Labor Markets with Imperfect Housing Markets

Peter Rupert, Etienne Wasmer

Labor Markets with Imperfect Housing Markets

Peter Rupert[1] Etienne Wasmer[2]

[1]University of California, Santa Barbara

[2]Sciences Po, OFCE, Paris, France

Presentation OFCE

January 11, 2008

EDHEC-ADRES Conference
Labor Market Outcomes, A Transatlantic Perspective

Introduction

- (Micro) Search theory: Stigler (1962), McCall (1970), Burdett Mortensen (1990), survey by Rogerson et al. (2007): based on dispersion of wages $\longrightarrow$ reservation strategy.
- An important determinant of job acceptance is commuting time.
  - Either the job is close enough...
  - Or it's far and then decide whether to move.
  - If moving is not easy: job is rejected.
- Explore a model which is the dual of conventional search models.
  - Interaction between the labor market and the housing market.
  - Strategy depends on distance.

What makes people (un)happy?

	Happiness Index	Average tine (hrs) /day
Sex	4.7	0.2
Socialising after work	4.1	1.1
Dinner	4.0	0.8
Relaxing	3.9	2.2
Lunch	3.9	0.6
Exercising	3.8	0.2
Praying	3.8	0.5
Socialising at work	3.8	1.1
Shopping, Cooking	3.2	3.1
Computer at home	3.1	0.9
Housework	3.0	1.1
Childcare	3.0	1.1
Evening commute	2.8	0.6
Working	2.7	6.9
Morning commute	2.0	0.4

...Introduction: Questions

- How might the functioning of the housing market affect unemployment/employment?
- Theory results: aggregate unemployment depends (at least partly) on frictions in the housing market.
  - More job offers are rejected;
  - Quits are more frequent;
  - Employers therefore post fewer vacancies;
  - Combined: multiplier effect.
- Quantitative part. Housing cause of a difference between the US and EU?
  - We find that housing frictions appear to matter more for Europe than the U.S.
  - Order of magnitude: percentage point ; the bulk is still in the labor market.

Mobility

- Mobility decisions are quite complex:
  - Job related reasons;
  - House related reasons;
  - Family related reasons;
  - Schools;
- For the U.S. and EU:

Mobility Data

	US	**EU15**
Mobility rate	15.5%	4.95%
Share within county / area	0.67	0.83
Share between county / area	0.33	0.17

- Data sources:
  - US: Census 2000
  - EU: European Community Household Panel (1999-2001)
  - NB: area not well defined (presumably smaller than a county).

...Mobility Data

	US		
All pop. (1+)	intra-county	inter-county	all
Work related	5.6%	31.1%	16.2
Family related	25.9%	26.9%	26.3
House related	65.4%	31.9%	51.6
Others	3.0%	10.1%	6.0
All reasons	100%	100%	100
	EU15		
	intra-area	inter-area	all
Job related	7.61%	40.0%	14.3%
Personal Reason	31.6%	29.8%	31.3%
House Related	59.1%	28.1%	52.7%
Not Available	1.7%	2.11%	1.8%
All reasons	100%	100%	100%

Model

- A dwelling: bundle of services generating utility X.
  - Services are attached to a location, immutable.
  - Many amenities associated with a location.
  - Could be a unit of production of household goods.
  - Could be a capital asset.
    - For these services pay a rent or mortgage.
  - General model, but focus on distance to jobs, ρ. Isotropy of space. Space is symmetric: the unemployed have the same chance of finding a job wherever their current residence.
- Therefore, ρ is a sufficient statistic. Plan to relax this assumption–allow for anisotropy.

Environment

- Time is continuous. Individuals discount at $r > 0$.
- Individuals either E or U.
  - Employed
    - Receive exogenous wage w.
    - Face an exogenous separation rate s.
    - No on-the-job search.
  - Unemployed
    - Receive flow b.
    - Receive job offers, indexed by distance to work ρ.
    - Find jobs at Poisson rate p.

