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WORKING PAPER

Does homeownership lead to longer unemployment spells? The role of mortgage payments

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Abstract

This paper examines the impact of housing tenure choice on unemployment duration in Belgium using EU-SILC micro data. We contribute to the literature in distinguishing homeowners with mortgage payments and outright homeowners. We simultaneously estimate unemployment duration by a mixed proportional hazard model, and the probability of being an outright homeowner, a homeowner with mortgage payments or a tenant by a mixed multinomial logit model. To be able to correctly identify the causal influence of different types of housing tenure on unemployment duration, we use instrumental variables. Our results show that homeowners with a mortgage exit unemployment first. Outright owners stay unemployed the longest. Tenants take an intermediate position. Moreover, our results reveal the different share of mortgage holders within the group of homeowners as a possible explanation for the discrepancy between former contributions to this literature.

JEL classification: C41, J64, R2.
Keywords: unemployment, housing tenure, duration analysis.

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1. Introduction

Does homeownership impair an individual's labour market outcome? Seminal work by A.J. Oswald (1996, 1997) suggests that it does. A key element in his view is that high costs of buying and selling homes make homeowners less geographically mobile than tenants. As a result, in case of job loss, the number of suitable vacancies within homeowners' reach will be much smaller. Their exit rate from unemployment will therefore be lower. Empirically, many studies confirm Oswald's claim that homeowners are geographically less mobile than tenants (see, e.g., Hughes and McCormick, 1981, 1987; Böheim and Taylor, 2002; Caldera Sánchez and Andrews, 2011; Isebaert, 2013). Nevertheless, direct research into the relationship between housing tenure choice and labour market outcomes using micro data does generally not find that homeowners have worse labour market perspectives than tenants. Battu et al. (2008) for example find no significant difference in the speed of transition from unemployment into employment among homeowners versus private tenants in the UK. Munch et al. (2006) even observe a faster exit from unemployment into employment among owners than among tenants in a large panel of Danish individuals, while van Leuvensteijn and Koning (2004) find a significant negative impact of homeownership on the risk of becoming unemployed in the Netherlands. These three papers are important not only for their results, but also methodologically. Each of them adequately deals with the impact of individuals' unobserved characteristics which may affect both their labour market situation and their tenure choice.

From a theoretical point of view, various explanations have been advanced in these and other micro studies to rationalize the better perspectives of owners on the labour market. Coulson and Fisher (2002) emphasize the importance of social networks in the search for work. Homeowners tend to invest more in their social network which improves their local job opportunities. Munch et al. (2006) add that because of high moving costs, homeowners have a lower reservation wage and a higher search intensity for local jobs. According to van Leuvensteijn and Koning (2004) and Munch et al. (2008) homeowners are willing to invest more in their job, in order to maximize the probability of staying in the local job. Accordingly, firms anticipate longer employment duration of homeowners and so are willing to invest in firm-specific training. This further increases firm-specific productivity of the homeowner.

This paper investigates the impact of housing tenure choice on unemployment duration in Belgium, using EU-SILC micro data. Our basic research question is therefore the same as that of Munch et al. (2006) and Battu et al. (2008). We also follow these studies in their choice of methodology. Our main contribution to the literature is that we distinguish different types of homeowners. Whereas Munch et al. (2006) only make the broad subdivision between homeowners and non-homeowners, and Battu et al. (2008) split up the second group into public and private tenants, we distinguish homeowners with mortgage payments and outright owners. For Belgium, where the rate of homeownership is close to 70%, this is clearly the most relevant distinction. About two thirds of all homeowners are mortgagees, about one third are outright owners[1]. From the point of view of the Oswald hypothesis, different labour market outcomes between both groups of owners should not be expected. The search and transaction costs that are associated with moving are similar for outright owners and mortgagees[2]. The motivation for not treating homeowners as a homogeneous group lies elsewhere. Rouwendal and Nijkamp (2010) embed the distinction between both types of owner-occupiers in a theoretical framework explaining search behaviour. Building on Munch et al. (2006), they develop a model with both local and non-local labour markets. Moving costs both decrease owners' nonlocal job search (the Oswald effect) and increase their local search. The net effect of moving costs in Rouwendal and Nijkamp is that owners on average experience longer unemployment duration. They further advance this theoretical model by introducing housing costs. The fraction of the wage that is not spent on housing goes to nondurable consumption which determines utility. Decreasing marginal utility explains why the unemployed will have a higher search intensity when housing costs are high. This result may critically affect the earlier theoretical outcome. According to Rouwendal and Nijkamp's model, if housing costs are lower for homeowners than for tenants (as is the case for outright homeowners), owners will experience even longer

[1] Private rental and social housing account for about 23% and 7% of housing supply respectively. In the UK that is 15.6% and 18% (Pittini and Laino, 2011).

[2] Unsurprisingly, the above mentioned empirical literature studying geographical mobility leaves us with mostly ambiguous answers to the question whether outright owners or mortgagees are more geographically mobile. For example, in a cross-section of 23 OECD countries, Caldera Sánchez and Andrews (2011) find outright owners to be less residentially mobile than owners with mortgage payments in 15 countries. They observe the opposite in 4 other countries. In 4 last countries, one of which is Belgium, there is no significant difference between outright owners and mortgagees. Isebaert (2013) by contrast uses panel data and finds mortgagees to be less geographically mobile than outright owners in Belgium. The only robust empirical result across studies seems to be that tenants are more residentially mobile than owners.

unemployment duration. The Oswald effect is then reinforced by a (low) housing cost effect. If housing costs for owners are higher than for tenants (as may be the case for mortgagees), the reverse occurs. The unemployed owners' search intensity will then rise, and their unemployment duration falls. The Oswald effect may then be beaten by a (high) housing cost effect. Building on this theory, one may therefore expect the fastest exit from unemployment for mortgagees, and the slowest for outright owners. Tenants may take an intermediate position[3].

