UI and DI: Macroeconomic Implications of Program Substitution [1]

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July 2019
SI 2019, Social Security

[1]The views expressed in this paper are those of the author(s) and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

Counter-cyclical DI take up

- Economic conditions play an important role for DI take up.
  - Autor et al. 2013; Autor & Duggan 2003; Black, Daniel & Sanders 2002; Michaud & Wiczer 2018
- SSDI applications and awards accelerate during recessions.
  - Autor & Duggan 2003; Maestas, Mullen & Strand 2018
- SSDI is costly: the present value of a single award around $\$300,000$.
  - Awardees rarely return to work (Autor & Duggan 2006).
  - Access to Medicare after 2 years on SSDI.
- Potential hysteresis effects and fiscal consequences of recessions.

Counter-cyclical UI benefit durations

- UI durations are regularly extended during recessions.
  - From 26 to a potential maximum of 99 weeks during Great Recession.

- Potential benefits:
  - Consumption insurance (Ganong & Noel 2019)
  - Aggregate demand effects (Mc Kay & Reis 2017; Kekre 2019)
  - Housing stabilizer (Hsu, Matsa & Melzer 2018)
  - Productivity gains (Acemoglu & Shimer 1999)

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  - Productivity gains (Acemoglu & Shimer 1999)

- Potential costs:
  - Disincentive effects on labor supply (Rothstein 2011; Farber, Rothstein & Valletta 2015; Johnston & Mas 2018)
  - Search externalities (Lalive, Landais & Zweimuller 2015)
  - Equilibrium effects on labor demand (Hagedorn, Karahan, Manovskii & Mitman 20XX; Chodorow-Reich, Coglianese & Karabarbounis 2019)

This Paper

More generous UI policies keep those that would o/w go on DI in the labor force.

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3. What are the effects of UI extensions in recessions given program substitution?

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New analysis to measure interactions between UI and DI programs

- Complementary to Lindner & Nichols 2012; Muller, Rothstein & von Wachter 2016; Rutledge 2012

What we do

Empirically,

1. Show that DI take up rise in recessions.

2. Exploit variation in UI duration during the Great Recession to show:

   - DI applications decline as UI durations get extended (state level).
   - DI applications rise in response to unanticipated UI cuts (Missouri).
   - DI take up decreases with UI durations (border county design).

Using a quantitative model:

1. Rationalize the empirical findings.

2. Study the effects of counter-cyclical UI policies on DI take up and the labor market.

Road Map

Empirical Analysis

Model

Quantitative Analysis

Data

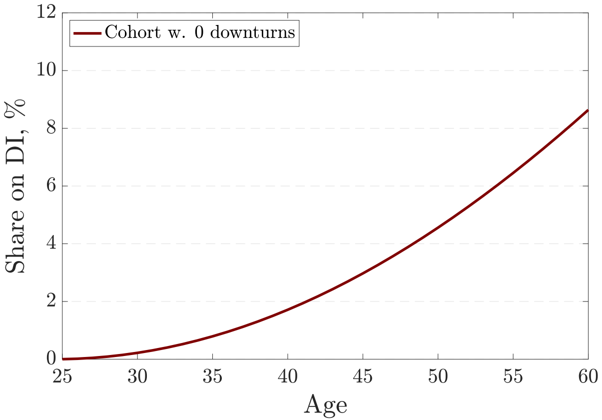
- Cohort analysis: SIPP
- Focus on the Great Recession covering 2006–2014.
- UI durations constructed from weekly trigger reports from the Department of Labor.
- Monthly DI applications at the state level from SSA
- Annual number of beneficiaries at the county level from SSA
- Other state and county level data from BLS LAUS, Census population estimates, etc.

Cyclicality of DI Take Up

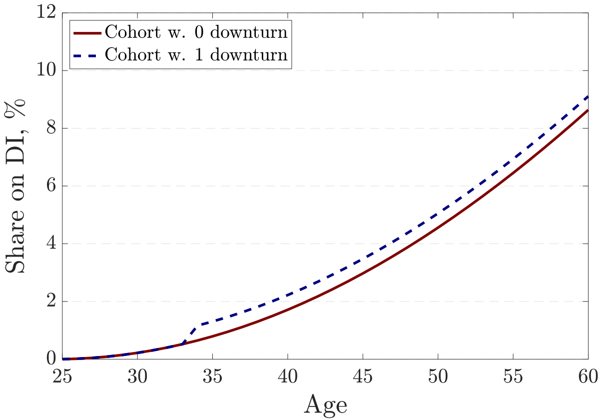
- Once on DI, return to work is rare.
- If take up is counter cyclical, cohorts exposed to more recessions would have higher shares on DI at any given age.
  - inspired by Storesletten, Telmer & Yaron 2004 (cyclicality of income risk).
- Compare share on DI across cohorts with same age but different histories.
- The share of DI recipients of a cohort at age a is given by $\mathrm{DI}_a = 1 - \prod_{i=1}^{a}(1 - f_a)$
  - f_a: share of individuals that go on DI at age a. Recessions: $f_a^r = f_a(1 + \chi_a^r)$
  - Assume DI is a completely permanent state.