Search with Frictions in the Housing Market

- Both employed and unemployed: face two types of housing shocks (Poisson):
  - Sometimes, they need to move (family or housing shock): δ.
    - Draw at any time from the existing stock of housing vacancies
    - Distributed as $G_S(\rho)$
  - At random time, they can relocate to get closer to jobs: λ_H.
  - Draw from a distribution of housing vacancies (may think of those vacancies as new)
  - Distributed as $G_N(\rho)$.
  - Presumably more attractive than $G_S(\rho)$.

...Search with Frictions in the Housing Market

- λ_H is the parameter reflecting frictions in the housing market.
  - If infinity, no frictions
  - If zero, no mobility.
- Idea behing λ_H: People may not move instantaneously to their preferred location.
  - All leases expire on June 30 in Quebec,
  - Discriminating strategies by landlord (length of eviction), minimum period for a lease.

Bellman Equations

- $E(\rho)$: Value of employment at distance ρ from the job.
- U: Value of unemployment.

$$
\begin{aligned}
(r+s)E(\rho) &= w - \tau\rho + sU + \lambda_H \int \max\left[0, (E(\rho') - E(\rho))\right] dG_N(\\
&\quad + \delta \int \max[U - E(\rho), E(\rho'') - E(\rho)] dG_S(\rho'') \\
(r+p)U &= b + p \int \int \max[U, E(\rho'), E(\rho'')] dF_J(\rho') dG_S(\rho''),
\end{aligned}
$$

- where $\tau\rho$ is the total commuting cost.
- Note: combine F_J and G_S such that $\int \max[U, E(\rho)] dF(\rho)$ and $1 - F = (1 - F_J)(1 - G_S)$.

Reservation Strategies

- Job acceptance and moving stategies: E is downward sloping in ρ,

$$\frac{\partial E}{\partial \rho} = \frac{-\tau}{r + s + \lambda_H P_W + \delta P_\delta},$$

  - where the P's are conditional probabilities of moving.
- $E(\rho)$ is monotonic, so a well-defined reservation strategy.
  - For those employed, $\rho^E(\rho) = \rho$.
    - Accept any *housing offer* that is closer.
  - For those unemployed, $E(\rho^u) = U$.
    - Accept any *job offer* closer than ρ^u.

...Reservation Strategies

- The model is quite parsimonious
  - ρ determines: *job acceptance* $F(\rho^U)$; *residential mobility rate* $\int \lambda_H G_N(\rho)$; quit rate after relocation, $\delta(1 - G_S(\rho^U))$.
  - Reservation rule ρ^U:

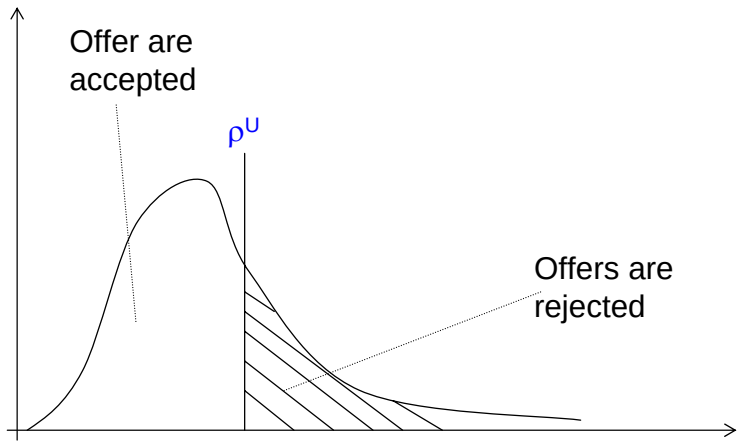
$$\rho^U = \frac{w-b}{\tau} + \int_0^{\rho^U} \frac{\lambda_H G_N(\rho) + \delta G_S(\rho) - pF(\rho)}{r + s + \lambda_H G_N(\rho) + \delta G_S(\rho^U)} d\rho.$$

- Higher G_N, higher G_S, higher λ_H, higher w: higher acceptance (can relocate later).
- Higher p, higher F, higher benefits: lower acceptance (better to wait).

