The Dynamics of Public Housing Tenure in Australia

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Abstract:

The analysis in this paper presents some evidence on the behaviour of tenants in public housing in Australia. Using a unique administrative dataset for West Australia, we utilise both non-parametric and parametric techniques to identify the nature of spells in public housing and the determinants of the length of those spells. Our results suggest that lone parents and single individuals tend to have longer spells in public housing compared to couple households. Similarly, households with children are less likely to exit public housing and therefore tend to have longer spells. 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). These findings are important in light of proposed policy reforms such as limited term tenures for public housing tenants.

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Introduction

Despite changes in government policy over the past two decades that have emphasised the provision of transfers that can be used in the private rental market, it remains the case that public housing represents an important social transfer program in Australia. Public rental housing refers to the government provision and administration of publicly owned dwellings funded through the *2003 Commonwealth State Housing Agreement* (CSHA). It is designed to provide appropriate, affordable and accessible shelter for low to moderate income families unable to access the private market or those otherwise in housing need for the duration of their need. Public housing programs, funded under the Commonwealth State Housing Agreement, are administered by state and territory governments.

As of 2004-05 there are approximately 335,000 households residing in over 340,000 government provided and administered dwellings. This represents approximately 4.5 per cent of all tenures in Australia. These households (71.4 per cent) are concentrated in a major city, with a further 26.4 per cent in regional areas. Over 85 per cent of these households receive a rental rebate, that is, pay less than the market rate of rent. As a group individuals in public housing are heavily dependent on public assistance. Over 90 per cent receive a government pension or benefit as the main source of income. In most cases this is either the age pension or the disability support. As a group, over one half of households in public housing are single adults and approximately one quarter are sole parent households. As a group, they tend to be somewhat older than the population in general, approximately 30 per cent of public housing tenants are aged 65 years and over and less than five per cent are aged less than 25 years (Department Family, Community Services and Indigenous Affairs 2005).

Notwithstanding the increasing emphasis on other forms of housing assistance over the past decade, especially Commonwealth Rent Assistance, it remains the case that the commitment of governments to public housing is substantial. For example, the public sector housing stock is valued at approximately $65 billion as of 2004-05. Further, expenditure of public housing remains at over $1 billion per annum under the Commonwealth State Housing Agreements, with a contribution form the Commonwealth government of over $700 million in 2004-05 (SCRGSP 2006). From a fiscal perspective then, understanding the use of public housing is clearly important.

The development of public housing in Australia was initiated post WWII, initially to alleviate a shortage in housing. Over time, the aim of the program was 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. Moreover, 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. Later, the public housing program was seen as an extension of the welfare sector.

Public housing comprises those dwellings owned (or leased) and managed by State and Territory housing authorities. The CSHA is the main source of funding for public housing and dwellings are available to people on low incomes and those with special needs. One consequence of recent allocation procedures is that people with a

disability are highly over-represented among public housing tenants compared to the general population. Whereas people with a disability represented 19 per cent of the total population in 2003, over 40 per cent of public housing tenants were people with a disability (Department Family, Community Services and Indigenous Affairs 2005).3 Public housing rents are generally set at market levels, and rebates are granted to low income tenants so they generally pay no more than 25 per cent of their assessable income in rent. Public housing allocations are constrained by the amount of housing stock available and are income tested.

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 by various means. 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 waiting list until a suitable tenancy becomes available. The need to allocate the limited number of tenures to those desiring public housing highlights the need to understand the behaviour of individuals in receipt of the program.

The aim of this paper is to explore the dynamics of participation in public housing in Australia. Understanding determinants of the length of stay is important for the reasons alluded to above. If public housing is seen as a component of the welfare system and as a pathway to achieve economic independence, identifying patterns of use is important for ensuing that public housing fulfils its income support role. Of particular relevance in this context is the length of time individuals spend in public housing tenure and differences across groups of individuals. For example, understanding which groups are likely to spend longer in public housing may be important for targeting programs that are designed to encourage economic independence. Moreover, the effect of income receipt on public housing tenures may be of use in formulating public housing policy such as those relating to rent setting rules.

The analysis in this paper uses techniques designed to identify the determinants of spells in public housing using a large administrative dataset from the authority responsible for the administration of public housing in Western Australia. We estimate a series of non-parametric hazard functions that depict the likelihood that households exit from public housing. Further, we estimate a series of econometric models that identify the determinants of the length of spells in public housing. The results of the analysis suggest that some groups, such as lone parents and singles, tend to have longer spells in public housing. Moreover, the greater is the value of the benefit conferred by the tenancy (that is the greater is the value of the market rent associated with associated with the dwelling), the lower is the probability that individuals are observed to exit public housing. Alternatively, the longer are spells in public housing. 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 remainder of this paper is structured as follows. In the next section, we discuss the literature that has examined the behaviour of public housing tenants. Following this, we describe the data used in the analysis and set out some descriptive statistics. Next, we describe the econometric methodology used in the paper and the underlying theoretical model used to characterise behaviour. In the following section we set out the results from the empirical analysis. The final section concludes.

1. 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 and the behaviour of public housing tenants. For Australia, Agrawal (1988) uses the Survey of Income and Housing costs to examine the program on the consumption pattern of participants, and of the benefits they derive from it. It also examines 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. This is to be expected, given that individuals are generally offered public housing on a take it or leave it basis. Refusal of an offer may result in a substantial wait before an alternative offer is made available. Moreover, public housing is lumpy so that the magnitude of offers which are made generally exceed the choices which recipients would take in the presence of an untied cash grant.

