Economic Uncertainty's Impact on Aggregate Employment Fluctuations: Estimating the Importance of Age Distribution

(AEA: San Antonio)

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Research Questions

- How does the impact of economic uncertainty on employment volatility depend on the age distribution of states?
- How do states with more prime-working-aged people (vs older working-aged) react differently to economic-uncertainty-induced labor-market fluctuations?
- Labor-market volatility is less responsive to economic uncertainty in prime-aged-heavy states than in states with more senior working-age populations.

Motivations

- The first Baby Boomers retired, leading to accelerated aging (Berg et al. (2021, JMCB)).
- A decline in the share of the workforce aged 25-54 (termed as Prime), and an increasing trend in the share aged 55-64 (Old).
- Economic Policy Uncertainty is negatively connected with US and state economic activity. ((Baker, Davis, and Levy (2022, JME); Baker, Bloom, and Davis (2016, QJE)) etc.

Figure: Prime

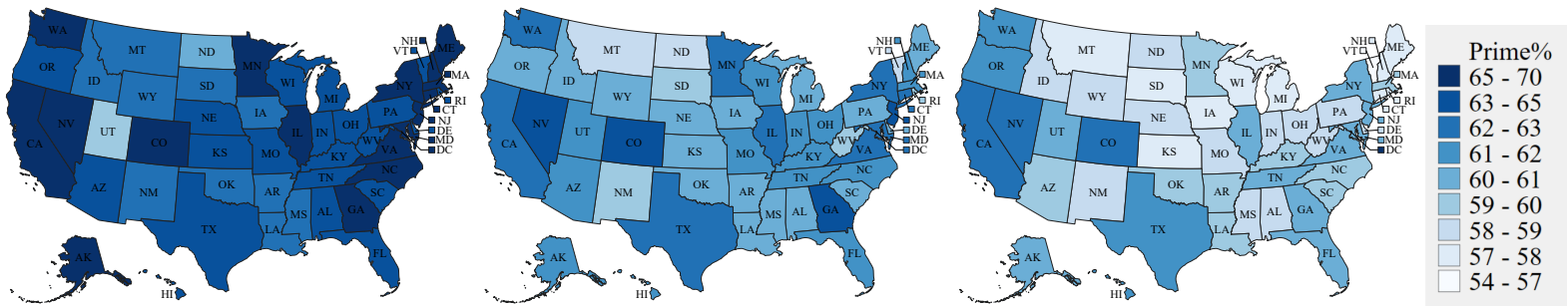
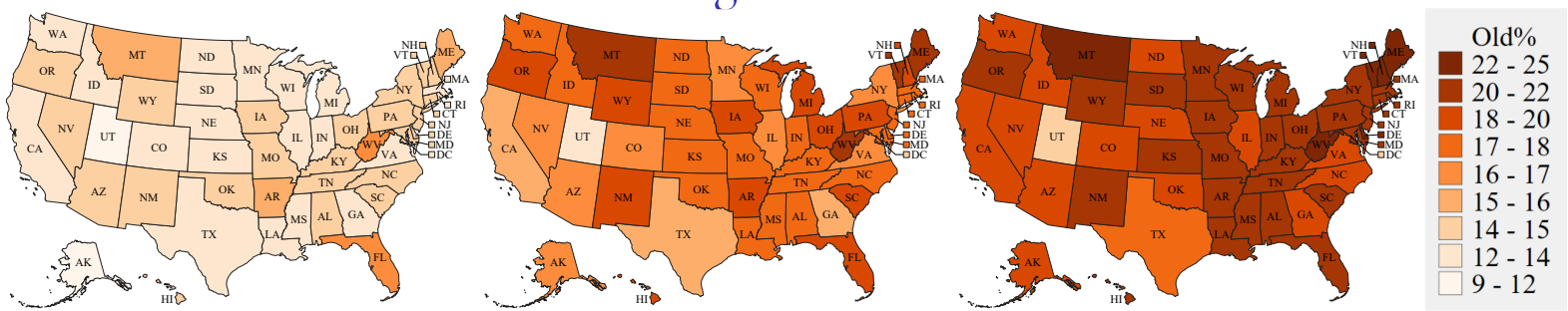


Figure: Old



2001Q4 2008Q4 2017Q4

Empirical Specification

The 1st Stage:

$$D_{i,t} = \gamma_i + \alpha_1 B_{i,t-k} + \alpha_2 (B_{i,t-k} - \overline{B}) * (N_t - \overline{N}) + \alpha_3 N_t + \omega_{i,t}, \quad (1)$$

$$U_{i,t} = \gamma_i + \rho_1 N_t + \rho_2 (B_{i,t-k} - \overline{B}) * (N_t - \overline{N}) + \rho_3 B_{i,t-k} + \upsilon_{i,t}, \quad (2)$$

$$(D_{i,t} - \overline{D}) * (U_{i,t} - \overline{U}) = \gamma_i + \chi_1 (B_{i,t-k} - \overline{B}) * (N_t - \overline{N}) + \chi_2 N_t + \chi_3 B_{i,t-k} + \xi_{i,t}, \quad (3)$$