...Reservation Strategies

Possible trajectory: U $\overset{p}{\text{----->}}$ E $\overset{\lambda_H}{\text{----->}}$ E' $\overset{s}{\text{----->}}$ U

Density of job offers F



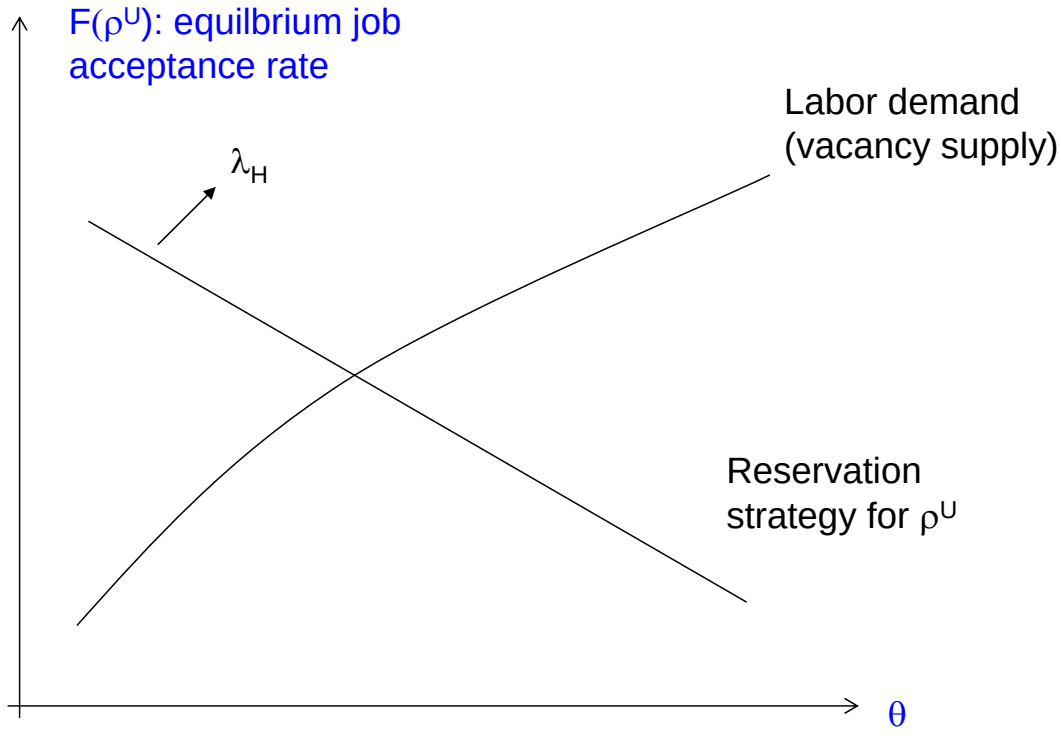
Equilibrium

- As said: higher p implies lower ρ^U (lower job acceptance). Workers can wait for a *closer* job!
- Implies a negative link between ρ^U and labor market tightness p (or $\theta = \frac{V}{U}$) (matching process behind).
- Last block: assume matching between vacancies and unemployed.
- Assuming free entry of firms and job advertising cost c:

$$\frac{y - w}{r + s'} = \frac{c}{q(\theta)F(\rho^U)}$$

  where $\theta = \frac{V}{U}$ (TIGHTNESS) and $q(\theta)$ is the probability of the firm meeting a worker.
- This generates a positive link between θ and $F(\rho^U)$: higher job acceptance by workers makes firm more willing to post vacancies.

Equilibrium



...Effects of Housing Frictions

- We also have:

Proposition 1: *An increase in λ_H makes the unemployed less choosy about jobs: $\partial \rho^U / \partial \lambda_H > 0$.*

- Differentiating the zero-profit condition for firms and using Proposition 1, we have:

Proposition 2: *An increase in λ_H increases job creation: $\partial \theta / \partial \lambda_H > 0$.*

Unemployment

- Let $p = p(\theta) = \theta q(\theta)$, the unemployment rate is:

$$u = \frac{s'}{s' + p(\theta)F(\rho^U)},$$

where

$$s' = s + \delta(1 - G_S(\rho^U)).$$

- Two types of separations: layoffs, s, and quits, $\delta(1 - G_S(\rho^U))$.

