

What determines unemployment:
low productivity or high opportunity cost of employment?

Saman Darougheh^a

^aDanmarks Nationalbank (but not their views/opinions)

Why are “the unemployed” unemployed?

- ▶ High opportunity cost of employment
 - ▶ High consumption when unemployed (benefits, support from partner, parents, ...)
 - ▶ High utility differential (high joy from leisure, high disutility from working)
 - ▶ “they don’t care enough to search”
- ▶ Low average productivity
 - ▶ “difficult to find productive job”

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Implications for optimal social policy?

- ▶ Lower UI to make unemployment more painful
- ▶ Keep UI high, instead consider retraining

Why are “the unemployed” unemployed?

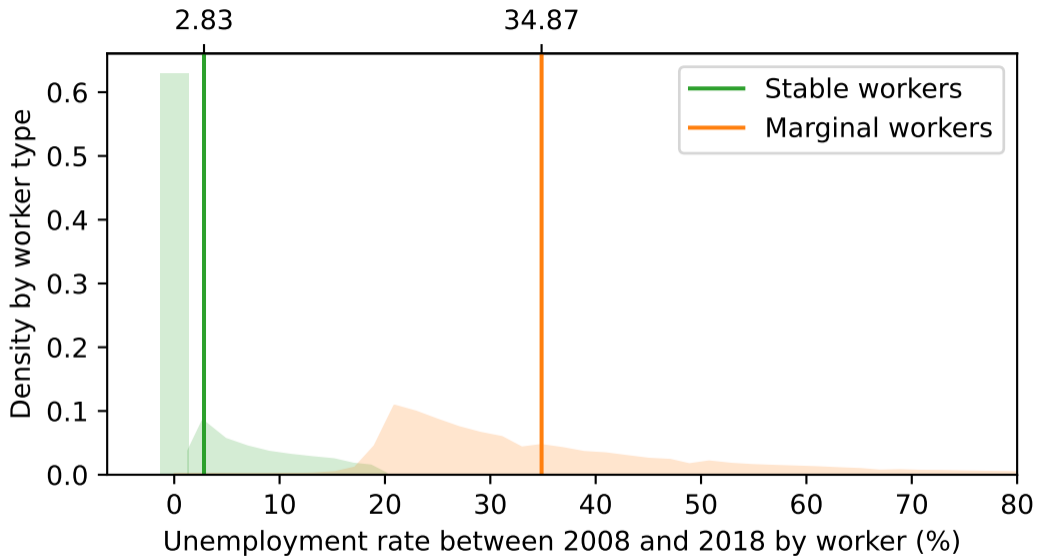
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Why are “the unemployed” unemployed?

- ▶ Today: minority of workers (“marginal workers”) makes up 2/3rd of unemployment
- ▶ How are these different?



This paper

1. Qualitative model that generates cross-sectional unemployment heterogeneity.
Source of heterogeneity affects:
 - ▶ Cost of unemployment
 - ▶ Optimal social security (example: unemployment insurance)

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 - ▶ Marginal workers have *worse* outside options and worse productivity

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3. Empirical evidence using administrative data: who are the marginal workers?
 - ▶ Marginal workers have *worse* outside options and worse productivity
4. Suggestive structural evidence
 - ▶ Extend model to include leisure and calibrate

Literature

Empirical estimation of worker types based on employment patterns

- ▶ Hall and Kudlyak (2019): Transition-rate heterogeneity (in CPS).
- ▶ Sahin et al (2022): HMS (in CPS)
- ▶ Gregory, Menzio, and Wiczer (2022): k-means (in CPS)
- ▶ **This paper**: k-means (in Danish administrative data). Suggestive evidence: worse outside-options, worse productivity

Small surplus needed to generate unemployment fluctuations

- ▶ Hagedorn and Manovskii (2008), ... , Ljungqvist (2009)
- ▶ Chodorow-reich and Karabarbounis (2016)
- ▶ **This paper**: estimate separately b and z for both worker types

Macroeconomic policy and worker heterogeneity

- ▶ Monetary policy and marginalized workers (Carpenter et al, 2022)
- ▶ Minorities strong recovery post covid (Autor, Dube, and McGrew, 2023)
- ▶ **This paper**: Optimal UI very different when considering heterogeneity

A simple model

Estimation of worker types

Empirical evidence: who are the marginal workers

Structural evidence: productivity or outside options?