The 2nd Stage:

$$Y_{i,t} = \gamma_i + \beta_1 U_{i,t} + \beta_2 (D_{i,t} - \overline{D}) * (U_{i,t} - \overline{U}) + \beta_3 D_{i,t} + \varepsilon_{i,t}, \quad (4)$$

- $Y_{i,t} = [\sum_{t-8}^{t+8} (cyclical\ emp_{i,t} - \overline{cyclical\ emp_{i,t}})^2 / 17]^{1/2}$ Employment Volatility Construction
- $D_{i,t}$: Young, Prime, or Old. $U_{i,t}$: $\Delta SEPU$. $B_{i,t-k}$: lagged birth rates. N_t: ΔEPU.
- β_1: Effect of uncertainty with a national-average share of age group $\overline{D}$.
- β_2: Effect of uncertainty considers deviation of the age share.
- $\beta_1 + \beta_2$: Total uncertainty effect linked with age share.

Identification on Uncertainty

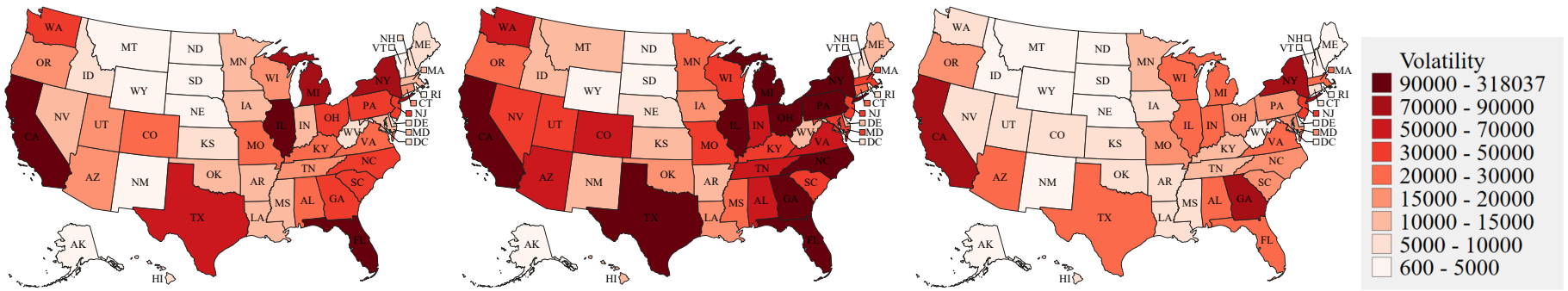
- $U_{i,t}$ has endogeneity concerns.
  - If newspaper search terms are influenced by employment volatility, the uncertainty measure is driven by volatility.
  - The state economic policy uncertainty index (SEPU) quantifies policy-related uncertainty using newspapers from each state, established by Baker, Davis, and Levy (2022, JME).
  - $U_{i,t}$ is constructed as the percentage change of the SEPU index.

- N_t is the instrument.
  - Constructed as the percentage change in the national EPU index from Baker, Bloom, and Davis (2016, QJE).

SEPU Construction EPU Figure

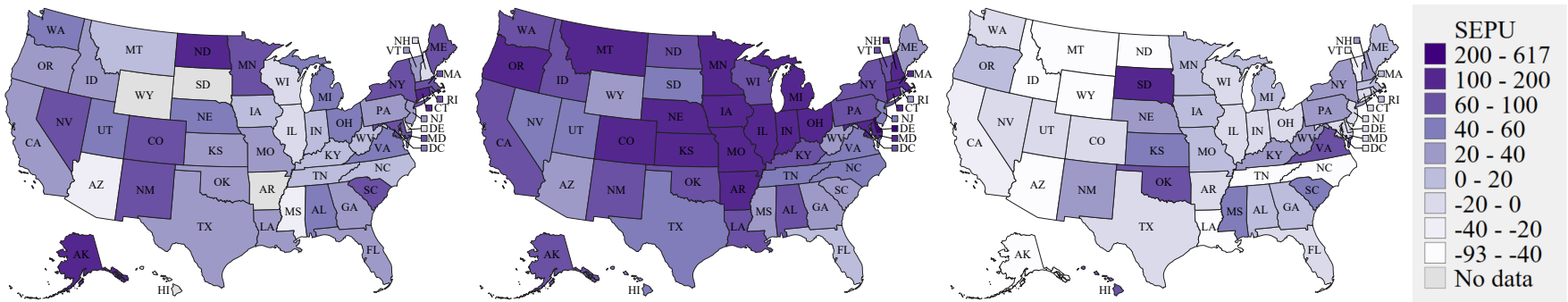
Evolution of Volatility and Uncertainty

Figure: Employment Volatility ($Y_{i,t}$)



2001Q4 2008Q4 2017Q4

Figure: $\Delta SEPU(U_{i,t})$



2001Q4 2008Q4 2017Q4

Identification on Age

- Age Shares $D_{i,t}$ have endogeneity concerns.
  - State age structure could be endogenous to employment volatility if states' working-age populations respond to economic uncertainty through migration flows.
  - Population data is from the Census Bureau National Population Estimate Program.