▸ Applications

Conceptual Illustration



Conceptual Illustration



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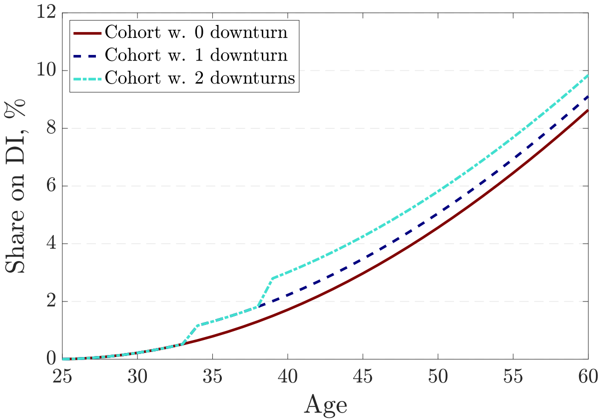

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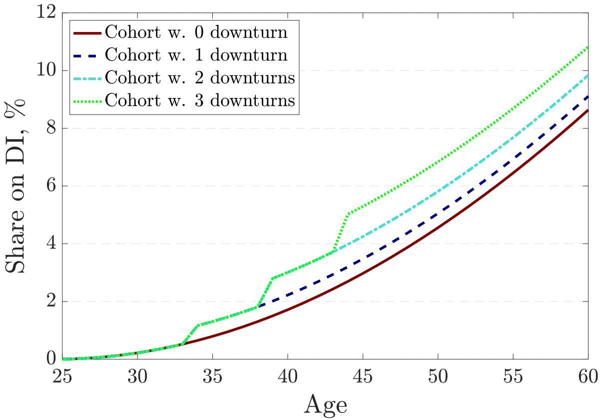

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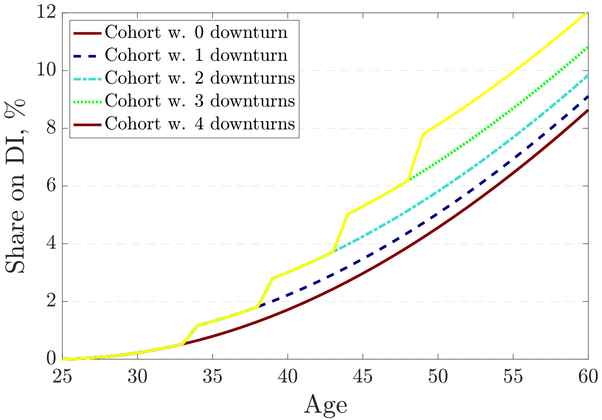

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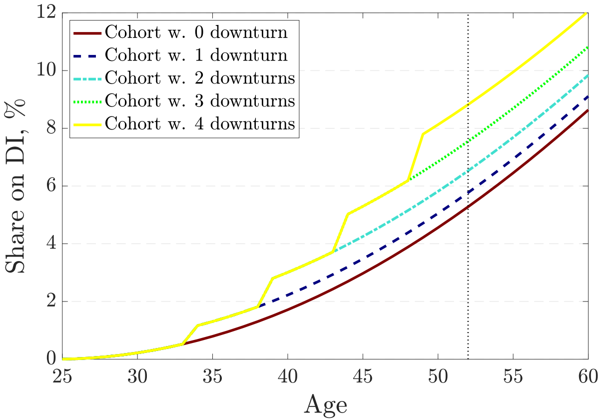

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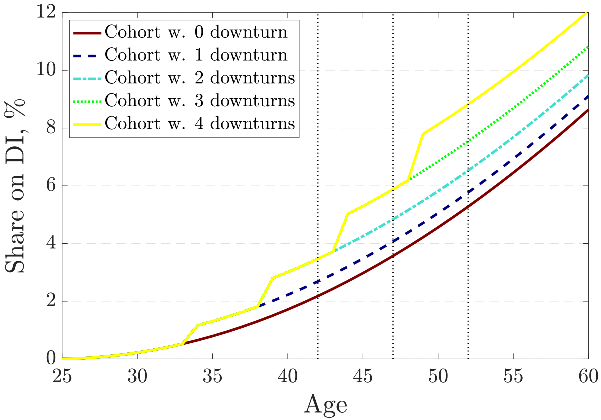
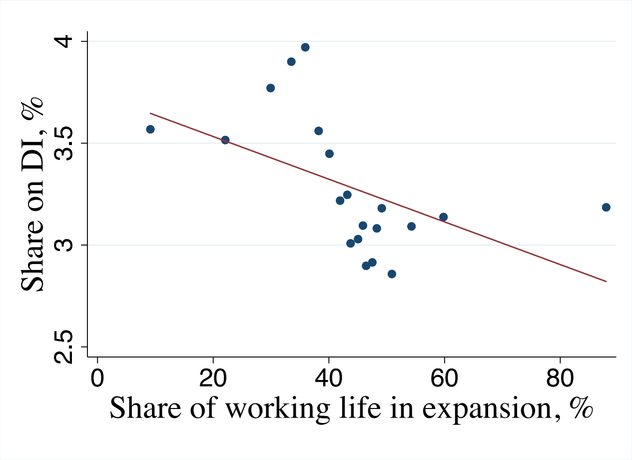


- Controlling for age, cov(#recessions, DI share) is informative of cyclicality.
- Strength of covariance at difference ages reveals sensitivity at different ages.

Cohort Analysis using SIPP Data

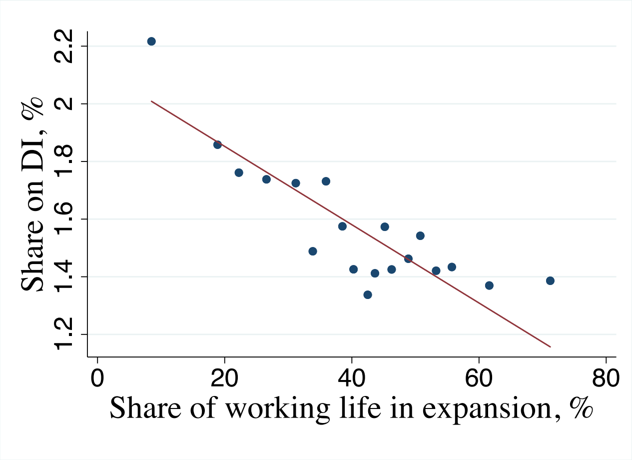
- Pool 1996–2008 SIPP panels, ages 25 to 60.
- For each cohort (c) and age (a) cell, compute the share on disability, DI_{ca}.
- Residualize DI_{ca} by removing age effects.
- Plot residualized DI_{ca} against the share of working life in expansionary years.
- A year is expansionary if real GNP growth is above its long-run average.