A simple model I

Two types of workers, $i \in \{m, s\}$

- ▶ In segmented labor markets with directed search
- ▶ In a shared assets market

That potentially differ on two aspects:

- ▶ Average productivity
- ▶ Average home production

A simple model II

Unemployed workers:

- ▶ Produce at home b_i
- ▶ Search for wage w
- ▶ Meet with firms that offer w
- ▶ Draw productivity z from distribution $G(z_i, \sigma_z)$
- ▶ If $z > w$, become employed

Employed workers:

- ▶ Exogenous separation at rate δ

Savings

- ▶ Workers can save at rate r
- ▶ Asset in zero net supply

The problem of the unemployed worker

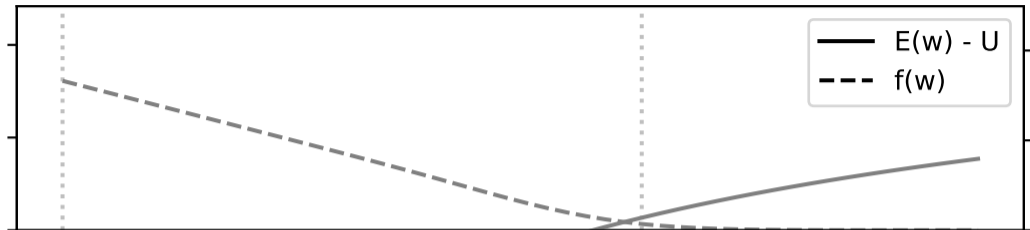
Worker of type i chooses consumption and wages

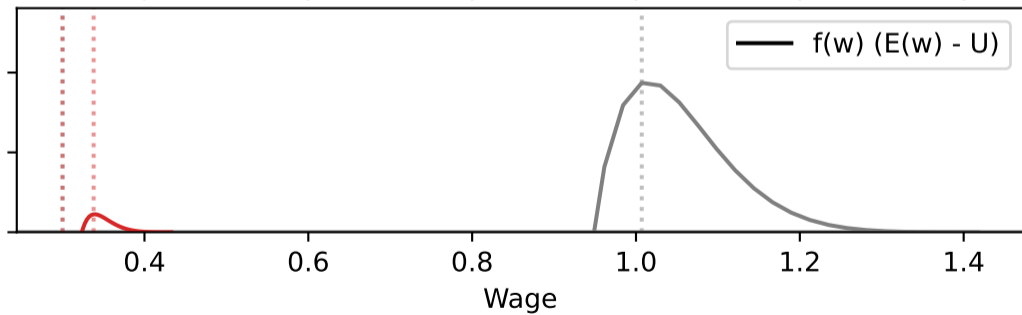
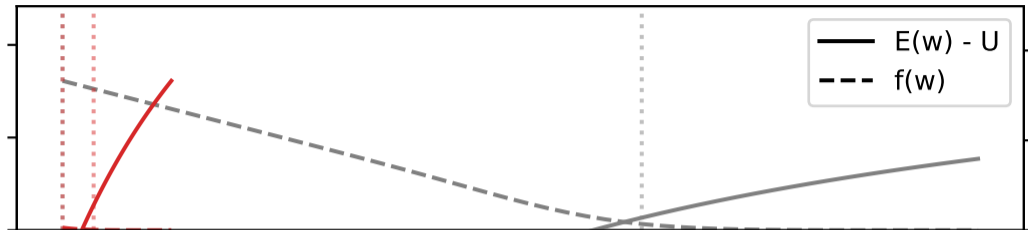
$$\rho U_i(a) = \max_{c,w} u(c) + f_i(w)(E_i(w, a) - U_i(a)) + \frac{\partial U_i(a)}{\partial a}(b_i + ra - c)$$

