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THE PUZZLE OF JOB SEARCH AND HOUSING TENURE: A RECONCILIATION OF THEORY AND EMPIRICAL EVIDENCE*

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ABSTRACT. Oswald's thesis posits that homeowners should have longer unemployment spells than renters due to restricted mobility, but repeatedly the reverse is found. I contribute to solve this puzzle analyzing both job search intensity and unemployment duration. First, I show that homeowner's mobility constraints have a negative impact on search. Theoretically, it is shown in a search model with moving costs. Using U.K. Labour Force Survey (LFS) data, it is confirmed when considering outright owners, while leveraged owners have the highest search. Second, I find evidence that homeowners select search methods associated with shorter unemployment spells, suggesting that they search more efficiently.

1. INTRODUCTION

In the last decades the orientation of several governments, particularly in Europe, has been to promote homeownership (DiPasquale and Glaeser, 1999; Rohe, Van Zandt, and McCarthy, 2002; Dietz and Haurin, 2003; Engelhardt et al., 2010). Conversely since the 1980s economists have raised concerns about the consequences of large homeownership rates on the functioning of the labor market (Hughes and McCormick, 1987; Bover, Muellbauer, and Murphy, 1989; Partridge and Rickman, 1997; Nickell, 1998; Nickell and Layard, 1999; Pehkonen, 1999). The analysis of the relation between the housing tenure and the labor market has received great attention after the contribution of Andrew Oswald, who in the 1990s pinned on high homeownership rates the blame for the high unemployment rates in Europe (Oswald, 1996, 1997, 1999). The receipt he proposed to reduce unemployment was strikingly at odds with the prevailing political wisdom: "We can put Europe back to work ...by reducing homeownership" (Oswald, 1999, p. 2). Although the contribution of Oswald was not the first to investigate the relationship between homeownership and unemployment, it has become popular to refer to it as "Oswald's hypothesis." Thereafter, several studies using regional or cross-country data have provided some support to Oswald's hypothesis (Belot and Van Ours, 2001; Green and Hendershott, 2001; Di Tella and MacCulloch, 2005; Munch, Rosholm, and Svarer, 2006; Coulson and Fisher, 2009; Blanchflower and Oswald, 2013).

The most influential microeconomic interpretation of the aggregate evidence has focused on the supposedly lower job finding rates of unemployed people who own their own home. In fact, since homeownership hampers the propensity to move for job reasons, homeowners should experience longer unemployment spells than otherwise comparable renters. While there is abundant evidence supporting the first element of this rationale

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(Henley, 1998; Munch, Rosholm, and Svarer, 2006; Battu, Ma, and Phimister, 2008; Van Vuuren, 2009), several empirical studies have found no support for the second, and in most cases even the opposite (Goss and Phillips, 1997; Coulson and Fisher, 2002; Flatau et al., 2003; Munch et al., 2006; Battu et al., 2008; Van Vuuren, 2009).[1]

Recently, Blanchflower and Oswald (2013) and Laamanen (2013) have reinforced the case against high homeownership rates assessing the role of possible negative externalities (Bover et al., 1989). Their argument is not that homeowners themselves are disproportionately unemployed (actually they find further evidence against that), rather that the positive relation between homeownership and unemployment rates can be explained by negative externalities that the housing market can produce upon the labor market.

The literature has investigated some possible explanations for the repeated failure of Oswald's hypothesis in micro data. One explanation looks at the dichotomy between the local and nonlocal labor markets in studying the effect of moving costs. Munch et al. (2006) point out that the lower mobility of owner-occupiers does not necessarily imply lower exit rates from unemployment. In fact, homeowners should have higher reservation wages for jobs that require a residential move, but also lower reservation wages for jobs that do not. Therefore, whether or not homeowners find jobs overall less quickly should be an empirical matter.

Another explanation has focused on the distinctions between outright owners and mortgage-holders, and between private and social renters. The straight comparison between owners and nonowners could be misleading as mortgagers share some similarities with private renters, and outright owners share some with social renters. First, committed housing expenditures such as the rent and, especially, the mortgage, should boost exit rates off unemployment through higher pressure to return to work (Rouwendal and Nijkamp, 2010; Arulampalam et al., 2000). However, for mortgagers this claim can be challenged by the well-known "lock-in" effect, hypothesizing that mortgagers are more reluctant to sell their homes, and hence less mobile, when their home's price declines, particularly as equity becomes negative (Zabel, 2012; Coulson and Grieco, 2013; Modestino and Dennett, 2013).[2] Although some empirical studies provide evidence for the lock-in effect (Henley, 1998; Ferreira, Gyourko, and Tracy, 2010; Modestino and Dennett, 2013), some others do not find any support (Donovan and Schnure, 2011; Schulhofer-Wohl, 2012; Coulson and Grieco, 2013), suggesting that negative equity could even increase mobility by bearing incentives to default (Coulson and Grieco, 2013). As consistent with the argument on committed expenditures, and with the latter evidence, mortgage-holders have typically the best labor outcomes (Goss and Phillips, 1997; Flatau et al., 2003; Brunet, Clark, and Lesueur, 2007; Kantor, Nijkamp, and Rouwendal, 2013). Second, social renters face lock-in effects similarly to homeowners, due to below-market rent, long waiting lists, security of tenure, and restricted transferability within social housing (Hughes and McCormick, 1981, 1987, 2000; McCormick, 1983; Flatau et al., 2003; Battu et al., 2008).

For the mobility mechanism to emerge, the relevant comparison should be made between outright owners and private renters. Indeed, restrictions to mobility of outright owners are not contrasted by mortgage commitments, and private renters do not have same mobility constraints as social renters. However, pieces of evidence on the comparison

[1]See Havet and Penot (2010) for a comprehensive survey of the literature analyzing the impact of housing tenure on labor market outcomes, both at micro and macro level.

[2]The lock-in effect has been also related to nominal loss aversion (Genesove and Mayer, 2001; Engelhardt, 2003; Cunningham and Engelhardt, 2008) and to below-market interest rates on the current mortgage (Quigley, 1987). However, Chan (2001) notes that the lock-in effect can be present only in case of localized price declines.

between outright owners and private renters are in general ambiguous (Flatau et al., 2003; Brunet et al., 2007; Battu et al., 2008), providing again scant support to Oswald's thesis. Moreover the use of a multinomial specification makes it more complicated to control for the likely endogeneity of housing tenure. Although the relevance of the endogeneity issue (Green and Hendershott, 2002; Flatau et al., 2003; Van Leuvensteijn and Koning, 2004; Munch et al., 2006; Brunet et al., 2007; Battu et al., 2008; Brunet and Lesueur, 2009; Van Vuuren, 2009; Coulson and Fisher, 2009) and of a more refined definition of housing tenure is often stressed in the literature, only seldom are these issues tackled jointly.

Despite this large body of research, the mechanisms leading less mobile homeowners to exit unemployment more rapidly are not fully understood yet. In this paper, taking into account existing explanations, I investigate a novel approach to solve this puzzle. The solution I propose has two key ingredients. The first consists in showing that, besides unemployment duration, homeowner's mobility constraints have a negative impact on job search intensity. This contribution moves from the consideration that job search intensity can be more appropriate than unemployment duration to capture the impact of housing tenure through the channel of interest.[3] In fact, while higher mobility costs translate in given differences in reservation wages and in search intensity levels between owners and nonowners, unemployment durations could diverge for other reasons. The second contribution of this paper consists in exploring one possible reason for diverging unemployment outcomes. Specifically, I enquire whether homeowners are more efficient in the search process.

The demonstration of the first proposition is conducted by performing a theoretical and empirical analysis. First, I develop a model of endogenous job search effort with two labor markets, which differ geographically as in Munch et al. (2006). In the baseline model with exogenous search effort, the assumption of higher mobility costs yields the result that homeowners have lower job finding rates far from home but higher job finding rates locally. However, the impact on the job finding rate as a whole remains undetermined. By treating search effort as endogenous, I show that lower mobility costs imply renters to have unambiguously higher overall search intensity and job finding rate.

Second, making use of a data set drawn from the U.K. Labour Force Survey (LFS), I test the main theoretical proposition by estimating the effect of housing tenure in a search intensity equation. In line with a wealth of empirical studies, the job search effort is proxied with the number of search methods used (Holzer, 1988; Blau and Robins, 1990; Wadsworth, 1991; Schmitt and Wadsworth, 1993; Gregg and Wadsworth, 1996; Böheim and Taylor, 2001; Addison and Portugal, 2000; Weber Mahringer, 2008; Manning, 2009; Bachmann and Baumgarten, 2013). No one, however, has yet explored Oswald's hypothesis by this means. Also, the present study departs from most of those which attempt to control for endogeneity of housing tenure by adopting a multinomial specification. Identification of the effect of multinomial treatments is achieved by using a set of instrumental variables in a housing tenure selection model that are excluded from the main search equation (Deb and Trivedi, 2006a, 2006b). The results show that outright owners search less than private renters by around 11 percent, which is precisely what one would expect according to the mobility argument. Moreover, I find that mortgage-holders have the highest search intensity, and that social renters search significantly less than private renters.

The finding that outright owners search less intensively than (private) renters, taken together with the repeated result that homeowners have shorter unemployment spells,

[3]Oswald's hypothesis has also been explored, though to a less extent, by looking at the effect of homeownership on the probability of being unemployed, on the risk of becoming unemployed, and on wages (Havet and Penot, 2010). Homeowners perform typically better even in these cases.

leads to the second contribution of this paper. Namely, I explore whether shorter unemployment duration of homeowners, and specifically of outright owners, can be explained by higher efficiency in the search process. The investigation of this insight is conducted empirically by estimating two models. On the one side, a multinomial logit (MNL) model is estimated to identify the effect of housing tenure on the selection of the main search method. On the other side, a competing-risks model with employment and inactivity as competing-risks is estimated to identify search methods with shorter hazards to job.

