

Temporary Layoffs, Loss-of-Recall, and Cyclical Unemployment Dynamics

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What We Do (1/2)

- ▶ Document the contribution of temporary layoffs (TL) to unemployment dynamics, from 1978 onwards
- ▶ Study contribution of “loss-of-recall” to the cyclical of unemployment
- ▶ Develop model of unemployment fluctuations that distinguishes between temporary and permanent separations ...

What We Do (2/2)

- ▶ Model has 2 types of unemployment, as in Hall and Kudlyak (2022):
 - ▶ Jobless unemployment (JL): search for new job
 - ▶ Temporary-layoff unemployment (TL): wait for recall
- Worker in u_{TL} moves to u_{JL} if prior job is destroyed (i.e., loss-of-recall)
- ▶ Calibrate model to dynamics of jobless and temporary-layoff unemployment using CPS, 1979-2019
 - ▶ Adapt the model to study the Covid-19 labor market

Why We Do It (1/2)

Revisit recessionary impact of temporary layoffs

- ▶ Stabilizing “direct” effect: due to recall hiring
 - ▶ Workers in u_{TL} return to work faster than workers in u_{JL}
 - ▶ Thus, TL's are stabilizing relative to permanent separations
 - ▶ Traditional view
- ▶ Destabilizing “indirect” effect: due to loss-of-recall
 - ▶ Workers in u_{TL} may lose their recall option and move to u_{JL}
 - ▶ They do so at a higher rate during recessions
 - ▶ We estimate $u_{JL-from-TL}$ to be countercyclical and highly volatile

Note: recall and loss-of-recall are endogenous and thus *policy-dependent*

Why We Do It (2/2)

- ▶ Onset of Covid-19 pandemic: surge of temporary layoffs
 - ▶ First month: 15% of employed workers move to u_{TL}
 - ▶ u_{TL} remains persistently high thereafter (across all sectors)
- ▶ Fiscal response: Paycheck Protection Program (PPP)
 - ▶ Forgivable loans for firms to recall workers
 - ▶ \$953-billion program— larger than 2009 Recovery Act
- ▶ What role did PPP play in shaping employment recovery?
 - ▶ What is the no-PPP counterfactual? Requires structural model
- ▶ Our findings: Large monthly reductions in u_{JL} due to PPP
 - ▶ ≈ 2 p.p. in short-run, ≥ 1 p.p. thru May 2021
 - ▶ Achieved by preventing loss-of-recall

Plan

- ▶ Empirics of temporary-layoff unemployment
- ▶ Model (three stocks, five flows)
- ▶ Model evaluation

and then

- ▶ Application to Covid-19 Recession

Empirics of Temporary-Layoff Unemployment & “Loss-of-Recall”

Empirics of Loss-of-Recall

1. u_{TL} comprises just 1/8 of total unemployment (u)

Table: Total (U), jobless (JL), and temporary-layoff (TL) unemployment, 1978–2019

	$U =$		
	$JL + TL$	JL	TL
mean(x)	6.2	5.4	0.8
std(x)/std(Y)	8.5	8.6	9.7
corr(x , Y)	−0.86	−0.82	−0.87

For second and third row, series are taken as (1) quarterly averages of seasonally adjusted monthly series, (2) logged, (3) HP-filtered with smoothing parameter 1600

Empirics of Loss-of-Recall

1. u_{TL} comprises just 1/8 of total unemployment (u)
2. But look at flows: E-to-TL's account for 1/3 of all separations to u

Table: Gross worker flows, 1978–2019

From	To			
	<i>E</i>	<i>TL</i>	<i>JL</i>	<i>I</i>
<i>E</i>	0.955	0.005	0.011	0.029
<i>TL</i>	0.435	0.245	0.191	0.129
<i>JL</i>	0.244	0.022	0.475	0.259
<i>I</i>	0.043	0.001	0.027	0.929

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2. But look at flows: E-to-TL's account for 1/3 of all separations to u
3. And, JL-from-TL's return to employment at substantially lower rate

Table: Transitions from JL, TL, and JL-from-TL, 1978–2019

From	To			
	<i>E</i>	<i>TL</i>	<i>JL</i>	<i>I</i>
<i>JL</i> , unconditional	0.244	0.022	0.475	0.259
<i>TL</i> , unconditional	0.435	0.245	0.191	0.129
<i>JL</i> -from- <i>TL</i>	0.271	0.000	0.556	0.173

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4. E-to-TL's are particularly important during recessions:

Table: Cyclical properties, gross worker flows

	$\rho_{E,TL}$	$\rho_{E,JL}$	$\rho_{TL,E}$	$\rho_{JL,E}$	$\rho_{TL,JL}$
std(x)/std(Y)	11.325	5.257	6.266	6.650	10.119
corr(x , Y)	-0.494	-0.683	0.620	0.784	-0.301

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Direct effect: $p_{E,TL} \uparrow$ & $p_{TL,E} \downarrow \Rightarrow u_{TL} \uparrow$

Indirect effect: $p_{E,TL} \uparrow$ & $p_{TL,JL} \uparrow \Rightarrow u_{JL\text{-from-TL}} \uparrow$