Cycličality of DI Take Up



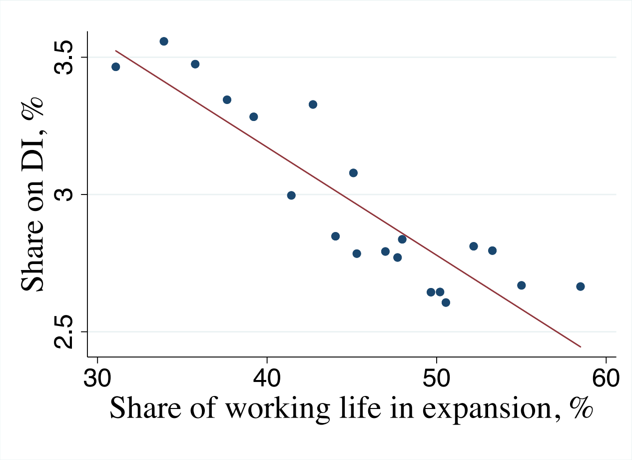
- Recessions increase DI take up.

Cyclicality of DI Take Up



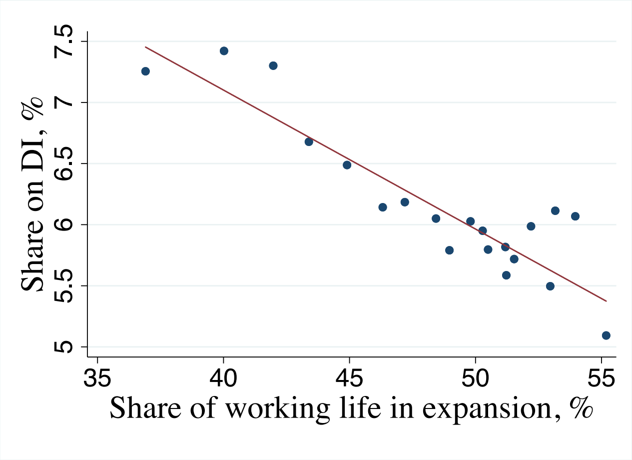
- Recessions increase DI take up.
- Slope for 30–39: -0.014

Cyclicality of DI Take Up



- Recessions increase DI take up.
- Slope for 30–39: -0.014
- Slope for 40–49: -0.039

Cyclicality of DI Take Up



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- Slope for 30–39: -0.014
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- Slope for 50+ : -0.114

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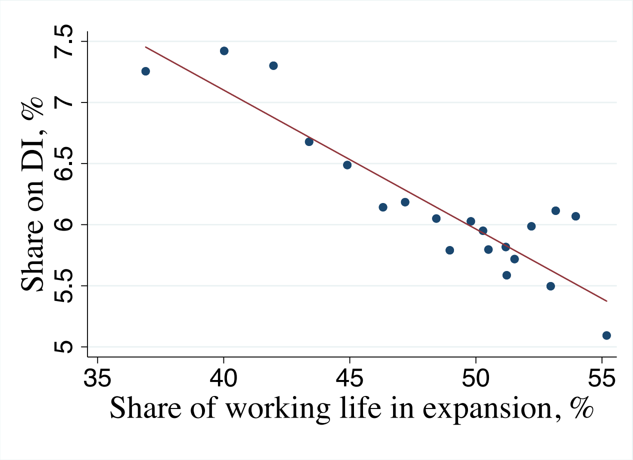
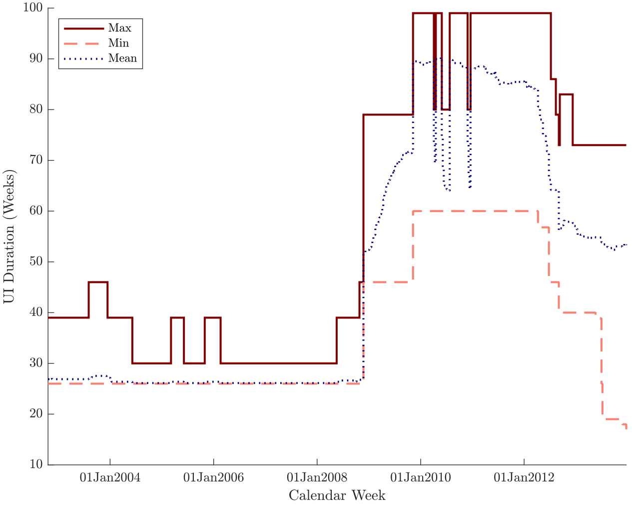


- Recessions increase DI take up.
- Slope for 30–39: -0.014
- Slope for 40–49: -0.039
- Slope for 50+ : -0.114
- DI take up is cyclically sensitive
  - more so for older individuals

Measuring the Effect of UI Durations on DI

- DI is a costly way of insuring business cycle shocks.
- Can more targeted insurance programs, such as UI, affect this behavior?
  - Use variation across states in UI durations during the Great Recession.
- UI is partly state administered. During the Great Recession:
  - Regular, Extended Benefits (EB), Emergency Unemployment Compensation (EUC).
  - 26 weeks to as long as 99 weeks of UI.
  - Duration contingent on state labor market cdts. $\Rightarrow$ variation across space and time.
- DI is fully federally administered. No geographical variation in generosity.

UI Duration During the Great Recession



Effect of UI on DI Outcomes

3 pieces of evidence to show longer UI durations lead to fewer DI applications and take up:

1. State-level monthly DI applications.
2. Large UI cut in Missouri in April 2011.
3. Border design on county-level annual DI take up.

State-level DI Applications

$$\log(\text{DI Applications}_{st}) = \alpha_s + \gamma_t + \beta \log(\text{UI Duration}_{st}) + X'_{st}\eta + \varepsilon_{st}$$

Variables	log(DI Applications)
log(UI Duration)	$-.082^{**}$
	(0.035)
Unemployment rate	0.020^{***}
	(0.006)
N	4896
Time FE	✓
State FE	✓

Large unanticipated UI cut in Missouri

- Missouri State House passed a law to extend EB to 20 weeks for federal funds.
- Republicans at the State Senate argued this would increase fiscal deficit.
- Following a filibuster in the State Senate, a compromise was reached.