I distinguish six main methods of job search: public employment centers (PEC), private employment agency (PRIAGENCY), newspaper advertisements (NEWS), direct approach to employer (DAE), social network (SOCNET), and other. PEC is typically observed to be ineffective for unemployed and its use has often been criticized (Holzer, 1988; Blau and Robins, 1990; Addison and Portugal, 2000; Longhi and Taylor, 2011). I find that (private) renters are significantly more likely to rely on PEC as the main search channel relative to (outright) owners, while (outright) owners are relatively more likely to use NEWS. Estimates of the competing-risks model suggest that PEC relatively lengthens the time needed to reenter employment. Also, counter-Oswald evidence emerges again in these estimates since outright owners and especially mortgagers are found to become employed more quickly than (private) renters. Taken jointly, these findings suggest that outright owners select search methods that are more effective for finding a job, which in turn can explain why they return to job faster in spite of lower search intensity.

This paper has the following structure. Section 2 presents the theoretical model of search. Section 3 describes the data. Section 4 describes the econometric methodology employed for the analyses of search intensity and search methods, respectively. Section 5 provides the results for both analyses. Section 6 concludes.

2. THEORETICAL MODEL

In this section, I present a simplified model of job search with endogenous search effort and exogenous wage offer distribution.[4] The effect of homeownership is captured by allowing for two distinct labor markets, which differ geographically as in Munch et al. (2006). The local labor market is defined as the region in which a worker can take a job without moving. Symmetrically, jobs in the nonlocal labor market require a move.[5] This framework allows for two distinct reservation wages, one for the local labor market and one for jobs outside, which diverge when moving entails a cost. The effect of owning one's home is captured by assuming larger relocation costs.

In case of exogenous search effort, the main result of the model is that homeowners have lower job finding rates far from home but higher job finding rates in the local labor market (Munch et al., 2006). However, the effect on the job finding rate as a whole is ambiguous. Treating search effort as endogenous allows to state propositions in terms of search and to overcome this ambiguity.

The lifetime utility of the employed is kept as simple as possible, with zero separation rate and no on-the-job search:

$$V^E(w) = \frac{w}{\rho}, \tag{1}$$

where w is the wage and ρ is the discount rate.

[4]See Mortensen (1986) for the background of search modeling and Manning (2009) for a similar version.

[5]See Kantor et al. (2013) for a model with commuting.

The unemployed can increase the job offer arrival rate through search effort at the cost of a utility loss C^s. With two labor markets, the model has two distinct cost functions and job offer arrival rates, which differ uniquely for the search effort expended in each of them, namely s_l and s_n. I assume that the total cost of search is an additive function in the two separate cost functions, that is, $C^s = c(s_l) + c(s_n)$, where $c' > 0$ and $c'' > 0$. The arrival rate of job offers in the local and nonlocal labor markets are, respectively, $\alpha(s_l)$ and $\alpha(s_n)$, where $\alpha' > 0$ and $\alpha'' < 0$. Wage offers are sampled from the *c.d.f.* $F(w)$, which I assume is the same for both markets.

When choosing how to allocate search effort between the two labor markets, the unemployed must take into account the cost of moving, that is, the cost incurred if finding and accepting a job in the other region. Relevant to the main proposition, is the assumption that this cost is higher for homeowners. For simplicity, this cost is set to zero for renters (Munch et al., 2006). The value equation for the unemployed renter is

$$\rho V^U = b - c(s_l) - c(s_n) + (\alpha(s_l) + \alpha(s_n)) \int_{w_r^*} (V^E(w) - V^U)\, dF(w), \tag{2}$$

where w_r^* is the reservation wage for the renter and b is the unemployment benefit.

The unemployed sets simultaneously the reservation wage and the search effort to maximize lifetime utility. w_r^* is identical for both markets because moving is costless for renters. Risk neutrality implies $w_r^* = \rho V^U$; replacing this and Equation (1) in Equation (2), and rearranging, I have

$$w_r^* = b - c(s_l) - c(s_n) + \frac{(\alpha(s_l) + \alpha(s_n))}{\rho} \int_{w_r^*} (w - w_r^*)\, dF(w). \tag{3}$$

Differentiating Equation (3) with respect to s_l and s_n I get the first-order conditions,

$$c'(s_l^*) = \alpha'(s_l^*)A, \tag{4}$$

$$c'(s_n^*) = \alpha'(s_n^*)A, \tag{5}$$

where $A := \rho^{-1} \int_{w_r^*} (w - w_r^*)\, dF(w)$. It is easy to show that the unemployed renter chooses the same search effort in both markets. In fact, from Equation (4) and Equation (5), I get $c'(s_l^*)/\alpha'(s_l^*) = c'(s_n^*)/\alpha'(s_n^*)$, which is true only when $s_l^* = s_n^*$.

If the unemployed is a homeowner, the cost m that is incurred if accepting a job in the nonlocal labor market has to be considered. The discounted lifetime utility for the unemployed homeowner is

$$\rho \tilde{V}^U = b - c(s_l) - c(s_n) + \alpha(s_l) \int_{w_l^*} \left(\frac{w}{\rho} - \tilde{V}^U \right) dF(w) + \alpha(s_n) \int_{w_n^*} \left(\frac{w}{\rho} - \tilde{V}^U - m \right) dF(w), \tag{6}$$

where I have already replaced $V^E(w) = w/\rho$. Now, there are two distinct levels of the reservation wage, one for each of the two markets. The reservation wage for the local labor market is $w_l^* = \rho \tilde{V}^U$, while the reservation wage for jobs outside is $w_n^* = \rho \tilde{V}^U + \rho m$: to accept a job offer which requires a move, the unemployed homeowner needs compensation for m. Equation (6) can be rewritten as

$$w_l^* = b - c(s_l) - c(s_n) + \frac{\alpha(s_l)}{\rho} \int_{w_l^*} \left(w - w_l^* \right) dF(w) + \frac{\alpha(s_n)}{\rho} \int_{w_n^*} \left(w - w_l^* - \rho m \right) dF(w). \tag{7}$$

The optimal search levels in the two markets are determined by the first-order conditions

$$c'(s_l^*) = \alpha'(s_l^*)B, \tag{8}$$

$$c'(s_n^*) = \alpha'(s_n^*)C, \tag{9}$$

where $B := \rho^{-1}\int_{w_l^*}(w - w_l^*)\,dF(w)$ and $C := \rho^{-1}\int_{w_n^*}(w - w_n^*)\,dF(w)$. Since $w_l^* < w_n^*$, $B > C$ holds for any w. From Equation (8) and Equation (9), $B > C$ implies $c'(s_l^*)/\alpha'(s_l^*) > c'(s_n^*)/\alpha'(s_n^*)$. For c convex and α concave, the latter inequality implies $s_l^* > s_n^*$. Unlike the renter, for the homeowner it is optimal to search harder in the local labor market than outside.

Given the optimal search levels of the homeowner, namely s_l^* and s_n^* ($s_l^* > s_n^*$), and of the renter, denoted by s_r^* (identical in both cases), the effect of homeownership on overall search can be identified by comparing $s_l^* + s_n^*$ to $2s_r^*$. A first result is stated in the following proposition (see Appendix A for the proof):

PROPOSITION 1. $s_l^* > s_r^* > s_n^*$.

The relation among the reservation wages is stated in the following proposition (see Appendix A for the proof), which is the counterpart of Proposition 1:

PROPOSITION 2. $w_l^* < w_r^* < w_n^*$.

The rationale of Proposition 1 is straightforward. When an unemployed person has to face a cost of moving to accept a job offer far from home, there is less searching outside, and the search effort is centered on the local area in order to reduce the probability of incurring this cost.[6] Whether or not the homeowner searches in general less than the renter depends on the balance of these two opposite effects. The result of the comparison is shown in the following proposition (see Appendix A for the proof):

PROPOSITION 3. $s_l^* + s_n^* < 2s_r^*$.

Proposition 3 states that the search level of the homeowner is unambiguously lower: an increase in m from zero to a positive number, which represents just a shift from the renter's to the owner's status, comes with a reduction of the total search effort. The rationale is that, although this cost is incurred only if the homeowner actually moves, it increases the *expected* cost of the search, which in turn makes unemployment more valuable. Thus, despite the incentive to search harder locally, this expected cost has to be covered by an extra reduction in the nonlocal search (from s_r^* to s_n^*) compared to what would be needed to compensate for the increase in the local search (from s_r^* to s_l^*).

Following Proposition 3, I can make clear predictions also on the whole job finding rates. The renter's job finding rate is two times $h_r = \alpha(s_r^*)[1 - F(w_r^*)]$, that is, the common job finding rate for both markets, while the owner's job finding rate is the sum of $h_l = \alpha(s_l^*)[1 - F(w_l^*)]$ and $h_n = \alpha(s_n^*)[1 - F(w_n^*)]$, that is, the hazards to local and nonlocal jobs, respectively. In order to compare job finding rates, I first remark that, by Propositions 1 and 2, $h_l > h_r > h_n$. This is, the standard result that hazards to jobs with relocation and hazards to local jobs are, respectively, higher and lower for the unemployed living in owner-occupied accommodations (Munch et al., 2006). However, from Proposition 3, I can derive the following stronger conclusion (see Appendix A for the proof):

PROPOSITION 4. $h_l + h_n < 2h_r$.

Proposition 4 states that the job finding rate is unambiguously lower for homeowners. This unambiguous result is not present in the model of Munch et al. (2006) with exogenous search, but it is present in the model of Van Vuuren (2009), who generalizes the model of Munch et al. (2006) by introducing the choice of homeownership. In Van Vuuren (2009),

[6] In this set-up, commuting would simply exacerbate the results by enlarging the homeowner's local labor market, however the main message would not be qualitatively affected (Munch et al., 2006).

the employed can become homeowner by paying a fixed cost for buying a home, and the result holds for a positive value of this cost.[7]

In conclusion, this theoretical section delivers a clear message: due to larger mobility costs, homeowners have lower search and lower exit rates from unemployment than renters. Therefore, the local versus nonlocal search explanation cannot falsify the main argument underlying Oswald's hypothesis. In the empirical section, I will provide evidence for the comparison in search intensity between unemployed homeowners and renters. Since the theoretical prediction is based on the difference in mobility costs, the relevant comparison will be between outright owners and private renters.

