

THE INS AND OUTS OF INVOLUNTARY PART-TIME EMPLOYMENT

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INTRODUCTION

- ▶ The analysis of worker flows plays a central role in the development of modern theoretical models of the labor market
- ▶ The literature focuses on a three-state model to describe unemployment dynamics (Fujita & Ramey [IER '09], Elsby et al. [AEJ-Macro '09], Shimer [RED '12], Elsby et al. [JME '15])
- ▶ Borowczyk-Martins & Lalé [AEJ-Macro '19] show that cyclical fluctuations in hours per worker are very well tracked by flows to and from part-time employment

INTRODUCTION

This paper

- ▶ We measure transition probabilities using a five-state model
- ▶ We distinguish between *voluntary* and *involuntary* part-time employment (cf. distinction between unemployment and nonparticipation)
- ▶ Our model allows us to
 1. Provide a comprehensive account of the dynamics of involuntary part-time work
 2. Describe interactions between involuntary part-time work and unemployment

INTRODUCTION

- ▶ Measurement of involuntary part-time employment stocks and flows with U.S. data faces two challenges:
 1. Change in definition of involuntary part-time employment due to the redesign of the Current Population Survey (CPS) in 1994
 2. Classification error
- ▶ Existing analyzes of U.S. involuntary part-time employment (Cajner et al. [Fed Notes '14], Canon et al. [FRB EQ '14], Farber [JoLE '17], Valletta et al. [JoLE, '20]) cover only the post-1994 period and do not address classification error

INTRODUCTION

Contribution

- ▶ We offer a new method to deal with the CPS 1994 redesign break. It offers an alternative (with some advantages) over the standard approach based on [Polivka & Miller \[LSMI '98\]](#)
- ▶ We decompose the short-run dynamics of unemployment and involuntary part-time employment rates since 1976
 - ▶ Our findings reinforce earlier conclusions about unemployment dynamics
 - ▶ We establish new facts on involuntary part-time employment dynamics, and discuss implications for macroeconomic analysis of labor markets

ROADMAP

DATA AND MEASUREMENT

ADJUSTMENT PROTOCOL

MAIN FINDINGS

CONCLUSIONS

I. Data and measurement

DATA AND MEASUREMENT

Data

- ▶ Basic monthly (BM) files of the CPS for the period 1976m01–2019m12
- ▶ Annual Social and Economic Supplement (ASEC) of the CPS

Definitions

- ▶ Part-time employment: less than 35 total usual hours per week
In the CPS, this measure includes usual paid and unpaid overtime hours
- ▶ Involuntary part-time work is based on the following question:
Some people work part time because they cannot find full time work or because business is poor. Others work part time because of family obligations or other personal reasons. What is (name's/your) MAIN reason for working part time?

DATA AND MEASUREMENT

1994 CPS redesign

	Before 1994	After 1994
Usual hours	Only for workers < 35 actual hours	All workers
Involuntary part-time work	Loose wording	Must want and be available for full-time

II. Our adjustment protocol

ADJUSTMENT PROTOCOL

Framework

- ▶ The labor market in period t is described by

$$\boldsymbol{\ell}_t = [F \quad V \quad I \quad U \quad N]'_t \quad (1)$$

where $\boldsymbol{\ell}_t$ is governed by a first-order Markov chain $\boldsymbol{\ell}_t = M_t \boldsymbol{\ell}_{t-1}$

- ▶ The elements of M_t are transition probabilities $p_t(j \rightarrow k)$ from state j to k
- ▶ Our goal: Decompose variation in the involuntary part-time employment rate,

$$i_t = \frac{I_t}{F_t + V_t + I_t + U_t}$$

ADJUSTMENT PROTOCOL

Statement of the problem

- ▶ From now on, the $p_t(j \rightarrow k)$'s are stacked into the vector p_t
- ▶ Our main goal is to estimate vectors p_t for every time period
- ▶ A transition probability $p_t(j \rightarrow k) = \frac{jk_t}{j_{t-1}}$ involves estimates of stocks (i.e., counts of workers) j_{t-1} and worker flows jk_t
- ▶ The CPS 1994 redesign creates breaks in series of employment stocks (F, V, I)
- ▶ This problem is magnified in the series of worker flows

ADJUSTMENT PROTOCOL

Our solution

- ▶ The March ASEC data provide us with consistent, albeit different, measures of employment stocks since 1976