There is also some international information on the dynamics of spells on housing assistance, especially public housing. The earliest studies are those by Hungerford (1996) and Freeman (1998). The Hungerford (1996) paper 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 has over time become to be seen as 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 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 recipients of public housing.

Freeman (1998) uses the Panel Study of Income Dynamics to identify how quickly non-elderly household heads leave public housing between 1986 and 1992 inclusive. 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 (1988) argues that the evidence suggests that public housing is not a trap from which it is difficult to escape. Freeman (1988) finds that the majority of public housing spells are short. Only 28 per cent respondents had been living in

public housing for more than five years and the hazard out of PH 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 findings reported indicate that repeat spells in public housing are associated with a lower hazard; total time spent on welfare has only 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 of the United States have a negative and significant effect on hazard. In general variables representing human capital do not have an impact on the hazard out of PH. Conversely, variables indicating local economic conditions do perform as expected. For example, the county unemployment rate is negative but insignificant; higher prices for owner-occupied housing are associated with 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) consider the determinants of tenure dynamics in public housing in New York City. They find that the following characteristics are associated with the highest probability of exiting from public housing, namely high income; being single; the young and very old; white residents and non-Latino residents. There is also evidence that tenants are more likely to leave less desirable properties, such as those characterised by high crime rates and smaller properties. The tenure patterns reported in Bahchieva and Hosier (2001) reflect, in part, the relatively tight rental market in New York. One interesting pattern identified is that of an increasing hazard rate (or probability of exit) over the first five to seven years in public housing, followed by a declining or flat hazard rate (p. 319).

Lubell *et al*. (2003) sets out some descriptive statistics of American housing assistance programs including public housing. Focusing on current tenants, they find that median length of stay for public housing tenants was 4.69 years, with a mean of 8.50 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. They also find that non-disabled non-elderly households with children that received earned income had a longer median length of stay than the median length of stay of welfare receiving households with children. They find that tenure was higher for families without children that had earnings of $15,000 or more, but no strong relationship between the level of earnings and length of stay in PH.

More recent studies of the behaviour of public housing residents in the United States include those by Freeman (2005), Olsen *et al*. (2005) and Ambrose (2005). These studies tend to show somewhat similarly patterns. For example, empirical estimates in Freeman (2005) indicate that white males are more likely exit housing assistance than other groups. Groups with relatively lower rates of exit include the disabled, welfare recipients and females with young children. The value of the benefit conferred on recipients was also important. Hence, where the HA was associated with a higher

subsidy exit rates from the program tended to be lower. Similarly, for areas in which vacancy rates in the private rental market are lower, exit rates out of HA programs tended to be lower. Similar patterns are identified in the analysis reported in Olsen (2005).

2. A Model of Public Housing Tenancy

The exit behaviour of participants in public housing may be better understood by considering a theoretical model with which to explain stays in public housing and with which to explain the empirical results. The basic analysis relies on a model in which individuals residing in public housing must choose whether to stay in public housing or to leave. The decision will reflect utility maximising behaviour on the part of tenants. In particular, if utility when an individual leaves public housing exceeds that while remaining in public housing, s/he will be observe to exit the program.

If an individual in public housing leaves the program, they will enter private rental accommodation or become an owner-occupier. This may be associated with participation in employment and or receipt of other income support payments such as Newstart, the Disability Support Pension or the age pension. Remaining in public housing will be associated with the continued, relatively secure tenancy, in which rents are related to the income level of the tenant. A stylised model of behaviour would suggest that offers for tenures outside of public housing arrive periodically. In each case, tenants must compare the utility derived from remaining in public housing with that of the utility derived 'outside' of public housing. In any given period, utility in each of these states will be a function of the individuals personal characteristics (X_t), the value of the benefit received while residing in public housing (B_t), the cost associated with changing ones tenure status (c_t) and the length of time in public housing in the current spell (T). This stylised characterisation of behaviour while in receipt of public hosing suggests a reduced form specification for the public housing hazard arte as follows:

$$h = h\left(X_t, B_t, c_t, T\right)$$

The empirical analysis presented in section 5 below will follow this reduced form specification by examining the probability that individuals (or household) exit public housing. In the econometric models various socio-economic characteristics of the individual (or household) residing in public housing are controlled for, as will be the maximum value of the benefit conferred by the public housing.

3. Data

The analysis in this paper exploits the Western Australian Dept of Housing and Works (DHW) information on applicants for public housing in that State. In particular, this is an administrative database that contains information associated with management of the public housing waiting list and public housing stock between January 1999 and November 2005 for Western Australia. The database contains details regarding the

population of individuals who applied for and have been placed in public housing in Western Australia in the period spanning January 1999 and November 2005.[1]

Like other administrative datasets, the data contains only a limited amount of information on the characteristics of households and their members. In general, only information required to administer the public housing program is collected and made available. This includes information on the age, gender and family composition of public housing applicants. Data is also available on the receipt of income while the individual is on the waiting list or resident in public housing. This includes details about the amount and source of income. Other socio-economic and demographic information, such as education levels, are 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.

