Spousal Insurance, Precautionary Labor Supply, and the Business Cycle

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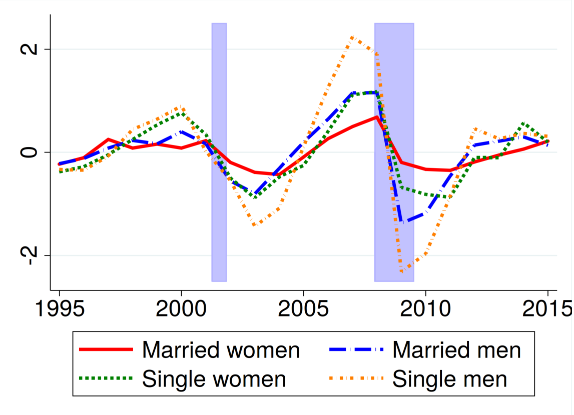
Employment Cyclicality

- Married women have relatively lower employment cyclicality than married men and single individuals



Detrended employment rates by gender and marital status for prime-age individuals (25-54 years) in U.S. betweeen 1988 and 2015 (HP filtered annual series)
Data Source: CPS March Supplements 1995-2015

▸ Decomposition ▸ By Industry ▸ More

Employment Attachment

- Monthly transitions from **E**mployment to **N**ot in the labor force

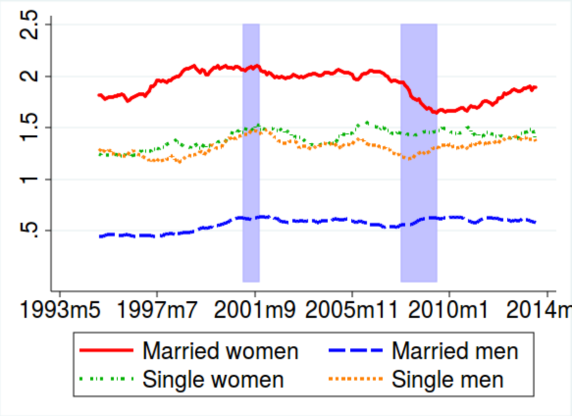


Figure: Married women leave employment more frequently

CPS monthly data 1995-2017; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

This Paper

Question

How much of the cyclicality in employment for married women is due to spousal insurance and what are the implications for intra-household risk sharing?

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Mechanism

- **Precautionary Labor Supply:** Married women remain employed and choose to not quit in recessions in response to husband's higher job loss risk
- Added-worker effect: Non-employed wife joins labor force in response to actual job loss of husband
  - Added-worker effect is small during recessions (Birinci(2018), Choi et al.(2019), Gorbachev (2016), Juhn et al.(2007))

This Paper

Quantitative Analysis

Explore precautionary labor supply mechanism quantitatively in a two-person household incomplete assets market model with

- aggregate risk in the form of cyclical labot market frictions and
- endogenous labor market transitions

Findings

Quantitative analysis shows that

- precautionary labor supply accounts for 62% of married women's low employment cyclicality
- spousal insurance provided by married women reduces consumption volatility by 67%

Related literature

- Joint-search, family labor supply, intra-household risk sharing over the business cycle
  - Mankart and Oikonomou (2016), Wang (2017), Ortigueira and Siassi (2013), Birinci (2018)
- Transition rates between labor market states over the business cycles in single-earner households
  - Krusell, Mukoyama, Rogerson, and Sahin (2017)
- Role of family labor supply and added-worker effect
  - Blundell, Pistaferri, and Saporta-Eksten (2016), Attanasio, Low, and Sanchez-Marcos (2008), Choi and Valladares-Esteban (2019)

Cyclicality of Transition Rates

- Cyclicality of transition rates as linear regression of log transition rate on log unemployment rate:
- E-to-U: only **involuntary** job loss
- For married women: If the unemployment rate doubles, E-to-N declines by about 25%

Transition rate	Estimated coefficient		
	Married Women	Married Men	Single Women
E-to-E	0.0024**	-0.0072***	-0.0031***
	(0.0008)	(0.0007)	(0.0010)
E-to-U	0.4950***	0.7946***	0.4633***
	(0.0716)	(0.0633)	(0.0854)
E-to-N	-0.2514***	0.1863***	0.0691
	(0.0363)	(0.0636)	(0.1911)

CPS monthly data 1995-2017; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS

More Graphs

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Empirical Summary

1. Married women have low employment cyclicality
2. Married women are more attached to employment and less likely to leave the labor force in recessions
3. Married men have a significantly higher job loss cyclicality than married women

Quantitative Model

Goal:

- Develop quantitative model of married women's labor supply over the business cycle
- Married women's labor supply decisions are determined by the interaction of
  - idiosyncratic shocks and
  - aggregate risk
- Quantify implications of cyclicality of labor market risk for precautionary labor supply and intra-household risk sharing

Model

- Incomplete assets markets with labor market frictions
- Model based on Krusell et al. (2017) and Mankart et al. (2016), augmented by a second earner and focus on married women's labor supply
- Households:
  - comprised of two members, husband ($j = 1$) and wife ($j = 2$)
  - unitary household, i.e. pool income and joint consumption
- Extensive labor supply:
  - Households take as given movement between employment and unemployment for husbands
  - Wives can be fired, otherwise endogenous moves between employment, unemployment and nilf
- Recessions: periods of low job finding and high job loss probabilities
- Exogenous wage rate and interest rate

Model Environment

- **Agents:** Continuum of infinitely lived married households
- **Preferences:** unitary household has consumption c_t, discrete labor supply $e_{2,t} \in \{0, 1\}$, and discrete search $s_{2,t} \in \{0, 1\}$ choice:

$$\log(c_t) - \delta\varepsilon_{2,t}e_{2,t} - \kappa_t s_{2,t} \tag{1}$$

- **Search:**
  - $s_{2,t} = 1$: unemployed (active search)
  - $s_{2,t} = 0$: not in the labor force (passive search)
  - κ_t distributed with mean $\bar{\kappa}$ and support $\{\bar{\kappa} - \varepsilon_\kappa, \bar{\kappa}, \bar{\kappa} + \varepsilon_\kappa\}$
- **Disutility from working:**
  - $\delta\varepsilon_{2,t}$, where $0 \leq \delta \leq 1$
- **Income:**
  - exogenous gender-specific labor income $w_j\varepsilon_{i,t}e_{j,t}$ where $\log \varepsilon_{i,t} = \rho_j \log \varepsilon_{i,t-1} + \sigma_{j,\varepsilon}\nu_{i,t}$
  - household productivity $\mathcal{E}$
- **Savings:** Risk-free asset with exogenous real interest r

Model Environment

- **Frictions:**
  - job arrival and job loss properties are gender-specific
  - recession dummy y determines level of frictions in recessionary and normal times
- Job arrival:
  - job arrival probabilities $\lambda_1(y)$ and $\lambda_2(s_2, y)$, where

$$\lambda_1(0) > \lambda(1) \tag{2}$$

$$\lambda_2(s_2, 0) > \lambda_2(s_2, 1) \tag{3}$$

$$\lambda_2(1, y) > \lambda_2(0, y) \tag{4}$$

- Job loss
  - correlated job loss among spouses
  - job loss probabilities $\Pi(y)$: job loss is higher in recessions

