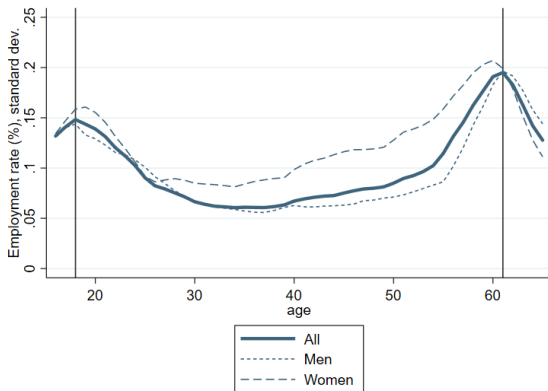


# The Life Cycle of Worker Flows in Europe

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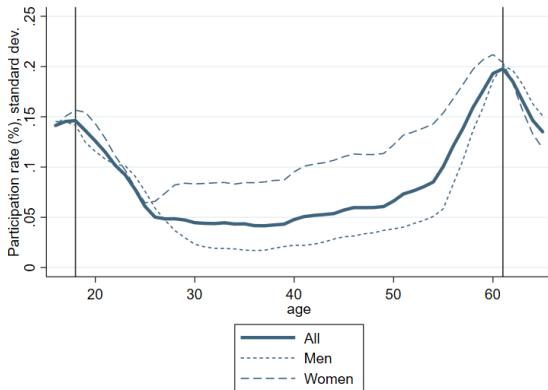
# Motivation



**Figure:** Cross-country standard deviation of employment (2004-2019) by age; EU-SILC and German SOEP survey data for 32 European countries and authors' calculation.

- Cross-country employment differences concentrated at the **two ends of the life cycle**

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**Figure:** Cross-country standard deviation of labor force/population (2004-2019) by age; EU-SILC and German SOEP survey data for 32 European countries and authors' calculation.

- Large variation in participation at the two ends of the life cycle.
- Variance increases ahead of statutory retirement ages (and declines after).

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- This influential body of work has been:
  - ① relying mostly on **representative-agent** frameworks;
  - ② interested mostly in **Europe vs. U.S.** differences;
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  - ② interested mostly in **Europe vs. U.S.** differences;
  - ③ focusing on the **unemployment** margin.
- Relatively little known about the role of life-cycle employment and participation in shaping aggregate employment cross-country differences.
  - especially across Europe—common macro shocks but very different institutions

# This paper

## Research question

- Implications of (i) life-cycle heterogeneity and (ii) participation margin for the sources of employment cross-country differences.

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- Aggregate employment cross-country stock-flow variance decomposition



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- Micro survey data for 32 European countries
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### ② Model

- Life-cycle equilibrium random search model with participation decisions
- Counterfactual: sources of employment differences (technology, search, policies)

# This paper

## Overview of results

- Novel facts emphasizing the importance of **life-cycle flows** and the **participation margin** for employment cross-country dispersion
- Model matches (untargeted) life-cycle flows between E, U, and N.
  - model's primitives are **independent of age**;
  - key ingredients: **heterogeneous match quality** and **endogenous search intensity**
- Sources of employment differences vary greatly across age (and gender) groups.
  - production technology explains cross-country variance for youth employment
  - search technology/home production explains differences for older individuals.

# Literature

## ① Life-cycle worker flows: empirical literature

- Most existing evidence: U.S. labor market (e.g., Topel, Ward, 1992; Choi, Janiak, Villena-Roldàn, 2014; Jung, Kuhn, 2019)
- Our paper: estimates for a large panel of European countries
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## ② Life-cycle worker flows: quantitative macro-labor/search

- Existing models: two-state transitions (e.g., Chéron, Hairault, Langot, 2013; Esteban-Pretel, Fujimoto, 2014; Telyukova, Visschers, 2016; Gorry, 2016)
- Recent contributions: Cajner, Güner, Mukoyama, 2022 and Goensch, Gulyas, Kospentaris, 2022; (WP version); effect of tax policy in the U.S.
- Our model: three states (E, U, and N); explains (untargeted) life-cycle transitions—all primitives independent of age.

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- Our model: three states (E, U, and N); explains (untargeted) life-cycle transitions—all primitives independent of age.

