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Regional Science and Urban Economics 35 (2005) 305–325

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regional
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ECONOMICS

Housing, mobility and unemployment

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Received 23 October 2000; accepted 2 April 2004

Available online 20 July 2004

Abstract

The paper elucidates the relationship between housing tenure, regional mobility and unemployment. It develops a model that can explain the paradoxical empirical regularity that higher owner occupation rates are associated with higher levels of unemployment although homeowners tend to be unemployed less often. The choice of housing tenure affects moving costs and thereby regional mobility and unemployment. In addition, moving costs reduce on-the-job search effort and search effectiveness. The paper analyzes the impact of symmetric and asymmetric shocks on regional mobility and unemployment and discusses effects of government intervention in the housing market.

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JEL classification: J6

Keywords: Housing; Mobility; Unemployment

1. Introduction

Much of the puzzle of high European unemployment is still unresolved despite substantial effort and remarkable theoretical progress. Blanchard and Katz (1997, p. 52) conclude that “[...] while many suspects have been identified, none has been convicted”. Nickell (1997) shows empirically that key factors of prominent models—including labor market rigidities, the treatment of the unemployed, taxes, union coverage, union and employer coordination in wage bargaining—do not provide a satisfactory explanation for cross-country differences in unemployment rates. Although Nickell (1997) mentions that lack of mobility potentially affects labor market outcomes adversely—an idea that is at

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least as old as the concept of the natural rate of unemployment¹—and despite a growing body of evidence of a positive correlation between rates of homeownership and unemployment (e.g., Oswald, 1996), he neglects regional mobility as an explanatory factor in his empirical analysis of equilibrium unemployment.² When Nickell (1998) adds the proportion of homeownership to the regression, its fit improves considerably. The R^2 rises from 0.76 to 0.82. The coefficient estimate implies that a 10% point rise in the owner-occupation rate is associated with an additional 1.3% points of the unemployment rate.

This paper develops a model that explains the links between housing tenure, regional mobility and unemployment.³ Few theoretical models focus on the interaction between regional mobility and unemployment. Oswald (1997) predicts that higher homeownership rates lead to more unemployment and that unemployment is concentrated among homeowners. The latter prediction is contradicted, however, by the empirical fact that renters have lower employment rates.⁴

This paper develops a model that is consistent with the stylized facts about unemployment, housing tenure and regional mobility. It shows why higher aggregate rates of homeownership are associated with higher unemployment rates, although unemployment might not be concentrated among homeowners. It explains why high-skilled workers are more mobile than low-skilled workers given the choice of housing tenure. The model illustrates that increased aggregate homeownership rates are associated with reduced search intensity, diminished attractiveness of job offers, and with higher unemployment. If mobility and search behavior are partly determined by conditions in the housing market, the wage pressure variable in models of the Layard and Nickell type (see Layard et al., 1991) or the search effectiveness parameter in matching models (e.g., Pissarides, 2000) become a function of housing market conditions. Interventions in the housing market consequently affect labor market outcomes. This has important policy implications.

The remainder of the paper is organized as follows. The following section discusses links between housing and labor markets and reports some stylized facts that motivate the model of housing, mobility and unemployment that is introduced in Section 3. Section 4 discusses how shocks affect mobility and unemployment. Section 5 refines the model. Section 6 extends the model to analyze interactions between search and moving costs. Section 7 focuses on policy implication. Finally, Section 8 concludes.

¹ Friedman (1968) already explained: “The natural rate of unemployment is the level which would be ground out by the Walrasian system of general equilibrium equations, provided that there is imbedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labor availabilities, the cost of mobility, and so on.”

² Evidence for a positive correlation between rates of homeownership and unemployment is also provided by Green and Hendershott (2001), Partridge and Rickman (1997) and Pehkohen (1999). See also footnote 9 below.

³ The model is concerned with regional mobility. Böheim and Taylor (2002, p. 370.) find in an analysis of data from the British Household Panel Survey (BHPS) that “[A] desire to move motivated by employment reasons has the single largest effect on the probability of moving between regions” and that it is the unemployed who are most likely to move, particularly between regions. Gardner et al. (2001) also find that joblessness stimulates mobility, both in data from the BHPS and the National Child Development Study.

⁴ In a sample, in which 75% are homeowners, Böheim and Taylor (2002) find that over 50% of the unemployed live in rented accommodation while less than 20% of those in work are renters.

2. Links between housing and labor markets—stylized facts and empirical evidence

The model is built to study the link between the choice of housing tenure, regional mobility and employment status. It generates predictions that are consistent with a broad pattern of empirical results and with the set of the following stylized facts.⁵

- (1) Job flows in the labor markets are immense.⁶
- (2) Most of the cross-country differences in unemployment rates can be ascribed to variations in long-term unemployment, and most of the rise in European unemployment can be attributed to an increase in the duration rather than to a higher inflow rate into unemployment.⁷
- (3) The outward shift of the Beveridge curve suggests that it has become harder to match workers and firms, possibly because workers are less prepared to move regions and spend less effort on search across regions.⁸
- (4) Aggregate rates of homeownership are positively correlated with unemployment.⁹
- (5) Private renters move relatively more than owners.¹⁰
- (6) High-skilled workers experience fewer and shorter spells of unemployment.
- (7) Skilled workers migrate more.¹¹
- (8) High-skilled workers also search more and prefer employed search.¹²
- (9) Regional migration is higher during economy-wide booms and is lower during recessions.¹³

⁵ The idea that housing and labor markets are linked is not new. Research by Hughes and McCormick (1981, 1985a, 1987) focuses on the private and public renting sector and concludes that council housing restricts labor mobility and hence raises unemployment. Bover et al. (1989) argue that regional house price/earnings differentials are important elements in wage and unemployment, vacancy equations.

⁶ See Davis et al. (1996), Contini and Revelli (1997) and OECD (1996), chapter 5.

⁷ See Nickell (1997).

⁸ In most countries, the number of unemployed has risen relative to the number of vacancies, indicating that vacancies are filled less efficiently.