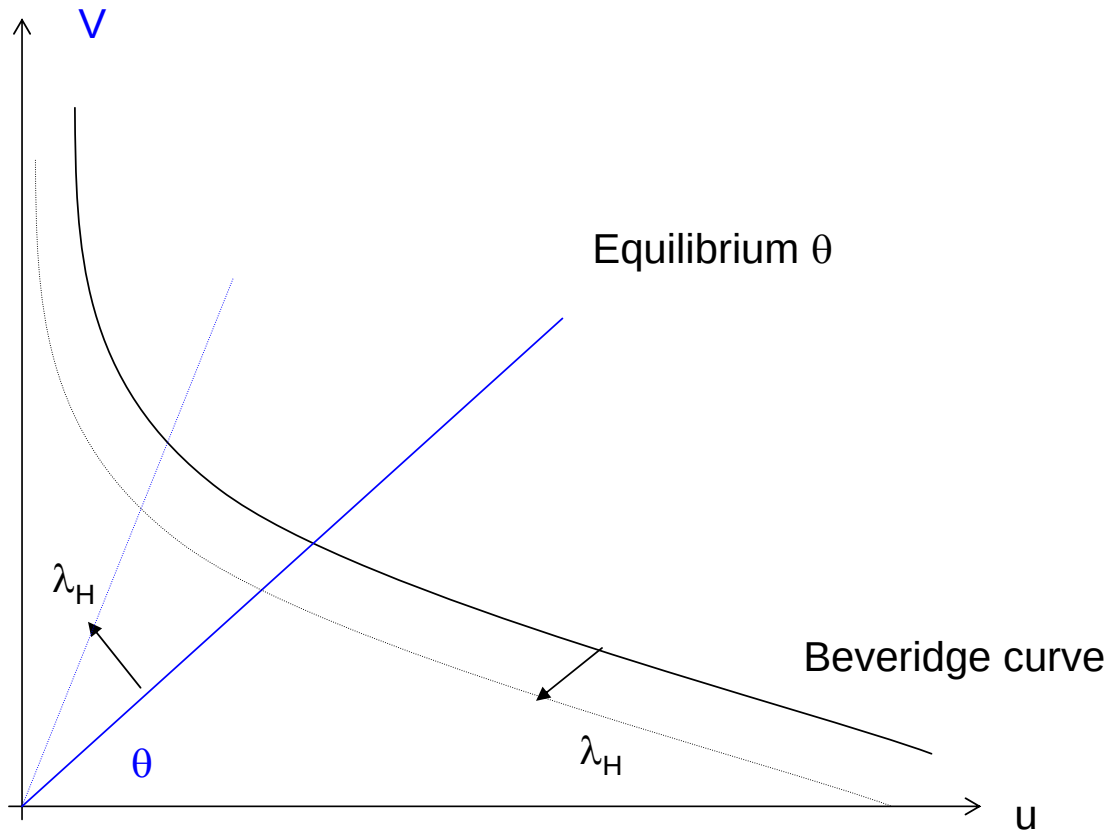
...Effects of Housing Frictions on Unemployment

Proposition 3: *An increase in λ_H has three effects on unemployment:*

- *it reduces the quit rate (only in δ shock case), $\Rightarrow u \downarrow$*
- *it raises the job acceptance rate of workers (through a higher thresehold ρ^U), $\Rightarrow u \downarrow$.*
- *it raises θ (Proposition 2) and thus job creations, $\Rightarrow u \downarrow$.*

...Unemployment and the Beveridge Curve

- Intuition of Proposition 3 in u-v space:



Mobility Rate

- Let $\Phi(\rho)$ be the steady-state distribution of employed workers living at a distance lower than ρ.
- Φ is governed by the following law of motion:

$$(1-u)\frac{\partial \Phi(\rho)}{\partial t} = upF(\rho) + (1-u)\left[1-\Phi(\rho)\right]\lambda_H G_N(\rho) + (1-u)\left[1-\Phi(\rho)\right]\delta G_S(\rho) - (1-u)\Phi(\rho)s$$