- ▶ We propose a two-step adjustment procedure:
 1. Use a regression framework and ASEC stocks to backcast pre-1994 stocks based on post-1994 definition
 2. Combine our Markovian measurement framework and adjusted stocks to estimate pre-1994 flows based on post-1994 definition

STEP 1: ADJUSTING STOCKS

- ▶ $s_{y,m}^{\text{BM}}$ denotes series calculated from the BM files
 $s \in \{V, I\}$, y and m are calendar years and months
- ▶ $s_y^{\widehat{\text{ASEC}}}$ denotes series calculated from the ASEC files

We run the following regression:

$$s_{y,m}^{\text{BM}} = \vartheta_0 + \vartheta_1 s_y^{\widehat{\text{ASEC}}} + \varepsilon_{y,m}, \quad y = 1994, \dots, 2007, \quad m = 1, \dots, 12 \quad (2)$$

and use $\widehat{\vartheta}_0$ and $\widehat{\vartheta}_1$ to predict yearly average of $s_{y,m}^{\text{BM}}$ (denoted $\widehat{s}_y^{\text{BM}}$) for $y \leq 1993$

STEP 1: ADJUSTING STOCKS

- ▶ To go from annual to monthly estimates, we posit:

$$\widehat{s}_{y,m}^{\text{BM}} = \phi_{0,y} + \phi_{1,y} \check{s}_{y,m}^{\text{BM}} \quad (3)$$

where $\check{s}_{y,m}^{\text{BM}}$ is series of stocks measured based on pre-1994 definition

- ▶ We solve

$$\min_{\phi_{0,y}, \phi_{1,y}} \sum_{y=1976}^{1993} \left(\widehat{s}_y^{\text{BM}} - \frac{1}{12} \sum_{m=1}^{12} \left(\phi_{0,y} + \phi_{1,y} \check{s}_{y,m}^{\text{BM}} \right) \right)^2 \quad (4)$$

- ▶ Our preferred approach is to rely on multiplicative coefficients, i.e. we impose $\phi_{0,y} = 0, \forall y$, and use $\phi_{1,y} = \widehat{s}_y^{\text{BM}} / \frac{1}{12} \sum_{m=1}^{12} \check{s}_{y,m}^{\text{BM}}$

STEP 1: ADJUSTING STOCKS

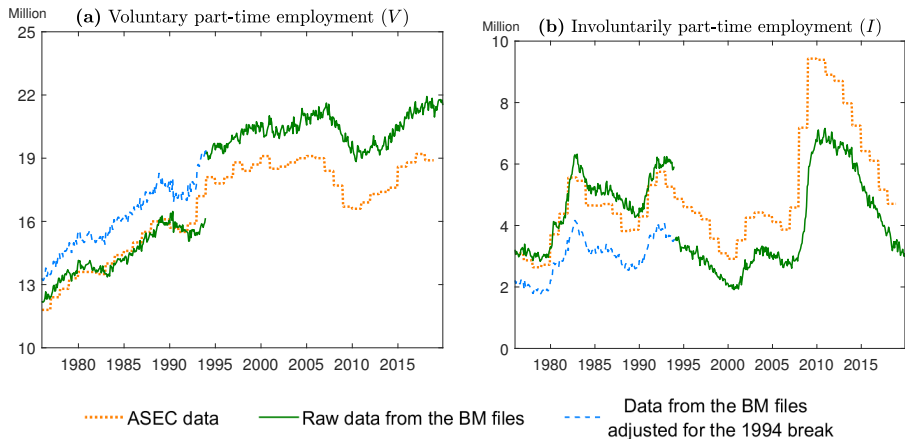


Figure 1: ASEC and BM counts of voluntary and involuntarily part-time workers

STEP 2: ADJUSTING FLOWS

- ▶ Prior to 1994, we have a biased measurement of p_t (denoted \check{p}_t) based on misclassified states available in BM files
- ▶ To recover p_t we combine the Markov chain assumptions (eq. (1)) and adjusted stocks obtained in step 1
- ▶ Specifically, we require that p_t be consistent with the dynamics of stocks obtained in step 1, by solving

$$\min_{p_t} (p_t - \check{p}_t)' W_t^{-1} (p_t - \check{p}_t) \quad \text{s.t.} \quad \Delta s_t = S_{t-1} p_t \quad (5)$$

S_{t-1} is a conformable matrix of previous period stocks, and W_t is a weighting matrix proportional to the covariance matrix of p_t