The key benefit of the data is that it contains information on all individuals or households that applied for public housing and the tenancy details of those applicants actually placed in DHW housing. The tenancy details include information on the dates when an application for public housing was made and the date(s) a tenancy commenced (and ended). Additional information is available on the characteristics of the tenancy that the individual or household was placed in such as location, the number of bedrooms and the market rent level for the dwelling.

In tables 1-3 below, we provide some descriptive statistics of individuals who are in the DHW dataset broken down by family or household type and length of spell in public housing. The sample used is confined to those individuals who are aged between 17 and 65.[2] The means reflect the characteristics of individuals (or couples) who resided in public housing between January 1999 and November 2005. The categorisation of households as lone parents (table 1), singles (table 2) and couples (with or without dependent children, table 3) is the same one used in the empirical analysis presented in section four.

A number of patterns are clear from the figures set out in tables 1 to 3. As expected, the majority of lone parents are female (table 1). Further, as a group lone parents who reside in public housing tend to be younger (32.5 years) than either single individuals (43 years) or couple individuals. Singles are also far more likely to report some form of disability compared to the other groups. Hence, whereas approximately 4 per cent of lone parents and 7 per cent of couples report a disability, among singles the rate is 18 per cent. Such patterns no doubt reflect the income support of welfare role that

public housing has taken on in recent years. Further, the proportion of indigenous individuals is relatively high in relation to the general population. Among lone parents and couples, indigenous individuals represent approximately 45 per cent of tenants in public housing. Note, however, that the proportion of indigenous individuals in public housing for long periods tends to be lower. For example, among couples 46 per cent of tenants in public housing for less than 2 years are indigenous. In comparison, less than 30 per cent of tenants in public housing for more than four years identify themselves as indigenous (table 3).

Table 1 – Lone parent spells in public housing

	Length of spells			
	0 – 2 years	2 – 4 years	> 4 years	All spells
Male (household head)	0.09	0.08	0.06	0.08
Age (household head)	32.02	32.98	34.06	32.54
Indigenous (household head)	0.47	0.47	0.41	0.46
Number children aged 0-4 yrs	0.73	0.79	0.74	0.75
Number children aged 5-9 yrs	0.70	0.80	0.86	0.75
Number children aged 10-14 yrs	0.56	0.69	0.81	0.62
Disability	0.04	0.04	0.04	0.04
Location	0.00	0.00	0.00	0.00
North Metro (Mirrabooka)	0.20	0.23	0.23	0.21
South Metro (Fremantle)	0.10	0.13	0.14	0.11
SE Metro (Cannington)	0.16	0.17	0.23	0.17
Great Southern (Albany)	0.04	0.04	0.03	0.04
South West (Bunbury)	0.05	0.06	0.05	0.05
Goldfields (Kalgoorlie)	0.09	0.07	0.06	0.08
Midwest-Gascoyne	0.09	0.09	0.09	0.09
Pilbara (Port Hedland)	0.11	0.09	0.08	0.10
Kimberley (Broome)	0.07	0.07	0.06	0.07
Wheatbelt (Northam)	0.09	0.05	0.04	0.08
Monthly rent	147.23	157.29	159.31	151.50
Priority case	0.36	0.43	0.51	0.40
Duration spell (months)	11.59	34.81	61.20	24.12
Censored	0.43	0.64	0.89	0.54
Sample size	7,694	3,524	1,586	12,804

Couples and lone parents also have approximately the same number of children on average in each of the age groups considered. One pattern that emerges across all groups considered is the disproportionately large number of long spells for tenants located in Perth. Consider lone parent spells reported in table 1. For this group, around 60 per cent of spells of all spells of duration greater than 4 years are located in Perth. In comparison, only 46 per cent of spells lasting less than 2 years are located in Perth. This pattern is also observed among other groups and reflects a tendency for tenants located in public housing in the Perth metropolitan area to be less likely to exit public housing compared to other regions.

Table 2 – Single individuals, spells in public housing

| | Length of spells | | | |
	0 – 2 years	2 – 4 years	> 4 years	All spells
Male (household head)	0.55	0.54	0.49	0.54
Age (household head)	40.47	45.69	49.34	43.03
Indigenous (household head)	0.26	0.20	0.12	0.22
Disability	0.18	0.20	0.14	0.18
Location				
North Metro (Mirrabooka)	0.25	0.30	0.33	0.27
South Metro (Fremantle)	0.17	0.16	0.18	0.17
SE Metro (Cannington)	0.20	0.22	0.24	0.21
Great Southern (Albany)	0.04	0.03	0.02	0.03
South West (Bunbury)	0.05	0.05	0.05	0.05
Goldfields (Kalgoorlie)	0.06	0.04	0.03	0.05
Midwest-Gascoyne	0.06	0.06	0.05	0.06
Pilbara (Port Hedland)	0.07	0.05	0.04	0.06
Kimberley (Broome)	0.05	0.05	0.03	0.05
Wheatbelt (Northam)	0.06	0.04	0.02	0.05
Monthly rent	112.89	118.65	118.65	115.13
Priority case	0.25	0.35	0.45	0.30
Duration spell (months)	10.53	35.04	62.29	23.99
Censored	0.38	0.71	0.89	0.53
Sample size	7,124	2,846	1,682	11,652

Two other patterns of interest are also clear from an examination of tables 1-3. First, weekly market rent tends to be higher for larger household types (single parent and couple households, $151 and $151 respectively) compared to singles ($115, table 2). Such a result is expected given the larger dwellings that are likely to be allocated to

households with more members. Further, for all household types, the average rent is higher the longer is the spell considered. For lone parents, spells lasting less than 2 years have an average rent of $147 compared to over $159 for spells lasting more than four years. Similar patterns are evident for both single individuals and couple households. This suggests that higher market rent levels, or put another way the maximum subsidy associated with a tenancy in public housing, is associated with a lower likelihood that the household exits public housing. In turn, spells will tend to be longer in situations where the market rent is higher.