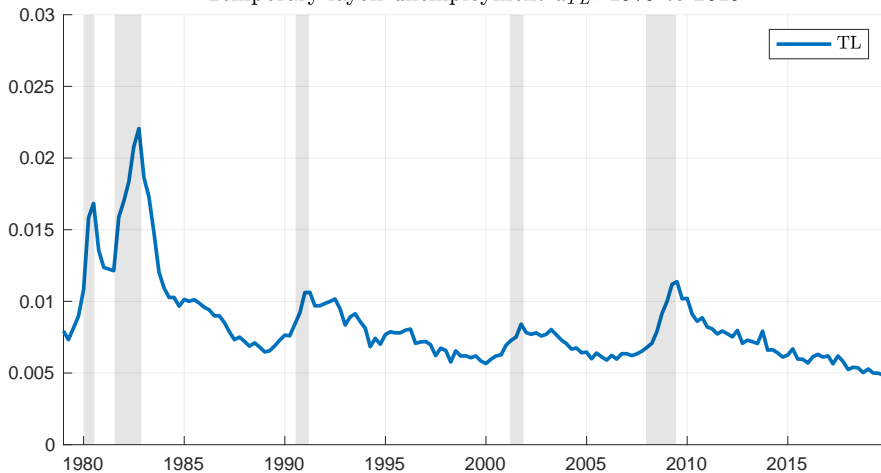
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 - 4.2 Fewer workers from u_{TL} are recalled to employment
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5. We develop methods to estimate the *indirect effect*, i.e. JL-from-TL

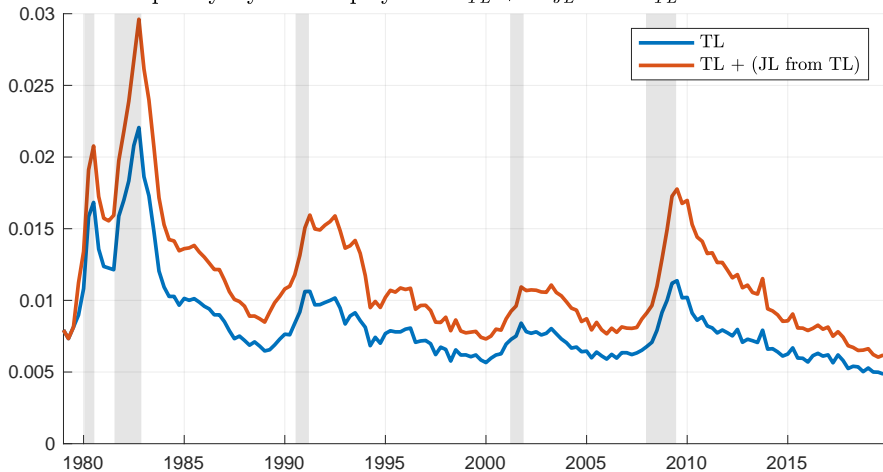
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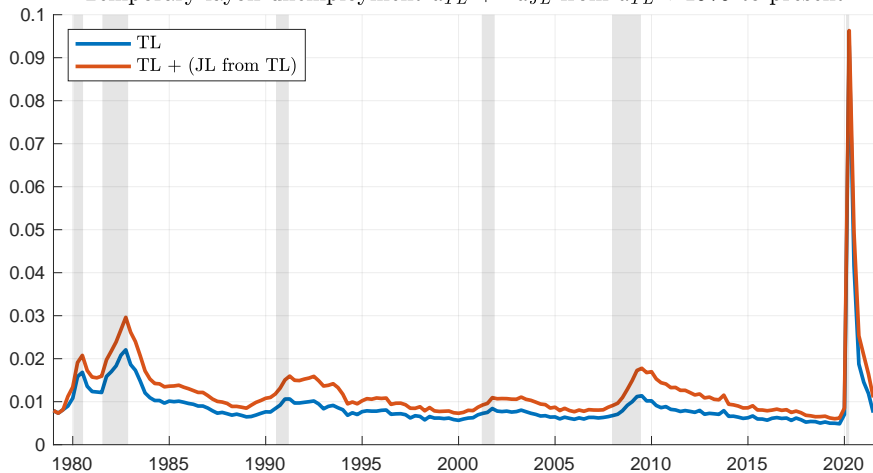
Temporary-layoff unemployment u_{TL} : 1979 to 2019



Temporary-layoff unemployment u_{TL} + “ u_{JL} from u_{TL} ”: 1979 to 2019

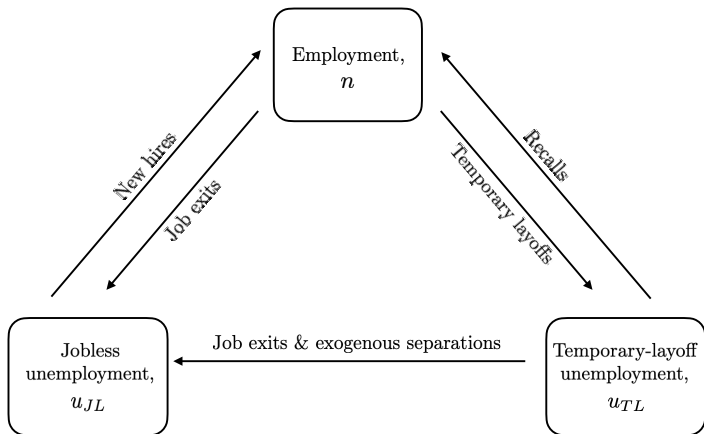


Temporary-layoff unemployment u_{TL} + “ u_{JL} from u_{TL} ”: 1979 to present



Model

Model



Model

Starting point: RBC model with search and matching

- ▶ Perfect consumption insurance
- ▶ Wage rigidity via staggered Nash wage bargaining

Key variations:

- ▶ Endog. separations into temporary-layoff unemp.
- ▶ Recall hiring from temporary-layoff unemployment
- ▶ Endogenous separations into jobless unemployment
 - ▶ Allow for **temporary paycuts**: avoid inefficient separations
 - ▶ Permanent sep. triggers $u_{TL} \rightarrow u_{JL}$ for some workers
- ▶ Hiring from jobless unemployment

