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THE IMPACT OF HOUSING MARKET INSTITUTIONS ON LABOUR MOBILITY

A EUROPEAN CROSS-COUNTRY COMPARISON

THOMAS DE GRAAFF
AND MICHIEL VAN LEUVENSTEIJN

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THE IMPACT OF HOUSING MARKET INSTITUTIONS ON LABOUR MOBILITY:

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Thomas de Graaff
and Michiel van Leuvensteijn*

Abstract

In this paper, we study the effects of housing market institutions on labour mobility. We construct durations for individuals leaving their current job for a different job, becoming unemployed or leaving the labour market, from a sample of households from 14 European countries in 1994-2001. We merge this data with country-specific housing market institutions, such as transaction taxes, and language and religion diversity. Similar to previous studies, estimated hazards indicate that home-ownership reduces job-to-job mobility as well as the probability to become unemployed or economically inactive on a individual level. However, a comparison between countries reveals that countries with high levels of homeownership rates also have high levels of unemployment. Therefore, this paper is able to reconcile the seemingly contrasting empirical results from both the macroeconomic and the microeconomic level.

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Contents

Summary

In this paper, we study the effect of home-ownership and housing market institutions on labour market mobility from an international perspective. To this end, we used a large European micro dataset from 1994 to 2001 together with institutional housing market variables measured on the country level. We used a competing risk framework, with for current employment spells exit destinations to jobs, unemployment and non-participation.

In this field, there are empirical contributions both at the macroeconomic level and at the microeconomic level. Exponents of the first approach, such as Green and Hendershott (2001a) for the USA and Nickell (1998) for the OECD countries find indeed that home-ownership constrains labour mobility and thus increases unemployment. However, most of the empirical contributions on the microeconomic level, such as Van Leuvensteijn and Koning (2004) and Munch et al. (2006), find the opposite result. They find that home-owners have stronger job commitment than renters and thus that home-ownership limits job mobility, but also that the probability to become unemployed is smaller for home-owners than for renters. Our contribution is that we reconcile these two contradictory outcomes. We show that transaction costs in the housing market have an indirect and direct effect on labour mobility. Transaction costs in the housing market diminish the attractiveness of buying residences. On an aggregate level, this causes job commitment to decrease because of lower home-ownership rates, which enhances job mobility. However, there is also a direct effect. Transaction costs hamper job mobility to jobs outside the home region. It is only attractive for employees to accept a job outside their home region if they are compensated for these transaction costs. This diminishes the probability to change jobs and creates inflexibility in labour markets. The two effects together explain why on the individual level we find that home-ownership reduces unemployment, but on the aggregate level home-ownership seems to increase unemployment.

1 Introduction

In a comparison of the labour markets of the US and Europe, some striking differences emerge. To start with, the economies of Europe display much higher levels of long-term unemployment. And secondly, unemployment is more unevenly spread across European regions than across US regions. In a series of papers in the 1990s, Oswald (1997, 1999) showed that the usual suspects, such as high unemployment benefits, high taxes on labour, and the presence of strong unions, could not explain these variations in unemployment rates sufficiently.

Oswald suggested an alternative driver for high unemployment rates: namely, home-ownership. Indeed, at the national level he found that countries with high home-ownership ratio's in 1990, such as New Zealand, Australia, Ireland and Spain, also suffered from high unemployment rates. And where home-ownership rates increased in most European countries since the 1960s, home-ownership in the United States actually decreased. Furthermore, in terms of explanatory power, Oswald found that the degree of home-ownership shows a high correlation with unemployment rates, above the impact of social benefits duration, union coverage and the like.

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Our contribution is that we reconcile these two contradictory outcomes. We show that transaction costs in the housing market have an indirect and direct effect on labour mobility. Transaction costs in the housing market diminish the attractiveness of buying residences. On an aggregate level, this causes job commitment to decrease because of lower home-ownership rates, which enhances job mobility indirectly. However, there is also a direct effect. Transaction costs hampers job mobility to jobs outside the home region. It is only attractive for employees to accept a job outside their home region if they are compensated for these transaction costs. This decreases the probability to change jobs and creates inflexibility in labour markets. The two effects together explain why on the individual level we find that home-ownership reduces the probability to become unemployed, but on the aggregate level home-ownership seems to increase umemployment.

For our analysis, we use a longitudinal dataset of employees for 14 European countries for the period 1994–2001. This dataset is combined with information on housing institutions, religion and language diversity. It provides us the opportunity to identify effects of transaction

costs not visible at the national level. Because the dataset contains multiple job spells, we are able to correct for spurious relationships and identify effects of home-ownership on labour mobility, and reverse. Both movements on the housing market and on the labour market are used to estimate the impact of home-ownership and transaction costs on job mobility as well as the probability of becoming unemployed. To this end, we use data collected by the European Community, the European Community Household Panel (ECHP). In the ECHP, about 130 thousand individuals are followed over time. These individuals can change between jobs, between unemployment and employment, between homes and between regions. In modeling these transitions, several variables in the ECHP may be useful: socio-economic characteristics, household characteristics, home-ownership, job tenure and what workers do after their current job spell.

The paper is structured as follows. The next section deals with an overview of the theoretical and empirical contributions that have been made to this particular literature concerning the impact of home-ownership on labour market mobility. Section 3 discusses briefly the modelling framework and econometric techniques. Subsequently, Section 4 offers an exposition of the data we use and the implementation of the model laid out in the previous section. Section 5 presents the empirical results. The last section concludes and offers lines for further research.

2 Theory and Review

The theoretical literature on the relationship between home-ownership on the one hand and job mobility and unemployment on the other hand does not predict a clear ex-ante outcome with respect to the direction of this relationship. From a macro-perspective, Green and Hendershott (2001b), e.g., offer some additional explanations for the fact that home-ownership may cause reduced labour market mobility. Firstly, when the economy is in a downfall, housing becomes a very illiquid asset, causing home-owners to be reluctant to sell their house and search for appropriate jobs outside their local labour market. Secondly, high interest rates may cause home-owners to be locked in as well, with similar consequences for residential mobility. And finally, high transaction costs usually associated with home-ownership may also cause reduced residential mobility. However, theoretically from a microeconomic perspective, Dohmen (2005), who studied directly the consequences of home-ownership in a theoretical framework with search and moving costs, concludes that high-skilled workers are more mobile than low-skilled workers and that home-owners are less mobile than renters, *ceteris paribus*. However, *high-skilled* home-owners may be more mobile than *low-skilled* renters if the income loss associated with unemployment exceeds the income loss associated with moving house. Along the same line of thought, Van Vuuren (2005) analysed the relationship between expected labour market outcomes and the housing market in a search theoretical framework, and argued that the empirically often observed positive correlation at the micro level between labour market mobility and housing tenure boils down to an endogeneity problem. Regarding the individual relation between residential and job mobility, several modelling frameworks exist, mostly in the context of job search theory (see, e.g., the study of Van den Berg and Gorter, 1997). Theoretical predictions for the impact of residential mobility on job mobility are less ambiguous than for the impact of housing tenure. If workers face substantial (monetary) costs in changing residence, job mobility is severely hampered. These moving costs are often caused by housing tenure, but may also stem from household characteristics (like coordination problems in two-earner households in combination with higher commuting costs, as in Van Ommeren (1996)).

Because of the theoretical ambiguity, the relationship between home-ownership and labour mobility and unemployment is mainly an empirical issue. Macroeconomic and microeconomic empirical analyses show however contradicting outcomes. On a macroeconomic level, several contributions show that home-ownership increases unemployment. Nickell (1998) analyzes the relationship between home-ownership and unemployment, using a panel of 20 OECD countries, from 1989 to 1994. With these data, Nickell shows that unemployment is (seemingly) positively correlated with home-ownership, with an elasticity of 0.13. Green and Hendershott (2001b) estimate an elasticity of 0.18, using aggregated data for the different states of the United States for the period 1970–1990. This estimate is close to the estimate of Oswald (1999), with an elasticity equal to 0.2. He analyzes the relationship between home-ownership and

unemployment, using panel time series data of 19 OECD countries, from 1960 to 1990. This relationship is not only found between countries, but also between the regions of France, Italy, Sweden, Switzerland, the US and the UK. In line with these results, Murphy et al. (2006) show that strong housing market conditions can prevent movement since expensive housing can deter migrants and make commuting more attractive as an alternative to movement.

Oswald (1997) posed five possible mechanisms to explain this positive relation between unemployment and home-ownership. All of these can actually be related to the linkage between reduced residential mobility, home-ownership and inefficient labour markets (as already mentioned by Blanchard and Katz, 1992). The first mechanism concerns the direct effect of high moving costs when owning a house. Given all tax regulations, mortgage and notary fees, moving residence for home-owners is far more expensive than for renters. This implies that home-owners are reluctant to move even when labour market opportunities elsewhere – such as a better job match or even a job at all – are more attractive. Secondly, housing markets dominated by home-ownership tend to impede newcomers (read youngsters) on the housing markets to find appropriate homes close to their preferred jobs. Note that this argument is a particular form of the spatial mismatch as introduced by Kain (1968), where frictions on the housing market lead to less (suitable) job matches. The third argument Oswald brings forward is actually an indirect variant on the first one. If less people are mobile, an economy becomes more inefficient which in the long term is harmful for production and the number of job vacancies. A fourth argument points to the fact that home-owners are more likely to prevent entrepreneurs to settle in residential areas than renters, mainly because their incentives to form political lobby groups are stronger. Finally, Oswald mentions that home-owners tend to commute over longer distances compared to renters. This probably leads to more congestion, which is harmful to the economy as a whole and causes job matching to be less efficient. This last hypothesis follows directly from the first hypothesis. home-owners are less mobile and thus have to increase their search space when looking for a suitable job.