Definition of Equilibrium

The equilibrium consists of a set of value functions $V^{S^1S^2}(a, \mathcal{E}, \kappa, y)$, decision rules for consumption $c_{S^1S^2}(a, \mathcal{E}, \kappa, y)$, savings $a'_{S^1S^2}(a, \mathcal{E}, \kappa, y)$, searching $s_2(a, \mathcal{E}, \kappa, y)$, and labor supply $e_2(a, \mathcal{E}, \kappa, y)$, as well as exogenous prices w_j and r, and shocks $\chi_j(y)$ and $\lambda_j(s, y)$, where $S^1 \in \{E, U\}$ and $S^2 \in \{E, U, N\}$, and a distribution of households Γ such that:

- Given w_j, r, $\chi_j(y)$, $\lambda_j(s, y)$, households policy functions $c_{S^1S^2}(a, \mathcal{E}, \kappa, y)$, $a'_{S^1S^2}(a, \mathcal{E}, \kappa, y)$, $e_2(a, \mathcal{E}, \kappa, y)$, and $s_2(a, \mathcal{E}, \kappa, y)$ maximize households value functions.

Why do Married Women Quit?

Normal Times

- Shock to disutility or earnings reduces value of employment
- Husband's income increases
- Household accumulates enough assets

Why do they quit less in recessions?

- Insurance: High job loss risk for husband (Decrease in income)
- Job hoarding: Harder to re-enter employment

▸ Household Problem ▸ Policy function ▸ Calibration

Model vs. Data: Transition rates

- Data from CPS:
  - monthly, seasonally-adjusted, 1995 until 2017
  - prime-age population (25-54 years old)

- **Data** flow rates for married women:

	E (t)	U (t)	N (t)
E $(t-1)$	0.9738	0.0070	0.0192
U $(t-1)$	0.2408	0.6329	0.1241
N $(t-1)$	0.0483	0.0120	0.9397

- **Model** flow rates for married women:

	E (t)	U (t)	N (t)
E $(t-1)$	0.9728	0.0063	0.0208
U $(t-1)$	0.2404	0.6362	0.1237
N $(t-1)$	0.0507	0.0213	0.9280

Stocks Std. deviations

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Stocks Std. deviations

Procyclical E-to-N transition rate

Result 1:

- Cyclicality of transition rates measured by regressing the log transition rate on the log unemployment rate

Married women		
Transition rate	Data	Model
E-to-N	-0.2514	-0.1578

- **Result:** Cyclicality of risks accounts for about 62% of procyclical E-to-N transition rate for married women

▸ More

Precautionary Labor Supply vs. Job Hoarding

- **Precautionary Labor Supply**:
  Wife's labor supply response to **husband's** increased job loss probability in recessions
- **Job Hoarding**:
  Wife's labor supply response to **own** increased job loss probability in recessions

Precautionary Labor Supply vs. Job Hoarding

- **Precautionary Labor Supply**:
  Wife's labor supply response to **husband's** increased job loss probability in recessions
- **Job Hoarding**:
  Wife's labor supply response to **own** increased job loss probability in recessions
- How much of the procyclical E-to-N transition rate for married women is due to
  - precautionary labor supply (increase in husband's risk) vs.
  - job hoarding (increase in own risk)?
- Counterfactuals:
  1. Turn off married men's cyclical aggregate risk
  2. Turn off married women's cyclical aggregate risk

Precautionary Labor Supply vs. Job Hoarding

Result 2:

	(1) Data	(2) Baseline	(3) No agg. risk women	(4) No agg. risk men
E-to-N Cyclicality	-0.2514	-0.1578	-0.3885	-0.1200
Comparison Baseline	-	-	More	Less

- If married women did not have cyclical labor market risk, married women would provide more spousal insurance
- If married men did not have cyclical labor market risk, married women would provide less spousal insurance

Decomposition of E-to-N transition rate

- Shapley-Owen Decomposition to derive the contribution of each risk to precautionary labor supply
- Decompose the differential impact of
  1. gender-specific differences in job loss/finding probabilities
  2. gender-specific differences in productivity process
  3. correlated job loss shocks

Decomposition of E-to-N transition rate

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- Decompose the differential impact of
  1. gender-specific differences in job loss/finding probabilities
  2. gender-specific differences in productivity process
  3. correlated job loss shocks
- Compute the implied contribution of each of the three factors by comparing counterfactual simulations
- Counterfactuals:
  1. assign married men's job loss/finding probabilities to married women
  2. men's productivity process for both married men and women
  3. uncorrelated job loss shocks

Decomposition of E-to-N transition rate

Result 3:

- Baseline Model: -0.1578

Counterfactual	Contribution	Impact spousal insurance
Married men's labor market frictions	146% ↑	Less
Uncorrelated shocks	3.5% ↓	More
Men's productivity process	1.3% ↓	More

- If married women would face married men's job loss and job finding probabilities, married women would provide less spousal insurance over the busines cycle

How much insurance?

Result 4:

- How much spousal insurance do married women provide over the business cycle?
- Compare the baseline model to a single-earner married household
  - Assumption: Married women never work
  - Married men as before: Work if with job, unemployed if without job
- Compute consumption (Var(Δc)) and income (Var(Δy)) volatility in both models following Blundell et al. (2008)
- $\frac{\text{Var}(\Delta c)}{\text{Var}(\Delta y)}$ is 67% lower in the baseline model compared with the single-earner model

Summary + Outlook

Summary

- Provide new mechanism of spousal insurance: precautionary labor supply
- I explore mechanism quantitatively and find that
  - precautionary labor supply accounts for 62% of the of the procyclical E-to-N transition rate
  - Spousal insurance by married women reduces consumption volatility by 67%

Summary + Outlook

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Outlook

- What is different in a pandemic?
- From trend to cycle: how does the rise in married women's labor supply affect business cycle dynamics?
- How does (housing) wealth factor in?

Aggregate Volatility

	Married		Single	
	Men	Women	Men	Women
Total volatility	0.6431	0.3015	1.2517	0.6601
Cyclical volatility	0.5827	0.2143	0.9808	0.4918
R^2	84.73	39.44	84.98	56.23

Table: Total and cyclical volatility for each gender and marital status combination

Note: Civilian unemployment rate (annual data) as indicator for business cycle volatility; HP-filtered data

◀ Motivation

Aggregate Volatility: Industry

	Married men	Married women	Single men	Single women
		Manufacturing		
Cyclical volatility	1.0638	0.6172	1.5607	0.8959
		Services		
Cyclical volatility	0.2899	0.1935	0.9093	0.4430

Table: Cyclical volatility by industry

Note: Civilian unemployment rate (annual data) as indicator for business cycle volatility; HP-filtered data

◀ Motivation ◀ Robustness

"Static" spousal insurance

Dependent variable: Hours worked by married women				
	OLS Proxy	OLS	OLS Proxy	OLS Proxy
	(1)	(2)	(3)	(4)
Husband unemployed	3.449***	-	1.995***	3.696***
	(0.103)	-	(0.065)	
Husband unemployed lag	-	2.087***	-	-
	-	(0.261)	-	-
Recession dummy	0.412***	0.457***	0.225***	0.177***
Married women	All	All	Working	All
Industry dummies	No	No	No	Yes
Occupation dummies	No	No	No	Yes

Note: Additionally controlling for wage wife, wage husband, children under 6, children under 18, education wife, education husband, quadratic function of age wife, household income percentile, total family earnings

Table: Estimation Results

back

Participation vs. Hours

Aggregate hours vary due to:

- Individuals moving between employment and non-employment
- Changes in hours worked by employed individuals

For married women:

- Extensive margin: **78%** of hours variance
- Intensive margin: **22%** of hours variance

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⇒ Focus on transitions between employment, unemployment, and not in the labor force.