- $B_{i,t-k}$ is the Instrument.
  - State lagged birth rates from 1936 to 2002 are collected from National Center for Health Statistics, Vital Statistics PDFs.

Summary Statistics

Table: Summary of Main Variables

	Mean	Min	Max	SD
Emp. Vol. ($Y_{i,t}$)	26,921	681	318,036	3,542
$\Delta SEPU$ ($U_{i,t}$)	9.92	-92.78	616.47	51.96
ΔEPU (N_t)	1.71	-31.63	46.94	16.61
$\boldsymbol{D_{i,t}}$				
Young (15-24)	21.16	17.77	30.48	1.52
Prime (25-54)	61.37	54.96	68.26	2.41
Old (55-64)	17.47	9.84	24.68	2.65
$\boldsymbol{B_{i,t}}$				
Birthrate (15-24)	15.29	11.00	26.70	1.82
Birthrate (25-54)	19.22	14.32	28.74	2.49
Birthrate (55-64)	25.02	16.24	35.65	3.41

- Total of 3,416 observations spread across states and quarter-years. Spanning from 2000Q1 to 2017Q4 for 48 states and DC. Alaska and Hawaii were omitted due to unavailable birth rates before 1956. There are also 112 missing observations in $\Delta SEPU$.

Main Estimation

Table: Role of Demographics

	(1) Prime	(2) Old	(3) Prime-Old Baseline
$U_{i,t}$	75.07***	89.45***	86.94***
	(17.88)	(16.44)	(21.90)
			[3.2%]
$U_{i,t}$*Prime$_{i,t}$	-28.54**		-48.38**
	(11.93)		(21.18)
			[1.8%]
$U_{i,t}$*Old$_{i,t}$		24.62**	
		(12.06)	
$U_{i,t}$*Young$_{i,t}$			✓
Young$_{i,t}$			✓
Prime$_{i,t}$	✓		✓
Old$_{i,t}$		✓	
$F-stat.$	55.42	73.67	49.19
Obs.	3416	3416	3416

- States with a greater Prime share (relative to Old) experience a reduction in volatility for every percentage-point increase in uncertainty (a 55% change).

Validity of the IVs Robustness

Dynamic Response Specification

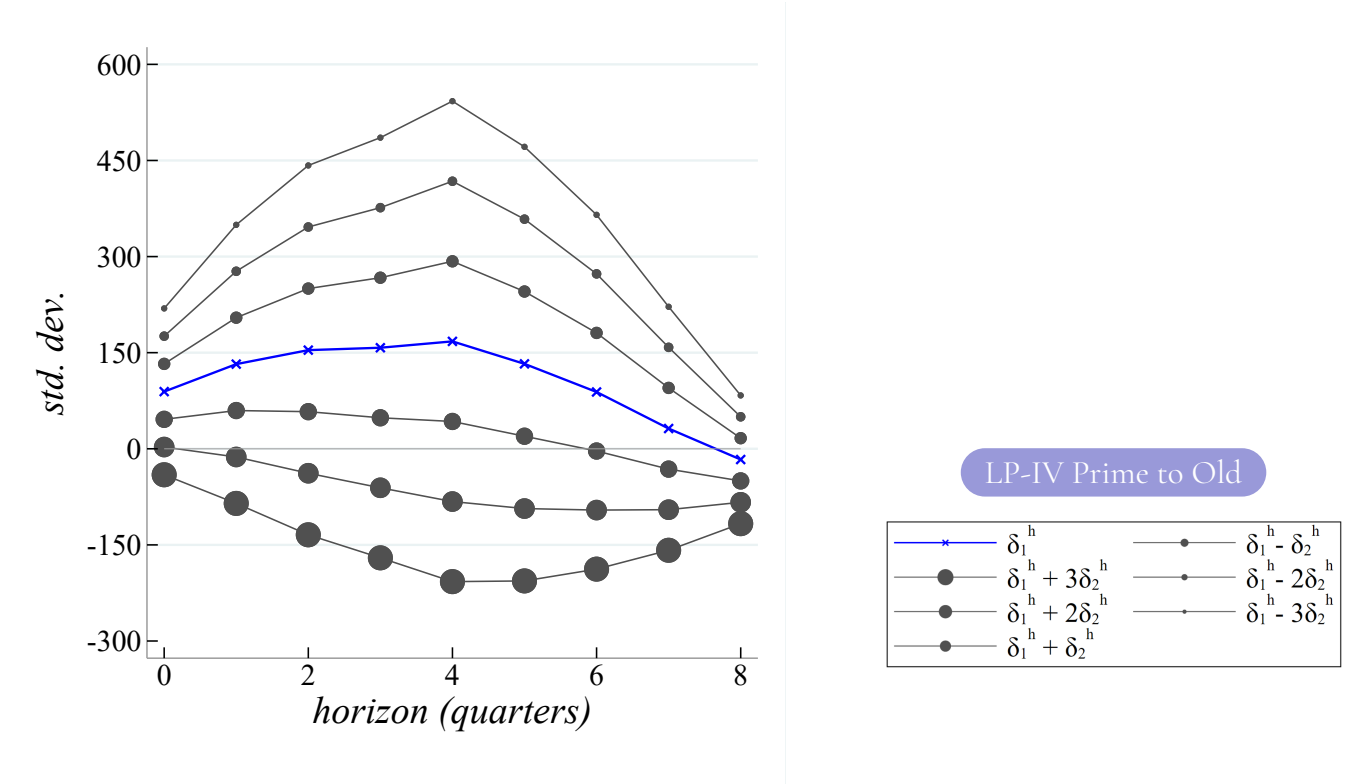
- Local Projection (LP-IV) estimation follows Jordà (2005, AER):