3. DATA

I use a data set drawn from the U.K. LFS, which collects address-based interviews of about 60,000 households for every quarter. Each individual is interviewed in five consecutive quarters on a rotating panel basis. The sample I use spans the period 1999–2009, resulting in 44 calendar quarters.

The LFS provides a rich set of information on job search methods. Unemployed people are asked to reply which specific search methods they used in the last four weeks, out of a total of 14. The count of methods is used here to measure search intensity. See Appendix B for the list of search methods.

Unemployed people are also asked to report the main method of search, which I consider for the second analysis on search methods. Finally, unemployment duration is measured by the minimum of the length of time since the start of job search and the last job. Durations are grouped in eight time intervals: zero to three months, three to six months, six to 12 months, one to two years, two to three years, three to four years, four to five years, five years or more.

For consistency with the research design, I restrict to a subsample of ILO unemployed[8] male heads of households (aged 16–64) and I make some further sample adjustments.[9] Only heads of households are considered in order to capture the impact of an individual tenure choice. For some nonheads of households, it may be misleading to seek for a causal link from housing tenure to labor market behavior given that the former may not reflect the outcome of an individual choice.[10]

4. METHODOLOGY

Job Search Intensity

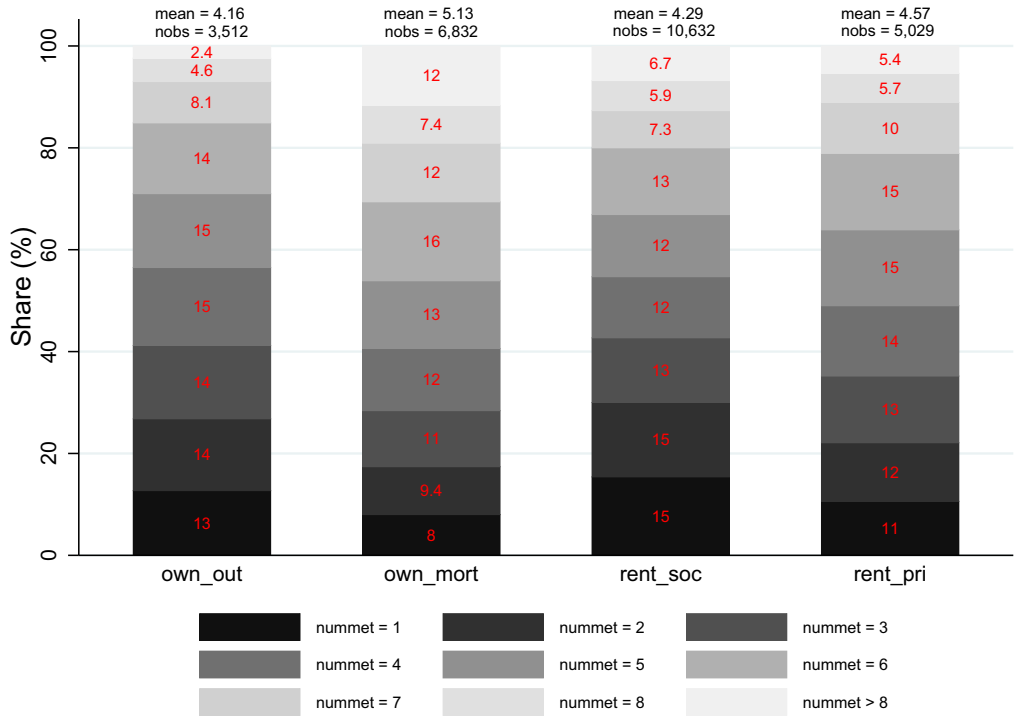
The theoretical model outlined in Section 2 predicts that higher mobility costs implied by homeownership reduce the optimal search intensity. This theory is tested by estimating the difference in search intensities between outright owners and private renters, as discussed in Section 1. Specifically, an equation of search intensity is estimated plugging

[7]In the model of Van Vuuren (2009), the effect of homeownership is still ambiguous in the special case that homeowners can receive unemployment benefits only for a fixed period while renters never run out of it.

[8]ILO unemployed are people without a job who have been looking for work in the last four weeks and are available to start a new job within the following two weeks.

[9]I drop observations for people who have never had a paid job, receive a retirement or old age pension, are searching for work only as self-employed, or are waiting to take up a job already obtained. Proxy responses are also dropped.

[10]Neither might the residential status of some heads of households be an individual choice, but this issue can be handled using controls at the household level in the empirical analysis.



Notes: Statistics are based on the estimation sample, which consists of ILO unemployed males heads of household.

FIGURE 1: Distribution of Search Methods by Housing Tenure.

in on the right-hand side a set of dummies indicating outright owners (*own_out*), mortgagers (*own_mort*), and social renters (*rent_soc*), where private renters (*rent_pri*) form the baseline category.

The dependent variable *nummet* is the count of search methods used (see Figure 1 for the distribution of *nummet* by housing tenure). Other measures of search effort have been used in the literature, such as the time spent for search in a given time interval, the number of employer contacts, or a combination of different measures (Green et al., 2011). The number of search methods may be an imperfect measure of search intensity as it cannot quantify the effort the individual dedicates to each method. Despite this criticism, evidence suggests that this variable can capture relevant dimensions of search intensity. In fact, it is typically found to be strongly associated to the probability of gaining job (Holzer, 1988; Gregg and Wadsworth, 1996; Böheim and Taylor, 2001), notably in U.K. data (Gregg and Wadsworth, 1996; Böheim and Taylor, 2001), and on the number of job offers (Holzer, 1988). It is also strongly related to other variables coherently with theory (Holzer, 1988; Blau and Robins, 1990; Schmitt and Wadsworth, 1993; Gregg and Wadsworth, 1996; Addison and Portugal, 2000; Weber Mahringer, 2008; Bachmann and Baumgarten, 2013).

When trying to identify the effect of housing tenure on search intensity, one should take into account that selection into housing tenure can be affected by unobserved factors that are likely to be related to labor market outcomes. For example, less mobile people as well as people with a greater desire to retain proximity to family members or friends

may self-select into homeownership, and restricted mobility is expected to be associated with low search intensity. I hence adopt a structural estimation method in which housing tenure and search intensity are jointly determined, and identification of the effect of housing tenure is achieved through exclusion restrictions. Specifically, I employ the endogenous multinomial treatment effect model developed by Deb and Trivedi (2006a, 2006b), which takes into account selection on unobservables in a framework with a multinomial treatment and a count distribution for the outcome.[11]

The estimation framework comprises a set of equations that model the generating process of the treatment variables, that is, residential states, and an outcome equation with a structural-causal interpretation. Each individual i chooses a residential status j from a set of four choices ($j = 0, 1, 2, 3$), where $j = 0$ is the control group (private renters). Following Deb and Trivedi (2006a), let d_j be binary selection variables representing the observed tenure choice and also let $\mathbf{d}_i = (d_{i1}, d_{i2}, d_{i3})$ and $\mathbf{l}_i = (l_{i1}, l_{i2}, l_{i3})$, where l_{ij} are latent factors which incorporate unobserved characteristics common to individual i's status choice and outcome. Then the probability function for the tenure choice is modeled by a latent class MNL:

$$P(\mathbf{d}_i|\mathbf{z}_i, \mathbf{l}_i) = \frac{\exp(\mathbf{z}_i'\theta_j + l_{ij})}{1 + \sum_{k=1}^{J} \exp(\mathbf{z}_i'\theta_k + l_{ik})}, \tag{10}$$

where $\mathbf{z}_i$ denotes a set of exogenous regressors and $J = 3$.[12] The equation for the expected count outcome is

$$E(y_i|\mathbf{d}_i, \mathbf{x}_i, \mathbf{l}_i) = \exp(\mathbf{x}_i'\beta + \sum_{j=1}^{J} \gamma_j d_{ij} + \sum_{j=1}^{J} \lambda_j l_{ij}), \tag{11}$$

where $\mathbf{x}_i$ is a set of exogenous variables within $\mathbf{z}_i$ and the γ_j-s are the treatment coefficients relative to private renters. The distribution of y_i is assumed to follow a Negative Binomial (NB) process that can accommodate overdispersion of the count variable unlike the standard Poisson (Cameron and Trivedi, 1998). The data are overdispersed if the conditional variance exceeds the conditional mean, which is the case in several applications. [13]

In principle, the parameters of this model are identified through nonlinearities even if all regressors in the outcome equation are included in the treatment equations, that is, $\mathbf{z}_i = \mathbf{x}_i$. However, nonlinearity is often a poor identification strategy, and the use of exclusion restrictions is strongly recommended (Deb and Trivedi, 2006a, 2006b). Therefore, I employ traditional exclusion restrictions by specifying instrumental variables in the residential status choice that are excluded from the search intensity equation. Estimation is carried out by maximizing the simulated log likelihood based on the joint distribution of the

[11]See also Trivedi and Munkin (2010) for a survey of recent developments in count models, in particular with reference to endogenous categorical regressors.

[12]Equation (10) already incorporates a set of normalization restrictions required for estimation. Besides the standard restrictions for the MNL ($\theta_j = 0$ for $j = 0$), a further set of restrictions is required for the latent factors. Following Deb and Trivedi (2006b) this amounts (i) to set equal to 0 coefficients of all non-j latent factors in the jth selection equation and (ii) to normalize to 1 the coefficient on l_{ij}.

