Geographic mobility over the life cycle

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Motivation

The question

- Economic activity is not uniformly distributed across different places $\Rightarrow$ spatial dispersion.
- Persistent differences in local labor markets are key (Moretti 2011).
- People cannot move easily (Hsieh & Moretti 2019) $\Rightarrow$
- identical people have different labor prospects and opportunities depending on where they are born.
- Policies designed to $\uparrow$ opportunities should take into account
  - heterogeneous effects over the life cycle,
  - the underlying frictions impeding mobility.

Motivation

This paper

We contribute in three dimensions:

1. We uncover mobility patterns across Urban Areas in Spain and their connection with features of local labor markets.
2. We build an OG model where people can migrate to match observed patterns. Heterogeneous return to experience are key.
3. We evaluate various location-based policies.

Motivation

The intuition

The evidence suggests that

- More productive locations give more stable jobs, higher accumulation of skills, more job opportunities everywhere.
- Less productive locations are cheaper.
- These pros and cons weigh differently and produce different migration decisions over the life cycle:
  - Young workers prefer high-productivity and less frictional local labor markets.
  - Elderly workers and retirees prefer cheaper locations.

The model implies that

- Labor market and mobility frictions interrupt careers. The cost is larger for young people born in less productive places.

Evidence

We use data from

- Spanish Census of Population and Housing, waves 1999, 2001, 2011.
- Continuous Sample of Employment Histories (MCVL).
- Labor Force Survey (EPA).

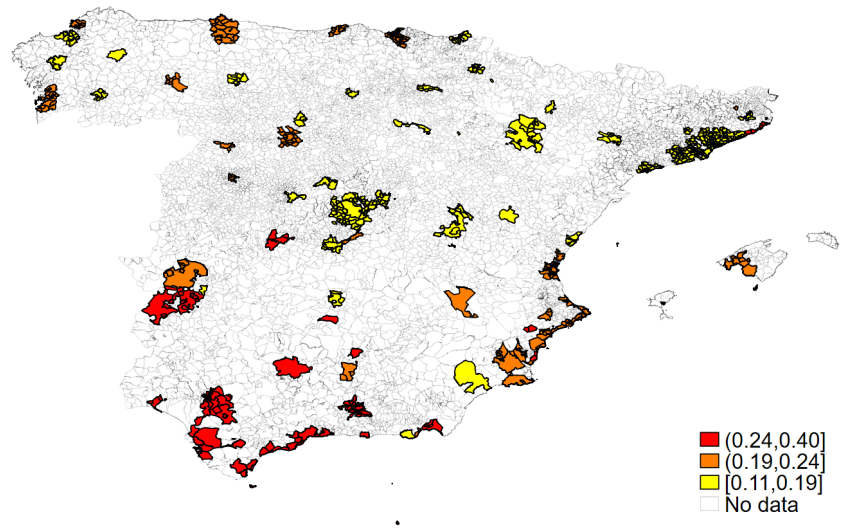
Mobility across urban areas

Main features from the Census

Geographical unit: Large Urban Areas ($>$ 50,000 pop) ▸ (def.)

Areas	Pop. % total*	
	2020	2011
Madrid	13.30	12.78
Barcelona	24.33	23.51
Valencia	27.66	26.81
Sevilla	30.44	29.58
50% Areas (43)	61.72	60.58
All LUA (86)	69.50	68.36