⁹ Oswald (1996) finds that the gradient of unemployment to owner-occupation is roughly 0.2 in different data sets including cross-sections of OECD countries, UK regions, U.S. states, regions of France, Sweden and Italy and a panel data set of UK regions. This empirical regularity is buttressed by the fact that nations with the fastest growth of homeownership rates experienced the strongest unemployment growth. A 10% point increase in the rate of owner-occupation is associated with an increase in the unemployment rate of approximately 2% points. Henley's (1998) findings also suggest that homeownership reduces mobility. Pehkohen (1999) confirms Oswald's results using Finnish data. Green and Hendershott (2001) find evidence for a positive correlation between rates of homeownership and unemployment in U.S. data for the middle age (35–64) classes. However, see also footnote 22.

¹⁰ Böheim and Taylor (2002) estimate that private renters are most likely to move between regions when controlling inter alia for income, education, age and employment status.

¹¹ Evans and McCormick (1994) find that nonmanual workers have much higher gross rates of interregional mobility. Pissarides and Wadsworth (1989) report that the likelihood of migration rises with educational attainment. See also Hughes and McCormick (1987) and McCormick (1997).

¹² Hughes and McCormick (1985b) find that education increases the probability of job search, and Pissarides and Wadsworth (1994) provide evidence that skilled workers search more and prefer employed search.

¹³ See Jackman and Savouri (1992), Pissarides and Wadsworth (1989) and Vanderkamp (1968).

- (10) Migration rates are affected by asymmetric regional shocks. Net migration from depressed regions largely comprises high-skilled workers but there is no correlation between regional employment growth and low-skilled worker net migration.¹⁴ Variations in regional unemployment rates do not stimulate migration of low-skilled workers unless there is geographic wage flexibility. High relative wages stimulate in-migration.¹⁵ Homeowners also do not appear to move from high unemployment areas to regions with lower unemployment.¹⁶ Therefore, high-skilled renters respond most to asymmetric shocks and are the first to leave the depressed region.

Taking into account that labor markets are characterized by large gross job flows [stylized fact (1)], a model is developed next that explains stylized facts (2) to (10).

3. A simple model

This section introduces a simple model that is consistent with the empirical regularities: that higher rates of homeownership are associated with higher rates of unemployment [stylized fact (4)], that private renters move relatively more than owners [stylized fact (5)] and that high-skilled workers migrate more and are less often unemployed than low-skilled workers [stylized facts (6) and (7)]. While these implications are not too surprising, the model generates the novel result that unemployment does not need to be concentrated among homeowners to explain the positive correlation between aggregate homeownership rates and aggregate unemployment rates. In fact, unemployment among the group of homeowners might be lower than among renters. The model demonstrates under which conditions regional mobility among homeowners is higher than among renters. This implication of the model is of great consequence for empirical work as it calls attention to the importance of controlling for the expected income of workers when estimating the effect of the type of housing tenure on regional mobility. The model is based on the following assumptions:

- (1) There are two identical regions, East and West. Hence, the size of the regions and the number of jobs in both regions are the same.
- (2) Workers must live where they work (unemployed can live anywhere). To accept a job offer outside the home region, a worker must move and incur the fixed moving costs k^m .
- (3) Workers are either homeowners or renters. The fixed moving costs k^m equal k^o for owners and k^r for renters. Moving is more expensive for owners, i.e., $k^o > k^r$.

¹⁴ Evans and McCormick (1994), Hughes and McCormick (1985a, 1994) and McCormick (1997) all find little evidence that manual workers migrate to low-unemployment markets, whereas absolute net migration rates are much higher for nonmanuals.

¹⁵ McCormick (1997) reports workers migrate to regional markets with high relative wages. See also Hughes and McCormick (1994) and Pissarides and Wadsworth (1989).

¹⁶ See Henley (1998).

- (4) There are two types of workers: High-skilled workers who earn a wage $W=H$ and low-skilled workers who earn $W=L$, where $H>L$.
- (5) High-skilled workers only receive job offers for high-skilled jobs and low-skilled workers only receive offers for low-skilled jobs.
- (6) Jobs last for one period. At the beginning of a period, each worker receives one job offer. The offer comes from a firm in West with probability q and from a firm in East with probability $(1 - q)$. Workers who reject become unemployed for one period and get another job offer at the beginning of the next period.¹⁷
- (7) In absence of asymmetric shocks, q is assumed to equal 0.5.
- (8) The unemployed receive benefits B with $B<L$. Benefits are net of any costs of unemployment, C , including mental costs.¹⁸
- (9) The discount factor is equal to δ , $0 < \delta < 1$.
- (10) Workers' lives are infinite.¹⁹

Because wages exceed benefits associated with unemployment for any worker type (by assumptions 4 and 8), every worker always accepts a job offer in his home region. Reluctance to migrate in order to accept a job offer outside the home region initiates unemployment. Since workers migrate only if they satisfy the condition

$$W - B > k^m \quad (1)$$

(see Appendix A), regional mobility—and hence unemployment—depends on wages relative to moving costs and unemployment benefits. A rise in net benefits, B , or an increase in moving costs, k^m , makes workers less likely to migrate and therefore more likely to become unemployed. Condition (1) implies that renters have *ceteris paribus* a higher propensity to migrate than homeowners, as they incur lower moving costs (assumption 3).²⁰ An increase in the homeownership rate raises aggregate moving costs and consequently leads to a fall in the job offer acceptance rate so that unemployment rises.

High-skilled workers are more likely to migrate than low-skilled workers for a given choice of housing tenure. High-skilled renters are most likely and low-skilled owners are least likely to migrate. Corroborating evidence is provided by Böheim and Taylor (2002) who estimate the probability of interregional mobility conditional on *inter alia* income, education, age and employment status. They find that income and education raise interregional mobility and that private renters are most likely to move between regions when income and education are held constant.

The model predicts that an increase in the proportion of low-skilled (high-skilled) owners unambiguously has an adverse effect on employment if moving regions is not

¹⁷ A fixed length of an employment spell is assumed for simplicity despite the awareness that there is great variation in the length of employment spells (Farber, 1999).