$$
\begin{aligned}
Y_{i,t+h} = \eta_i^h &+ \delta_1^h U_{i,t} + \delta_2^h [(D_{i,t} - \overline{D}) * (U_{i,t} - \overline{U})] + \delta_3^h D_{i,t} \\
&+ \delta_4^h \sum_{s=1}^{2} U_{i,t-s} + \delta_5^h \sum_{s=1}^{2} [(D_{i,t-s} - \overline{D}) * (U_{i,t-s} - \overline{U})] + \delta_6^h \sum_{s=1}^{2} Y_{i,t-s} \\
&+ \omega_{i,t+h}, h = 0, 1, ..., 8 ,
\end{aligned}
\tag{5}
$$

- $Y_{i,t+h}$: Cumulative cyclical employment volatility.
- δ_1: Changes in volatility from t to $t+h$ post economic policy shock at t.
- δ_2: Effect of uncertainty on volatility from t to $t+h$ considering age-share diversity.
- $\delta_1 + \delta_2$: Total uncertainty effect from t to $t+h$ linked with age share.

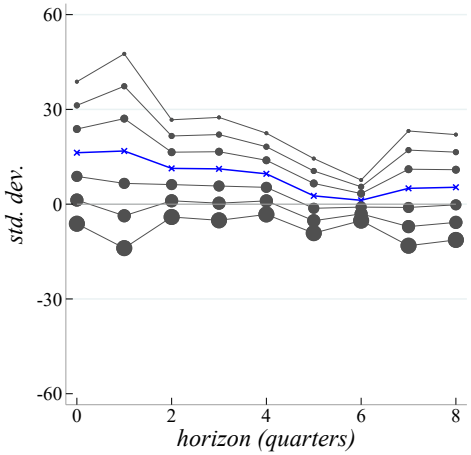
Dynamic Response of Employment Volatility

Figure: Employment Volatility Response Comparing Prime to Old

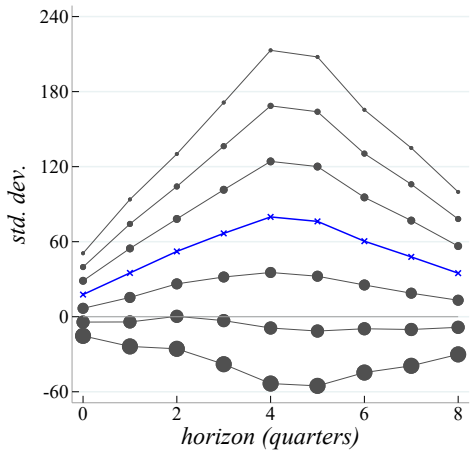


- A one percentage point higher share of Prime over Old correlates with a 70% decrease in volatility by the fourth quarter following the uncertainty shock.
- Each additional percentage point of Prime is associated with a substantial reduction in uncertainty-driven volatility compared to states with more Old.