Empirically, to the best of our knowledge, only Goss and Phillips (1997) and Flatau et al. (2003) made the distinction between outright owners and owners with a mortgage to address differences in unemployment duration before. Both papers find higher exit rates from unemployment for homeowners with a mortgage. Methodologically, however, the empirical models used in these studies do not adequately handle the potential endogeneity bias that may arise if a person's unobserved characteristics affect both his unemployment duration and housing tenure. Munch et al. (2006) provide the example of a person who is inherently less mobile because of preference for stability. On the one hand, this person will be inclined to buy a house and settle in a chosen area. On the other hand, the stability-preferring individual is less willing to move for job reasons, extending the duration of an unemployment spell. One might falsely interpret the combination of these events as a causal relationship from homeownership to longer unemployment. To resolve this issue, we adopt an econometric framework that builds on those used by van Leuvensteijn and Koning (2004), Munch et al. (2006) and Battu et al. (2008). More precisely, we simultaneously estimate unemployment duration by a mixed proportional hazard model, and the probability of being an outright homeowner, a homeowner with mortgage payments or a tenant by a mixed multinomial logit model. To be able to correctly identify the causal influence of different types of housing tenure on unemployment duration, we use instrumental variables (exclusion restrictions). These are variables that influence housing tenure but do not directly

[3] Available data for Belgium support the idea that housing costs differ significantly by tenure situation. Vastmans and Buyst (2011) reveal that monthly mortgage payments account for 24.6% of a household's net monthly income, on average. Housing costs of outright owners by contrast are limited to the maintenance costs. As to the distinction between homeowners with a mortgage and tenants, Heylen et al. (2007) report a mean rental price in the Flemish region in 2005 of 396€, while the mean mortgage payment was equal to 564€. The latter clearly represents the heaviest burden on the household budget. Furthermore, tenants experience lower costs of maintenance since the depreciation of a dwelling is to a great extent at the expense of the owner.

affect unemployment duration. Finding good instruments is often a delicate task in this literature. We contribute by adding a new instrument, which is the relative price of buying to renting a house at the moment in the past that people signed the contract underlying their current tenure.

This paper is the first to analyse the research question at stake for Belgium. For several reasons Belgium may be a very interesting case to test the link between housing and labour market situation at the micro level. The rate of homeownership is considerably higher than in the countries analysed in the aforementioned studies (van Ewijk and van Leuvensteijn, 2009). Furthermore, Belgian tax rates on housing transactions are among the highest in the world (European Mortgage Federation, 2010). Also Belgian labour market characteristics differ strongly from those in the previously investigated countries. To mention one, unemployment benefit duration is much longer (OECD, 2013). Taking into account all these considerations, if there were one country to expect a strong Oswald effect, it would be Belgium. Recent macroeconomic work also confirms this. Using aggregate data of Belgian districts since 1970, Isebaert et al. (2013) find strong empirical evidence in favour of the Oswald hypothesis.

In accordance with the aforementioned theoretical expectations in the spirit of Rouwendal and Nijkamp (2010), our empirical results prove that homeowners are not a homogeneous group. The result found by Munch et al. (2006) that homeowners have shorter unemployment spells than tenants, only applies to homeowners with a mortgage. Outright owners by contrast remain unemployed the longest. Not having to pay rent or to repay a mortgage seemingly decreases the search intensity of an individual. This result survives various robustness checks. For example, it does not depend on the specific exclusion restrictions that we impose on the model. Neither is it conditional on the age of the individuals in our sample: it also holds if we restrict the sample to owners younger than 50.

Our results may transcend the single Belgian case. A possible explanation for the discrepancy between the results of Munch et al. (2006) for Denmark and Battu et al. (2008) for the UK is the different share of mortgage holders within the group of homeowners. In Denmark the fraction of mortgagees is about 73%. Therefore, it is not surprising that the positive effect for this subgroup dominates the negative effect for outright owners, when no

distinction is made between both groups. In the UK the fraction of mortgagees in the group of owners is (only) about 56%. Positive and negative effects on the exit rate from unemployment from both subgroups may then cancel out.

The structure of this paper is as follows. In the next section we provide the reader with an introduction to the dataset and some descriptive analyses. The specification of our methodological framework is included in Section 3. In Section 4 we show the results of our estimations. A final section concludes.

2. Data and descriptive statistics

To analyse unemployment spells in Belgium, we use the recent dataset of the European Union Statistics on Income and Living Conditions (EU-SILC). This survey provides longitudinal data of topics such as labour market conditions, education, housing tenure, income and social exclusion. It was designed in order to replace the less harmonized European Community Household Panel (ECHP). By using the EU-SILC data, we are able to analyse household behaviour in the period 2003-2008. A prominent characteristic of this survey is the rotating sample design. The first quarter of the sample is replaced each year. Hence, the sample of households is fully renewed after four years.

We use the spells of unemployment that start after a period of employment (i.e. left-censored spells are withheld). A spell can end with re-employment or with right-censoring. The latter can be the result of an activity status different from (un)employment[4], or can be due to non-observation in the next period. Consequently, unemployment spells that outreach the period of observation, are automatically right-censored. Only the first unemployment spell of each individual is included. During the 6 year time interval, we observe 1048 unemployment spells of which 26 are dropped from the sample because of missing values for one or more of the explanatory variables. Yet another 9 spells are filtered out for the individuals indicating they enjoy “free housing accommodation”. From the remaining 1013 unemployment spells, 557 spells are fully recorded and 456 spells are right-censored.

[4] Possible destinations are retirement, being permanently disabled or taking up domestic tasks and care responsibilities.