Table 3 – Couple households, spells in public housing

| | Length of spells | | | |
	0 – 2 years	2 – 4 years	> 4 years	All spells
Male (household head)	0.76	0.66	0.62	0.71
Age (household head)	37.05	39.85	42.91	38.51
Indigenous (household head)	0.46	0.41	0.29	0.43
Number children aged 0-4 yrs	0.76	0.71	0.60	0.73
Number children aged 5-9 yrs	0.63	0.68	0.62	0.64
Number children aged 10-14 yrs	0.48	0.60	0.60	0.53
Disability	0.06	0.08	0.07	0.07
Location				
North Metro (Mirrabooka)	0.18	0.20	0.24	0.19
South Metro (Fremantle)	0.09	0.12	0.14	0.11
SE Metro (Cannington)	0.16	0.18	0.24	0.17
Great Southern (Albany)	0.03	0.04	0.05	0.04
South West (Bunbury)	0.06	0.06	0.07	0.06
Goldfields (Kalgoorlie)	0.08	0.05	0.04	0.07
Midwest-Gascoyne	0.10	0.09	0.06	0.09
Pilbara (Port Hedland)	0.10	0.10	0.05	0.09
Kimberley (Broome)	0.08	0.08	0.05	0.08
Wheatbelt (Northam)	0.09	0.06	0.04	0.08
Monthly rent	148.07	155.22	154.78	150.74
Priority case	0.32	0.37	0.51	0.36
Duration spell (months)	10.36	34.77	62.23	23.24
Censored	0.33	0.62	0.90	0.48
Sample size	3,546	1,435	747	5,728

Finally, note that priority cases tend to be overrepresented among longer spells. Priority cases are situations in which individuals have some identified need which means they are not placed on the normal waiting list. The tenancies which result from these cases tend to be somewhat longer than those applications allocated using a wait-turn process. That is, on average we might expect those cases to exhibit a lower tendency to exit public housing.

4. Econometric specification

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 empirical hazard functions and survival probability functions for spells in public housing for each of the family (or household) types of interest. Recall that the hazard function shows the proportion of spells at risk of ending, actually end in any given period. The estimate of the survival function at time T (measured in months) is the proportion of spells that are at least T (months) in duration. The survivor function provide 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. In presenting the hazard and survivor functions for spells in public housing, separate estimates are provided by family type.

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. To allow maximum flexibility in the shape of the underlying hazard function, a proportional hazard model similar to that applied in Meyer (1990) and discussed in Lancaster (1990, pp. 172-208) is estimated to describe the hazard of exiting from public housing.

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

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.

Following Meyer (1990) the baseline hazard can be estimated non-parametrically as a piece-wise constant function. The time axis is divided into a finite number of intervals and a separate baseline hazard parameter is estimated for each segment. The baselines used in the present analysis are a series of one month intervals up to month 36, six 3 month intervals and a interval of 6 months. Spells longer than 60 months are treated as censored. Assuming that $z_n(\tau)$ does not vary within a given interval, the contribution to the log likelihood function for the nth spell is given by:

$$l_n^i(\tau_n / z_n, \gamma, \beta) = \lambda_n \log[1 - \exp(-\exp[\gamma(\tau_n) + z_n(\tau_n)'\beta])]$$
$$- \sum_{k=1}^{\tau_n - 1} \exp[\gamma(k) + z_n(k)'\beta] \qquad (2)$$

where τ_n is the observed length of the nth spell, $\gamma(\tau)$ is the baseline parameter corresponding to the τth period, and λ_n equals one if the spell ends before being censored. The likelihood function for any given set of observed spells in state i in can be characterized as the sum of all terms like (2).

Holford (1976) and Prentice and Gloeckler (1978) have shown that, for the continuous time proportional hazards model, the corresponding discrete time hazard is the complementary log-log with the coefficient vector β being identically equal to that in the proportional hazards model. Given that β is the same in both the proportional hazards model and equation (2) above, discrete time estimates based on equation (1) are 'also estimates of the underlying continuous-time model' (Allison, 1982, p. 73). Note that this hazard model also allows for several time-varying covariates, such as age, home locality and place of work. Further, the data are constructed so that all length censored spells are not included in the sample used to estimate the duration models. Such an approach avoids the inclusion of spells that are, on average longer, and the problem of length biased sampling. The results of the empirical analysis are presented in section 4.