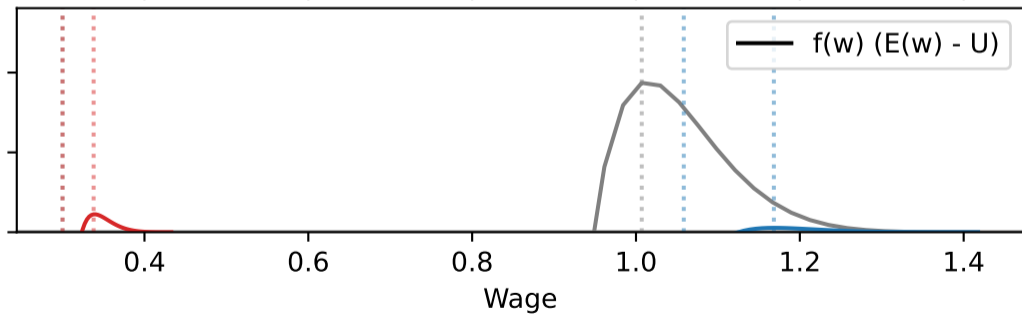
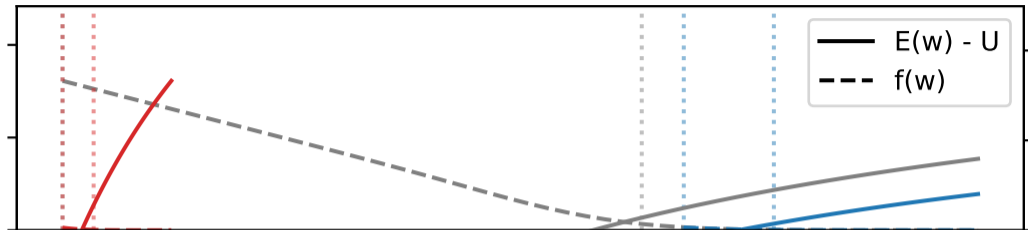
Two calibrations:

Low productivity: Workers differ in $z_i \Rightarrow f_i(w)$, but not in b_i

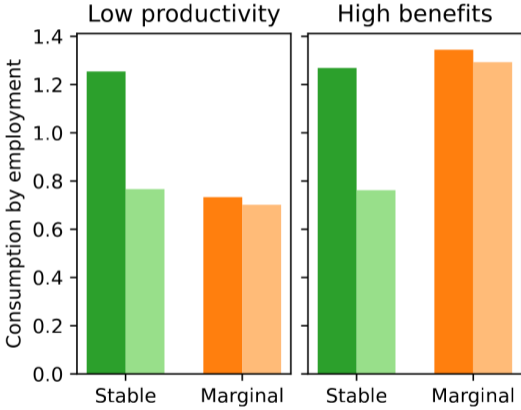
High benefits: Workers differ in b_i , but not in z_i







Consumption of employed and unemployed



Results

- ▶ High benefits \Rightarrow marginal workers consume *more*
 - ▶ High benefits: marginal \succ stable
 - ▶ Low productivity: marginal \prec stable
- ▶ Consumption volatility always smaller for marginal workers
 - ▶ Unemployment insurance less valuable for marginal workers

Results

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What does this mean for social security?

Introduction of simple UI:

- ▶ Unemployed workers receive g (additionally to b)
- ▶ Employed workers pay proportional tax τ
- ▶ Result: if unemployment due to low productivity, optimal UI much higher
- ▶ Increasing UI:
 - ▶ Provides unemployment insurance
 - ▶ Provides redistribution (insurance against being marginal)
 - ▶ Lowers employment, particularly of marginal workers

A simple model

Estimation of worker types

Empirical evidence: who are the marginal workers

Structural evidence: productivity or outside options?

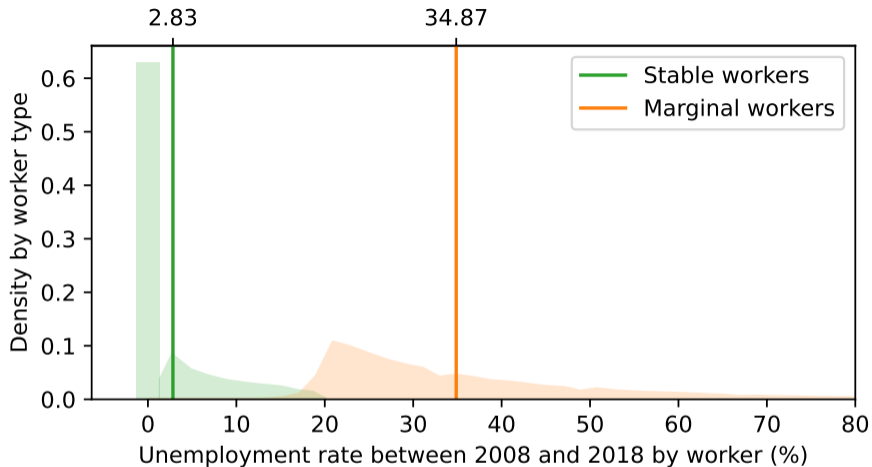
Estimation of worker types

Apply Gregory-Menzio-Wiczner (2021) to Danish administrative data

- ▶ Summarize a worker's employment history in 15 standardized moments [Details](#)
- ▶ Apply k-means clustering
 - ▶ 2 groups: out-of-sample error of 0.1%

Some details

- ▶ Universe of Danish wage payments 2008-2018 (BFL)
- ▶ Matched with unemployment benefits from DREAM
- ▶ Sample: core workforce with labor force attachment
 - ▶ Ages 30-65
 - ▶ Exclude workers with too long non-employment or unemployment
 - ▶ Final sample: roughly 1.5m workers [Restrictions](#)



- ▶ 15% of workers are marginal workers
- ▶ Share of marginal workers among unemployed: 60%

A simple model

Estimation of worker types

Empirical evidence: who are the marginal workers

Structural evidence: productivity or outside options?