* Cumulative

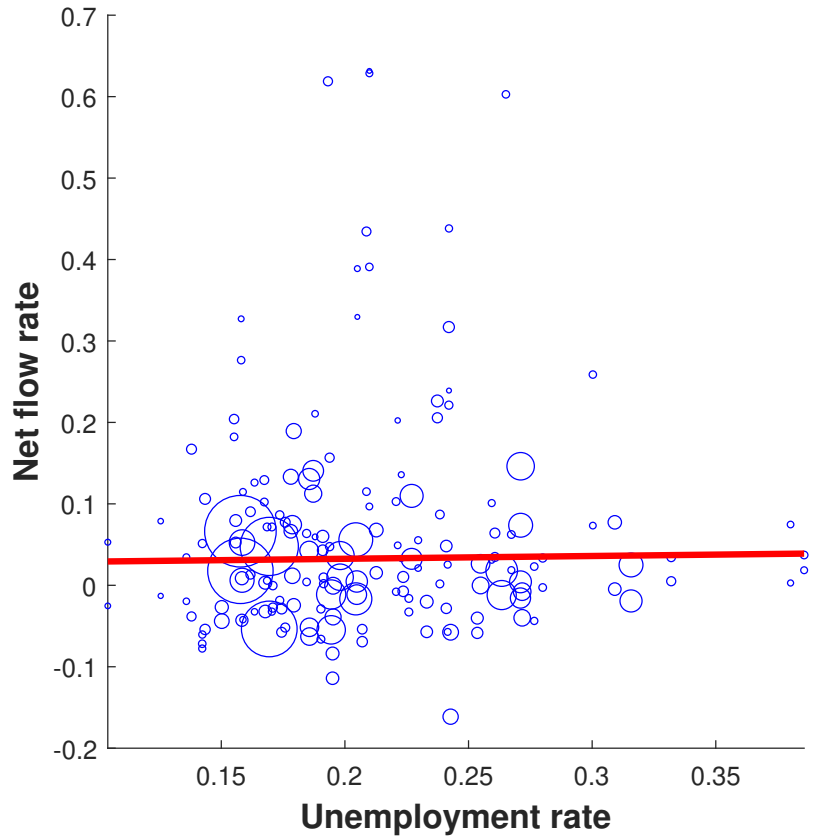


76% of total employment is concentrated in LUAs

Mobility across urban areas

Net flows almost flat in spite of large differences across UAs

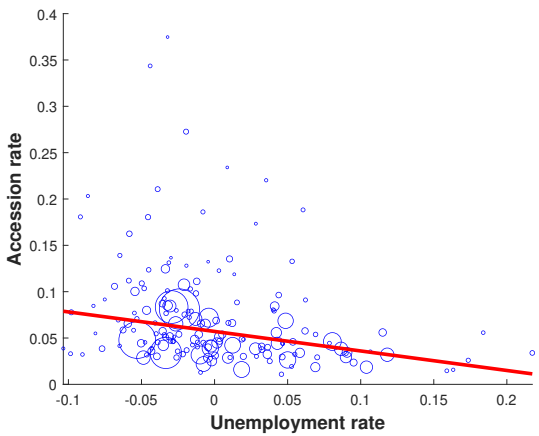
- UAs ranked according to unemployment rate.
- Net migration rate across UAs: 0.93%, vs. US interstate migration rate 1.5% (Kaplan and Schulhofer-Wohl 2012). ▸ MCVL
- Is this important geographically?
  - Accession flow rate: AF_{lt}/N_{lt-1}.
  - Separation flow rate: SF_{lt}/N_{lt-1}.
  - Net flow rate (the difference).

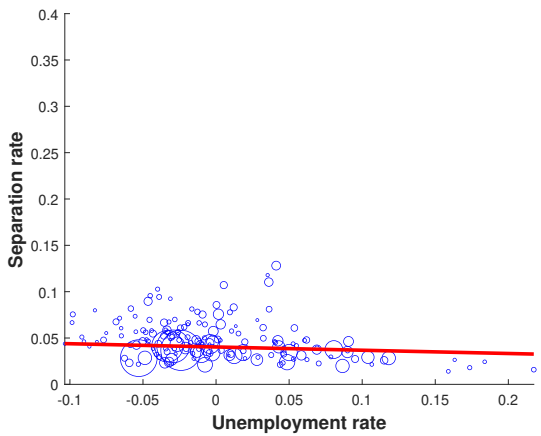


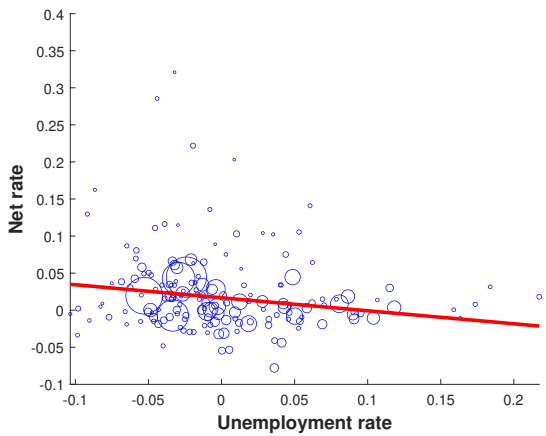
Mobility across urban areas

... more things going on across different cohorts (I)

- Young people (< 30) go to low unemployment areas, they leave all types of locations
- (Net flows) On average, young workers move to urban areas with about 1.5pp lower unemployment rates