¹⁸ Gross benefits include any payment or subsidy an unemployed worker receives as well as the monetary value of additional leisure time or self-employment he enjoys. Let M be the monetary value of gross benefits and C the monetary value of any cost associated with unemployment, then $B=M - C$.

¹⁹ An infinite horizon facilitates the algebra and exposition but the important implications of the model can be derived with finite lives.

²⁰ This is confirmed empirically by Böheim and Taylor (2002).

optimal for low-skilled (high-skilled) owners but for low-skilled (high-skilled) renters. High-skilled owners are even more mobile than low-skilled renters if $H - L > k^o - k^r$.²¹ Not conditioning on income, homeowners might be more mobile on average if high-wage earners are more likely to be homeowners. This indicates that econometric specifications in empirical studies of the determinants of regional mobility must be carefully specified to fully control for moving costs and expected gains from moving.²²

4. The effects of shocks

Next, it is analyzed how shocks affect mobility and unemployment rates for the different types of workers. Predictions are derived that are consistent with stylized facts (9) and (10). Asymmetric shocks reduce employment opportunities in the depressed region (say East) and increase job offers and employment opportunities in the booming region (West). This is modelled as a rise in q . Temporary random asymmetric shocks, in which q changes for one period only, and persistent asymmetric shocks, are considered. Adverse symmetric shocks are modelled as a fall of the job offer arrival rate. In particular, it is assumed that workers receive a job offer every second period rather than every period. Analogously, a positive symmetric shock is modelled as an increase in the job offer arrival rate.

4.1. Asymmetric shocks

Proposition 1. *A temporary random asymmetric shock tends to increase the number of workers moving to the booming region (West) and tends to lower the number of workers moving to the depressed region (East).*

Proof of Proposition 1. If the shock is temporary, i.e., lasts one period, the moving constraint is still given by condition (1) because the income stream from the next future period onwards is not affected by the region of residence. However, as the asymmetric shock increases q , a bigger fraction of workers in East is offered a job in West, while fewer workers in West are offered a job in East. Since those who do not satisfy condition (1)

²¹ In this simple model setting low-skilled renters either always or never move. Lowering moving costs has no impact on mobility over some range but causes discrete jumps in mobility rates once the moving condition is met by a particular group of workers. These results disappear if we, more realistically, either assume continuous wage offer distributions for different types of workers or a continuum of mobility costs.

²² Coulson and Fisher (2002) find, for example, that homeowners typically earn significantly higher wages than renters do and are more mobile. Green and Hendershott (2001) point out that selection issues are important. For example, those who expect to have more stable employment (and thus can amortize the sunk costs associated with owning over a longer period) are likely to have lower user costs of owning and are consequently more likely to become homeowners. Although the partial equilibrium analysis takes the housing choice as given, the model implies that a higher job offer arrival rate and a lower job destruction rate reduce the need for moving regions for job reasons. Green and Hendershott (2002) deal with some of the issues of selectivity and aggregation. Flatau et al. (2003) analyze Australian data and point out that empirical results conflicting with Oswald's findings (Oswald, 1996) stem from (1) highly leveraged owners having a greater incentive to stay employed and search hard to become reemployed quickly after job loss and from (2) public house tenants paying below market rents and thus having reduced incentives to move for job reasons.

become unemployed, unemployment rises in East and falls in West. Unemployment remains concentrated among immobile workers. \square

Proposition 2. *A persistent asymmetric shock makes workers in the depressed region more likely to leave and workers in the booming region more likely to stay. Because the effect is bigger the longer the shock is expected to persist, serially correlated shocks have a bigger impact on mobility than random shocks. High-skilled renters are the first to leave a depressed region while the low-skilled workers, especially low-skilled homeowners, might not move at all.*

Proof of Proposition 2. If differences in job offer arrival rates between regions persist throughout the next future period, the moving constraint for a worker in East changes to

$$W - B > k^m - \delta(2q - 1)\max[k^m; W - B], \quad (2)$$

while the moving constraint for a worker in West changes to

$$W - B > k^m + \delta(2q - 1)\max[k^m; W - B]. \quad (3)$$

Since $2q - 1 > 0$, the moving condition becomes more likely to be satisfied compared to condition (1) for workers in East and less likely to be satisfied for workers in West. For a proof of the effect of serially correlated shocks, see Appendix B. \square

The bigger δ , i.e., the more workers value the future, and the bigger q , i.e., the more intense the shock is, and the longer it persists (see Appendix B), the more attractive moving becomes for workers in East and the more attractive staying becomes for workers in West. High-skilled renters are predicted to be the first to leave a depressed region while low-skilled owners are the last to leave. These predictions are consistent with the evidence reported by McCormick (1997) and Henley (1998). A comparison of Eqs. (1) and (2) and of Eqs. (1) and (3) shows that the asymmetric shock changes the moving condition most for workers earning higher wages. High-skilled workers in the depressed region become more likely to move regions in response to the shock than low-skilled workers do. Interestingly, it is possible that high-skilled owners are induced by the shock to move between regions while low-skilled renters remain immobile even if their moving probability in absence of the shock had been the same. Suppose, for example, that $H - B - k^o = L - B - k^r < 0$ so that both groups of workers would not move in the absence of the shock, then an asymmetric shock could make moving profitable for the high-skilled owner but not for the low-skilled renter. This surprising result, which to this author's knowledge has not been derived in theoretical work, could be tested in future empirical work. The differential mobility responses of high-skilled and low-skilled workers suggest that regional differences in unemployment rates are much more persistent in the low-skilled labor market. These theoretical predictions are corroborated by the empirical results of Evans and McCormick (1994). They distinguish between manual and nonmanual workers and find that manual workers have low levels of gross migration and that variations in regional unemployment persist in the manual labor market. In contrast, nonmanual labor markets are characterized by similar regional unemployment rates and by net migration towards regions with low unemployment and relatively high rates of regional mobility.