State regular weeks cut from 26 weeks to 20 weeks.
Federal EUC depends on regular benefits, implying additional 10 week cut.

$\Rightarrow$ UI cut from 73 weeks to 57 weeks in April 2011.

- Largely unanticipated: First news on April 8, law passed on April 13.

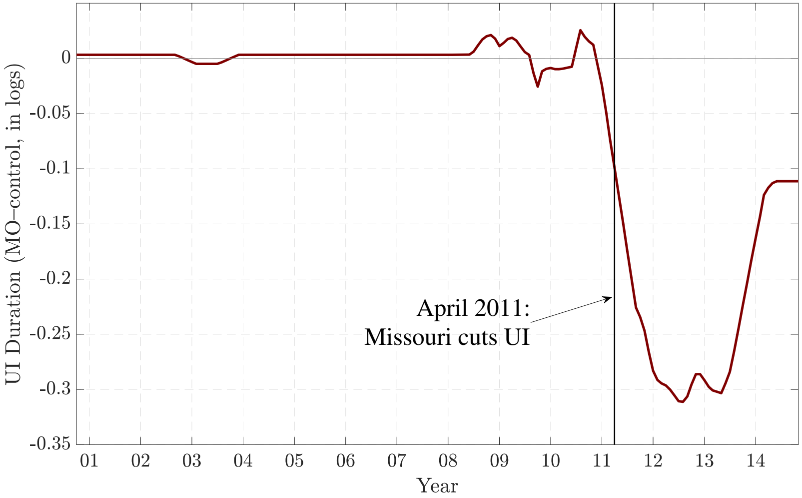
Missouri Natural Experiment

- Compare Missouri to a synthetic control constructed from other US states
  - following Johnston and Mas (2018)

- Match states based on:
  - disability applications
  - unemployment rate
  - UI duration
  - employment shares by NAICS–1 sectors

  before the April 2011 cut.

Missouri Natural Experiment



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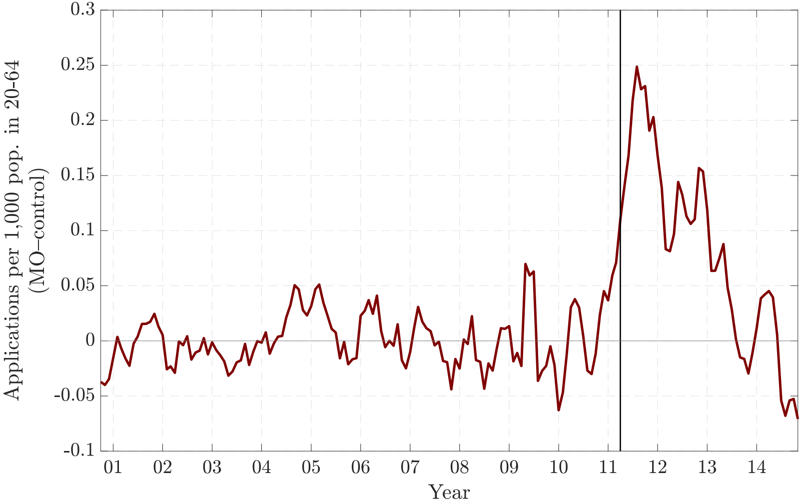

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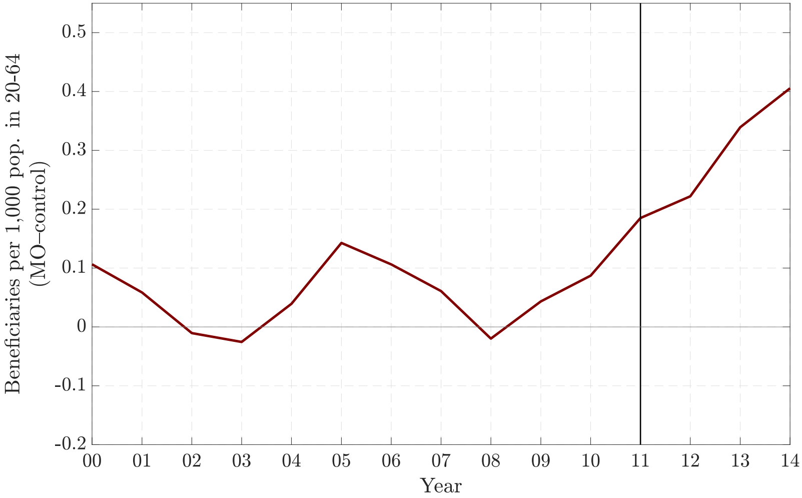

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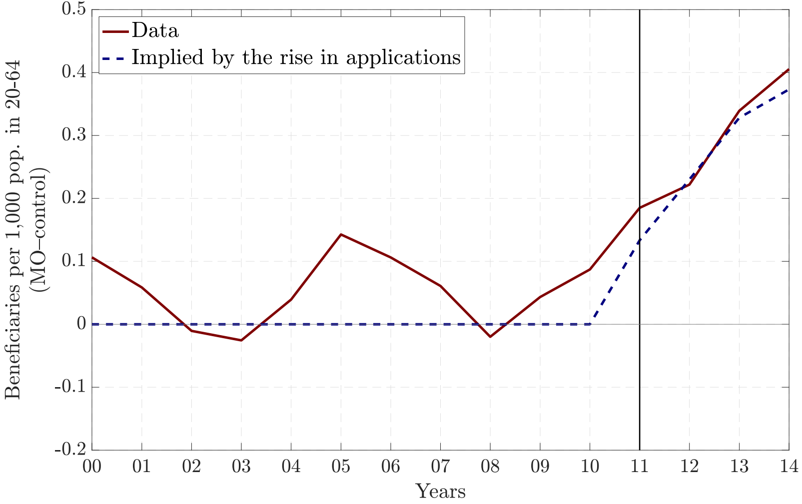
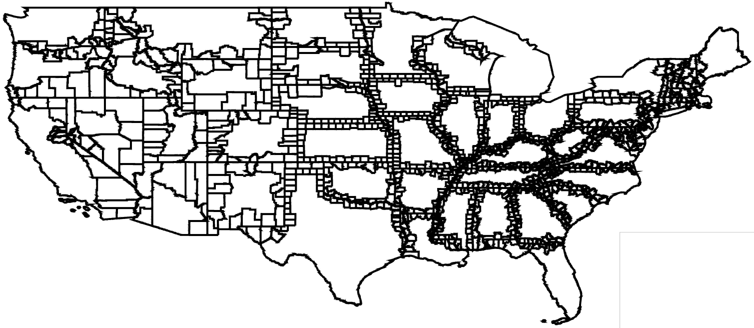


Border Discontinuity

- Extensions tied to state-level conditions.
- Compare two neighboring counties on different sides of state borders.