Contrarily to the findings presented above, several microeconomic contributions show that home-ownership actually diminishes the probability to become unemployed. Van Leuvensteijn and Koning (2004) and Munch et al. (2006) have analysed the effect of home-ownership on respectively job mobility and unemployment for respectively the Netherlands and Denmark. They find no effects on job mobility but identify a small negative effect on the probability to acquire a job outside their local area. Van der Vlist (2001) studied the Dutch situation as well and concludes that home-ownership has a small positive effect on changing jobs. Barcelo (2003) analysed for five major European countries the effects of home-ownership on unemployment and found that owners are more reluctant to move than renters. Using U.S. household data, Green and Hendershott (2001a) found that unemployed home-owners indeed find jobs at a slower rate than renters, but only with an impact of an eighth of what is found for aggregate data.

Following Dietz and Haurin (2003)), the conclusion from the above literature is that the

empirical results concerning the effect of home-ownership on labour market mobility is ambiguous. It seems that, in general, studies using micro data tend to reject the Oswald hypothesis – i.e., home-ownership hampers labour mobility and increases unemployment – while studies using macro data support it. This might point to the existence of a spurious relation at the macro level or omitted variables at the micro level.

As mentioned above, our paper adds to this empirical literature by showing that if one focuses on transaction costs, like transfer taxes, in the housing market instead of home-ownership, the seemingly contradictory outcomes on both the micro- and macro-economic level can be reconciled. Within European countries, e.g., there is a large variation between tax relief and real estate agent fees. Both are most likely to reduce residential mobility and thus should have a negative effect on labour market performance. Apart from housing market institutions that deal directly with transaction costs, there are institutions that deal with the easy of buying a house. In Europe, e.g, most countries allow interest rates on mortgages to be (partly) deducted from income taxes, which should have a positive impact on home-ownership, and thus affects labour market performance indirectly.

3 The Modeling Framework

To study labour market mobility, we focus on the probability of ending a job and the various exit destinations. We assume that workers only end their current job for three possible reasons. First, they may find another job (whether more suited for the worker or not). Secondly, workers may become unemployed. And thirdly, workers may leave the labour force altogether because of retirement, raising a child, looking after disabled family members, study purposes and so on. If labour mobility is hampered, it might show up in two ways. First, a worker may remain longer in her current job and move at a slower rate to a new one. This indicates that a worker is hampered in his or her upward career mobility. Secondly, a worker may end up faster in unemployment or leave the labour force faster. This happens when a worker faces difficulties in finding a job close to his of her residential location and when it is too costly to move to areas with more attractive job opportunities. Reflecting the Oswald hypothesis we incorporate individual home-ownership to test whether this adequately measures residential mobility and to what extent it affects job duration and exit destination.

The model we construct consists of a competing risk duration framework for the various exit rates of employment in combination with a discrete choice model for the probability of buying or renting a house. The fundamental assumption we make is that the decision to buy or rent a house is correlated with labour market behaviour through observed and unobserved components. First, as mentioned above, we allow labour market mobility to be directly related with housing tenure, by incorporating home-ownership in the job duration model. This entails a direct test whether home-owners are more or less mobile on the labour market relative to renters. Simultaneously, we allow for unobserved heterogeneity to control for those unobserved factors that drive both job mobility and housing tenure. In our case, unobserved heterogeneity may occur because of unobserved skills and job commitment. E.g., workers with short-term contracts are less likely to buy a house compared with workers with tenure. And workers who intend to leave their current job in six months to travel around the world are less likely to buy a house as well.

To capture the effect of housing market institutions, we include country-specific institutional variables, such as taxes on transferring residence and language and religion variables, in both the labour market and the housing model. Variables that are hypothesised to affect the labour market indirectly via the housing market, such as income tax deduction, are only included in the housing model. The intuition behind this construction is that country specific institutional variables and home-ownership may simultaneously affect labour market behaviour. Both serve then as a proxy for the degree of residential mobility, although the housing institution variables are measured rather crudely (on a country level) and home-ownership may incorporate other effects on labour market mobility (such as a positive one due to job commitment).

The modeling approach we adopt in this paper closely resembles that of Van Leuvensteijn and Koning (2004) and Munch et al. (2006), and to a certain extent that of Bover et al. (2002), so

not much attention is spent to technical details. The first subsection deals with the econometric model. Subsequently, we spend some attention to the issue of identification. The last subsection combines all components and specifies the complete likelihood function to be estimated.

3.1 The econometric model

To model the probability of leaving a job we use a duration analysis framework. The basic concept in duration analysis is the hazard rate θ, which is defined here as the rate that workers leave their current job in the time interval $[T, T + \mathrm{d}t]$ given that these workers occupy their job at least up to T. The probability that someone leaves employment within an interval $\mathrm{d}t$ after t can be denoted as $\Pr(T < t < T + \mathrm{d}t \,|t \geq T)$ (see, e.g, Lancaster, 1990). Dividing this probability by $\mathrm{d}t$, we get the average probability of leaving employment per unit time period:

$$\theta_b(t) = \frac{\Pr(T < t < T + \mathrm{d}t \,|t \geq T)}{\mathrm{d}t}, \tag{3.1}$$

where the subscript $b \in \{e, u, o\}$ indicates the exit destination, which in our case are: employment (e), unemployment (u) and out of the labour force (o). Note that if $\mathrm{d}t \to 0$, we have an instantaneous rate of leaving per unit time period at t.

We use a proportional hazard rate specification, indicating that we assume that the impact of individual characteristics are proportional to the impact of the elapsed time of the job spell. Further, each destination specific hazard is a function of a set of observed characteristics – such as age, sex, being married and education, but also country-specific housing market institutions, such as transaction costs –, which may vary over time, $\mathbf{X}_t$, a time varying indicator for ownership status, h_t, a function which measures duration dependence for a specific exit destination, $\lambda_b(t)$, and unobserved characteristics, v_b. Thus, the hazard rate of a specific destination may be written as:

$$\theta_b(t|\mathbf{X}_t, h_t, v_b) = \exp\left(\mathbf{X}_t\beta_b + \lambda_b(t) + \gamma_b h_t + v_b\right). \tag{3.2}$$

Often, $\lambda_b(t)$ is also referred to as the baseline hazard. We adopt here a nonparametric flexible specification in the form of a piecewise constant specification. So, duration dependence is assumed to be constant within duration intervals.

We assume the dichotomous home-ownership variable h_t to follow the following logit specification:

$$\begin{aligned} \Pr(h_t = 1|\mathbf{X}_t, \mathbf{Y}_t, \mu_h) &= \frac{\exp(\mathbf{X}_t\beta_h + \mathbf{Y}_t\delta_h + \mu_h)}{1 + \exp(\mathbf{X}_t\beta_h + \mathbf{Y}_t\delta_h + \mu_h)}, \\ \Pr(h_t = 0|\mathbf{X}_t, \mathbf{Y}_t, \mu_h) &= 1 - \Pr(h_t = 1|\mathbf{X}_t, \mathbf{Y}_t, \mu_h), \end{aligned} \tag{3.3}$$

where h is one, if the worker owns his current residence and zero, if the worker rents it. $\mathbf{Y}_t$ denotes a set of variables that characterises the choice between buying or renting a house, but which does not influence labour market mobility directly. $\mathbf{X}_t$ consists of the same set of

variables, which are used to model job duration spells. Finally, to account for unobserved heterogeneity, we incorporate an additional unobserved random component, denoted with μ_h.

In contrast to regression models, unobserved heterogeneity causes an estimation bias in duration modeling. Therefore, several modeling approaches have been developed to control for unobserved heterogeneity. We adopt here the often used nonparametric approach proposed by Heckman and Singer (1984). Basically, this boils down to the assumption of a discrete distribution, denoted G, with a prespecified number (say K) of mass points. Moreover, we allow v_e, v_u, v_o and μ_h to be correlated. Together with K mass points, this leaves us with 4^K possible combinations between the mass points, each with a seperate probability, which have to be estimated simultaneously. When using constant terms the distribution is identified by normalising the first point of support to $\{0,0,0,0\}$, so that the number of mass points to be estimated reduces to $(K-1)\times 4$.[1]

As shown above, our model consists of two parts; the housing model and the job duration model. If not for the correlation between the unobserved heterogeneity components, these two parts can be estimated separately. Allowing for correlation creates a mixture model which has to be integrated out over the entire distribution of unobserved variables, $G\{v_e, v_u, v_o, \mu_h\}$ (see Van den Berg, 2001, for more details on the application of mixture distributions in duration models).