- In steady state for all $\rho < \rho^u$:

$$\Phi(\rho) = \frac{\frac{F(\rho)}{F(\rho^u)}s + \lambda_H G_N(\rho) + \delta G_S(\rho)}{s + \lambda_H G_N(\rho) + \delta G_S(\rho)} \leq 1$$

...Mobility Rate

- A special case:
  - If jobs are not destroyed: $s = 0 \Rightarrow \Phi(\rho) = 1$ for all $\rho > 0$,
    - All workers eventually find a house infinitely close to their job.
- Other special case where $\lambda_H \to \infty$: also collapses to $\Phi(\rho) = 1$.
  - Then

$$\begin{aligned} \rho^U &= \frac{w-b}{\tau} + \int_0^{\rho^U} d\rho : \text{indeterminacy} \\ \frac{u-u^*}{u} &\simeq 1 - F(\rho^U) = \text{reject. rate} \end{aligned}$$

where u^* is the rate of unemployment, were housing frictions totally removed.

Calibration

- Time period is a month. r $= 4\%$ annually.
- First: $\delta = 0$ (no demographic shock) and $G_S = 0$ (no stock of vacant houses)
- This leaves us with two distributions:
  - G_N, new housing offers and F, job offers in terms of distance ρ
    - Assume $F = G_N = 1 - e^{-\alpha\rho}$: exponential distribution (α).

...Calibration

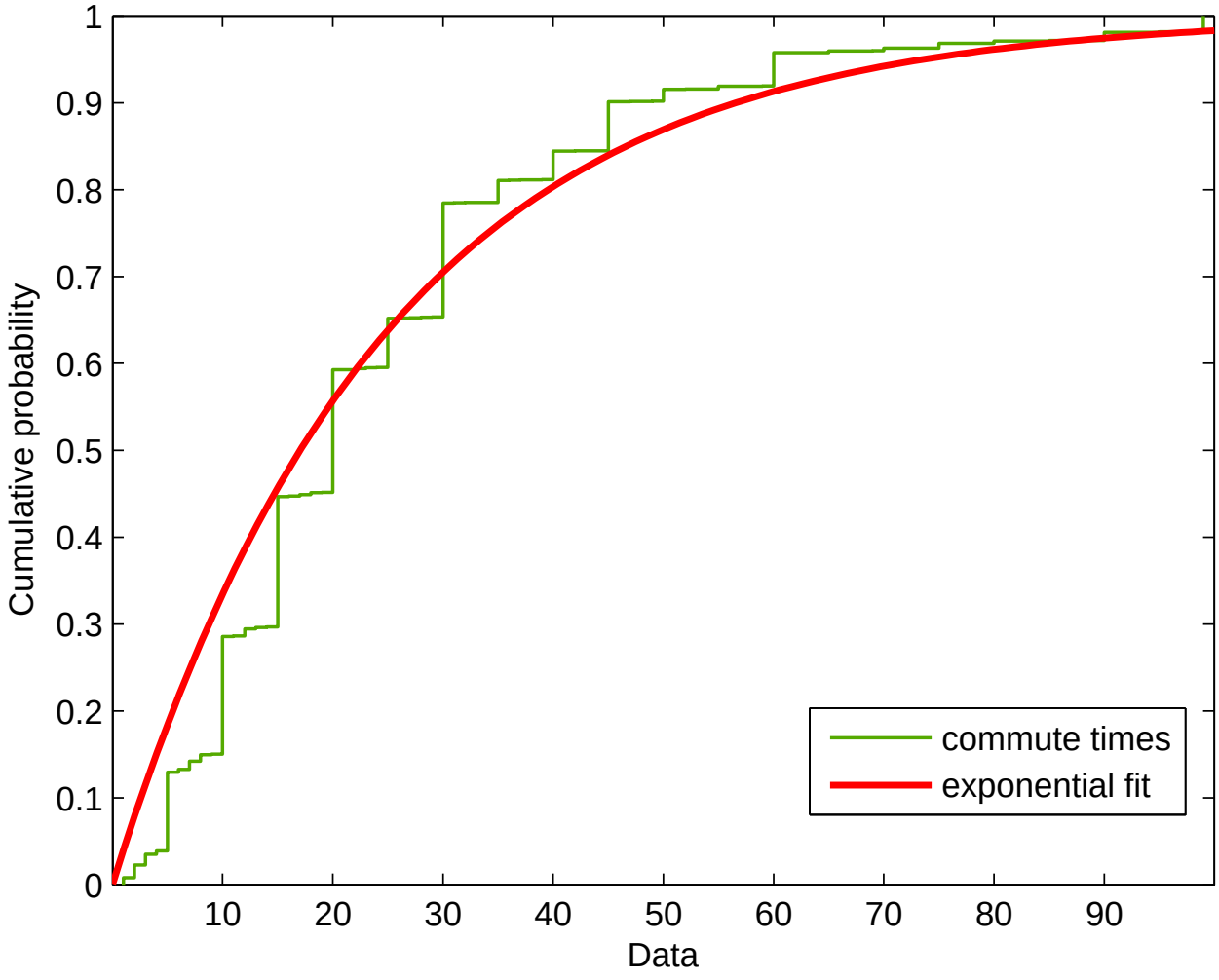
- The program finds the parameters of the model (λ_H, c, A) to match:
  - U.S. unemployment: 4.2% (average between 1999Q1 and 2000Q1).
  - $pF(\rho^U) = 1/2.4$ monthly $\implies$ unemployment duration of 2.4 months.
  - Mobility target of the employed (the only movers here): 17% annually.
  - We also set $p(\theta) = A\theta^{0.5}$, $y = 1$, $w = 0.8$, $q(\theta) = A\theta^{-0.5}$.