Border Discontinuity

$$\Delta_p \log(\text{DI Stock}_{c(p)t}) = \alpha_p + \beta \Delta_p \log(\text{UI Duration}_{c(p)t}) + \Delta_p X'_{c(p)t}\eta + \varepsilon_{pt}$$

Variables	(1) log(DI Stock)	(2) log(DI Stock)	(3) log(DI Stock)
$\Delta_p \log(\text{UI Duration})$	-0.039^{***}	-0.038^{***}	-0.040^{***}
	(0.012)	(0.011)	(0.012)
$\Delta_p \log(\text{Pop}_{20-64})$	0.391^{***}	0.396^{***}	0.468^{***}
	(0.095)	(0.099)	(0.100)
$\Delta_p \log(\text{Unemployed})$		-0.007	
		(0.014)	
$\Delta_p \log(\text{Employed})$			-0.109^{**}
			(0.045)
N	10534	10534	10534
County Pair FE	✓	✓	✓

Road Map

Empirical Analysis

Model

Quantitative Analysis

Environment

- Equilibrium search model:
  - + worker heterogeneity in health and skill
  - + stochastic UI and DI eligibility
  - + DI applications

- Unit mass of workers and large mass of potential firms.

- Random search and free entry.
  - Matching function $M(S, v)$, labor market tightness $\theta = v/S$.
  - Worker contact rate $f(\theta) = M/S$, firm contact rate $q(\theta) = M/v$.
  - Search subject to convex cost $c(.)$.

- Exogenous match destruction rate δ.

- Wages determined according to Nash Bargaining.

Worker Heterogeneity

Labor market states:

- Employed and UI eligible/ineligible.
- Unemployed and UI and DI eligible/ineligible.
- Apply for DI benefits.
- Receive DI benefits (probabilistic).

Health h:

- improve with $\lambda^a(h)$, worsen with $\lambda^d(h)$
- mortality rate ν
- disutility from work $v(h)$, $v'(h) < 0$.

Skill s:

- appreciate when employed with π^a
- depreciate when non-employed with π^d.

Government Programs

- UI and DI payments: b and d.

DI eligibility:

- Non-employed become long-term unemployed and eligible to apply for DI at rate ω.
- Applicants are admitted with probability $p(\theta, h, s)$; $p_h < 0$.

UI eligibility:

- Ineligible employed re-entitled for UI at rate r.
- Eligible unemployed exhausts UI at rate e.
- DI applicants become ineligible automatically.

- Programs financed with proportional tax τ on output. ▸ Equations

Calibration

- Health transitions

	Severe	Moderate	Good
Severe	.9712	.0106	.01812
Moderate	.0205	.9098	.0695
Good	.0017	.0035	.9946

- Targets

Moment		Data	Model
Unemployment Rate		0.05	0.049
DI share		0.045	0.045
EN separation rate		0.015	0.015
	Severe	0.0860	0.0862
Job Finding Rate	Moderate	0.2260	0.2255
	Good	0.2516	0.2501

Model Parameters

Parameter	Description	Value	Source
		A. PREDETERMINED	
β	Discount Factor	0.9967	4% annual interest rate
ν	Death probability	1/480	40-year work life
e	UI expiration rate	1/5.983	26-week regular UI benefits
r	UI re-entitlement rate	1/5.523	6-month employment
ω	DI eligibility rate	1/5	5-month waiting period
ϕ	Worker bargaining share	0.5	–
λ	Matching function parameter	0.4	Hagedorn and Manovskii (2008)
$p(h_1)$		1/4	
$p(h_2)$	DI admission probability	1/12	
$p(h_3)$		0	
$v(h_3)$	No work limitation disutility	0	Normalization
ξ	Home production	0	–
ψ	Search cost shape parameter	1	–
λ^a	Skill appreciation probability	0.0137	Returns to tenure
λ^d	Skill depreciation probability	0.5464	Earnings loss after job displacement
		B. ESTIMATED	
κ	Vacancy posting cost	0.0063	Unemployment rate
d, b	DI/UI flow benefit level	0.1570	Disability beneficiary share
δ	Exogenous separation rate	0.0089	Average EN rate
$v(h_1)$	Severe work limitation disutility	0.1628	Job finding rate for h_1
$v(h_2)$	Moderate work limitation disutility	0.1061	Job finding rate for h_2
A	Search cost scale parameter	0.5	Job finding rate for h_3