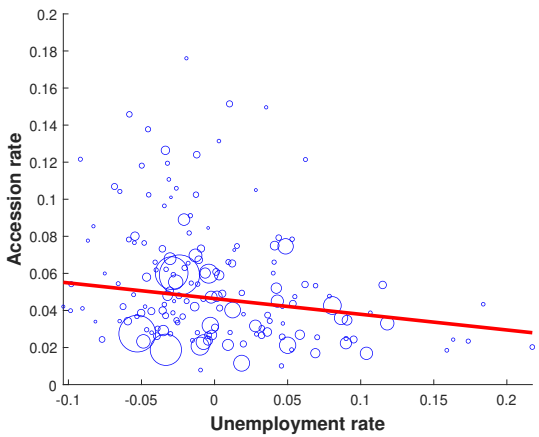


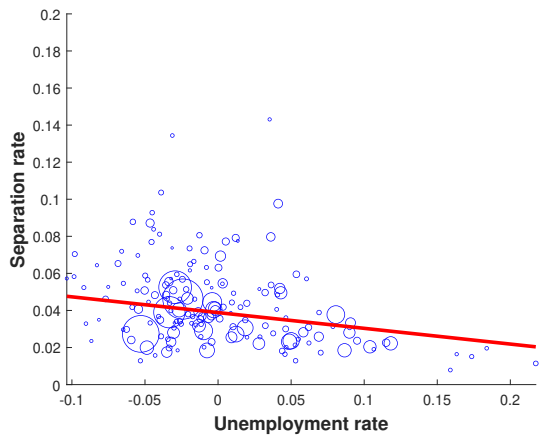


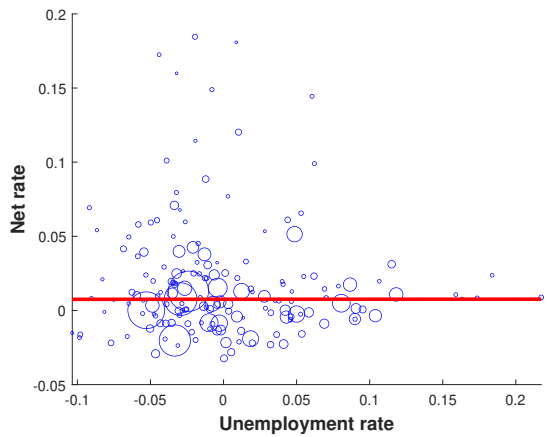
Mobility across urban areas

... and more so across different cohorts (II)

- Prime-age people (30-49) living in low unemployment UA are very mobile



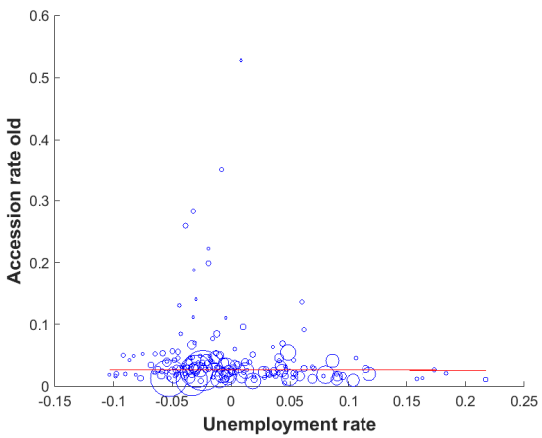


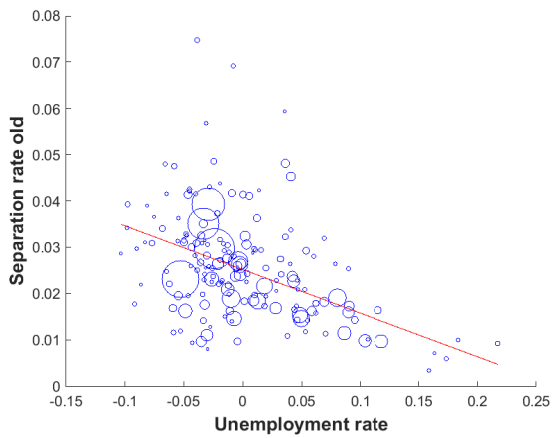


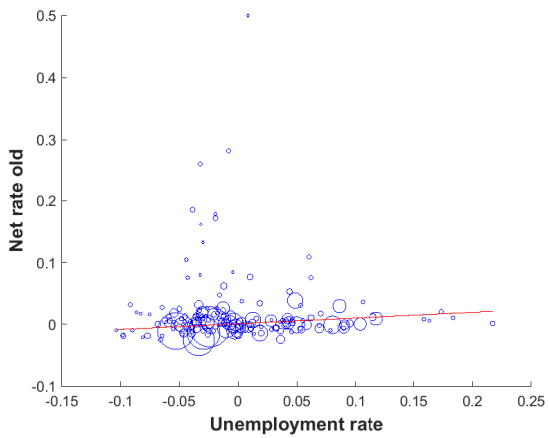
Mobility across urban areas

... and more so (III)

- Older workers and retirees (> 50) leave low unemployment locations
- (Net flows) On average, they move to urban areas with about 2pp higher unemployment rates.



