in an outcome variable are caused by differences in the relevant explanatory variables. In analysis such as this, empirical identification is often hindered by the following problems. First, there is the familiar omitted variable problem. Second, eligibility for public housing is determined by income, which will be correlated with labour market participation. As a result, it is often difficult to determine whether labour supply changes are the cause or the effect of residence in public housing.

To isolate the impact of entry into public housing on employment outcomes, we utilise a quasi-experimental framework in which we compare working-age individuals who have entered public housing within the timeframe (the treatment group) with working-age individuals who did not enter public housing within the timeframe (the control group). In our case, the treatment is therefore transition into public housing. If those in the treatment and control groups are randomly assigned, it is safe to assume that any difference in their employment outcomes is due to entry into public housing (the treatment). Thus if the treatment were not delivered, the outcomes of both groups would on average be the same. Any differences that do emerge with treatment can be attributed to the effects of that treatment rather than differences in the characteristics of the two groups. We exploit public housing institutional rules that cause variation in housing assistance that are plausibly unrelated to employment outcome. In the present context, we follow Fischer's (2000) use of the rationing of public housing. There are more people eligible for public housing than there are vacancies. Eligibility requires satisfaction of income tests, and once these tests are met, applicants enrol on wait-turn lists. Once applicants reach the top of the wait-turn lists they are offered a public housing property; administrators cannot select from the wait-turn lists those who have tended to have inferior employment records. As a consequence, variation in housing assistance between applicants making transitions into public housing (treatment group) and applicants still on wait-turn lists (control group) are assumed to be uncorrelated with omitted or unobservable variables that shape employment outcomes.

Using the quasi-experimental framework, we are able to estimate a difference-in-difference model. Suppose the average pre-treatment value of the outcome variable for the treatment and control groups are $\overline{Y}_0^T$ and $\overline{Y}_0^C$ respectively, where *T* represents the treatment group, *C* represents the control group and 0 represents the time period before the treatment group receives treatment. The average post-treatment values of the outcome variable for the treatment and control groups are $\overline{Y}_1^T$ and $\overline{Y}_1^C$ respectively, where 1 represents the time period after the treatment group receives treatment. The average impact of the treatment is $\left(\overline{Y}_1^T - \overline{Y}_0^T\right) - \left(\overline{Y}_1^C - \overline{Y}_0^C\right)$. The formula measures a difference of differences, that is, the difference in post- and pre-treatment outcomes of the treatment group, relative to the contemporaneous difference in post- and pre-treatment outcomes of the control group. Such a quasi-experiment mimics the approach of medical and social psychology researchers who randomly assign clients between treatment groups that receive a drug or other form of assistance, and control groups that receive a placebo.

Difference-in-difference modeling has been used in various studies to isolate the impact of a normally endogenous treatment on outcome variables. Card and Krueger (1994) evaluate the impact of the minimum wage on employment. Their treatment

group consists of fast food restaurants from New Jersey and the control group comprises a group of similar restaurants in Pennsylvania. The minimum wage was raised in New Jersey in 1992 but not in Pennsylvania. Differences in employment outcomes before and after the minimum wage hike in New Jersey were compared with differences in employment outcomes in Pennsylvania over the same time period. Surprisingly, the difference-in-difference estimate from Card and Krueger's (1994) study indicates that there was actually a small increase in the employment rate in New Jersey relative to Pennsylvania despite the minimum wage rise in New Jersey.

Another example is Gruber (2000), who examines the impact of disability insurance benefits on labour supply. There are two different disability pension plans in Canada, the Quebec Pension Plan (QPP), which covers only the province of Quebec and the Canada Pension Plan (CPP), which covers the rest of Canada. In January 1987, the CPP benefits increased by 36 percent while the QPP benefits remained constant. The employment outcomes of individuals under the CPP before and after the increase in benefits are compared with the employment outcomes of individuals under the QPP over the same time period. The study estimated that the elasticity of labour force non-participation with respect to disability insurance benefits was between 0.28 and 0.36. Gruber (1994) and Edwards (2006) have used difference-in-difference models to examine the impact of maternity leave provisions on wages.

The difference-in-difference specification in traditional quasi-experiments can be written as:

$$Y_{it} = f\left(\alpha + \beta T_i + \gamma z_i + \delta\left(T_i \cdot z_i\right) + \varphi X_{it} + \varepsilon_{it}\right) \qquad (7.1)$$

where Y_{it} =1 if individual *i* is employed at time period *t*, and z_i =1 if the observation is taken from the time period after the treatment group receives the treatment, and z_i =0 if the observation is taken from the time period before the treatment group receives the treatment. The variable z_i captures unobservables (fixed effects) specific to the time period *t* but common to all *i*. T_i =1 if the individual *i* is in the treatment group and 0 if *i* belongs to a control group. *X* is a vector of socio-demographic characteristics. We can interpret β as the treatment group specific effect (average permanent differences between treatment and control groups). The coefficient γ may be interpreted as a time trend common to treatment and control groups. Finally, δ is the difference-in-difference estimator, which isolates the impact of the treatment from average permanent differences between the two groups, time trend effects and socio-demographic characteristics.

Importantly, our quasi-experiment differs from the traditional quasi-experiments described previously in two significant ways. In traditional quasi-experiments, individuals in the treatment group all receive the treatment at the same time, and the control group can be observed over the same timeframe as the treatment group. In our case, the 'treatment' (transition into public housing) is received by people at different times. Furthermore, we have people dropping off the wait list before many in the treatment group have even entered public housing. It is therefore impossible to simply divide the time periods of observations into two periods – before the treatment group receives the treatment and after the treatment group receives the treatment.

Given the differences between the nature of our quasi-experiment and traditional quasi-experiments, we estimate the following model specification:

$$Y_{it} = \alpha + \beta P_i + \sum_{j=2}^{T} \gamma_t YEAR_{ij} + \delta(P_i \cdot z_{it}) + \varphi X_{it} + \varepsilon_{it} \qquad (7.2)$$

Where:

- Y_{it} = 1 if individual *i* is employed at time *t* and 0 otherwise.
- $YEAR_{ij}$ is equal to 1 if *t* = *j* = 2, …T, zero otherwise and captures unobservables (fixed effects) specific to *t* but common to all *i*.
- P_i = 1 if at any time *t* = 1, 2, …T, the individual *i* has made a transition into public housing and 0 if *i* belongs to a control group of wait list applicants who do not make a transition into public housing by period *T*.
- z_{it} = 1 if for individual *i* if period *t* occurs after the treatment (entry into public housing) has begun, and 0 if the period *t* occurs before the treatment has begun. Because treatment is never received by the control group, z_{it} = 0 regardless of *t* for all individuals in the control group.
- *X* is a vector of socio-demographic characteristics.
- We can interpret β as the treatment group specific effect (average permanent differences between treatment and control groups).
- The coefficient γ may be interpreted as a time trend common to treatment and control groups.
- δ is the difference-in-difference estimator.

Individuals in the dataset can be either normal or transfer cases. Normal cases are individuals who apply for public housing from outside the public housing sector. Transfer cases are individuals already living in public housing, who have applied to transfer to another public housing property[21]. The latter have the benefit of already having been allocated a public housing property. For example, they enjoy a housing stability that applicants from outside the public housing sector may not have. Moreover, they are on a 'transfer wait list', which is separate from the wait list for normal applicants from outside the public housing sector. Hence, the employment behaviour of transfer cases may differ from the employment behaviour of normal cases. Transfer cases have been excluded from the present analysis.

An important condition for any difference-in-difference analysis is that the selection variable assigning people between the treatment and control groups should be unrelated to the outcome variable (see Meyer, 1995). In our case the selection variable is the eligibility tests for public housing that are based on income and asset levels. An assumption here is that the rationing feature in public housing programs ensures that both public housing tenants and applicants are likely to share the same characteristics because both must satisfy income and asset eligibility rules as well as reside in rental or rent-free housing when applying for entry onto wait lists.

The sample comprises working-age persons, that is, non-dependent persons aged 15 to under 65. To test whether our sample satisfies this condition, Table 7.2 tests for significant differences in the characteristics of tenants (the treatment group) and applicants (the control group). Fixed characteristics, described in Table 7.2, are

[21] Applicants from outside the public housing sector receive what DHW call 'normal assistance'. Applicants who have applied for transfers from within the public housing sector receive what DHW call 'transfer assistance'.

characteristics that are time invariant. There are several significant differences between the fixed characteristics of the treatment and control groups. The treatment group is more likely to be older, a priority applicant and Aboriginal. There are also some regional differences across groups. However, these differences are controlled for in our analysis by including these fixed characteristics into our panel model as control variables. Importantly, the differences between public housing tenants and applicants are much smaller than differences between tenants and persons living in other tenures (see Wood et al, 2007).

Table 7.2: Means of fixed characteristics and test of significant differences between treatment and control groups[a]

Fixed characteristic	*Control*	*Treatment*
Year of birth	1967	1965*
Female	0.588	0.582
Aboriginal	0.131	0.337*
Priority case	0.011	0.209*
Metropolitan regions		
North Metro	0.351	0.232*
South Metro	0.187	0.130*
South East Metro	0.187	0.182
Country regions		
Great Southern	0.031	0.032
South West	0.063	0.054*
Goldfields	0.037	0.068*
Midwest-Gascoyne	0.044	0.077*
Pilbara	0.035	0.090*
Kimberley	0.054	0.075*
Wheatbelt	0.010	0.061*
Sample	36,567	18,497

Source: Authors' calculations from DHW public housing data 1999–2005

* Significantly different from applicants at 1 per cent level.

a. Excludes transfer cases.