[13]In the general class of NB models, the variance is modeled by a function of the mean μ_i and of an overdispersion parameter δ: $V[y_i|x_i] = \mu_i + \delta\mu_i^p$. For $p = 1$ and $p = 2$, one has the two most known densities: the NB of the first (NB1) and of the second kind (NB2), for which the variance is either proportional or quadratic in the mean. For $\delta = 0$, the NB reduces to the Poisson.

outcome and treatment variables. See Deb and Trivedi (2006a, 2006b) for a formal and more detailed representation.[14]

Several variables have been proposed in the literature to instrument housing tenure, or more specifically homeownership. One prominent instrument is the regional homeownership rate (Van Leuvensteijn and Koning, 2004; Munch et al., 2006; Brunet and Lesueur, 2009). However, this instrument has also been criticized for being likely related to labor market aggregate outcomes, hence likely to impact on individual performance (Coulson and Fisher, 2009; De Graaff, Leuvensteijn, and Van Ewijk, 2009; De Graaff and Van Leuvensteijn, 2013).[15] Other instruments used in the literature are the user cost of owning compared to renting in the area (Flatau et al., 2002; Brunet and Lesueur, 2004; Barrios García and Rodríguez Hernández, 2004; Brunet and Lesueur, 2009), father's job (Battu et al., 2008; Brunet et al., 2007), age at entry into the housing (Brunet et al., 2007), average distance to jobs (Brunet and Lesueur, 2004, 2009), past residential status of parents (Van Leuvensteijn and Koning, 2004), homeownership rate in the city where the individual was born (Van Leuvensteijn and Koning, 2004), age dummies (Flatau et al., 2003), and U.S. states dummies (Green and Hendershott, 2002). Unfortunately these variables are often based on barely convincing arguments for exogeneity or rare in data. Coulson and Fisher (2009) employ a careful application of IV techniques using a set of plausible instruments: the percentage of households in the area living in multifamily housing, an indicator capturing whether the two first-born children in the household have the same sex, and the state marginal tax rate as applied to the mortgage interest deduction.

In the present analysis, I use a set of three instruments, borrowing from Coulson and Fisher (2009) the first and second instrument, and using the relative cost of owning with mortgage versus renting as third instrument. Specifically, I use $ln(multifamrate)$, $samesex$ and $ln(C_{mort}/C_{rent})$, which I assume to be relevant for the housing tenure choice and to be exogenous to search intensity once the effect of the included regressors is partialled out. $multifamrate$ indicates the percentage of households living in multifamily housing for each region and quarter. House sharing among families is more common in rented than in owner-occupied dwellings as a rent can be more easily shared than an ownership or a mortgage. Therefore, the propensity for homeownership should be correlated to the share of multifamily dwellings in the area (Coulson and Fisher, 2009).[16]

The instrument *samesex* has been originally designed by Angrist and Evans (1998) to identify the causal effect of fertility on the males labor supply. Since fertility decisions can be endogenously determined with labor force participation, Angrist and Evans (1998) exploit the preference of parents for siblings of different sexes to instrument the number of children. They find that the number of children does not have any effect on male labor outcomes. Considering that the presence of children is correlated with the propensity to become owners, Coulson and Fisher (2009) use the sex of children in the household as an instrument for homeownership in a male unemployment equation. I replicate this instrument using the dummy *samesex*, which indicates whether the two first-born children in the household are the same sex. In the estimation sample, households for whom the

[14]Since the latent factors enter into the likelihood function but are unknown, the maximization of the likelihood function is performed through simulation by drawing several random numbers from a standard normal distribution. Provided that the number of draws is sufficiently large, maximization of the simulated log likelihood is equivalent to maximizing the log likelihood (Gourieroux, Monfort, and Trognon, 1984). I used 2,000 draws; estimation with fewer draws gave remarkably similar results.

[15]DiPasquale and Glaeser (1999) proposed a modification of this, stratifying the local homeownership rate by race and income quantile.

[16]Coulson and Fisher (2009) point out that multifamily housing could be endogenous at the individual level.

two first-born children are the same sex are 3.7 percent more likely to have more kids.[17] Moreover, households with two children are 16.2 percent more likely to be homeowners than households with more than two children.

The third instrument is the regional ratio between mortgage costs and rental costs and varies over years and quarters. These data are drawn from the U.K. Family Resource Survey (FRS) since information on housing costs is not present in the LFS (see Appendix B for details). The higher the cost of holding a mortgage on one's home relative to the market rent in the area, the lower should be the propensity of occupying home with a mortgage rather than a rent.

Job Search Methods

The choice of the amount of effort to spend on search affects the job finding rate by enhancing the probability of receiving a job offer. However the job finding rate can be influenced by the way this effort is allocated as well. For example, stronger ties with the local community may lead homeowners to select search channels more efficiently, for a given total effort expended. I investigate this issue by estimating two models. First, I estimate a MNL that models the selection process of the main search method. I group main methods in the following six possible choices: PEC, PRIAGENCY, NEWS, DAE, SOCNET, and other. The housing tenure dummies are included as regressors to identify the probability of selecting a specific method for each status, controlling for the total number of methods *nummet*.

Second, I perform an unemployment duration analysis to identify search methods that are associated with faster job finding, controlling for *nummet*. I measure the spell length considering the value recorded in the last interview before a transition into job or inactivity, yet the spell is right censored if unemployment is recorded in the last interview available. I estimate a competing-risks model with two possible risks, namely exits into employment and exits into inactivity. The duration variable is grouped in discrete intervals, therefore the likelihood of exiting into a specific state is modeled by a MNL using data expanded into person-period form and trimesters as time unit (Allison, 1982).[18] This allows for unobserved factors affecting each destination-specific hazard. I consider a subsample of 11,374 spells with stable housing tenure; 3,579 spells end in employment, 1,769 end in inactivity, and 6,026 are right censored.[19]

5. EMPIRICAL RESULTS

Job Search Intensity

Table 1 shows estimates of different models for *nummet*. I first report OLS results to provide a baseline estimate. However, these results do not take into consideration either the count dimension of the dependent variable, either overdispersion or endogeneity. The exogenous NB model deals with the first two issues. The test of the overdispersion parameter δ confirms the presence of a significant amount of overdispersion, supporting the use of a NB specification over a Poisson.

[17] As compared to 7 percent in Angrist and Evans (1998) and 6 percent in Coulson and Fisher (2009), who make different sample restrictions.

[18] Regressors are assumed spell constant and refers to the last interview before the exit, or to the last interview for censored spells.

[19] Specifically, I drop a negligible amount of spells for individuals who switch housing tenure in the quarter either immediately preceding or following the one in which the spell ends.

TABLE 1: The Effect of Housing Tenure on Unemployed's Search Intensity

	OLS		NB—exogenous		NB—endogenous	
	β	*s.e.*	β	*s.e.*	β	*s.e.*
own_out	−0.0567**	(0.0150)	−0.0617**	(0.0122)	−0.1163**	(0.0147)
own_mort	0.0753**	(0.0129)	0.0733**	(0.0104)	0.1232**	(0.0134)
rent_soc	−0.0664**	(0.0112)	−0.0285**	(0.0092)	−0.0467**	(0.0115)
white	0.0438**	(0.0138)	0.0218	(0.0112)	0.0201	(0.0112)
married	0.0200*	(0.0091)	0.0199**	(0.0075)	0.0121	(0.0077)
claimant	0.2812**	(0.0088)	0.2316**	(0.0073)	0.2324**	(0.0074)
disabben	−0.0817**	(0.0167)	−0.0741**	(0.0151)	−0.0742**	(0.0151)
Age						
age_35_44	0.0336**	(0.0110)	0.0207*	(0.0089)	0.0153	(0.0090)
age_45_54	0.0110	(0.0115)	0.0055	(0.0094)	0.0035	(0.0095)
age_55_64	−0.0808**	(0.0136)	−0.0721**	(0.0116)	−0.0592**	(0.0121)
Highest education						
degree	0.2190**	(0.0164)	0.2078**	(0.0136)	0.2016**	(0.0140)
higher_educ	0.2295**	(0.0179)	0.2201**	(0.0146)	0.2136**	(0.0148)
gce	0.1963**	(0.0123)	0.1884**	(0.0102)	0.1834**	(0.0104)
gcse	0.1567**	(0.0126)	0.1484**	(0.0106)	0.1455**	(0.0107)
other_qual	0.1228**	(0.0133)	0.1182**	(0.0112)	0.1176**	(0.0112)
Duration since last job						
0–3 months	0.2439**	(0.0182)	0.2061**	(0.0158)	0.1927**	(0.0161)
3–6 months	0.2477**	(0.0184)	0.2111**	(0.0157)	0.2027**	(0.0160)
6–12 months	0.2150**	(0.0180)	0.1768**	(0.0153)	0.1724**	(0.0156)
1–2 years	0.1792**	(0.0176)	0.1495**	(0.0153)	0.1486**	(0.0155)
2–3 years	0.1213**	(0.0203)	0.0956**	(0.0177)	0.0960**	(0.0178)
3–4 years	0.1143**	(0.0234)	0.0984**	(0.0200)	0.0995**	(0.0201)
4–5 years	0.0868**	(0.0254)	0.0606**	(0.0221)	0.0633**	(0.0223)
5–8 years	0.0479*	(0.0221)	0.0396*	(0.0198)	0.0422*	(0.0198)
occupation dummies	√		√		√	
region dummies	√		√		√	
quarter dummies	√		√		√	
year dummies	√		√		√	
δ (overdispersion)			0.2209**	(0.0107)	0.1834**	(0.0124)
λ_{own_out}					0.0684**	(0.0094)
λ_{own_mort}					−0.0633**	(0.0095)
λ_{rent_soc}					0.0244**	(0.0086)
Log-likelihood			−84,205.3		−84,197.6	
LR exogeneity test					$\chi^2(2) = 15.4$ ($p < 0.01$)	
Obs.	26,005		26,005		26,005	

Notes: * significant at 5 percent ; ** significant at 1 percent. The dependent variable y is the count of search methods used. In the OLS case, the logarithm of y is used so β-s are semi-elasticities. For the Negative Binomial (NB) models, β-s are coefficients of the linear index, whereas exponentiated β-s have the standard interpretation in terms of factor change. The variance function used for the NB models is $V[y_i|x_i] = \mu(1+\delta)$, leading to the NB1 version. Positive δ implies overdispersion. The sample is made of respondent male heads of households who are ILO unemployed. Observations are quarterly for the period 1999–2009. Standard errors are clustered for regions, years, and quarters. See Appendix B for the base categories of discrete regressors.