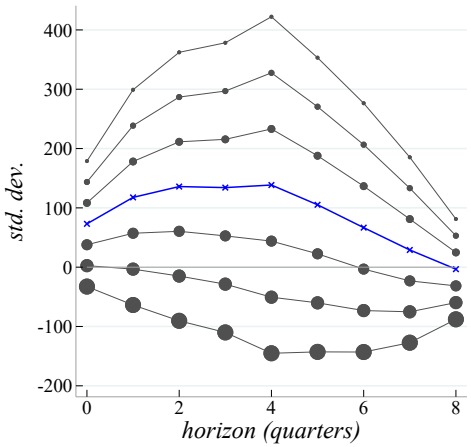
Decompose Response of Employment Volatility



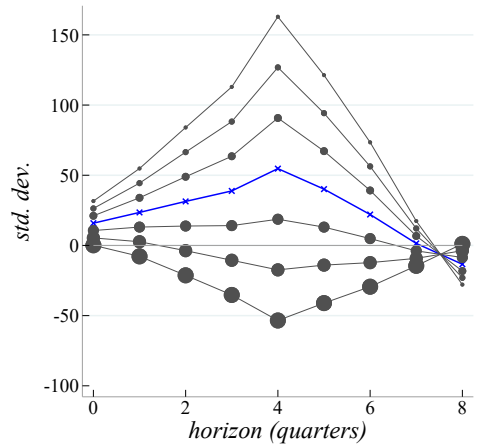
Responses of Job Gains Vol.



Responses of Job Loss Vol. IV Results



Responses of Unemployment Vol.



Responses of Participation Vol. IV Results

Robustness Checks with Various Controls

- 2nd Stage with controls:

$$Y_{i,t} = \gamma_i + \lambda_1 U_{i,t} + \lambda_2 (D_{i,t} - \overline{D}) * (U_{i,t} - \overline{U}) + \lambda_3 D_{i,t} + \lambda_4 (C_{i,t} - \overline{C}) * (U_{i,t} - \overline{U}) + \lambda_5 C_{i,t} + \varepsilon_{i,t}, \quad (6)$$

- $C_{i,t}$ stands for various controls
  state demographics, education level, sectoral income, individual income, welfare policies, and political climate.
- The main results are also robust to:
  - Cluster Standard Error at State Level
  - Different Time Windows
  - Different Outcome Specifications
  - Other economic policy uncertainty measures

Sum Stat of Controls

Discussion and Conclusion

- Findings:
  - Using data from Q1 2000 to Q4 2017 and instrumental variables, states with a higher Prime share experience a 55% reduction in volatility.
  - Using LP-IV, uncertainty effect peaks in 4th quarter post-shock, with a 70% reduction.
  - The results remain consistent using different variable definitions, model specifications, state-level controls, and labor changes in job losses and participation volatility.

- Future Outlook:
  - Additional studies can unveil other mechanisms by which Prime affects the labor market.
  - As Baby Boomers near retirement, further research can investigate these trend implications and policy effects.