Calculation hours variance back

“Dynamic” spousal insurance

- I link households for 4 consecutive months
- Linear probability regression with married women’s transition rate into and out of the labor force as dependent variable

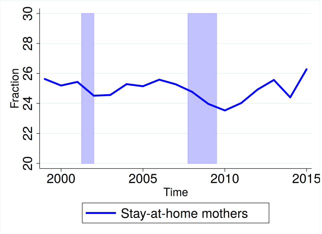
	(1) Join LF	(2) Join LF	(3) Leave LF	(4) Leave LF
Husband E-to-U(t-1)	0.01944***		-0.0035***	
	(0.0059)		(0.0007)	
Husband E-to-U(t-2)	0.0364***		-0.0029***	
	(0.0041)		(0.0006)	
Husband E-to-E(t-1)		-0.0069***		0.0015***
		(0.0017)		(0.0003)
Husband E-to-E(t-2)		-0.0065***		0.0010***
		(0.0013)		(0.0002)

Additionally controlling for age, race, number of children, number of children younger than 5, education of both spouses, work status of both spouses, occupations of both spouses, industries of both spouses, and time dummies

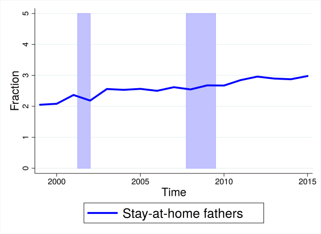
Table: Estimation Results

back

Participation decision



(a) Procyclical fraction of stay-at-home (married) mothers



(b) Acyclical fraction of stay-at-home (married) fathers

Data Source: CPS March Supplements 1998-2015

Robustness

Hours variance decomposition

- Volatility in hours can be decomposed into hours per labor force participant and number of labor force participants:

$$\text{Average Hours} = \frac{\text{Hours}}{\text{Labor Force}} \times \text{Labor Force Participants} \tag{5}$$

- Hours per labor force participant can be further decomposed into number of employed and hours per employed:

$$\frac{\text{Hours}}{\text{Labor Force}} = \frac{\text{Employed}}{\text{Labor Force}} \times \frac{\text{Hours}}{\text{Employed}} \tag{6}$$

back

CPS Information

- I use data for the time period: 1995 - 2017
  - abstract from trend: Slowing growth in mid-1990s for women
- Current Population Survey (CPS)
  - basic monthly and Annual and Social Economics (ASEC) files
  - information about household and each member in the household
  - possibility of matching across months/years to creat short panel
  - prime-age population: 25-55 years old
  - married couples: only those with both spouses present
  - single = not married

back

Transition rates + "DeNUNification"

- Use short panel in CPS monthly files and link individuals across subsequent months

Transition rates + "DeNUNification"

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- **Problem**: Unemployment and Not in the labor force (Nilf) commonly misclassified
- Flows between labor market states suffer from possible inaccuracy due to:
  1. Rotation group bias/Panel conditioning (e.g. Krueger (2017))
  2. Classification error (e.g. Abowd (1985))

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⇒ **Solution**: "DeNUNify" the data: Recode NUN and UNU sequences as NNN and UUU as developed in Elsby et al. (2015)

back

Gross worker flows

	To current month		
From previous month	Employment	Unemployment	Not in labor force
Employment	E-to-E	E-to-U	E-to-N
Unemployment	U-to-E	U-to-U	U-to-N
Not in labor force	N-to-E	N-to-U	N-to-N

Table: Transition rates

- where e.g.

$$\text{E-to-U} = (\text{E-to-U})_t / \text{U}_{t-1}$$

back

Employment to Not in the labor force

- Married women leave employment more frequently

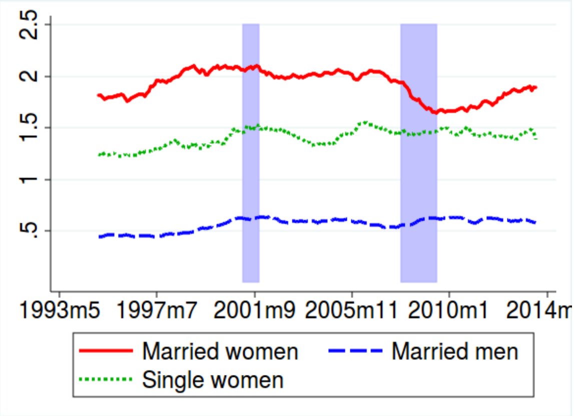


Figure: Procyclical E-to-N flows for married women

CPS monthly data 1995-2017; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

More back

Employment to Unemployment (Job Loss)

- Similar job loss for different groups

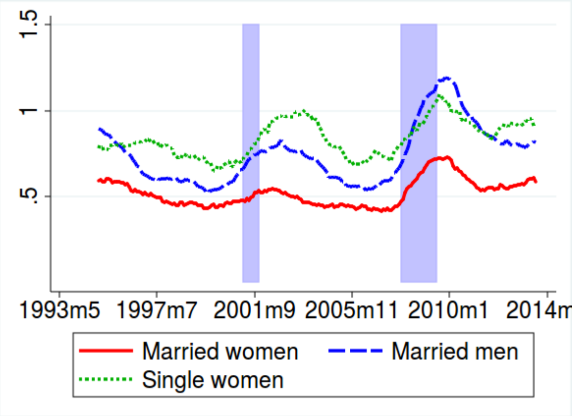


Figure: Countercyclical E-to-U flows for married women

CPS monthly data 1995-2017; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

More back

Employment to Employment

- Countercyclical E-to-E flows

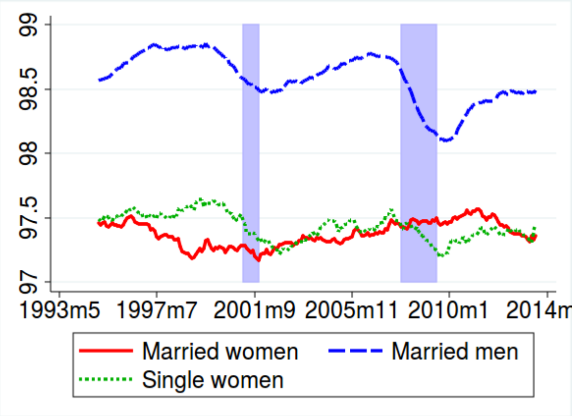


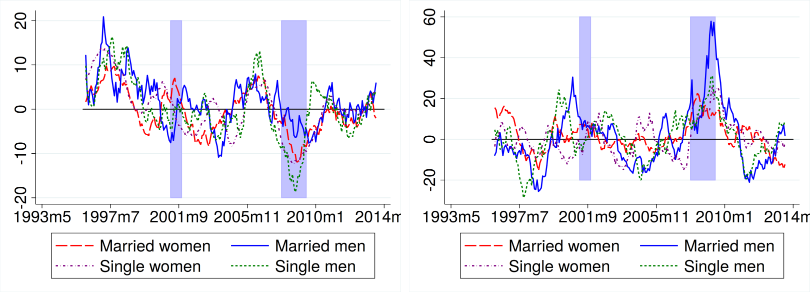
Figure: Mildly countercyclical E-to-E flows for married women