Road Map

Empirical Analysis

Model

Quantitative Analysis

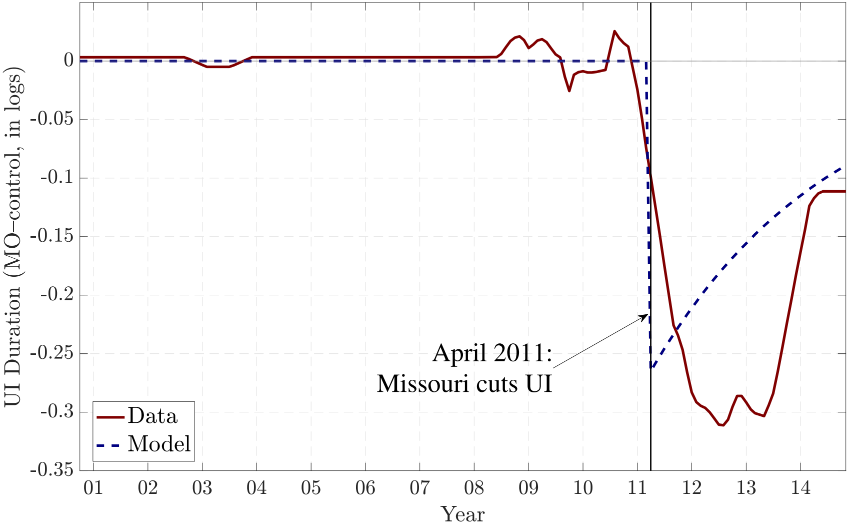
Missouri Natural Experiment Revisited

- Hit the model with one-time unanticipated and persistent UI cut.

$$e = 1 \quad / \quad \underbrace{16.8}_{=73\text{ weeks}} \longrightarrow e = 1 \quad / \quad \underbrace{12.9}_{=56\text{ weeks}}$$

- Study perfect-foresight transition dynamics.

Missouri Natural Experiment Revisited



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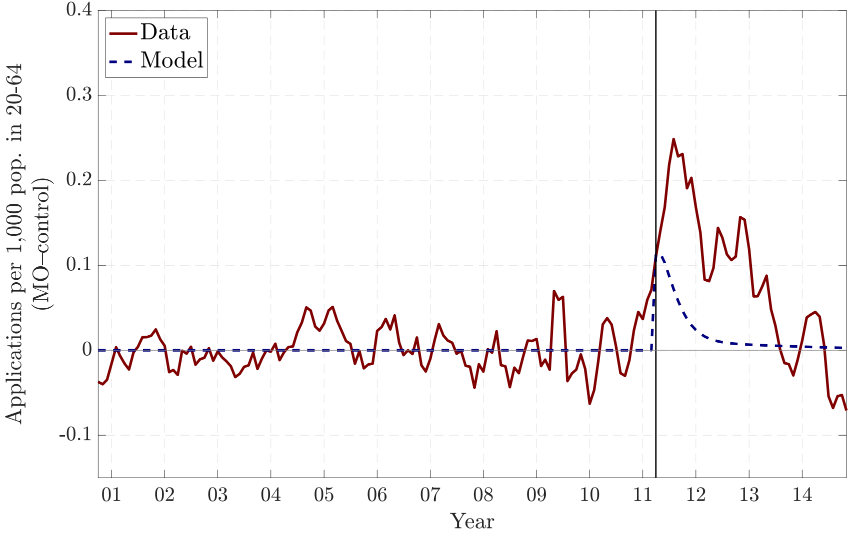

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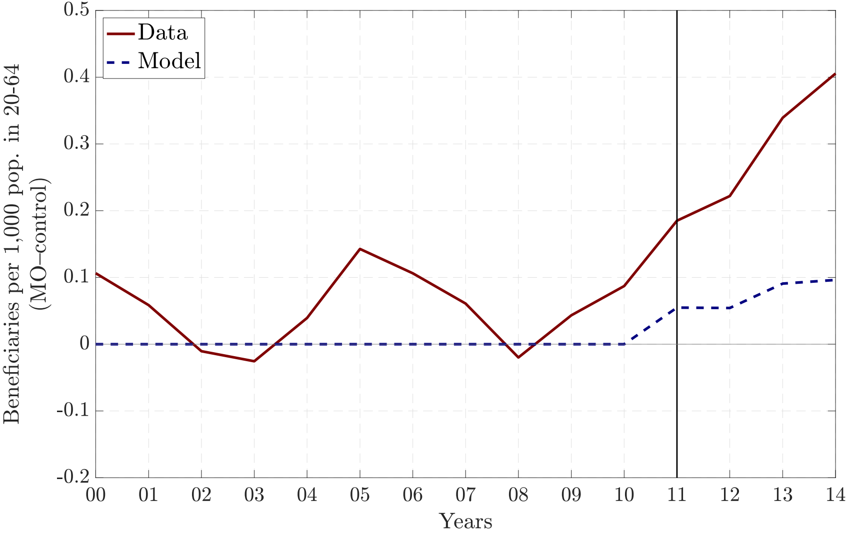
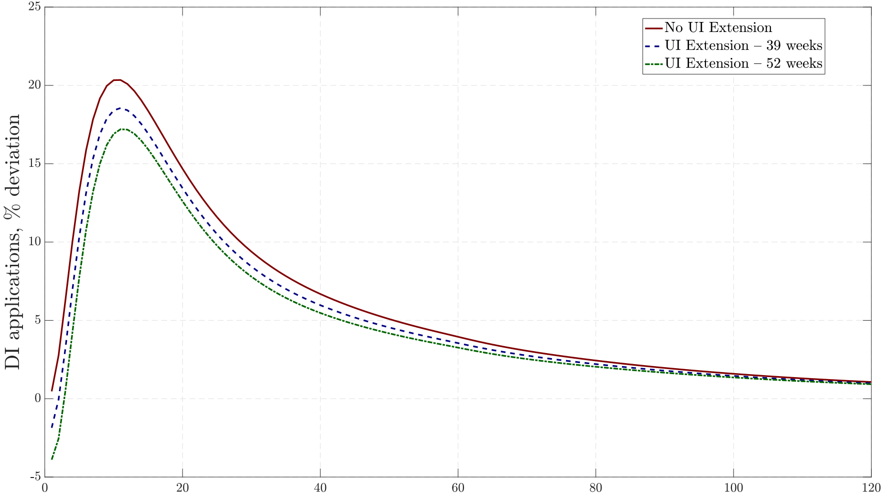


Recessions and DI take up

- Hit the model with one-time negative productivity shock.
  - No UI extension.
  - Extend UI from 26 weeks to 39 weeks.
  - Extend UI from 26 weeks to 52 weeks.