EPU and EPU Index

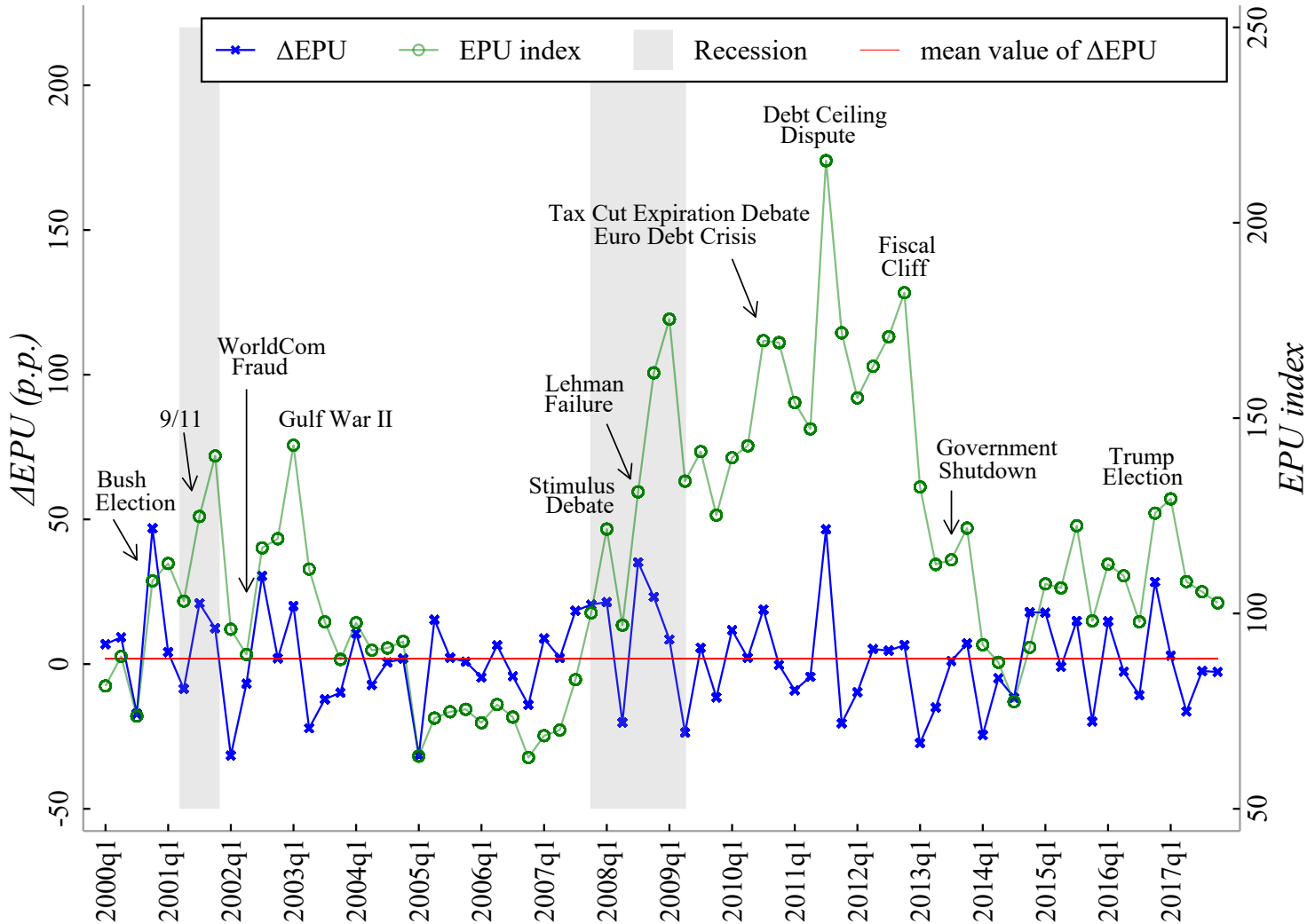


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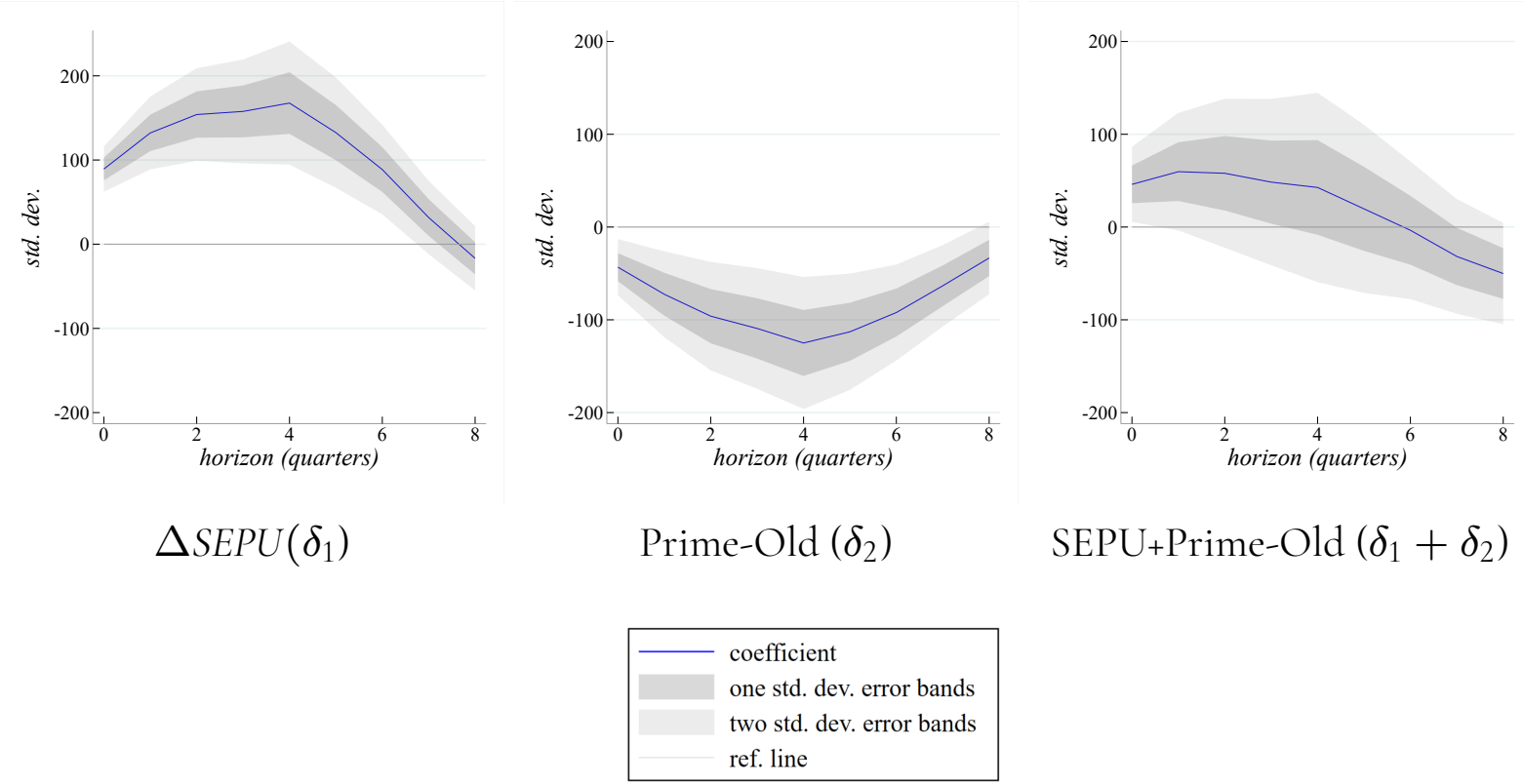
Figure: Comparing Responses: Prime vs Old