Endogeneity of housing tenure is accounted for estimating a multinomial endogenous treatment effects model, where a NB for y is estimated jointly with a multinomial logit for the housing tenure choice (see Table 2). λ-s are loading factors of the latent terms and positive (negative) λ indicates positive (negative) selection on unobservables. The LR test strongly supports rejection of exogeneity.

In the third column, I report NB estimates that take into account also endogeneity of housing tenure. The housing tenure coefficients are strongly significant. Owning one's home outright implies $(\exp(-0.1163) - 1) \cdot 100 = -11.0$ percent lower search intensity than private renting. This large "exogenous" difference in search intensity between outright owners and private renters captures the impact of different mobility constraints. Moreover, mortgagers have $(\exp(0.1232) - 1) \cdot 100 = 13.1$ percent higher search intensity than private renters, while social renters search less by (approximately) 4.7 percent.[20]

The coefficients of the latent factors l_{ij} in Equation (11) capture the effect on the search intensity of unobserved characteristics related to housing tenure. In particular, a positive (negative) λ_j means that unobserved components increasing the relative probability of selecting the jth residential status have a positive (negative) impact on the search intensity. Estimates point to positive selection in unobservables for *own_out* and *rent_soc*, and point to negative selection for *own_mort*. Consistently, γ_j-s in the endogenous NB are smaller for the former states and larger for the latter. A simple likelihood ratio (LR) test for exogeneity of housing tenure can be constructed under the null hypothesis that the λ_j-s are jointly equal to zero, that is, $\lambda_{own\_out} = \lambda_{own\_mort} = \lambda_{rent\_soc} = 0$. The LR statistic suggests that exogeneity can be safely rejected.

The coefficients of the other regressors are generally consistent with standard economic interpretation and with earlier empirical evidence using *nummet* as proxy for search intensity (Holzer, 1988; Blau and Robins, 1990; Schmitt and Wadsworth, 1993; Gregg and Wadsworth, 1996; Addison and Portugal, 2000; Weber Mahringer, 2008; Bachmann and Baumgarten, 2013), confirming the good performance of this measure.[21] Nevertheless, as a further sensitivity check, I re-estimated the model collapsing *nummet* in the six most used methods (the ones considered in the analysis of individual methods). The correlation between the two versions of *nummet* is very high (∼90 percent), and estimates hold very similar.[22]

The estimates of the MNL for housing tenure, as showed in Table 2, are also consistent with expectations and earlier evidence (Flatau et al., 2002, 2003; Van Leuvensteijn and Koning, 2004; Battu et al., 2008; Brunet and Lesueur, 2009). In particular, the instruments are significant and have the expected signs. The LR test for joint significance of instruments is fairly large confirming their relevance. In regions with larger share of multifamily dwellings, individuals are more likely to select ownership status. Families with two first-born children of the same sex are more likely to occupy with rentals than owning outright. This difference is particularly strong for social tenancy, with a significantly larger likelihood than private tenancy. Ownership with mortgage stands out as a peculiar case, with a positive and significant coefficient. Considering that *samesex* is capturing the effect of the number of children, this result points out that families with more kids tend to prefer ownership with loan than outright, reaffirming the importance of distinguishing between ownership states. The third instrument $ln(C_{mort}/C_{rent})$ impacts positively the likelihood of owning with mortgage relative to tenancy. Supporting the

[20]These coefficients are estimates of γ_j-s in Equation (11). Since the conditional mean of *nummet* is exponential, exponentiated coefficients measure the factor increase in *nummet* for a switch in the status.

[21]The positive coefficient of *claimant* is consistent with the fact that eligibility to unemployment benefits in the U.K. is conditioned on compliance with relatively strict search-related criteria (Manning, 2009; Petrongolo, 2009). Estimates hold very similar omitting the regressor *claimant*.

[22]These results are made available by the author upon request. Further estimation checks are made available by the author concerning (i) the impact of having kids on search intensity and (ii) the subsample of unmarried people. In case (i), binary indicators capturing the presence of at least one kid (below different age cutoffs) does not have any impact on *nummet*, consistently with earlier evidence and with the use of the instrument *samesex*. In case (ii), results are qualitatively unaffected.

TABLE 2: The Housing Tenure Choice—Multinomial Logit

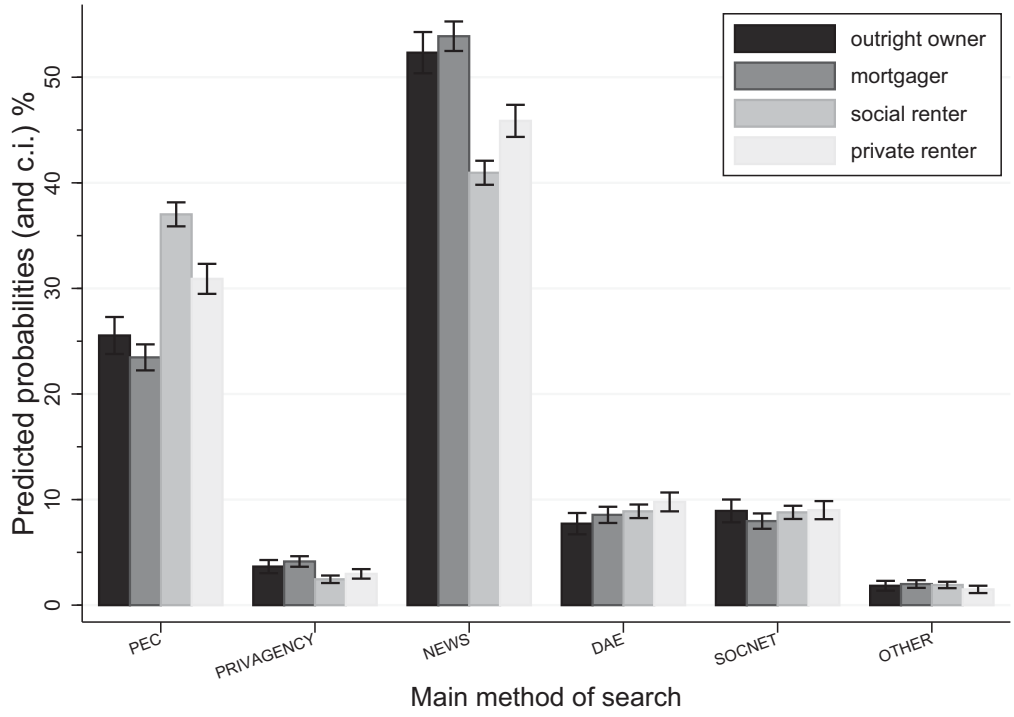
	own_out		*own_mort*		*rent_soc*	
	β	*s.e.*	β	*s.e.*	β	*s.e.*
$ln(multifamrate)$	-0.748^{*}	(0.336)	-0.570^{*}	(0.260)	-0.314	(0.229)
samesex	-0.381^{**}	(0.130)	0.203^{*}	(0.090)	0.582^{**}	(0.083)
$ln(C_{mort}/C_{rent})$	-0.107	(0.289)	-0.469^{*}	(0.236)	-0.135	(0.211)
white	0.451^{**}	(0.126)	0.407^{**}	(0.089)	0.051	(0.072)
married	1.236^{**}	(0.060)	1.561^{**}	(0.054)	0.094	(0.052)
claimant	-0.641^{**}	(0.058)	-0.405^{**}	(0.050)	0.513^{**}	(0.045)
disabben	0.101	(0.120)	0.371^{**}	(0.108)	0.699^{**}	(0.088)
Age						
age_35_44	1.569^{**}	(0.111)	1.248^{**}	(0.062)	0.262^{**}	(0.053)
age_45_54	3.017^{**}	(0.113)	1.728^{**}	(0.070)	0.377^{**}	(0.063)
age_55_64	4.482^{**}	(0.112)	1.884^{**}	(0.078)	0.480^{**}	(0.075)
Highest education						
degree	0.663^{**}	(0.119)	0.667^{**}	(0.096)	-1.365^{**}	(0.095)
higher_educ	0.601^{**}	(0.133)	0.789^{**}	(0.113)	-0.867^{**}	(0.109)
gce	0.375^{**}	(0.094)	0.574^{**}	(0.079)	-0.573^{**}	(0.065)
gcse	0.180	(0.104)	0.409^{**}	(0.083)	-0.268^{**}	(0.069)
other_qual	-0.174	(0.103)	-0.018	(0.083)	-0.203^{**}	(0.065)
Duration since last job						
0–3 months	0.381^{**}	(0.131)	1.233^{**}	(0.119)	-0.998^{**}	(0.093)
3–6 months	0.632^{**}	(0.131)	1.069^{**}	(0.123)	-0.759^{**}	(0.093)
6–12 months	0.552^{**}	(0.130)	0.736^{**}	(0.123)	-0.585^{**}	(0.094)
1–2 years	0.375^{**}	(0.128)	0.323^{**}	(0.119)	-0.476^{**}	(0.088)
2–3 years	0.157	(0.144)	0.083	(0.137)	-0.402^{**}	(0.101)
3–4 years	0.223	(0.162)	-0.026	(0.151)	-0.458^{**}	(0.116)
4–5 years	0.089	(0.175)	-0.308	(0.174)	-0.416^{**}	(0.133)
5–8 years	-0.174	(0.151)	-0.369^{*}	(0.153)	-0.285^{**}	(0.105)
occupation dummies	√		√		√	
region dummies	√		√		√	
quarter dummies	√		√		√	
year dummies	√		√		√	
LR test for instruments $\sim \chi^2(9)$			91.7 ($p < 0.01$)			
LR test for instruments $\sim \chi^2(3)$	14.0 ($p < 0.01$)		13.2 ($p < 0.01$)		51.1 ($p < 0.01$)	
Obs.			26,005			

Notes: * significant at 5 percent; ** significant at 1 percent. The table shows estimates of the MNL model for housing tenure estimated jointly with the NB for search intensity. Results for the latter are shown in Table 1. Notes to that table apply here. β-s are coefficients of the index function. Standard errors are adjusted for 867 clusters in regions, years and quarters, to account for aggregate instrumental variables. The LR statistic tests the joint significance of the instrumental variables $ln(multifamrate)$, $ln(C_{mort}/C_{rent})$ and *samesex*.

relevance of these instruments is also the fact that their coefficients are jointly significant in each treatment equation.