7.4 Findings

The straightforward comparisons of pre- and post-transition employment rates presented in Table 6.1 suggested that there is a net positive impact on employment outcomes from entry into public housing. The aggregate employment rate of 14 per cent at entry onto the wait list increases to 16 per cent at entry into public housing, but then rises to 20 per cent at the most current point in time.

A difficulty with that analysis is that labour market conditions could be relatively more favourable in the post-entry phase and so we falsely attribute differences in employment rates to the effects of making a transition into public housing, when it in fact reflects change in labour market conditions. Table 7.3 addresses these concerns by comparing the employment outcomes of working-age tenants during year t with the contemporaneous employment outcomes of working-age wait list applicants in the same year. The year t employment outcome of applicants and tenants are both measured on 1 July. Table 7.3 reports contemporaneous outcomes of all working-age tenants and applicants. Table 7.4 cross tabulates by priority status.

Table 7.3 demonstrates that the employment rate of wait list applicants is below that of those who have already entered public housing. The average employment rate of tenants is 18 per cent, compared to a contemporaneous employment rate of 13 per cent for applicants. Hence, overall, tenants are 5 percentage points more likely to be employed than applicants and this difference is statistically significant at the 1 per cent level. The same pattern persists across the years, with tenants' employment being more favourable than applicants' contemporaneous outcomes. We find the same pattern by gender, disability status, Aboriginality and region, with tenants' outcomes being significantly better than the contemporaneous outcomes of applicants in all subgroups examined[22].

Table 7.3: Employment rates, weekly wage and number of applicants and tenants, by year

	1999	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*All*
Employment rate (%)								
Applicants	15.3	14.9	13.9	12.6	12.0	12.0	12.2	12.9
Tenants	15.9*	18.9*	17.4*	16.1*	17.9*	18.4*	20.0*	18.2*
Sample (all working age)								
Applicants	4,255	10,472	15,298	16,073	15,643	15,422	15,284	92,447
Tenants	578	2,368	4,420	6,464	8,230	9,720	10,686	42,466
Average weekly wage of employed persons ($)								
Applicants	323	295	299	303	296	595	315	348
Tenants	322	342*	324*	317	313+	316*	352*	328
Sample (working-age employed)								
Applicants	648	1,558	2,111	1,999	1,865	1,834	1,853	11,868
Tenants	92	444	764	1,030	1,466	1,769	2,115	7,680

Source: Authors' calculations from DHW public housing data 1999–2005

* Significantly different from applicants at 1 per cent level.

+ Significantly different from applicants of same priority level at 5 per cent level.

a. Excludes transfer cases.

Table 7.4 separates wait-turn from priority cases. We emphasise this distinction because the latter are in greater need of housing because their housing (e.g. homeless) and other circumstances (e.g. victims of drug abuse) are more desperate. Getting onto the wait-turn list is simply a matter of meeting the income eligibility and residence rules. Wait-turn applicants are more likely to have stable housing while on the wait list than priority applicants, who comprise individuals who are victims of domestic violence, homeless and living in emergency housing while on the wait list. Hence, any post-entry improvements in employment outcomes observed among priority applicants are more likely attributable to the housing stability created by transition into public housing. Wait-turn applicants typically spend slightly over one year on the wait list, while the average wait list period for priority applicants is nearly half that duration, at 7 months[23]. The former are then more prone to welfare locks than the latter, given the longer wait list times they have to serve[24]. Any post-entry

[22] Details available from authors on request.

[23] These are average wait times calculated from a sample of normal applicants who entered public housing within the data timeframe.

[24] Administrators have no discretion over when wait-turn applicants are offered accommodation – it is simply on a 'first-come, first-served' basis. Selection effects will not contaminate the housing and employment profile of wait-turn applicants.

improvements in employment outcomes observed among wait-turn applicants are more likely attributable to welfare locks.

Table 7.5 shows that regardless of priority level, tenants' employment outcomes are more favourable than applicants' contemporaneous outcomes. The typical gain in employment outcomes following public housing entry appear to be similar across priority levels. Overall wait-turn (priority) tenants' employment rate is 7 (6) percentage points higher than wait-turn (priority) applicants' employment rate. Overall differences between applicants and tenants are all statistically significant at the 1 per cent level regardless of priority level.

Table 7.4: Employment rates and weekly wages of applicants and tenants, by priority level and year

	1999	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*All*
Wait-turn								
Employment rate (%)								
Applicants	15.6	15.3	14.3	12.9	12.4	12.3	12.6	13.3
Tenants	18.4*	20.1*	18.8*	17.1*	19.9*	20.7*	22.5*	20.1*
Average weekly wage of employed persons ($)								
Applicants	324	296	299	304	296	598	315	349
Tenants	325	351*	319+	313	313+	322	355*	330
Priority								
Employment rate (%)								
Applicants	11.3	8.9	7.3	7.2	6.5	6.8	6.4	7.3
Tenants	4.0*	14.4*	12.7*	12.7*	12.2*	12.0*	13.2*	12.6*
Average weekly wage of employed persons ($)								
Applicants	269	244	278	214	317	375	305	297
Tenants	253	297	353#	333*	313	291	339	321

Source: Authors' calculations from DHW public housing data 1999-2005

* Significantly different from applicants of same priority level at 1 per cent level

+ Significantly different from applicants of same priority level at 5 per cent level

Significantly different from applicants of same priority level at 10 per cent level

a. Excludes transfer cases.

Table 7.5 presents panel model estimates based on equation (7.2). The estimates indicate that entry into public housing has a positive and significant impact on employment outcomes for both males and females. For males, being in public housing increases employment probability by 11 percentage points relative to being on the wait list. For females, the increase in employment probability is smaller than for males, at 5 percentage points. The overall model is highly significant. Table 7.6 shows that the model's predictive accuracy is 83 per cent for males and 87 per cent for females.

Most socio-demographic variables have the expected impacts on employment outcomes. Some noteworthy observations are that males and females with a psychiatric disability are less likely to be employed than those with other disabilities. Interestingly, persons with an intellectual disability are more likely to be employed than persons with no disability, and this difference is significant and very large[25].

[25] It is worth noting, however, that employed persons with an intellectual disability have significantly lower wages than non-disabled persons and those in other disability categories. In the dataset, the average weekly wage of employed persons with an intellectual disability is $100, compared to $348 for non-

There are very small numbers in the cognitive and neurological disability categories. Hence, individuals suffering from a cognitive or neurological disability have been grouped together with those with unspecified disabilities (the 'other disability' group). The reference year variable category is the year 2005. The coefficients on the year variables indicate that for males, labour market conditions in 1999 and 2000 were better than in 2005. However, labour market conditions for males were poorer between 2001 and 2004. For females, labour market conditions between 2000 and 2001 were better than in 2005, and then flattened out. The treatment group variable is negative and significant, indicating that there are some unobservable differences between tenants and applicants that have a negative impact on the employment outcomes of tenants relative to applicants.

Next we attempt to unbundle the positive net impact of public housing into a welfare lock effect and a housing stability effect. As described previously, priority applicants are less likely to be subject to a welfare lock because they spend very short periods on the wait list. Hence any post-public housing entry employment gains can be attributed to housing stability effects. On the other hand, wait-turn applicants spend comparatively longer periods on the wait list and are likely to have a stable address while waiting for a public housing property to become available Hence, the employment gains of wait-turn individuals are more likely attributable to a welfare lock effect. Tables 7.7 and 7.8 present panel model estimates for wait-turn males and females only. Tables 7.9 and 7.10 present panel model estimates for working-age priority males and females only.

Referring to Table 7.7 on wait-turn individuals, we observe that for wait-turn males, being in public housing increases employment probability by 12 percentage points relative to being on the wait list. For wait-turn females, the increase in employment probability is smaller, at 5 percentage points. Referring to Table 7.9 on priority individuals, we find that for priority males, being in public housing increases employment probability by 4 percentage points relative to being on the wait list. For priority females, the increase in employment probability is smaller at 2 percentage points. Thus, for both genders, the improvement in employment rates upon entry into public housing is more than twice as large for wait-turn individuals than for priority cases. Since we argue that there is no welfare lock effect for priority cases, their smaller increase in employment probability can be interpreted as a 'pure' housing stability effect. This suggests that for wait-turn individuals, the increase in employment probability is primarily due to the negative welfare lock effect of being on the wait list rather than the positive housing stability effect. In the case of both wait-turn and priority cases, the effects are twice as strong for males as for females.

disabled employed persons, $230 for physically disabled employed persons and $194 for employed persons with a psychiatric disability.