## ③ Cross-country differences in aggregate labor-market outcomes

- Most existing work: two-state representative agent models (e.g., Mortensen, Pissarides, 1999; Ljungqvist, Sargent, 1998; Pries, Rogerson, 2005; Ljungqvist, Sargent, 2007)
- More recently: life-cycle but no explicit N margin (e.g., Gorry, 2013; Kitao, Ljungqvist, Sargent, 2018; Engbom, 2022; Deopke, Gaetani, 2022)
- Our paper: implications of life-cycle and N flows for employment differences.

# Empirical analysis

## 1 Data

- *Statistics on Income and Living Conditions (EU-SILC) – Eurostat*
  - 31 European countries, 2004-2019
  - annual household survey data
  - 20,000 (Iceland) - 234,000 individuals (Italy)
- *German Socio-Economic Panel (SOEP)*
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## 2 Estimation of transition probability age profiles

- Compute worker-flow series using retrospective information on LF status
  - Flows between **E**, **U**, and **N**.
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## 3 Employment variance decomposition

- "Markov-chained" employment profiles
- Decomposition into demographics and worker-flows (and initial conditions)
- $6! = 720$  possible decomposition orders: take Shapley values.



# Empirical analysis

Cross-country key facts:

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  - ③ **Participation** flows:  $\approx 1/2$  of women's emp. variance and  $\approx 1/4$  of men's
  - ④ **EU** flows main contributor for men; **NE**: main contributor for women.
  - ⑤ Life-cycle transition profiles qualitatively consistent across countries
    - EU and EN decline; UE and NE decrease
    - NU decreases, UN increases.
- 
- Hold for Europe top 5 (France, Germany, Italy, Spain, and the U.K.) and for our sample of 32 European countries.

# Model overview

- Barebone:
  - Random search
  - Free entry of vacancies
  - Idiosyncratic shocks
  - Life-cycle, finite horizon
  - Participation decisions
- Steady-state equilibrium
- Calibration to Europe top 5 (men & women)

# Model overview – key elements

- ① Finite life-cycle horizon
- ② Endogenous search effort
- ③ Discrete participation choice
  - Extreme value type-one **utility shocks** (e.g., Aguirregabiria and Mira (2010))
  - lower marginal search cost in U than in N
  - positive U fixed costs
- ④ Heterogeneity in match quality (experience good)

## Key implications

- 1 to 3  $\implies$  declining UE, NE, NU **and** increasing UN rates
  - “Horizon” effect (Chéron, Hairault, Langot, 2013)
- 4  $\implies$  declining EU and EN rates

## Model overview – institutional environment

- **Firing costs**  $F > 0$ ,  $\mu_e \in [0, 1]$  (FC)
  - Proxy **strictness** of **employment protection legislation**
  - “Red-tape” administrative/procedure (pure deadweight) costs
  - In expectation, increasing with tenure—tenure-dependence scheme in legislation
    - High ( $\tilde{F} = F > 0$ ) and low ( $\tilde{F} = 0$ ) FC regime
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    - Transition to (absorbing) high-state regime with a probability  $\mu_e$
- **Unemployment benefits**,  $b_0 > 0$ ,  $b_1 > 0$ ,  $\mu_u \in [0, 1]$  (UB)
  - “**Generosity**” of **unemployment insurance**
  - Decreasing with unemployment duration—UB duration-dependence scheme
    - Low ( $\tilde{b} = b_0$ ) and high ( $\tilde{b} = b_1 \geq b_0$ ) UB regime
    - Transition to (absorbing) low-state regime with a probability  $\mu_u$

## Model overview – institutional environment

- **Proportional tax** on wages,  $\psi \in [0, 1]$ 
  - Employer/employee **social security contributions** (**large** differences across Europe)
  - Statutory incidence on worker, passed-through profits through wage bargaining (Nash)
- Exogenous **retirement age**,  $T \in \mathbb{N}$ 
  - Strictness of pay-as-you-go requirements for retirement pension eligibility