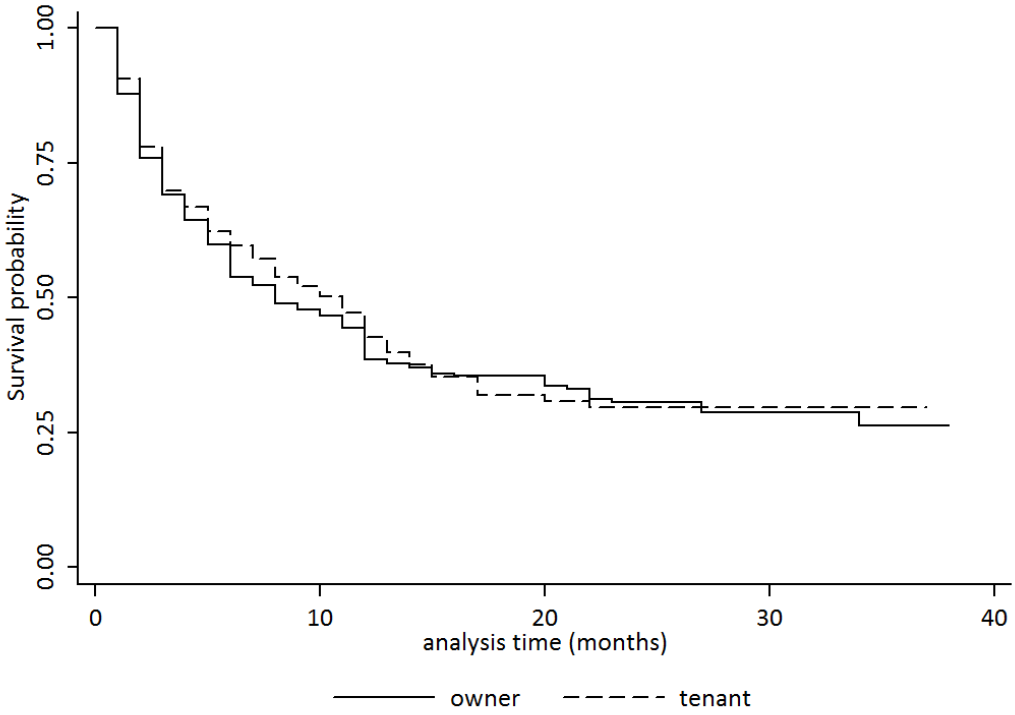
In the EU-SILC dataset, the labour market status is observed monthly. For comparison, it is measured with a weekly frequency in the Danish dataset of Munch et al. (2006). Labour market observations in the BHPS used by Battu et al. (2008) are also monthly. Figure 1 reports non-parametric Kaplan-Meier estimates of the monthly transition out of unemployment by housing status at the start of the unemployment spell in our dataset. Panel A illustrates that owners and tenants show similar transition patterns when we merge outright owners and owners with mortgage payments into one group. By contrast, when we distinguish the latter two categories of owners, as presented in Panel B, we find clear differences between the three housing options. Outright owners have, on average, the longest unemployment spells (with a median duration of 33 months). Tenants and mortgagees have shorter spells with a median duration of 8 respectively 5 months. However, since this comparison does not take selection on neither observable nor unobservable characteristics into account, we cannot conclude from this descriptive evidence that the transition out of unemployment happens slower for outright owners. These particular individuals might have very low chances to leave unemployment fast because of other factors that are dominant within the group of outright owners. The econometric method that we apply in this paper takes the selection on (un)observable characteristics into account and leads therefore to a better founded answer to our research question.

The mean and standard deviation of the explanatory variables used in our analysis are listed in Table 1. As a matter of illustration, these two statistics are shown for each housing status separately as well. For all the explanatory variables in both the unemployment duration model and the housing status model, we use their value at the start of the unemployment spell, and then keep it constant. If these variables were not kept constant, the assumption of strict exogeneity would be violated due to the possibility of reverse causality (see the next section for a more extensive elaboration on this).[5] EU-SILC measures the status of all these explanatory variables with a yearly frequency, at the start of each calendar year (around March). Also the housing status is measured with a yearly frequency. Given our monthly observations of the labour market status, we interpolate in

[5] The only explanatory variable that we allow to vary during unemployment spells is the regional unemployment rate. This variable is strictly exogenous all the way. It contributes to the model by capturing the business cycle at the regional level. Belgium consists of three regions (Flanders, Wallonia and Brussels).

Figure 1: Kaplan-Meier estimates – unemployment duration by housing status

A. Owners versus tenants



B. Mortgagees versus outright owners versus tenants

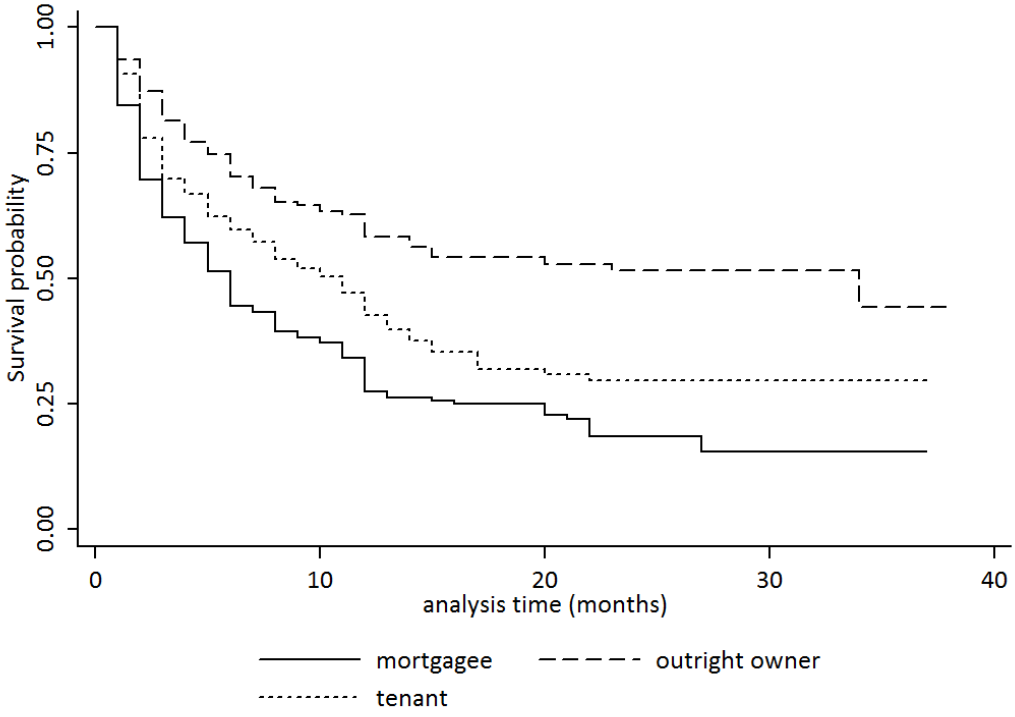


Table 1: Descriptive Statistics of Explanatory Variables								
	Overall		Tenants		Outright owners		Mortgagees	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Housing tenure categories								
Tenant	0.35	(0.48)						
Outright owner	0.23	(0.42)						
Mortgagee	0.42	(0.49)						
Explanatory variables used in both unemployment duration and housing equations								
Woman	0.57	(0.49)	0.59	(0.49)	0.46	(0.50)	0.62	(0.48)
Foreign nationality	0.15	(0.36)	0.23	(0.42)	0.07	(0.25)	0.14	(0.35)
Age 16-24 years	0.09	(0.29)	0.14	(0.35)	0.06	(0.24)	0.07	(0.25)
Age 25-34 years	0.31	(0.46)	0.36	(0.48)	0.15	(0.36)	0.36	(0.48)
Age 35-49 years	0.33	(0.47)	0.33	(0.47)	0.18	(0.38)	0.41	(0.49)
Age ≥ 50 years	0.27	(0.44)	0.16	(0.37)	0.61	(0.49)	0.17	(0.37)
Low educated	0.27	(0.44)	0.32	(0.47)	0.28	(0.45)	0.22	(0.42)
Middle educated	0.40	(0.49)	0.43	(0.50)	0.44	(0.50)	0.37	(0.48)
High educated	0.33	(0.47)	0.26	(0.44)	0.28	(0.45)	0.41	(0.49)
Cohabiting partner	0.66	(0.47)	0.51	(0.50)	0.65	(0.48)	0.80	(0.40)
Working partner	0.42	(0.49)	0.30	(0.46)	0.27	(0.45)	0.61	(0.49)
Having children younger than 18	0.52	(0.50)	0.46	(0.50)	0.24	(0.43)	0.72	(0.45)
Densely populated area	0.54	(0.50)	0.67	(0.47)	0.49	(0.50)	0.45	(0.50)
Brussels	0.12	(0.33)	0.19	(0.40)	0.09	(0.28)	0.08	(0.27)
Flanders	0.53	(0.50)	0.50	(0.50)	0.58	(0.49)	0.53	(0.50)
Wallonia	0.34	(0.48)	0.30	(0.46)	0.33	(0.47)	0.39	(0.49)
Unemployment rate (province)	0.12	(0.06)	0.13	(0.06)	0.12	(0.06)	0.12	(0.06)
Unemployment rate (region)	0.11	(0.06)	0.12	(0.06)	0.11	(0.05)	0.11	(0.05)
Explanatory variables used only in housing equations								
% homeowners (province)	0.67	(0.10)	0.65	(0.12)	0.68	(0.09)	0.68	(0.09)
House price to rent ratio in year of contract (province)	1.47	(0.63)	1.79	(0.78)	1.20	(0.43)	1.36	(0.45)