Worker characteristics

	Worker type	
	Stable	Marginal
# Obs.	1 309 763	208 680
Share	0.86	0.14
Worker characteristics		
Male	0.52	0.52
Age	46.72	45.42
Education: HS or less	0.17	0.32
Large city	0.61	0.61
Rural municipality	0.18	0.20
Danish citizen	0.94	0.88
Non-Danish origin	0.10	0.19

Outside options

	Worker type	
	Stable	Marginal
Share	0.86	0.14
Worker wealth		
Net wealth ('000s)	286.61	69.54
Ever delinquent	0.12	0.27
Interest payments ('000s)	10.67	8.76
Worker relationship		
Has partner	0.61	0.43
L. earnings (partner)	12.52	12.25
Partner worker type: Stable	0.91	0.77
Partner worker type: Marginal	0.09	0.23

Firm-level value added

- ▶ How does firm-level VA correlate with employment of marginal and stable workers?

$$va_{i,t} = \alpha + \beta_{\text{stable}} l_{\text{stable},i,t} + \beta_{\text{marginal}} l_{\text{marginal},i,t} + X_i + T_t + \epsilon_{i,t}$$

Firm-level value added

	(1)	(2)	(3)	(4)	(5)	(6)
	log_va	log_va	log_va	log_va	log_va	log_va
Stable: log hours	0.391*** (97.73)	0.247*** (97.39)	0.257*** (102.17)	0.126*** (54.64)	0.117*** (29.48)	0.276*** (93.35)
Marginal: log hours	0.114*** (29.97)	0.0713*** (58.85)	0.0717*** (60.13)	0.0450*** (39.02)	0.0829*** (26.50)	0.0652*** (52.04)
Other: log hours	0.390*** (100.50)	0.260*** (104.68)	0.227*** (95.76)	0.102*** (43.59)	0.0954*** (26.22)	0.249*** (85.59)
Log (firm size)				0.580*** (86.09)		
Observations	1076480	1062513	1062513	1062513	133230	952088
Firm FE	No	Yes	Yes	Yes	Yes	Yes
Month FE	No	No	Yes	Yes	Yes	Yes
Firm size					Small	Large

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Summary of marginal workers

- ▶ Less educated, lower wage
- ▶ **Jobs**: lower earnings, lower hours, more temporary jobs, more separations for economic reasons
- ▶ Less wealth, more debt, more delinquency
- ▶ Partners: Fewer, poorer and lower-income (assortative mating)
- ▶ **Parents**: Less educated, poorer, more in debt
- ▶ Employment correlates with lower value added at the firm
- ▶ **Mental health:** worse

A simple model

Estimation of worker types

Empirical evidence: who are the marginal workers

Structural evidence: productivity or outside options?

Challenge from an empirical stand point

What is the worker's outside options?

- ▶ Unemployment benefits
- ▶ Home production
- ▶ Income/help from partner, parents
- ▶ Utility of leisure

Empirical evidence on these useful, but not conclusive.

⇒ Structural model

The problem of the unemployed worker, extended

$$\rho U_i(a) = \max_{c,w} u(c) + h_i + f_i(w)(E_i(w, a) - U_i(a)) + \frac{\partial U_i(a)}{\partial a}(b_i + ra - c)$$

- ▶ No leisure component h while employed
- ▶ Will normalize $h_s = 0$

Calibration strategy

(every parameter affects every moment, but:)