In addition, the model implies that this effect is magnified if there is uncertainty about the length of the shock. To appreciate this argument, assume that shocks either persist three periods or one period and that both scenarios are equally likely so that the expected length of a shock is two periods. Suppose that there is a group of workers for whom migration is optimal only if the shock lasts at least for three periods. Given an expected duration of two periods, it is *ex ante* never optimal for them to move, although in half of the cases migrating is optimal *ex post*. When workers learn about the true type of the shock (say after one period), the remaining duration of the shock is too short to make migration profitable. The moving constraint (2) might remain binding for some workers while unemployment in the depressed region is increasing.²³ This is consistent with Evans and McCormick's (1994) finding that relative demand shocks do not stimulate out-migration from the depressed region unless local wages fall.

Although migration rates for some workers seem not to respond to higher unemployment rates, a higher unemployment level that creates downward wage pressure has an (indirect) effect on regional mobility if wages are flexible such that wages in East fall to W^E , while wages in West equal W^W , $W^W > W^E$. Moving away from the depressed region, East becomes more attractive as relative wages in the booming region rise.²⁴ To illustrate, consider the moving constraint of a worker in East who is offered a job in the booming region. If the shock lasts for one future period, after which relative wages are equal to 1, moving is preferred if²⁵

$$W^W - B > k^m - \delta \{ q(W^W - \max[W^W - k^m, B]) + (1 - q)(W^E - \max[W^E - k^m, B]) \}. \quad (4)$$

In all three cases — (i) workers satisfying $W^E - B > k^m$, (ii) workers not satisfying $W^E - B < k^m < W^W - B$ and (iii) workers satisfying $W^E - B < k^m$ — the moving constraint (4) is eased more the higher the wage in the booming region W^W and the larger the shock q is.²⁶

4.2. Symmetric shocks

An adverse symmetric shock that affects both regions in the same way does not alter the moving condition (1), given that wages remain unchanged. Moreover, the length of the recession does not affect the moving decision either (see Appendix C). The shock, however, does raise the level of unemployment because everybody enters the unemployment pool

²³ Note that the unemployment rate rises in the depressed region among immobile workers because fewer of them receive a job offer in their home region.

²⁴ This is consistent with the findings of Hughes and McCormick (1994), McCormick (1997) and Pissarides and Wadsworth (1989).

²⁵ A worker's expected discounted future income when moving to West is given by

$$W^W - k^m + \delta \{ qW^W + (1 - q)\max[W^E - k^m, B] \} + \frac{0.5\delta^2}{1 - \delta} \{ W + \max[W - k^m, B] \},$$

the present value of staying is given by

$$B + \delta \{ (1 - q)W^E + q\max[W^W - k^m, B] \} + \frac{0.5\delta^2}{1 - \delta} \{ W + \max[W - k^m, B] \}.$$

²⁶ For more details see Dohmen (2000).

after an employment spell. The expected unemployment duration is exactly one period for mobile workers [those who satisfy condition (1)] but exceeds one period for immobile workers. Consequently, the unemployment rate is higher among immobile workers.

Proposition 3. *An adverse symmetric shock results in a higher level of unemployment but does not affect regional mobility.*

Proof of Proposition 3. See argument above and Appendix C. □

Proposition 3 documents an important result that should guide empirical research because it highlights the importance of controlling for changes in relative labor market demand conditions (e.g., relative vacancy inflow and vacancy filled rates) rather than for absolute changes therein when estimating regional mobility rates. It should be noted, however, that mobility is reduced during economy-wide downturns if wages fall during recessions because the moving constraint (1) is then less likely to become satisfied. This enlightens Pissarides and Wadsworth (1989, p.750.) conclusion “[...] that higher overall unemployment reduces (1) the likelihood that unemployed workers will migrate and (2) the effectiveness of the incentives to migrate provided by vacancy differentials.”

Positive symmetric shocks cause jobs to last longer than the period between two job offers. Here, it is assumed that employment lasts for t periods, $t \in \mathbb{N}$ and $t > 1$. Workers must fulfill their contract and receive a job offer either when their job ends or after each period of unemployment.²⁷

Proposition 4. *A positive symmetric shock raises mobility and reduces unemployment. The effect is stronger the stronger the boom.*

Proof of Proposition 4. If the shock is temporary, say lasts for one period such that only jobs accepted in the first period last for two periods, the moving constraint alters to

$$W - B > k^m - 0.5\delta(W - \max[W - k^m; B]). \quad (5)$$

The moving barrier is reduced by $0.5\delta(W - \max[W - k^m; B])$. For immobile workers (i.e., for whom $W - k^m < B$), this reduction is larger the higher the wage and the lower unemployment benefits are.

If employment lasts t periods, a permanent positive symmetric shock alters the moving constraint for workers who satisfy $W - k^m > B$ to

$$W - B > k^m - \frac{0.5(\delta - \delta^t)}{1 - \delta^t} k^m. \quad (6)$$

Since $[(\delta - \delta^t)/(1 - \delta^t)] > 0$, moving becomes more attractive. This is because a longer employment duration reduces the number of expected future moves. The coefficient

²⁷ The alternative assumption that a job offer arrives in each period irrespective of the employment status complicates analysis. An employed worker would optimally accept a job offer in his home region, quitting the current job to be employed for another $t - 1$ periods in his home region, but he would reject an offer from the other region and rather fulfill his current contract waiting for the job offer he gets after his current contract will have expired.

$[(\delta - \delta')/(1 - \delta')]$ is increasing in t .²⁸ Thus, the stronger the boom, the more mobile workers become. \square

The moving barrier is reduced more during a temporary boom than during a permanent boom for all workers (compare (5) and (6) and note that $\delta > [\delta/(1 + \delta)]$). Opportunity costs of not moving are higher during a temporary boom. Workers who do not satisfy condition (1) but condition (6) become mobile and will therefore not become unemployed. Workers who do not satisfy condition (6) become unemployed when their job ends. Yet, they are still better off after the shock because they are employed more often in their home region as jobs last twice as long. That regional mobility is positively correlated with the business cycle squares nicely with the evidence reported in the literature (e.g., Jackman and Savouri, 1992; Pissarides and Wadsworth, 1989; Vanderkamp, 1968).