CPS monthly data 1995-2017; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

More back

Added-worker effect

- Year-over-year growth rates for monthly transition rates



(a) Nilf to Employment (N-to-E)

(b) Nilf to Unemployment (N-to-U)

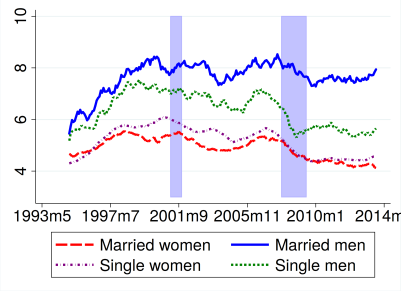
Figure: Similar cyclicality and level of flows from Nilf

CPS monthly data 1995-2015; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

back

Added-worker effect

- Levels for monthly transitions



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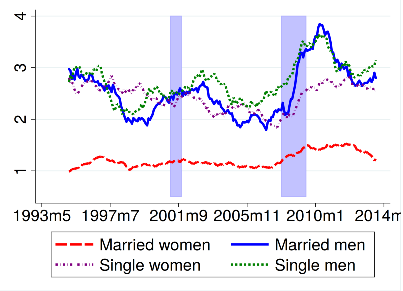

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back

Added-Worker Effect

- Added-worker effect: non-employed wife joins labor force in response to husband's job loss
- What we would expect: High N-to-E and/or N-to-U transition rates for married women in recessions

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Transition rate	Estimated coefficient			
	Married Women	Married Men	Single Women	Single Men
N-to-E	-0.2952***	-0.0724***	-0.3636***	-0.3200***
	(0.0398)	(0.0583)	(0.0226)	(0.0569)
N-to-U	0.3778***	0.6253***	0.2490***	0.5057***
	(0.0719)	(0.1188)	(0.0889)	(0.1041)

Figure Levels Static AWE Dynamic AWE

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Figure | Levels | Static AWE | Dynamic AWE

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Figure Levels Static AWE Dynamic AWE

Employment to Not in the labor force

- Year-over-year growth rates for monthly transition rates

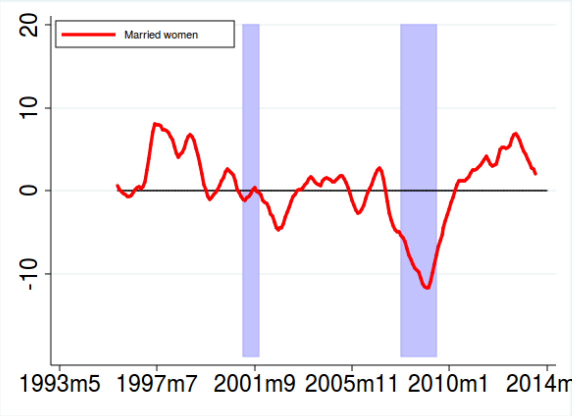


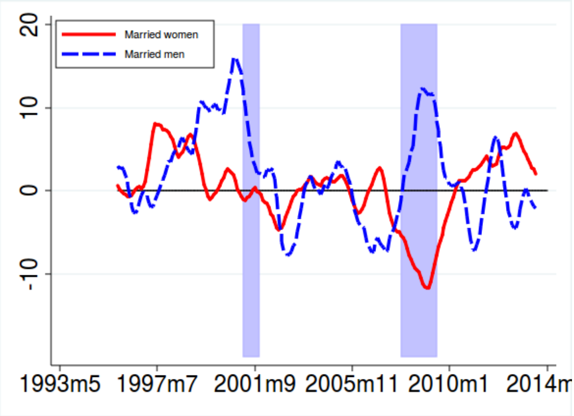
Figure: Procyclical E-to-N flows for married women

CPS monthly data 1995-2015; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

Levels More

Employment to Not in the labor force

- Year-over-year growth rates for monthly transition rates



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back More

Employment to Not in the labor force

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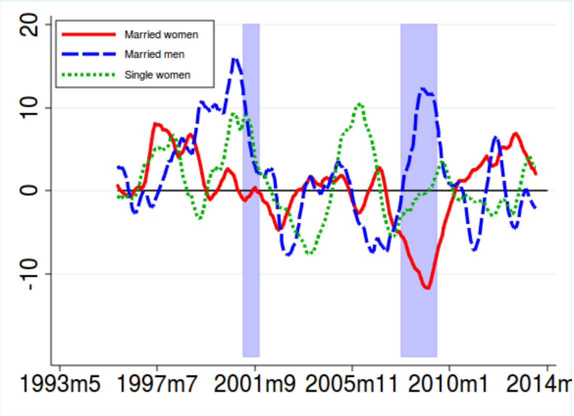

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Levels More

Industry of Husband

- Year-over-year growth rates for monthly transition rates

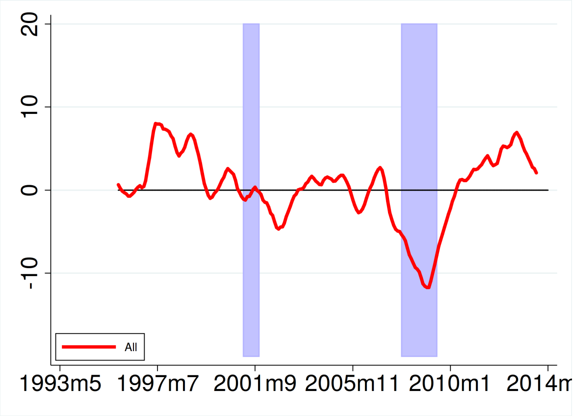
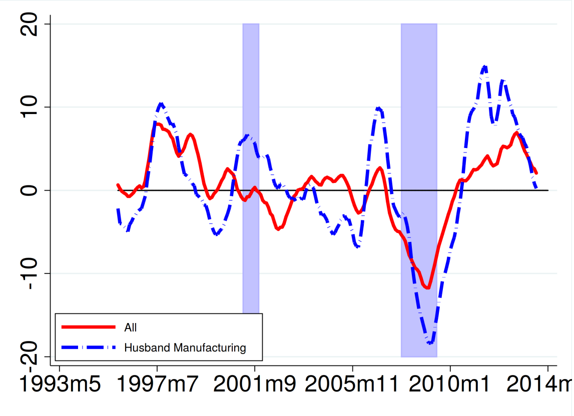