Details of Model

- ▶ Unemployed are either in
 - JL: Searching for work in a DMP-style matching market
 - TL: Waiting for recall or loss-of-recall
- ▶ Firms, w/ CRS technology in labor and capital, draws cost shocks
 - ▶ Overhead costs to entire firm \Rightarrow separations to JL and JL-from-TL
 - ▶ Worker-specific overhead costs \Rightarrow separations to TL
- ▶ After separations: firms rent capital, hire from JL, and recall from TL
 - ▶ Separate hiring costs: recalls less expensive than new hiring
- ▶ Base wages set via staggered Nash bargaining
 - ▶ But temporary paycuts avoid inefficient exit

Model Evaluation

Calibration

- ▶ Calibrate model to match standard labor market stocks and flows...
 - ▶ Plus characteristics of temporary layoff, recall, and loss-of-recall
- ▶ Nested, two-stage estimation of 18 parameters
 - ▶ Inner loop: long-run moments
 - ▶ Outer loop: business cycle features

▶ Parameters and Moments

- ▶ Where we tie our hands:
 - ▶ Not a small-surplus calibration
 - ▶ Wage rigidity to match evidence on contract duration
 - ▶ Temporary paycuts can undo wage rigidity
- ▶ Model does well!

▶ Stocks & Wages

▶ Flows

▶ Loss-of-Recall

Application to the Covid-19 Recession

Adapting the Model to the Covid-19 Recession

- ▶ Introduce **two shocks**:
 - ▶ “Lockdown” shocks: workers move to **lockdown-TL** (MIT shock)
 - ▶ Persistent shocks to effective TFP w/ each wave (social distancing)
- ▶ Add **two parameters** specific to workers on **lockdown-TL**:
 - ▶ Allow for different recall cost (vs. TL)
 - ▶ Allow for different rate for loss-of-recall (vs. TL)
- ▶ Treatment of **PPP**:
 - ▶ Direct factor payment subsidy, à la Kaplan, Moll, Violante (2020)
 - ▶ Pre-announcement: program is unexpected
 - ▶ Post-announcement: availability of funds is known
- ▶ **Estimate** shocks and parameters to match stocks and flows
 - ▶ Model does well! ▶ Stocks, model vs. data ▶ Flows, model vs. data

No-PPP Counterfactual

Q: What did PPP do?

- ▶ Keep decision rules, parameters, and shocks, but remove PPP

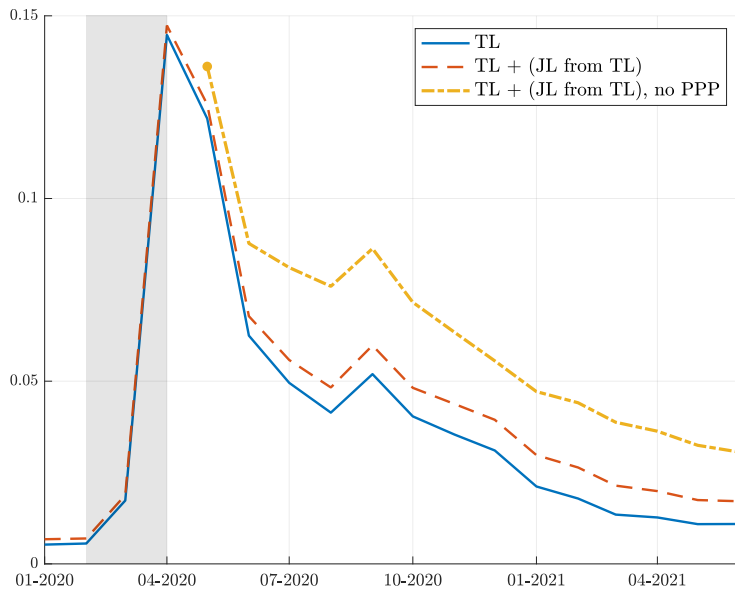
A: Saved a lot of worker/job matches!

- ▶ Average monthly employment gains of ≈ 2.14 p.p. in first 6 months
- ▶ Doubled cumulative number of recalls over the same period
- ▶ Achieved through reduction of **loss-of-recall**

▶ Stocks, no-PPP counterfactual

▶ Flows, no-PPP counterfactual

Counterfactual: JL-from-TL without PPP



Conclusion

Concluding Remarks

Two Directions for Further Work

1. Match-specific capital

- ▶ Recalls preserve match-specific capital
- ▶ Thus, interesting to consider heterogenous match quality

2. Reallocation

- ▶ Evidence that smaller firms benefited more from PPP
- ▶ PPP might have hindered efficient reallocation

Supplementary Slides

Estimating JL-from-TL

- Use accumulation equations:

$$u_{JL\text{-from-TL},t} = \sum_{j=0}^T e'_{JL} x_{t-j-1,t}$$

where $x_{t-j-1,t}$ is the distribution of workers at time t whose last exit from employment was for u_{TL} at time $t-j-1$, s.t.

$$\begin{aligned} x_{t-m,t-j} &= \tilde{P}_t x_{t-m,t-j-1} \\ x_{t-m,t-m} &= e_{TL} \cdot (n_{t-m-1}^E \cdot p_{t-m}^{E,TL}) \end{aligned}$$

- Relatively small: $u_{JL\text{-from-TL}}$ is 40% of u_{TL}
- Highly volatile: **twice** as volatile as total unemployment, **16×** as GDP