5. Refinements of the simple model

So far, it has been assumed that only wages differ for high-skilled and low-skilled workers. There is ample evidence, however, that high-skilled workers receive more wage offers. Moreover, employment spells for workers with firm specific skills and workers in high-wage industries last longer than low-skilled jobs. Heterogeneity with respect to job offer arrival rates and employment duration is considered next.

Proposition 5. *The higher the job offer arrival rate, the lower are moving barriers and the lower is the risk of becoming unemployed.*

Proof of Proposition 5. See the proofs of previous Propositions. \square

Because high-skilled workers are more likely to receive job offers at a higher rate, high-skilled workers are more mobile, less frequently unemployed and more often observed to move in the data. Proposition 5 also highlights the importance of controlling for occupation-specific job offer arrival rates in econometric models of regional mobility.

Proposition 6. *The longer the expected length of an employment spell is, the more mobile a worker is and the less likely he is to become unemployed.*

Proof of Proposition 6. See the Proof of Proposition 4. \square

Workers with longer expected employment relationships are more prepared to move in order to accept a job offer outside their home region. Therefore, they are less likely to become unemployed than low-skilled workers.

It is more realistic to assume that wage offer distributions are not degenerate as has been assumed so far (see assumption 4). Suppose that H and L are the respective mean wages of the wage offer distribution functions $f(w)$ for high-skilled workers and

²⁸ The first derivative with respect to t is given by $(-\delta'/(1 - \delta')) \ln \delta$ which is positive because $0 < \delta < 1$.

$g(w)$ for low-skilled workers with cumulative distribution functions $F(w)$ and $G(w)$. Defining the wage required to make moving optimal as w^o for homeowners and w^r for renters, with $w^o > w^r$, the probabilities that workers who receive a job offer from a firm in the other region accept the offer and move are given by $1 - F(w^r)$ for high-skilled renters, $1 - F(w^o)$ for high-skilled owners, $1 - G(w^r)$ for low-skilled renters and $1 - G(w^o)$ for low-skilled owners. Renters are more likely to migrate than owners because $w^o > w^r$ so that $1 - F(w^r) > 1 - F(w^o)$ and $1 - G(w^r) > 1 - G(w^o)$ because $F(w^r) < F(w^o)$ and $G(w^r) < G(w^o)$. High-skilled renters are more mobile than low-skilled renters if $F(w^r) < G(w^r)$, while high-skilled owners are more mobile than low-skilled owners if $F(w^o) < G(w^o)$.²⁹ The latter two conditions are always satisfied if $f(w)$ and $g(w)$ only differ in the mean such that $F(w) < G(w)$ for any w in the support.

Proposition 7. *Everything else equal, a rise in the mean of the wage distribution increases the probability of receiving a wage offer that makes moving optimal.*

Proof of Proposition 7. See the argument above. □

Proposition 8. *An increase in the variance of the wage offer distribution raises mobility if the wage required to make moving optimal exceeds the expected offer wage.*

Proof of Proposition 8. If $f(w)$ and $\tilde{f}(w)$ (with respective cumulative distribution functions F and \tilde{F}) differ only with respect to the variance which is bigger for $\tilde{f}(w)$, then $\tilde{F}(w) < F(w)$ for values exceeding the mean \bar{w} . Since $w^m > \bar{w}$ by assumption, such that $\tilde{F}(w^m) < F(w^m)$, acceptable job offers from outside the home region arrive more often. □

Proposition 8 therefore implies that mobility rates tend to be lower, *ceteris paribus*, in countries with more compressed wage distributions.

It is likely that the variance of an individual's wage offer distribution is positively related to his skills.³⁰ A straightforward way to integrate this idea into the model is to assume that workers can either have a “good” job paying $(1+h)H$ or a “bad” job paying $(1-h)H$, $h > 0$. Similarly, low-skilled workers can either earn $(1+l)L$ or $(1-l)L$, $l > 0$. The moving constraint for a high-skilled worker being offered a “good” job is then given by $H - B + hH > k^m$; for those being offered a “bad” job, it is $H - B - hH > k^m$; and similarly, the respective moving constraints for low-skilled workers become $L - B + lL > k^m$ and $L - B - lL > k^m$.³¹ High-skilled workers who are offered a “good” job are most likely to move for a given choice of housing tenure as long as $l < [(1+h)H - L]/L$. It is possible that they are the only type of workers who move in absence of any shocks if in addition $(1+h)H > k^m + B > (1-h)H$.

²⁹ The condition that makes high-skilled owners more mobile than low-skilled renters is given by

$$1 - F(w^o) > 1 - G(w^r)F(w^o) < G(w^r).$$

³⁰ The skewed aggregate wage distribution observed in reality provides support for the hypothesis that the variance of the offer distribution is positively related to income (and hence skills).

³¹ If there are as many “good” as “bad” jobs, h^2H^2 and l^2L^2 are the variance of the job offer distribution for high-skilled and low-skilled workers, respectively. If $l = h$; that is, if remuneration of “good” jobs is $2h\%$ higher than that of “bad” jobs for both types of workers, the wage offer distribution for workers with a higher mean income also has a larger variance.

6. Interactions between search and moving costs

So far, it has been assumed implicitly that search is costless because workers automatically receive a job offer at given intervals. Relaxing this assumption, the model generates novel results concerning the interaction between fixed moving costs and job search. For this purpose, the simple model of Section 3 is altered in two ways. Firstly, a worker becomes unemployed for one period after his employment contract expires. In each of the following periods, he receives a job offer free of charge. Secondly, a worker can search for a job while employed in order to generate one job offer at a fixed cost, s , i.e., on-the-job search is more expensive than search from unemployment.³²

Beyond the obvious effect that higher search costs have a negative impact on search effort and hence employment, the current model predicts—consistent with empirical findings in the literature (e.g., [Pissarides and Wadsworth, 1994](#))—that high-skilled workers search more and prefer on-the-job search. Higher opportunity costs make it more profitable for high-skilled workers to engage in costly on-the-job search activity so that they are less likely to become unemployed.³³ The model also implies that immobile workers would concentrate their search activity locally if this was possible. This is likely to lead to inefficient matching. The result that moving costs have a negative impact on employment continues to hold.³⁴ A new result is, however, the model's prediction that the type of housing tenure influences search behavior.