Unfortunately, there is no formal test for the validity of exclusion restrictions in a nonlinear setting such this. However, as an informal check of exogeneity I estimated the same model but including instrumental variables also in the outcome equation. Their coefficients turn out to be individually and jointly not significant, which is quite a strong result given the sample size and the significance of the other coefficients.[23]

[23]These results are made available by the author upon request.



Notes: Predicted probabilities are computed from estimates of the multinomial logit reported in Table 3. The quantity reported is the probability $P(main = i|HT = j, X = \bar{X})$ of selecting the main method $main = i$ $(i = 1, \ldots, 6)$, for given housing tenure $HT = j (j = 0, \ldots, 3)$ and with regressors evaluated at sample means.

FIGURE 2: Selection of Main Method of Search by Housing Tenure.

Job Search Methods

In Table 3, I report estimates of the MNL for the six main methods of search. These estimates are used to compute the conditional probabilities of selecting each method by housing tenure, that are reported in Figure 2. PEC and NEWS account for a large portion of the distribution of methods. Statistically significant differences between outright owners and private renters are found only for NEWS and for PEC, with outright owners preferring the former, and private renters preferring the latter.

Concerning the effectiveness of search methods, related studies have documented that PEC are typically poorly effective for unemployed and their use has often been criticized (Holzer, 1988; Blau and Robins, 1990; Bishop and Abraham, 1993; Ports, 1993; Addison and Portugal, 2000; Longhi and Taylor, 2011). Unemployed who do not rely mainly on PEC are likely to be more proactive in their job search, therefore having enhanced chances to find a job (Longhi and Taylor, 2011). However, the PEC may be often approached when alternative search channels are not available (Bachmann and Baumgarten, 2013), hence it may be also possible that PEC is less effective because used at the last resort (Green, 2012). The coefficient of $ln(nummet)$ in Table 3 suggests actually that unemployed who use more methods prefer any method to PEC.

In Table 4, I report estimates of the competing-risks model for the unemployed. First, consistently with standard theory and evidence, *nummet* has strong positive impact on the hazard to job, and strong negative impact on the hazard to inactivity. Moreover I

TABLE 3: Selection of the Main Method of Search—Multinomial Logit

	PRIAGENCY		NEWS		DAE		SOCNET		OTHER	
	RRR	*s.e.*	*RRR*	*s.e.*	*RRR*	*s.e.*	*RRR*	*s.e.*	*RRR*	*s.e.*
own_out	1.492**	(0.186)	1.380**	(0.088)	0.955	(0.097)	1.200	(0.118)	1.490*	(0.269)
own_mort	1.839**	(0.181)	1.547**	(0.082)	1.152	(0.094)	1.165	(0.096)	1.764**	(0.256)
rent_soc	0.691**	(0.073)	0.745**	(0.032)	0.759**	(0.051)	0.815**	(0.057)	1.070	(0.149)
ln(nummet)	1.193**	(0.076)	1.419**	(0.042)	1.274**	(0.066)	1.129**	(0.051)	0.598**	(0.053)
white	1.394**	(0.155)	1.640**	(0.088)	1.285**	(0.114)	1.345**	(0.119)	1.773**	(0.285)
married	0.993	(0.073)	1.252**	(0.045)	1.209**	(0.069)	1.044	(0.058)	1.272*	(0.127)
claimant	0.356**	(0.026)	0.516**	(0.020)	0.509**	(0.029)	0.465**	(0.027)	0.557**	(0.057)
disabben	0.718	(0.123)	1.077	(0.070)	0.870	(0.096)	1.046	(0.104)	1.547**	(0.221)
incsup	0.572**	(0.099)	0.954	(0.055)	0.717**	(0.071)	1.045	(0.089)	1.350*	(0.195)
Age										
age_35_44	0.981	(0.089)	1.126**	(0.049)	0.943	(0.063)	1.180*	(0.081)	0.809	(0.100)
age_45_54	0.966	(0.093)	1.122*	(0.052)	0.874	(0.064)	1.156*	(0.085)	0.786	(0.104)
age_55_64	0.974	(0.108)	1.159**	(0.061)	0.822*	(0.071)	1.151	(0.096)	0.558**	(0.090)
Highest education										
degree	5.173**	(0.740)	3.114**	(0.237)	1.923**	(0.222)	1.962**	(0.220)	5.316**	(0.945)
higher_educ	3.221**	(0.510)	2.270**	(0.182)	1.639**	(0.205)	0.990	(0.133)	3.336**	(0.668)
gce	2.030**	(0.257)	1.708**	(0.083)	1.556**	(0.121)	1.235**	(0.091)	1.820**	(0.284)
gcse	1.385*	(0.191)	1.442**	(0.071)	1.197*	(0.099)	0.941	(0.075)	1.608**	(0.260)
other_qual	1.425*	(0.201)	1.264**	(0.062)	1.347**	(0.107)	1.059	(0.081)	1.276	(0.214)
Duration since last job										
0–3 months	5.198**	(1.322)	0.828**	(0.057)	1.625**	(0.187)	1.394**	(0.150)	0.952	(0.188)
3–6 months	4.239**	(1.090)	0.912	(0.063)	1.587**	(0.186)	1.196	(0.131)	1.035	(0.209)
6–12 months	3.302**	(0.848)	0.869*	(0.058)	1.323*	(0.152)	1.102	(0.119)	0.795	(0.161)
1–2 years	2.352**	(0.604)	0.887	(0.056)	1.223	(0.137)	0.879	(0.094)	0.839	(0.166)
2–3 years	2.031*	(0.575)	0.893	(0.067)	1.106	(0.147)	0.990	(0.119)	0.845	(0.191)
3–4 years	1.409	(0.453)	0.838*	(0.071)	0.975	(0.150)	1.003	(0.135)	0.931	(0.223)
4–5 years	2.190*	(0.710)	0.962	(0.090)	0.993	(0.169)	0.701*	(0.115)	1.161	(0.299)
5–8 years	0.729	(0.249)	0.851*	(0.065)	1.049	(0.142)	0.753*	(0.096)	0.803	(0.183)
occupation dummies					√					
region dummies					√					
quarter dummies					√					
year dummies					√					
Obs.					26,005					

Notes: * significant at 5 percent; ** significant at 1 percent. The dependent variable indicates six categories of main search methods, where the base category is PEC. See Appendix B for the base categories of discrete regressors. Relative Risk Ratios (*RRR*) are defined, for a pair outcome states (i_1, i_2) and a pair of residential states (j_1, j_2), as $RRR_{i_1,i_2,j_1,j_2} = (p_{i_1,j_1}/p_{i_2,j_1})/(p_{i_1,j_2}/p_{i_2,j_2})$, where $p_{i,j} = P(main = i|HT = j, X = \bar{X})$. Also, $RRR_{i_1,i_2,j_1,j_2} = \exp(\beta_{i_1,i_2,j_1,j_2})$, where β_{i_1,i_2,j_1,j_2} is the multinomial logit coefficient. Robust standard errors are similarly transformed. The sample is made of respondent male heads of households who are unemployed and use at least one method of search. Observations are quarterly for the period 1999–2009.

TABLE 4: Competing Risks Model for Unemployment Duration

	risk=job		risk=inactivity	
	RRR	*s.e.*	*RRR*	*s.e.*
own_out	1.551**	(0.075)	1.581**	(0.072)
own_mort	1.922**	(0.077)	1.200**	(0.053)
rent_soc	1.345**	(0.047)	1.446**	(0.051)
ln(nummet)	1.328**	(0.033)	0.652**	(0.013)
white	1.296**	(0.056)	1.388**	(0.060)
married	1.393**	(0.038)	1.202**	(0.033)
claimant	0.903**	(0.026)	0.574**	(0.017)
disabben	0.673**	(0.035)	1.648**	(0.058)
incsup	0.547**	(0.026)	1.263**	(0.042)
Main search method				
PRIAGENCY	1.297**	(0.081)	0.843*	(0.065)
NEWS	1.103**	(0.033)	1.078**	(0.031)
DAE	1.213**	(0.056)	1.035	(0.053)
SOCNET	0.937	(0.045)	1.267**	(0.056)
OTHER	1.439**	(0.110)	1.113	(0.086)
Spell duration				
3–6 months	0.780**	(0.029)	1.042	(0.046)
6–12 months	0.637**	(0.022)	1.056	(0.041)
1–2 years	0.520**	(0.018)	1.025	(0.038)
2–3 years	0.430**	(0.020)	1.009	(0.043)
3 over	0.403**	(0.022)	0.986	(0.046)
Age				
age_35_44	0.995	(0.034)	1.140**	(0.044)
age_45_54	0.864**	(0.031)	1.185**	(0.045)
age_55_64	0.561**	(0.023)	1.538**	(0.061)
Highest education				
degree	1.415**	(0.071)	1.109*	(0.056)
higher_educ	1.206**	(0.070)	0.942	(0.055)
gce	1.371**	(0.053)	1.108**	(0.038)
gcse	1.290**	(0.052)	1.026	(0.040)
other_qual	1.320**	(0.051)	1.064	(0.038)
occupation dummies		√		
region dummies		√		
quarter dummies		√		
year dummies		√		
Obs.		54,995		

Notes: * significant at 5 percent; * significant at 1 percent. The base category for the main method of search is PEC. See Appendix B for the base categories of the other discrete regressors. Reported coefficients are Relative Risk Ratios (*RRR*). Robust standard errors are reported. The sample is made of unemployment spells of respondent male heads of households who use at least one method of search. The unemployment spell can end with a job, with inactivity or be right censored.

find the typical result that homeowners have higher chance to escape unemployment for a job than renters. In particular, mortgagers have the best performance and outright owners have 55.1 percent higher risk of finding job than private renters. In agreement with previous evidence, I find that, relatively to PEC, four methods are associated with higher relative risk to find a job, namely PRIAGENCY, DAE, NEWS and OTHER. The fact that NEWS shortens significantly the unemployment duration relatively to PEC is

somewhat interesting given that outright owners select significantly more the former and private renters the latter.