Model: Full Slides

Searchers, Matching and Recalls

► Jobless unemployment (DMP matching market)

- New hires m from unemployment

$$m = \sigma_m(u_{JL})^\sigma (v)^{1-\sigma}$$

- Job finding and job filling probabilities p and q , hiring rate x

$$p = \frac{m}{u_{JL}}, \quad q = \frac{m}{v}, \quad x = \frac{p \cdot u_{JL}}{\mathcal{F}(\vartheta^*)n} = \frac{q \cdot v}{\mathcal{F}(\vartheta^*)n}$$

► Temporary-layoff unemployment

- Recalls m_r from TL unemployment, recall hiring rate x_r

$$m_r = p_r u_{TL}, \quad x_r = \frac{p_r u_{TL}}{\mathcal{F}(\vartheta^*)n}$$

- Workers in $u_{TL} \rightarrow u_{JL}$ with prob. $1 - \rho_r$ or if firm exits (prob. $1 - \mathcal{G}(\gamma^*)$)

Firms (or plants, shifts, production units, etc.)

- ▶ Firms are “large”, i.e., hire a continuum of workers
 - ▶ Firm, or establishment, or assembly line, etc.
- ▶ CRS technology
 - ▶ $n \equiv$ beginning of period employment
 - ▶ $\mathcal{F} \equiv$ fraction of workers not on temporary layoff
 - ▶ $\xi_k, \xi_n \equiv$ factor utilization rates

$$\begin{aligned}y &= \check{z}(\xi_k k)^\alpha (\xi_n \mathcal{F} n)^{1-\alpha} \\ &= z k^\alpha (\mathcal{F} n)^{1-\alpha}\end{aligned}$$

- ▶ Given CRS technology, firm decisions scale independent

Overhead Costs: Temporary versus Permanent Layoffs

$\gamma \equiv$ i.i.d. firm-specific cost shock

$\vartheta \equiv$ i.i.d. worker-specific cost shock

- ▶ Non-exiting firms ($\gamma < \gamma^*$) pay overhead costs to operate:

$$s(\gamma, \vartheta^*)n = \left[s_\gamma \gamma + s_\vartheta \int^{\vartheta^*} \vartheta d\mathcal{F}(\vartheta) \right] n$$

$$\mathcal{F}(\vartheta^*) = \Pr\{\vartheta \leq \vartheta^*\} \quad \mathcal{G}(\gamma^*) = \Pr\{\gamma \leq \gamma^*\}$$

- ▶ Temporary layoff: each worker draws ϑ
 - ▶ Workers w/ $\vartheta \geq \vartheta^*$ (endog. thresh.) go on temporary layoff
- ▶ Permanent layoff: firms draws γ
 - ▶ Firm operates if $\gamma < \gamma^*$ (endog. thresh.); otherwise exits

Timing of Events

1. Firm enters period with stock of workers n
2. Aggregate & worker-specific shocks revealed
3. Firms and workers bargain over base wages w
4. Firms assigns $1 - \mathcal{F}(\vartheta^*)$ workers to temporary layoff
5. Firm-specific shock γ revealed
 - ▶ If $\gamma \geq \gamma^* \rightarrow$ firm exits, employed workers move to u_{JL}
 - ▶ Firm's workers in u_{TL} move to u_{JL}
 - ▶ If $\gamma < \gamma^* \rightarrow$ firm continues
 - ▶ Rents capital and produces output
 - ▶ Hires workers from u_{JL} , recalls workers from u_{TL}
 - ▶ Possibility of temporary paycuts, i.e. remitted wages $\omega < w$

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Solve backwards

Behind the Timing

- ▶ Timing accomplishes the following:
 1. Temporary layoff policy v^* independent of γ
 - ▶ Analytical tractability
 2. Base wages are independent of γ
 - ▶ Computational tractability
 3. Firm cannot cut wages to avoid temporary layoffs
 - ▶ Consistent with data
- ▶ (1) and (2) achieved by mid-period realization of γ
- ▶ (3) achieved by separation of temporary layoffs and bargaining

Firm Problem (at non-exiting firms w/ TL policy ϑ^*)

$$J(\mathbf{w}, \gamma, \mathbf{s}) = \max_{\check{k}, x, x_r} \left\{ z\mathcal{F}(\vartheta^*)\check{k}^\alpha - \omega(\mathbf{w}, \gamma, \mathbf{s})\mathcal{F}(\vartheta^*) - r\mathcal{F}(\vartheta^*)\check{k} \right. \\ \left. - (\iota(x)\mathcal{F}(\vartheta^*) + \iota_r(x_r)\mathcal{F}(\vartheta^*)) - \varsigma(\vartheta^*, \gamma) \right. \\ \left. + \mathcal{F}(\vartheta^*)(1 + x + x_r) \mathbb{E}\left\{ \Lambda(\mathbf{s}, \mathbf{s}')\mathcal{J}(\mathbf{w}', \mathbf{s}') |, \mathbf{w}, \mathbf{s} \right\} \right\}$$

with

$$\varsigma(\gamma, \vartheta^*) = \varsigma_\gamma \gamma + \varsigma_\vartheta \int^{\vartheta^*} \vartheta d\mathcal{F}(\vartheta)$$

$$\iota(x) = \chi x + \frac{\kappa}{2} (x - \tilde{x})^2, \quad \iota_r(x_r) = \chi x_r + \frac{\kappa_r}{2} (x_r - \tilde{x}_r)^2$$

$$\mathcal{J}(\mathbf{w}, \mathbf{s}) = \max_{\vartheta^*} \int^{\gamma^*} J(\mathbf{w}, \gamma, \mathbf{s}) d\mathcal{G}(\gamma)$$