Source: own calculations based on EU-SILC data, except for unemployment rate (VDAB, FOREM, Belgostat, Vlaamse Arbeidsrekening), homeownership rate (Social-Economic Survey 2011) and house price to rent ratio. (FOD Economie, Belgian Federal Government)
A more detailed definition of each variable is given in appendix A.1.

the spirit of van Leuvensteijn and Koning (2004) and Battu et al. (2008) the yearly observations for the explanatory variables into monthly observations. We assume that the monthly values from October of year *y-1* until September of year *y* equal the observed yearly value in year *y*.[6] This may unavoidably cause some measurement errors. Housing status may in some cases be misperceived. As an example, it might be possible that an individual

[6] The interpolation that we impose assigns the yearly observation in EU-SILC s to six months before and six months after the moment of measurement (around March). This also brings the advantage of a larger sample. When new households enter the panel in year *y*, data is collected also about their labour market situation in the twelve months of *y-1*. Spells that start in October of *y-1* can therefore also be included in our sample.

becomes unemployed in October of year *y-1* and changes tenure in December of that year. In that case our interpolation would imply a wrong value for the housing status variable related to this unemployment spell. Van Leuvensteijn and Koning (2004) also recognize this possibility of measurement error, but state that there are no strong a priori beliefs that these errors lead to an important bias in the estimation results. Considering the results of a sensitivity analysis that we did, we agree. More precisely, we imposed for the yearly observed explanatory variables an alternative interpolation, namely that the monthly values from January until December of year *y* equal the observed yearly value of year *y*. Estimating our model for exactly the same sample (including the maximum number of unemployment spells that can be included under both types of interpolation), our results are very similar. Estimated values for the key coefficients in our model differ by much less than one standard error (details are available upon request).

Table 1 shows that, concerning the housing status, mortgagees constitute the largest fraction in our dataset, followed by tenants. When inspecting the explanatory variables used in both unemployment duration and housing equations by housing status at the start of the unemployment spell, we see that the subsample of outright owners contains relatively more individuals (61%) who are older than 50. As re-employment chances for the elderly are relatively low in Belgium (OECD, 2012), this immediately provides one example of a factor that could have biased the descriptive evidence in Figure 1. When further comparing outright owners and mortgagees, it can be observed that the latter group comprises relatively more female, foreign, high-educated and cohabiting individuals. In addition, compared to both groups of owners, more tenants have a foreign background, are low-educated, are single and are living in a densely populated area.

The lower part of Table 1 shows the two variables that serve as instruments in order to control for the endogeneity of housing tenure. First, we follow van Leuvensteijn and Koning (2004) and Munch et al. (2006, 2008) and introduce the percentage of homeowners in the province into our model. This fraction ought to have a positive effect on the probability of becoming a homeowner. The validity of this instrument is discussed thoroughly by van Leuvensteijn and Koning (2004). Note, however, that Coulson and Fisher

(2009) challenge this validity[7]. We will therefore also conduct a sensitivity analysis without this instrument. We iterate this exercise for the other instrument as well. As our second instrument, we use the ratio of the market price of houses to the rental price at the level of the province, and in the year of signing the rental contract for tenants or the year of purchase for homeowners. When buying a house is relatively inexpensive in comparison to renting, the probability of becoming a homeowner instead of a tenant will increase. Furthermore, this instrument contributes to explaining the probability of being an outright owner versus a mortgage holder. When house prices are relatively high, households will be compelled to borrow larger amounts. One can expect this to imply longer repayment periods, reducing the probability that individuals will be outright owners. Since this price ratio is computed at the aggregate provincial level and concerns the past, the assumption of exogeneity is respected.

3. Methodology

3.1. Model

In order to investigate the effect of housing status on the duration of unemployment, we adopt an econometric framework that builds on those presented by van Leuvensteijn and Koning (2004), Munch et al. (2006) and Battu et al. (2008). On the one hand, the part of the model that describes the transition into employment is specified as a mixed proportional hazard model. On the other hand, given the potential endogeneity of the housing status, for which the former contributions have given evidence, we simultaneously model the probability of being an outright homeowner, a mortgagee or a tenant as captured by a mixed multinomial logit model. We allow that the unobserved heterogeneity captured in both models is mutually correlated.

Our model differs from the models of the aforementioned studies in three main aspects. First, in order to disentangle the effect of being a homeowner with or without mortgage payments, we model the housing status as a multinomial logit model instead of a

[7] Coulson and Fisher emphasize external effects. Regional homeownership rates may affect wage setting and other costs of doing business in a region. This may affect individuals' chances on the labour market. The use of regional homeownership rates as exclusion restriction would then be invalid.

binary logit model. Battu et al. (2008) used the same practice to disentangle the diverging influence of social renting and private market renting. Second, like for all explanatory variables, we model the housing status only at the start of the unemployment spell and use only this (time-constant) status to explain unemployment duration. Our procedure is in contrast with the former contributions which model the housing status for each month of the unemployment spell and include this time-varying housing status variable in the unemployment duration model. We believe, however, that the latter approach may lead to an endogeneity bias as a change in housing status during the unemployment spell might be caused by the unemployment duration. Third, since in our data we do not measure time continuously but on a monthly basis, we take this time-grouping explicitly into account in the specification of the model and - ipso facto - of the likelihood function. The alternative option is to estimate a pure continuous time model on these time-grouped data as if the data were continuous. Although adopted by most of the aforementioned studies, this approximation may lead to substantial estimation biases. Gaure et al. (2007, p.1178) argue, based on their extensive Monte Carlo assessment of the Timing of Events approach, that this is due to the approximation's inherent failure in locating the appropriate unobserved heterogeneity distribution.