# Calibration

- Data
  - OECD.stats: institutions
  - ECB: job vacancies (private sector)
  - EU-SILC and GSE: transition rates.
- Empirical targets
  - **Aggregate** transition rates between E, U, and N
    - search technology and domestic production
  - Distribution of separation rates across age/gender cells
    - distribution of match quality and productivity shocks
  - Vacancy rates
    - vacancy posting costs
  - policies: UB replacement ratios; severance payments (firing costs)

## Model fit: employment rate (untargeted)

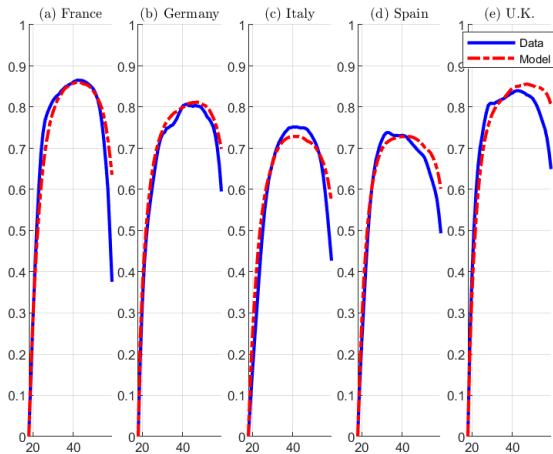


Figure: Employment rate age profiles, data and model

## Model fit: transition probabilities (untargeted)

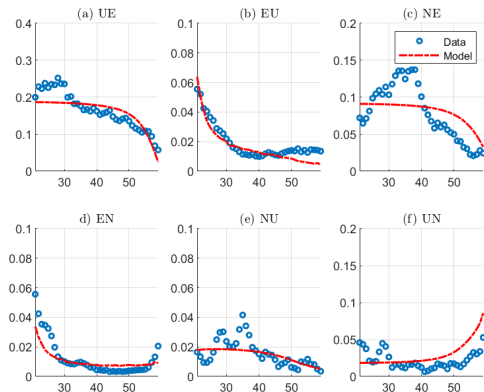


Figure: Transition probabilities for Germany, men (data and model)

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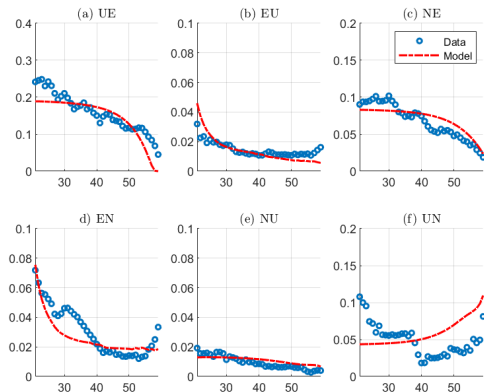


Figure: Transition probabilities for Germany, women (data and model)

# Life-cycle employment cross-country variance decomposition

- Consider following sources of cross-country employment variance:

$$\vartheta = (\sigma_x^2, \sigma_z^2, \alpha, \delta) \quad \text{(technology)}$$

$$\varphi = (A, c_v, \chi_u, \chi_n, c_{eu}, c_{nu}, \bar{c}_u, y_0) \quad \text{(search)}$$

$$\lambda = (T, b_0, b_1, F, \psi, \phi) \quad \text{(policies)}$$

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- Cross-country employment difference decomposition

$$\begin{aligned} E(\vartheta^c, \varphi^c, \lambda^c) - E(\vartheta^r, \varphi^r, \lambda^r) &= \underbrace{E(\vartheta^c, \varphi^c, \lambda^c) - E(\vartheta^r, \varphi^c, \lambda^c)}_{\text{technology}} \\ &+ \underbrace{E(\vartheta^r, \varphi^c, \lambda^c) - E(\vartheta^r, \varphi^r, \lambda^c)}_{\text{search}} \\ &+ \underbrace{E(\vartheta^r, \varphi^r, \lambda^c) - E(\vartheta^r, \varphi^r, \lambda^r)}_{\text{policy}}. \end{aligned} \quad (1)$$

$c$ : country index;  $r$ : reference (hypothetical) country with average parameters.

- Variance decomposition by age/gender; Shapley values.