...Calibration

- Crucial parameter: α (exponential distribution).
  - Data on commute times from Census 2000
    - Regression using an exponential CDF:
    - $\alpha = 2.19$

...Calibration

Figure: Distribution of Commute Times



Findings: U.S.

Table: U.S. Calibration

	$\lambda_h = 0.0533$	$2 * \lambda_h$	$3 * \lambda_h$	$10 * \lambda_h$
θ	1.0000	1.1522	1.2148	1.2493
ρ^U	1.0278	1.4738	1.9521	5.6238
F^U	0.8947	0.9603	0.9861	1.0000
rej. rate	0.1053	0.0397	0.0139	4.5E-6
unemployment	0.042	0.0367	0.0348	0.0339
mobility	0.0136	0.0215	0.0269	0.0445

...Findings

- Now, calibrate to Europe
  - Mobility is 1/3 of the U.S.
  - Unemployment duration 3 times longer.
  - U-rate is 10%.
- We find $\lambda_h = 0.0153$:
  - About a third of housing offers compared to the U.S.
- We find $A = 0.1836$
  - Scale parameter of matching about 1/3 lower in Europe.
- We also find hiring costs to be about the same in Europe
  - US: $c/q = 3.8579/0.4657 = 8.28$,
  - EU: $c/q = 1.4803/0.1836 = 8.06$.

...Findings–Europe

Table: European Calibration

	$\lambda_h = 0.0153$	$2 * \lambda_h$	$3 * \lambda_h$	$10 * \lambda_h$
θ	1.000	1.1436	1.2647	1.6684
ρ^U	0.6446	0.7554	0.8678	1.7196
F^U	0.7563	0.8088	0.8505	0.9769
rej. rate	0.2437	0.1912	0.1495	0.0231
unemployment	0.1000	0.0886	0.0808	0.0624
mobility	0.0042	0.0078	0.0108	0.0234

...Findings–What have we learned?

- Europe: Lower λ_h, so reject more job offers...
  - Since it will be more difficult to move subsequently
- Reducing frictions in the housing market
  - Reduces unemployment. By how much: counterfactual...

