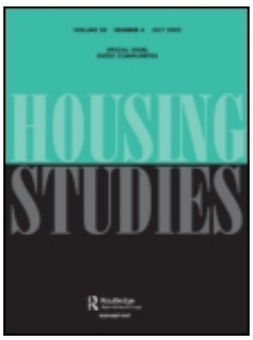

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Housing Allowance and the Recipient's Homeownership: Evidence from a Panel Data Study in Sweden

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ABSTRACT *This paper investigates whether housing allowance affects recipients' tenure choice in Sweden. To answer this question, a two-stage conditional maximum likelihood probit (2SCMLP) model is applied in a panel data setting to simultaneously control for individual heterogeneity, state dependence and endogeneity. The empirical study is based on administrative data of housing allowance recipients living in three major metropolitan areas of Sweden between the years 1994 and 2002. The results indicate that the housing allowance positively affects recipients' homeownership propensity in Sweden. Therefore the worry of a 'rental trap' is dismissed within the Swedish housing allowance system. Instead, we conclude that the Swedish housing allowance system is doing a fairly good job in supporting low-income households to obtain and maintain their homeownership. Furthermore, no evidence was found to indicate that the reform of the Swedish housing allowance system in 1996–97 essentially changed this fact.*

KEY WORDS: Housing allowance, homeownership, dynamic panel data, endogeneity, 2SCML

Introduction

Recent decades have witnessed a clear shift in housing policy from a supply-side approach to a demand-side approach across major industrial countries (Ditch *et al*., 2001). At least four reasons for this shift in housing policy have been suggested: (1) the strong resurgence of market-oriented economic philosophy during the last two decades has pushed governments to give the household sovereignty and as much freedom of choice as possible (Fallis, 1993); (2) the increasing perceived belief among policy makers that the demand-side assistance could be less costly when compared to the supply-side policy (Anas & Arnott, 1997; Fallis *et al*., 1995; Howenstine, 1986). Other authors, Galster (1997) for example, claimed that the demand-side subsidies are generally superior to supply-side subsidies, as they directly attack the root of the fundamental housing problem in most

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markets, i.e. the inability of some households to afford decent-quality housing at current rents; (3) the view that the demand-side assistance helps the most needy (Buckner, 1999); (4) finally, factors such as ageing, increasing numbers of single households and social structural transformation all contribute to favour the demand-side housing policy (Ditch *et al*., 2001).

Housing allowance is the core of the demand-side housing policy and has become the most important housing-related welfare benefit in many advanced economies.[1] Nonetheless, although increasing interest has been devoted to evaluating the performance of housing allowance, the potential impact of the housing allowance on the recipient's tenure choice behaviour is ignored. To the authors' best knowledge, no previous research has been carried out to study the relation between the housing allowances and the tenure choice. This point is particularly highlighted in Ditch *et al*. (2001), where tenure choice and housing allowance are the two key topics covered, but there is no discussion about any interaction between them.

However, there are a number of reasons justifying a study of this issue. First, housing allowance programmes typically affect a massive population. In the US, roughly 4 million households receive housing allowance, which costs US $21 billion per year (Painter, 2001). In Sweden, 15.5 per cent of all Swedish households receive housing allowance. The total amount of expenditure on housing allowance was SEK14 billion in 2000 (SCB, 2003). Therefore, it is necessary to examine any potential behaviour impact of a housing allowance system on both recipients and society as whole. Second, a large number of authors have stressed the social benefits of homeownership (Aaronson, 2000; Coulson *et al*., 2002). Therefore, a close look at potential factors that affect the homeownership propensity among the low-income population may have important policy implications.

The Swedish case is particularly interesting to study as the Swedish housing allowance system is open to households of all tenure types, and thus a priori does not favour any particular tenure choice. That is not the case in most other countries (Ditch *et al*., 2001).

The remainder of this paper is organised as follows. First there is a brief introduction of the housing tenure distribution and the housing allowance system in Sweden. Next is a presentation of the data source and sample. The subsequent section describes the analysis framework and model specification. The estimation results from the regression models are then presented and the final section discusses the policy implications of the estimation result.

Tenure Forms and Housing Allowance in Sweden

Tenure Distribution in Sweden

In Sweden, three major tenure forms are available in the housing market: owner occupancy, tenant-ownership and rental. In 2000, 41 per cent of Swedish households lived in owner-occupied housing, 17.5 per cent lived in tenant-owned condominiums and 41.5 per cent lived in rental apartments (SCB, 2003).

Owner-occupied housing generally refers to detached single-family housing, where buyers can enjoy full real estate rights. Tenant-ownership implies membership of a housing co-operative association. Membership rights are obtained through a capital investment and maintained by monthly charges to cover the cost of the association's loans and capital expenditures etc. Tenant-owned housings are generally multi-family

apartments, so members cannot obtain full ownership rights of the dwelling they live in. However, members are allowed to sell their tenant-owned dwellings at any time and at any price they wish, except in a few cases where the association can step in to determine selling prices.

About 50 per cent of the rental housing is provided and managed by non-profit municipality housing companies, usually one such company operates within each municipality. Municipality housing is open to all residents, regardless of their income. Unlike practices common in the UK and west European countries, in Sweden there is no social housing sector reserved for particular disadvantaged groups. The rest of the rental housing is privately provided and usually the houses are older than in municipal housing.

The prices for housing in co-operative owning and owner-occupied housing are set by the market, while the rental housing market has been regulated since 1968 by what is known as utility-value provisions. In Sweden tax relief is also provided on owner-occupied houses and tenant-owned homes, equaling 30 per cent of interest expenditures. A capital gains tax is also levied on profits derived from the sale of owner-occupied houses and tenant-owned homes.