Table 7.5: Employment logit, all working-age males and females[a]

Explanatory variables[b]	*Males*				*Females*			
	Coef.	*Robust std. error*	*Sig.*	*Marg. effect*	*Coef.*	*Robust std. error*	*Sig.*	*Marg. effect*
Treatment group	-0.237	0.043	0.000	-0.029	-0.167	0.035	0.000	-0.017
Difference-in-difference estimator	0.810	0.044	0.000	0.111	0.493	0.037	0.000	0.053
Year 1999	0.158	0.069	0.022	0.020	0.069	0.062	0.265	0.007
Year 2000	0.088	0.048	0.070	0.011	0.122	0.042	0.004	0.013
Year 2001	-0.039	0.043	0.360	-0.005	0.068	0.037	0.066	0.007
Year 2002	-0.188	0.042	0.000	-0.022	-0.045	0.036	0.216	-0.004
Year 2003	-0.163	0.041	0.000	-0.019	-0.002	0.035	0.963	0.000
Year 2004	-0.102	0.040	0.010	-0.012	-0.024	0.034	0.486	-0.002
Age	-0.024	0.006	0.000	-0.003	0.071	0.006	0.000	0.007
Age squared	0.000	0.000	0.612	0.000	-0.001	0.000	0.000	0.000
Partnered	0.724	0.031	0.000	0.101	-0.059	0.030	0.049	-0.006
No. children aged 0–2	0.023	0.032	0.474	0.003	-0.876	0.033	0.000	-0.088
No. children aged 3–4	0.015	0.039	0.696	0.002	-0.572	0.032	0.000	-0.058
No. children aged 5–9	0.021	0.022	0.344	0.003	-0.218	0.018	0.000	-0.022
No. children aged 10–14	0.118	0.023	0.000	0.014	-0.067	0.018	0.000	-0.007
Aboriginal	-0.142	0.032	0.000	-0.017	-0.318	0.030	0.000	-0.030
Physical disability	-0.585	0.068	0.000	-0.060	-0.570	0.066	0.000	-0.047
Intellectual disability	0.628	0.116	0.000	0.095	0.335	0.120	0.005	0.038
Psychiatric disability	-1.119	0.125	0.000	-0.094	-0.654	0.100	0.000	-0.052
Sensory disability	-0.010	0.169	0.952	-0.001	0.018	0.162	0.910	0.002
Other disabilities	-0.647	0.090	0.000	-0.064	-0.513	0.089	0.000	-0.043
Priority case	-0.515	0.050	0.000	-0.054	-0.481	0.043	0.000	-0.042
South Metro	-0.089	0.044	0.040	-0.011	0.100	0.035	0.004	0.010
South East Metro	0.103	0.039	0.009	0.013	0.083	0.034	0.015	0.009

Explanatory variables[b]	*Males*				*Females*			
	Coef.	*Robust std. error*	*Sig.*	*Marg. effect*	*Coef.*	*Robust std. error*	*Sig.*	*Marg. effect*
Great Southern	0.741	0.068	0.000	0.115	0.433	0.061	0.000	0.051
South West	0.434	0.055	0.000	0.061	0.284	0.046	0.000	0.031
Goldfields	0.516	0.061	0.000	0.075	0.406	0.054	0.000	0.047
Midwest-Gascoyne	0.421	0.055	0.000	0.059	0.527	0.049	0.000	0.063
Pilbara	1.137	0.051	0.000	0.193	0.959	0.045	0.000	0.132
Kimberley	1.592	0.047	0.000	0.294	1.466	0.042	0.000	0.231
Wheatbelt	0.414	0.073	0.000	0.058	0.452	0.065	0.000	0.054
Constant	-1.331	0.122	0.000		-2.909	0.109	0.000	
Sample	51,567				81,829			
Wald Chi-sq(31)	3,962.12		0.000		3,341.70		0.000	
Log pseudo-likelihood	-21,226.342				-29,915.52			
Pesudo R-sq	0.099				0.060			

Source: Authors' calculations from DHW public housing data 1999-2005

a. Excludes transfer cases.

b. Omitted year = 2005; Omitted region = North metro

Table 7.6: Employment logit classification table, all working-age males and females

Observed	*Males*				*Females*			
	Predicted			*% correct*	*Predicted*			*% correct*
	Not employed	*Employed*	*Total*		*Not employed*	*Employed*	*Total*	
Not employed	42,253	531	42,784	98.8	71,063	20	71,083	100.0
Employed	8,039	744	8,783	8.5	10,728	18	10,746	0.2
Total	50,292	1,275	51,567	83.4	81,791	38	81,829	86.9

Source: Authors' calculations from DHW public housing data 1999-2005

Table 7.7: Employment logit, all working-age wait-turn males and females[a]

Explanatory variables[b]	*Males*				*Females*			
	Coef.	*Robust std. error*	*Sig.*	*Marg. effect*	*Coef.*	*Robust std. error*	*Sig.*	*Marg. effect*
Treatment group	-0.255	0.045	0.000	-0.031	-0.143	0.036	0.000	-0.015
Difference-in-difference estimator	0.811	0.047	0.000	0.115	0.457	0.039	0.000	0.053
Year 1999	0.174	0.071	0.014	0.023	0.072	0.064	0.267	0.008
Year 2000	0.099	0.050	0.050	0.013	0.118	0.044	0.008	0.013
Year 2001	-0.035	0.045	0.442	-0.004	0.076	0.039	0.051	0.008
Year 2002	-0.196	0.044	0.000	-0.023	-0.051	0.038	0.182	-0.005
Year 2003	-0.170	0.043	0.000	-0.020	-0.006	0.037	0.873	-0.001
Year 2004	-0.104	0.042	0.014	-0.013	-0.020	0.037	0.585	-0.002
Age	-0.024	0.007	0.000	-0.003	0.075	0.006	0.000	0.008
Age squared	0.000	0.000	0.584	0.000	-0.001	0.000	0.000	0.000
Partnered	0.741	0.032	0.000	0.106	-0.091	0.032	0.004	-0.009
Number of children aged 0-2	0.000	0.035	0.991	0.000	-0.895	0.036	0.000	-0.095
Number of children aged 3-4	0.015	0.041	0.710	0.002	-0.570	0.034	0.000	-0.061
Number of children aged 5-9	0.021	0.024	0.388	0.003	-0.236	0.019	0.000	-0.025
Number of children aged 10-14	0.117	0.024	0.000	0.015	-0.068	0.019	0.000	-0.007
Aboriginal	-0.122	0.035	0.000	-0.015	-0.297	0.033	0.000	-0.030
Physical disability	-0.620	0.073	0.000	-0.064	-0.596	0.072	0.000	-0.051
Intellectual disability	0.540	0.127	0.000	0.081	0.387	0.129	0.003	0.047
Psychiatric disability	-1.034	0.129	0.000	-0.091	-0.610	0.105	0.000	-0.052
Sensory disability	0.051	0.189	0.787	0.007	0.038	0.176	0.828	0.004
Other disabilities	-0.779	0.102	0.000	-0.075	-0.535	0.096	0.000	-0.047
South Metro	-0.074	0.046	0.104	-0.009	0.138	0.036	0.000	0.015
South East Metro	0.114	0.041	0.005	0.015	0.137	0.036	0.000	0.015
Great Southern	0.751	0.070	0.000	0.119	0.451	0.064	0.000	0.056

Explanatory variables[b]	*Males*				*Females*			
	Coef.	*Robust std. error*	*Sig.*	*Marg. effect*	*Coef.*	*Robust std. error*	*Sig.*	*Marg. effect*
South West	0.404	0.057	0.000	0.057	0.301	0.048	0.000	0.035
Goldfields	0.537	0.064	0.000	0.079	0.396	0.057	0.000	0.048
Midwest-Gascoyne	0.405	0.057	0.000	0.057	0.533	0.052	0.000	0.068
Pilbara	1.121	0.055	0.000	0.193	0.962	0.049	0.000	0.139
Kimberley	1.593	0.050	0.000	0.297	1.453	0.045	0.000	0.237
Wheatbelt	0.455	0.076	0.000	0.066	0.508	0.067	0.000	0.064
Constant	-1.328	0.128	0.000		-2.980	0.114	0.000	
Sample	46,491				71,058			
Wald Chi-sq(30)	3,577.65		0.000		2,925.00		0.000	
Log pseudo-likelihood	-19,821.478				-26,852.21			
Pesudo R-sq	0.097				0.057			

Source: Authors' calculations from DHW public housing data 1999-2005

a. Excludes transfer cases.

b. Omitted year = 2005; Omitted region = North metro

Table 7.8: Employment logit classification table, all working-age wait-turn males and females

Observed	*Males*				*Females*			
	Predicted			*% correct*	*Predicted*			*% correct*
	Not employed	*Employed*	*Total*		*Not employed*	*Employed*	*Total*	
Not employed	37,972	486	38,458	98.7	61,260	18	61,278	100.0
Employed	7,343	690	8,033	8.6	9,763	17	9,780	0.2
Total	45,315	1,176	46,491	83.2	71,023	35	71,058	86.2

Source: Authors' calculations from DHW public housing data 1999-2005

Table 7.9: Employment logit, all working-age priority males and females[a]

Explanatory variables[b]	*Males*				*Females*			
	Coef.	*Robust std. error*	*Sig.*	*Marg. effect*	*Coef.*	*Robust std. error*	*Sig.*	*Marg. effect*
Treatment group	0.369	0.183	0.044	0.033	0.279	0.158	0.078	0.017
Difference-in-difference estimator	0.377	0.126	0.003	0.036	0.294	0.097	0.002	0.019
Year 1999	-0.273	0.313	0.383	-0.025	-0.089	0.250	0.722	-0.006
Year 2000	-0.173	0.186	0.353	-0.016	0.021	0.157	0.894	0.001
Year 2001	-0.204	0.153	0.183	-0.019	-0.181	0.136	0.182	-0.011
Year 2002	-0.188	0.140	0.180	-0.018	-0.094	0.117	0.419	-0.006
Year 2003	-0.188	0.133	0.158	-0.018	-0.047	0.108	0.663	-0.003
Year 2004	-0.148	0.125	0.238	-0.014	-0.114	0.103	0.270	-0.007
Age	-0.022	0.021	0.293	-0.002	0.039	0.019	0.038	0.003
Age squared	0.000	0.000	0.940	0.000	-0.001	0.000	0.009	0.000
Partnered	0.579	0.099	0.000	0.063	0.200	0.090	0.026	0.014
Number of children aged 0-2	0.241	0.090	0.007	0.024	-0.716	0.093	0.000	-0.048
Number of children aged 3-4	0.018	0.112	0.876	0.002	-0.603	0.101	0.000	-0.040
Number of children aged 5-9	0.043	0.062	0.494	0.004	-0.099	0.051	0.050	-0.007
Number of children aged 10-14	0.145	0.064	0.023	0.014	-0.062	0.048	0.199	-0.004
Aboriginal	-0.204	0.091	0.025	-0.020	-0.303	0.076	0.000	-0.020
Physical disability	-0.342	0.186	0.067	-0.031	-0.338	0.167	0.042	-0.020
Intellectual disability	1.259	0.312	0.000	0.193	0.173	0.339	0.610	0.012
Psychiatric disability	-2.010	0.499	0.000	-0.105	-0.980	0.324	0.002	-0.045
Sensory disability	-0.180	0.379	0.634	-0.017	-0.139	0.426	0.744	-0.009
Other disabilities	-0.020	0.197	0.919	-0.002	-0.337	0.229	0.141	-0.020
South Metro	-0.214	0.151	0.154	-0.020	-0.285	0.119	0.016	-0.018
South East Metro	0.040	0.138	0.772	0.004	-0.412	0.118	0.000	-0.025
Great Southern	0.696	0.262	0.008	0.089	0.225	0.213	0.289	0.016