3.2 Identification

A key issue in the literature on home-ownership and labour market mobility is the identification of the causal effect. home-ownership may cause a change in labour market mobility, but the reverse relation is – a priori – just as likely. Those workers who have good prospects on long job spells (or on lower probabilities to end up unemployed) are the ones most likely to buy a house. The literature distinguished two approaches to deal with this endogeneity. The first one is using instrumental variables, where variables that affect home-ownership but not labour market mobility are incorporated in the housing model to control for endogeneity. Van Leuvensteijn and Koning (2004) have proposed to use regional home-ownership as an instrument while Munch et al. (2006) used home-ownership of the parents in 1980 and the proportion of home-owners in the municipality where the individual was born. Usually, however, the impact of these instrumental variables is rather low, indicating that these models are already fairly well identified or that the performance of the chosen instruments is rather weak.

We choose a second approach by using multiple spells for identification, cf. Van Vuuren (2005) and Munch et al. (2006), where the latter spend much attention to the intuition behind this (see Abbring and Van den Berg, 2003, for a formal argumentation for this identification

[1] Note that this leaves the number of probabilities to be estimated still up to 4^K.

strategy). To summarize their arguments, it is not diffult to see that using repeated observations on one individual removes all interpersonal variation.[2] Thus, if there are multiple job spells available for a specific individual and if her housing tenure status varies as well over these spelle, then the effect of housing tenure on labour market mobility is theoretically identified.[3] Thus, identification is then based on a subsample with multiple spells and changes in housing tenure status, where the existence of multiple spells ensure that the unobserved heterogeneity components capture the 'within person' effects (Munch et al., 2006).

3.3 The log-likelihood function

To construct the log-likelihood we introduce some additional notation. Conform Lancaster (1990), let there be B binary destination vectors d_b, where d_b is one when there is a transition to state b and zero otherwise. Because we do not observe all job duration spells to end, we model right-censored job duration spells as well. We do this by theoretically treating right-censoring as an additional dummy state. Thus, the set of possible destination vectors B now consists of employment, unemployment, out-of-labour force, and censoring.[4] Thus, given that individuals have an elapsed duration time T and job exit destination b, and conditional on their observed characteristics, housing tenure and mass point v_b, the log-likelihood for job durations may be written as:

$$\ell\ell_T(\phi_b|T,b,\mathbf{X}_t,h_t,v_b) = \sum_{b=1}^{B}\left[d_b \ln\theta_b(T) - \int_0^T \theta_b(t)\mathrm{d}t\right], \tag{3.4}$$

where ϕ_b is shorthand notation for the parameter vector $\{\beta_b,\lambda_b(t),\gamma_b\}$. Note that the first part of equation (3.4) displays the hazard rate of the transition to destination b, while the second part denotes the probability of survival of the job spell until time T.

The log-likelihood of owning or renting a house h_t during the total length of the job spell conditional on the observed characteristics and country specific housing market variables follows immediately from the logit equation (3.3), and is given by:

$$\ell\ell_h(\phi_h|h_t,\mathbf{X}_t,\mathbf{Y}_t,\mu_h) = \sum_{t=1}^{T} h_t \ln(\Pr(h_t=1|\mathbf{X}_t,\mathbf{Y}_t,\mu_h)) + (1-h_t)\ln(\Pr(h_t=0|\mathbf{X}_t,\mathbf{Y}_t,\mu_h)), \tag{3.5}$$

where ϕ_h denotes the parameter vector $\{\beta_h,\delta_h\}$. The joint log-likelihood is now formed by multiplying the likelihoods of (3.4) and (3.5) – given the discrete unobserved heterogeneity

[2] However, as one referee rightfully observed, this is only true if unobserved individual heterogeneity is constant over time. Because in our case of job and housing mobility this assumption might be a bit strong, we incorporate as many variables as we can in models (3.2) and (3.3) that might reflect changes in preference structures, i.e. because of life-cycle effects.

[3] That is, apart from possible changes in her preference structure, which may well arise if, e.g., life cycle effects are not properly accounted for by the exogeneous variables.

[4] To avoid confusion, we do not model censoring as another competing risk. In other words, transitions to state b do not include censoring, while the destination vector d_b does include censoring.

distribution –, and integrating out over the entire distribution of mass points $G\{\nu_e, \nu_u, \nu_o, \mu_h\}$. Allowing for the presence of multiple job spells, the joint log-likelihood for the contribution of an individual i can be written as:

$$\ell\ell_{Th,i} = \ln \iiiint \prod_{j=1}^{N_j} \exp\left[\ell\ell_{T_j}(\phi_b) + \ell\ell_{h_j}(\phi_h)\right] \mathrm{d}G\{\nu_e, \nu_u, \nu_o, \mu_h\}, \tag{3.6}$$

where, j ($j \in \{1, \ldots, N_j\}$) stands for spell j and N_j for the total amount of job spells of individual i. The log-likelihood in (3.6) basically states that the log-likelihood of job duration as in (3.4) and the log-likelihood of owning or renting a house as in (3.5) has to be integrated out over the distribution of mass points, which raises an additional difficulty in the sense that we do not have to optimize over a set of parameters, but over a probability distribution as well. To solve this issue we apply an Expectation-Maximisation (EM) algorithm to solve for the parameters of equation (3.6) we are interested in. Appendix A gives further details of the implementation of the EM-algorithm for this specific application.

4 Data and Implementation

4.1 Data and descriptive statistics

The data set used in this analyses is derived from the European Community Household Panel (ECHP). The ECHP-survey is based on a standardised questionnaire that involves annual interviewing of a representative panel of households and individuals in each country. The questionnaire covers a wide range of topics like income, health, education, housing, demographics and employment characteristics, which makes this database especially suitable for our analysis. The ECHP covers the period 1994 to 2001. In the first wave, i.e. in 1994, a sample of some 60,500 nationally representative households were interviewed in the 12 member states at that juncture, which equals to approximately 130,000 adults aged 16 years and over. Austria, Finland and Sweden joined the project in respectively 1995, 1996 and 1997.[5]

For our analysis, we need to construct job spells' durations and exit destination upon job termination. For this purpose, we use the survey's questions to individuals to report on their last year's individual activity states on a monthly basis.[6] We avoid left-censoring of job spells by only selecting observed job durations. However, we do observe a fair amount of rightcensored or incomplete spells (about 33.9 of our observations). Furthermore, due to the panel structure of the database, we are able to observe multiple job spells for each individual. Simultaneously, a set of individual characteristics, including job history, demographic variables and residential history is available including tenure on the housing market.

[5] Data for Sweden has been derived from the Swedish Living Conditions Survey and transformed into ECHP format.

[6] Except for the Netherland and Sweden. For the Netherlands it was still possible to construct monthly activity states from other questions, for Sweden it was not. Therefore, we had to drop Sweden from the final estimation. Because of this procedure, small job spells may have been unrecorded for the Netherlands resulting in an underestimation of the number of job spells and an overestimation in the length of the average job spell. Further, information on out-of-labour force exits were not available for the Netherlands. Because it does not affect the other exit rates, we left that competing risk out for the Netherlands.

Table 4.1 Description of variables (mean)

	Countries													
Variable	Ger.	Den.	Net.	Bel.	Lux.	Fra.	UK	Ire.	Ita.	Gre.	Spa.	Por.	Aus.	Fin.
Age	33.62	34.88	37.61	36.19	36.02	36.12	37.53	33.75	35.66	35.77	34.73	36.56	31.64	35.25
Female	0.49	0.52	0.49	0.52	0.45	0.51	0.53	0.45	0.43	0.43	0.41	0.47	0.46	0.53
Education dummies (baseline: education = low)														
Educ. medium	0.53	0.50	0.20	0.36	0.36	0.28	0.21	0.41	0.41	0.35	0.21	0.13	0.60	0.49
Educ. high	0.15	0.24	0.09	0.36	0.18	0.23	0.40	0.18	0.09	0.22	0.22	0.08	0.06	0.29
Children within the household (baseline: no children $\leq$ 18)														
Children $<$ 11	0.26	0.31	0.32	0.31	0.34	0.37	0.33	0.36	0.29	0.31	0.31	0.35	0.37	0.31
Children 12–15	0.11	0.05	0.13	0.07	0.07	0.10	0.08	0.17	0.10	0.11	0.12	0.11	0.11	0.09
Children 16–18	0.11	0.06	0.07	0.07	0.06	0.07	0.08	0.21	0.10	0.11	0.14	0.12	0.24	0.10
Living w. partner	0.58	0.68	0.74	0.71	0.63	0.68	0.68	0.46	0.57	0.59	0.55	0.63	0.52	0.67
Spouse employed	0.39	0.51	0.47	0.53	0.40	0.48	0.47	0.29	0.33	0.34	0.29	0.44	0.36	0.48
home-owner	0.39	0.62	0.61	0.70	0.66	0.49	0.73	0.84	0.73	0.76	0.80	0.65	0.65	0.65
Employment spell characteristics														
Length (months)	24.08	28.22	46.87	38.16	42.08	34.70	35.13	35.13	28.66	26.78	22.41	36.40	29.94	23.55
Repeated spells	10.59	7.94	3.59	5.20	2.21	4.51	4.51	6.73	6.39	5.94	6.11	4.88	7.57	4.61
Censored	0.33	0.28	0.48	0.40	0.56	0.40	0.39	0.29	0.31	0.28	0.24	0.35	0.32	0.29
Exit: empl.	0.42	0.37	0.19	0.26	0.16	0.25	0.24	0.32	0.31	0.28	0.31	0.25	0.37	0.26
Exit: unempl.	0.10	0.14	0.09	0.13	0.07	0.18	0.10	0.11	0.16	0.19	0.24	0.15	0.11	0.14
Exit: out of lab.	0.11	0.19	–	0.16	0.18	0.16	0.21	0.24	0.16	0.14	0.15	0.16	0.17	0.25
Number of spells	42,711	11,507	11,497	7,284	7,025	18,199	22,401	12,351	21,152	11,869	24,393	14,683	10,514	13,037

Table 4.1 offers the means of the variables of the selected countries in the ECHP dataset. The spells presented are job duration spells and are not yet corrected for right-sensoring. Clearly, there is much variation between the countries in terms of the length of job durations, age structure, educational attainment and household structure. In most countries, average job duration is about 2.5–3.5 years, with the notably exceptions of Spain and Finland, which have an average job duration lower than 2 years.