Proposition 9. *High-skilled workers are more likely to search on-the-job than low-skilled workers and are less likely to experience unemployment. Renters are ceteris paribus more likely to search on-the-job. The more expensive moving becomes, the less likely are mobile workers to search.*

Proof of Proposition 9. See Appendix D. □

A worker, who would move even if on-the-job search was not possible, always prefers on-the-job search if

$$W - B > + \frac{1+\delta}{\delta} s + 0.5k^m, \quad (7)$$

(see Appendix D) which is more likely to be satisfied, the higher W . A fall in δ , a rise in search costs s and higher moving costs k^m all increase the right-hand side of Eq. (7) and

³² The assumption that search from unemployment is free of charge is a result of scaling costs such that on-the-job search is more costly so that s can be interpreted as the excess cost of employed over unemployed search. This assumption is reasonable because unemployed often receive additional support from employment agencies; furthermore, employed workers have to take time off to search and, unlike unemployed, incur a loss of income.

³³ In fact, opportunity costs impact on the decision to search on-the-job. Workers whose wage largely reflects firm-specific skills face higher opportunity costs than workers with more general skills and are therefore less likely to search and migrate.

³⁴ It should be noted that the assumptions about the length of the periods of employment and unemployment are not crucial to derive these implications. In principle, the longer expected employment becomes relative to the period between two job offers, the more likely a worker becomes to search and migrate. The length of the periods chosen facilitates the illustration of the main implications of the model.

therefore reduce search activity of workers who are prepared to move. A worker who optimally rejects a job outside his home region, searches on-the-job if

$$W - B > + \frac{\delta + 2}{\delta} s. \quad (8)$$

(see Appendix D). Again, an increase in search costs and a higher discount rate, i.e., lower δ , make searching less attractive.

Search costs are more important for immobile workers—the coefficient on search costs in Eq. (8) is bigger than the one in Eq. (7)—since workers who are not prepared to migrate only accept half of the job offers they generate and their search effort is obsolete half of the time. However, the excess amount of income over benefits, $W - B$, that is required to make search attractive is lower for immobile workers if $k^m > 2s/\delta$ which is always satisfied if $[(1 + \delta)/\delta]s + 0.5k^m > W - B > [(\delta + 2)/\delta]s$.³⁵ Thus, higher moving costs, lower search costs and a lower discount rate δ make mobile workers less likely to search relative to immobile workers. The less a worker values the future, the lower is search intensity and the higher is unemployment. However, the unemployment rate of nonsearching mobile workers is lower than the unemployment rate of searching immobile workers because the expected duration of unemployment is longer for immobile workers.³⁶

An increase in moving costs affects search effort via two channels that lead to reduced employment. Firstly, it reduces the net gain of search for mobile workers tending to diminish their search activity. Secondly, it increases the proportion of immobile workers. Although this tends to increase overall search activity, fewer matches will be formed in the aggregate because immobile workers who accept only half of the offers search less effectively. Although the inflow rate into unemployment might fall—some nonsearching mobile workers might become searching immobile workers in response to higher moving costs—outflow rates fall even more. The unemployment rate rises because unemployment duration increases. These theoretical results are consistent with the combination of two stylized facts: (1) homeownership rates have risen in OECD countries between 1960 and 1990 (Oswald, 1996), while at the same time, (2) the Beveridge curve has shifted outwards meaning that vacancies are filled less efficiently; that is, it has become harder to match workers and firms.

Workers can belong to one of the following four groups:

- (i) If they satisfy condition (7) and the moving condition (D.1), which is given in Appendix D, they will search, accept any offer and will never become unemployed.
- (ii) Workers might satisfy the search condition but do not find it optimal to migrate. Proportion q of them will become unemployed, where q is the probability of receiving a job offer in the other region.
- (iii) Workers who are mobile but do not search experience a spell of unemployment that lasts exactly one period. Thereafter, they accept a job offer in any region.
- (iv) Workers who neither move nor search will become unemployed and the expected duration of unemployment is two periods.

³⁵ This is because it implies that $k^m > [(2 + \delta)/(\delta - 0.5\delta^2)]s$. Hence, $k^m > (2s/\delta)$ because $[(2 + \delta)/(\delta - 0.5\delta^2)] > (2/\delta)$.

³⁶ For nonsearching mobile workers, the expected duration of unemployment is one period, while the expected duration for searching immobile workers are two periods.

6.1. Implications of shocks

Random temporary shocks do not impact on search behavior when workers decide to search before a shock is revealed.³⁷ Things are different if workers expect a shock to persist in the future. If q , the probability of getting a job offer in West exceeds 0.5 throughout the next future period, workers take the higher employment prospects in West into account. Searching becomes less attractive for workers in the depressed region and more attractive in the booming region. For mobile workers in the depressed (booming) region, the expected benefit from searching falls (rises) by $\delta(q - 0.5)k^m$, whereas the expected gain from searching falls (rises) by $\delta(q - 0.5)(W - B)$ for immobile workers. Workers in the depressed region become not only more likely to migrate if the shock persists for longer, as shown in Section 4, but their value of search increases because searching raises the chances of finding employment in the booming region early, which is more attractive because it makes future moves less frequent.

7. Policy implications

The model implies that policies that raise moving costs reduce mobility and thereby increase unemployment. The analysis of asymmetric shocks indicates that higher moving costs slow the adjustment process as unemployment among immobile workers in the slump region remains high for a prolonged period. Additional interactions between moving costs and job search behavior reinforce the adverse effects of such policies. These interactions are largely neglected in the theoretical and empirical literature but explain the correlation between homeownership rates and the level of unemployment.