In this study, members of housing co-operatives and homeowners are grouped together in a single homeownership tenure category against rental tenure and the terms 'owner occupation', 'homeownership' and 'houseownership' are used interchangeably. Co-operative owning and houseownership differ a great deal (Åsberg, 1999; Zetterström, 2001). However, the data in this study suggest that homeowners and co-operatives are very similar with regard to their income, housing expenditures/housing costs and housing allowance benefits received while both are distinctly different from renters. Thus, the difference between homeowners and co-operatives should be of minor importance to the issues being analysed here.

Housing Allowance System in Sweden

The Housing Ministry of Sweden states that the main focus of the Swedish housing allowance system is to provide better opportunities for households in obtaining dwellings of appropriate size at a reasonable cost, to diminish overcrowding and to serve as a housing cost equaliser for people living in different regions of the country (The Swedish Housing Board, 1999). The main target population is low-income households, especially those with children. A key distinction of the Swedish housing allowance system is that housing benefits are open to households of all tenure types, and thus a priori does not favour any particular tenure choice.

In Sweden, the housing allowance benefits consist of three distinct components. The first component is called housing allowance to young people and families with children; the second is called housing supplement to disability persons; and the third is housing supplement to pensioners. In 1995, 99 per cent of all single parents with children and 33 per cent of couples with children in Sweden received housing allowances. The total amount of housing allowance expenditure was SEK19.7 billion and accounted for 1.2 per cent of the GDP (SCB, 2003). Globally, this ratio is second only to Germany which has a ratio of 1.85 per cent (World Bank, 2002).

The calculation for housing allowances is based on the family composition of the household (single or spouses, number of children etc.), household income and housing expenditure, where rules vary for different tenure forms. Housing expenditures of renters

include the rent payment and also heating and the charges that concern the dwelling. Housing expenditures of homeowners include the monthly mortgage payment, the real estate tax and 70 per cent of the site-lease rent if any, as well as the heating and other operating expenditures according to a standard deduction.

The household income is defined as the income before tax, excluding the social benefits. The housing allowance is approved for a maximum of one year and then recipients have to apply again. This paper is only examining the housing allowances to families with children and youths, since this is the main target group that the welfare policy should concern. The housing allowance to pensioners is independent from housing allowance to families and specific for Sweden and cannot carry comparisons with other countries.

The 1996–97 Reform of the Housing Allowance System in Sweden

The Swedish housing allowance system experienced a dramatic reform between 1996 and 1997. The major goals of this reform were to enhance administrative control, improve the targeting and to reduce fiscal expenditures (The Swedish Housing Board, 1999).

In addition to the fiscal expenditure cutback, the reform resulted in more strict eligibility qualifications than before. The major population group that this reform has affected is childless households older than 29 years, which were excluded from the housing allowance system after 1996. Further, before 1996 there were no limits on the qualifying floor space when receiving housing allowances. The new legislation imposed an upper limit on qualifying floor space and people can now only receive housing allowance for the part of the useful floor space that is within this limit. These upper limitations vary across different household types. As the floor space is generally larger for owner-occupied houses than for rental dwellings, such constraints are particularly unfavourable to homeowners. Whether this change has had any effect on the recipients' tenure choice is one of the key research questions to be answered in this paper (Table 1).

The total number of households receiving housing allowance decreased by 45 per cent during the period 1994 to 2001 while the total amount of family allowance dropped about 33 per cent in the same period (SCB, 2003) (Table 2).

Table 3 describes the housing allowance regulation for the years between 1998 and 2003. The maximum allowances are constructed by the combination of fixed allowances for children and housing expenditures eligible for allowances, as indicated in Table 3. The household income base to calculate the payable allowances is the authors' own assessment[2] of the next year's earnings plus 15 per cent of the wealth held beyond the threshold level. When the household income exceeds the income threshold, as Table 3 indicates, the payable allowances will be reduced by 20 per cent of the income above the threshold for households with children and by 33 per cent for households without children.

Data Source and Sample Description

The sample for this study is extracted from the Swedish National Insurance Department's databank on housing allowances. This database has never before been utilised in academic research. The administrative database is register-based and contains detailed information of all Swedish recipients between the period 1994 and 2002. Data acquisition was made in May each year.

Table 1. Housing allowance expenditure in Sweden, 1995–2000

	Family (million SEK)	Disabled (million SEK)	Pensioner (million SEK)	Total Housing Allowance (million SEK)	Total Social Insurance (million SEK)	Ratio *f*	Ratio *d*	Ratio *p*	HA/SI
1995	9220	2297	8142	19659	314075	.47	.12	.41	.06
1996	8373	2183	7740	18296	305540	.46	.12	.42	.06
1997	6195	2233	7311	15739	301839	.39	.14	.46	.05
1998	5749	2346	7245	15340	296274	.37	.15	.47	.05
1999	5067	2498	7437	15002	326604	.34	.17	.50	.05
2000	4373	2564	7055	13992	343063	.31	.18	.50	.04

Source: SCB (Statistics Sweden), 2003.

Note: HA = housing allowance and SI = total social insurance expenditures. Ratio *f* is the share of the housing allowance expenditure to families in the total housing allowance expenditures; *d* = disabled and *p* = pensioners; HA/SI = the share of housing allowance to total social insurance.

Table 2. The housing expenditure and housing allowance of Swedish households in 2000

	All households	Home owners	Co-operatives	Renters
Total number, 1000	3176	1301	557	1318
%	100	41	17.5	41.5
Non-recipients, 1000	2682	1268	482	931
%	100	47.3	17.9	34.7
Recipients, 1000	494	32.1	75.4	387
%	100	6.4	15.3	78.3
Recipient rate (%)	15.5	2.4	13.5	29.3
Mean annual housing expenditure and housing allowance, 1000 SEK				
Expenditure (E)	53.2	60.1	43.8	48.9
Non-recipient	54.3	61.2	46.7	48.7
Recipient	48.0	41.8	43.1	49.4
Allowance (A)	18.6	12.5	17.3	19.3
(A/E) for recipients, %	38.5	29.9	40.1	39.0

Source: SCB (Statistics Sweden), 2003.