In terms of job exit destination, most spells end in a job move (apart from censoring), especially in Germany, Austria and Denmark, while in countries such as France and Spain, workers end up relatively frequent in unemployment. Finally, employees in Ireland and Finland exit the labour market relatively frequent when their current job is ended. Due to the fact that some exit destinations – in particular self-employment – are not taken into consideration, all exit destinations' means (including censoring) do not sum up to one.

Tenure varies enormously among countries. Most employees from Ireland, Spain and Greece are home-owners, while in France and Germany, employees are mostly renters. To analyse the impact of various housing institutions, we use additional – aggregate – data information on residential mobility or the probability of buying residences. Our primary source of information is Belot and Ederveen (2005). They constructed several indicators that reflect differences in various types of transaction costs between countries. The following five indicators are incorporated in our dataset:

- **Tax**

  This indicator displays the percentage of the property's value paid by home-owners for transferring residences. Besides transfer taxes, this indicator also contains registration duties, notary fees and mortgage fees and the average real estate agent's fee as percentage of a property's value. Often, these latter fees are subject to negotiation between the real estate agent and the buyer or the seller. Usually, it is not compulsory to involve a real estate agent in the residential transaction.
- **Aggregate home-ownership**

  This indicator shows the percentage of home-ownership within a country (as opposed to renting). Note that this variable actually reflects the originals Oswald hypothesis. Moreover, this variable may capture unobserved country-specific effects in the choice between buying or renting a house. Different than the other indicators, this indicator shows intertemporal variation. It is based upon the dataset of Belot and Ederveen (2005) and upon additional data from Eurostat.
- **Mortgage interest deductability**

  This (binary) indicator is taken from Van den Noord and Heady (2001) and shows whether interest payments of mortgage loans are deductable from the personal income tax. Most countries allow for such tax deduction to some extent, with the exception of some larger countries like France, Germany and the UK.

- **Language diversity**

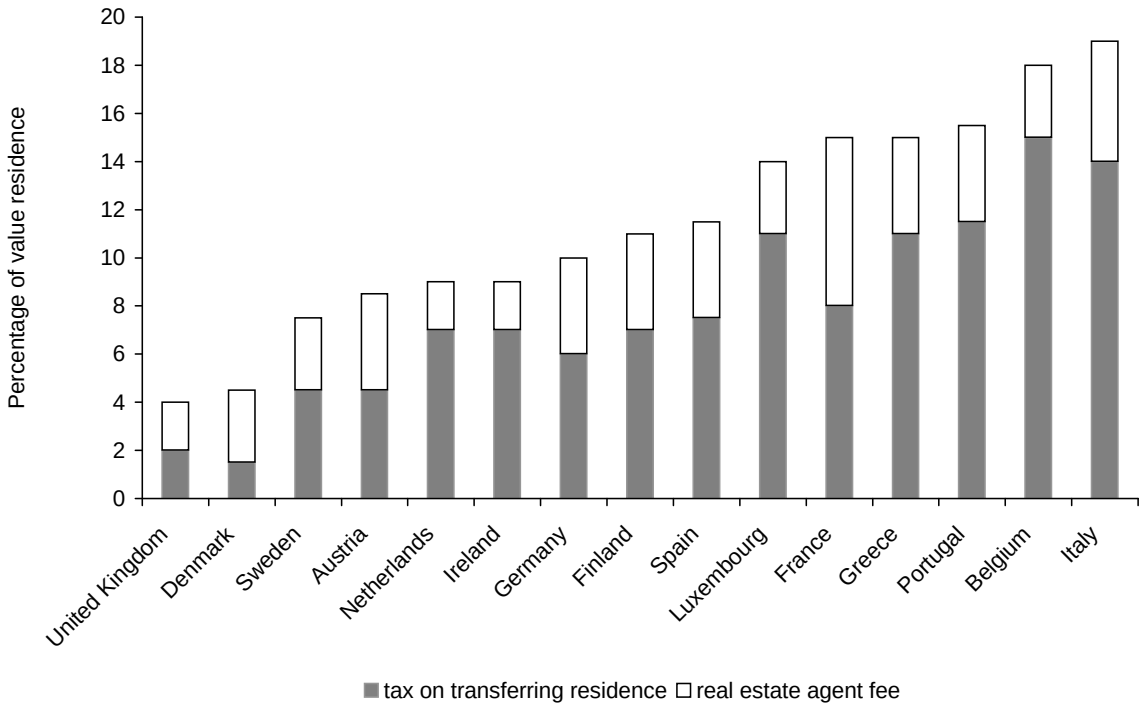
  This indicator measures on a scale from 0 to 1 the variety in languages (or dialects) within a country. We incorporate this variable because it may proxy the ease of moving to another region within a country. The particular variable we use here is the Ethnologue indicator, which actually uses the variation in local dialect. If $s_{i,A}$ denotes the share of the population speaking dialect i in country A, then the language diversity indicator is calculated as: $\text{language}_A = 1 - \sum_i s_{i,A}^2$.

- **Religion diversity**

  This indicator measures on a scale from 0 to 1 the variety in religion within a country. The argument is the same as for the previous indicator. If religion is rather heterogeneous within a country, people are hypothesized to be less inclined to move between regions. The indicator is calculated as: $\text{religion}_A = 1 - \sum_i s_{i,A}^2$, where $s_{i,A}$ denotes the share of the population with religion i in country A.

To gain insight in the variation of these institutions between European countries, Figure 4.1 displays the level of the 'Tax' indicator – separated in direct tax on transferring residences and mortgage fees – for the countries in our dataset.

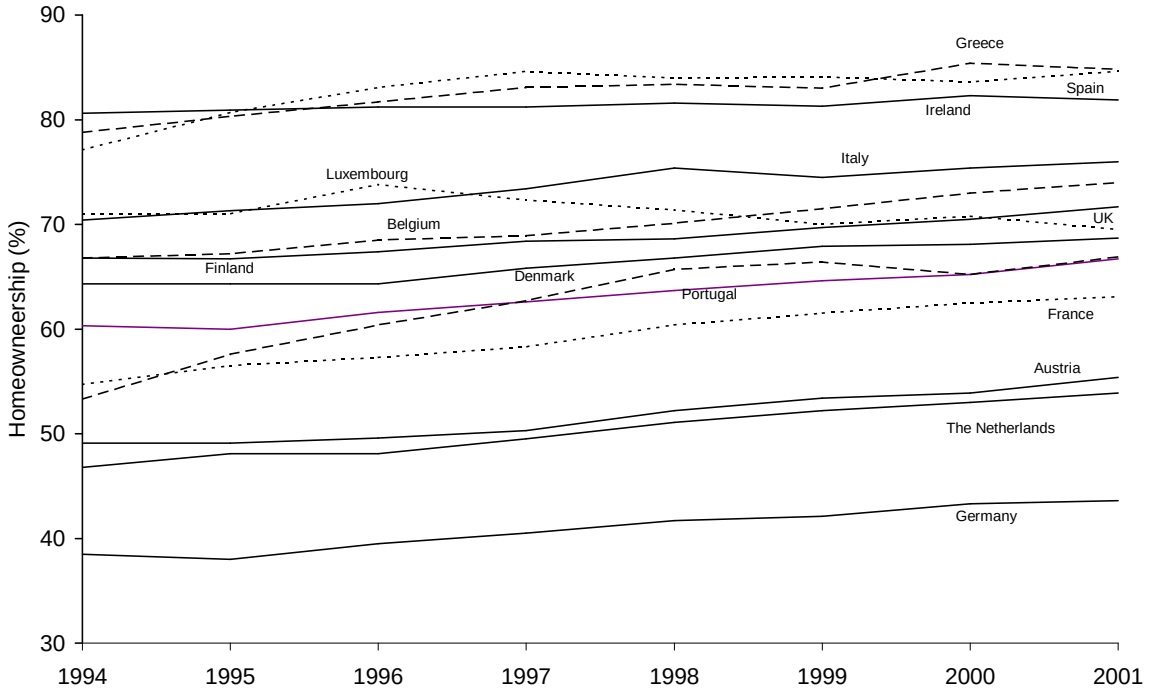
Figure 4.1 Taxation for moving residence and real estate agent fee for several European countries. (Source: Belot and Ederveen, 2005)



Residential movers in The United Kingdom seem to best off, with transaction costs of around 4%, while movers in Italy face the highest transactions costs (19%). Some geographical pattern is discernable. Southern European countries (together with Belgium and Luxembourg) have

relatively high transaction costs for moving residence compared to Northern countries, such as the Scandinavian countries, the United Kingdom (together with Austria). Usually, direct taxes are higher then real estate agents fees with the exception of Denmark and the United Kingdom.[7] Figure 4.2 gives the geographical and intertemporal variation in aggregate ownership rates.