Subsidizing moving costs, for example, by making them tax deductible or by offering some other form of tax benefit, increases mobility and thereby reduces the level of unemployment. However, when a policy favors a particular type of housing tenure, substitution effects have to be considered. For example, a subsidy for buying or building a home reduces moving costs for those who decide to move into owned property. However, it also makes owning more attractive so that more workers are lured into homeownership. This has negative effects on future job mobility. Such a policy is especially bad if the subsidy is only paid once upon becoming a homeowner because it raises aggregate moving costs in future periods after the homeownership rate has—induced by the policy—risen.

Subsidies to the renting sector have to be evaluated carefully as well. At first sight, rent control would probably be judged to be beneficial for renters as it is designed to keep rents low. However, rent control reduces landlords' return on their investment in renting property, triggering a reduction of supply, either because property is sold off or simply

³⁷ A negative (positive) symmetric shock increases (reduces) unemployment among immobile workers. An asymmetric shock increases (decreases) unemployment in the region that is negatively (positively) affected because it reduces (increases) job offers for immobile workers. Although the shock has no impact on the employment status of mobile workers, mobile workers in the depressed region are worse off as they become more likely to incur the moving costs. Mobile workers in the booming region gain because the risk of having to incur the moving costs falls.

due to attrition. Therefore, renters become constraint in their housing consumption.³⁸ This makes owning more attractive so that some workers leave the renting sector.³⁹ Aggregate moving costs rise so that unemployment increases. Whether unemployment rises more among owners is ambiguous because the most mobile renters leave the private renting sector first as the costs of additional immobility are smallest for them.⁴⁰ An increase in the proportion of homeowners therefore decreases average mobility in the renting sector. It would therefore not be surprising to see a higher unemployment rate among renters after the homeownership rate has risen in response to the subsidy.

8. Conclusion

The model explains the empirical regularity that higher owner occupation rates are associated with higher aggregate unemployment rates. For an individual, regional mobility, and hence unemployment, depends on the difference between moving costs and foregone income during unemployment. Any rise in the value of unemployment relative to the value of employment, e.g., an increase in unemployment benefits or a reduction in wages, reduces mobility and causes unemployment to rise. Because foregone earnings during unemployment are larger for high-skilled workers, they are more willing to move regions to accept a job than low-skilled workers given the same choice of housing tenure. Conditional on the earnings potential, regional mobility is lower for homeowners than for renters. However, high-wage homeowners are more mobile than low-wage renters if the differential income loss associated with a spell of unemployment exceeds the difference in moving costs associated with owning versus renting a home. Failing to fully control for expected income (losses) it is consequently possible to find empirically that homeowners are more mobile than renters. On the one hand, this result indicates that econometric models in empirical studies of the determinants of regional mobility must be carefully specified. On the other hand, this theoretical finding helps us in reconciling the seemingly paradoxical findings that a higher rate homeownership rate is associated with a higher equilibrium level of unemployment although homeowners have lower unemployment rates on average.

Higher moving costs and lower mobility raise unemployment. If the private renting sector shrinks, e.g., because of government intervention or a change in preferences, more mobile workers are likely to leave the renting sector first, causing average mobility in the

³⁸ A shrinking private renting sector limits choices of those who are remaining in the renting sector even further if landlords reduce supply at a higher rate than the exit rate from the renting sector.

³⁹ Note that they are worse off than without controlled rents because they preferred renting when their consumption opportunity were not limited. The loss in utility is reflected in lower mobility.

⁴⁰ Moreover, those with higher incomes are more mobile and more likely to be able to afford ownership. In Britain, workers at lower incomes have opted to leave the private renting sector for council housing. Mobility of council tenants is lower than mobility of private renters (see [Hughes and McCormick, 1981](#)). Council tenants wishing to migrate have to obtain council housing in their destination region, and that process does not seem to work well. [Hughes and McCormick \(1987\)](#) argue that council tenants are no less likely than owner-occupiers to wish to migrate but merely less successful in fulfilling their intentions.

renting sector to fall. If the average wage among workers leaving the renting sector is lower than the average wage among homeowners, mobility also falls in the owner-occupied sector. A higher rate of owner-occupation is therefore associated with more unemployment.

Economy-wide booms raise mobility of all workers but affect high-wage workers the most that move most often in absence of shocks. Economy-wide recessions reduce regional mobility. Asymmetric shocks increase migration to the booming region and reduce the number of workers leaving the booming region. Asymmetric shocks affect mobility of high-wage workers most, so that they are the first to leave a depressed region.

The type of housing tenure also affects search behavior and hence job matching because workers search less effectively for new jobs; the higher are their moving costs, the lower is the income loss associated with unemployment. Because search effectiveness is an increasing function of mobility, a reduction in mobility leads to less-efficient matching of unemployed workers to vacancies, as is observed in many European countries. The choice of housing tenure and its effect on regional mobility is likely to prove an important step towards explaining the puzzle of European unemployment.

The possibility to commute increases worker's opportunities and raises their mobility. To account for commuting and the importance of distance, elements from gravity models might be integrated with the kind of modelling suggested in this paper. Additional aspects that could be integrated in a more general model include the consumption and investment characteristics of housing which affect mobility through adjustments of housing prices.

Acknowledgements

I thank Andrew Oswald, Gerard Pfann and Ben Kriechel for fruitful discussions and very useful remarks on earlier drafts of the paper. Comments by two anonymous referees and the editor have improved the paper.