5. Empirical Analysis

Empirical hazard and survivor functions

The hazard functions and survivor functions are defined over spells in public housing measured in months and presented below. The hazard and survivor functions are presented separately for each household type identified above. Figures 1(a) and 1(b) show the results for sole parents. Following a 'spike' in the hazard rate in the first month, the hazard increases for approximately the next 8 months. 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 ate these durations. As noted in the previous section, an alternative characterisation of duration data is the survivor function. The survivor function for lone parents (figure 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.
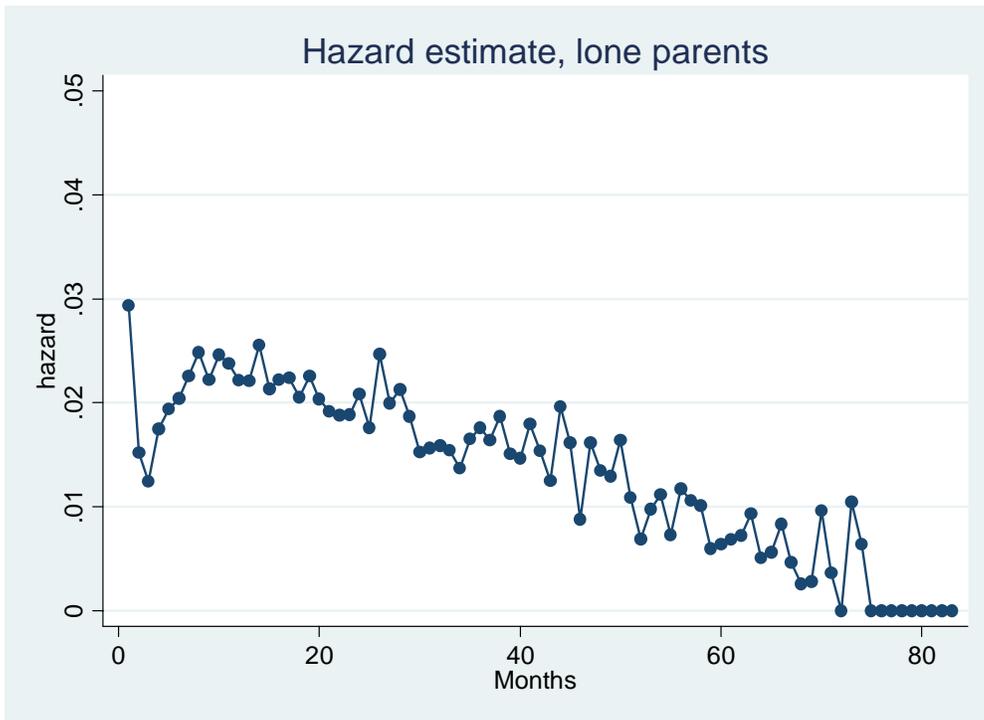
Figure 1a: Hazard function, lone parents

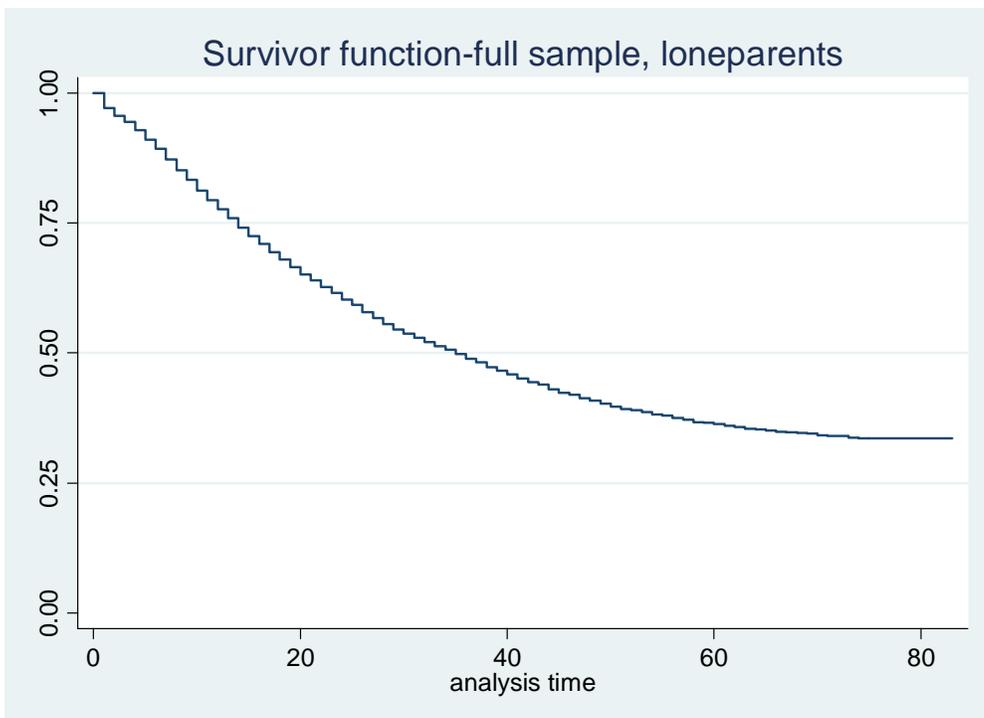Figure 1b: Survivor function, lone parents
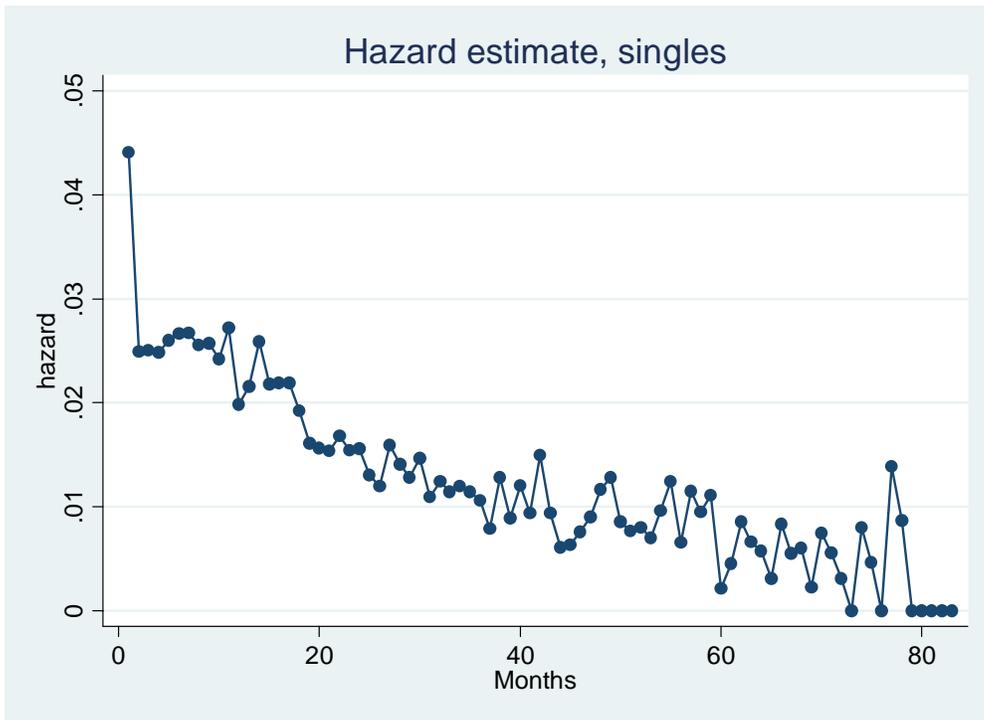
Figure 2a: Hazard function, singles