Figure: Degree of procyclicality varies by husband industry

back

Industry of Husband

- Year-over-year growth rates for monthly transition rates



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back

Industry of Husband

- Year-over-year growth rates for monthly transition rates

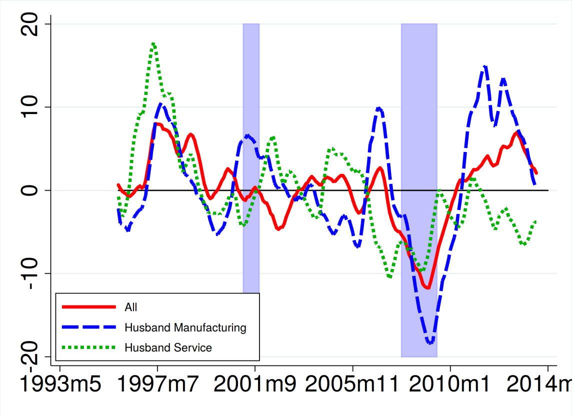

Figure: Degree of procyclicality varies by husband industry

back

Employment to Unemployment (Job Loss)

- Year-over-year growth rates for monthly transition rates

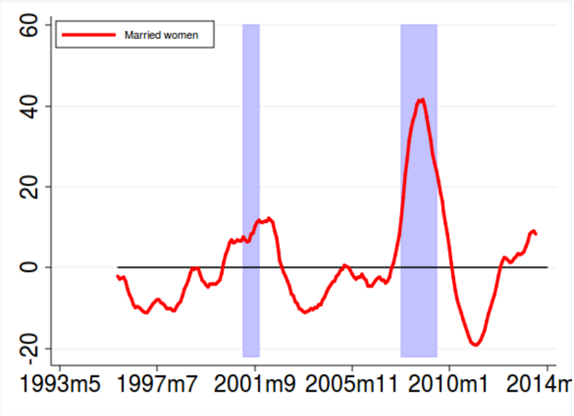

Figure: High job loss in recessions

CPS monthly data 1995-2015; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

Levels

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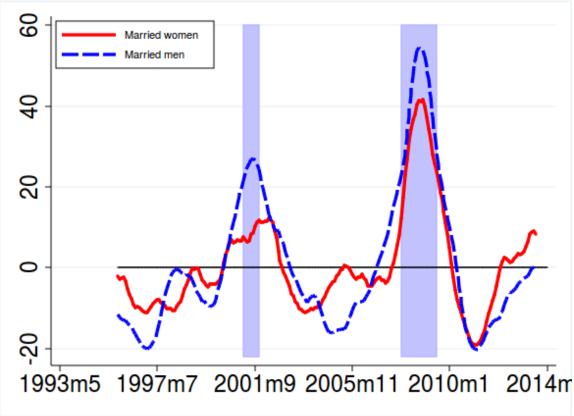

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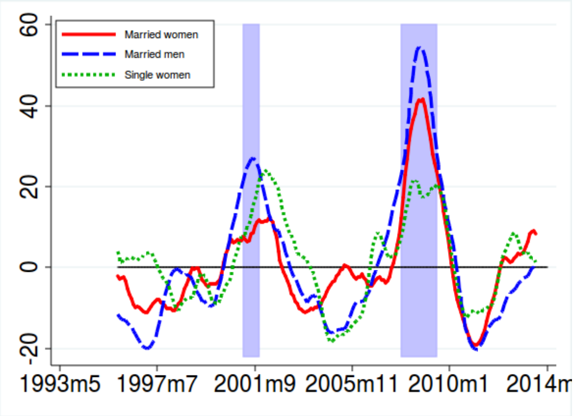

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Levels

Employment to Employment

- Year-over-year growth rates for monthly transition rates

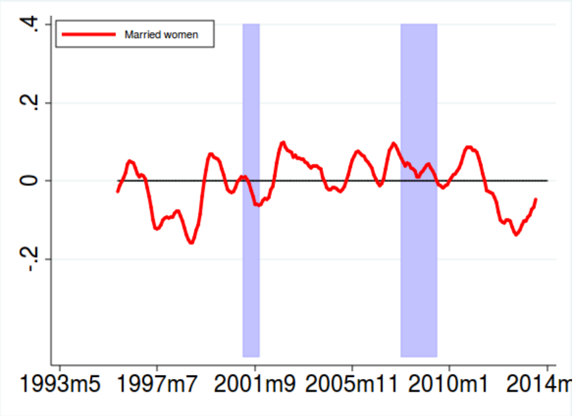


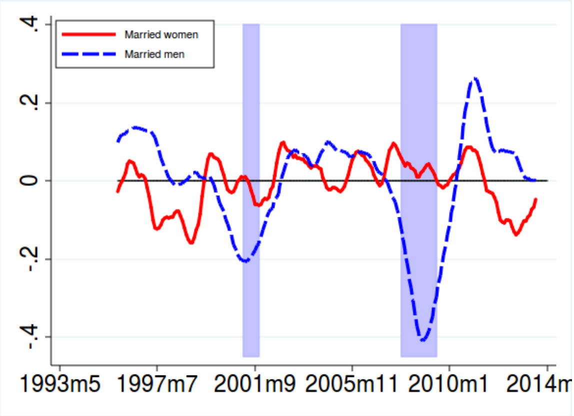
Figure: Mildly countercyclical E-to-E flows for married women

CPS monthly data 1995-2015; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

Levels

Employment to Employment

- Year-over-year growth rates for monthly transition rates



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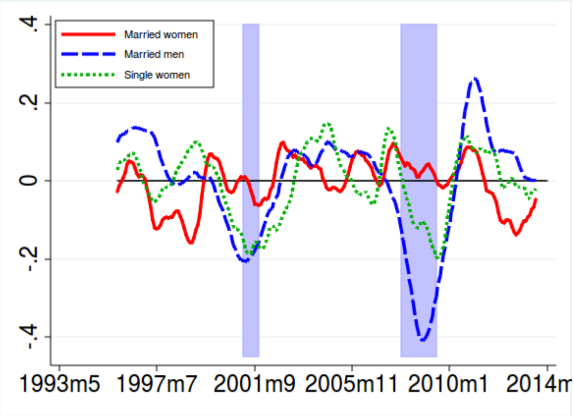

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Levels

Employment to Not in the labor force

- Levels for monthly transitions

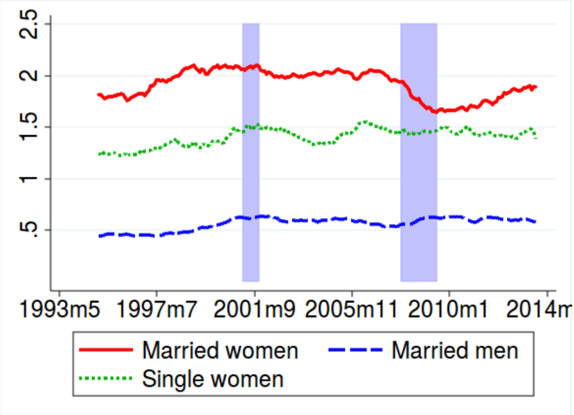

Figure: Procyclical E-to-N flows for married women

CPS monthly data 1995-2017; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS; deNUNified; 12-month centered moving average