Figure 4.2 Home-ownership rate for European countries between 1994-2001. Source: Eurostat

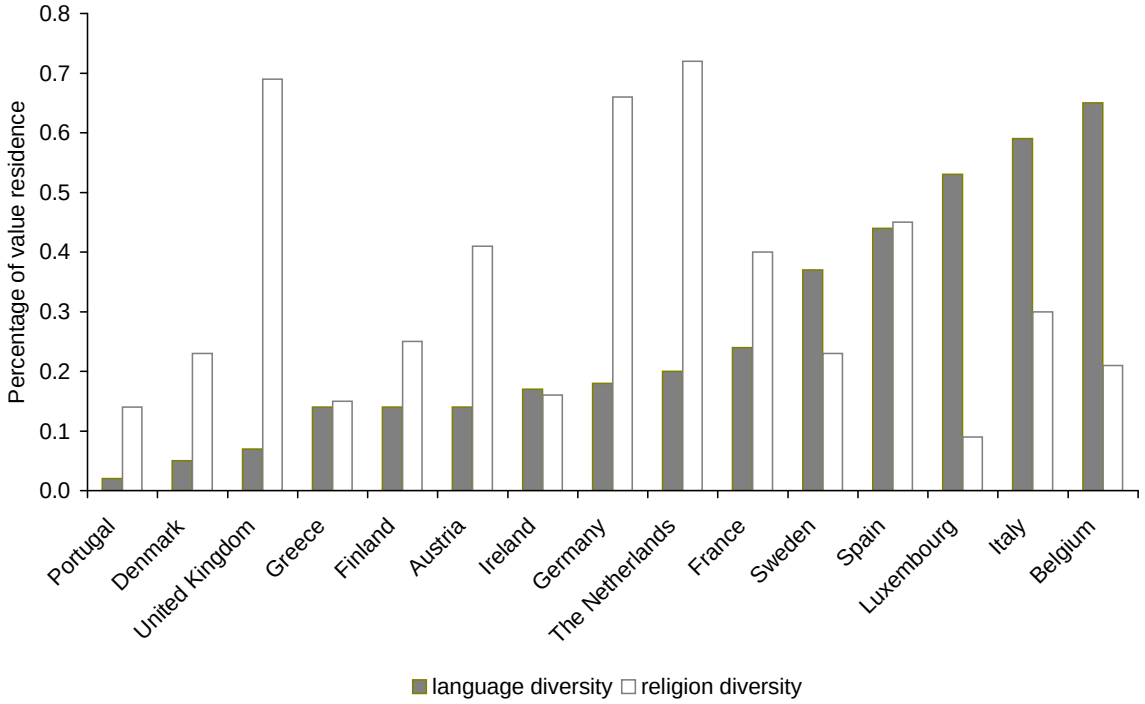


Although a geographical pattern is more difficult to discern, again it seems that Southern European countries together with Ireland and the United Kingdom have higher home-ownership rates than northern Europe. Moreover, there are some indications that countries with generous welfare systems, such as the Scandinavian countries, Germany and the Netherlands, have low home-ownership rates, although this pattern is less clear. Most countries show a rising homeowernship rate between 1994 and 2001. Especially Denmark (+14%), Belgium (+7%), Austria (+7%), France (+8%), and the Netherlands (+7%) witnessed a rapid increase in home-ownership during this period.

Finally, Figure 4.3 depicts the variation in language and religion diversity between countries. Unsurprisingly, most variation in language can be found in countries like Belgium, Italy, and Spain, the least in Portugal, Denmark and the United Kingdom. Religious diversification can be found especially in the United Kingdom, Germany and the Netherland – countries which happen to have large populations of immigrants – and display a more heterogeneous picture. Moreover,

[7] Interestingly, in the United States real estate agent fees are about three times higher than transaction taxes.

Figure 4.3 Language and religion diversity within several European countries. (Source: Belot and Ederveen, 2005)



countries like Germany and the Netherlands have large populations of both Protestants and Roman Catholics, where the former is usually divided in various religious subgroups.

In terms of demography, countries like Ireland and Austria seem to have a much younger age structure than countries like France, Greece or Belgium, with the Scandinavian countries somewhere in between. The educational level seems to be highest in countries like Belgium and Denmark and lowest in Portugal and Austria, although it is difficult to compare these variables directly because they have all been measured differently. Most countries display a similar pattern with regard to the number of children living in the household, Ireland and Austria are here the exceptions. The marital status shows more variation across countries. In Belgium about 72% of the employees in our sample live with a partner, while in Ireland this figure drops to 46% (which is remarkable given the number of children in the household). The variable describing whether the spouse is employed or not, displays a huge variation as well. In countries like Spain, Italy, Greece and Ireland the spouse usually is not employed, while in the Scandinavian countries, UK, Belgium, and France one out of two spouses has an income.

4.2 Implementation

We have monthly information about each worker's status and yearly information on all other characteristics. Thus, job tenure is measured in months and housing tenure in years. In terms of

exit destinations, we denote a job move when a worker changes job or apprenticeship, unemployment only when the next activity is labelled unemployment, and out-of-the labour force when a worker becomes retired, spends his or her time to (unpaid) housework activities, is doing community or military service, or ends up in other activities that are economically inactive.

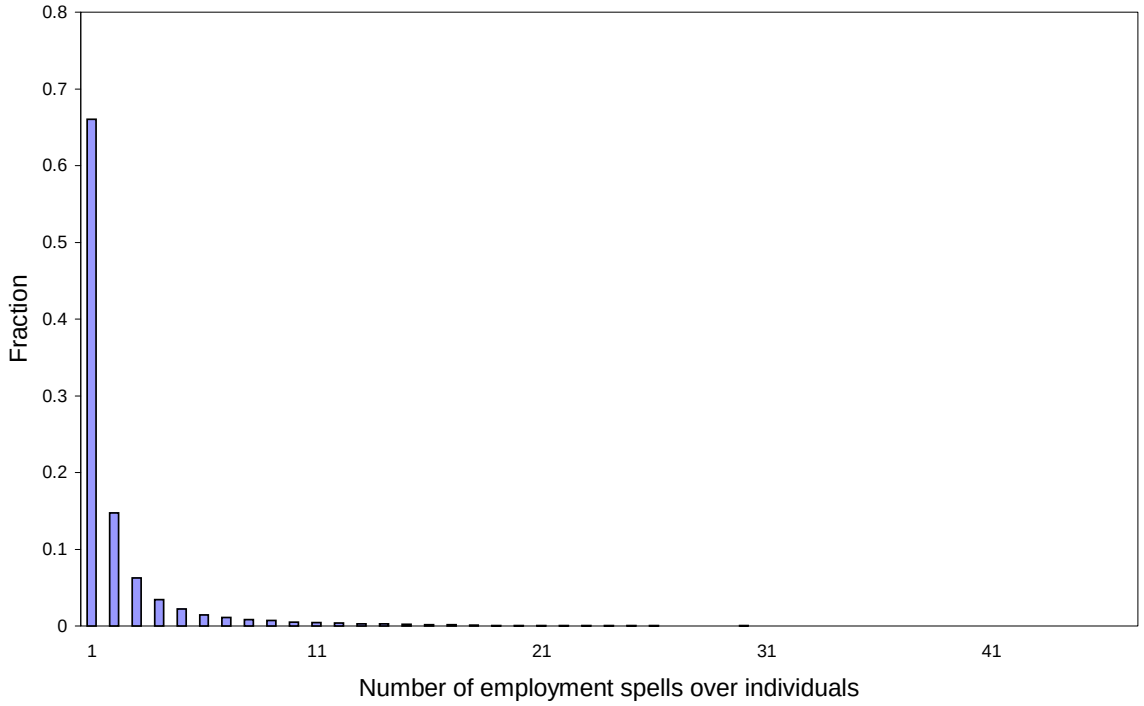
We use individual and household characteristics to control as much as possible for individual, household and life-cycle effects that might influence the event of leaving the current job spell apart from mobility effects. First, we use age cohort dummies as age controls rather well for live-cycle effects that might cause, e.g., individuals to enter an out-of-labour force status. Secondly, gender is included to control for the fact that females have a higher probability to look after the children and thus might leave a current job spell faster to become economically inactive. The same accounts for the dummies that control for the presence of children of different ages within the household. We include education – measured as low, medium and high – to control for the fact that higher educated workers earn higher wages and therefore show higher home-ownership rates. Here, medium education denotes the secondary level and high education a university degree or above. Having a partner in the household and whether the partner earns an income is included, as these households usually have higher probabilities to own a house as well. Finally, whether the worker rents or owns a house is included to test the Oswald hypothesis on a micro-level.