$\Delta SEPU(\delta_1)$ Prime-Old (δ_2) SEPU+Prime-Old ($\delta_1 + \delta_2$)

- Each additional share of Prime relative to Old correlates with a decrease in volatility following an uncertainty shock. The peak effect sees a reduction of approximately 70% in volatility by the 4th quarter after the shock.

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Analyzing Volatility of Gains and Loss

Table: Estimations on Vol. of Gains and Loss

	(1) *Gains* Prime	(2) *Gains* Old	(3) *Gains* Prime-Old	(4) *Loss* Prime	(5) *Loss* Old	(6) *Loss* Prime-Old
$U_{i,t}$	21.05***	18.85***	23.84***	18.65***	19.64***	21.63***
	(3.366)	(3.398)	(4.730)	(4.613)	(4.494)	(5.918)
$U_{i,t}$*Prime$_{i,t}$	-1.193		-9.718**	-8.043**		-15.48***
	(2.371)		(4.766)	(3.204)		(5.760)
$U_{i,t}$*Old$_{i,t}$		-3.726			3.901	
		(4.367)			(4.573)	
$U_{i,t}$*Young$_{i,t}$			X			X
Young$_{i,t}$			X			X
$F-stat.$	98.94	109.2	77.02	61.71	75.20	53.15
Obs.	3416	3416	3416	3416	3416	3416

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Analyzing Volatility of Unemployment and Participation

Table: Estimations of Vol. of Unemployment and Participation

	(1) *Unemp* Prime	(2) *Unemp* Old	(3) *Unemp* Prime-Old	(4) *Participate* Prime	(5) *Participate* Old	(6) *Participate* Prime-Old
$U_{i,t}$	71.97***	86.27***	84.18***	12.09	10.71*	14.98*
	(14.66)	(14.53)	(20.62)	(7.433)	(6.471)	(8.103)
$U_{i,t}$*Prime$_{i,t}$	-22.15**		-41.80*	-7.116		-13.19*
	(8.685)		(21.56)	(6.003)		(7.687)
$U_{i,t}$*Old$_{i,t}$		16.56			4.234	
		(10.92)			(5.832)	
$U_{i,t}$*Young$_{i,t}$			X			X
Young$_{i,t}$			X			X
$F-stat.$	52.36	52.46	44.64	148.3	159.4	122.0
Obs.	3416	3416	3416	3416	3416	3416

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Employment Volatility ($Y_{i,t}$)

- Employment data is from the BLS QCEW statistics.
- Apply Hodrick-Prescott (HP) filter, to get cyclical employment.
- Employment volatility ($Y_{i,t}$) is constructed as the centered-rolling windows of cyclical employment:

$$Y_{i,t} = [\sum_{t-8}^{t+8} (cyclical\ emp_{i,t} - \overline{cyclical\ emp_{i,t}})^2 / 17]^{1/2}, \tag{7}$$

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Uncertainty Measure ($U_{i,t}$)

- The state economic policy uncertainty index (SEPU) quantifies policy-related uncertainty using newspapers from each state.
- The authors analyze local news articles, excluding state-specific national newspapers. Their analysis focuses on two aspects: local policy uncertainty and the state-level impact of national policies.
- The index is created by monthly evaluations of articles containing specific keywords, measuring their frequency against the total articles published in that month.
- The index is standardized using data prior to 2018, which reflects the average state-level impact of national policy uncertainty, to maintain consistency in comparisons.
- $U_{i,t}$ is constructed as the percentage change of the SEPU index:

$$U_{i,t} = (SEPU\ index_t - SEPU\ index_{t-1})/SEPU\ index_{t-1} * 100\%, \quad (8)$$

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Instrument (N_t)

- $U_{i,t}$ has endogeneity concerns if newspaper search terms are influenced by employment volatility, meaning the uncertainty measure is driven by volatility.
- Use national ΔEPU (N_t) as an Instrument (IV). Basso and Rachedi (2021, AEJ)
- N_t is constructed as the percentage change in the national EPU index from Baker, Bloom, and Davis (2016, QJE).