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Cyclicality of Transition Rates

- Cyclicality of transition rates as linear regression of log transition rate on log unemployment rate:
- E-to-U: only **involuntary** job loss
- For married women: If the unemployment rate doubles, E-to-N declines by about 25%

Transition rate	Estimated coefficient			
	Married Women	Married Men	Single Women	Single Men
E-to-E	0.0024** (0.0008)	-0.0072*** (0.0007)	-0.0031*** (0.0010)	-0.0086*** (0.0013
E-to-U	0.4950*** (0.0716)	0.7946*** (0.0633)	0.4633*** (0.0854)	0.5802*** (0.0669)
E-to-N	-0.2514*** (0.0363)	0.1863*** (0.0636)	0.0691 (0.1911)	0.0628 (0.0610)
nonE-to-E	-0.2284*** (0.0298)	-0.2069*** (0.0351)	-0.3904*** (0.0359)	-0.3391*** (0.0340)

CPS monthly data 1995-2017; prime-age individuals (25-54 years); seasonally adjusted using X13-ARIMA-SEATS

back

Mechanism

- Number of employed today: 10
- Consider 2 different scenarios tomorrow:

	Scenario 1: Expansion	Scenario 2: Recession
Employed		
Job loss		
Not in the labor force		

Mechanism

- Number of employed today: 10
- Consider 2 different scenarios tomorrow:

	Scenario 1: Expansion	Scenario 2: Recession
Employed	5	
Job loss	2	
Not in the labor force	3	

Mechanism

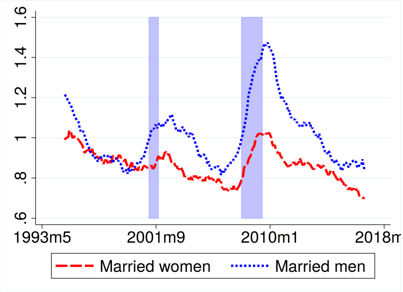
- Number of employed today: 10
- Consider 2 different scenarios tomorrow:

	Scenario 1: Expansion	Scenario 2: Recession	
Employed	5	5	
Job loss	2	4	$+\Delta 2$
Not in the labor force	3	1	$-\Delta 2$

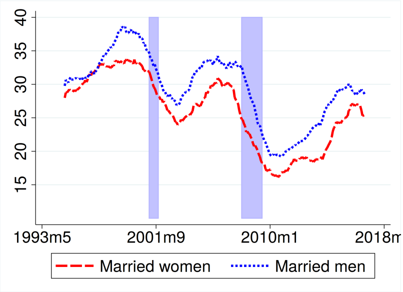
back

Job Loss and Finding Probabilities

- Following Shimer (2012), I estimate job loss and job finding probabilities for married men and women



(a) Job Loss Probabilities



(b) Job Finding Probabilities

Figure: Job loss and finding probabilities for married men and women in the U.S. between 1995 and 2017

back

Household Problem

Recursive formulation of household problem:

- Husband is Employed and wife has Job offer:

$$W^{EJ}(a, \mathcal{E}, \kappa, y) = \max\{V^{EE}(a, \mathcal{E}, \kappa, y), V^{EU}(a, \mathcal{E}, \kappa, y), V^{EN}(a, \mathcal{E}, \kappa, y)\}$$

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- Husband is Unemployed and wife is jobLess:

$$W^{UL}(a, \mathcal{E}, \kappa, y) = \max\{V^{UU}(a, \mathcal{E}, \kappa, y), V^{UN}(a, \mathcal{E}, \kappa, y)\}$$

- Husband is Employed, wife is jobLess:

$$W^{EL}(a, \mathcal{E}, \kappa, y) = \max\{V^{EU}(a, \mathcal{E}, \kappa, y), V^{EN}(a, \mathcal{E}, \kappa, y)\}$$

- Husband is Unemployed, wife has Job offer:

$$W^{UJ}(a, \mathcal{E}, \kappa, y) = \max\{V^{UE}(a, \mathcal{E}, \kappa, y), V^{UU}(a, \mathcal{E}, \kappa, y), V^{UN}(a, \mathcal{E}, \kappa, y)\}$$

back

Household Problem

Household with Employed husband and Employed wife:

$$V^{EE}(a, \mathcal{E}, \kappa, y) = \max_{c,a'} \log(c) - \delta\varepsilon_{2,t} + \beta\mathbb{E}_{\mathcal{E}',\kappa',y'}\Big[$$

Household Problem

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1. Husband keeps job and Wife keeps job:

$\pi_{E'J'}$(state of economy)$W^{EJ}(a', \mathcal{E}', \kappa', y')+$

Household Problem

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1. Husband keeps job and Wife keeps job:

$\pi_{E'J'}$(state of economy)$W^{EJ}(a', \mathcal{E}', \kappa', y')+$

2. Husband loses job and Wife keeps job:

$\pi_{U'J'}$(state of economy)$W^{UJ}(a', \mathcal{E}', \kappa', y')+$

Household Problem

Household with Employed husband and Employed wife:

$$V^{EE}(a, \mathcal{E}, \kappa, y) = \max_{c,a'} \log(c) - \delta\varepsilon_{2,t} + \beta\mathbb{E}_{\mathcal{E}',\kappa',y'}\Big[$$

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$\pi_{E'J'}$(state of economy)$W^{EJ}(a', \mathcal{E}', \kappa', y') +$

2. Husband loses job and Wife keeps job:

$\pi_{U'J'}$(state of economy)$W^{UJ}(a', \mathcal{E}', \kappa', y') +$

3. Husband keeps job and Wife loses job:

$\pi_{E'L'}$(state of economy)$W^{EL}(a', \mathcal{E}', \kappa', y') +$

Household Problem

Household with Employed husband and Employed wife:

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3. Husband keeps job and Wife loses job:

$\pi_{E'L'}$(state of economy)$W^{EL}(a', \mathcal{E}', \kappa', y') +$

4. Husband loses job and Wife loses job:

$\pi_{U'L'}$(state of economy)$W^{UL}(a', \mathcal{E}', \kappa', y') \Big]$

Household Problem

Household with Employed husband and Employed wife:

$$V^{EE}(a, \mathcal{E}, \kappa, y) = \max_{c,a'} \ \log(c) - \delta\varepsilon_{2,t} + \beta\mathbb{E}_{\mathcal{E}',\kappa',y'}\Big[$$

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3. Husband keeps job and Wife loses job:

$\pi_{E'L'}(\text{state of economy})W^{EL}(a', \mathcal{E}', \kappa', y')+$

4. Husband loses job and Wife loses job:

$\pi_{U'L'}(\text{state of economy})W^{UL}(a', \mathcal{E}', \kappa', y')\Big]$

s.to $\quad c + a' = (1 + r)a + w_1\varepsilon_1 + w_2\varepsilon_2, \qquad a' \geq 0$

back

Household Problem

Household with Employed husband and jobLess wife:

$$
\begin{aligned}
V^{EL}(a,\mathcal{E},\kappa,y) = \max_{c,a',s}\ & \log(c) - \kappa s_2 \\
& +\beta \mathbb{E}_{\mathcal{E}',\kappa',y'}[(1-\chi_1(y))\lambda_2(s,y)W^{EJ}(a',\mathcal{E}',\kappa',y')+ \\
& \qquad \chi_1(y)\lambda_2(s,y)W^{UJ}(a',\mathcal{E}',\kappa',y')+ \\
& \qquad (1-\chi_1(y))(1-\lambda_2(s,y))W^{EL}(a',\mathcal{E}',\kappa',y')+ \\
& \qquad \chi_1(y)(1-\lambda_2(s,y))W^{UL}(a',\mathcal{E}',\kappa',y')]
\end{aligned}
$$

s.to $c + a' = (1+r)a + w_1\varepsilon, \qquad a' \geq 0$

back

Household Problem

Household with Unemployed husband and jobLess wife:

$$
\begin{aligned}
V^{UL}(a,\mathcal{E},\kappa,y) = \max_{c,a',s}\ & \log(c) - \kappa s_2 \\
& +\beta\mathbb{E}_{\mathcal{E}',\kappa',y'}[\lambda_1(y)\lambda_2(s,y)W^{EJ}(a',\mathcal{E}',\kappa',y')+ \\
& \qquad (1-\lambda_1(y))\lambda_2(s,y)W^{UJ}(a',\mathcal{E}',\kappa',y')+ \\
& \qquad \lambda_1(y)(1-\lambda_2(s,y))W^{EL}(a',\mathcal{E}',\kappa',y')+ \\
& \qquad (1-\lambda_1(y))(1-\lambda_2(s,y))W^{UL}(a',\mathcal{E}',\kappa',y')]
\end{aligned}
$$

s.to $\quad c + a' = (1+r)a, \qquad a' \geq 0$

back

Household Problem

Household with Unemployed husband and employed wife:

$$
\begin{aligned}
V^{UE}(a, \mathcal{E}, \kappa, y) = \max_{c, a'} \; & \log(c) - \alpha \\
& + \beta \mathbb{E}_{\mathcal{E}', \kappa', y'} [\lambda_1(y)(1 - \tilde{\chi_2}(y)) W^{EJ}(a', \mathcal{E}', \kappa, y') + \\
& \quad (1 - \lambda_1(y))(1 - \tilde{\chi_2}(y)) W^{UJ}(a', \mathcal{E}', \kappa', y') + \\
& \quad \lambda_1(y) \tilde{\chi_2}(y) W^{EL}(a', \mathcal{E}', \kappa', y') + \\
& \quad (1 - \lambda_1(y)) \tilde{\chi_2}(y) W^{UL}(a', \mathcal{E}', \kappa', y')]
\end{aligned}
$$

$$
\text{s.to} \quad c + a' = (1 + r)a + w_2 \varepsilon, \qquad a' \geq 0
$$

◂ back

Job Loss and Finding Probabilities

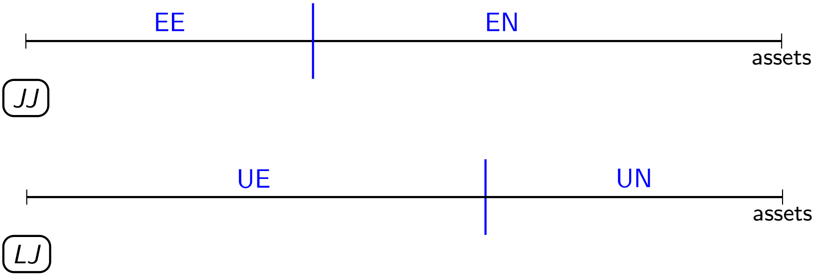
- Correlation of log job loss and log job finding probabilities with the log unemployment rate as regression:

		Married men	Married women
Cyclicality	Job loss probability	0.5286***	0.2078***
		(0.0579)	(0.0591)
	Job finding probability	-0.7641***	-0.8533***
		(0.0390)	(0.0523)

CPS monthly data 1995-2017; prime-age individuals (25-54 years); detrended

Mechanism: Added-worker effect

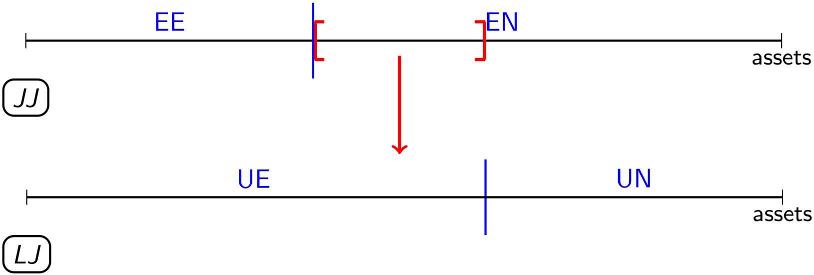
- For a fixed productivity level for husband and wife:



back

Mechanism: Added-worker effect

- For a fixed productivity level for husband and wife:

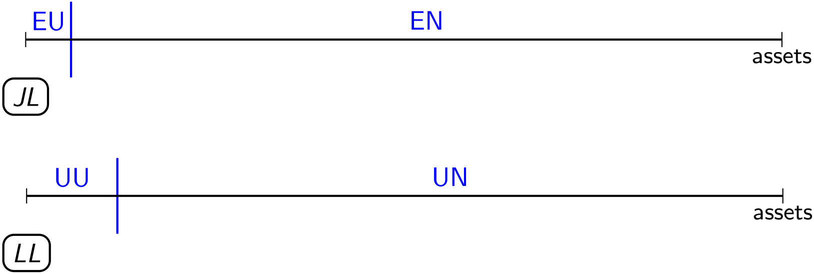


- After job loss of husband, household will find it optimal to choose E instead of N for the wife

back

Mechanism: AWE from unemployment

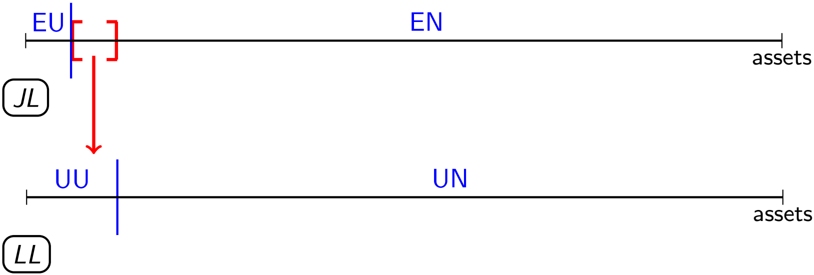
- For a fixed productivity level for husband and wife:



back

Mechanism: Added-worker effect

- For a fixed productivity level for husband and wife:



- After job loss of husband, household will find it optimal to choose U instead of N for the wife

back

Correlated job loss probabilities

- Following Ortigueira et al. (2013), household's joint job loss probability $\Pi(y)$ with typical element

$$\pi_S^m[(1-\varphi)\pi_S^f + \varphi\mathbb{1}\{S^m = S^f\}]$$

- where

$$\pi_U^m(y) = \chi_1(y)$$
$$\pi_E^m(y) = 1 - \chi_1(y)$$

- and

$$\pi_L^f(y) = \chi_2(y)$$
$$\pi_J^f(y) = 1 - \chi_2(y)$$

back

Correlated job loss probabilities

- Following Ortigueira et al. (2013), household's joint job loss probability $\Pi(y)$ with typical element: uncorrelated $\varphi = 0$

$$\pi_{UL} = \pi_U^m \pi_L^f$$

- where

$$\pi_U^m(y) = \chi_1(y)$$
$$\pi_E^m(y) = 1 - \chi_1(y)$$

- and

$$\pi_L^f(y) = \chi_2(y)$$
$$\pi_J^f(y) = 1 - \chi_2(y)$$

back

Correlated job loss probabilities

- Following Ortigueira et al. (2013), household's joint job loss probability $\Pi(y)$ with typical element: perf. correlated $\varphi = 1$

$$\pi_{UL} = \pi_U^m$$

- where

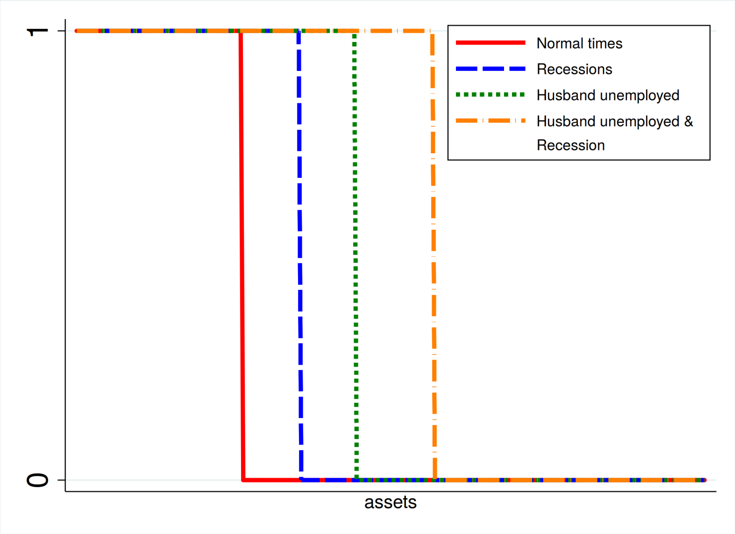
$$\pi_U^m(y) = \chi_1(y)$$
$$\pi_E^m(y) = 1 - \chi_1(y)$$

- and

$$\pi_L^f(y) = \chi_2(y)$$
$$\pi_J^f(y) = 1 - \chi_2(y)$$

back

Quit Policy from Employment



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Definition of recession

- Shocks to frictions following Krusell et al. (2017)
- Job loss probability:
  - Bad times: $\chi_j^B = \chi_j + \varepsilon_{\chi_j}$
  - Good times: $\chi_j^G = \chi_j - \varepsilon_{\chi_j}$
- Job finding probability:
  - Bad times: $\lambda_j^B(s) = \lambda_j(s) - \varepsilon_{\lambda_{j,s}}$
  - Good times: $\lambda_j^G(s) = \lambda_j(s) + \varepsilon_{\lambda_{j,s}}$
- Shocks ε_{χ_j} and $\varepsilon_{\lambda_{j,s}}$
  - are gender-specific
  - estimated such that the standard deviation of the model transition rates matches the standard deviation of the transition rate in the data
- agg. state y follows a two state Markov process with diagonal element ρ in the symmetric transition matrix

In the data | Correlated job loss | back

Externally set parameters

- Model period: 1 month

Externally set			
Parameter		Value	Target
Persistence of productivity MM	ρ_1	0.980	Chang and Kim (2006)
Std. dev. of productivity MM	σ_1	0.13	Chang and Kim (2006)
Persistence of productivity MW	ρ_2	0.973	Chang and Kim (2006)
Std. deviation of productivity MW	σ_2	0.15	Chang and Kim (2006)
Prob. markov matrix	ρ	0.986	NBER recessions
Wage husband	w_1	1	normalized
Wage wife	w_2	0.8	wage gap CPS 1995-2017
Job loss MM	χ_1	0.0085	avg. E-to-U transition rate MM
Job offer (U) MM	λ_1	0.2870	avg. U-to-E transition rate MM
Job offer (U) MW	$\lambda_2(1)$	0.2408	avg. U-to-E transition rate MW
Shock to job loss MM	ε_{χ_1}	0.0025	Std. deviation E-to-U (MM)
Shock to job offer (U) MM	ε_{λ_1}	0.0765	Std. deviation U-to-E (MM)
Shock to job offer (U) MW	$\varepsilon_{\lambda_{2,U}}$	0.0686	Std. deviation U-to-E (MW)

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Jointly estimated parameters

Parameter		Value	Moment	Target	Model
Disutility of search	$\bar{\kappa}$	0.1460	Unemployment rate MW	0.0366	0.0366
Search shock	ε_κ	0.0756	avg. U-to-N transition rate MW	0.1233	0.1237
Disutility of work	δ	0.4019	Employment-Population ratio MW	0.7164	0.7180
Discount factor	β	0.994	avg. assets-to-income ratio married	5.90	5.88
Job loss MW	χ_2	0.0125	avg. E-to-U transition rate MW	0.0070	0.0063
Job offer (N) MW	$\lambda_2(0)$	0.1204	N-to-E transition rate (MW)	0.0490	0.0507
Correlation separation shock	φ	0.0465	Correlation job loss	0.0298	0.0282
Shock to job loss MW	ε_{χ_2}	0.0018	Std. deviation E-to-U MW	0.0018	0.0017
Shock to job offer (N) MW	$\varepsilon_{\lambda_{2,N}}$	0.0125	Std. deviation N-to-E MW	0.0080	0.0086

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Model vs. Data: Stocks

- Data from CPS:
  - monthly, seasonally-adjusted, detrended, 1995 until 2017
  - prime-age population (25-54 years old)

Stock	Data	Model
Married women		
Employment-Population ratio	71.64%	71.80%
Unemployment rate	3.66%	3.66%
Labor force participation rate	74.17%	74.53%

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Std. deviation of transition rates

Married women		
Std. deviation	Data	Model
Unemployment rate MW	0.0091	0.0101
E-to-U	0.0018	0.0017
N-to-E	0.0080	0.0086

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All transition rates

Married women		
Transition rate	Data	Model
E-to-E	0.0024	-0.0014
E-to-U	0.3648	0.4899
E-to-N	-0.2616	-0.0889
U-to-E	-0.8193	-0.6021
U-to-U	0.3431	0.2167
U-to-N	-0.2418	0.1907
N-to-E	-0.2863	-0.3602
N-to-U	0.4309	0.9048
N-to-N	0.0090	-0.0009

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Joint Labor Market States

- Distribution of joint labor market states

	Data	Model
EE	0.7101	0.6837
EU	0.0213	0.0227
EN	0.2371	0.2536
UE	0.0212	0.0262
UU	0.0028	0.0030
UN	0.0075	0.0061

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