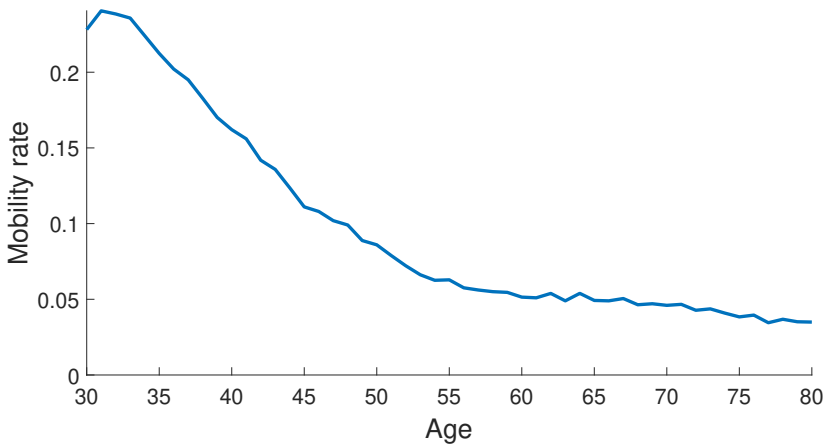


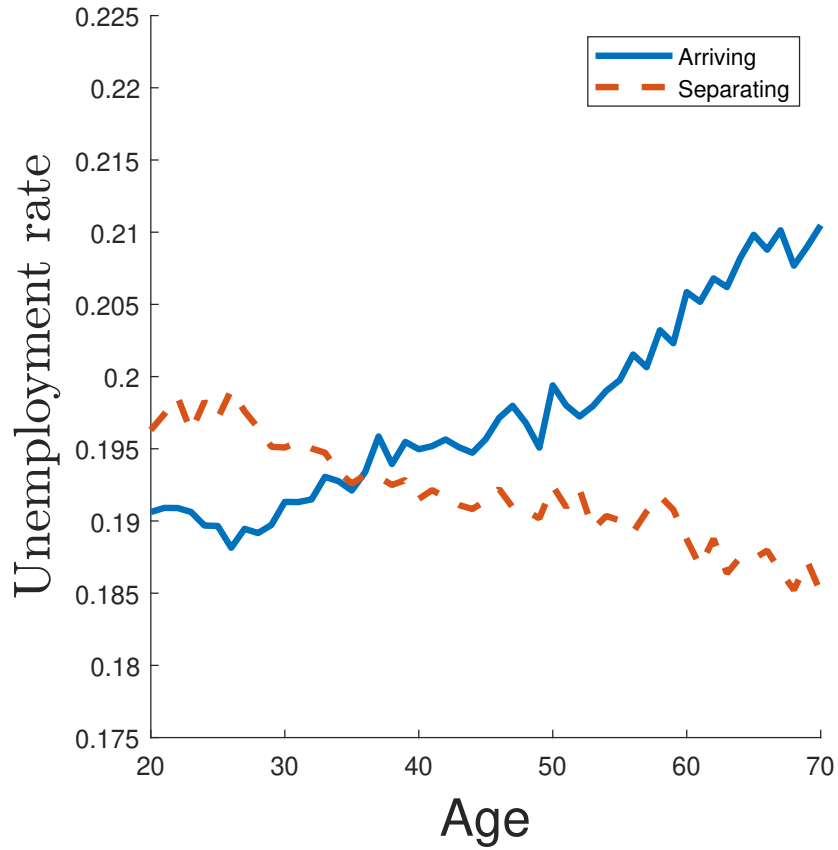


Mobility across urban areas

In summary, mobility flows have an important life cycle component

This is consistent with mobility in MCVL:





Local labor market characteristics

Sizeable population and income differences across UAs...

UAs ranked according to unemployment rate – terciles

Urban Tercile	T1	T2	T3
Population per UA	335,572	200,035	164,857
Population per km^2	1,500	1,153	844
Annual Earnings per Worker	24,472	19,241	18,493
Housing price per m^2	1,948	1,254	1,256

Source Census, Digital Atlas of Urban Areas (http://atlasau.mitma.gob.es/#c=home). Population-weighted averages within a urban area. Unemployment and Population are time-averaged values from the Census 1991, 2001, and 2011. The reference year of housing prices is 2021, but deflated to 2009 euros. The reference year of population density is 2011.

UA with lower U rate have higher density, earnings and housing prices.

Local labor market characteristics

... significant differences in local labor markets...

UA with higher wages have more stable job markets – higher creation and lower destruction rates of jobs

Urban Tercile	T1	T2	T3
Unemployment Rate (%)	16.5	21.2	29
Job Finding Rate (%)	33.2	30.4	29.4
Job Destruction Rate (%)	8.5	9.5	11.2
Job-to-job Rate (%)	12.7	11.3	10.7
(%) J2J down	0.41	0.41	0.45

Time-averaged values from the MCVL 2006-2008. Job transition rates within the same urban. The job finding rate is the share of non-employed workers who find a job in the next year. The job destruction rate is the share of employed workers who are non-employed in the next year.

Local labor market characteristics

... and sizable differential experience premium...

$$\log w_{ijt} = \omega_i + \tau_t + \alpha_{j(i,t)} + \sum_{\ell=1}^{2} \delta_\ell \, e_{i\ell t} + \gamma_1 \, \epsilon_{it} + \gamma_2 \, \epsilon_{it}^2 + \boldsymbol{X}_{\boldsymbol{it}}' \, \beta + \varepsilon_{ijt}.$$

- i, worker, j, location, t month, ℓ location u% type.
- $e_{i\ell t}$ extra experience accumulated up to period t in Q_ℓ, $\ell = 1, 2$.
- One additional year of experience in Q1 raises average earnings by 1.15% relative to accumulating the same year in Q3.