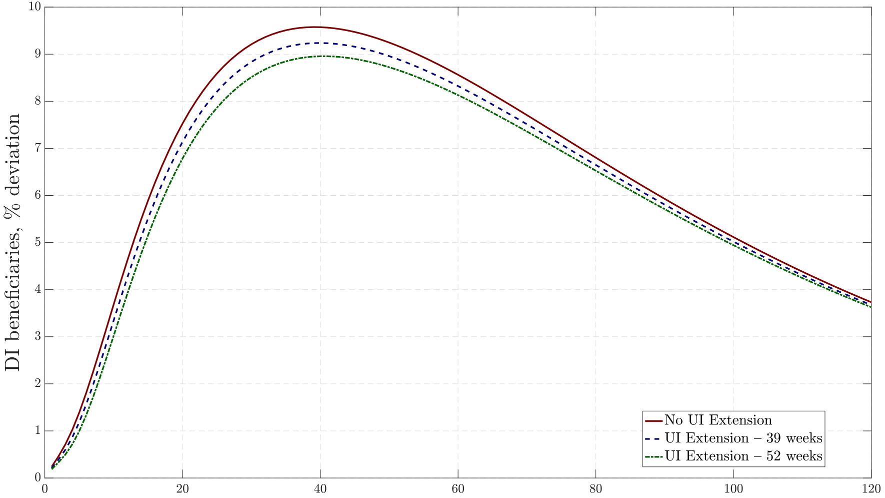
- To isolate the DI application channel, fix the macro (market tightness) and micro (search effort) reponses to the no UI extension benchmark.

DI OUTCOMES

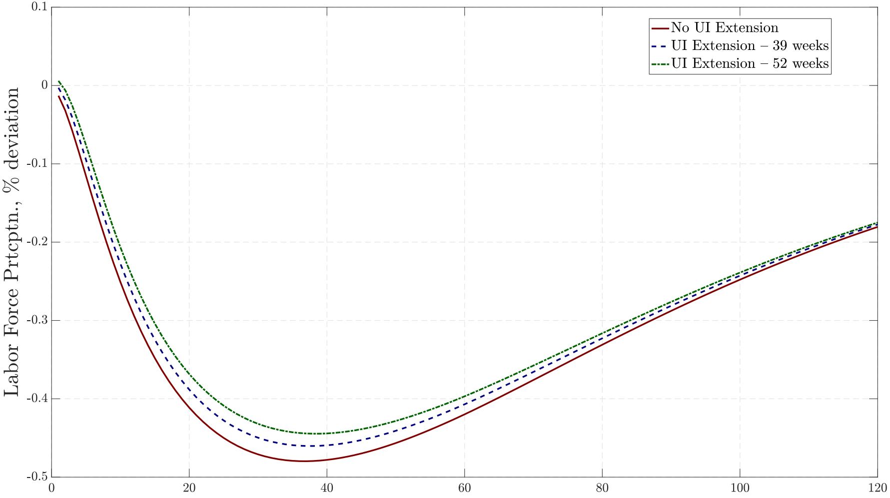


No UI Extension
UI Extension – 39 weeks
UI Extension – 52 weeks
DI applications, % deviation
25
20
15
10
5
0
-5
0
20
40
60
80
100
120

DI Outcomes


DI beneficiaries, % deviation
0
1
2
3
4
5
6
7
8
9
10
0
20
40
60
80
100
120
No UI Extension
UI Extension – 39 weeks
UI Extension – 52 weeks

DI Outcomes



No UI Extension
UI Extension – 39 weeks
UI Extension – 52 weeks
Labor Force Prtcptn., % deviation
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
0
20
40
60
80
100
120

Macro effects as a result of UI-DI interactions

When UI is cut, unemployment declines due to several channels

- Unemployed claim DI at higher rates (participation margin)
- Market tightness increases (macro effect) due to a macro effect
  - increased profits (Hagedorn, Karahan, Manovskii and Mitman 20XX)

Macro effects as a result of UI-DI interactions

When UI is cut, unemployment declines due to several channels

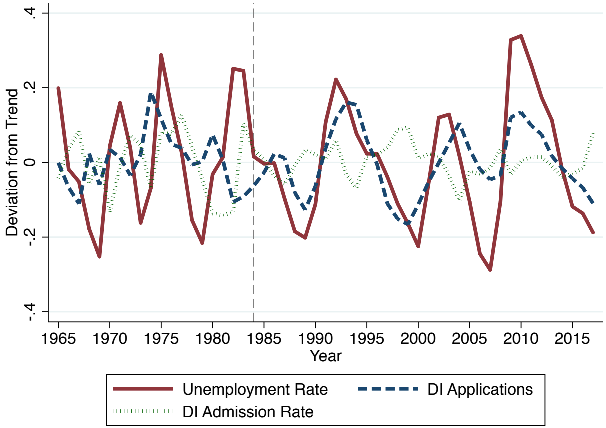
- Unemployed claim DI at higher rates (participation margin)
- Market tightness increases (macro effect) due to a macro effect
  - increased profits (Hagedorn, Karahan, Manovskii and Mitman 20XX)
  - Composition of the unemployed pool

[decomposition in progress]

Conclusions

- We study the substitutability of two large income replacement programs in the U.S.
- Disability insurance is used by households to deal with lost income during the Great Recession—not the main goal of the program.
- Extending unemployment benefits can mitigate this behavior.
- A model can rationalize the empirical findings and is used to study the effects of counter cyclical UI policies in the presence of this margin.
- A new composition channel. Cutting UI:
  - leads low skill/health workers to drop out of the labor force
  - increases the job finding rate of the rest.