Hazard estimate, singles

Figure 2b: Survivor function, singles

Survivor function-full sample, Singles

Figure 3a: Hazard function, couples
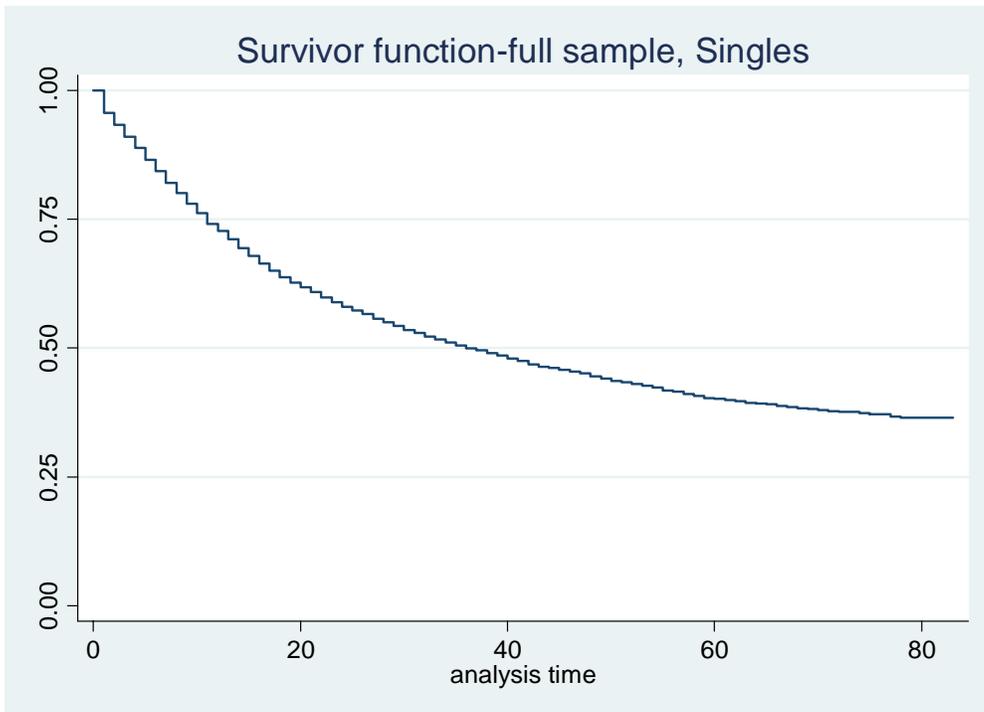

Hazard estimate, couples

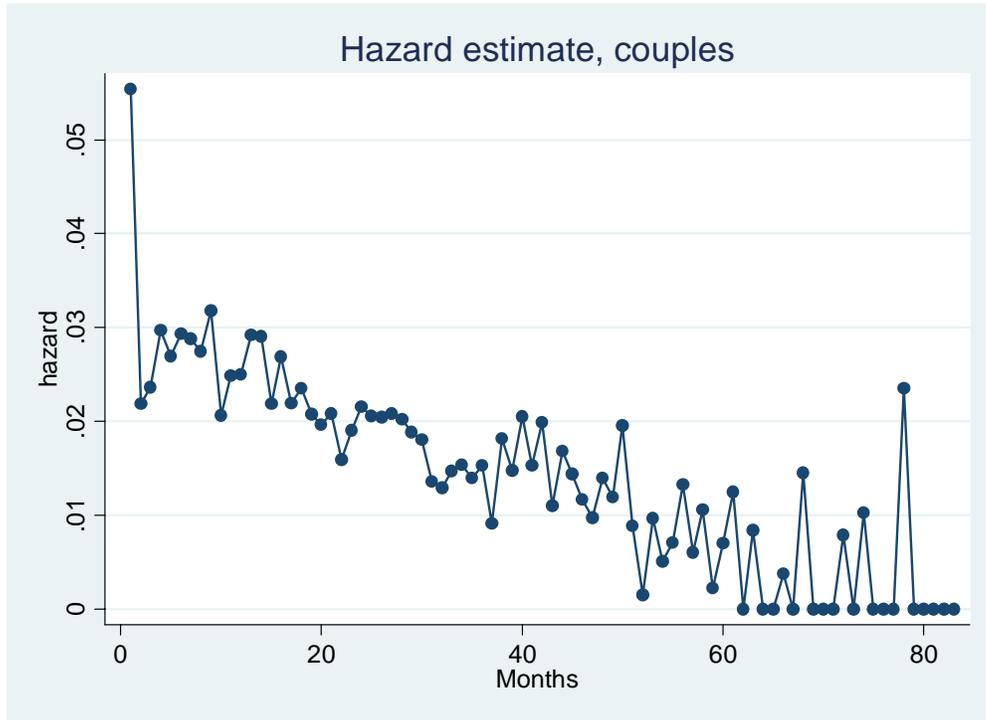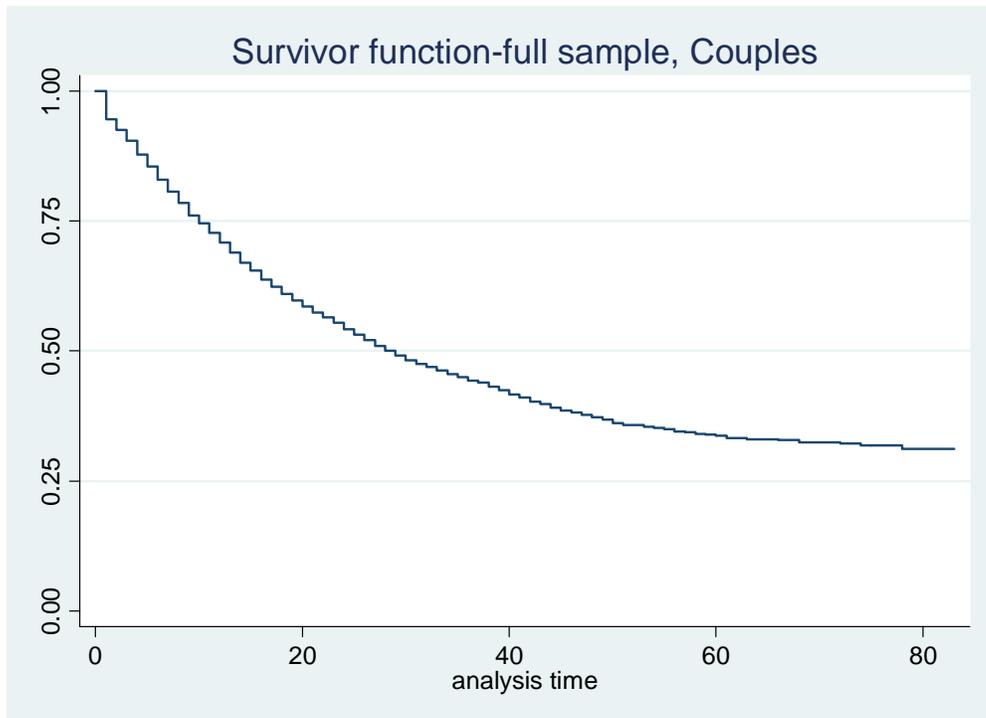Figure 3b: Survivor function, couples

Survivor function-full sample, Couples

The hazard rates and survivor functions for the other groups considered, singles and couple households, are presented in figures 2 and 3 below. In both cases the hazard

functions show similar patterns, namely a hazard rate that tends to decline over the course of the spell. A closer observation of the hazard functions for singles and couples indicates that the hazard rates tends to be higher for the former group. As a consequence of this, the survivor function for singles lies above that of couples. That is, in general couple households are likely to exit from public housing in a quicker fashion. Hence, whereas singles and lone parents have similar median spell lengths (around 36 months), it is substantially shorter for couple households at around 28 months.

Duration model estimates

Results from the duration models are presented in table 4 below. Recall how the coefficients reported in table 4 are to be interpreted. 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 group 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 affect applies to all time periods during the spell. That is, the covariates shift the entire hazard up or down proportionately.

In general, the patterns observed in table 4 correspond to those reported in tables 1-3. For example, consider the affect of being male for lone parents discussed above. In table 1 we identified that the proportion of males with spells of less than 2 years was equal to 9 per cent. In comparison, for spells greater than 4 years in duration only 6 per cent were male. This suggest that on average males exit public housing at a relatively quicker rate so that fewer long spells for lone parents are those with males as the head of the household. In turn, they tend to experience shorter spells in this particular type of tenancy. This is consistent with the results from the duration models in table 4.

The coefficients reported in table 4 also 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 higher numbers 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.