Following De la Roca and Puga 2018

	Log earnings	
α_1/α_3	0.0926***	(0.0024)
α_2/α_3	0.0471***	(0.0024)
δ_1 UA T1	0.0115***	(0.0004)
δ_2 UA T2	0.0019***	(0.0005)
γ_1	0.0850***	(0.0008)
γ_2	-0.0023***	(0.0000)
Worker Controls	Yes	
Job/Sector Controls	No	
City FE	Yes	
Worker FE	Yes	
Time FE	Yes	
N	7,364,713	
R-Squared	0.0272	

$^{*}\, p < 0.10, \; ^{**}\, p < 0.05, \; ^{***}\, p < 0.01.$

▸ (MCVL detail)

Model economy

- Dynamic version of Roback (1982) and Rosen (1979) economy.
- Augmented with heterogeneous frictional local labor markets and heterogeneous workers.
- Moreover, overlapping generations.

Environment

Locations

- There is a measure one of urban areas (locations).
- The size of fixed housing stock in each location is $\overline{H}$.
- Each location is characterized by its productivity type level, $A_l \in \{\mathcal{A}_1, \ldots, \mathcal{A}_L\}$, where $\mathcal{A}_1 > \cdots > \mathcal{A}_L$.
- The measure of each productivity type is σ_ℓ, $\ell = 1, \ldots, L$.

Environment

Demography and preferences

- Measure one of agents who live for T periods.
- When they die they are replaced by a new born agent.
- Newborns uniformly distributed across locations***.
- Agents value non-housing c, housing, h, and amenities, s. Utility of new born:

$$\sum_{t=1}^{T} \beta^{t-1} \left[c_{t\ell} + \hbar \log \left(h_{t\ell} \right) + v(s_{t\ell}) \right].$$

Environment

Technology

- Workers produce c with a linear technology,

$$\begin{aligned} \ln w(z, a, \ell) = & \ln \mathcal{A}_\ell + z + a(e, \ell, i), \\ a(i, e, \ell) = & e + \delta_\ell + \gamma_1 i + \gamma_2 i^2, \\ e' = & e + \delta_\ell, \end{aligned}$$

  and may have different jobs z and gain portable productivity δ_ℓ.
- Unemployed working age agents do not loose skills.
- Agents of age $i > R$ have no productivity and become retired.
- Notice that locations (names) do not affect productivity directly.

Market arrangements

- Housing in each locations is owned by absentee landlords (by now).
- r_{lt} is the rental price of housing in location l.
- Competition among landlords ensures that

$$p_{lt} = r_{lt} + \beta \, E_t \, p_{lt+1}.$$

People's decisions

Last stage, end of period: Migration

- Probability of migration opportunities depends on status and location, μ_ℓ^J, $J = R, U, E$.
- Migration opportunity from ℓ to particular ℓ' is drawn from a uniform distribution.
- People receive a draw of amenity value of ℓ', s', with probability $f_S(s')$.
- Working age: Migration opportunities may come with a job offer with probability $\phi_{\ell'}$ and a productivity draw z' from f_Z.
- Migration cost: utility cost κ.

People's decisions

Second stage: Local labor market shocks

- Unemployed people:
  - They get job offers with probability ϕ_ℓ and a productivity draw z with probability $f_Z(z)$.
  - They can refuse offers.
- Employed people:
  - They become unemployed with probability λ_ℓ, or
  - ...they may stay with current productivity z, or
  - ...they may have to decide between new draw z' and current productivity z, or
  - ...they may have to decide between new draw z' and unemployment.

People's decisions

First stage: work and consume

- Workers collect their wage.
- Unemployed working age collect their unemployment subsidy, b_U.
- Retirees collect their pension, b_R.
- All consume, enjoy housing services and amenities.
- The local housing rental market clears.

Equilibrium

- We focus on steady states (for now).
- Notice that due to quasilinear preferences, in equilibrium, $h = \hbar / r_l$:
  - Housing expenditure is constant across locations $r_l \, h = \hbar$.
  - The rental price depends on population size $r_l = \hbar \, N_l / \overline{H}$.
- The felicity function is linear in income,

$$u(c, h) + v(s) = y - \hbar + \hbar \, \log(\hbar / r_l) + v(s).$$

Equilibrium details

Calibration overview

	T1	T2	T3	Target
ϕ_ℓ (%)	38.5	33.5	27.5	UA unemployment
λ_ℓ (%)	6.6	7.3	9.1	EU rate of UA stayers
Λ (%)		24.04		17 % JTJ rate UAs-wide
λ_d (%)		60.0		40 % JTJ are age losses UAs-wide
	$\mu_\ell^J = p_J \, eff_\ell$			
p^U (%)		3.0		Mobility rate of 0.95%
p^E (%)		4.7		Ratio of E to U movers: 2.7
p^R (%)		3.0		$p_r = p_n$
eff_ℓ	2.15	1	0.69	Relative worker turnover