Taken jointly, these results suggest that outright owners, and homeowners in general, tend to select search methods associated with shorter unemployment spells. This finding can be related to a better position to identify more efficient channels that homeowners have locally, due to their longer expected tenure in the community. Certainly, homeowners can access more easily relevant information and opportunities in the area they reside in, because they are more well established and can rely on a denser SOCNET therein. This can explain why homeowners are, on the one hand, less likely to use PEC (Osberg, 1993), and, on the other hand, more likely to use NEWS. Indeed it has to be remarked that NEWS can be used for national as well as local jobs and hence it can be efficient for homeowners. On the contrary, individuals with less tight connections with the local community should be less aware of or have limited access to search channels other than PEC (Bachmann and Baumgarten, 2013), which can be less effective. Because PEC can typically lead to local jobs, it can be also less efficient for renters. In the end, it seems that the spatial bias in search activities induced by mobility constraints, with homeowners searching relatively more locally and renters relatively more nonlocally, is more beneficial to owners.

6. CONCLUSIONS

This paper has investigated the well-known argument that homeownership reduces exit rates from unemployment by hampering residential mobility, known as Oswald's hypothesis. The empirical literature has confirmed that unemployed homeowners are less prone than renters to move for job reasons, but it has also found that homeowners have typically shorter unemployment spells, as opposite to Oswald's hypothesis. A novel solution to this puzzle has been explored in this paper by emphasizing the distinction between the unemployed's job search intensity and unemployment duration, and by using a multinomial definition of housing tenure.

A first contribution has been to show that mobility constraints induced by homeownership have a negative impact on search. In a simple model of endogenous search with moving costs, I have shown that homeowners search more intensively than renters for jobs in the local area, but search much less intensively in distant areas, so that their total search level is unambiguously lower. Accordingly, the present econometric analysis has shown that outright owners search less intensively than private renters, even after controlling for endogeneity of housing tenure. It has to be remarked that outright owners are not committed to mortgage payments potentially counteracting the effect of the restricted mobility of owning one's home. Indeed, as consistent with the argument that these obligations bear higher pressure to reenter employment, mortgagers are found to have the highest search. This latter finding suggests that, whether or not mortgagers are locked into their homes when the price declines, their job search and therefore job inflows are relatively modestly hampered. Finally, I have found that social renters search significantly less than private renters, corroborating the intuition that lock-in effects can hinder their incentive to search.

But still, why do outright owners search less intensively than renters and have at the same time better chances of escaping unemployment? I have pointed out that while higher mobility costs affect the search intensity and reservation wages in the first place, unemployment outcomes could diverge for other reasons. Therefore, a second contribution has been to investigate empirically the choice of search methods as an explanation of diverging unemployment outcomes. The evidence I have come up with shows that the two types of renter rely more on public employment offices and the two types of homeowner

rely more on newspapers advertisements, whereas the latter channel is associated with relatively shorter unemployment spells. It follows that the selection of more effective search methods could explain outright owners' better unemployment outcomes in spite of a lower overall amount of search.

The selection of more effective methods can be put down to homeowners' longer expected tenure in the community they reside in. Indeed, a stronger connection with the local SOCNET can ease access to relevant information and opportunities in the area, while renters may be constrained to rely extensively on PEC, that can be less effective and more concerned with local jobs. Therefore, the present evidence suggests overall that mobility constraints, by limiting the spatial extension of the search process, may bring about a redistribution of search activities more efficient for homeowners. In particular, comparative advantages in the local search may compensate for disproportionately lower nonlocal search, resulting ultimately in shorter unemployment duration.

This line of reasoning can provide a solution to the puzzle of unemployment and housing tenure, and can open the way for further analysis based on the search behavior. In this respect, it would be of interest to investigate the extent to which different search methods are conducive to local and nonlocal jobs. Moreover, while in the present analysis the focus has been on the unemployed's behavior, other explanations could focus on the employer's side. For example, employers may prefer to hire workers who own their own accommodation since their expected job tenure is longer (Gregg and Wadsworth, 1992). Investigation of these insights is left for future research.

APPENDIX A: PROOFS OF THEORETICAL PROPOSITIONS

I report below proofs of the propositions stated in Section 2.

Proof of Proposition 1.

(a) $s_l^* > s_r^*$. The proof makes use of the derivative of s_l^* with respect to m, which is defined by the implicit function theorem. First, dw_l^*/ds_l and dw_l^*/dm are defined and evaluated at the optimum. Differentiating Equation (7) with respect to w_l^* and s_l one has

$$\frac{dw_l^*}{ds_l} = \frac{\rho^{-1}\alpha'(s_l)\int_{w_l^*}(w - w_l^*)\,F'(w)dw - c'(s_l)}{1 + \rho^{-1}\alpha(s_l)[1 - F(w_l^*)] + \rho^{-1}\alpha(s_n)[1 - F(w_n^*)]}, \tag{A1}$$

which is equal to 0 for $s_l = s_l^*$, since the numerator is equal to 0 (as follows directly from the first order condition for s_l^*). Moreover, $dw_l^*/ds_l > (<)0$ if $s_l < (>)s_l^*$. Differentiating Equation (7) with respect to w_l^* and m one obtains

$$\frac{dw_l^*}{dm} = -\frac{\alpha(s_n)[1 - F(w_l^* + \rho m)]}{1 + \rho^{-1}\alpha(s_l)[1 - F(w_l^*)] + \rho^{-1}\alpha(s_n)[1 - F(w_n^*)]} < 0, \tag{A2}$$

which is negative for any value of s_l. Intuitively, w_l drops as m increases since the acceptance of a job far from home comes with a lower expected surplus. I rewrite now the first order condition for s_l^* as

$$\Phi(s_l^*, m) = c'(s_l^*) - \frac{\alpha'(s_l^*)}{\rho}\int_{w_l^*(s_l^*, m)}[w - w_l^*(s_l^*, m)]F'(w)dw = 0, \tag{A3}$$

which is used to compute $\Phi_{s_l^*}$ and Φ_m. Specifically:

$$\Phi_{s_l^*} = c''(s_l^*) - \rho^{-1}\alpha''(s_l^*)\int_{w_l^*}(w - w_l^*)F'(w)dw > 0, \tag{A4}$$

which uses the fact that $dw_l^*/ds_l = 0$ when $s_l = s_l^*$, and

$$\Phi_m = \rho^{-1}\alpha'(s_l^*)\int_{w_l^*}\left(\frac{dw_l^*}{dm}\right)F'(w)dw < 0, \tag{A5}$$

where inequalities derive from $c'' > 0$, $F' > 0$, $\alpha' > 0$, $\alpha'' < 0$ and $dw_l^*/dm < 0$. Then, applying the implicit function theorem one has

$$\frac{ds_l^*}{dm} = -\frac{\Phi_m}{\Phi_{s_l^*}} = -\frac{\rho^{-1}\alpha'(s_l^*)\int_{w_l^*}\left(\frac{dw_l^*}{dm}\right)F'(w)dw}{c''(s_l^*) - \rho^{-1}\alpha''(s_l^*)\int_{w_l^*}(w - w_l^*)F'(w)dw} > 0. \tag{A6}$$

As expected, s_l^* increases as m increases; since the relation between s_l^* and m is positive for any value of m, this will be true in particular when $m = 0$, that is, when the optimal search locally (and nonlocally) is $s_r^* = s_l^*$. Thus, when m becomes positive, which captures a shift from tenant to owner status, the local search increases from s_r^* to s_l^*.

(b) $s_n^* < s_r^*$. As in the previous case, I calculate the derivatives dw_n^*/ds_n and dw_n^*/dm and I study the sign of ds_n^*/dm. Differentiating the equation $w_n^* = w_l^* + \rho m$ with respect to w_n^* and s_n one obtains

$$\frac{dw_n^*}{ds_n} = \frac{\rho^{-1}\alpha'(s_n)\int_{w_n^*}(w - w_n^*)\,F'(w)dw - c'(s_n)}{1 + \rho^{-1}\alpha(s_l)[1 - F(w_l^*)] + \rho^{-1}\alpha(s_n)[1 - F(w_n^*)]}. \tag{A7}$$

Given the first order condition for s_n^*, this derivative is equal to 0 when $s_n = s_n^*$. Moreover, $dw_n^*/ds_n > (<)0$ if $s_n < (>)s_n^*$. Differentiating with respect to w_n^* and m one obtains

$$\frac{dw_n^*}{dm} = \frac{\rho + \alpha(s_l)[1 - F(w_l^*)]}{1 + \rho^{-1}\alpha(s_l)[1 - F(w_l^*)] + \rho^{-1}\alpha(s_n)[1 - F(w_n^*)]} > 0, \tag{A8}$$

which is positive for any value of s_n. A rise in m requires a higher wage to induce the homeowner to move for a job. I rewrite the first order condition for s_n^* as

$$\Psi(s_n^*, m) = c'(s_n^*) - \frac{\alpha'(s_n^*)}{\rho}\int_{w_n^*(s_n^*, m)}[w - w_n^*(s_n^*, m)]F'(w)dw = 0, \tag{A9}$$

which is used to compute $\Psi_{s_n^*}$ and Ψ_m. Specifically:

$$\Psi_{s_n^*} = c''(s_n^*) - \rho^{-1}\alpha''(s_n^*)\int_{w_n^*}(w - w_n^*)F'(w)dw > 0, \tag{A10}$$

which uses the fact that $dw_n^*/ds_n = 0$ when $s_n = s_n^*$, and

$$\Psi_m = \rho^{-1}\alpha'(s_n^*)\int_{w_n^*}\left(\frac{dw_n^*}{dm}\right)F'(w)dw > 0, \tag{A11}$$

where inequalities derive from $c'' > 0$, $F' > 0$, $\alpha' > 0$, $\alpha'' < 0$ and $dw_n^*/dm > 0$. Then, applying the implicit function theorem, one has

$$\frac{ds_n^*}{dm} = -\frac{\Psi_m}{\Psi_{s_n^*}} = -\frac{\rho^{-1}\alpha'(s_n^*)\int_{w_n^*}\left(\frac{dw_n^*}{dm}\right)F'(w)dw}{c''(s_n^*) - \rho^{-1}\alpha''(s_n^*)\int_{w_n^*}(w - w_n^*)F'(w)dw} < 0. \tag{A12}$$

ds_n^*/dm is negative for any value of m, thus when m increases from 0 to a positive number the nonlocal search is reduced from s_r^* to s_n^*. □

Proof of Proposition 2.