Hiring and Recall (at non-exiting firms w/ TL policy ϑ^*)

- FOC's for hiring and recall:

$$\chi + \kappa(\mathbf{x} - \tilde{\mathbf{x}}) = \mathbb{E} \{ \Lambda(\mathbf{s}, \mathbf{s}') \mathcal{J}(\mathbf{w}', \mathbf{s}') \mid \mathbf{w}, \mathbf{s} \}$$

$$\chi + \kappa_r(\mathbf{x}_r - \tilde{\mathbf{x}}_r) = \mathbb{E} \{ \Lambda(\mathbf{s}, \mathbf{s}') \mathcal{J}(\mathbf{w}', \mathbf{s}') \mid \mathbf{w}, \mathbf{s} \}$$

- Calibrated model (and data):

$$\underbrace{\left(\frac{\chi}{\kappa_r \tilde{\mathbf{x}}_r} \right)}_{\text{Recall elasticity}} > \underbrace{\left(\frac{\chi}{\kappa \tilde{\mathbf{x}}} \right)}_{\text{New hires elasticity}}$$

- Relation of $\{\mathbf{x}, \mathbf{x}_r\}$ to job-finding/recall probabilities $\{p, p_r\}$:

$$\mathbf{x} = \frac{p u_{JL}}{\mathcal{F}(\vartheta^*) n}, \quad \mathbf{x}_r = \frac{p_r u_{TL}}{\mathcal{F}(\vartheta^*) n}$$

Temporary Layoffs

- ▶ Firm must pay overhead costs to continue to operate:

$$\varsigma(\gamma, \vartheta^*) = \varsigma_\gamma \gamma + \varsigma_\vartheta \int^{\vartheta^*} \vartheta d\mathcal{F}(\vartheta)$$

- ▶ FOC for optimal ϑ^* determines TL threshold:

$$\underbrace{\mathcal{J}(\mathbf{w}, \mathbf{s}) + \varsigma_\gamma \Gamma + \varsigma_\vartheta \mathcal{G}(\gamma^*)}_{\text{Job value net of period overhead costs}} \Theta = \underbrace{\varsigma_\vartheta \vartheta^* \mathcal{F}(\vartheta^*) \mathcal{G}(\gamma^*)}_{\text{Marginal overhead costs}}$$

with $\Gamma \equiv \int^{\gamma^*} \gamma d\mathcal{G}(\gamma)$ and $\Theta \equiv \int^{\vartheta^*} \vartheta d\mathcal{F}(\vartheta)$.

Firm Exits (and Temporary Paycuts)

- ▶ Given cost shock γ and base wage w , allow temp. paycuts to avoid exit
- ▶ Shutdown threshold γ^* solves $J(\underline{w}, \gamma^*, \mathbf{s}) = 0$
 - ▶ $\underline{w} \equiv$ reservation wage
- ▶ Payout threshold $\gamma^\dagger \in (0, \gamma^*)$ solves $J(w, \gamma^\dagger, \mathbf{s}) = 0$
 - ▶ Payout wage keeps zero firm surplus for $\gamma \in (\gamma^\dagger, \gamma^*)$
- ▶ Firm's active laborforce + workers on TL go to u_{JL} upon exit

Workers (1/2)

- ▶ Value of work

$$V(w, \gamma, \mathbf{s}) = \omega(w, \gamma, \mathbf{s}) + \mathbb{E} \{ \Lambda(\mathbf{s}, \mathbf{s}') \mathcal{V}(w', \mathbf{s}') | w, \mathbf{s} \},$$

with

$$\begin{aligned} \mathcal{V}(w, \mathbf{s}) = & \mathcal{F}(\vartheta^*) \left[\int^{\gamma^*} V(w, \gamma, \mathbf{s}) d\mathcal{G}(\gamma) + (1 - \mathcal{G}(\gamma^*)) U_{JL}(\mathbf{s}) \right] \\ & + (1 - \mathcal{F}(\vartheta^*)) \mathcal{U}_{TL}(w, \mathbf{s}) \end{aligned}$$

where

- ▶ $U_{JL}(\mathbf{s})$ is the value of jobless unemployment
- ▶ \mathcal{U}_{TL} is the expected value of temporary-layoff unemployment
- ▶ $\omega(w, \gamma, \mathbf{s})$ are remitted wages

Workers (2/2)

- Value of jobless unemployment

$$U_{JL}(\mathbf{s}) = b + \mathbb{E} \{ \Lambda(\mathbf{s}, \mathbf{s}') [p \bar{V}_x(\mathbf{s}') + (1 - p) U_{JL}(\mathbf{s}')] \mid \mathbf{s} \}$$

where \bar{V}_x is the expected value of being a new hire

- Value of temporary-layoff unemployment

$$\begin{aligned} U_{TL}(\mathbf{w}, \mathbf{s}) = & b + \mathbb{E} \{ \Lambda(\mathbf{s}, \mathbf{s}') [p_r \mathcal{V}(\mathbf{w}', \mathbf{s}') \\ & + (1 - p_r) \rho_r \mathcal{U}_{TL}(\mathbf{w}', \mathbf{s}') \\ & + (1 - p_r) (1 - \rho_r) U_{JL}(\mathbf{s}')] \mid \mathbf{w}, \mathbf{s} \}. \end{aligned}$$

with

$$\mathcal{U}_{TL}(\mathbf{w}, \mathbf{s}) = \mathcal{G}(\gamma^*) U_{TL}(\mathbf{w}, \mathbf{s}) + (1 - \mathcal{G}(\gamma^*)) U_{JL}(\mathbf{s}).$$