▸ Full details

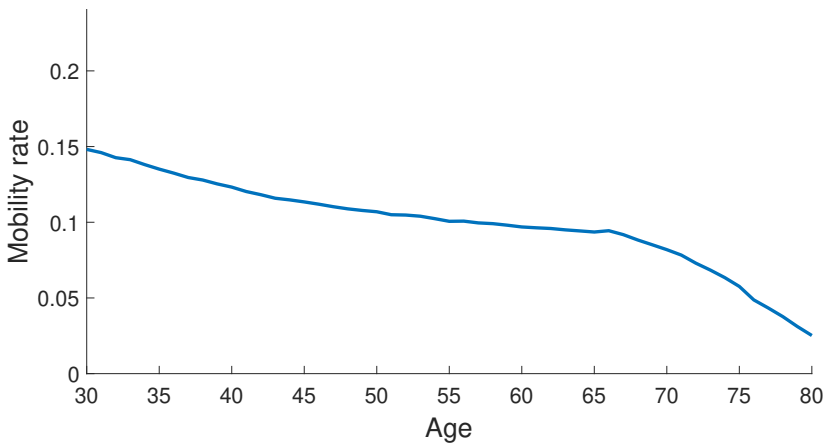
Results

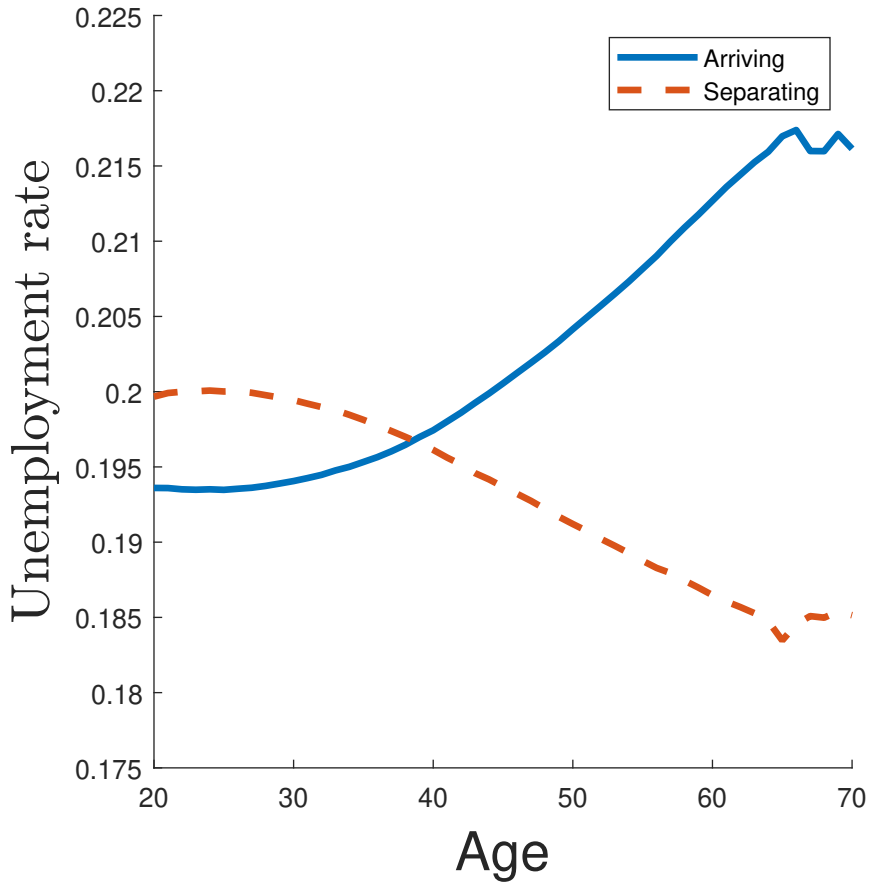
6 Results
- Understanding mobility
- Welfare cost

Understanding mobility

Mobility over the life cycle

- Migration frictions important to understand mobility size.
- Local labor market frictions important to understand sorting.





▸ Mobility in the data

Understanding mobility

The role of amenities and idiosyncratic productivity

Model	Mobility rate %	Share moving to better urban areas
Baseline	9.95	0.25
$\sigma_s = 0$	2.65	0.52
$\sigma_s = 0$ and $\sigma_z = 0$	2.09	0.6

Note: Share of people moving to higher ranked urban areas

Mobility flows have a large heterogeneity.

Welfare costs of being born in high u-rate UA

The effect of place-based policies

	Baseline	(1)	(2)	(3)
		No fixed costs	Subsidy young T1	Transfer T3
Welfare T1	1.46	1.48	1.46	1.45
Welfare T2	1.31	1.33	1.31	1.31
Welfare T3	1.23	1.24	1.22	1.24
Mobility rate %	9.95	14.00	9.99	9.96
r_2/r_1	0.80	0.82	0.75	0.8
r_3/r_1	0.76	0.79	0.72	0.79

1. $\downarrow$ mobility cost $\uparrow$ mobility rate of elderly $\Rightarrow$ Low u-rate UA less congested by elderly $\Rightarrow$ better for young people born in T1.
2. A subsidy w/o reducing labor market frictions only help young born in T1 and rise housing prices in T1.
3. Transfers to people in T3 brings more elderly – higher rents.