Given the first-order conditions (4), (5), (8), and (9), the result of Proposition 1 and that $c'(\cdot)/\alpha'(\cdot)$ is an increasing function, it follows that

$$w_l^* < w_r^* \longleftrightarrow B > A \longleftrightarrow \frac{c'(s_l^*)}{\alpha'(s_l^*)} > \frac{c'(s_r^*)}{\alpha'(s_r^*)} \longleftrightarrow s_l^* > s_r^*,$$

$$w_n^* > w_r^* \longleftrightarrow C < A \longleftrightarrow \frac{c'(s_n^*)}{\alpha'(s_n^*)} < \frac{c'(s_r^*)}{\alpha'(s_r^*)} \longleftrightarrow s_n^* < s_r^*. \qquad \square$$

Proof of Proposition 3.

Since the closed form for the optimal search levels cannot be derived, the proof relies on ds_l^*/dm and ds_n^*/dm evaluated at $m = 0$, that is, the case of identical search. The (opposite) marginal variations at $m = 0$ can be interpreted simply as "marginal" differences in each market's search levels between the homeowner and the renter. The key for the proof is to demonstrate that the magnitude of the marginal decrease in the nonlocal search is higher than the marginal increase in the local search.

Equation (A6) and Equation (A12) represent the marginal variations of the homeowner's local and nonlocal search, respectively. When $m = 0$, one has $s_l^* = s_r^* = s_n^*$; hence the two derivatives are identical except for the derivatives of the reservation wage in the numerator, which have opposite signs:

$$\frac{ds_l^*}{dm}(m=0) = -\frac{\rho^{-1}\alpha'(s_r^*)\int_{w_r^*}\left(\frac{dw_l^*}{dm}(m=0)\right)F'(w)dw}{c''(s_r^*) - \rho^{-1}\alpha''(s_r^*)\int_{w_r^*}(w-w_r^*)F'(w)dw}, \tag{A13}$$

$$\frac{ds_n^*}{dm}(m=0) = -\frac{\rho^{-1}\alpha'(s_r^*)\int_{w_r^*}\left(\frac{dw_n^*}{dm}(m=0)\right)F'(w)dw}{c''(s_r^*) - \rho^{-1}\alpha''(s_r^*)\int_{w_r^*}(w-w_r^*)F'(w)dw}. \tag{A14}$$

Making use of Equation (A2) and Equation (A8), I can evaluate the derivatives of the reservation wages at the optimal values of search when $m = 0$:

$$\frac{dw_l^*}{dm}(s_r^*, m=0) = -\frac{\alpha(s_r^*)[1-F(w_r^*]}{1+\rho^{-1}\alpha(s_r^*)[1-F(w_r^*)] + \rho^{-1}\alpha(s_r^*)[1-F(w_r^*)]}, \tag{A15}$$

$$\frac{dw_n^*}{dm}(s_r^*, m=0) = \frac{\rho+\alpha(s_r^*)[1-F(w_r^*)]}{1+\rho^{-1}\alpha(s_r^*)[1-F(w_r^*)] + \rho^{-1}\alpha(s_r^*)[1-F(w_r^*)]}. \tag{A16}$$

It is easy to show that $\rho > 0$ implies $\frac{dw_n^*}{dm}(s_r^*, m=0) > |\frac{dw_l^*}{dm}(s_r^*, m=0)|$, which in turn implies $|\frac{ds_n^*}{dm}(m=0)| > \frac{ds_l^*}{dm}(m=0)$. This means that the difference in the nonlocal search between homeowner and renter is higher, in absolute value, than the difference in the local search, that is $s_r^* - s_n^* > s_l^* - s_r^*$. $\square$

Proof of Proposition 4.

I just need to prove that the derivative of $(h_l + h_n)$ with respect to m at the optimal values of search when $m = 0$ is negative. Letting $\frac{dw_l^*}{dm}(s_r^*, m=0) = L^w$, $\frac{dw_n^*}{dm}(s_r^*, m=0) = N^w$, $\frac{ds_l^*}{dm}(m=0) = L^s$, and $\frac{ds_n^*}{dm}(m=0) = N^s$, one has

$$\begin{aligned}\frac{d(h_l+h_n)}{dm}(s_r^*, m=0) &= \alpha'(s_r^*)\left[1-F(w_r^*)\right]L^s - \alpha(s_r^*)F'(w_r^*)L^w \\ &\quad + \alpha'(s_r^*)\left[1-F(w_r^*)\right]N^s - \alpha(s_r^*)F'(w_r^*)N^w = \\ &= \alpha'(s_r^*)\left[1-F(w_r^*)\right](L^s+N^s) - \alpha(s_r^*)F'(w_r^*)(L^w+N^w) < 0,\end{aligned} \tag{A17}$$

where the latter inequality holds since $(L^s + N^s) < 0$ and $(L^w + N^w) > 0$; see Proposition 3. □

APPENDIX B: DESCRIPTION OF VARIABLES

Housing Tenure: *own_out*: accommodation owned outright; *own_mort*: accommodation owned with mortgage; *rent_soc*: accommodation rented from Local Authorities or Housing Associations; *rent_pri*: accommodation rented from private.

nummet: Count of search methods used by unemployed people. People who state they have been looking for work in the last four weeks are asked to reply whether or not they used any of the following methods: (1) visiting a Jobcentre, (2) visiting a Careers Office, (3) visiting a Jobclub, (4) having owns name on the books of a private employment agency, (5) advertising for jobs in newspapers or journals, (6) answering advertisements in newspapers and journals, (7) study vacant situations in newspapers or journals, (8) apply directly to employers, (9) ask friends, relatives, colleagues, or trade unions about jobs, (10) waiting for the results of job application, (11) looking for premises or equipment, (12) seeking any kind of permit, (13) trying to get a loan or other financial backing for a job or business, (14) doing anything else to find work. *nummet* is the sum of positive answers. I drop individuals who search only as self-employed.

Main method of search: Each individual is asked to report the main method of search used. I group methods in the six most used: PEC: (1)+(2)+(3); PRIAGENCY: (4); NEWS: (5)+(6)+(7); DAE: (8)+(10); SOCNET: (9); OTHER: (11)+(12)+(13)+(14).

white: Race dummy.

married: Whether legally married (not separated), regardless of living in the same household.

claimant: Whether claiming the Jobseeker's Allowance (JSA).

disabben: Whether on sickness or disability benefit.

incsup: Whether claiming income support not related to unemployment.

Age: Omitted category in regressions is *16–34* years.

Highest education: Education dummies refer to the highest education level attained. Categories are: (1) Degree or equivalent (2) higher education, (3) GCE, A-level or equivalent, (4) GCSE grades A*-C or equivalent, (5) other qualifications, (6) no qualification. The base category in the regressions is (6).

Duration since last job: (1) Less than three months, (2) three months but less than six, (3) six months but less than 12, (4) one year but less than two, (5) two years but less than three, (6) three years but less than four, (7) four years but less than five, (8) five years or more, (9) more than eight years ago. Category (9) is omitted in regressions.

Occupation in last job: (1) Managers and administrators, (2) professional occupations, (3) associate professional and technical occupations, (4) clerical or secretarial occupations, (5) craft and related occupations, (6) plant and machine operatives, (7) other occupations.

Region dummies: (1) Tyne and Wear, (2) Rest of North East, (3) Greater Manchester, (4) Merseyside, (5) Rest of North West, (6) South Yorkshire, (7) West Yorkshire, (8) Rest of Yorkshire and the Humberside, (9) East Midlands, (10) West Midlands and Metropolitan County, (11) Rest of West Midlands, (12) Eastern, (13) Inner London, (14) Outer London, (15) South East, (16) South West, (17) Wales, (18) Strathclyde, (19) Rest of Scotland, (20) Northern Ireland.

Quarter dummies: *qrtr1* (January-March), *qrtr2* (April-June), *qrtr3* (July-September), *qrtr4* (October-December).

Year dummies: The sample spans the period 1999–2009 for a total of 11 years and 44 quarters of observations.

$ln(multifamrate)$: The variable *multifamrate* indicates the percentage of households living in multifamily housing for each region and quarter.

$ln(C_{mort}/C_{rent})$: The variables C_{mort} and C_{rent} capture average housing costs for mortgagers and renters at regional and quarter level. Data on housing costs are retrieved from the U.K. Family Resource Survey (FRS). For mortgagers, I consider the total weekly mortgage costs including mortgage payments, endowment policies, structural insurance and service payments. For renters, I consider the total weekly rent payment comprehensive of service charges. These variables are expressed in real weekly pounds of 2010q2 and are weighted with household sampling weights. In the FRS around 25,000 households are surveyed for each year using a stratified random sample. The primary sampling unit (PSU) is the postcode sector. For each year, the PSUs are systematically allocated to quarters to ensure that the sample is balanced on a quarterly basis.

samesex: Dummy indicating whether the two first-born children in the household are the same sex.

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