# Life-cycle employment cross-country variance decomposition (men and women)

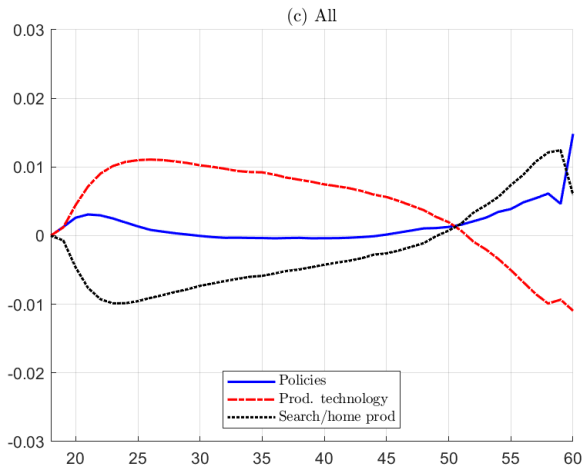


Figure: Variance contribution to total employment cross-country variance

# Life-cycle employment cross-country variance decomposition (men)

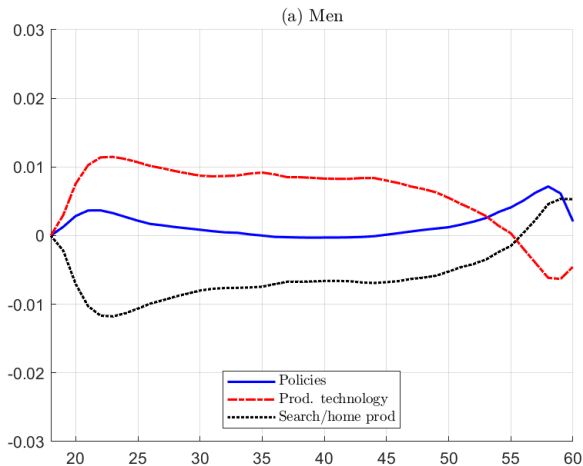


Figure: Variance contribution to total employment cross-country variance

# Life-cycle employment cross-country variance decomposition (women)

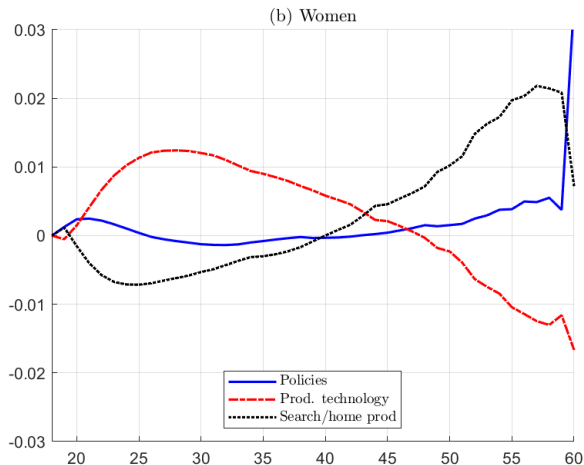
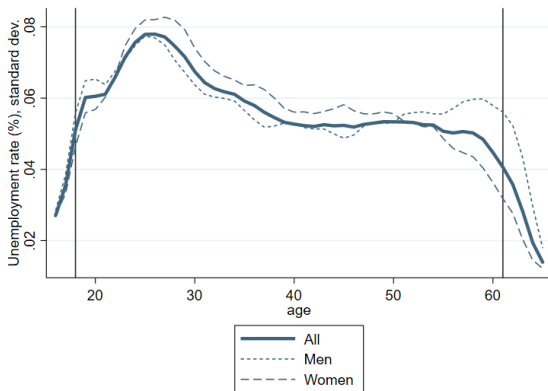


Figure: Variance contribution to total employment cross-country variance

# Conclusion

- Implications of life-cycle heterogeneity and participation flows for aggregate employment across countries.
- A (finite-horizon) life-cycle model with endogenous search intensity and heterogeneity in match quality explains life-cycle worker-flow profiles.
- Sources of differences in employment variance differ significantly by age.

## Cross-country unemployment-rate variance over the life-cycle



**Figure:** Cross-country standard deviation of labor force/population by age; EU-SILC / GES survey data for 31 European countries and authors' calculation.

- The unemployment-rate margin is important for younger individuals; it is flat otherwise.