Staggered Nash Wage Bargaining

- ▶ Each period, probability $1 - \lambda$ of renegotiating base wage
- ▶ Parties bargain over surpluses prior to realization of γ
 - ▶ Worker surplus: $\mathcal{H}(w, \mathbf{s}) \equiv \mathcal{V}(w, \mathbf{s}) - U_{JL}(\mathbf{s})$
 - ▶ Firm surplus: $\mathcal{J}(w, \mathbf{s}) \equiv \max_{\vartheta^*} \int^{\gamma^*} J(w, \mathbf{s}) d\mathcal{G}(\gamma)$
- ▶ Contract wage w^* solves

$$\max_{w^*} \mathcal{H}(w, \mathbf{s})^\eta \mathcal{J}(w, \mathbf{s})^{1-\eta}$$

subject to

$$w' = \begin{cases} w & \text{with probability } \lambda \\ w^{*'} & \text{with probability } 1 - \lambda \end{cases}$$

and to wage cut policy

Model Evaluation: Full Slides

Calibration: Assigned Parameters

Parameter values		
Discount factor	β	$0.997 = 0.99^{1/3}$
Capital depreciation rate	δ	$0.008 = 0.025/3$
Production function parameter	α	0.33
Autoregressive parameter, TFP	ρ_z	$0.99^{1/3}$
Standard deviation, TFP	σ_z	0.007
Elasticity of matches to searchers	σ	0.5
Bargaining power parameter	η	0.5
Matching function constant	σ_m	1.0
Renegotiation frequency	λ	8/9 (3 quarters)

Calibration: Estimated Parameters (inner loop)

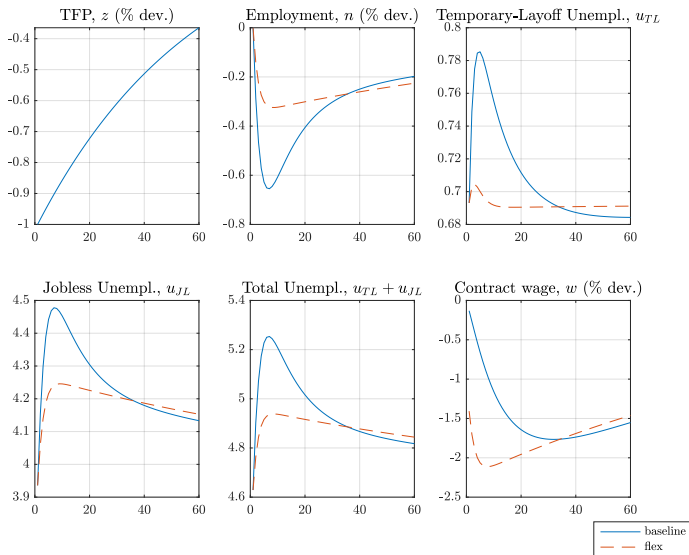
Parameter	Description	Value	Target
χ	Scale, hiring costs	1.1779	Average JL , E rate (0.303)
$\varsigma_{\vartheta} \cdot e^{\mu_{\vartheta}}$	Scale, overhead costs, worker	1.8260	Average E , TL rate (0.005)
$\varsigma_{\gamma} \cdot e^{\mu_{\gamma}}$	Scale, overhead costs, firm	0.3599	Average E , JL rate (0.011)
$1 - \rho_r$	Loss of recall rate	0.3858	Average TL , JL rate (0.207)
b	Flow value of unemp.	0.9834	Rel. value non-work (0.71)

Calibration: Estimated Parameters (outer loop)

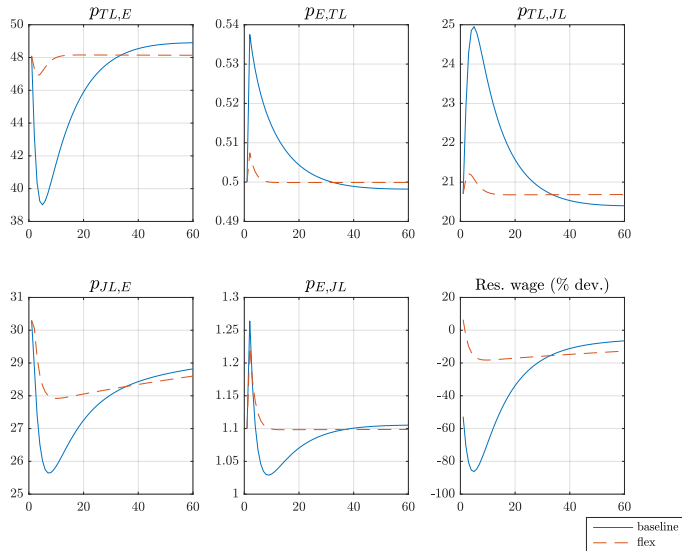
Parameter	Description	Value
$\chi/(\kappa\tilde{X})$	Hiring elasticity, new hires	0.5943
$\chi/(\kappa_r\tilde{X}_r)$	Hiring elasticity, recalls	1.1631
σ_{ϑ}	Parameter lognormal \mathcal{F}	1.8260
σ_{γ}	Parameter lognormal \mathcal{G}	0.3599

Moment	Target	Model
SD of hiring rate	3.304	3.257
SD of total separation rate	5.553	4.676
SD of temporary-layoff unemployment, u_{TL}	9.715	9.865
SD of jobless unemployment, u_{JL}	8.570	9.939
SD of hiring rate from u_{JL} relative to SD of recall hiring rate from u_{TL}	0.443	0.443