This study extracts a 1 per cent random subsample of recipients living in Stockholm, Gothenburg and Malmö from this database. The total observation units in this sample are 9700, containing information from 3131 recipient households. Average benefit period length for samples is 3.1 years and 2147 recipients received allowances for at least two years, 1405 recipients received allowances for at least three years, 1000 households received allowances for at least four years, and only very few, 132 households, were recipients throughout the nine years.

In order to isolate the effects of inflation, all cost and income variables measured in monetary units have been normalised to the price level of 2002, using the annual consumer price index as the deflator.

Sample

All continuous variables are normally distributed and pass Skewness/Kurtosis tests (Table 4).

For the whole sample, the mean age of the household head is 36.6 years. Renters generally are clearly younger than homeowners, and after 1997, the mean age of recipients is slightly higher than before.

The mean family size, 2.65, is quite large when compared with the national average level of 2.1. Renters on average have 1.37 children, while the owners on average have 1.38 children, essentially no difference. In the reverse direction, it also suggests that there is no remarkable variation of homeownership rate across households with different numbers of children. The child adoption situation did not change after the 1997 reform.

The mean annual income is SEK119 800 and the mean housing expenditure is SEK60 400, while the national average figures are SEK231 000 and SEK50 400, respectively. So it is clear that the low-income population with high housing expenditure dominates the recipients of housing allowance. The average housing cost burden ratio, as measured by the ratio of housing expenditure divided by income (without housing

Table 3. Housing allowance regulation for 1998–2003

Number of children	Child grant (SEK/month)	75% of housing costs between (SEK/month)	50% of housing costs between (SEK/month)	Maximum living area (square metres)	Income limit—single (tSEK/year)	Income limit—couples (tSEK/year)
No child*		1800–2600	2600–3600	60	41	58.5/applicant
1 child	600	2000–3000	3000–5000	80	117	58.5/applicant
2 children	900	2000–3300	3300–5000	100	117	58.5/applicant
3 + children	1200	2000–3600	3600–6600	120–160	117	58.5/applicant

*Only for applicants aged between 18–29.

Table 4. Sample description

	Before 1997			After 1997			
Variable	Whole Mean (std)	Renters Mean (std)	Homeowners Mean (std)	Renters Mean (std)	Homeowners Mean (std)	Renters Mean (std)	Homeowners Mean (std)
Age	36.6 (9.61)	36.13 (9.68)	39.13 (8.90)	35.43 (10.11)	38.77 (8.80)	36.68 (9.31)	39.57 (9.01)
Family size	2.65 (1.43)	2.64 (1.43)	2.68 (1.39)	2.42 (1.42)	2.67 (1.40)	2.65 (1.43)	2.70 (1.38)
Children[a]	1.37 (1.18)	1.37 (1.20)	1.38 (1.16)	1.35 (1.19)	1.35 (1.15)	1.38 (1.20)	1.42 (1.17)
Allowances	19.3 (11.5)	19.58 (11.44)	17.41 (11.65)	18.48 (11.74)	18.11 (12.12)	20.42 (11.15)	16.57 (11.00)
Housing cost	60.4 (20.9)	57.93 (15.66)	71.81 (34.53)	54.72 (15.25)	74.44 (41.44)	60.40 (15.53)	68.60 (23.18)
Ratio[b]	0.315 (0.16)	0.33 (0.16)	0.25 (0.16)	0.32 (0.17)	0.26 (0.18)	0.33 (0.15)	0.24 (0.14)
Space	79.6 (28.5)	75.22 (22.07)	100.09 (43.05)	74.22 (23.49)	103.00 (50.45)	75.98 (20.89)	96.54 (31.48)
Rooms	3.01 (1.09)	2.87 (0.99)	3.70 (1.26)	2.80 (1.01)	3.78 (1.35)	2.92 (0.97)	3.60 (1.13)
Income	119.8 (83.8)	107.76 (80.52)	176.81 (74.90)	104.10 (79.25)	183.15 (79.11)	110.57 (81.37)	169.11 (68.70)
Female, %[c] %	53.4 49.9	53.7 50.9	52.9 46.9	49.7 48.5	41.5 41.1	56.7 54.7	64.9 59.3
Couple (%)	28.2	27.63	30.74	27.59	32.90	27.66	28.10
Childless (%)	27.8	27.9	26.4	28.4	27.7	27.4	24.8
Observations, %	9700	8005 82.5	1695 17.5	3472 78.8	930 21.2	4533 85.6	765 14.4
Households	3131	2615	649	1793	482	1646	333

Notes:

[a]*Children* are the number of children 0–17 years old living with their parents. A child, older than 17 still living with his/her parents, is defined as a lodger in the housing allowance system.

[b]*Ratio* is the ratio of actually received housing allowance benefit to housing expenditure in this year.

[c]First *female* ratio is for observations level and the second is for household level.

allowances), is 50.4 per cent for recipient households, more than twice the national average level, 22 per cent.

Owners apparently have higher incomes than renters. The mean income of renters is SEK108 000 and for owners it is SEK177 000. After the 1997 reform, the income of homeowner-recipients was lower than before while the income of renter-recipients was higher. For all observations, the homeownership rate is 17.5 per cent. It is clear from the data that, since 1997, homeowners face increasing difficulties obtaining housing allowance benefits.

Consistent with the prediction of economic theory and classic literature, it is found that the homeownership rate increases as the income increases. For instance, among households with an annual income of less than SEK72 000, the homeownership rate is 5.44 per cent; among households with an annual income above SEK72 000 but less than SEK144 000, the homeownership rate is 13.63 per cent.