Explanatory variables[b]	*Males*				*Females*			
	Coef.	*Robust std. error*	*Sig.*	*Marg. effect*	*Coef.*	*Robust std. error*	*Sig.*	*Marg. effect*
South West	0.870	0.204	0.000	0.117	0.099	0.183	0.590	0.007
Goldfields	0.328	0.198	0.098	0.037	0.394	0.153	0.010	0.031
Midwest-Gascoyne	0.634	0.199	0.001	0.079	0.411	0.162	0.011	0.032
Pilbara	1.249	0.143	0.000	0.181	0.807	0.114	0.000	0.072
Kimberley	1.534	0.156	0.000	0.244	1.400	0.124	0.000	0.158
Wheatbelt	-0.518	0.383	0.176	-0.043	-0.496	0.333	0.137	-0.027
Constant	-1.947	0.413	0.000		-2.905	0.389	0.000	
Sample	5,076				10,771			
Wald Chi-sq(30)	445.13		0.000		411.35		0.000	
Log pseudo-likelihood	-1,868.560				-3,007.952			
Pesudo R-sq	0.121				0.075			

Source: Authors' calculations from DHW public housing data 1999-2005

Notes:

a. Excludes transfer cases.

b. Omitted year = 2005; Omitted region = North metro

Table 7.10: Employment logit classification table, all working-age priority males and females

Observed	*Males*				*Females*			
	Predicted			*% correct*	*Predicted*			*% correct*
	Not employed	*Employed*	*Total*		*Not employed*	*Employed*	*Total*	
Not employed	4,276	50	4,326	98.8	9,805	0	9,805	100.0
Employed	694	56	750	7.5	966	0	966	0.0
Total	4,970	106	5,076	85.3	10,771	0	10,771	91.0

Source: Authors' calculations from DHW public housing data 1999-2005

7.5 Concluding comments

In this section we have examined the impact of public housing assistance on employment outcomes. It is often difficult to accurately measure the impact of public housing on employment because public housing is correlated with unobservable factors that may discourage employment. This study circumvents the issue of endogeneity by using a quasi-experimental approach in which individuals who entered public housing within the data timeframe form a treatment group that can be compared to a control group consisting of public housing applicants who did not enter public housing within the timeframe. An important condition for our analysis is that the selection variable assigning people between the treatment and control groups should be unrelated to the outcome variable. In our case the selection variable is the eligibility tests for public housing that are based on income and asset levels. An assumption here is that the rationing feature in public housing programs ensures that both public housing tenants and applicants are likely to share the same characteristics because both must satisfy income and asset eligibility rules as well as reside in rental or rent-free housing when applying for entry onto wait lists. We find that transition into public housing has a positive net impact on employment outcomes. The difference-in-difference estimator shows that transition into public housing increases employment probability by 5 percentage points for females. For males, the increase is twice as high at 11 percentage points.

The positive impact of public housing assistance can be attributable to a welfare lock effect and/or a housing stability effect. The welfare lock argument states that because of the rationing of public housing stock, individuals depress their labour supply while on the public housing wait list in order to maintain eligibility for public housing. The housing stability hypothesis states that the employment outcomes of individuals improve once they have been allocated a public housing property because they have a secure address from which they can conduct their job search. These questions are important from a policy perspective. The welfare lock argument suggests that eligibility criteria should be relaxed once an applicant has been accepted onto wait lists, or public housing opportunities should be expanded so that wait times are reduced and welfare locks eroded. If it is due to positive virtues of public housing then we have to be cautious about applying fixed-term tenures that might threaten stability of tenants' housing circumstances. Overall, we find the welfare lock effect to be stronger than the housing stability effect.

We have identified two drawbacks to our approach. First, individuals who have not yet entered public housing are only reviewed at the date of entry onto the wait list and the date of entry into public housing. We are unable to observe their profile in the same way as tenants who are subject to annual reviews. The gap in the income review dates poses a problem for our analysis in that we have to assume that there is no change in employment status between the two review dates. If applicants were to undertake employment while on the wait list and then quit employment when a property becomes available, this would be a stronger indication that a welfare lock problem exists. We intend to circumvent this issue in the future by exploiting the sample of transfer applicants in the data. Transfer applicants are individuals already living in public housing, who have applied to transfer to another public housing property. The use of transfer applicants has two distinct advantages. First, because transfer applicants are already living in public housing, they are subject to annual income reviews and we are able to observe their income annually while they are on the transfer wait list, as opposed to normal applicants who are only reviewed at entry onto the wait list and entry into public housing. Second, because transfer applicants are already living in public housing, they have a secure address from which they can

conduct job search. Housing instability is minimised because of their public housing status. We will therefore be able to control for the housing stability effect and measure the extent of the welfare lock problem by examining the employment behaviour of transfer applicants.

A second weakness in the present analysis is that it does not take into account attrition bias. Once an individual drops off the wait list or exits public housing, she or he also drops out of the data. This is a potential source of attrition bias which we will seek to address in future analyses.

8 THE IMPACTS OF PUBLIC HOUSING SUBSIDIES ON LABOUR SUPPLY

Following the standard neo-classical treatment of the labour supply decision suggests that the provision of public housing subsidies may have an adverse effect on labour supply and hence employment outcomes. Moreover, when the subsidy is in the form of an in-kind transfer it may well have a different impact upon incentives than an equivalent cash transfer, though there are grounds to argue that the in-kind nature of housing subsidies may both ameliorate and accentuate any disincentive effects. The theoretical underpinnings of these potential effects were discussed in Section 2, along with empirical studies from Australia and overseas that have found that public housing tenants exhibit inferior labour market outcomes relative to persons in other housing tenures. We noted, however, that this does not necessarily imply causality because the provision of public housing subsidies is potentially correlated with a wide range of observable and unobservable factors which may also contribute to inferior outcomes for those who find themselves in need of accessing public housing programs. This identification problem is well enunciated by Fischer as follows:

> '… (a) simple comparison of the labour supply of housing subsidy recipients with that of the rest of the population would have little meaning. Eligibility for subsidies is determined by income, and income would be expected to correlate closely with hours worked and labour force participation. As a result, such a comparison would be unable to determine whether labour supply changes were the cause or the effect of program participation' (Fischer, 2000: 157).

Natural experiments are one means of tackling the identification problem in such situations where there may be numerous sources of endogeneity between the causal and outcome variables, many of which cannot be observed or satisfactorily measured with the available data. The natural experiment approach is akin to the instrumental variable approach, in that it seeks to utilise an exogenous source of variation in the explanatory variable which can safely be assumed to be random with respect to the outcomes variable. In this section we employ a natural experiment to attempt to isolate the impact of housing subsidies on labour supply by utilising exogenous variation in the size of property allocated to families that are numerically equivalent, and which can safely be assumed to be random with respect to employment outcomes. Section 8.1 contains an outline of the natural experiment approach. We then outline our methodology and key findings, and end with concluding comments.

8.1 Natural experiments and instrumental variables

In recent years, various studies have exploited naturally random events as instrumental variables in natural experiments. Random outcomes that have typically been used as instruments include twin births, birth date, gender, and weather events (Rosenzweig and Wolpin, 2000). Studies such as Angrist and Evans (1998) and Chun and Oh (2002) use the gender mix of children to isolate the impact of fertility on the labour force participation of females. Angrist and Krueger (1991, 1992) analyse the impact of school entry age on educational outcomes by using the variation in school starting age created by children's dates of birth to conduct a natural experiment in which children are compelled by compulsory school attendance laws to attend school for different lengths of time depending on their birth dates. Miller, Mulvey and Martin

(1995)[26] and Rouse (1999) use samples of twins to analyse the impact of human capital on returns to schooling.

The overseas public housing research literature has used exogenous variation in the gender mix of children as an instrumental variable to isolate the effects of public housing on outcome variables. Currie and Yelowitz (1998) and Yelowitz (2001) use this exogenous variation to isolate the impact of public housing on labour supply. Currie and Yelowitz (2000) use this exogenous variation to measure the impact of public housing on the educational outcomes of children in public housing, and Fertig and Reingold (2006) on health outcomes. Currie and Yelowitz (2000) find that children in public housing are 11 percentage points less likely to be held back than children in other rental housing, though the finding is only moderately significant at the 10 per cent level. Fertig and Reingold's (2006) findings indicate that public housing does not have a significant impact on maternal health outcomes. However, when the gender mix instrumental variable is used, the findings indicate that children experience improved health outcomes after three years in public housing.