Welfare costs of being born in high u-rate UA

Labor market reforms

	Baseline	(1) Job stability	(2) Retirement
Welfare T1	1.46	1.48	1.47
Welfare T2	1.31	1.32	1.32
Welfare T3	1.23	1.23	1.24
r_2/r_1	0.80	0.78	0.79
r_3/r_1	0.76	0.75	0.75
w	2.18	2.28	2.14
Y	1.31	1.36	1.35
Std. log wages between urban %	15.34	15.98	15.95
Mobility rate %	9.95	8.28	9.95
Mean $\ln s$ %	6.94	6.74	6.93

1. Higher job stability rises the return to experience, and this return is higher in T1.
2. Likewise, rising retirement age increases return to experience, which has a higher premium in T1.

¡Gracias!

Mobility

- US interstate migration rate is 1.5% (Kaplan and Schulhofer-Wohl 2012).
- Flows dominated by people below 50 years old.
- Urban migration rate larger than provincial rate (people do not move too far away).
- 73% of movers are employed.

Urban Mig. Rate	0.95
Urban Mig. Rate ($<$50)	1.14
Urban Mig. Rate ($\geq$50)	0.34
Provincial Mig. Rate	0.86
% of Emp. Movers	73.00
% of Non-emp.Movers	27.00

Sample of contributors who live in an identified urban area in the MCVL between 2006 and 2008.

Urban areas

- There are 86 LUA 86 $>$ 50,000 habitants
- 755 municipalities, where 32 millions of habit. (Padrón Municipal 2020)
- LUAs comprise 9.6% of national territory
- Only 19 LUAs are composed by one municipality

The MCVL

- A random sample of 4% of contributors to Social Security.
- Monthly panel following each worker during the Census period.
- Workers' locations mapped to Census urban areas.
- CPI used to deflate to 2008€.
- Size of flows in Census and MCVL seem consistent.

Value functions

Migration stage

Retirees

$$V_t^R(\ell, s) = \left(1 - \mu_\ell^R\right) \beta W_{t+1}^R(\ell, s) + \mu_\ell^R \sum_{\ell'} \Omega_t^R(\ell, s, \ell') \pi(\ell'),$$

$$\Omega_t^R(\ell, s, \ell') = \sum_{s'} \max\left\{\beta W_{t+1}^R(\ell, s), \beta W_{t+1}^R(\ell', s') - \kappa\right\} f_S(s').$$

Migration stage

Unemployed

- Migration opportunity: $V_t^U(\ell, s, e') = \left(1 - \mu_\ell^U\right) \beta W_{t+1}^U(\ell, s, e') +$

$$\mu_\ell^U \sum_{\ell'} \left[(1 - \phi_{\ell'}) \Omega_t^{UU}(\ell, s, e', \ell') + \phi_{\ell'} \Omega_t^{UE}(\ell, s, e', \ell') \right] \pi(\ell'), .$$

- Valuing leaving with without a job:

$$\Omega_t^{UU}(\ell, s, e', \ell') = \sum_{s'} \max \left\{ \beta W_{t+1}^U(\ell, s, e'), \beta W_{t+1}^U(\ell', s', e') - \kappa \right\} f_S(s').$$

- Valuing leaving with a job: $\Omega_t^{UE}(\ell, s, e', \ell') =$

$$\sum_{z'} \sum_{s'} \max \left\{ \beta W_{t+1}^U(\ell, s, e'), \beta W_{t+1}^E(\ell', s', e', z') - \kappa \right\} f_S(s') f_Z(z').$$

Migration stage

Employed

- Migration opportunity: $V_t^E(\ell, s, e', z) = \left(1 - \mu_\ell^E\right) \beta W_{t+1}^E(\ell, s, e', z) +$

$$\mu_\ell^E \sum_{\ell'} \left[(1 - \phi_{\ell'}) \Omega_t^{EU}(\ell, s, e', z, \ell') + \phi_{\ell'} \Omega_t^{EE}(\ell, s, e', z, \ell') \right] \pi(\ell'),$$

- Valuing leaving with without a job: $\Omega_t^{EU}(\ell, s, e', z, \ell') =$

$$\sum_{s'} \max \left\{ \beta W_{t+1}^E(\ell, s, e', z), \beta W_{t+1}^U(\ell', s', e') - \kappa \right\} f_S(s').$$

- Valuing leaving with a job: $\Omega_t^{EE}(\ell, s, e, z, \ell') =$

$$\sum_{z'} \sum_{s'} \max \left\{ \beta W_{t+1}^E(\ell, s, e, z), \beta W_{t+1}^E(\ell', s', e, z') - \kappa \right\} f_S(s') f_Z(z').$$