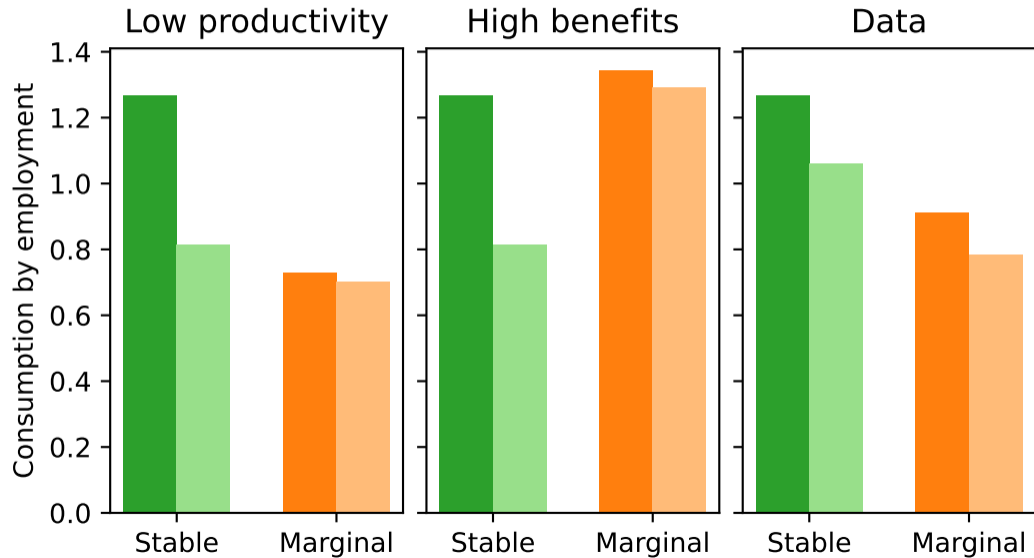
- ▶ **Consumption** informative about income difference employed vs unemployed (b_i)
- ▶ **VA** informative about productivity difference $z_s - z_m$
- ▶ Assumption: matching market identical across types
- ▶ Vacancy cost c pins down u_s (normalizing $h_s = 0$)
- ▶ Given c : h_m pins down $u_m - u_s$

Consumption moments

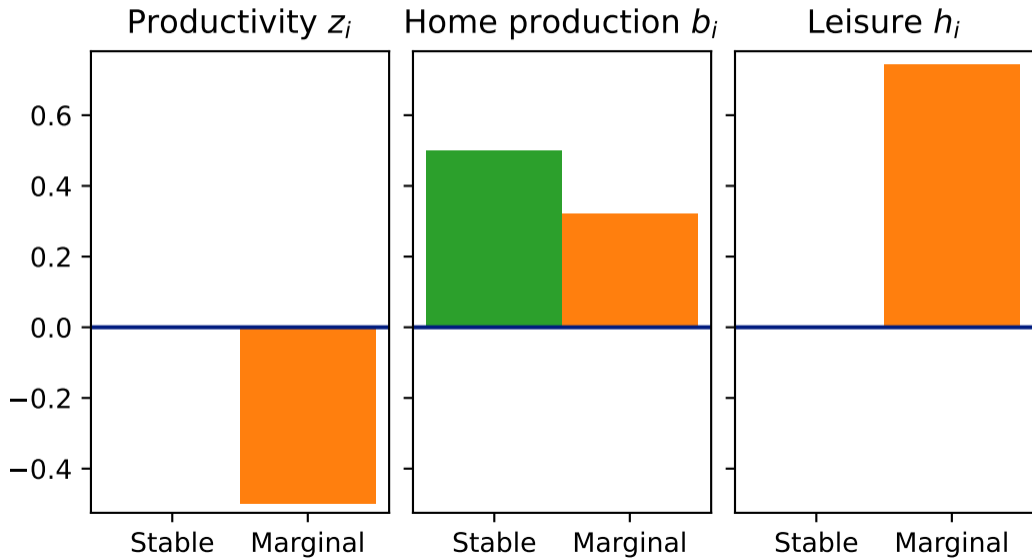
- ▶ Estimate in administrative data
- ▶ Annual data on consumption and unemployment
- ▶ Using within-person variation
- ▶ By cluster, estimate:

$$c_{i,t} = \alpha u_{i,t} + X_i + T_t + \epsilon_{i,t}$$

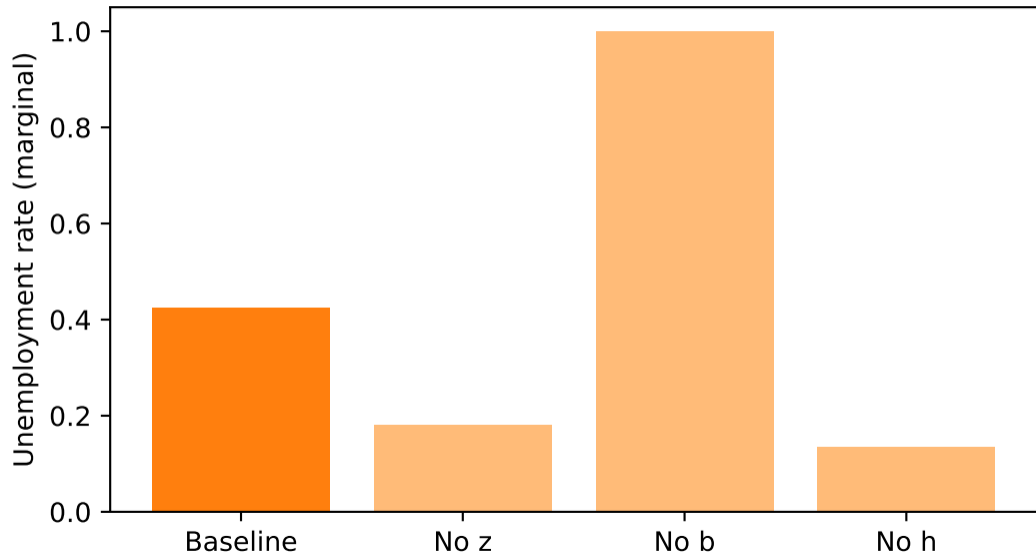
Relevant joint moments



Preliminary calibration



Role of various dimensions



Conclusion

- ▶ Large unemployment risk heterogeneity in the population
- ▶ Determinants matter for social cost and optimal policy
- ▶ Empirical evidence: marginal workers less productive and worse monetary outside-options
- ▶ Structural evidence: marginal workers less productive and higher disutility from work

Work in progress

- ▶ Optimal UI under calibrated model
- ▶ Type-specific separation rates
- ▶ Room for firm-side heterogeneity?

	Worker type	
	Stable	Marginal

# Obs.	1 309 763	208 680
Share	0.86	0.14

Clustering

Match: 1– 3M	0.11	0.17
Match: 3– 6M	0.08	0.17
Match: 6–12M	0.10	0.18
Match: 12–24M	0.16	0.21
Match: 24+M	0.56	0.27
Nonemp: 0–1M	1.00	0.97
Nonemp: 1–3M	0.00	0.00
Nonemp: 3–6M	0.00	0.01
Nonemp: 6–12M	0.00	0.01
Nonemp: 12+M	0.00	0.01
#Jobs per month	0.02	0.06
Nonemployment rate	0.00	0.01
Unemployment rate	0.03	0.35

Sample restrictions

# Obs	Sample restriction
3 169 414	In labor force during sample time
1 919 490	Within the age 30-60
1 752 138	At least two years in labor force
1 537 248	At least 12 months employed
1 518 443	Maximum nonemployment spell less than 2 years

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The problem of the employed worker

$$\rho E(w, a) = \max_c u(c) + \delta(U(a) - E(w, a)) + \frac{\partial E(w, a)}{\partial a} \dot{a}(c)$$
$$\dot{a}(c) = w + ra - c$$

The problem of the firm

Value of the firm

$$J(z, w) = \frac{z - w}{\rho + \delta},$$

Denote by $G_i(z)$ the c.d.f. of productivity draws for type i .

$$\rho V(i, w) = -c + \overbrace{q(\theta(i, w))}^{\text{Type-wage specific tightness}} \int_w^\infty \underbrace{J(z, w) dG_i(z)}_{\text{Type-specific productivity distribution}}$$

Matching

In equilibrium: $\theta(i, w)$ such that $V(i, w) = 0$.

$$f(w) = \overbrace{\theta(i, w)^{1-\alpha}}^{\text{Matching rate}} \underbrace{(1 - G_i(w))}_{\text{Match productive enough}}$$

[Back to model](#)

Comparing two calibrations

Common parameters		Value
Exogenous separation rate	δ	0.04
Discount rate	ρ	0.01
Matching: elasticity	α	0.50
Productivity dispersion	σ_z	0.15
Log productivity (stable)	z_s	0.00
Income of unemployed (stable)	b_s	0.70