Currie and Yelowitz (1998) and Yelowitz (2001) do not report estimates from the gender mix variable. The instrumental variable which is the focus of their attention is the public housing notch. Currie and Yelowitz (1998) and Yelowitz (2001) use the public housing notch as an instrumental variable in examining the impact of public housing on labour supply. At the point at which a non-public housing tenant loses eligibility for public housing, the market rent that the individual is faced with will generally exceed the rent that is payable if the individual resides in public housing. This generates a notch or discrete jump in the value of the housing subsidy at the point where the individual loses eligibility for public housing. The size of this notch will vary according to the income limit at which an individual loses eligibility for public housing; the proportion of earned income that the individual must pay in rent to the public housing authority and the market rent the individual would face if he or she did not reside in public housing. The notch has the expected impact in that increasing the notch increases work disincentives and creates incentives to collect other transfer income.

Jacob (2004) uses an exogenous source of variation generated by public housing demolitions in Chicago to examine the impact of high-rise public housing on student outcomes. Public housing households affected by the demolition are given housing vouchers to relocate to other neighbourhoods. Because the majority of households that leave high-rise public housing in response to the demolitions move to schools and neighbourhoods that resemble those they left, the study argues that the impact of the demolitions can be assumed to be exogenous. The study finds that students in households affected by the demolitions do no better or worse than their peers in public housing households not affected by the demolition.

Our natural experiment framework uses the size of the property, or number of bedrooms, as the instrumental variable. The number of bedrooms is our chosen instrumental variable for two reasons. First, there is market rent variation by the number of bedrooms, as shown in Table 8.1. In general, market rent increases noticeably as the number of bedrooms increases.

[26] A rare Australian study based on natural experiment.

Table 8.1: Mean weekly market rent, by number of bedrooms and region, November 2005 dollars

Region	*Mean weekly market rent ($)*						
	0 BR	*1 BR*	*2 BR*	*3 BR*	*4 BR*	*5 or more BR*	*Total*
North Metro	86.6	106.7	132.2	153.1	176.4	186.0	134.3
South Metro	91.6	99.6	126.3	151.8	173.3	184.4	131.8
South East Metro	60.5	93.6	114.5	148.7	172.1	185.2	129.0
Great Southern	57.2	91.4	106.9	134.0	176.1	158.9	125.8
South West	57.8	102.3	131.3	157.4	189.9	187.3	142.3
Goldfields	63.0	114.9	153.6	208.5	294.0	277.3	197.1
Midwest-Gascoyne	60.0	83.6	111.6	146.9	205.1	159.9	140.7
Pilbara		168.3	182.4	257.7	400.8	315.0	245.2
Kimberley	88.0	176.1	218.9	281.9	364.4	276.4	266.1
Wheatbelt	43.8	131.3	113.1	132.7	216.7	138.1	139.9
Total	79.2	105.2	134.5	176.2	219.7	186.0	153.6

Source: Authors' calculations from DHW public housing data

BR: bedrooms

Second, the variation can safely be assumed to be random because the allocation of properties is random. Table 8.2 lists the number of public housing properties by number of bedrooms in 2006. The table shows that three-bedroom properties make up 42 per cent of the public housing stock and there are 1.5 times as many three-bedroom properties as there are two-bedroom properties. Families in areas with limited demand can be allocated bedrooms in excess of their entitlement and vice versa in areas with a shortage of public housing stock. Applicants will be made one offer of accommodation, according to their choices as stated on the application form. In principle, families that are observationally equivalent will receive different housing subsidies due to exogenous variation in the number of bedrooms allocated. In the case of a family with two children, the family may be allocated a two- or three-bedroom property depending on the supply and demand of housing stock in their area and the gender mix of their children. The maximum subsidy that can be received from a three-bedroom property is larger than the maximum subsidy received from a two-bedroom property. Applicants must provide a valid reason for decline of a property in order not to be penalised. Examples of valid reasons for refusal include:

- Medical reasons with medical evidence;
- Too far from an essential amenity, e.g. a special needs school;
- Too far from public transport if reliant upon it;
- Too far from employment, especially if reliant on public transport;
- Too far from family if a need for support is demonstrated;
- Too close to known person/s who would be troublesome to the applicant, e.g. domestic violence, racial harassment;
- Changed circumstances since application which render the accommodation unsuitable, e.g. gained a partner, extra dependants or pet (WA DHW, 2006).

Table 8.2: Public housing stock, by number of bedrooms, 2006

No. of bedrooms	*Public housing stock*	
	No. of properties	*Per cent*
0 (bedsitter)	761	1.6
1	8,756	18.6
2	13,271	28.1
3	19,560	41.5
4	4,288	9.1
5	458	1.0
6	59	0.1
7	3	0.0
Total	47,156	100.0

Source: Authors' calculations from DHW public housing data

If an applicant refuses a valid offer, they are taken off the wait list and then have to reapply, which effectively puts them at the bottom of the list (Hafekost, 2007[27]). For priority cases, the DHW policy manual explicitly states that given the limited time available to locate housing for priority applicants, priority applicants must be prepared to compromise in their choice. For example, a priority applicant may be made an offer of accommodation which may not be their preferred zone or accommodation type, but which meets their needs. An applicant declining such an offer will be placed on the wait-turn list and made another offer of accommodation when their turn is reached (WA DHW, 2006). The key feature here is that those willing and able to wait for a preferred housing option are not given the opportunity once they reach the top of the queue.

We conduct the natural experiment using a sample comprising working-age families with two children. The occupancy rules governing the size of accommodation that will be offered to public housing applicants at the top of wait lists state that a family with two children is entitled to either two- or three-bedroom accommodation, depending on a combination of random factors, such as the supply and demand of housing stock in their area, gender mix of their children etc. The maximum housing subsidy that can be received from a two-bedroom property is smaller than the maximum subsidy received from a three-bedroom property. Working-age families are families where at least one parent is aged 15–64 years.

8.2 Comparing families with two children by number of bedrooms

In any given region the occupation by a family with two children of two- or three-bedroom accommodation should be independent of their socio-economic and demographic characteristics. We test whether significant differences exist between families with two children in two- and three-bedroom properties at the point of entry into public housing, that is, at the point of allocation of accommodation. Our sample comprises working-age single-family households with two children. We analyse fathers and mothers separately.

Table 8.3 shows that most differences between fathers in two- and three-bedroom properties are insignificant at the 5 per cent level, indicating that occupation by fathers with two children of two- or three-bedroom accommodation are independent of their socio-economic and demographic characteristics. There are, however, some

[27] *Two Questions Re: Policy*, email to r.ong@murdoch.edu.au (18/07/2007).

significant differences between mothers. Those residing in three-bedroom properties are more likely to be partnered and disabled, and less likely to be Aboriginal. While the variables listed are used in the model as control variables, the comparisons suggest that fathers in two- and three-bedroom properties are more comparable groups than mothers for the purposes of the analysis.

Table 8.3: Comparison of means of characteristics of working-age fathers/mothers in families with two children, at entry into public housing, by number of bedrooms

	Fathers		*Mothers*	
	2 BR	*3 BR*	*2 BR*	*3 BR*
Partnered	0.58	0.75#	0.12	0.21*
Sole parent	0.42	0.25#	0.88	0.79*
Mean age[a]	37.10	34.38	29.45	30.62#
Aboriginal[b]	0.58	0.37+	0.54	0.41*
Disabled[b]	0.08	0.04	0.01	0.04*
Transfers[c]	0.08	0.30*	0.18	0.29*
Priority case	0.28	0.31	0.38	0.39
Region				
North Metro	0.22	0.17	0.21	0.21
South Metro	0.08	0.09	0.06	0.10+
South East Metro	0.11	0.16	0.13	0.17#
Great Southern	0.08	0.04	0.07	0.04
South West	0.00	0.07*	0.03	0.06
Goldfields	0.11	0.09	0.05	0.10*
Midwest-Gascoyne	0.08	0.09	0.07	0.09
Pilbara	0.17	0.10	0.23	0.10*
Kimberley	0.11	0.11	0.06	0.07
Wheatbelt	0.03	0.09+	0.09	0.07
Sample	36	782	179	2,727

Source: Authors' calculations from DHW public housing data

a. Public housing tenants commonly apply for transfers within public housing for reasons such as dwelling or neighbourhood security and inadequate space (Burke and Hulse, 2002).

* Statistically significantly different from same sex at 1 per cent level

+ Statistically significantly different from same sex at 5 per cent level

Statistically significantly different from same sex at 10 per cent level

If there are no asterisks, the difference from mixed sex is not statistically significant at the 1, 5 or 10 per cent level.

In Table 8.4, we compare employment rates of fathers, mothers and families by the number of bedrooms at two years after entry into public housing. If employment analysis is undertaken at the point of entry, the housing subsidy effect would presumably be small, as tenants would not yet have had time to respond to the housing subsidy effect. A family is considered employed if at least one working-age parent is employed. The table suggests different trends for fathers and mothers. Partnered fathers and fathers overall are significantly more likely to be employed if residing in two-bedroom properties. However, the opposite trend is observed for mothers who are sole parents. The sample numbers show that while most fathers are partnered, most mothers are sole parents. However, the first pass employment

estimates in Table 8.4 do not allow us to accurately measure the direction and magnitude of the housing subsidy effect on employment outcomes. This is done in section 8.4 through multivariate estimation.

Table 8.4: Employment rates of working-age families with two children after entry into public housing, by family type

Family type	*Fathers*		*Mothers*	
	2 BR	*3 BR*	*2 BR*	*3 BR*
Employment rates (%)				
Partnered	68.2	46.5#	22.7	15.0
Sole parents	40.0	11.8	7.8	15.4+
All	59.3	38.5+	11.6	15.3
Sample (n)				
Partnered	22	228	22	226
Sole parents	10	68	64	719
All	32	296	86	945

Source: Authors' calculations from DHW public housing data

* Statistically significantly different from same sex at 1 per cent level

+ Statistically significantly different from same sex at 5 per cent level

Statistically significantly different from same sex at 10 per cent level

If there are no asterisks, the difference from mixed sex is not statistically significant at the 1, 5 or 10 per cent level.