3.1.1. Unemployment duration model

In our unemployment duration model, the time interval Δt is normalized to one month. The hazard rate[8] into employment is specified as follows[9]:

$$\vartheta\left(t\left|\mathbf{x}, z_1, z_2, v\right.\right) = \lambda\left(t\right)\exp\left(\mathbf{x'\beta} + z_1\delta_1 + z_2\delta_2 + v\right), \qquad (1)$$

where t is the elapsed duration since the individual became unemployed. $\boldsymbol{x}$ is the vector of observed individual characteristics introduced in the previous section and v is a component capturing unobserved heterogeneity. The baseline hazard $\lambda(t)$, representing the duration dependence in the hazard rate, is specified as a piecewise constant non-parametric function. Last - and most important - the dummy variables z_1 and z_2 capture whether the individual is a tenant respectively a homeowner without mortgage payments at the start of the

[8] The hazard rate is defined as the probability to flow into employment at date t conditional on being unemployed up to t. See Kiefer (1988) for an introduction into duration analysis.

[9] To avoid cumbersome notation, we ignore that the regional unemployment rate is a time-varying covariate.

unemployment spell (being a homeowner with mortgage payments is the reference category). These variables indicate the causal effect of a particular housing status at the start of the unemployment spell on the transition rate out of unemployment afterwards.

3.1.2. Housing status model

The probability of each housing status type at the start of the unemployment spell is specified by a multinomial logit model with unobserved effects:

$$\Pr\left(y = h \middle| \tilde{\mathbf{x}}, u_1, u_2\right) = \frac{\exp\left(\tilde{\mathbf{x}}'\boldsymbol{\alpha}_{\mathbf{h}} + u_h\right)}{1 + \exp\left(\tilde{\mathbf{x}}'\boldsymbol{\alpha}_{\mathbf{1}} + u_1\right) + \exp\left(\tilde{\mathbf{x}}'\boldsymbol{\alpha}_{\mathbf{2}} + u_2\right)} \tag{2}$$

in which $h = \{1,2\}$ and $y = 3 - 2z_1 - z_2$. Furthermore, u_1 and u_2 represent the unobserved heterogeneity in the housing status model. The probability of the reference housing status, i.e. homeowner with mortgage payments, is then given by:

$$1 - \Pr\left(y = 1 \middle| \tilde{\mathbf{x}}, u_1, u_2\right) - \Pr\left(y = 2 \middle| \tilde{\mathbf{x}}, u_1, u_2\right). \tag{3}$$

$\tilde{\boldsymbol{x}}$ is a vector containing $\boldsymbol{x}$ supplemented with the set of additional variables only affecting the housing status on which we elaborated in the previous section. This exclusion restriction is an important issue with respect to the econometric identification of the housing status effect.[10] Therefore, as a sensitivity analysis we will re-estimate the model for subsets of the instruments.

3.2. Estimation

3.2.1. Likelihood conditional on unobserved heterogeneity distribution

The coefficients of the presented model are estimated by maximum likelihood estimation. We assume that all sources of correlation between the unemployment duration and the housing tenure processes - beyond those captured by the observed explanatory variables - can be represented by the (time-invariant and individual-specific) unobserved heterogeneity terms. We first derive the likelihood contributions of these two processes conditional on the unobserved components u_1, u_2 and v.

[10] The alternative identification strategy is to exploit the multiple spell feature of the data which is, however, not an option given that we observe only few unemployment spells during which the individual's housing status mutates.

As to unemployment duration, we assume that the censoring times are stochastically independent of the corresponding length of the unemployment spells and the explanatory variables. The conditional likelihood of *T*, which is the unemployment duration as observed in the dataset, of a particular individual can be described as[11]:

$$f_T\left(T\middle|\mathrm{x},z_1,z_2,v\right)=\left[\exp\left[-\sum_{t=1}^{T-1}\vartheta(t)\right]-\exp\left[-\sum_{t=1}^{T}\vartheta(t)\right]\right]^{(1-c)}\exp\left[-\sum_{t=1}^{T}\vartheta(t)\right]^{(c)}. \quad (4)$$

This equation expresses the probability of leaving unemployment between T-1 and T (first factor of the RHS) if T is not censored, i.e. if *c* is 0. If *T* is censored, i.e. if *c* is *1*, the likelihood of *T* equals the survival probability.

The individual likelihood of *y*, the housing status at the start of the unemployment spell of an individual, is given by:

$$\Pr\left(\mathrm{y}\middle|\tilde{\mathbf{x}},u_1,u_2\right)=$$
$$\Pr\left(y=1\middle|\tilde{\mathbf{x}},u_1,u_2\right)^{z_1}\Pr\left(y=2\middle|\tilde{\mathbf{x}},u_1,u_2\right)^{z_2}\left[1-\Pr\left(y=1\middle|\tilde{\mathbf{x}},u_1,u_2\right)-\Pr\left(y=2\middle|\tilde{\mathbf{x}},u_1,u_2\right)\right]^{(1-z_1-z_2)} \quad (5)$$

3.2.2. Integrated likelihood

To obtain the unconditional likelihood contributions, we integrate the conditional contributions over the unobserved heterogeneity distribution. In this respect, we adopt a non-parametric discrete distribution by analogy with Heckman and Singer (1984).[12] We estimate, in the spirit of van den Berg et al. (2002), our model for an optimal number *K* - optimal according to reliable information criteria - of heterogeneity types in the population under investigation. Their proportions are specified as logistic transforms:

$$p_k=\frac{\exp(q_k)}{\sum_{j=1}^{K}\exp(q_j)} \quad \text{, with } k = [1,K] \text{ and } q_k \text{ parameters to be estimated } (q_1 \text{ normalized to } 0). \quad (6)$$

[11] To avoid cumbersome notation, we simplified the notation for theta.

[12] The methodology as advocated by these authors boils down to the assumption that a sample consists of a finite number of subsamples with different levels of time-invariant unobservable effects. Then, for all subsamples the corresponding proportions are estimated as well as the impact of the unobserved differences on the outcomes.