As variables that measure residential mobility we include the above discussed ‘Tax’, ‘Aggregate home-ownership’, ‘Mortgage interest deductability’, ‘Language diversity’, and ‘Religion Diversity’ variables. However, because aggregate home-ownership and mortgage interest deductability are assumed to influence only housing tenure and not job mobility, they are only included in the housing model. Note that possibilities for identification based upon these two variables are feable at best. Basically, identification is done mostly upon the availability of multiple spells, beside the functional form and the above mentioned country-specific variables. Figure 4.4 shows the distribution of multiple spells in our dataset.
There is a fair amount of multiple spells present in the data. More than 30% of the observed workers displays two or more employment spells.

All variables are measured at the moment the workers leaves his or her current job. As mentioned above, to control for duration dependence we adopt a nonparametric flexible specification. Here, duration dependence is assumed to be constant within the following duration intervals: within one year, between one and three years, between three and five years, and above five years. A specific approach to incorpote such a nonparametric specification is shown in Lancaster (1990).

Finally, we set the number of mass points (K) at two, which – in theory – leaves us with 16 probabilities to be estimated. However, experiments with subsamples show that a smaller amount of these probabilities is not only considerably faster, but gives (almost) the same estimation results as well. We therefore only use seven of these probabilities.

Figure 4.4 Number and distribution of multiple spells over individuals

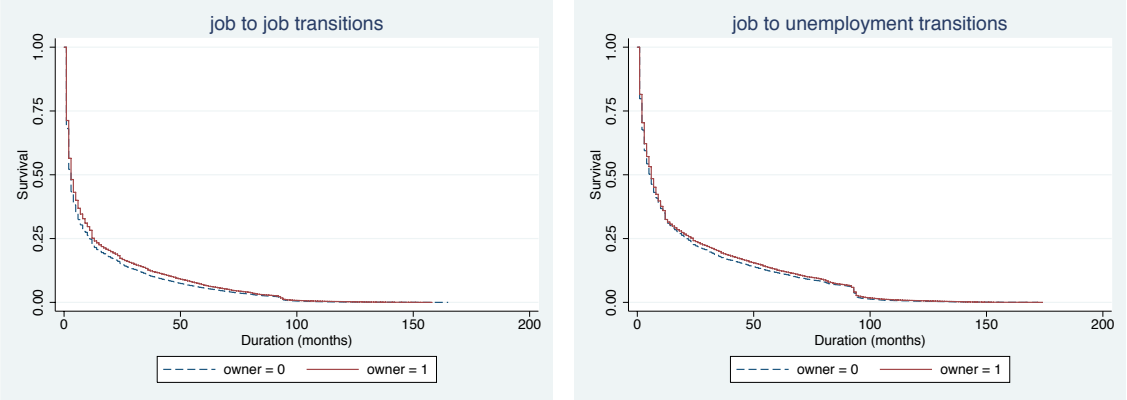


5 Empirical Results

5.1 Results

Before analysing the estimation results, the empirical nonparametric (Kaplan-Meyer) survival functions provide a first insight in the impact of home-ownership on job duration (see, e.g., Kiefer, 1988). Figure 5.1 presents these survival functions for job to job transitions and transitions to unemployment.

Figure 5.1 Kaplan-Meyer survival rates for (a) job to job transitions, and (b) job to unemployment transitions, duration in months



(a) (b)

From Figure 5.1, it follows that there is a general positive impact of home-ownership on the survival rate of the current job spell, regardless the exit destination. Thus, empirically, home-owners are less likely to end up in unemployment.[8] Further, they also have a tendency to change jobs less frequently than renters. However, these results do not shed light on the direction of the causal relation between home-ownership and job mobility, but merely depict their correlation. To look into this relation we estimate the joint model of residential and job mobility as given in equation (3.6).

In Table 5.1 the results of the joint model are presented. To facilitate the estimation we reduced our sample to a random subsample containing 10% of total observations. This subsample itself still consists of about 23,000 observations.

Looking first at the competing risk model, we find that most estimated coefficients of the competing hazard rate model are significant and comform intuition. Our main variable of

[8] Note the drop after 8 years in both Kaplan-Meyer survival functions. These are caused by the end of the ECHP survey in 2001. Some spells may, however, last longer than 8 years, because these spells started before the survey (and their starting date was recorded).Furthermore, the Kaplan-Meyer survival function for job to non-participation transitions provides a similar picture as those presented in Figure 5.1.

Table 5.1 Joint estimation of housing and competing risk model[a]

Variable	Prob. home-owner	$\theta_b(t)$ Employment	Unemployment	Non-participation
Constant	− 5.675 (0.18)			
Age dummies (baseline: age $<$ 25)				
Age 25–35	− 0.183 (0.05)	− 0.480 (0.03)	0.070 (0.05)	− 0.762 (0.05)
Age 35–45	0.450 (0.06)	− 0.986 (0.04)	− 0.224 (0.06)	− 1.488 (0.06)
Age $>$ 45	0.952 (0.06)	− 1.316 (0.04)	− 0.489 (0.06)	− 0.913 (0.05)
Female	− 0.128 (0.03)	0.175 (0.02)	0.128 (0.04)	0.688 (0.04)
Education dummies (baseline: education $=$ low)				
Education medium	0.280 (0.04)	− 0.064 (0.03)	− 0.271 (0.04)	0.024 (0.04)
Education high	0.256 (0.04)	− 0.316 (0.04)	− 0.636 (0.05)	0.030 (0.05)
Spouse employed	0.654 (0.04)	− 0.255 (0.04)	− 0.382 (0.05)	− 0.188 (0.05)
Living with partner	− 0.293 (0.05)	0.042 (0.04)	− 0.004 (0.05)	− 0.065 (0.05)
Children within the household (baseline: no children $\leq$ 18)				
Children $<$ 11	0.128 (0.04)	− 0.085 (0.03)	0.045 (0.04)	0.187 (0.04)
Children 12–15	0.501 (0.06)	− 0.134 (0.04)	0.063 (0.06)	− 0.133 (0.06)
Children 16–18	0.416 (0.06)	0.265 (0.04)	0.304 (0.06)	0.241 (0.05)
Home-owner		− 0.190 (0.03)	− 0.280 (0.04)	− 0.145 (0.04)
Tax (%)	− 0.031 (0.01)	− 0.021 (0.00)	− 0.011 (0.01)	− 0.048 (0.01)
Aggregation homeowers (%)	0.052 (0.00)			
Interest deduction	0.092 (0.04)			
Language diversity	0.151 (0.13)	0.564 (0.09)	0.814 (0.12)	0.313 (0.12)
Religion diversity	0.821 (0.12)	− 0.006 (0.07)	− 0.375 (0.10)	− 1.270 (0.09)
Baseline Hazard				
0–1 year		− 2.781 (0.07)	− 3.932 (0.11)	− 2.993 (0.09)
1–3 years		− 4.797 (0.08)	− -5.829 (0.12)	− 4.658 (0.10)
3–5 years		− 4.910 (0.09)	− 5.952 (0.13)	− 4.694 (0.11)
$>$ 5 years		− 4.831 (0.09)	− 5.312 (0.12)	− 4.267 (0.10)
Unobserved heterogeneity distribution				
Mass point	4.140 (0.03)	0.638 (0.03)	0.531 (0.04)	0.413 (0.04)
Probabilities				
$\Pr(G=\{0,0,0,0\})$	0.244			
$\Pr(G=\{0,1,0,0\})$	0.000			
$\Pr(G=\{0,0,1,0\})$	0.000			
$\Pr(G=\{0,0,0,1\})$	0.000			
$\Pr(G=\{1,0,0,0\})$	0.523			
$\Pr(G=\{0,1,1,1\})$	0.070			
$\Pr(G=\{1,1,1,1\})$	0.158			
Mean log-likelihood	− 3.879			
Number of spells	22,819			

[a] standard errors between parentheses

interest, being a home-owner, reduces the probability to change jobs significantly (risk reduction 17%). This result is very similar to outcomes of previous microeconomic studies (see, e.g., Van Leuvensteijn and Koning, 2004; Munch et al., 2006).[9] Further, home-ownership ensures that workers face smaller probabilities to become unemployed (risk reduction 24%) or non-participant (risk reduction 14%). Basically, this confirms the hypotheses of Dietz and Haurin (2003) and van Van Leuvensteijn and Koning (2004), that home-owners have larger job-commitment than renters. This can partly be explained by the substantial monetary transaction costs when being forced to sell their house because of, e.g., unemployment.

Looking at these transaction costs, we may conclude that the housing market institutions variables perform more or less conform expectations. Especially, high transfer tax and real estate agent's fees decrease the probability to change jobs significantly and have a corresponding effect on the hazard rate. Taxation on moving residence substantially reduce labour mobility. In this case each percentage point of taxation causes a risk reduction of 2% into a new job, 1% into unemployment and 5% into the out-of-labour force after taking the indirect effect through the housing model into account. Thus, with high taxation of each housing transaction, home-owners face substantial moving costs and reduce thus their geographical mobility. This effect causes their hazard rates out of employment to decrease. Note that this taxation effect is remarkably similar to the effect of home-ownership.