8.3 Effect of housing subsidies on the labour supply of families with two children

There are two standard approaches to applying the instrument variable strategy in a modelling framework. Currie and Yelowitz (1998) and Yelowitz (2001) apply their instrumental variable strategy by entering the instrumental variables directly into their regressions, where the dependent variables include a labour force participation dummy and earnings. This is the most transparent specification. Currie and Yelowitz (2000) and Fertig and Reingold (2006) employ two-stage equations in their analysis using samples of families with two children. In the first stage, the endogenous variable (public housing residence) is instrumented using the instrumental variable (gender mix of children). In the second stage, the predicted public housing residence variable is used in place of the observed one to analyse the impact on the outcome variable.

In order to accurately measure the causal impact of housing subsidies on employment, we follow Currie and Yelowitz's (2000) and Fertig and Reingold's (2006) two-stage model framework to generate empirical estimates of the direction and magnitude of housing subsidies on the labour supply of working-age families with two children in two- and three-bedroom properties. As the name suggests, this model runs in two stages. In the first stage, the endogenous variable (housing subsidy) is regressed or instrumented using the instrumental variable of number of bedrooms and the socio-demographic characteristics listed in Table 8.3. The housing subsidy variable is the maximum weekly subsidy that can be received in November 2005 dollars, which is equivalent to the market rent. In the second stage, the predicted housing subsidy variable regressed on the socio-demographic characteristics in Table 8.3 to analyse the exogenous impact of housing subsidy on employment outcomes. When fathers (mothers) are analysed on their own, the employment outcome variable is defined as 1 if the father (mother) is employed, and 0 otherwise. The regressions are run separately for fathers and mothers.

First stage estimates are presented in Table 8.5. Only the instrumental variable estimates are reported. The significant and negative coefficients show that the instrumental variable is significant and operates in the expected direction. The larger the number of bedrooms, the larger the housing subsidy.

Table 8.5: Instrument variable estimate of two-stage model, families with two children, by family type

Family type and number of bedrooms[a]	*Coef.*	*Std. error*	*Sig.*	*Model prob > F*
Fathers				
Less than 3 bedrooms	-36.615	5.795	0.000	0.000
More than 3 bedrooms	17.399	6.007	0.004	0.000
Mothers				
Less than 3 bedrooms	-30.193	3.407	0.000	0.000
More than 3 bedrooms	20.789	3.382	0.000	0.000

Source: Authors' estimations from DHW public housing data

a. Omitted category: Three bedrooms.

The second stage estimates are presented in Tables 8.6 and 8.7 for fathers and mothers respectively. The findings suggest that the causal impact of housing subsidy on the employment outcomes of fathers is negative and highly significant, though the effect is small. The coefficient on the housing subsidy variable is a measure of the marginal effect of increasing weekly housing subsidy by one dollar on employment probability. The coefficient of –0.007 indicates that a dollar increase in weekly housing subsidy causes employment probability to fall by 0.7 percentage points. For mothers, on the other hand, the housing subsidy effect appears to be insignificant. Given the large number of mothers who are sole parents, we run a regression separately for female sole parents only and find that the housing subsidy effect for female sole parents is positive and weakly significant at the 10 per cent level. The results suggest that public housing subsidies have differential effects on employment participation for fathers and mothers, and differential effects again for partnered and sole-parent mothers.

Table 8.6: second-stage estimates of two-stage model, fathers with two children, by family type[ab]

Explanatory variable		*Coef.*	*Std. error*	*Sig.*
Constant		1.203	0.652	0.066
Housing subsidy		**-0.007**	**0.002**	**0.006**
Sole parent		-0.446	0.080	0.000
Age[c]		0.013	0.024	0.605
Age squared[c]		0.000	0.000	0.512
Aboriginal[d]		-0.091	0.078	0.243
Disabled[d]		-0.181	0.150	0.230
Number of disabled children		-0.092	0.130	0.483
Age of youngest child		0.012	0.009	0.205
Age of oldest child		-0.012	0.012	0.293
Priority case		0.056	0.071	0.428
Transfer case		0.089	0.070	0.204
Year of observation	2001	-0.021	0.097	0.832
	2002	0.015	0.083	0.859
	2003	0.062	0.084	0.461
	2004	0.086	0.082	0.297
Region	South Metro	0.149	0.109	0.172
	South East Metro	0.053	0.089	0.553
	Great Southern	-0.062	0.153	0.687
	South West	0.141	0.123	0.251
	Goldfields	0.010	0.139	0.943
	Midwest-Gascoyne	-0.143	0.141	0.311
	Pilbara	0.546	0.155	0.000
	Kimberley	0.959	0.294	0.001
	Wheatbelt	-0.349	0.188	0.064
Dwelling type	Townhouse - One level	-0.143	0.098	0.144
	Townhouse - Two or three levels	-0.012	0.105	0.913
	Other	-0.347	0.189	0.067
Diagnostics				
Sample		358		
Degrees of freedom		27		
F		2.112		
Prob > F		0.001		
Adjusted R squared		0.078		

Source: Authors' estimations from DHW public housing data

a. The following variables are 0-1 dummies: Sole parent; Aboriginal; Disabled; Priority case; Transfer case; Year of observation; Region; Dwelling type.

b. Omitted categories are: Year of observation – 2005; Region – North Metro; Dwelling type – Single detached dwelling.

Table 8.7: Second-stage estimates of two-stage model, mothers with two children, by family type[ab]

Explanatory variable		*Coef.*	*Std. error*	*Sig.*
Constant		-0.083	0.223	0.708
Housing subsidy		**0.001**	**0.001**	**0.375**
Sole parent		-0.012	0.025	0.627
Age[c]		0.000	0.011	0.989
Age squared[c]		0.000	0.000	0.963
Aboriginal[d]		-0.062	0.026	0.015
Disabled[d]		-0.010	0.058	0.863
Number of disabled children		-0.042	0.057	0.463
Age of youngest child		0.015	0.004	0.000
Age of oldest child		0.004	0.005	0.379
Priority case		-0.042	0.026	0.100
Transfer case		-0.011	0.025	0.667
Year of observation	2001	-0.008	0.043	0.843
	2002	0.001	0.034	0.969
	2003	0.010	0.032	0.749
	2004	0.024	0.030	0.430
Region	South Metro	0.062	0.041	0.128
	South East Metro	0.012	0.034	0.733
	Great Southern	0.048	0.063	0.445
	South West	-0.003	0.049	0.954
	Goldfields	0.085	0.049	0.086
	Midwest-Gascoyne	0.127	0.054	0.019
	Pilbara	0.064	0.059	0.279
	Kimberley	0.093	0.116	0.423
	Wheatbelt	0.049	0.081	0.544
Dwelling type	Townhouse - One level	-0.015	0.035	0.661
	Townhouse - Two or three levels	0.066	0.048	0.170
	Other	-0.032	0.068	0.639
Diagnostics				
Sample	1,120			
Degrees of freedom	27			
F	2.529			
Prob > F	0.000			
Adjusted R squared	0.036			

Source: Authors' estimations from DHW public housing data

a. The following variables are 0-1 dummies: Sole parent; Aboriginal; Disabled; Priority case; Transfer case; Year of observation; Region; Dwelling type.

b. The omitted categories are: Year of observation – 2005; Region – North Metro ; Dwelling type – Single detached dwelling.

8.4 Concluding comments

This section has examined the question of whether or not subsidies in the form of public housing create disincentive effects that cause reduced employment rates among subsidy recipients. Empirical investigation of this question has traditionally been frustrated by the fact that low income (and hence often non-employment) is typically one of the main qualifying criteria for entry into public housing. Thus low employment rates can be seen as the 'cause' of public housing tenants being in receipt of the subsidy. Moreover, once one has qualified for public housing, the amount of subsidy received is typically negatively related to income, such that non-employment can also be said to 'cause' higher subsidy receipts.

This endogeneity problem is addressed in two ways. First, the sample for analysis is restricted to persons in public housing. As virtually all public housing tenants pay below market rent, effectively everyone in the sample receives some subsidy. The problem of non-employment leading to eligibility for a subsidy has thus been eliminated. Second, a natural experiment approach is used to exploit random variation in the level of the subsidy. There is considerable variation in the level of the subsidy received and this arises partly from the rules relating to property allocations for families with different gender mixes of children, and partly simply because persons are allocated the first suitable property available once they reach the top of the wait list, irrespective of the market rent. These allocation processes can be reasonably taken to imply that the variation in the subsidy is random with respect to employment outcomes.

To exploit the natural experiment, the analysis focuses on families with two children. A comparison of employment rates shows that fathers who are allocated a three-bedroom property are more likely to be employed than fathers who are allocated a two-bedroom property. This result is confirmed in two-stage multivariate modelling which implements the instrumental variable approach. The effect is highly significant in statistical terms and large in magnitude. With the variables evaluated at their means, a $10 per week increase in the value of the housing subsidy received is estimated to reduce the likelihood of the father being in employment by 7 percentage points.

This result is consistent with the hypothesis of a higher subsidy reducing work incentives. It is important to note, however, that this finding may not be applicable to the general population, as it is based on a very specific subgroup. The effect was also not found to be significant in the case of mothers. The majority of these are sole parents, and a separate estimation on female sole parents also failed to support the hypothesis. As sole parents face greater barriers to employment participation, it is likely that there are differential incentive and enabling effects of public housing subsidies at work.

9 CONCLUSION

9.1 Overview

The linkages between participation in public housing programs and employment outcomes are not well understood in Australia, and are a matter of ongoing debate in the international literature. An individual's application to the wait list and their subsequent entry into public housing potentially have a range of positive (enabling) and negative (disincentive) effects on socio-economic outcomes for that person and their family. The mechanisms through which these various effects operate and the magnitude of the effects on economic outcomes have implications for how public housing programs should be designed and targeted, and the 'net impact' has implications for the overall social contribution of public housing, and hence how extensive programs should be.