Besides the estimation of these proportions, this approach induces the estimation of one mass point (location) for u_1, u_2 and v for each heterogeneity type: u_{1k}, u_{2k} resp. v_k (u_{11}, u_{21} resp. v_1 are normalized to *0*)[13].[14] Hence, the likelihood for an agent *i* is:

$$l_i = \sum_{k=1}^{K} p_k \cdot f_T\left(T \middle| \mathrm{x}, z_1, z_2, v\right) \cdot \Pr\left(\mathrm{y} \middle| \tilde{\mathbf{x}}, u_1, u_2\right). \tag{7}$$

We can then write the unconditional log-likelihood as the sum of the unconditional individual log-likelihood contributions:

$$L = \sum_{i=1}^{N} l_i \,. \tag{8}$$

4. Results

4.1. Basic results

Table 2 shows our main estimation results of the model. The Akaike Information Criterion (AIC) indicates an optimal number of two heterogeneity types (K=2)[15]. Homeowners with mortgage payments (who are the reference group) have ceteris paribus the shortest unemployment spells. Outright owners, by contrast, stay unemployed the longest. Their monthly probability to be re-employed is 39% lower than the re-employment probability of owners with mortgage payments[16]. Our results are consistent with the intuition that having to make a monthly payment increases the incentive of finding a job. Tenants have a 21% lower probability to exit from unemployment each month compared to mortgagees.

[13] We impose this normalisation since we allow for a constant term in the vector of observed characteristics ***x***.

[14] We take both the locations and the probabilities of the mass points to be unknown parameters without constraining the correlation between u_1, u_2, and v. Allowing only perfect correlation or no correlation or a priori limiting the number of heterogeneity types to an arbitrary number – the latter constraint is adopted in most of the mentioned former contributions – may lead to biased estimates, as shown by Gaure et al. (2007). The estimation procedure for gathering the probabilities and locations of the mass points is implemented according to the latter authors.

[15] Table A.2 in the Appendix reveals that the alternative information criteria (Hannan-Quinn Information Criterion and Bayesian Information Criterion) indicate an optimal number of only 1 type (K=1). Following the argument in Gaure et al. (2007), we believe that the AIC is preferable when the sample is relatively small. Nevertheless, we also report in Table A.3 in the Appendix (column 1) the estimation results of the main coefficients in our model when we allow only one single heterogeneity type. The results are very similar to those obtained from estimation with K=2. Note that Battu et al. (2008) also model two heterogeneity types. Van Leuvensteijn and Koning (2004) specify three, Munch et al. (2006) no less than eight.

[16] $1 - \exp(-0.50) = 0.39$.

Table 2: Unemployment duration and housing model – estimation results

	Exit to employment			Tenant			Outright owner		
Explanatory variables									
Tenant	**-0.24**	******	**(0.11)**						
Outright owner	**-0.50**	*******	**(0.18)**						
Constant	-3.06	***	(0.45)	0.16		(0.99)	0.14		(1.23)
Woman	-0.10		(0.10)	0.24		(0.19)	-0.09		(0.22)
Foreign nationality	-0.01		(0.13)	0.53	**	(0.26)	-0.36		(0.41)
Age 16-24 years	0.11		(0.18)	0.30		(0.33)	0.11		(0.47)
Age 25-34 years	0.33	***	(0.11)	-0.06		(0.22)	0.04		(0.34)
Age ≥ 50 years	-0.84	***	(0.15)	-0.14		(0.28)	1.62	***	(0.31)
Low educated	-0.02		(0.12)	0.01		(0.22)	-0.63	**	(0.28)
High educated	0.34	***	(0.11)	-0.80	***	(0.22)	-0.55	**	(0.26)
Cohabiting partner	0.33	**	(0.15)	-0.71	***	(0.26)	-0.35		(0.31)
Working partner	0.15		(0.14)	-0.74	***	(0.25)	-0.52		(0.29)
Having children younger than 18	-0.17		(0.11)	-0.94	***	(0.20)	-1.49	***	(0.27)
Densely populated area	-0.06		(0.10)	0.64	***	(0.19)	0.45	*	(0.24)
Brussels	2.55	**	(0.99)	-3.01		(2.35)	-0.10		(2.62)
Wallonia	1.50	***	(0.56)	-1.59		(1.10)	-1.01		(1.26)
Unemployment rate (province)	-0.22		(2.06)	12.53	***	(4.56)	-0.30		(6.20)
Unemployment rate (region)	-1.08	***	(0.37)	0.42		(0.74)	0.46		(0.87)
% homeowners (province)				0.13		(0.37)	0.17		(0.48)
House price to rent ratio (province)				1.09	***	(0.15)	-1.03	***	(0.27)
Duration dependence									
t = [1] (ref.)									
t = [2]	0.25	*	(0.14)						
t = [3]	-0.11		(0.16)						
t = [4,6]	-0.41	***	(0.14)						
t = [7,9]	-0.88	***	(0.18)						
t = [10,12]	-0.40	**	(0.17)						
t = [13,15]	-0.94	***	(0.28)						
t > 15	-1.68	***	(0.26)						
Unobserved heterogeneity: estimates									
$v_2/u_{1,2}/u_{2,2}$	0.80		(1.31)	-20.00			8.81		(8.19)
q_2				-3.99	***	(0.76)			
Unobserved heterogeneity: resulting probabilities and correlation									
p_1				0.98					
p_2				0.02					
Corr(v,u_1)				-1.00					
Corr(v,u_2)				1.00					
Corr(u_1,u_2)				-1.00					
Log-likelihood				-2645.44					
Akaike Information Criterion				5420.89					
Parameters				65					
N				1013					

***(**)((*)) indicates significance at the 1%(5%)((10%)) significance level. Standard errors in parentheses. Some heterogeneity parameters are estimated as a very large negative or positive number causing a 0 or 1 probability with respect to related housing tenure status for a subset of individuals. This is numerically problematic. When we face this problem, in the spirit of Gaure et al. (2007), we mark the offending parameter as 'infinity', stick it to -20 resp. 20, and keep it out of further estimation.

The outlined results underline the importance of distinguishing outright owners and mortgagees for an adequate analysis of the relationship between housing and labour market outcomes. In particular, they confirm the hypotheses that we derived from Rouwendal and Nijkamp (2010) in the introduction to this paper. Furthermore, they may help to understand the mixed findings in former contributions that did not distinguish the two types of owners. The very high fraction of mortgagees in Denmark (73%) may explain why Munch et al. (2006) find faster exit rates for owners than for tenants. Along the same line of thought, the more balanced composition of the group of owners in the UK, where only 56% are mortgagees, may explain why Battu et al. (2008) find no significant difference in the exit rates of owners and private tenants[17]. In Table 1 we reported data on the composition of the group of owners in Belgium. With 64.6% of them holding a mortgage, Belgium takes a position somewhat in the middle between the UK and Denmark. The empirical results that we present in Table A.4 in the Appendix should then come as no surprise. The table contains the outcome of a more restricted version of our model in which we do not distinguish between both categories of homeowners. Merging outright owners and mortgagees, we find no significantly different exit rate from unemployment compared to tenants anymore. This result is in line with Battu et al. (2008).