Table 4 – Results of duration analysis

	Lone parents	Singles	Couples
Male	0.225*	0.009	0.370*
	(0.049)	(0.028)	(0.043)
Age	-0.016	-0.054*	0.029*
	(0.010)	(0.007)	(0.013)
$(Age)^2$	0.000	0.000*	-0.001*
	(0.000)	(0.000)	(0.000)
Presence disability	0.132***	0.090**	-0.029
	(0.070)	(0.040)	(0.082)
No. kids aged 0-4 years	-0.046*	-	-0.053**
	(0.018)		(0.024)
No. kids aged 5-9 years	-0.045*	-	-0.078*
	(0.017)		(0.023)
No. kids aged 10-14 years	-0.052*	-	-0.050***
	(0.019)		(0.025)
Indigenous	-0.114*	0.179*	0.058
	(0.030)	(0.035)	(0.044)
Priority case	-0.092*	-0.334*	-0.122*
	(0.031)	(0.033)	(0.044)
Receipt govt. pay (person 1)	0.099***	0.620*	0.342*
	(0.051)	(0.107)	(0.067)
Receipt earnings (person 1)	-0.164*	-0.664*	-0.109**
	(0.062)	(0.075)	(0.055)
Receipt other income (person 1)	-0.170*	-0.293*	0.181*
	(0.030)	(0.078)	(0.065)
Amount govt. pay (person 1)	0.005*	-0.133*	0.006*
	(0.002)	(0.015)	(0.002)
Amount earnings (person 1)	0.021*	0.016*	0.012*
	(0.004)	(0.004)	(0.002)
Amount other income (person 1)	0.007*	-0.032***	-0.007
	(0.003)	(0.016)	(0.010)
North Metro (Mirrabooka)	-0.459*	-0.355*	-0.325*
	(0.058)	(0.062)	(0.081)
South Metro (Fremantle)	-0.638*	-0.207*	-0.464*
	(0.068)	(0.064)	(0.097)
South East Metro (Cannington)	-0.596*	-0.388*	-0.391*
	(0.060)	(0.060)	(0.081)
Great Southern (Albany)	-0.533*	-0.126	-0.514*
	(0.083)	(0.088)	(0.118)
South West (Bunbury)	-0.577*	-0.320*	-0.374*
	(0.079)	(0.086)	(0.102)
Goldfields (Kalgoorlie)	0.153**	0.136***	0.008
	(0.063)	(0.078)	(0.094)
Midwest-Gascoyne (Geraldton)	-0.210*	-0.220*	-0.117
	(0.058)	(0.076)	(0.080)
Pilbara (Port Hedland)	0.065	-0.031	-0.007
	(0.066)	(0.079)	(0.091)
Kimberley (Broome)	0.205**	0.051	0.245**
	(0.085)	(0.093)	(0.107)
Market rent ($00s per month)	-0.171*	-0.135*	-0.105*
	(0.011)	(0.012)	(0.014)
Log likelihood	-27066.697	-24892.758	-13041.02
Number of spells			

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 results is counter intuitive, especially in light of the increasing tendency for public housing to be allocated to the least advantaged, especially the disabled. 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 4, 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 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 from the analysis points to an effect of income that varies with the amount of income received. For example, consider single individuals. For these individuals, the receipt of a government payment is associated with a large positive effect on the likelihood that they are 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 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 the opportunity of homeownership.

The results for other groups are somewhat different. For lone parents, the receipt and amount of government pay have a positive effect on the hazard out of public housing (coefficients of 0.099 and 0.005 respectively). Receipt of income from employment earnings has a negative effect on the hazard (coefficient of -0164) but the amount of earnings has a positive effect on the hazard (a coefficient of 0.021). Couples exhibit similar patterns to those of lone parents in terms of the signs of the coefficients.

These findings highlight the likelihood 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 4 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 4 indicates that higher market rent levels are associated with a significantly lower likelihood that the individual (or household) is observed to exit public housing. Again, such a result is consistent with a priori expectations. Recall that the level of market rent on the tenure corresponds with 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 and lower likelihood that those participating are observed to exit the program. This is the pattern observed in table 4.

Consider the effect of a $100 increase in the 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 monthly market rent for lone parents is approximately $150 (table 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 are consistent whereby the greater pecuniary benefit bestowed on tenants in public housing, the less likely they are to exit that particular form of tenancy.

6. Conclusions & Policy Implications

The analysis in this paper presents some evidence on the behaviour of tenants in public housing in Australia. Until now, this important social program had largely been overlooked despite the number of individuals affected and the large and ongoing support for the program by governments in Australia.

This analysis is important on a number of levels. First, various 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 U.S. 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 can 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 tenancies in public housing change as 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 compared to 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 properties of the income support framework in general. 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).

From a policy point of view, the analysis highlights a number of issues. First, groups such as singles and sole parents are more likely to be constrained by limits on tenancy in public housing. One implication of this is that if such a policy is instituted more widely, then programs designed to ensure that tenants achieve self-sufficiency should be targeted at these groups in particular. Further, rent setting policies may be designed in a way that discourages long term dependency on public housing. For example, minimum rent levels are likely to increase the hazard out of public housing and reduce the length of time spent in public housing.

In many ways the analysis presented in this paper should be seen as a first step towards understanding the implications of this important social program. For example, there is a strand of literature that suggests that certain types of tenure such as

public housing discourage individuals from participating in the labour market. To the extent that this is true, public housing may encourage dependency and inhibit the economic independence of tenants. Given the importance of a high level of income in encouraging exit from public housing, there is clearly scope for understanding the relationship between employment activities and tenancy in public housing.

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