With a stock of around 340,000 properties and net government expenditure of over $1 billion on public housing each year in Australia, these issues are clearly of considerable importance for policy makers and for the wellbeing of a large number of Australian families. However, there is little empirical evidence on even some of the more basic parameters of interest, and a lack of suitable data available to researchers has precluded addressing the difficult methodological challenges in identifying causal relationships or estimating the net impact of public housing participation on socio-economic outcomes. Through the compilation of a unique longitudinal dataset of applicants' and tenants' administrative records held by the Western Australian Department of Housing and Works, the analyses contained in this report have been able to address a number of these issues for the first time.

Sections 4 to 6 of the report provide some important descriptive information about the characteristics of public housing applicants and tenants, and their experiences once they have engaged with the public housing program. The fact that the data are longitudinal and contain information on persons both while they are on the wait list and once they enter public housing has enabled a far richer picture to be developed than has previously been possible for independent researchers in Australia, particularly with respect to the dynamics of program participation and the relationships between program participation and employment outcomes.

Between 1999 and 2005 the Western Australian public housing applicant and tenant population aged significantly, and at a faster rate than the state's population at large. Tenants are increasingly likely to live in family units with no children, enter the system as priority cases, to be Indigenous and to have a disability. The incidence of psychiatric disabilities among both applicants and tenants more than doubled, albeit from a small base. The 'typical' tenancy in this period lasted for around three years, although a significant number of public housing tenants remain in a property for over five years.

The main goal of the report has been to provide information for the formulation and design of public housing policies that aim to improve economic participation among tenants. Importantly, for the first time in Australia, we have been able to investigate potential welfare locks facing people on the wait list, as well as possible effects from entry to public housing. Section 6 shows that there is a general improvement in employment rates as people move from the wait list and into public housing. Sections 7 and 8 seek to tackle identification problems that have beset previous attempts to identify causal relationships between public housing programs and employment.

Section 7 implements a difference-in-differences approach through estimation of a panel model of transitions to employment which includes observations for persons on the wait list and those who occupy public housing properties. The important feature of this approach is that it controls for omitted variable bias in assessing the impact of entering public housing on employment outcomes. The omitted variable problem arises if those who enter public housing and those who don't enter public housing are different in ways that we cannot observe. This is overcome by having data on applicants (a close control group) and on public housing tenants both before and after they are assigned a property.

However, the net effect of entering public housing in the difference-in-differences model still comprises both the wait list 'welfare lock' effect and any enabling or disincentive effects of public housing. A positive impact of public housing on employment is identified, and this can be either because disincentive effects are weaker for tenants than applicants, or because of the enabling effect of stability of housing. We attempt to distinguish between these possible explanations by separately analysing tenants who entered the wait list as wait-turn applicants and those who entered as priority cases, for whom we argue the 'welfare lock' effects should be trivial or at least much smaller.

Finally, a natural experiment approach is utilised to further attempt to isolate a causal relationship between the level of housing subsidy received and employment outcomes (Section 8). This methodology addresses both omitted variable bias and endogeneity, or 'reverse causation', between employment and subsidy levels. However, the findings cannot be generalised, that is, they are not applicable to all subsidies or to the entire population. We find that, at least in the case of male public tenants in families with two children, higher subsidies do result in lower employment outcomes. The result cannot confidently be extrapolated to imply, for example, that the same negative effect would hold for the receipt of a subsidy relative to not receiving any subsidy. Evidence for women with two children is inconclusive, and the finding appears not to hold for female sole parents.

9.2 Findings in relation to key research questions

To assess the linkages between public housing and economic participation, four key policy and research questions were posed in the introduction. Taking each of these in turn, our major findings are as follows:

9.2.1 How does the length of public housing tenure vary across socio-demographic groups and what are the main causes of exits from public housing?

A significant proportion of public housing tenancies last for less than one year, and most have been terminated within three years. However, a considerable number – approximately 30 per cent – continue beyond five years. Priority cases and sole parents have longer expected tenancies in public housing, and the more children a family has, the longer they are likely to remain in a tenancy. There is considerable variation across regions, in both average time spent on the wait list and average time spent in a tenancy. In general, tenants in regions with shorter mean wait times tend to have shorter spells in public housing, probably reflecting a more transient population. The exit rate is also lower for larger families, suggesting that public housing tends to provide a greater benefit to these families relative to the housing they could access in the private market.

The hazard analysis of the length of spells in public housing shows that a number of socio-demographic characteristics associated with barriers to employment are also

associated with longer tenancies. These include being a priority case, a sole parent and receiving higher levels of government payments. These findings suggest that employment opportunity and earnings potential, as embodied in the characteristics either of the tenant or of the region in which they reside, is a major determinant of exits from public housing. Moreover, persons who are employed but with low earnings have a markedly lower likelihood of exiting public housing, as do tenants who receive high levels of government payments. The exit rate increases with higher earnings and with lower levels of government benefits. That is to say, increasing the financial independence of tenants does lead to withdrawal from public housing.

Another marked effect revealed in the hazard models is that the higher the market rent of the property, the longer tenants can be expected to remain in public housing. We interpret this as an indication that the greater the subsidy available under the program, the longer people will remain.

9.2.2 How are the labour market outcomes of actual and potential public housing tenants affected by the rationing of public housing stock; that is, how are labour market outcomes influenced by the presence of a public housing wait list?

As discussed in section 2, there are grounds for expecting that the presence of wait lists for public housing creates 'lock-in' effects. Between 1999 and 2005 the average employment rate for persons when they first entered the wait list was 13.9 per cent. When they entered public housing, typically around 10 months later, it had risen to 15.8 per cent. It must be noted, however, that far more of the applicants who join the wait list drop off the list before a property becomes available than actually ever enter public housing. In the timeframe covered by the data, 161,000 entrants applicants joined the wait list. Almost precisely half this number dropped off the list during the same period, while around one-third entered public housing. The 13.9 (15.8) per cent employment probability observed at entry to the wait list (public housing) relates only to a minority of applicants. It is to be expected that many of those who dropped off the wait list may have done so either because their employment situation had improved and had enabled them to secure adequate housing in the private market, or because they knew they would no longer be eligible and therefore withdrew. Of course, applicants may also drop off the list for reasons unrelated to their own employment, such as changes in marital status or relocation to another state.

A further comparison is provided by the hazard models out of non-employment for applicants and tenants (section 6). This does show an increase in the rate at which people enter work as they move from the wait list and into public housing, which may be attributable to a lock-in effect of being on the wait list. Less than one-half of 1 per cent of non-employed applicants are observed to move into employment each month. In this analysis, non-employment spells on the wait list are treated as censored if they are terminated by exit from the wait list or by entry to public housing before any earned income is observed. If a significant proportion of applicants left the wait list because they gained work but without an increase in earnings being recorded, then the hazard will be biased downwards. That is, we will be underestimating the rate at which non-employed applicants gain employment.

We cannot say for sure whether a welfare lock does or does not exist as a result of the rationing of public housing. The large proportion of persons leaving the wait list before entering public housing implies that any such effect is minor. In contrast, two pieces of evidence point to a more substantial effect: the increase in employment rates between entry to the wait list and entry to public housing, and the modest difference in employment rates following entry to public housing. Note, however, that if

the effect of being in public housing has a significant negative effect on employment outcomes, as suggested by our natural experiment findings with respect to the subsidy, then this last piece of evidence may be misleading — it would imply that the wait list lock-in effects must be larger. However, the welfare lock estimates could potentially be biased as a result of attrition and/or differences in the time intervals separating reviews when on the wait list and when a tenant.

Even if the rationing of public housing does not have a major impact on labour market outcomes, it must still be remembered that the applicants may be suffering in other dimensions of their lives. One figure of concern is that around one-third of wait-turn applicants later become priority during their time on the wait list. A very significant proportion of applicants thus appear to experience a major deterioration in their life circumstances of one form or another while they wait for public housing to become available. If these events would have occurred anyway, then they may not be of relevance to housing policy. On the other had, if the inadequacy of applicants' housing arrangements while they are on the wait list positively contributes to these negative life events, then this should indeed be considered a significant policy issue.

9.2.3 How does the labour market activity of those on the wait list change following transitions into public housing?

The employment rate increases from 14 per cent at entry on to the wait list, to 16 per cent at entry to public housing and then rises to 20 per cent for tenants who have been in public housing for some time (based on their most recent record). These increases are minor in percentage point terms – from first joining the wait list an increase of 2 percentage points on entry to public housing and another 4 percentage points when later observed during their tenancy. However, it must be remembered that these are from a low baseline employment rate. Expressed in terms relative to the initial entry to the waitlist, these figures represent an increased likelihood of being employed of 14 per cent at entry to public housing and 43 per cent during a tenancy. The employment rate increases by 25 per cent between entry to public housing and the most recent observation while in public housing. In this light, the change in employment rates following entry to public housing is of considerable magnitude. Moreover, changes in employment rates of similar magnitude are observed across all subgroups of the population, and increases in wages are also observed for tenants.

We have stressed throughout the report that such estimates cannot be taken to imply a causal impact of public housing subsidies on labour market outcomes. The difference-in-difference approach most rigorously identifies a causal impact of leaving the wait list and entering public housing, and finds a positive and highly significant effect. After controlling for other factors that might influence employment outcomes, entering public housing is estimated to increase the probability of being employed by around 11 percentage points for males and 5 percentage points for females. Although we believe the methodology establishes this as a causal relationship, there is a need to further distinguish between whether the effect is caused by the negative lock-in effects of being on the wait list or the positive enabling effects of public housing. The effect is about one-third as large for priority applicants, for whom we argue that lock-in effects should be less relevant. On this basis it appears that the increase in employment outcomes for tenants can be mostly attributed to the lock-in effect of the wait list. Notwithstanding this, the evidence still points to a small positive enabling effect arising from the stability of tenure and affordability offered by public housing.