As expected, owning housing is more costly than renting a house. The mean housing cost for owners is SEK71 800 thousand, about 20 per cent higher than the renters' SEK57 900 thousand. But this gap has narrowed a great deal since the 1997 reform. Apparently, the new upper limitation on housing cost excludes many homeowner-applicants living in expensive housing. The distribution of useful living space before and after 1997 also reveals a similar message.

The mean annual housing allowance amount received by recipients is SEK19 300 thousand, recipient households can on average expect 32.0 per cent of housing expenditure to be subsidised by housing allowance benefits. However, renters tend to receive higher allowances than homeowners and it should be noted that this differential grew after the 1997 reform. For this reason, as well as the fact that homeowners were noticeably less represented in the recipient sample after 1997 than before, it is necessary to be cautious about the endogeneity issue in attempts to identify the impact of the allowance on recipients' tenure choice.

With regard to gender distribution, 53.4 per cent of total observations and 49.9 per cent of total households are female. However, there is no indication that the gender factor plays an important role in tenure choice behaviour. To see this, the mean homeownership rate is 17.7 per cent for male-headed households and 16.7 per cent for female-headed households. This is consistent with findings in Åsberg (1999) and Zetterström (2001).

It has been pointed out that the investigation of housing allowance impacts should be carried out within a local context (Shroder, 2002). Local housing market and labour market conditions can be decisive in affecting the performances of housing allowance. In order to control for a number of regional-specific aspects that make the identification of the housing allowance's impact too complicated, the investigation is restricted to the three biggest cities in Sweden: Gothenburg, Malmö and Stockholm.

The regional distribution in the sample is 57 per cent living in Stockholm, 29 per cent in Gothenburg and 14 per cent in Malmö. There is a slight difference in the homeownership rate across the three cities, 18 per cent for Stockholm, 17 per cent for Gothenburg and 12 per cent for Malmö.

In contrast to most empirical studies of tenure choice, the study did not include a variable to measure the relative ownership cost in the tenure choice model. This decision was based on the following reasons. First, it is well recognised that it is extremely complex to obtain a precise measure of user costs for owner-housing, which requires very detailed information about personal income, expert knowledge of tax and a problematic estimation

of expected inflation. The liquidity constraint, speculated to be fairly severe in a low-income population, is even more difficult to measure. Coarse measures of the user cost variable will not alleviate the omitted variable biases but may rather worsen the situation by serious error-in-variable biases. Second, measuring the renter's housing cost is far from as simple as it may appear. In a strictly regulated rental market, rent cost is only part of the total cost to obtain rental accommodation, potentially yielding serious error-in-variable biases too. Third, on the assumption that the relative ownership cost is independent of the housing allowance impact variable, the omission of this variable will not affect the consistence of estimated coefficient for allowance impact, although the impact variable's variance will be biased upward and inference on the impact coefficient be biased to be too easily dismissed as insignificant. However, it is hoped that the large sample size will alleviate this problem.

Methodology and Analysis Framework

Theoretical Framework

In essence, housing allowance is a way to subsidise the recipient's housing consumption. Therefore it necessarily yields two types of effects: income effect and substitution effect.

The income effect arises when housing allowance makes the recipients feel richer and thus induces them to increase demand for housing, provided that the recipients regard housing as a normal good. In this perspective, the housing allowance works in the same way as income assistance. Tenure literatures typically suggest that homeownership propensity would increase with increased household income (Gyourko & Linneman, 1996; Ioannides, 1987; Painter, 2000). From this viewpoint, it seems like housing allowances will unambiguously promote a recipient's homeowner propensity. But, such a prediction has two problems. First, since it is quite common to find an income elasticity for housing demand well below unit among low-income households (Fallis 1993), a limited amount of cash inflow cannot be expected to affect the recipients' housing consumption very much. Second and more severely, treating housing allowance as a permanent increase in the disposable income is dubious. So the assumed income effect on homeownership propensity from housing allowance is ambiguous.

In addition to income effects, housing allowance distinguishes itself from income support as it also produces a substitution effect: subsidising housing consumption makes housing goods become cheaper and stimulates more consumption of housing. However, it is hard to predict a priori how this affects the recipients' choices between owner-occupied housing and rental housing. It is argued that both directions are possible. If the rental market is perfectly free, while costs of owner-occupied housing are difficult to calculate and get approved by the authority, the preference for rental housing will increase. If instead the rent price is only a small proportion of the total costs to get rental housing, e.g. if the rental market is strictly regulated and there are massive costs of queuing, while the calculation of costs of owner-occupied housing is simple and easy to get accepted by the authority, the preference for homeownership will increase.

Nonetheless, even in situations where income effects and substitution effects from housing allowance are supposed to be substantial, it is still hard to tell how the recipients' tenure transition decision will actually be affected, considering the very high transition costs in the housing market. The existence of high transition costs implies that there should

be a large amount of state dependence effects in tenure choice, which is a critical challenge for the econometric model development.

In summary, there is no clear-cut and universal prediction on how tenure choice will be affected by housing allowance from economic theory. Specific features of the housing market and the housing allowance administration rules appear to be influencing factors in the assumed impacts. Hence, the question of how housing allowance affects the recipient's tenure choice needs to be empirically examined within a particular institutional context.

It should be noted that the aggregate effects have been neglected here and the focus is only on the partial-equilibrium analysis of housing allowances on the household's demand for ownership. Such neglect is allowable if it is thought the housing allowance has not significantly affected the demand structure in the housing market. In this paper, the impact of housing allowances for tenure choice is measured by the ratio of housing allowance to housing expenditure. It is thought that this index best describes the recipient's dependence on housing allowances as it captures the substitution effect directly.

Empirical Framework

The empirical investigation here of the housing allowance effect on a household's tenure choice is conducted in a dynamic binary choice model with a panel data set up.