Although our methodology does not allow interpreting the coefficients of the other explanatory variables structurally, their sign and level of statistical significance reveal some information about the control variables. The observed effects on unemployment duration on the left side of Table 2, are generally consistent with our expectations. Ceteris paribus, unemployment spells tend to last longer for individuals who are older than 50, not highly educated and not cohabiting. Although the latter is also found by Munch et al. (2006) and Battu et al. (2008), it might seem rather odd. A possible explanation could be the appearance of positive network effects that are associated with having a partner. Also, unemployment replacement rates are slightly lower when cohabiting[18]. Last, we see that regional dummies and the regional unemployment rate help to determine unemployment duration as well.

[17] The percentages that we mention have been derived from the EU-SILC database by Dol and Neuteboom (2009).

[18] Data are available from Van Vliet and Caminada (2012).

The other columns of Table 2 show the results of the simultaneously estimated mixed multinomial logit model for housing tenure. Also for this component of our model, the coefficients of the explanatory variables show the expected sign. We are particularly interested in the performance of the selected instruments. The percentage of homeowners in the province has only low explanatory power. A possible explanation might be the large scale of the province, summing away most variation. In earlier studies, the municipality was selected as the aggregate level allowing for more variation. Much higher predictive power is attained by the provincial relative price of buying a house versus renting in the year of contract/purchase. In line with our expectations, a high ratio causes a higher probability of renting and a lower probability of being an outright owner.

4.2. Additional results and robustness checks

We conducted several sensitivity analyses to test the robustness of our main finding, i.e. the longer unemployment duration for outright owners compared to tenants and mortgagees. Table A.3 in the Appendix shows the estimated coefficients and corresponding standard errors for our main variables of interest. We summarize the results here:

- We re-estimated our basic model first omitting one of the two instruments while maintaining the other. Then we re-estimated the model without including any instruments. The main results of the three additional estimations are shown in columns (2), (3) and (4) of Table A.3. The results without the provincial homeownership rate as instrument are close to the benchmark model. When not including the house price to rent ratio in the year of purchase or contract, the standard errors increase and so does the estimated coefficient for outright owners. The difference between homeowners with a mortgage and tenants is no longer significant. These results are close to those in column (4), the model without instruments. These findings underscore the importance of introducing the innovative relative price of owning versus renting as an instrument.
- We re-estimated our model dropping all individuals older than 50 from our sample. As was clear from our description of the data in Section 2, there is a strong correlation between being older than 50 and being an outright owner. Although we control for age in our estimations, it could be advisable to check whether our results are not in

some way driven by this age group. As is well-known, and confirmed in Table 2, people older than 50 have typically longer unemployment spells. When we drop individuals older than 50, all our basic findings survive. We report the main results of this re-estimation in column (5) of Table A.3.

- Finally, we introduced alternative age variables in column (6). More precisely, instead of four crude age categories, we directly included individuals' age and its square as continuous explanatory variables. All our basic findings again survive.

5. Conclusions

Seminal work by A.J. Oswald (1996, 1997) suggests that homeownership impairs an individual's labour market outcome. A key element is that high costs of buying and selling homes make homeowners less geographically mobile, which reduces the number of suitable vacancies within their reach in the case of job loss. Homeowners should therefore be expected to incur longer unemployment spells than tenants. Existing microeconometric research for the UK and Denmark, however, comes to different conclusions. Battu et al. (2008) find no significant difference in the speed of transition from unemployment into employment among homeowners versus private tenants in the UK. Munch et al. (2006) even observe a faster exit from unemployment into employment among owners than among tenants in a large panel of Danish individuals.

This paper examines the impact of housing tenure choice on unemployment duration in Belgium using EU-SILC micro data for 2003-2008. Our research question and methodology are basically the same as those of the aforementioned studies. We contribute to the literature in distinguishing homeowners with mortgage payments and outright homeowners. We simultaneously estimate unemployment duration by a mixed proportional hazard model, and the probability of being an outright homeowner, a homeowner with mortgage payments or a tenant by a mixed multinomial logit model. To be able to correctly identify the causal influence of different types of housing tenure on unemployment duration, we use instrumental variables. Finding good instruments is always a delicate task. We propose a new (and strong) instrument, which is the relative price of buying versus renting a house at the moment in the past that people signed the contract underlying their current tenure.

Our results show that homeowners with a mortgage exit unemployment first. Outright owners stay unemployed the longest. Tenants take an intermediate position. From the point of view of the Oswald hypothesis these findings cannot be rationalized as the search and transaction costs associated with moving are similar for outright owners and mortgagees. Instead, our results support the theoretical framework developed by Rouwendal and Nijkamp (2010) and the role of housing costs. If the latter are high, liquidity constraints and the induced reduction of consumption generate strong incentives for the unemployed to find a job soon. Search intensity will be high, the unemployment spell short. If housing costs are low, by contrast, search behaviour will be less intense and the unemployment spell longer. The fact that ceteris paribus the monthly burden of housing costs is much higher for mortgagees than for outright owners, with tenants again in the middle (although undoubtedly closer to mortgagees) can rationalize our empirical findings.

Our results also provide a possible explanation for the discrepancy between the former contributions to this literature. When the distinction between both groups of homeowners is not taken into account, the perceived effect of homeownership will basically be the result of the composition of the group of owners. A much higher share of mortgage holders within the group of homeowners in Denmark compared to the UK may explain the different findings of Munch et al. (2006) versus Battu et al. (2008).