DI Applications are Counter Cyclical



- Comovement at bus. cycle frequency (HP-trend, $\alpha = 100$, post-1984 corr=0.8). Back

Worker Problem: Disability

Non-employed worker with UI and DI eligibility status $i \in \{\text{E}, \text{I}\}$ and $j \in \{\text{ED}, \text{ID}\}$:

$$\tilde{U}^{i,\text{ED}}(h,s) = \max\left\{\underbrace{U^{i,\text{ED}}(h,s)}_{\text{Search for job}}, \underbrace{D^{\text{A}}(h,s)}_{\text{Apply for DI}}\right\}$$

Value of applying for DI:

$$D^{\text{A}}(h,s) = \xi + \beta\Big[p(\theta,h,s)\mathbb{E}_n[D^{\text{R}}(h',s')] + (1-p(\theta,h,s))\mathbb{E}_n[\tilde{U}^{\text{I,ED}}(h',s')]\Big]$$

Value of receiving DI:

$$D^{\text{R}}(h,s) = \xi + d + \beta\mathbb{E}_n\Big[\max\left\{D^{\text{R}}(h',s'), U^{\text{I, ID}}(h',s')\right\}\Big]$$

Worker Problem: Job Search

Value of UI-ineligible, DI-ineligible job search:

$$U^{\mathrm{I,ID}}(h,s) = \max_{\sigma}\ \xi - c(\sigma) + \beta\Big[\big(1-\sigma f(\theta)\big)\Big((1-\omega)\mathbb{E}_n U^{\mathrm{I,ID}}(h',s') + \omega\mathbb{E}_n \tilde{U}^{\mathrm{I,ED}}(h',s')\Big) + \sigma f(\theta)\mathbb{E}_e W^{\mathrm{I}}(h',s')\Big]$$

Value of UI-ineligible, DI-eligible job search:

$$U^{\mathrm{I,ED}}(h,s) = \max_{\sigma}\ \xi - c(\sigma) + \beta\Big[\big(1-\sigma f(\theta)\big)\mathbb{E}_n \tilde{U}^{\mathrm{I,ED}}(h',s') + \sigma f(\theta)\mathbb{E}_e W^{\mathrm{I}}(h',s')\Big]$$

Worker Problem: Job Search

Value of UI-eligible, DI-ineligible job search:

$$U^{\mathrm{E,ID}}(h,s) = \max_{\sigma}\ \xi + b - c(\sigma) + \beta\Big[(1-\omega)(1-\sigma f(\theta))\Big(e\mathbb{E}_n U^{\mathrm{I,ID}}(h',s') + (1-e)\mathbb{E}_n U^{\mathrm{E,ID}}(h',s')\Big)$$
$$+ \omega(1-\sigma f(\theta))\Big(e\mathbb{E}_n \tilde{U}^{\mathrm{I,ED}}(h',s') + (1-e)\mathbb{E}_n \tilde{U}^{\mathrm{E,ED}}(h',s')\Big) + \sigma f(\theta)\mathbb{E}_e W^{\mathrm{E}}(h',s')\Big]$$

Value of UI-eligible, DI-eligible job search:

$$U^{\mathrm{E,ED}}(h,s) = \max_{\sigma}\ \xi + b - c(\sigma) + \beta\Big[(1-\sigma f(\theta))\Big(e\mathbb{E}_n \tilde{U}^{\mathrm{I,ED}}(h',s') + (1-e)\mathbb{E}_n \tilde{U}^{\mathrm{E,ED}}(h',s')\Big)$$
$$+ \sigma f(\theta)\mathbb{E}_e W^{\mathrm{E}}(h',s')\Big]$$

Worker Problem: Employment

UI-eligible employment value:

$$W^{\mathrm{E}}(h,s) = w^{\mathrm{E}}(h,s) - v(h) + \beta\Big[\delta\mathbb{E}_n U^{\mathrm{E,ID}}(h',s') + (1-\delta)\mathbb{E}_e \max\{W^{\mathrm{E}}(h',s'), U^{\mathrm{E,ID}}(h',s'))\}\Big]$$

UI-ineligible employment value:

$$\begin{aligned} W^{\mathrm{I}}(h,s) = w^{\mathrm{I}}(h,s) - v(h) + \beta\Big[\delta\mathbb{E}_n\big[U^{\mathrm{I,ID}}(h',s')\big] + (1-\delta)\Big(r\mathbb{E}_e\Big[\max\big\{W^{\mathrm{E}}(h',s'), U^{\mathrm{E,ID}}(h',s')\big\}\Big] \\ + (1-r)\mathbb{E}_e\Big[\max\big\{W^{\mathrm{I}}(h',s'), U^{\mathrm{I,ID}}(h',s')\big\}\Big]\Big)\Big] \end{aligned}$$

Firm Problem

Firm with eligible worker:

$$J^{\mathrm{E}}(h,s) = (1-\tau)y(h,s) - w^{E}(h,s) + \beta(1-\delta)\mathbb{E}_e\mathbb{I}\left\{W^{\mathrm{E}}(h',s') > U^{\mathrm{E,ID}}(h',s')\right\}J^{\mathrm{E}}(h',s')$$

Firm with ineligible worker:

$$\begin{aligned} J^{\mathrm{I}}(h,s) =& (1-\tau) \times y(h,s) - w^{\mathrm{I}}(h,s) + \beta(1-\delta)\Big[r\mathbb{E}_e\Big[\mathbb{I}\left\{W^{\mathrm{E}}(h',s') > U^{\mathrm{E,ID}}(h',s')\right\}J^{\mathrm{E}}(h',s')\Big] \\ &+ (1-r)\mathbb{E}_e\Big[\mathbb{I}\left\{W^{\mathrm{I}}(h',s') > U^{\mathrm{I,ID}}(h',s')\right\}J^{\mathrm{I}}(h',s')\Big]\Big] \end{aligned}$$

Stationary Equilibrium

Equilibrium is a set of value functions, proportional output tax, market tightness, and wages such that:

- Value functions solve the worker and firm Bellman Equations.
- Wages solve the Nash Bargaining problem.
- Worker distribution evolves consistently with worker and firm decisions.
- Market tightness satisfies the firm free-entry condition.
- Output tax balances government budget.

$$\tau \times \text{Output} = b \times \text{UI Eligible Unemployed} + d \times \text{DI Beneficiaries}$$

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