ADDITIONAL ADJUSTMENTS

1. Remove outliers and seasonally adjust worker stocks and flows using X13-ARIMA-SEATS
2. There may be some fuzziness in the distinction between voluntary and involuntary part-time employment
 - 2.1 The high levels of transitions across these two states are suggestive of classification error (next slide)
 - 2.2 We address it using a practical reclassification approach similar to the one developed by [Elsby et al. \[JME '15\]](#) (next slide)
3. Correction for time aggregation bias similar to [Shimer \[RED '12\]](#)

ADDITIONAL ADJUSTMENTS

Misclassification

Observed	Adjusted	Observed	Adjusted
$F \rightarrow V \rightarrow I \rightarrow V$	$F \rightarrow V \rightarrow V \rightarrow V$	$F \rightarrow I \rightarrow V \rightarrow I$	$F \rightarrow I \rightarrow I \rightarrow I$
$V \rightarrow V \rightarrow I \rightarrow V$	$V \rightarrow V \rightarrow V \rightarrow V$	$I \rightarrow I \rightarrow V \rightarrow I$	$I \rightarrow I \rightarrow I \rightarrow I$
$U \rightarrow V \rightarrow I \rightarrow V$	$U \rightarrow V \rightarrow V \rightarrow V$	$U \rightarrow I \rightarrow V \rightarrow I$	$U \rightarrow I \rightarrow I \rightarrow I$
$N \rightarrow V \rightarrow I \rightarrow V$	$N \rightarrow V \rightarrow V \rightarrow V$	$N \rightarrow I \rightarrow V \rightarrow I$	$N \rightarrow I \rightarrow I \rightarrow I$
$V \rightarrow I \rightarrow V \rightarrow F$	$V \rightarrow V \rightarrow V \rightarrow F$	$I \rightarrow V \rightarrow I \rightarrow F$	$I \rightarrow I \rightarrow I \rightarrow F$
$V \rightarrow I \rightarrow V \rightarrow V$	$V \rightarrow V \rightarrow V \rightarrow V$	$I \rightarrow V \rightarrow I \rightarrow I$	$I \rightarrow I \rightarrow I \rightarrow I$
$V \rightarrow I \rightarrow V \rightarrow U$	$V \rightarrow V \rightarrow V \rightarrow U$	$I \rightarrow V \rightarrow I \rightarrow U$	$I \rightarrow I \rightarrow I \rightarrow U$
$V \rightarrow I \rightarrow V \rightarrow N$	$V \rightarrow V \rightarrow V \rightarrow N$	$I \rightarrow V \rightarrow I \rightarrow N$	$I \rightarrow I \rightarrow I \rightarrow N$

ASSESSMENT OF OUR PROTOCOL

Stocks

1. Compare our CPS monthly adjusted stocks of involuntary part-time workers with those from SIPP panels around 1994
2. Compare our adjustment factors (multiplicative and additive) with those estimated by Polivka & Miller [LSMI '98]
3. Test for structural breaks in corrected time series of stocks and flows
4. Adjustment works well for disaggregated series (age, education, marital status)
We provide estimates for 20 different subgroups of the population
5. Adjustment works well for involuntary part-time work by reason ('slack work' and 'could not find full-time job')