The variables 'Language diversity' and 'Religion diversity' were hypothesised to negatively affect job mobility because they hamper geographical mobility. However, especially the coefficients for 'Language diversity' do not confirm such a hypothesis. It may be that these variables pick up some unobserved country specific effects like the generosity of the welfare system or the importance of the social rented sector. The variable 'Religion diversity' show that countries that score high on this scale (Belgium, Spain, Italy, France) face higher risks out of employment, regardless of the exit destination. Countries with a high diversity in religion (like the UK, Germany and the Netherlands) show more job-to-job transitions, but lower hazards into unemployment or the out-of-labour force. Here, there seems to be some kind of European North-South division at work, rather then that these variables actually measure moving costs related to religion or language variety. As mentioned above, most other coefficients are conform intuition and have the (intuitively) right sign. First, consider the housing model. Transfer taxes, including real estate agent fees, reduces the probability to be home-owner. The country-specific home-ownership rate increases the probability of home-ownership and probably captures country-specific unobserved effects in the inclination to buy a house. As could be expected, the dummy for interest deduction on income tax is positive and significant, indicating that such policy measures might indeed lead to higher home-ownership rates.

[9] Risk into the out-of-labour force is somewhat inconsistent across studies. In our case, the coefficient is (marginally) significantly negative. Van Leuvensteijn and Koning (2004), e.g., find for the Netherlands that the coeffient is insignificantly positive. In any case, the coefficient is small, pointing to the limited effect of home-ownership in leaving the labour force.

Age tends to increase the probability on home-ownership just as being male, educated and having an employed spouse. Living together with an (unemployed) partner reduces home-ownership, while having (older) children increases this probability again. The latter is probably a proxy for a life-cycle effect, where individuals have a higher home-ownership rate at a later age. Finally, we consider language and religion diversity. The former increase the probability to be home-owner insignificantly, while the latter increases substantially home-ownership rates. These effects are a bit more difficult to explain, although it seems that the protestant countries, such as the UK, the Netherlands and Germany, favour home-ownership, while countries with many dialects, such as Italy, Luxembourg, and Belgium hamper home-ownership. However, again, we have to be careful here, because these variables may pick up an unobserved country-specific effect like the generosity of the welfare system, and its accompanying large social renting system.

The hazard rate for job-to-job transitions is declining with age, which is understandable because younger workers are more mobile on the labour market. The same accounts for the probability to enter unemployment. However, hazard rates into non-participation seems to rise again for older workers (with an age above 45). Females seem to have in general higher hazard rates out of employment than men; where females tend to end up as non-participant (their risk is about 88% higher). Higher educational levels results in a smaller hazard into another job or unemployment, although education does not affect the probability to become a non-participant very much. Having an employed spouse or living with a partner diminishes the risk of changing jobs or becoming unemployed. Again, the effect on leaving the labour force is less clear. Finally, having older children increases the probability of changing jobs, becoming unemployed or leaving the labour force. This might again point to a life-cycle effect.

The piecewise constant specification for duration dependence gives consistent and intuitively appealing outcomes. After the first year, all hazard rates out of employment drop significantly and continue falling with the employee's job duration. Finally, we turn to the unobserved heterogeneity distribution. All mass points are positive and very signicant. Most probability mass is assigned to the combination with low exit rates and a high probability on owning a home. Interestingly, only a small part of our population – around 23% – face higher exit rates out of their current job. The current estimation where seven segments are used show that two segments make up for almost 65% of all individuals.[10] The actual allocation of the probabilities to the segments depend upon the number of segments and the initial starting point of the algorithm, but experiments show that all combinations converge to the same loglikelihood and that the largest group is usually the segment that contains all favorable mass points (thus the one denoted as $G = \{1,0,0,0\}$).)

[10] Actually, estimations with only two segments – one with all mass points and one with no mass points, result in almost the same log-likelihood and coefficient estimates.

5.2 Discussion

The most intriguing finding from Table 5.1 is that some housing market institutions, such as the transfer tax on moving residence, negatively affect both the probability to own a house and the mobility on the labour market. This entails that, e.g., the transfer tax affect the labour market directly and indirectly. Directly via the negative effect on home-ownership rates and indirectly via the negative effect on labour market mobility. The latter effect is caused by the increase in (monetary) transaction costs when changing local labour markets.

Therefore, it is interesting to look at the impact of both direct and indirect effects of our housing market institutions as listed in Table 5.1. To do so, we first look at the separate country specific effects of individual home-ownership. Table 5.2 reports these effects in terms of percentage risk change.[11]

Table 5.2 Impact of home-ownership on labour mobility across European countries (%)[a]

	Employment	Impact on the risk on unemployment	Non-participation
Country	%		
Germany	7	− 48	10
Denmark	2	− 25	− 62
Netherlands	− 108	− 99	-
Belgium	2	− 102	25
Luxembourg	− 78	− 175	− 46
France	− 35	− 32	13
United Kingdom	− 67	− 53	− 16
Ireland	− 20	− 52	− 20
Italy	22	− 36	40
Greece	1	34	− 28
Spain	10	33	21
Portugal	− 55	− 49	− 51
Austria	− 12	− 41	− 47
Finland	− 7	17	16

[a] significant at 5% in bold

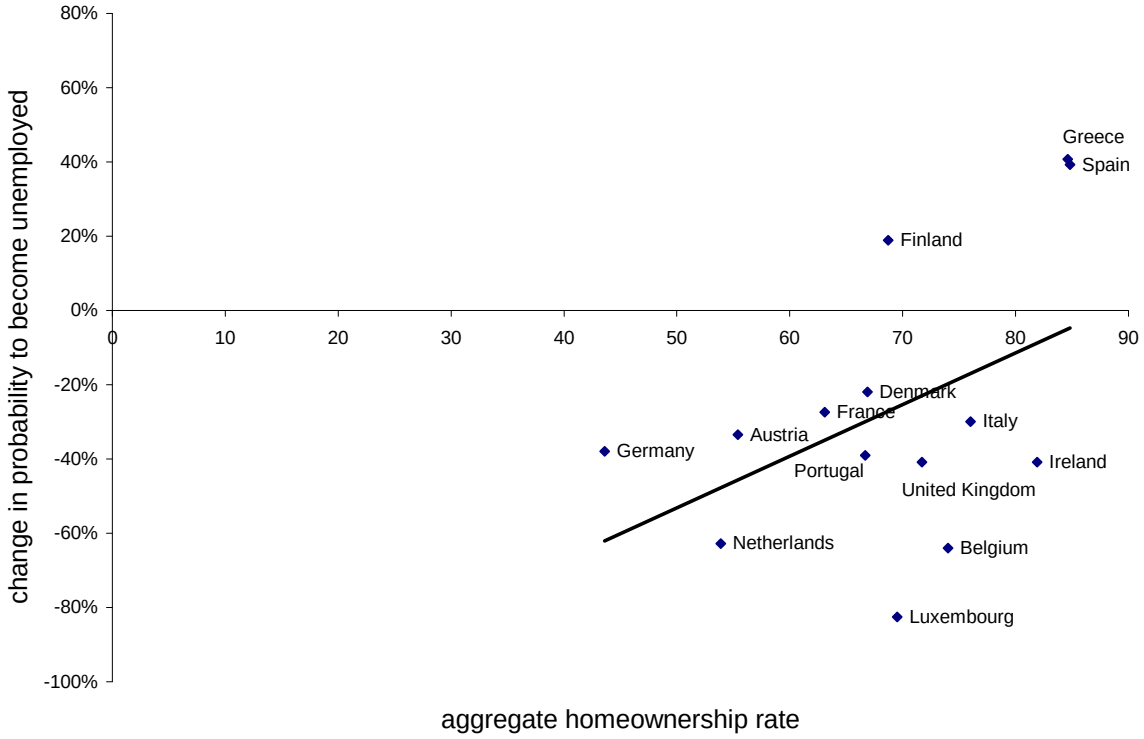
Clearly, there are some differences between European countries but the overall result seems to be rather consistent. Home-ownership has a negative impact on the job-to-job transition rate and on the changes of getting unemployed or becoming a non-participant. Noteworthy exceptions are Spain, Greece and Italy, where in the former two countries home-ownership leads to higher job-to-unemployment transition rates and in the latter country home-ownership has a positive impact on the rate of changing jobs or leaving the labour force. The effects of home-ownership

[11] Basically, these effects are derived from a similar estimation as shown in Table 5.1, but then with country specific individual home-ownership effects instead of generic individual home-ownership effects.

are rather high in countries like The Netherlands, Luxembourg, The United Kingdom and Portugal, although a real geographical pattern is difficult to discern.

Focussing on the relation between unemployment and the national home-ownership rate, Figure 5.2 depicts the relation between the country specific individual home-ownership effect on the risk on unemployment and the national home-ownership rate.[12]

Figure 5.2 Relation between country specific effects on the risk on unemployment and aggregate home-ownership.