Additional Counterfactuals for Europe

Europe	*Benchmark*	λ_h^{US}	A^{US}	A^{US} , c^{US}	b^{US}
θ	1.000	1.3153	2.4385	0.6122	1.4177
ρ^U	0.6446	0.9224	0.2862	0.4278	1.0535
F^U	0.7563	0.8673	0.4657	0.6082	0.9005
rej. rate	0.2437	0.1327	0.5343	0.3918	0.0995
unemp.	0.1000	0.0779	0.0436	0.0651	0.0727
mobility	0.0042	0.0121	0.0030	0.0037	0.0051

Generalized calibration: U.S. with Demographic Shock

- $\alpha_{F_J} = \alpha_{G_N}$, $\alpha_{G_S} = 1/4$ of those.
- $c = 4.6303$
- $A = 0.4182$

Table: U.S. calibration, $\delta > 0$

	$\lambda_h = 0.0048$	$2 * \lambda_h$	$3 * \lambda_h$	$10 * \lambda_h$
θ	1.0000	1.0039	1.0057	1.0073
ρ^U	0.4109	0.4669	0.5244	0.9403
F^U	0.9964	0.9983	0.9992	1.0000
rej. rate	0.0036	0.0017	7.6E-4	2.6E-6
unemployment	0.0420	0.0407	0.0397	0.0356
mobility	0.0018	0.0035	0.0049	0.0123

Generalized calibration: Europe with Demographic Shock

- Set $b = 0.65$ (otherwise rejection rate too low)
- $c = 1.574$
- $A = 0.1528$

Table: EU calibration, $\delta > 0$

	$\lambda_h = 0.0046$	$2 * \lambda_h$	$3 * \lambda_h$	$10 * \lambda_h$
θ	1.000	1.016	1.032	1.11
ρ^U	0.273	0.283	0.293	0.367
F^U	0.909	0.916	0.923	0.960
rej. rate	0.091	0.084	0.077	0.040
unemployment	0.1000	0.098	0.097	0.089
mobility	6.1E-4	2.2E-3	3.3E-3	1.1E-2

Additional Counterfactuals for Europe with positive delta

Europe	*Benchmark*	$\lambda_h^{US} = 0.0069$	A^{US}	A^{US} , c^{US}	b^{US}
θ	1.000	1.031	tbd	tbd	tbd
ρ^U	0.273	0.293			
F^U	0.909	0.923			
rej. rate	0.091	0.077			
unemp.	0.1000	0.0967			
mobility	6.1E-4	3.3E-4			

Conclusion

- Tractable model of the labor market and housing market.
- Calibration suggests substantial gains to removing housing frictions in Europe
- Say, 1 percentage point.
- Most of unemployment still determined on the labor market.
- Model simple enough to be extended in several dimensions.

Appendix: Reasons for Moving-US

CPS Question on Reason for Moving

"What was [your/name] main reason for moving?"

Family-Related Reasons

1. Change in marital status.
2. To establish own household.
3. Other family reasons.

Employment-Related Reasons

4. New job or job transfer.
5. To look for work or lost job.
6. To be closer to work/ easier commute.
7. Retired.
8. Other job-related reasons.

Housing-Related Reasons

9. Wanted to own home, not rent.
10. Wanted new or better house/apartment.
11. Wanted better neighborhood/less crime.
12. Wanted cheaper housing.
13. Other housing reason.

Other Reasons

14. To attend or leave college.
15. Change of climate.
16. Health reasons.
17. Other reason (specify).

Appendix: Reasons for Moving-EU

HA004 REASON FOR MOVE

Question: What was the main reason for you to move? Was it …
- job related (such as you or some other household member wanted to be nearer to work, found a job or started a business here, retired or stopped work for other reasons, etc)
– housing related (i.e. found a more suitable accommodation or wanted a new place to live)
– or just personal reasons?

Codes	*Labels*
1	job-related
2	house-related
3	personal reasons
-8	not applicable
-9	missing

Base: Households that moved to the current address at the earliest two years before they joined the survey.

National differences and changes between waves

	Sub-sample																
	B	*DK*	*D*		*EL*	*E*	*F*	*Irl*	*I*	*L*		*NL*	*A*	*P*	*Fin*	*S*	*UK*	
			Echp	*Soep*						*Echp*	*Psell*						*Echp*	*Bhps*
1994											■		■		■	■		
1995											(1)				■	■		
1996											(1)					■		
1997			■							■	(1)					(1)	■	
1998			■							■	(1)					(1)	■	