III. Main findings

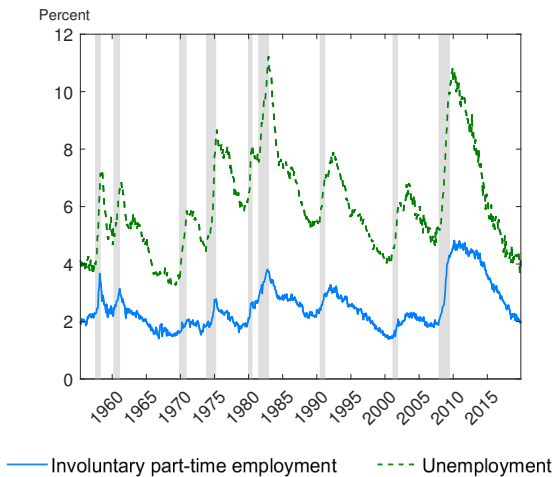


Figure 2: The involuntary part-time employment and unemployment rates

AVERAGE BEHAVIOR

Table 1: Sample averages: involuntary part-time work vs. unemployment

Involuntary part-time work				Unemployment			
Inflows		Outflows		Inflows		Outflows	
$q(F \rightarrow I)$	28.6	$p(I \rightarrow F)$	28.8	$q(F \rightarrow U)$	17.5	$p(U \rightarrow F)$	15.7
$q(V \rightarrow I)$	16.2	$p(I \rightarrow V)$	15.1	$q(V \rightarrow U)$	6.67	$p(U \rightarrow V)$	7.70
$q(U \rightarrow I)$	16.0	$p(I \rightarrow U)$	11.1	$q(I \rightarrow U)$	4.39	$p(U \rightarrow I)$	6.28
$q(N \rightarrow I)$	5.27	$p(I \rightarrow N)$	4.40	$q(N \rightarrow U)$	15.7	$p(U \rightarrow N)$	12.4
$\sum_{i \neq I} q(i \rightarrow I)$	66.1	$\sum_{j \neq I} p(I \rightarrow j)$	59.5	$\sum_{i \neq U} q(i \rightarrow U)$	44.2	$\sum_{j \neq U} p(U \rightarrow j)$	42.1

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CYCLICAL BEHAVIOR

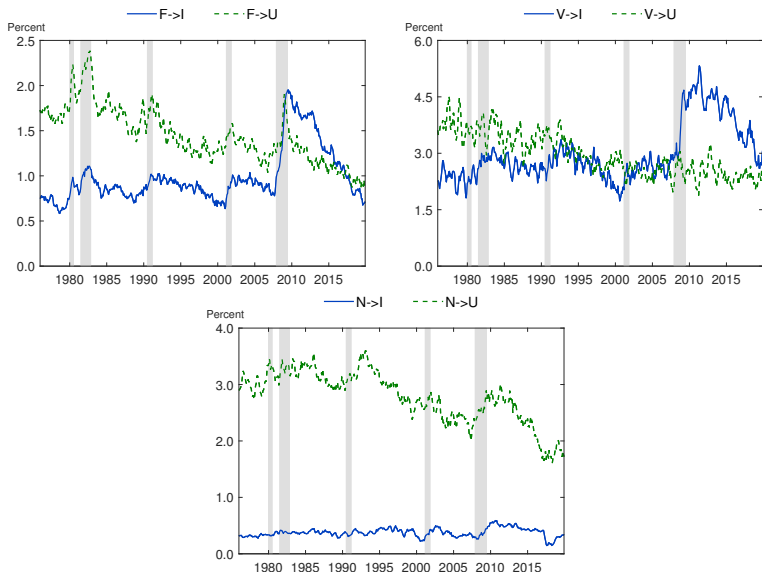


Figure 3a: Involuntary part-time work and unemployment inflows

CYCLICAL BEHAVIOR

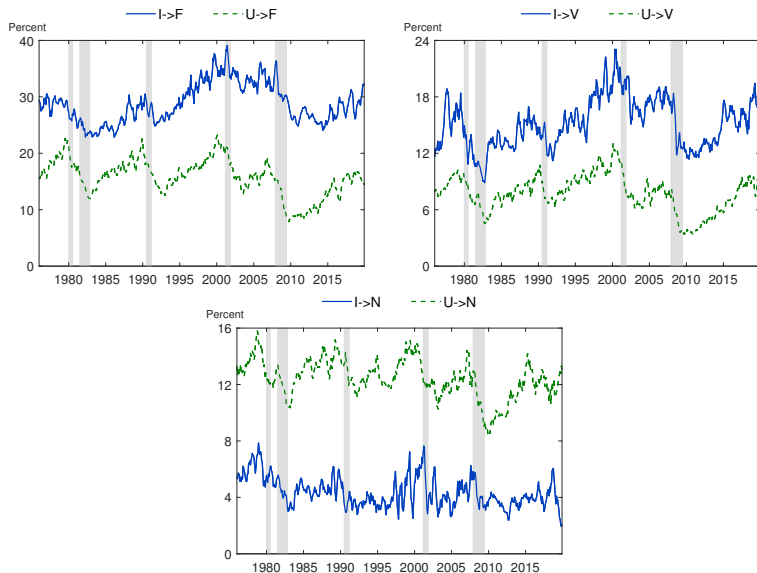


Figure 3b: Involuntary part-time work and unemployment outflows

DYNAMIC VARIANCE DECOMPOSITION

Decomposition

- ▶ Estimate the relative importance of each flow hazard λ^{jk} to the dynamics of involuntary part-time work using [Elsby et al. \[JME '15\]](#)'s method
- ▶ Specifically, the contribution of each flow hazard λ^{jk} to the variation in the involuntary part-time employment rate i_t is:

$$\beta(j \rightarrow k) = \frac{\text{Cov}(\Delta i_t, \Delta \tilde{i}_t^{jk})}{\text{Var}(\Delta i_t)}$$