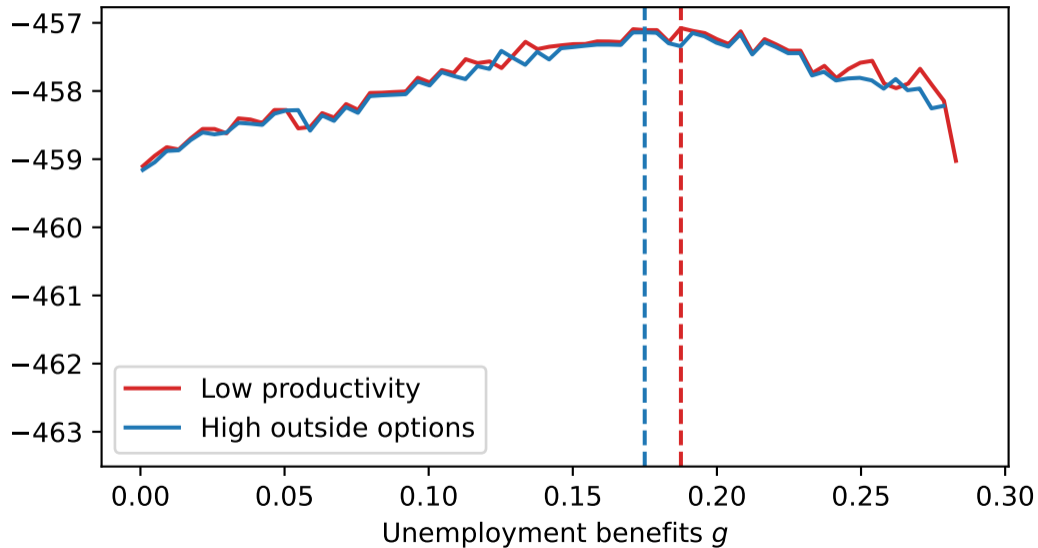
Comparing two calibrations

Common parameters		Value
Exogenous separation rate	δ	0.04
Discount rate	ρ	0.01
Matching: elasticity	α	0.50
Productivity dispersion	σ_z	0.15
Log productivity (stable)	z_s	0.00
Income of unemployed (stable)	b_s	0.70
Specific parameters		Low prod.
Vacancy search cost	c	0.00
Income of unemployed (marginal)	b_m	0.70
Log productivity (marginal)	z_m	-0.60

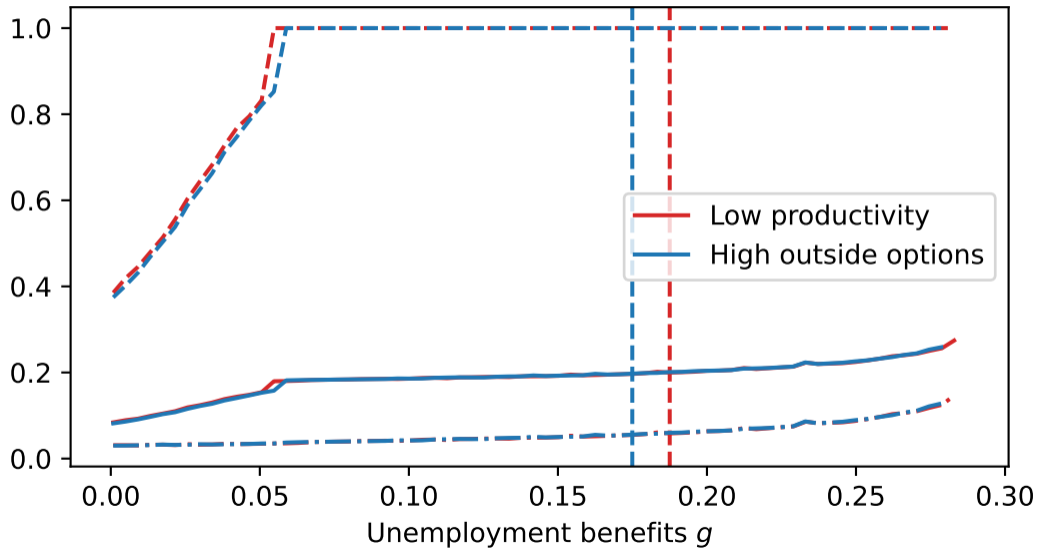
Comparing two calibrations

Common parameters		Value	
Exogenous separation rate	δ	0.04	
Discount rate	ρ	0.01	
Matching: elasticity	α	0.50	
Productivity dispersion	σ_z	0.15	
Log productivity (stable)	z_s	0.00	
Income of unemployed (stable)	b_s	0.70	
Specific parameters		Low prod.	High out. opt.
Vacancy search cost	c	0.00	0.00
Income of unemployed (marginal)	b_m	0.70	1.29
Log productivity (marginal)	z_m	-0.60	0.00