The starting point is to specify an additive random utility model for any individual i at time period t:

$$U_{it} = X_{it}\beta + \varepsilon_{it}, \quad i = 1, \ldots, N, \quad t = 1, \ldots, T_i^* \tag{1}$$

X is the set of determining factors that influence the level of U_{it}. For unbalanced panel data the time period T_i^* for individual i is not necessarily equal to T_j^* for individual j.

Typically, discrete choices are analysed by LDV (limited dependent variable) models in the form of either logit or probit. The linear probability model is still popular for its easy implementation and flexibility, although it is meaningless for prediction. In this paper, the linear probability model will be employed in order to guide the variable selection and gauge robustness of LDV models.

$$Y_{it} = \begin{cases} 1, \textit{if owner or } U_{it} > 0 \\ 0, \textit{if rental or } U_{it} \leq 0 \end{cases} \tag{2}$$

$$\begin{aligned} \Pr(Y_{it} = 1|X_{it}) &= \Pr(U_{it} > 0|X_{it}) = \Pr(X_{it}'\beta_i + \varepsilon_{it} > 0|X_{it}) \\ &= \Pr(\varepsilon_{it} < -X_{it}'\beta_i|X_{it}) \end{aligned} \tag{3}$$

Following most panel data applications with one-way error components, the errors are decomposed into two parts: unobservable individual-specific heterogeneity, α_i and the remaining random disturbance, u_{it}.

$$\varepsilon_{it} = \alpha_i + u_{it} \tag{4}$$

$$E\left[\varepsilon_i \varepsilon_i^1\right] = \sigma_\alpha^2 e_i e_i^1 + \sigma_u^2 I_{T_i^* T_i} = \sigma_\varepsilon^2 \tag{5}$$

In this way, the effect of individual unobservable heterogeneity can be isolated from effects from observable covariates.

Econometric problems. The key interest is to identify the impact of housing allowances on the recipient's homeownership propensity. However, to obtain a consistent estimation of the impact coefficient, three major methodology challenges must be overcome. The first one is a common problem perplexing nearly all behavioural studies of household activities: how to control the individual heterogeneity that is unobservable to analysts but crucially affects the outcomes of the individual's activities. The second one is more specific to tenure studies, how to appropriately account for the serial persistence feature or state dependence effect in a household's behaviour (Heckman & Borjas, 1980). The third one is particular to the research question addressed here, how to avoid the pitfalls of endogeneity and consistently identify the true impact from the 'seemingly' reciprocal relationship between ratio and tenure choice.

The utilisation of panel data makes it possible to control for disturbances of individual heterogeneity. However, most existing panel data studies of tenure choice are static and do not account for the dynamic feature of human behaviour in tenure choice.

The decision made today may have short-term effects on decisions made in the future (Heckman & Borjas, 1980). This point is particularly relevant in analysing tenure choice behaviour since the transition cost is tremendously high in the housing market. Households are generally very reluctant to adjust their choice, unless their housing consumption is too far from equilibrium (Frieden, 1980; Goodman, 2003; Kan, 2000). Unfortunately, very often, people are conflating this effect with influences of individual heterogeneity that permanently affect the outcomes in all periods and cannot distinguish 'spurious state dependence' from true state dependence (Heckman & Borjas, 1980).

In this paper, two approaches are applied to address the state dependent effect. The first one is to ignore the 'initial condition' problem and instrument lagged $(t-1)$ dependent variable with lagged $(t-2)$ dependent variable. The second one is to follow the random effect probit framework developed by Wooldridge (2000):

$$P(Y_{it}=1|X_{it,}X_i,Y_{i0},\alpha_i)=\Phi(\gamma_l Y_{i,t-1}+\gamma_0 Y_{i0}+\gamma_X X_{it}+\gamma_1 X_i+a),\quad i=1,\ldots,N,\ \ t=1,\ldots,T_i^* \tag{6}$$

X_i are individual time-invariant explanatory variables while X_{it} are individual time-varying covariates. The coefficient tells the direction of the relationship between individual effects and Y_{i0}. The first approach is standard but sensitive to the severity of the 'initial condition'. The second approach is expected to give more efficient estimates as it explores more information in the data. In empirical practice, it was found that the Wooldridge approach provides more sensible estimates of the state dependent effect.

Endogeneity: IV or 2SLS vs 2SCML. Maybe the biggest challenge in this paper is the potential endogeneity, or the simultaneity between housing allowance 'reliance' and the tenure choice. As noted in the description of the Swedish housing allowance system, tenure status may not only affect the probability of being a recipient but also determine the benefit amount one recipient actually can receive.

A number of methods exist which aim to correct for endogeneity bias in nonlinear LDV models.[3] The study here applies the model of 2SCML (two-stage conditional maximum likelihood) developed by Rivers & Vuong (1988). Rivers & Vuong (1988) show that 2SCML estimators are consistent and asymptotically efficient and their performance always beat 2SIV and AGLS in Monte Carlo experiments. This argument was also supported by a number of other Monte Carlo experiments (Arendt, 2002; Bollen *et al*., 1995). Another attraction of 2SCML is that it provides a convenient implementation of the exogeneity test (Rivers & Vuong, 1988).

However, only Vella & Verbeek (1999) and Arendt (2002) have empirically applied the 2SCML method in panel data setting. Vella & Verbeek (1999) also show that it is possible to include dynamics and sample selection correction in their application of panel data 2SCML. In this paper, the 2SCML approach of Vella & Verbeek (1999) is followed to address the endogeneity issue in panel data. But the treatment of state dependence effect follows the Wooldridge approach and is different from Vella & Verbeek (1999).