Appendix A. Moving condition in simple model

Proof. Suppose a worker receives a job offer in the other region. If he accepts and moves, his expected income, Y^a , is given by

$$Y^a = W - k^m + \frac{0.5\delta}{1 - \delta} (W + \max[W - k^m; B]).$$

His expected income when rejecting, Y^r , and staying is given by

$$Y^r = B + \frac{0.5\delta}{1 - \delta} (W + \max[W - k^m; B]).$$

(Note that q equals 0.5 by assumption 7). Hence, a worker migrates if

$$W - B > k^m, \text{ which proves equation (1).} \quad \square$$

Appendix B. Persistent asymmetric shocks

To prove that moving to the booming region (West) becomes more attractive the longer the boom is expected to persist, suppose it is optimal for a worker in East not to move to West if the asymmetric shock persists only in the next future period; that is, the worker does not satisfy $W - B < k^m - \delta(2q - 1)(W - B)$ (condition (2)). If the shock persists for another period, it is never optimal to move in the second period after not having moved in the first. If the shock persists for the next two periods, not accepting a job offer in West yields an expected income of

$$B + \delta\{(1 - q)W + qB\} + \delta^2\{(1 - q)W + qB\} + \delta^3V,$$

where V is the expected stream of income discounted to period 3 which is the same in expectation for movers and nonmovers. The income when accepting can be calculated by backward induction and is given by

$$W - k^m + \delta\{qW + (1 - q)B\} + \delta^2\{qW + (1 - q)B\} + \delta^3V$$

because $W - B < k^m - \delta(2q - 1)(W - B)$ and $W > B$. A worker will hence move if

$$W - B > k^m - \delta(2q - 1)(W - B) - \delta^2(2q - 1)(W - B) \quad (\text{B.1})$$

When the shock persists for just one more future period, the moving constraint was given by condition (2):

$$W - B > k^m - \delta(2q - 1)(W - B).$$

Comparing (B.1) with (2) it is obvious that moving becomes more likely because the additional term, $\delta^2(2q - 1)(W - B)$, in (B.1) is positive.

B.1. Serially correlated shocks

If the shock is serially correlated, the moving condition is given by

$$W - B > k^m - 2\delta\rho\sigma k^m,$$

where ρ is defined as the correlation coefficient and σ is a measure of the shock with $0 < \sigma < 0.5$ and $0 < \rho < 1$. This is derived as follows: A worker in the depressed region who accepts a job offer in the booming region and who will always move, has an expected income of

$$W - k^m + \delta(W - 0.5k^m + \rho\sigma k^m) + \delta^2(W - 0.5k^m + \rho^3\sigma^3k^m) + \dots$$

Somebody who rejects, but would move in the second period, receives

$$B + \delta(W - 0.5k^m - \rho\sigma k^m) + \delta^2(W - 0.5k^m + \rho^3\sigma^3k^m) + \dots$$

Notice that the expected income from the second period onwards is the same because the probability of being in the booming region is the same.

Appendix C. Adverse symmetric shocks

Assume that workers receive a job offer every second period while a job lasts for one period such that all workers whose job ends become unemployed for at least one period. We derive the moving constraint for those who receive a job offer outside their home region. At the time the moving decision has to be made, i.e., in the second period, the expected income from accepting the job offer equals

$$W - k^m + \frac{\delta}{1 - \delta^2}B + \frac{0.5\delta^2}{1 - \delta^2}(W + \max[W - k^m; B]),$$

whereas rejecting the offer yields an income of

$$B + \frac{\delta}{1 - \delta^2}B + \frac{0.5\delta^2}{1 - \delta^2}(W + \max[W - k^m; B]),$$

so that a worker accepts the job offer and moves if

$$W - B > k^m, \text{ which is identical to condition (1).}$$

Appendix D. Mobility and search

The moving condition in the absence of search differs from (1) as a nonsearching worker becomes unemployed every second period, which lowers the net benefit from moving. The discounted stream of income for somebody who is offered a job in the other region and moves is given by

$$W - k^m + \frac{\delta}{1 - \delta^2}B + \frac{0.5\delta^2}{1 - \delta^2}(W + \max[W - k^m; B]),$$

while expected income when rejecting the offer equals

$$B + \frac{0.5\delta}{1 - \delta^2}(W + \max[W - k^m; B]) + \frac{\delta^2}{1 - \delta^2}B,$$

so that it is optimal to move if

$$W - B > k^m + \frac{0.5\delta}{1 + \delta}(W + \max[W - k^m, B]) - \frac{\delta}{1 + \delta}B. \quad (D.1)$$

Consider now the search decision of workers satisfying (D.1). Their expected income when searching only in the first period is given by

$$W - s + \frac{\delta}{1 - \delta^2}W - \frac{0.5\delta}{1 - \delta^2}k^m + \frac{\delta^2}{1 - \delta^2}B,$$

while not searching yields an expected income of

$$W + \frac{\delta}{1 - \delta^2}B + \frac{\delta^2}{1 - \delta^2}W - \frac{0.5\delta^2}{1 - \delta^2}k^m.$$

Hence, search is optimal if

$$W - B > \frac{1 + \delta}{\delta}s + 0.5k^m. \quad (D.2)$$

A worker satisfying (D.1) will always search on-the-job because his expected income when always searching is given by

$$W - s + \frac{\delta}{1 - \delta}W - \frac{\delta}{1 - \delta}s - \frac{0.5\delta}{1 - \delta}k^m.$$

Always searching is hence preferred to never searching if

$$W - B > + \frac{1 + \delta}{\delta}s + 0.5k^m, \text{ which gives equation (7).}$$

The present value of income of workers who optimally reject a job offer outside the home region equals is given by

$$W - s + \delta(0.5W + 0.5B) + \delta^2[0.5B + 0.5(0.5W + 0.5B)] + \delta^3[(.25B + .75(0.5W + 0.5B))] + \dots$$

when searching only in the first period; while the present value of future income when not searching is given by

$$W + \delta B + \delta^2(0.5W + 0.5B) + \delta^3[0.5B + 0.5(0.5W + 0.5B)] + \dots$$

⁴¹ Notice that the term $[(0.5\delta)/(1 + \delta)](W + \max[W - k^m, B]) - [\delta/(1 + \delta)]B$ is always positive, confirming that moving in this setting is generally less attractive than in the simple model.

Search is hence profitable if

$$W - B > \frac{\delta + 2}{\delta}s, \text{ which gives equation (8).}$$

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