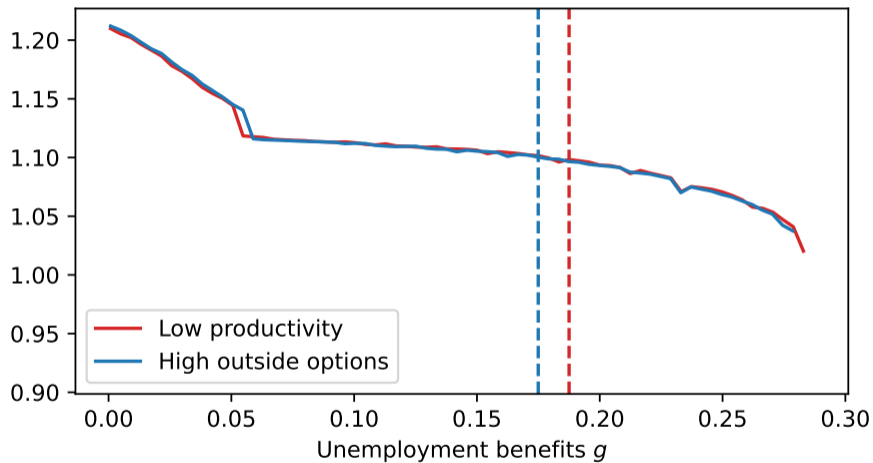
Optimal policy



Optimal policy: unemployment



Optimal policy: output



The relevance of household heterogeneity

Low productivity versus high outside options: what drives high unemployment?

- ▶ $\downarrow \mu_z$: downwards shift in finding rate, $f(w)$
 - ▶ Lowers $U(a)$ – unemployment is more costly
- ▶ $\uparrow b$: lower opportunity cost of waiting, $E(w, a) - U(a)$
 - ▶ Raises $U(a)$ – unemployment is less costly

Welfare cost of unemployment depends on determinant of unemployment.

Wages and job characteristics

	Worker type	
	Stable	Marginal
Share	0.86	0.14
Worker earnings		
Monthly hours worked	132	113
Annual earnings ('000s)	3651	1661
Part time	0.17	0.21
Part time: cannot find fulltime	0.18	0.20
Temporary	0.04	0.18
Mincer resid.	-0.02	-0.12
AKM worker FE	0.02	-0.09
Separation: economic reason	0.06	0.15

Outside options

Parents

	Worker type	
	Stable	Marginal
Share	0.86	0.14
<hr/>		
Father		
Education: High school or less	0.21	0.24
Net wealth ('000s)	1030.78	667.34
Ever delinquent	0.12	0.17
Age difference	29.18	29.04
Worker type: Stable	0.90	0.84
Worker type: Marginal	0.10	0.16

Outside options

Parents

	Worker type	
	Stable	Marginal
Share	0.86	0.14
Mother		
Education: High school or less	0.36	0.41
Net wealth ('000s)	549.36	358.98
Ever delinquent	0.08	0.14
Worker type: Stable	0.91	0.84
Worker type: Marginal	0.09	0.16

Outside options

Parents

	Worker type	
	Stable	Marginal
Share	0.86	0.14

Worker health

Any hospital visit	0.51	0.57
Hospital visit: mental illness	0.03	0.04
Visit: psychiatrist	0.04	0.09
Visit: psychologist	0.11	0.15

Results

	Low productivity		High benefits	
Interest rate	-0.0215		-0.0218	
Cost of being marginal	69.4416		-23.7345	
By worker type	Marginal	Stable	Marginal	Stable
Welfare cost of unemployment	0.001	-0.008	0.002	-0.008
Unemployment rate	0.353	0.028	0.339	0.029
Asset holdings	0.000	0.118	0.000	0.118
Consumption (employed)	0.730	1.265	1.343	1.265
Consumption (unemployed)	0.700	0.814	1.292	0.812
Savings (employed)	0.000	0.003	0.000	0.003
Savings (unemployed)	0.000	-0.114	0.000	-0.113
Wages	0.730	1.271	1.343	1.271

Number of workers

	(1)	(2)	(3)	(4)	(5)
	log_va	log_va	log_va	log_va	log_va
Stable: log workers	0.544*** (88.97)	0.338*** (95.19)	0.0297*** (5.51)	0.270*** (25.29)	0.355*** (95.76)
Marginal: log workers	-0.0503*** (-4.88)	0.0998*** (33.20)	-0.0000796 (-0.02)	0.233*** (15.65)	0.102*** (34.33)
Other: log workers	0.414*** (75.12)	0.386*** (111.71)	-0.0286*** (-4.57)	0.226*** (24.39)	0.342*** (89.86)
Log (firm size)			0.868*** (64.02)		
Observations	1080779	1066827	1066827	134187	955511
Firm FE	No	Yes	Yes	Yes	Yes
Month FE	No	No	Yes	Yes	Yes
Firm size				Small	Large

[Back](#)

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