Women, Wealth Effects, and Slow Recoveries

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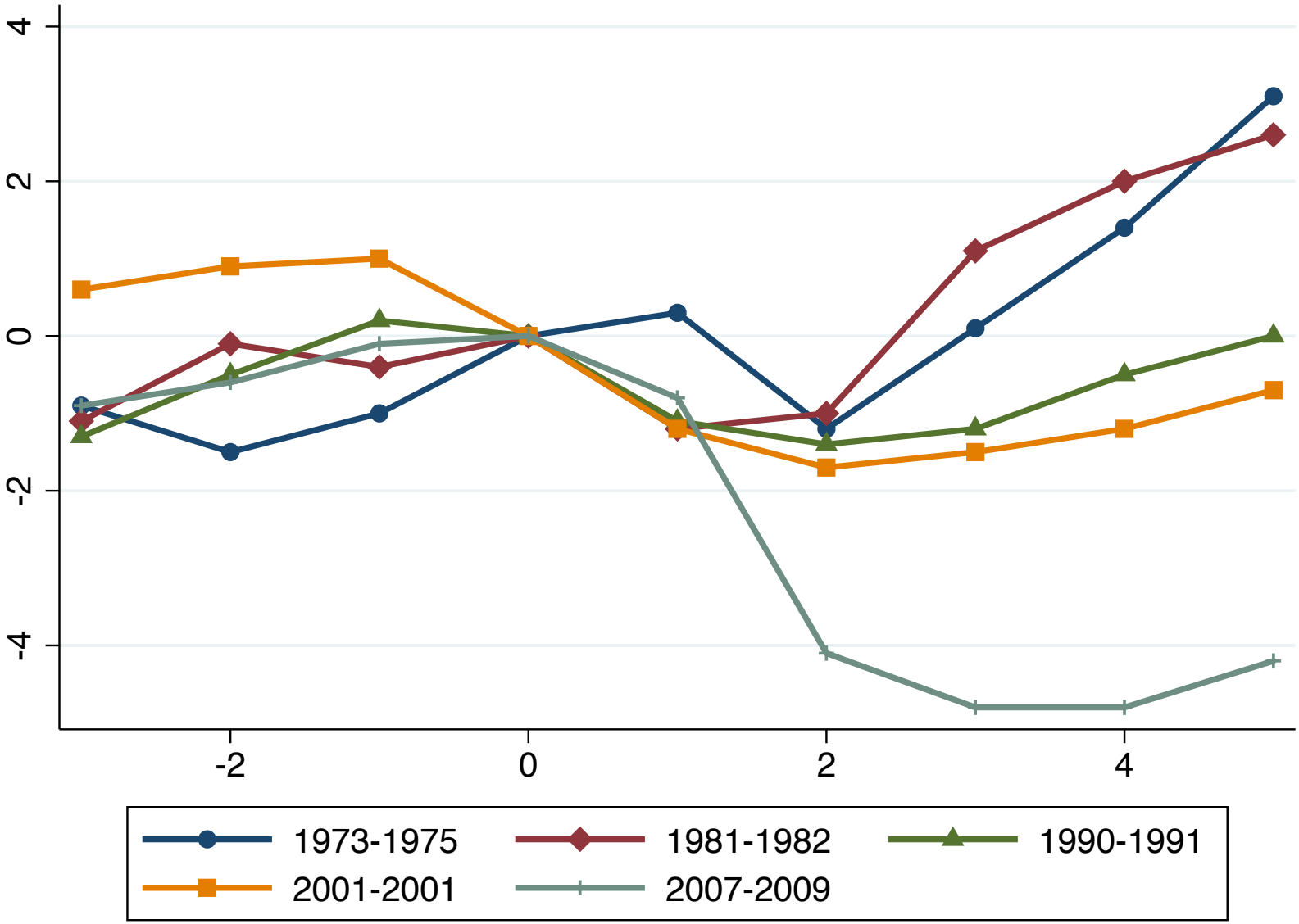
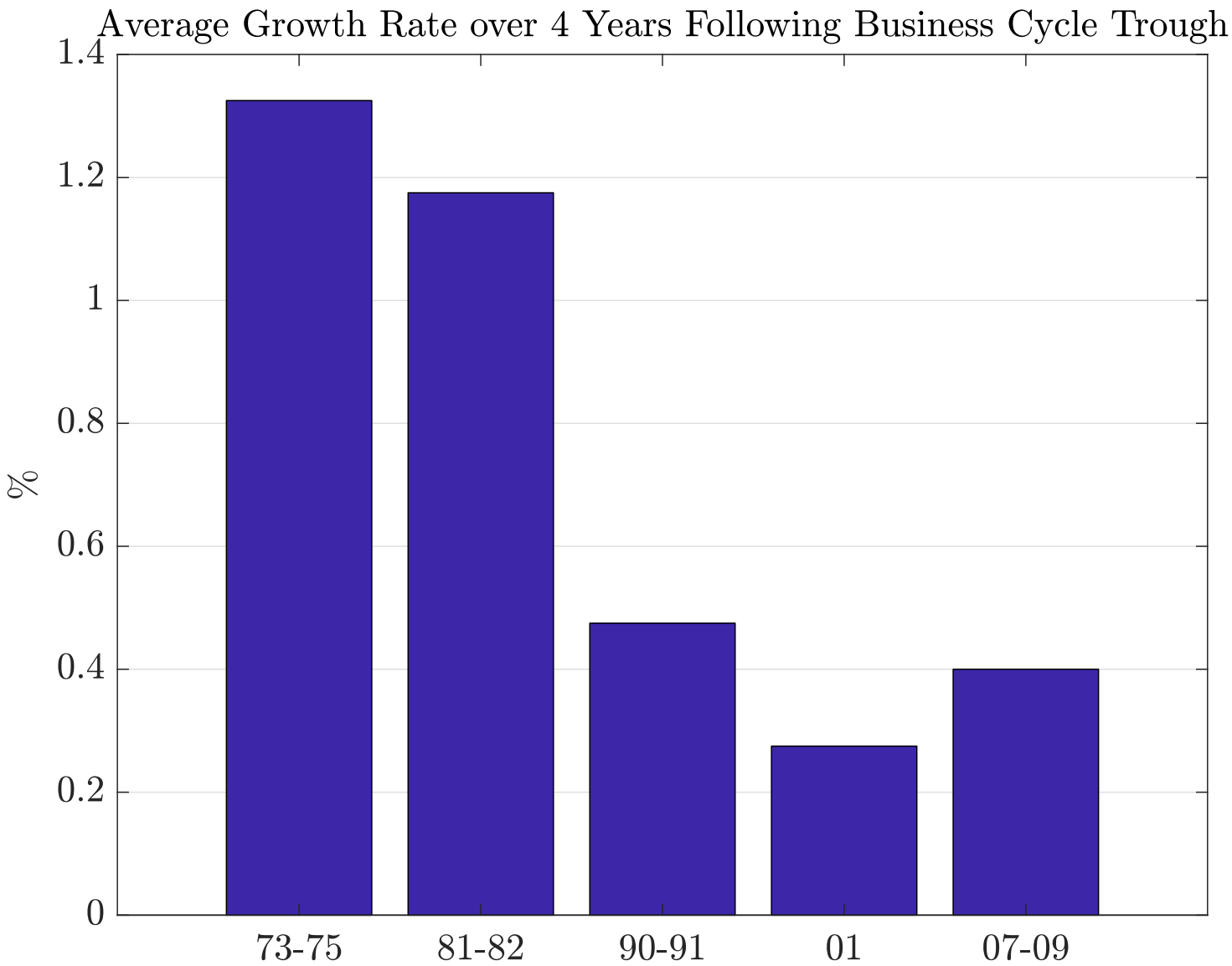
Slow Recoveries: Prime Age Employment