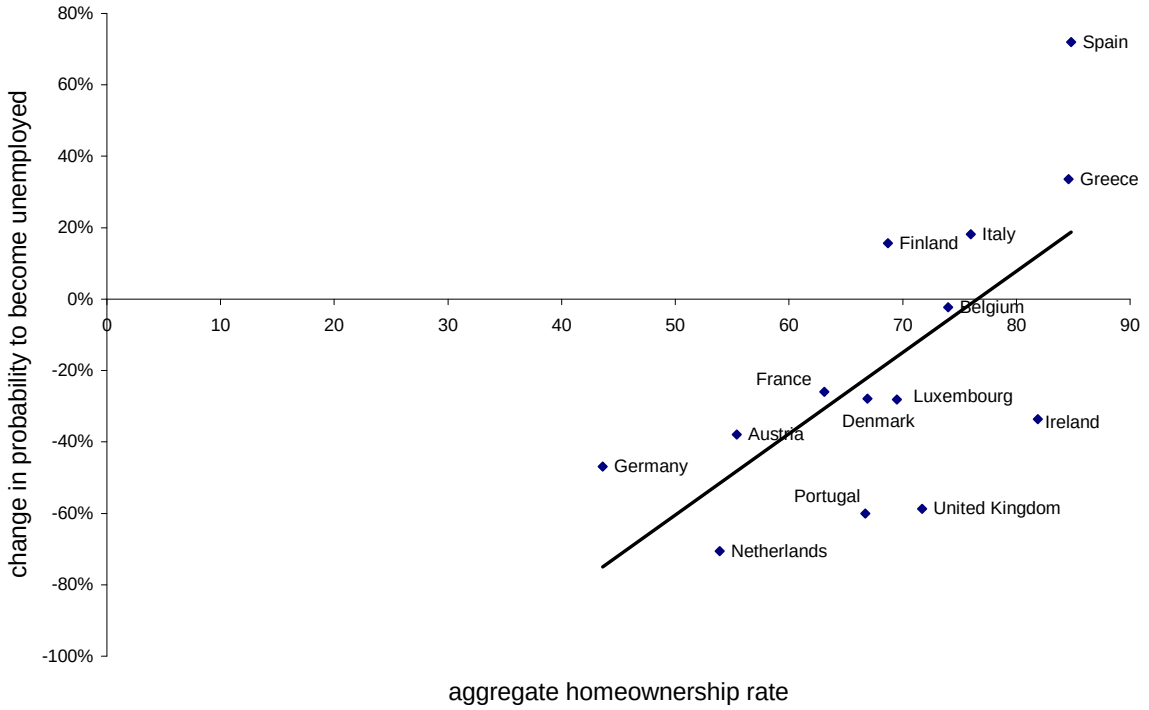


Interestingly, Figure 5.2 shows the same relationship as found by macroeconomic reseach (such as in, e.g. Oswald, 1997, 1999). So it seems that the variation in country specific unemployment rates is not caused by individual home-ownership per se, but instead by country specific factors. Indeed, if we take into account our housing market variables (transfer tax, religion and language variables) as well – as in Figure 5.3 –, then the relation between these country specific effects together with the housing market institutions and aggegrate home-ownership becomes even stronger (the R^2 more than doubles).

Obviously, both Figures 5.2 and 5.3 depict mere correlations instead of causal effects. However, using our microeconomic results it is possible to mimic the macroeconomic results of Oswald.

[12] The national home-ownership rate is measured here as the mean national home-ownership rate taken over the period 1994–2001.

Figure 5.3 Relation between country specific effects together with housing market institutions on the risk on unemployment and aggregate home-ownership.



Our results suggest that – although home-ownership causes workers to be less mobile on the labour market – country specific factors and especially housing market institutions causes both a decrease in national home-ownership rates as well as a decrease in labour market mobility leading to a seemingly causal relation between unemployment and home-ownership rates.

To a certain extent, this result should carry over to research at the regional level, as long as the regions under consideration are larger than local labour markets. However, national housing market institutions, such as the taxation on buying a house, stop playing a role at the regional level. Thus, one may predict that the relation between aggregate home-ownership and unemployment decreases – and finally may even becomes negative as our individual empirical results suggest – when looking at a more detailed spatial level.

Admittedly, our research focuses solely on home-owners. However, workers that rent from governmental of non-profit organisations may face substantial transaction costs as well – especially when this (social) renting market is very tight. In this case, the sign of these transaction costs is not directly clear. Do they increase when the social renting market increases, because of, e.g., a tighter and less mobile housing market or do they decrease because of an increasing ease in finding a new residence? Experiences from the Netherlands and the UK at least suggest the first relationship, which would mean that large social renting sectors increase both aggregate and individual unemployment rates.

6 Conclusion

From the micro-econometric literature, the conclusion can be drawn that home-ownership diminishes unemployment by decreasing the probability to become unemployed. From the macro-econometric literature it follows that aggregate home-ownership increases unemployment, mainly due to decreased flexibility of housing markets. home-ownership impedes labour mobility between regions. In this paper, we are able to reconcile these two contradictory outcomes by focusing on transaction costs in the housing market instead of home-ownership rates. We show that transaction costs impede labour mobility, but also diminish the attractiveness of becoming home-owner.

Our microeconomic competing risk model clearly shows that – in line with previous research – home-ownership reduces labour mobility. Thus, home-owners have lower exit rates to any destination out of their current job spell. However, there are other variables, i.e. housing institutions, that play an influential role as well. These housing institutions, like transaction costs are usually country (or region) specific and affect both home-ownership incidence and labour market mobility. Firstly, housing markets institutions, such as transaction costs, might hamper the ease of buying a house. Secondly, they also create obstacles for workers to move residence, because of, e.g., finding a more suitable job in a different local labour market, and thus reduce labour market mobility. This means that from a macroeconomic perspective countries with higher home-ownership rates may coincide with countries with higher unemployment rates, because actual transaction costs for moving in those countries are higher (transaction costs of home-owners tend to be higher than that of renters). However, this relation is not driven by home-ownership but mostly by the direct effect of transaction costs on the housing market and on labour mobility.

Another contribution of this paper to the literature is the overview it gives of the differences between European countries. The effects of home-ownership seems to be lowest for the northern European countries: Denmark and Finland. Especially strong effects of individual home-ownership can be found in countries such as the Netherlands, Portugal, Luxembourg and the UK. For southern European countries, such as Spain and Greece, home-ownership has even a positive impact on the risk on unemployment.

Finally, from this paper follows a clear policy implication for Europe. Labour markets will become more flexible by diminishing the transfer tax on moving residence. Reduced transfer taxes enhance the attractiveness for the unemployed to search outside their local area for jobs, and will encourage employees to change jobs.

Appendix A The EM algorithm

Since a direct application of the maximum likelihood to a mixing distribution is – at least theoretically – not feasible, we apply the EM algorithm to fit the mixture distribution. Originally the EM procedure has been proposed by Dempster et al. (1977) to control for missing data, but the procedure seems to be particularly well equipped to deal with finite mixtures (see, e.g., Guo and Rodriguez, 1992, for an application of an EM algorithm in a duration framework).

The procedure proceeds as follows. Suppose we want to fit a mixture distribution with K support points leading to a total number of M combinations of segments.[13] These segments have unknown values drawn from a certain probability distribution, say $v_1, \ldots, v_M$, to which unknown probabilities, $\pi_1, \ldots, \pi_M$, are attached. Now, for each individual, introduce a vector of indicator variables, $z_i = (z_{i1}, \ldots, z_{iM})$, where z_{im} takes the value 1 if individual i is associated with the m-th segment, else it is zero. Thus, z_i has a multinomial distribution with parameters π, or:

$$f(z_i|\pi) = \prod_{m=1}^{M} \pi_m^{z_{im}}, \tag{A.1}$$

Now denote the individual combined likelihood of the competing risk model with the housing tenure model as $L_i^*(\phi)$, then, if z_i would have been observed, individual i would contribute to the log-likelihood (apart from the multiple spells) as follows:

$$\log L_i(\pi, v, \phi) = \sum_{m=1}^{M} z_{im} \left[\log(\pi_k) + \log L_i^*(\phi, v)\right]. \tag{A.2}$$

In the expectation step (E), we first estimate the cluster probabilities for each individual (*cf.* Leisch, 2004). Thus, the probability that individual i belongs to segment m is:

$$\hat{z}_{im} = \frac{\pi_m \log L_i^*(\phi, v_m)}{\sum_{k=1}^{M} \pi_k \log L_i^*(\phi, v_k)}. \tag{A.3}$$

The $\hat{z}_{im}$'s are evaluated at current parameter estimates and can be plugged in in the log-likelihood function (A.2).

The maximisation step (M) now consists of estimating the parameter vectors v, ϕ, and π. The first two can be found, e.g, by applying conventional maximum likelihood procedures to:

$$\log L_i(v, \phi) = \sum_{m=1}^{M} z_{im} \left[\log L_i^*(\phi, v)\right]. \tag{A.4}$$

And the vector $\pi = (\pi_1, \ldots, \pi_M)$ can easily be found by:

$$\hat{\pi}_m = \frac{1}{N} \sum_{i=1}^{N} \hat{z}_{im}. \tag{A.5}$$

The E- and M-steps are repeated until the log-likelihood of (A.2) stops improving.

[13] In our case, we have a maximum of $(K-1) \times 4$ support points.

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European Network of Economic Policy Research Institutes
c/o Centre for European Policy Studies
Place du Congrès 1 ▪ 1000 Brussels ▪ Tel: 32(0) 229.39.11 ▪ Fax: 32(0) 219.41.51
Website: http//:www.enepri.org ▪ E-mail: info@enepri.org