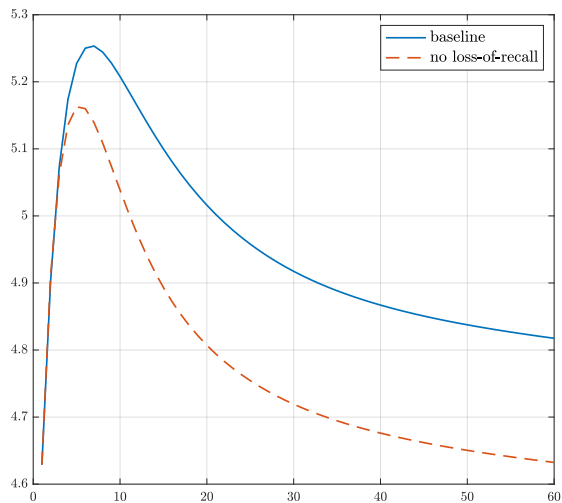
TFP Shock: Employment, Unemployment and Wages



TFP Shock: Transition Probabilities



TFP Shock: Shut off u_{JL} from u_{TL}



Application to PPP: Full Slides

Adapting the Model to the Covid-19 Recession

Introduce series of **shocks** and two **parameters**

1. Shocks:

- ▶ “**Lockdown**” shocks
 - ▶ Beginning of period: fraction $1 - \nu$ move to TL unemp
 - ▶ Unanticipated (MIT shock)
- ▶ **Utilization restrictions** on capital and labor
 - ▶ Transitory shock at start of pandemic
 - ▶ New persistent shock with each Covid wave
- ▶ **PPP** as factor payment subsidy (as in KMV)
 - ▶ PPP 2020: 12.5% of quarterly GDP, most payments May-July 2020
 - ▶ PPP 2021: 5.4% of quarterly GDP, most payments Jan-April 2021

Adapting the Model to the Covid-19 Recession, cont.

...

2. Two parameters:

- ▶ (Possibly) reduced recall costs for workers in lockdown

$$\chi X_r + \frac{\kappa_r}{2} \left(x_r - \underbrace{\xi \frac{(1-\phi)u_{TL}}{\mathcal{F}(\vartheta^*)n}}_{\text{Workers on lockdown}} - \tilde{x}_r \right)^2$$

- ▶ $0 \leq \xi \leq 1$
- ▶ Different rate of exogenous TL-to-JL for workers on lockdown, $\rho_r \phi$

Recession Experiment

► Thus, need to **estimate**:

1. Lockdown shocks for each month of pandemic (+ T)
2. Size of transitory utilization shock at onset of pandemic (+1)
3. Size of persistent utilization shock for three waves (+3)
4. Autoregressive parameter of persistent utilization shock (+1)
5. Two model parameters (+2)

► Moments to match:

1. **Stocks**: $\{u_{TL}, u_{JL}\}_\tau$ since onset of pandemic
2. **Gross flows**: $\{g_{E,TL}, g_{TL,E}, g_{TL,JL}\}_\tau$ since onset
3. **Inflows into u_{JL}** : March-April 2020 only
 - To discipline size of transitory shock

Recession Experiment, cont.

- ▶ Estimate by SMM:
 - ▶ T months of pandemic w/ 3 waves (for now)
 - ▶ $(5 \cdot T + 1)$ moments to match
 - ▶ $(T + 7)$ parameters to estimate
 - ▶ System is highly overidentified

Parameter and Shock Estimates

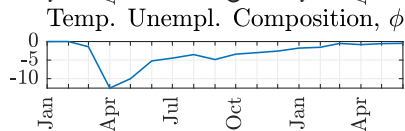
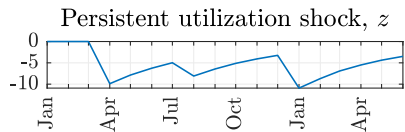
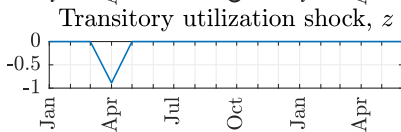
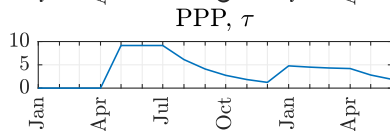
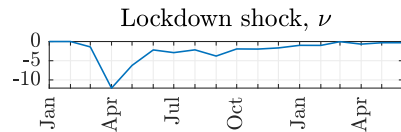
Parameters

Variable	Description	Value
ρ_z	Autoregressive coefficient for persistent utilization shocks	0.7955
ξ	Adjustment costs for workers on lockdown	0.5103
$1 - \rho_r \phi$	Probability of exogenous loss of recall for workers in temporary unemployment	0.3631

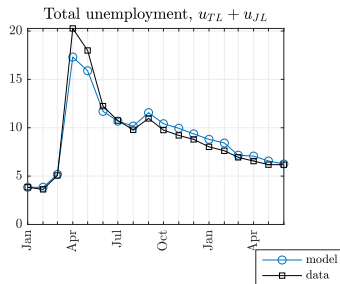
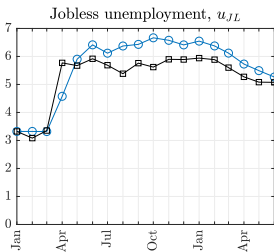
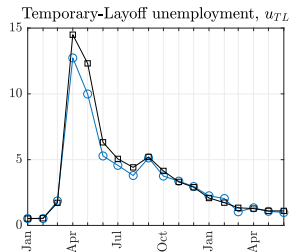
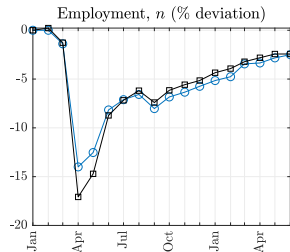
Shocks