Appendix A: Additional tables

Table A.1: Definitions of variables	
Variable name	**Definition**
Tenant	Dummy equals 1 if the household rents the house.
Outright owner	Dummy equals 1 if the household owns the house and no mortgage payments have to be made.
Mortgagee	Dummy equals 1 if the household owns the house and pays off a mortgage.
Woman	Dummy equals 1 for females, 0 for males.
Foreign nationality	Dummy equals 1 if the individual has a foreign nationality, 0 if not.
Age 16-24 years	Dummy equals 1 if the individual is 16-24 years old.
Age 25-34 years	Dummy equals 1 if the individual is 25-34 years old.
Age 35-49 years	Dummy equals 1 if the individual is 35-49 years old.
Age ≥ 50 years	Dummy equals 1 if the individual is ≥ 50 years old.
Low educated	Dummy equals 1 if the individual did not finish secondary education.
Middle educated	Dummy equals 1 in case of a secondary or post-secondary non tertiary degree.
High educated	Dummy equals 1 in case of a tertiary degree.
Cohabiting partner	Dummy equals 1 if the individual lives together with a partner, 0 otherwise.
Working partner	Dummy equals 1 if the individual lives together with a working partner, 0 if not.
Having children younger than 18	Dummy equals 1 if the person has children younger than 18, 0 otherwise.
Densely populated area	Dummy equals 1 if the individual lives in a municipality with a density superior to 100 inhabitants per square kilometer, and either with a total population for the set of at least 50,000 inhabitants or adjacent to a densely-populated area.
Brussels	Dummy equals 1 when living in the region Brussels.
Flanders	Dummy equals 1 when living in the region Flanders.
Wallonia	Dummy equals 1 when living in the region Wallonia.
Unemployment rate (province)	Unemployment rate in the province (continuous number between 0 and 1).
Unemployment rate (region)	Unemployment rate in the region (continuous number between 0 and 1).
% homeowners (province)	Percentage of homeowners in the province of residence.
House price to rent ratio in year of contract (province)	Ratio of the provincial house price index (with Belgium1990=100) to the rent index (with Belgium1990=100), calculated in the year of purchase or contract.

Note: As explained in the text, values are fixed at the start of the unemployment spell for all variables except for the regional unemployment rate.

Table A.2: Model selection (benchmark model)

	# param.	Log-likelihood	AIC	HQIC	BIC
1 type	61	-2654.283	5430.566	6152.887*	5730.726*
2 types	65	-2645.444	5420.888*	6190.575	5740.732
3 types	69	-2642.842	5423.684	6240.7371	5763.211
4 types	73	-2639.318	5424.635	6289.053	5783.844
5 types	77	-2638.714	5431.428	6343.211	5810.320

Note: *: Preferred specification by this criterion.
AIC: Akaike Information Criterion.
HQIC: Hannan-Quinn Information Criterion.
BIC: Bayesian Information Criterion.

Table A.3: Unemployment duration and housing model – Sensitivity Analysis

Exit to employment	**(0) Benchmark results (Table 2)**	**(1) Estimating the benchmark model with K=1**	**(2) Omitting provincial rate of homeowner-ship as instrument**	**(3) Omitting historical house price to rent ratio as instrument**	**(4) Estimating without instruments**	**(5) Omitting individuals older than 50 from the sample**	**(6) Including age and age² as continuous explanatory variables**
Tenant	-0.24 ** (0.11)	-0.24 ** (0.11)	-0.24 ** (0.11)	-0.22 (0.32)	-0.23 (0.32)	-0.27 ** (0.11)	-0.24 ** (0.11)
Outright owner	-0.50 *** (0.18)	-0.40 *** (0.13)	-0.50 *** (0.18)	-0.81 ** (0.41)	-0.82 ** (0.41)	-0.54 ** (0.23)	-0.48 *** (0.18)
Optimal K	2	-	2	3	3	2	2
Log-likelihood	-2645.44	-2654.28	-2645.56	-2701.89	-2703.20	-2033.56	-2643.29
AIC	5420.89	5430.57	5417.11	5537.78	5536.36	4191.11	5410.57
Parameters	65	61	63	67	65	62	62
N	1013	1013	1013	1013	1013	739	1013

***(**)((*)) indicates significance at the 1%(5%)((10%)) significance level. Standard errors in parentheses. Some heterogeneity parameters are estimated as a very large negative or positive number causing a 0 or 1 probability with respect to related housing tenure status for a subset of individuals. This is numerically problematic. When we face this problem, in the spirit of Gaure et al. (2007), we mark the offending parameter as 'infinity', stick it to -20 resp. 20, and keep it out of further estimation.

Table A.4: Unemployment duration and housing model (restricted) – estimation results						
	Exit to employment			**Tenant**		
Explanatory variables						
Tenant	**-0.05**		**(0.12)**			
Constant	-3.30	***	(0.44)	-0.68		(0.97)
Woman	-0.09		(0.09)	0.26		(0.18)
Foreign nationality	-0.01		(0.13)	0.64	***	(0.25)
Age 16-24 years	0.10		(0.17)	0.34		(0.30)
Age 25-34 years	0.33	***	(0.10)	-0.07		(0.22)
Age ≥ 50 years	-0.99	***	(0.15)	-0.88	***	(0.26)
Low educated	0.01		(0.12)	0.22		(0.21)
High educated	0.36	***	(0.10)	-0.63	***	(0.21)
Cohabiting partner	0.35	**	(0.14)	-0.63	***	(0.24)
Working partner	0.20		(0.13)	-0.64	***	(0.24)
Having children younger than 18	-0.11		(0.10)	-0.57	***	(0.20)
Densely populated area	-0.10		(0.09)	0.54	***	(0.18)
Brussels	2.64	***	(0.92)	-3.02		(2.16)
Wallonia	1.56	***	(0.51)	-1.33		(1.02)
Unemployment rate (province)	-0.55		(2.03)	14.00	***	(4.89)
Unemployment rate (region)	-1.10	***	(0.34)	0.26		(0.70)
% homeowners (province)				0.12		(0.35)
House price to rent ratio (province)				1.44	***	(0.18)
Duration dependence						
t = [1] (ref.)						
t = [2]	0.26	*	(0.13)			
t = [3]	-0.10		(0.16)			
t = [4,6]	-0.41	***	(0.14)			
t = [7,9]	-0.87	***	(0.18)			
t = [10,12]	-0.39	**	(0.17)			
t = [13,15]	-0.95	***	(0.27)			
t > 15	-1.69	***	(0.26)			
Unobserved heterogeneity: estimates						
v_2/u_2	0.66		(0.54)	-20.00		
q_2				-2.64	***	(0.61)
Unobserved heterogeneity: probabilities and correlation						
p_1			0.933			
p_2			0.067			
Corr(v,u)			-1.00			
Log-likelihood			-2348.70			
Akaike Information Criterion			4785.39			
Parameters			44			
N			1013			

***(**)((*)) indicates significance at the 1%(5%)((10%)) significance level. Standard errors in parentheses. Some heterogeneity parameters are estimated as a very large negative or positive number causing a 0 or 1 probability with respect to related housing tenure status for a subset of individuals. This is numerically problematic. When we face this problem, in the spirit of Gaure et al. (2007), we mark the offending parameter as 'infinity', stick it to -20 resp. 20, and keep it out of further estimation.

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