Stages 1 and 2

Retirees

They wait:

$$
\begin{aligned}
W_t^R(\ell, s) = \quad & \max_{c,h} \left\{ u(c, h, s) + V_t^R(\ell, s) \right\} \\
\text{s. t} \quad & c + r_\ell \, h \leq b_R, \\
& c \geq 0, \; h \geq 0.
\end{aligned}
$$

Stages 1 and 2

Unemployed

They may get a job offer:

$$
\begin{aligned}
W_t^U(\ell, s, e) = \quad & \max_{c,h} \Big\{ u(c, h, s) + (1 - \phi_\ell)\, V_t^U(\ell, s, e) + \\
& \qquad \phi_\ell \sum_z \max \Big\{ V_t^U(\ell, s, e), V_t^E(\ell, s, e, z) \Big\} f_Z(z) \\
\text{s. t} \quad & c + r_\ell\, h \leq b_U, \\
& c \geq 0,\ h \geq 0.
\end{aligned}
$$

Stages 1 and 2

Employed

- They may become unemployed

$$
\begin{aligned}
W_t^E(\ell, s, e, z) = \quad & \max_{c,h} \left\{ u(c, h, s) + \lambda_\ell V_t^U(\ell, s, e') (1 - \lambda_\ell) \Psi_t(\ell, s, e', z) \right\} \\
\text{s. t} \quad & c + r_\ell h \leq w(\ell, e, z, t), \\
& c \geq 0, \; h \geq 0, \\
& e' = e + \delta_\ell.
\end{aligned}
$$

- Value of employment: $\Psi_t(\ell, s, e', z) =$

$$
(1 - \Lambda) V_t^E(\ell, s, e', z) + \Lambda \Big[(1 - \lambda_d) V^{EE}(\ell, s, e', z) + \lambda_d V_t^{ER}(\ell, s, e', z) \Big].
$$

- Going job-to-job:

$$
\begin{aligned}
V_t^{EE}(\ell, s, e', z) = \quad & \sum_{z'} \max \left\{ V_t^E(\ell, s, e', z), V_t^E(\ell, s, e', z') \right\} f_Z(z). \\
V_t^{ER}(\ell, s, e', z) = \quad & \sum_{z'} \max \left\{ V_t^U(\ell, s, e'), V_t^E(\ell, s, e', z') \right\} f_Z(z).
\end{aligned}
$$

Properties of equilibrium

Assumptions

1. The employment distribution of newborns is equal to the stationary distribution of employment shocks.
2. The distribution of amenity values s is i.i.d over age, location and productivity.
3. The probability distribution $\pi(\ell)$ is uniform.
4. Moving costs and unemployment benefits are not too high.

Properties of equilibrium

Symmetric equilibrium (I)

Symmetric equilibrium

Locations of the same productivity type have the same size and the same equilibrium rental price.

App

Otherwise, the expensive location should empty over time.

Locations of higher productivity have higher rent

$\Rightarrow$ more population

App

Likewise, the less productive location should empty over time.

Properties of equilibrium

Symmetric equilibrium (II)

- If agents could move freely, this proposition follows easily. Here they cannot. Every period they draw an opportunity to move to some other location.
- Population in l is the sum of all past net flows of people.
- Moreover, probabilities are uniform for locations of the same type.
- If two locations of the same productivity have different prices, the in-flows are always larger for the cheaper location. Conversely, outflows are lower. Thus, the cheaper location must have a larger population, arriving to a contradiction. Hence, the price must be the same.

Properties of equilibrium

Sorting

- It follows from the previous proposition.
- If a less productive location is as expensive than a more productive location, the net flows to the less productive town must be lower than to the

Calibration

Labor market

	T1	T2	T3	Target
$\ln \mathcal{A}_\ell$	1.09	1.05	1	Estimated
δ_ℓ (%)	1.13	0.2	0	Estimated
γ_1 (%)		5.6		Estimated
γ_2 (%)		-0.08		Estimated
b_u		0.45		Monthly benefits of 666€
b_R		0.52		Monthly benefits of 776€
$\hbar$		$0.4\,\mathcal{A}_1$		Average rent exp. of 520€
ϕ_ℓ (%)	38.5	33.5	27.5	UA unemployment
λ_ℓ (%)	6.6	7.3	9.1	EU rate of UA stayers
Λ (%)		24.04		17 % JTJ rate UAs-wide
λ_d (%)		60.0		40 % JTJ are age losses UAs-wide
σ_Z		0.16		Std of job switchers 0.22

Calibration

Mobility

Probability of being able to move $\mu_\ell^J = p^J \times eff_\ell$

	T1	T2	T3	Target
p^U (%)		3.0		Mobility rate of 0.95%
p^E (%)		4.7		Ratio of E to U movers: 2.7
p^R (%)		3.0		$p_r = p_n$
eff_ℓ	2.15	1	0.69	Relative worker turnover
κ		3.0		Mob< 50/Mob≥ 50 =3.3
σ_S		0.29		% T1 to T1 prime-age 55%

To match relative worker turnover locations high productivity locations must give more job opportunities everywhere.