The 2SCML model. Consider the following simultaneous equation system:

$$U_{it} = \gamma Y_{i,t-1} + X_{it}\beta + \lambda R_{it} + \alpha_i + \mu_{it},\ i = 1,\ldots,N,\ t = 1,\ldots,T_i^* \tag{7}$$

$$Y_{it} = F(U_{it}, \vartheta) \tag{8}$$

$$R_{it} = Z_{it}\delta + X_{it}\varsigma + \upsilon_i + \tau_{it},\ i = 1,\ldots,N,\ t = 1,\ldots,T_i^*,\ \mathrm{v_i,iid} \tag{9}$$

where U_{it} is an unobservable latent variable, Y_{it} is the observable tenure status, the function mapping U_{it} into Y_{it} can be linear, logit or probit. X_{it} is the set of exogenous covariates in the primary equation: age, female, couple, number of children, and income. R_{it} is the ratio of housing allowance to housing expenditure, indicating the reliance of the recipient on the allowance benefit. The sign and magnitude of R_{it} is the main interest of this paper. Z_{it} is the instrument sets to be included as regressor in equation (9).

If R_{it} is exogeneous, it will not be correlated with u_{it}, and consistent coefficient estimates can be obtained for all covariates. But if it is endogenous, estimation methods ignoring its correlation with the error terms will produce biased estimates for all covariates.

2SCLM is implemented in two stages. The first-stage regression is maximising the marginal log likelihood for the instrument equation and the second-stage regression is applying random effect likelihood function for the primary equation. To be specific, first the endogenous variable is regressed based on equation (9). The predicted value and residuals of endogenous variables obtained from the first-stage regression are then included into the primary regression equation as explanatory variables. The *t*-test of the estimated coefficient for first-stage regression residuals will be a convenient test of endogeneity (Rivers & Vuong, 1988).

In this paper, two 2SCLM models are specified to examine the relationship between housing allowance and the recipient's homeownership propensity. Equation (10) is the 2SCLM random effect probit model where the lagged tenure ($t - 1$) was treated as an endogenous variable, ignoring the initial condition issue.

$$P(Y_{it} = 1|X_{it}, R_{it}, \alpha_i) = \Phi(\lambda_l \hat{Y}_{i,t-1} + \lambda_{ye} e\_Y_{i,t-1} + \lambda_X X_{it} + \lambda_R \hat{R}_{it} + \lambda_{re} e\_R_{it} + \alpha) \tag{10}$$

Table 5. Estimation results from alternative models with lagged dependent as the only regressor.

Models	BE	RE	FE
Pre-home R-square: within = 0.1359 between = 0.9266 overall = 0.8694	0.9760232 (0.0073335)	0.8677866 (0.0074608)	0.3405136 (0.015633)

e_Yi,t.-1 and *e_Rit* are the residuals of the first-stage regression. Hatted variables are the predicted values from first-stage regressionss.

Equation (11) is the 2SCML-P where the dynamics are treated in the random effect framework (Wooldridge, 2000):

$$P(Y_{it} = 1|Y_{i0}, X_{it,}X_i, R_{it}, \alpha_i)$$

$$= \Phi(\gamma_l Y_{i,t-1} + \gamma_0 Y_{i0} + \gamma_X X_{it} + \gamma_1 X_i + \gamma_R \hat{R}_{it} + \gamma_{re} E\_R_{it} + \alpha) \qquad (11)$$

There have been many panel studies in the field of housing research. Application of dynamic panel data models has also emerged recently. However, the model here will, to the authors' best knowledge, be the first panel data model that simultaneously allows for both dynamics and endogeneity in this field.

Empirical Results

The Amount of the State Dependence Effect

First is the panel linear probability model where the lagged tenure status is the only regressor, in order to have a sense of how important state dependence is in tenure choice (Table 5).

It is found that lagged tenure status alone accounts for 87 per cent of the total variance in tenure. Between estimates give a too high estimate of the lagged dependent coefficient as they do not isolate the effects of heterogeneity and true state dependence is mixing with spurious state dependence (Heckman & Borjas, 1980). When heterogeneity has been taken into account, the estimated magnitude of the lagged dependent coefficient is reduced, especially in the FE model. However, the FE estimate is not reliable either, for it does not account for the endogeneity of the lagged dependent variable and attributes too much variance to the individual heterogeneity effect. The RE estimate appears most reasonable as it is a compromise between the FE and BE estimates. (See Chay & Hyslop (1998) and Arellano & Carrasco (2003) for more discussion on the biases in the estimation of lagged dependent variable.)

Taking Account of Endogeneity

The next step is to include a set of covariates that are believed to have potential impacts on tenure choice. Guided by economic theory and classic tenure literature, the variables in Table 6 are included. Time dummies for each year as well as regional dummies are also used.

In any panel models that blindly ignore the endogeneity of *ratio*, either FE or RE, linear or logit or probit, the following findings are always encountered:

- the estimated coefficient of *prehome* is not affected by the inclusion of covariates at all. This is consistent with previous literature (Chay & Hyslop, 1998);
- the estimated coefficient for *ratio* is negative and significant;
- *income* with unexpected sign and insignificant;
- most demographic variables are insignificant; age and couple are also associated with unexpected signs.

A series of regressions can be conducted to obtain information on the endogeneity of *ratio*. In a regression where the one-period lagged *ratio* is included as a variable, it is found that lagged ratio does not help to predict tenure status. Neither is the *ratio* of one-period ahead. So there seems to be no need to consider feedback effects. However, current tenure status does appear to be an important determinant of *ratio*, the marginal effect of being a homeowner will increase *ratio* by 5 to 9 per cent. But lagged tenure status appears irrelevant. Results from this set of regressions do not give solid evidence of the endogeneity of *ratio*. Nonetheless, it is known that the lagged *ratio* can work as a valid instrument, since it is found to be highly associated with the variable to be instrumented, ratio, but there is no correlation with the dependent variable, tenure status.