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Checking the Validity of the IVs

Table: 1st Stage Estimations

	(1) $B_{i,t-k}$ Young	(2) $B_{i,t-k}$ Prime	(3) $B_{i,t-k}$ Old	(4) N_t Young	(5) N_t Prime	(6) N_t Old	(7) $N_t * B_{i,t-k}$ Young	(8) $N_t * B_{i,t-k}$ Prime	(9) $N_t * B_{i,t-k}$ Old
Coef.	0.645***	1.028***	0.945***	1.519***	1.517***	1.503***	94889***	-111752***	-26737***
	(0.0191)	(0.0161)	(0.0270)	(0.0515)	(0.0509)	(0.0519)	(26818)	(29604)	(5691)
$F-stat$	823.2	341.6	74.41	18.65	19.01	19.33	21.22	16.41	17.49
Obs.	3416	3416	3416	3416	3416	3416	3416	3416	3416

- Lagged peer birth rate for Young, Prime, Old, and national *EPU* are valid instruments.

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Role of Demographics: Robustness Checks

	(1) Prime Partial	(2) Old Partial	(3) Prime-Old Partial	(4) Prime Reduced	(5) Old Reduced	(6) Prime-Old Reduced
N_t	101.7***	122.1***	113.3***	399.2***	-19.87	144.0
	(23.41)	(21.89)	(26.28)	(142.3)	(98.23)	(173.6)
N_t*Prime$_{i,t}$	-40.14**		-75.46**			
	(17.15)		(34.11)			
N_t*Old$_{i,t}$		26.77				
		(19.02)				
N_t*Prime Birth$_{i,t}$				-15.62**		-42.80***
				(6.772)		(16.47)
N_t*Old Birth$_{i,t}$					5.293	
					(3.737)	
N_t*Young$_{i,t}$			X			X
Young$_{i,t}$			X			X
$F-stat.$	68.12	90.73	61.23	78.37	110.9	70.80
Obs.	3416	3416	3416	3416	3416	3416

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Table: Summary Statistics of Control Variables

	Mean	Min	Max	SD	N
personalincome	1206423.46	95243.58	9557959.92	1391595.74	3416
wagesalary	626320.16	48016.74	4967020.28	723268.38	3416
constrcut	54008.00	3361.03	452084.98	62023.44	3400
manufact	95319.05	-67.97	746985.97	105235.72	3404
retailtrade	55173.27	3061.84	409413.84	62867.71	3416
transport	31235.72	1667.21	229932.42	35365.15	3400
health	90913.88	5114.37	649032.62	98601.16	3416
Food Insecure	13.54	3.27	25.22	3.37	3416
Gross State Product	307104.64	18013.50	2939071.85	374929.91	3416
Workers' compensation	298834.28	4220.25	3507711.00	530654.64	3416
Poverty Rate	12.84	4.50	23.10	3.32	3416
State EITC Rate	0.07	0.00	0.85	0.11	3416
State Minimum Wage	6.69	2.65	12.81	1.39	3416
Medicaid beneficiaries	1126960.70	45141.00	12656781.00	1499903.64	3416
Governor is Democrat (1=Yes)	0.44	0.00	1.00	0.48	3344
Number in Lower House Democrat	57.01	8.00	239.00	32.00	3272
Number in Lower House Republican	57.14	6.00	296.00	33.95	3272
total personal income	25723.09	18118.64	41560.52	2758.01	3416
wage and salary income	23451.18	16045.48	38723.09	2549.11	3416
non-farm business income	107.18	-106.02	1641.59	147.53	3416
welfare (public assistance) income	13.37	0.00	233.36	19.31	3416
retirement income	332.77	0.00	2736.50	263.04	3416
income from unemployment benefits	125.05	0.00	1141.14	97.94	3416
white	83.00	29.58	98.63	10.89	3416
black	10.98	0.00	66.52	11.10	3416
female	51.50	47.94	56.06	1.08	3416
femar	31.01	21.34	36.44	1.80	3416
fework	24.37	18.71	32.05	1.95	3416
immigrant	4.77	0.04	18.43	3.29	3416
hisp	9.97	0.20	49.15	10.11	3416
hrwork	38.87	36.11	41.51	0.78	3416
lwskill	58.20	35.50	73.03	5.35	3416
lesshigh	13.79	6.82	23.51	2.89	3416
higschool	24.01	12.11	37.13	3.52	3416
somecollege	21.17	9.72	29.23	2.87	3416
college	13.41	5.98	25.72	2.77	3416
grad	7.21	2.74	30.10	3.01	3416

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