$\Delta \tilde{i}_t^{jk}$ denotes changes in the counterfactual involuntary part-time rate whose evolution is based on the past and contemporaneous changes of λ^{jk}

- ▶ It can be shown that:

$$\sum_{j \neq k} \beta(j \rightarrow k) \approx 1$$

DYNAMIC VARIANCE DECOMPOSITION

Table 2: Inflow and outflow transition probabilities: Variance contributions

Involuntary part-time rate				Unemployment rate			
Inflows		Outflows		Inflows		Outflows	
$\beta(F \rightarrow I)$	28.2	$\beta(I \rightarrow F)$	23.6	$\beta(F \rightarrow U)$	16.4	$\beta(U \rightarrow F)$	32.9
$\beta(V \rightarrow I)$	15.3	$\beta(I \rightarrow V)$	11.4	$\beta(V \rightarrow U)$	5.33	$\beta(U \rightarrow V)$	11.8
$\beta(U \rightarrow I)$	10.3	$\beta(I \rightarrow U)$	4.23	$\beta(I \rightarrow U)$	2.34	$\beta(U \rightarrow I)$	3.79
$\beta(N \rightarrow I)$	3.53	$\beta(I \rightarrow N)$	3.16	$\beta(N \rightarrow U)$	11.4	$\beta(U \rightarrow N)$	14.8
$\sum_{i \neq I} \beta(i \rightarrow I)$	57.3	$\sum_{j \neq I} \beta(I \rightarrow j)$	42.4	$\sum_{i \neq U} \beta(i \rightarrow U)$	35.5	$\sum_{j \neq U} \beta(U \rightarrow j)$	63.2
$\sum_{i \neq I} \beta(i \rightarrow I) + \sum_{j \neq I} \beta(I \rightarrow j) = 99.8$				$\sum_{i \neq U} \beta(i \rightarrow U) + \sum_{j \neq U} \beta(U \rightarrow j) = 98.8$			

DYNAMIC VARIANCE DECOMPOSITION

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MORE ON $F \rightarrow I$ AND $I \rightarrow F$

Table 3: Further decomposition of within-employment flows

	Inflow $F \rightarrow I$		Outflow $I \rightarrow F$	
	1976-2019	1994-2019	1976-2019	1994-2019
β (SAME)		92.8	β (SAME)	89.3
β ($F \rightarrow S$)	67.8	66.9	β ($S \rightarrow F$)	63.1
β ($F \rightarrow C$)	32.2	33.1	β ($C \rightarrow F$)	37.6
			β (SHARE)	-0.72
β ($F \rightarrow S$, SAME)		62.8	β ($S \rightarrow F$, SAME)	61.3
β ($F \rightarrow C$, SAME)		29.8	β ($C \rightarrow F$, SAME)	27.6
			β (SHARE, SAME)	-0.36

MORE ON $F \rightarrow I$ AND $I \rightarrow F$

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β ($F \rightarrow S$, SAME)		62.8	β ($S \rightarrow F$, SAME)	61.3
β ($F \rightarrow C$, SAME)		29.8	β ($C \rightarrow F$, SAME)	27.6
			β (SHARE, SAME)	-0.36

RECESSION EPISODES

- ▶ The $\beta(j \rightarrow k)$'s summarize variation over a long time period. What about the dynamics specific to recession periods?
- ▶ Was the 2007-09 Great Recession different from other recessions?

Zooming in on recessions

- ▶ Counterfactual changes:

$$\sum_{\tau=t_0}^{t_1} \Delta \tilde{i}_{\tau}^{Ik} + \sum_{\tau=t_0}^{t_1} \Delta \tilde{i}_{\tau}^{jI}$$