9.2.4 For those in public housing, do public housing rental rebates depress labour market outcomes?

There are two main indications that rental subsidies do depress labour market outcomes. The hazard models estimated in section 5 revealed that the higher the market rent of the property, the longer the expected duration of a tenancy. To the extent that exits from public housing arise because of increased earnings, this would suggest that higher market rents depress earnings (and labour supply). The market rent is a useful instrument for this purpose — it is not a direct measure of the subsidy received, but rather the maximum subsidy available if the tenant allocated to that property had no income. Unlike the actual subsidy received, the market rent of the property can be considered exogenous to the labour supply decision (that is, earnings do not influence the market rent).[28]

Second, the results from the natural experiment show that, for fathers with two children, the higher the level of subsidy received, the lower the likelihood that the father will be employed. For every $10 increase in the subsidy, the likelihood of being employed is reduced by 7 percentage points. This effect is very large when it is considered that the employment rate among these fathers is around 40 percent, and that the mean market rent for public housing properties (and hence the maximum subsidy) is $154 per week. It is not known whether this effect similarly affects fathers with different numbers of children or men with no children, but there is no reason to believe the same incentive effects would not apply equally to these other males. However, the effect was not found to be significant for mothers with two children, and the presence of any negative effect on female sole parents can be clearly rejected.

9.3 Policy implications

Although the empirical results are not robust enough for us to make claims about the exact magnitude of the various effects, the analysis suggests that there is a sizeable 'lock-in' effect created by the rationing of public housing and that higher rental subsidies do create disincentives to increased economic participation. We believe there is also evidence of an enabling effect of entering public housing through stability of tenure and the release of tenants' resources that can boost economic participation. The enabling effect and subsidy disincentive effects have an offsetting impact, such that the net effect on employment outcomes (relative to the absence of any subsidy) may be positive or negative. However, our results indicate the net impact is at least less negative than the lock-in effect while on the wait list, because employment participation increases following transition into public housing.

It is already well established that public housing tenants display very low rates of economic participation. What is less clear is the extent to which the design of housing assistance programs contributes to these low levels of economic participation as opposed to ameliorating the pre-existing barriers confronting these individuals. The data clearly show that applicants and tenants are becoming increasingly disadvantaged over time, due to a combination of a falling public housing stock and increases in the wider population facing such barriers. The growing proportion of applicants and tenants with a disability is a case in point that we have already highlighted. There is therefore an increasing need to combine public housing programs with other programs to support social and economic participation. We have seen that increased economic independence, in the form of increased earnings, has in itself a significant impact on the rate of exit from public housing. Thus more

[28] See the discussion in section 8.1 relating to the random nature of the allocation of properties.

integrated assistance programs would have an offsetting budgetary impact, or at least allow others in need to move into public housing.

Moreover, such an integrated program of assistance may benefit from an early intervention strategy which starts with applicants on the wait list, and not just with tenants. Partly this is justifiable because of the evidence of lock-in effects for people on the wait list, which is obviously undesirable. But also we have noted that the circumstances of a significant number of wait-turn persons change while they are on the wait list in such a way that they then become priority cases. There is a real danger that the negative effects of being on the wait list, either through disincentives to economic participation or other consequences of being in housing need, actually contribute to a deterioration in the life circumstances of these applicants. In this case, there is an even stronger onus upon government to provide additional support.

Appropriate policy responses to the evidence of lock-in effects would be to relax eligibility criteria once an applicant has been accepted onto the wait list, or an expansion of public housing opportunities so that waiting times are reduced and welfare locks eroded.[29] A policy consistent with both these approaches would be to allow tenants on the wait list to earn in excess of the maximum amount required to remain eligible, but for earnings to be offset against any future rental subsidy. That is, a similar formula as that used for assessing rent could be applied to applicants' earnings, but where the notional rent increase (subsidy withdrawal) would be averaged over, say, the first 12 months of the tenancy once they enter public housing. Under this policy, tenants could accept short- or even medium-term jobs without necessarily forgoing their place on the wait list. However, with greater economic participation the value of the subsidy they will receive if they enter public housing will fall. For those whose engagement in the labour market leads to a more permanent increase in earnings, the value of their expected subsidy upon entry to public housing will fall substantially and they will be more likely to leave the wait list voluntarily. This reduces the risk of accepting job offers where the individual faces uncertainty about the ongoing earnings potential associated with accepting that offer. The implementation of such a policy would, however, require more stringent monitoring of applicants' earnings than is currently undertaken.

To the extent that the increase in employment rates following the transition into public housing represents an enabling effect, then we have to be cautious about the application of fixed-term tenures that might threaten the stability of tenants' housing circumstances, or alternatively, ensure that the tenants have the means to establish stable alternative housing before removing them from public housing. One lesson from the program evaluation literature is that programs need to be effectively targeted in order to maximise net benefits. Tighter targeting of wait list places and public housing tenancies to those in greatest need will minimise disincentive effects, as those who take these places will be less likely to have otherwise gained employment. That is to say, disincentive effects will have little impact on people who already have a very low likelihood of gaining employment. Equally, enabling effects of public housing and any integrated support programs are likely to have the greatest net impact on those in greatest need.

Of course there is also a trade-off involved with tighter targeting. With a constant or falling public housing stock, increasing numbers of people who are in need will be refused program eligibility. One potential question that could be addressed with the

[29] Caution needs to be exercised in drawing policy implications from the findings relating to welfare locks since, as previously noted, there are several potential sources of bias which have not been addressed in the analysis.

DHW data but which was not addressed in this report is: which applicants are least likely to eventually enter public housing? Or, stated alternatively: who is most likely to drop off the waitlist? Closer targeting to exclude from eligibility those most likely to drop off the waitlist would reduce lock-in effects while minimising the undesirable consequences of exclusion from the program.

9.4 Directions for future research

There are many other possible research questions that could be addressed with the DHW data. The findings presented in this report essentially represent the research team's first attempts at applying these data to contribute positively to policy and theoretical issues. Throughout the report we have highlighted the instances in which the nature of the data has enabled policy questions and methodological challenges to be tackled for the first time in an Australian context. These include: investigation of the presence of lock-in effects from the rationing of public housing; the use of duration modelling to investigate the dynamics of participation in public housing programs and employment; the application of the difference-in-differences model to address omitted variable bias; and the use of allocation rules to generate a natural experiment to address both omitted variable bias and endogeneity in analysing the impact of public housing subsidies on employment outcomes.

Given the opportunity, there is great potential for researchers to build on this initial work. The current authors will benefit considerably from greater familiarisation with the data and with Western Australian public housing policies and procedures, such as how allocation rules are implemented. The data relate only to Western Australian applicants and tenants; however, given the common culture and broadly similar public housing arrangements in each state, the results should be applicable nationally. The value of the data will grow if the coverage extends to a longer time period, especially periods with significant policy changes. There would also be enormous value in other state housing jurisdictions making similar data available, as this would enable comparative studies and techniques such as the difference-in-differences estimators to exploit jurisdiction-specific policy differences and changes over time. Further, the data have the potential to be proactively exploited in the evaluation and refinement of policy, such as implementing trials in one region but not another, or staggering their introduction.

To the extent that time and resources permit, we hope to continue with the current program of research, confident that this will lead to significant contributions in the Australian and the international housing research literature. Some areas of ongoing development and new future directions include:

- Further extensions to the hazard modelling of non-employment spells. Initial attempts at incorporating entry into public housing as an explanatory variable in estimating a multivariate hazard function returned a very large and positive coefficient, implying an unrealistically positive effect of entering public housing on employment. Sensitivity tests on the treatment of censored observations, such as treating exits from the wait list as transitions to employment, and the use of entry into public housing as a time-varying covariate remain potential avenues for further development.
- Continued experimentation with the specifications of the difference-in-differences model and the natural experiment model;
- Implementation of matching models to provide further evidence on the lock-in effects for applicants and the impact of moving into public housing;

- Analysis of the factors influencing applicants' changes in status from wait-turn applicants to priority cases;
- Examining the employment outcomes of transfer cases[30];
- Undertaking separate analyses on client groups of particular policy interest, such as Indigenous persons and sole parents.

Probably the major limitation of the data is that we do not have a true 'control group' of persons who have not engaged with housing assistance programs. All people in the sample are potentially subject to program effects either by joining the wait list for housing assistance or by being in receipt of assistance. This can only be overcome by incorporating data from other sources into the analysis. The longitudinal Household, Income and Labour Dynamics in Australia (HILDA) survey is a promising candidate. Another useful addition to the existing data would be an exit survey of a sample of people who drop off the wait list. These two pieces of missing information – what happens to 'similar' people who have never been admitted to a wait list or into public housing, and what happens to those who leave the wait list without ever entering public housing – would be most important in isolating lock-in effects, and thereby also providing greater confidence in estimates of the enabling effect of public housing.

[30] Because transfer applicants are already living in public housing, they are subject to annual income reviews and we are able to observe their income annually while they are on the transfer wait list, as opposed to normal applicants who are only reviewed at entry onto the wait list and entry into public housing. Furthermore, because transfer applicants are already living in public housing, they have a secure address from which they can conduct job search. Housing instability is minimised because of their public housing status. We will therefore be able to control for the housing stability effect and measure the extent of the welfare lock problem by examining the employment behaviour of transfer applicants.

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