Description	Value
Persistent utilization shock, April 2020	-9.89%
Transitory utilization shock, April 2020	-0.89%
Persistent utilization shock, September 2020	-4.14%
Persistent utilization shock, January 2021	-8.35%

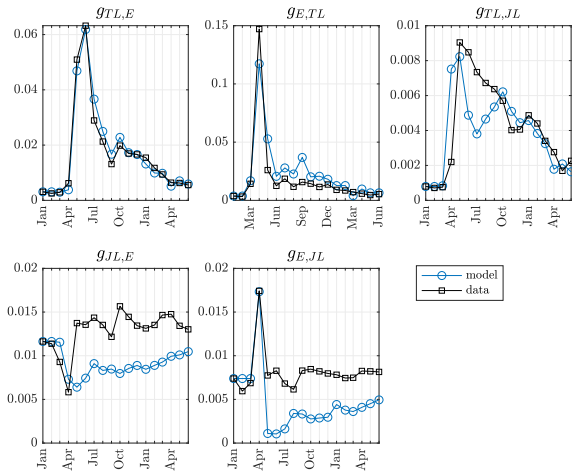
Parameter and Shock Estimates, cont.



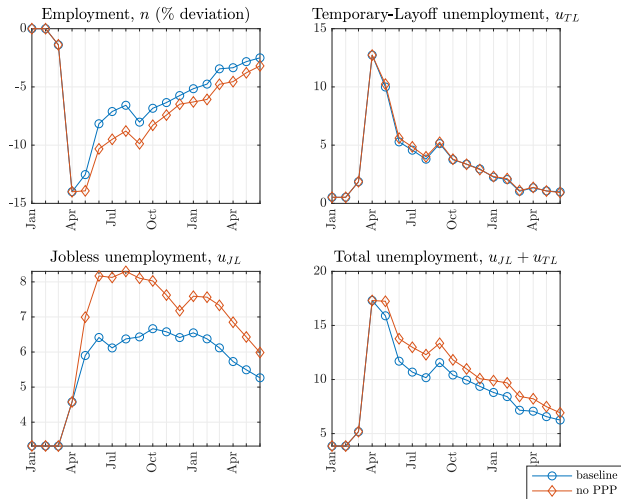
Covid Onset, Stocks



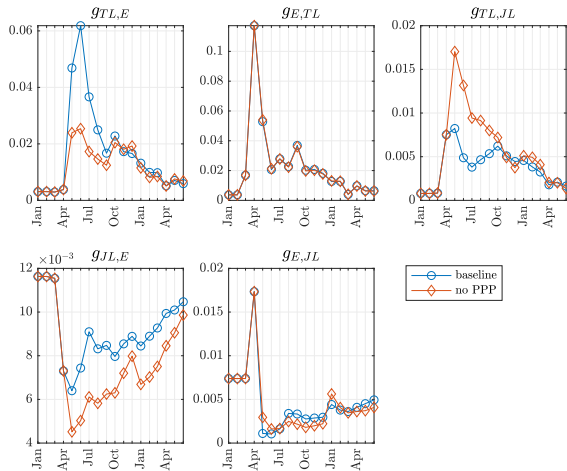
Covid Onset, Gross Flows



Policy Counterfactual: No PPP, stocks



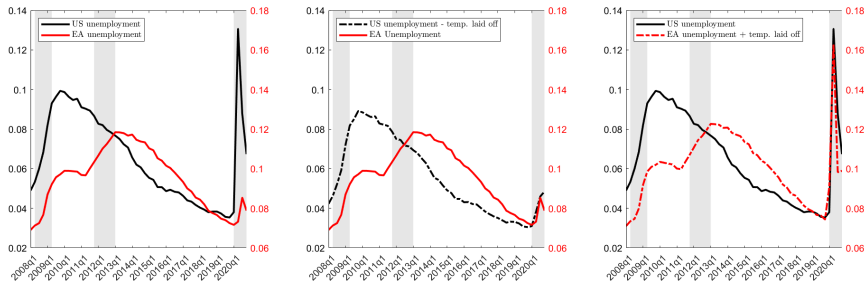
Policy Counterfactual: No PPP, flows



PPP takeaway

- ▶ PPP achieved sizeable employment gains
- ▶ Immediate term: **May to September 2020**
 - ▶ Achieved average monthly employment gains of **2.14%**
 - ▶ Doubled cumulative recalls
- ▶ Longer term
 - ▶ Smaller persistent employment gains
 - ▶ Avg. monthly empl. at least **1%** higher through **May 2021**
- ▶ Employment gains came from **recalls**
 - ▶ PPP preserved ties btwn firms and workers in u_{TL}
 - ▶ Fulfilled mandate

A Tale of Two Unemployment Rates: US vs. EA in Covid



- ▶ Unemployment measured differently, e.g. temporary laid off workers
- ▶ **Temporary laid off workers** counted among the **unemployed** in the **US** and among the **employed** in the **EA**
- ▶ 2 counterfactual scenarios:
 1. TL counted among the employed also in the US (middle panel)
 2. TL counted among the unemployed also in the EA (right panel)
- ▶ But differences exist in **TL definitions**: **more attachment to job in EA**