To formally test the endogeneity of *ratio*, the exogeneity test for fixed-effect panel data is applied (Davidson & MacKinnon, 1993). When *ratio* is instrumented by one-period lagged *ratio* and *housecost*,[4] the Davidson-MacKinnon test value of exogeneity is 13.59026 and p-value $= 2.3e\text{-}04$, suggesting it should be rejected that *ratio* is an exogenous variable in the model. An over-identification test (Wooldridge, 2002) could not reject the validity of the choice of instruments. The test value of over-identifying restrictions is 129.102 and Chi-square (1) p-value $= 6.4e - 30$. In the FE panel linear

Table 6. Variable definition

Dependent variable	
Homeown	Dummy variable for tenure form (renters = 0, homeowners = 1)
Explanatory Variables	
Ratio	The ratio between received housing allowances and housing expenditure
Prehome	Dummy variable = 1 if homeowner last year, otherwise = 0
Region	Dummy variable for region (region in question = 1, otherwise = 0)
Female	Dummy variable for gender (1 if household head female, otherwise = 0)
Income	Income before tax without housing allowances
Age	Age of household head
Couple	Dummy variable = 1 if spouses, otherwise = 0
Children	Number of children in the household
Reform	Dummy variable = 1 if the household received housing allowances before 1997, otherwise = 0. Is included as an interaction variable

probability model where both *ratio* and *prehome* are treated as endogenous variables and instrumented, the following were found:

- Over-identification and endogeneity tests are passed.
- Coefficients for *ratio* are now positive and statistically significant.
- Coefficients for *income* are now with expected signs and significant.
- 10 per cent higher *ratio* can increase the homeowner rate from 2.7 to 3.4[5] per cent. This is a substantial amount considering the marginal effect of 50 000 more per cap *income* can only promote a 3.0-percentage points higher homeowner rate.
- Other demographic variables are insignificant, as is the region dummy.
- Year dummy for 2000 is significantly negative, but all other time dummies are insignificant.

When the same models are regressed on subsamples where households have stayed more than four years in the allowance system, it is found that the coefficient of *ratio* increases, suggesting the impact of housing allowance increases with the time length. It is also true that the impact of *ratio* is becoming larger since 1997 than before.

The authors are fully aware of potential sample biases in the models. This is an unfortunate limitation of the data as recipient observations can only be obtained from administrative resources. However, since in this paper interest is limited to identifying how the variations of allowance reliance ('between' and 'within' recipients) affect the tenure choice of recipients, especially on the sign of this impact, the coefficient estimates of other covariates' impacts are not necessarily crucial to the investigation. Another concern may be whether the unbalanced panel data may bias the inference. However, this has been automatically addressed in the Stata 8.0 software package by appropriate time weighting. Baltagi & Chang (2000) also prove that methods for simultaneous equations with balanced panel data carry over to the unbalanced cases.

Estimation Results from 2SCML Models

A set of panel models that allow endogenous variables are estimated, as described in the econometrics section. The preferred regression model is RE-2SCML-probit. Here, only the results are reported where dynamics are treated as in the random effect framework of Wooldridge (2000). Treating the lagged dependent variable as endogenous produces very similar coefficient estimates of covariates except that the estimated degree of state dependence is lower. However, the accrued estimate of state dependence is not of primary concern in this paper, so a decision was made to ignore it (Table 7).

All models include region dummies and year dummies, but only the year dummy for 2000 is significant and its marginal effect is around -0.03. 2SCML probit estimation results confirm the endogeneity of the housing allowance ratio and justify the use of two-stage methods.

Other Models Allowing for Endogeneity

Other models are also applied to compare the estimates. In all models that correct for endogeneity it is always found that the coefficients for ratio are consistently positive, however, not always statistically significant, and the point estimates are generally smaller than in 2SCML models. As noted, the statistical insignificance of the ratio coefficient

Table 7. Estimation results from RE-2SCML-probit models

	Full sample		Sub-sample after 1997		Sub-sample for at least 3 years	
	Coefficients and *p*-value	Marginal effects	Coefficients and *p*-value	Marginal effects	Coefficients and *p*-value	Marginal effects
Prehome	*3.9004*	*0.9311*	*4.050*	*0.9399*	*4.1028*	*0.9441*
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Home_i0	0.1434	0.0143	0.0773	0.0056	0.2970	0.0257
p-value	0.411	0.449	0.725	0.738	0.148	0.232
Age	−0.0091	−0.0008	−0.0120	−0.0008	−0.0040	−0.0003
p-value	0.128	0.128	0.106	0.107	0.610	0.609
Female	0.0273	0.0025	0.0572	0.0039	0.0176	0.0012
p-value	0.795	0.794	0.676	0.672	0.903	0.902
Children	0.0604	0.0055	0.0411	0.0028	0.0068	0.0005
p-value	0.160	0.159	0.457	0.455	0.911	0.911
Couple	0.0238	0.0022	0.0174	0.0012	−0.1899	−0.0125
p-value	0.835	0.837	0.905	0.906	0.234	0.199
Income	*0.0045*	*0.0004*	*0.0046*	*0.0003*	*0.0050*	*0.0003*
p-value	0.000	0.000	0.001	0.001	0.003	0.004
P-Ratio	*1.234*	*0.1126*	*1.8040*	*0.1234*	*2.4100*	*0.1701*
p-value	0.058	0.060	0.039	0.041	0.026	0.029
Res_ratio	*− 2.583*	*− 0.2357*	*− 3.7800*	*− 0.2596*	*− 4.0796*	*0.2879*
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Y2000	*− 0.4697*	*− 0.0321*	*− 0.5242*	*− 0.0274*	*− 0.5735*	*− 0.0288*
p-value	0.019	0.001	0.019	0.002	0.012	0.000
Constant	*− 3.0378*		*− 3.0563*		*− 3.5843*	
p-value	0.000		0.000		0.000	
Ln-likelihood	−354.9410		−228.61926		−202.0566	
Sigma_ui	0.0009		0.0009		0.0009	
Rho-error	8.32e − 07		8.32e − 07		8.32e − 07	
/lnsig2u	−14		−14		−14	
n	4422		2968		3017	

Note: The marginal effect for dummy variables is for the discrete change of dummy variable from 0 to 1.
The coefficients in italics are significant at least at the 5 per cent level.

could be due to the omitted variable biases (see the results in Table 8). Income is consistently positive and significant. However, its marginal effect is quite small. Nearly all the demographic effects are insignificant. Again, only the year dummy for 2000 is significant and its marginal effect is around -0.035.