with $s \in \{F, V, U, N\}$

RECESSION EPISODES

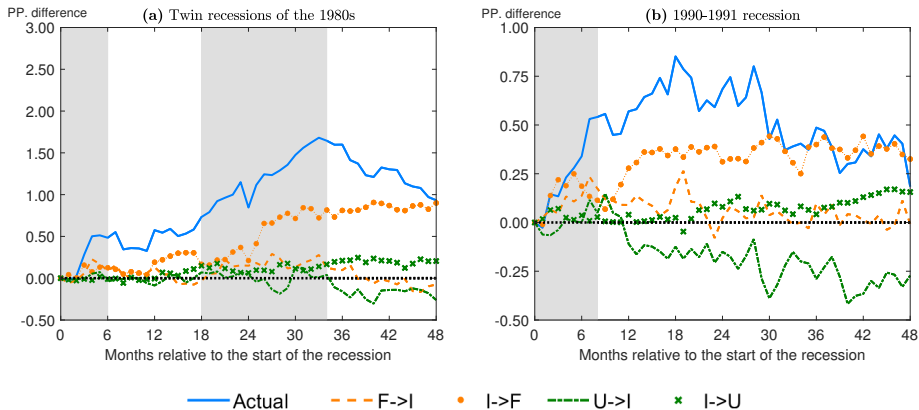
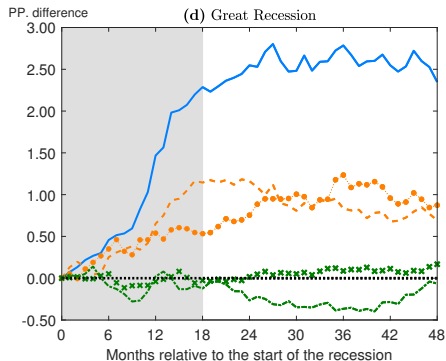
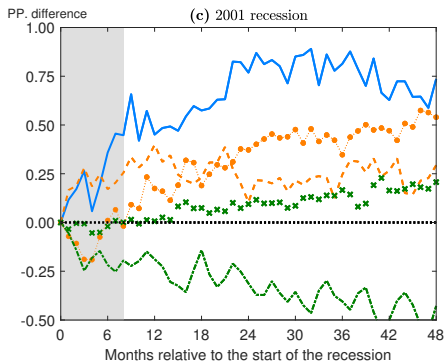


Figure 4: Recessionary increases in involuntary part-time employment

RECESSION EPISODES



— Actual - - - F->I • I->F - - - U->I * I->U

Figure 4: Recessionary increases in involuntary part-time employment

RECESSION EPISODES

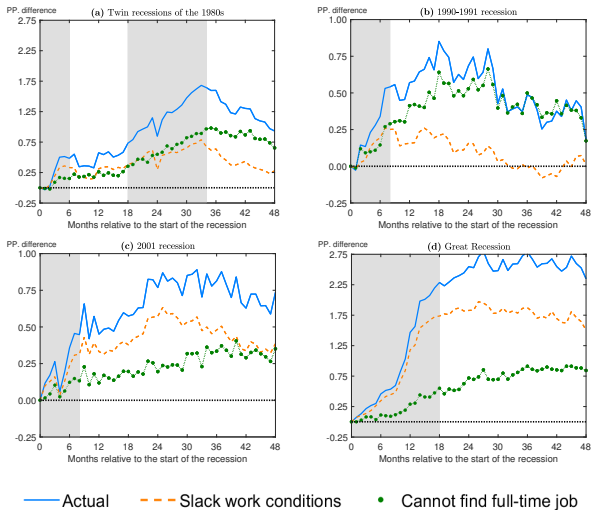


Figure 5: Reasons for involuntary part-time employment during recessions

TAKING STOCKS

Our main findings are:

1. Involuntary part-time work is a very transitory labor-market state
2. Cyclical variation is driven by changes in transitions across employment states
3. Stable pattern: in recessions the ins go up and the outs drop

Moreover, we find

4. Small interaction between unemployment and involuntary part-time work
5. Change in composition of involuntary part-time dynamics in the last two recessions

Conclusions

INTERPRETATION OF FINDINGS

- ▶ Our analysis suggests the operation of two labor adjustment channels. Following a negative shock:
 1. Some workers are put on part-time hours with the understanding that they will be brought back to full-time hours when business conditions improve
 2. Others are permanently separated from their employers
- ▶ Workers on part-time hours remain in the internal labor market, while permanently separated workers can only regain employment via the external labor market

IMPLICATIONS

- ▶ U-6, non-employment index or underemployment rate? How to measure labor market slack?
- ▶ Our findings caution against a common practice of adding involuntary part-time workers to the unemployed to measure labor market slack
- ▶ According to this view, involuntary part-time employment is high during a slack recovery because too few full-time jobs are being created
- ▶ Our findings suggest instead that, long after the trough of a recession, many full-time employment relationships remain fragile / have not returned to their normal hours

CONCLUSION

- ▶ We develop an adjustment protocol to estimate ins and outs of involuntary part-time employment
- ▶ We showed ins and outs of involuntary part-time work carry additional information relative to those of unemployment
- ▶ We hope our dataset will be used to inform the development and assessment of models of aggregate labor adjustment