RE-G2SLS was also implemented (Baltagi, 2001) and it was found that it increases the estimated marginal effect of ratio to 0.065. Baltagi-Chang (2000) consistent estimators of the variance are also applied and it does not make any meaningful difference. The results are not reported here but are available upon request.

Short Summary of Empirical Findings

The key research question in this paper is to identify the effect of housing allowances on the tenure choice and on recipient's homeownership propensity. Using the ratio of housing allowance to housing expenditure to proxy the impact of housing allowances, there are some interesting findings. In all models that do not account for endogeneity, the estimated impact is negative and statistically significant. In all models that allow for endogeneity, positive impacts of housing allowance are consistently detected. The marginal effect of an additional 10 per cent-point housing expenditure subsidy ratio tends to increase the 0.3 to 2.0 per cent-point homeownership rate among recipients. The income keeps its significance and positive sign across all models, but its marginal effect is quite small in magnitude. Most demographic variables are insignificant, but this may be due to the homogeneity in the data sample and estimates suffer from sample selection biases, so they are not reliable. But the consistent estimates of large state-dependence in the data argue the need to apply dynamic models for tenure choice and cast doubts on findings in static tenure choice studies.

Concluding Remarks

This paper attempts to answer the question of whether housing allowance depresses or promotes recipients' homeownership propensity in Sweden. In a 2SCML panel model estimation, the result indicates that if the housing allowance ratio increases by 10 percentage points, the propensity of the average recipient population being a homeowner will increase by 1.1 percentage points. This implies that the income effect and substitution effect are fairly substantial and work in the direction of promoting owner-occupied tenure. It could be thought that the recipients are accumulating the economic resources saved from housing benefits and using them to gain upward mobility in the housing market. As the paper has noted, the aim of the housing allowance is to allow families with low financial capacity to be able to acquire sound and sufficiently large accommodation. The result therefore indicates that the assisted households are acting according to the housing policy goal. It is also argued that the marginal impact of housing allowance is actually quite large.

The paper also investigated whether the Swedish housing allowance reform in 1997 has made an impact on the recipients' tenure choice. When analysing the subsample of recipients receiving housing allowances after the reform in 1997, no evidence of changed impacts was found. The analysis for the long-term recipients suggests the impacts increase slowly with the spell length.

In summary, the worry of a 'rental trap' can be dismissed, i.e. that housing allowance recipients are trapped in rental apartments in order to keep their allowances within the

Table 8. Estimation results from alternative panel IV models

	G2SLS-RE	IV-GMM-linear	AGLS-Probit	
	Coefficients and *p*-value	Coefficients and *p*-value	Coefficients and *p*-value	Marginal effects
Ratio	*0.0590*	0.03034	0.4192	0.0302
p-value	0.106	0.331	0.568	0.568
Prehome	*0.8598*	*0.9355*	*4.0543*	*0.9424*
p-value	0.000	0.000	0.000	0.000
Home_i0	*0.0561*	−0.0031	0.03519	0.0026
p-value	0.000	0.860	0.871	0.871
Age	−0.0005	−0.0004	−0.0099	−0.0007
p-value	0.162	0.202	0.181	0.181
Couple	0.0040	0.0030	0.0249	0.0018
p-value	0.491	0.585	0.863	0.863
Female	0.0009	0.0030	0.1210	0.0085
p-value	0.889	0.533	0.368	0.368
Income	*0.0002*	*0.0001*	*0.0026*	*0.0002*
p-value	0.003	0.092	0.030	0.030
Children	0.0013	0.0005	0.0434	0.0031
p-value	0.587	0.837	0.428	0.428
Y2000	− *0.0189*	− *0.0226*	− *0.5084*	− *0.0281*
p-value	0.014	0.003	0.021	0.021
Constant	−0.0027	0.01261	− *2.5070*	
p-value	0.903	0.506	0.000	
R-sq: within between overall	0.0368			
	0.9240			
	0.8525			
Sigma.u	0.0446			
Sigma_e	0.1034			
Rho (fraction of var due to u_i)	0.1568			
n	4422	4422	4422	

Note: For the IV-GMM model, the Hansen J statistics of the over-identification test are 11.222 and the *p*-value of Chi.sq (1) is 0.00008.

Swedish housing allowance system. To the contrary, robust evidence can be found to claim that the Swedish housing allowance system is doing a good job in supporting recipient households to obtain and maintain their homeownership.

The Swedish housing allowance system has a number of unique features that distinguish it from others and the results here could not straightforwardly carry over to other country contexts. However, the findings may still have interesting policy implications for housing policy makers worldwide. For example, in addition to a number of merits that are well recognised, housing allowance can also be a good policy tool to promote homeownership among the low-income population.

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Notes

[1] 'Housing allowance' is the term widely used in mainland Europe, but is known more as 'housing voucher' and 'rent certificate' in the US, as 'housing benefit' in the UK, and as 'shelter assistance' in Canada.

[2] This will be checked against the actual income and the excess allowances must be returned.

[3] For example, 2SIV (two-stage instrument variable) by Lee (1981), G2SP (generalised two-stage simultaneous probit) by Amemiya (1978), AGLS (Amemiya generalised least square) developed by Newey, and 2SLSP (two-stage least square probit) by Hausman & Taylor (1981).

[4] Other instruments have been tested, such as lagged ratio and years of being a recipient, but none passed the over-identification test. When instrumented only by lagged ratio, it could not pass the exogeneity test.

[5] The first number is the marginal effect taking account of individual heterogeneity and the second one without.

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