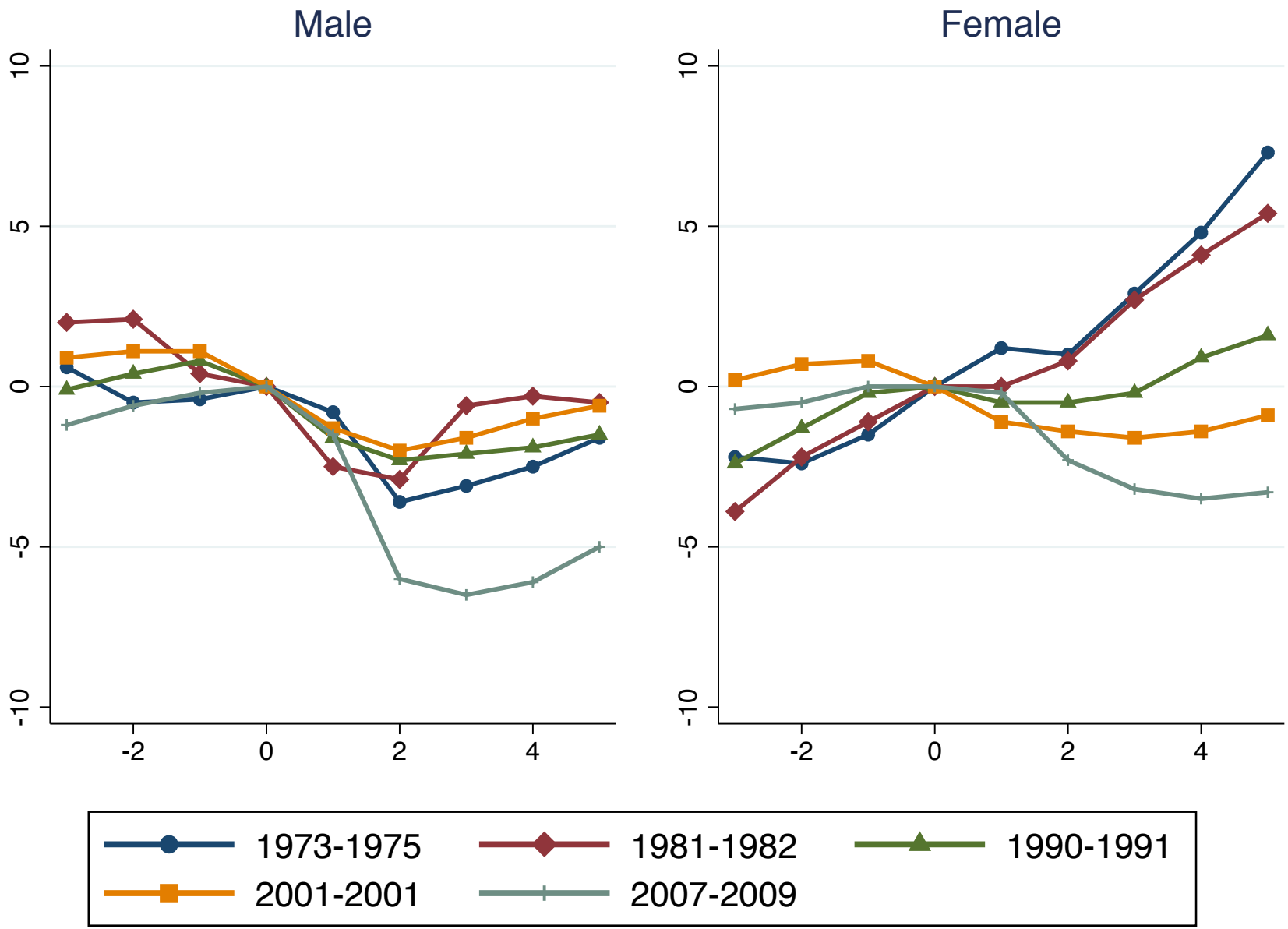


Slow Recoveries

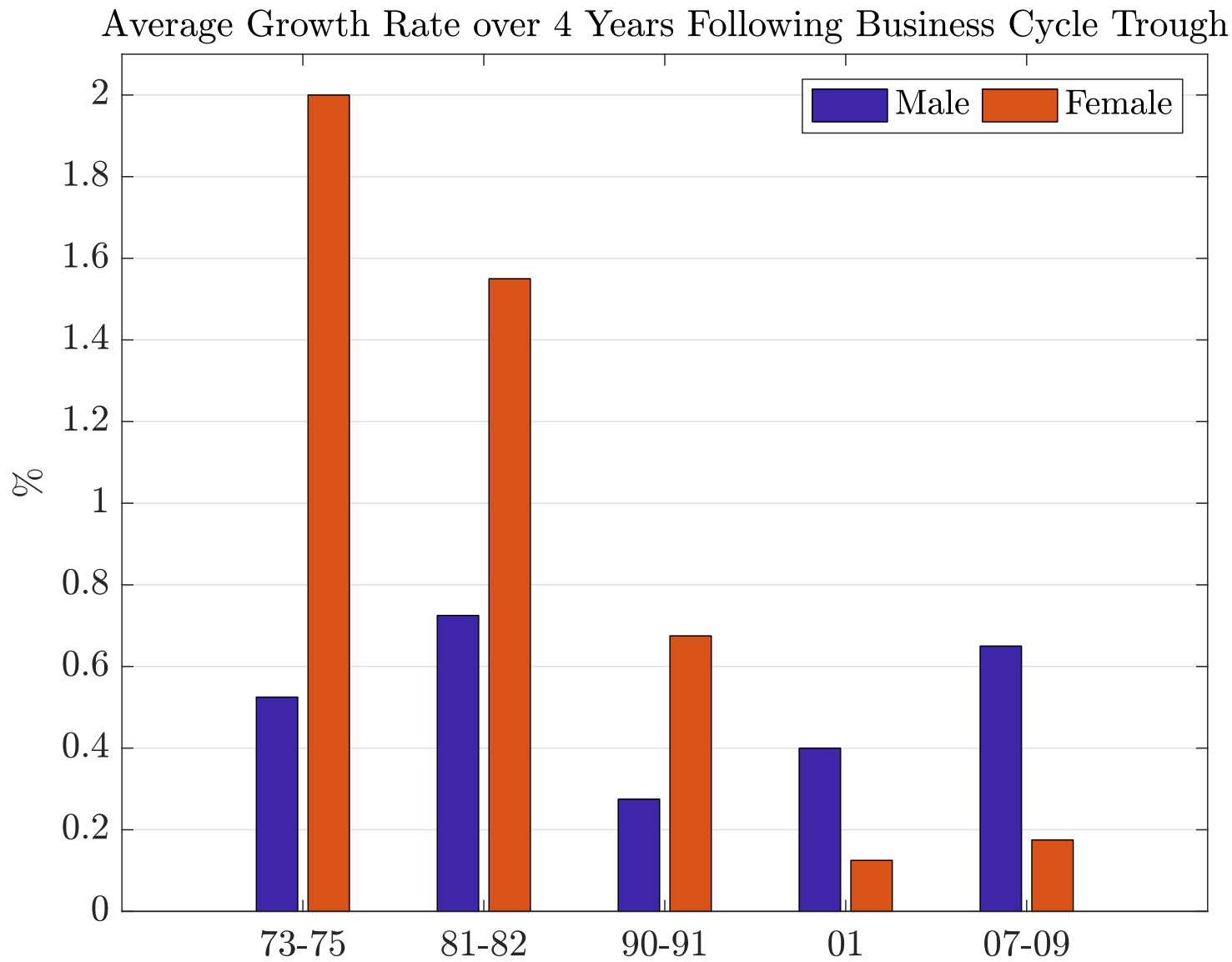


Table

Slow Recoveries: Men versus Women



Five Recessions: Prime Age Employment



Table

Do Women Play a Key Role?

Strikingly different patterns for men vs. women:

- For men, recoveries have been slow since (at least) the 1970's
- For women, recoveries were fast and have slowed sharply

Do Women Play a Key Role?

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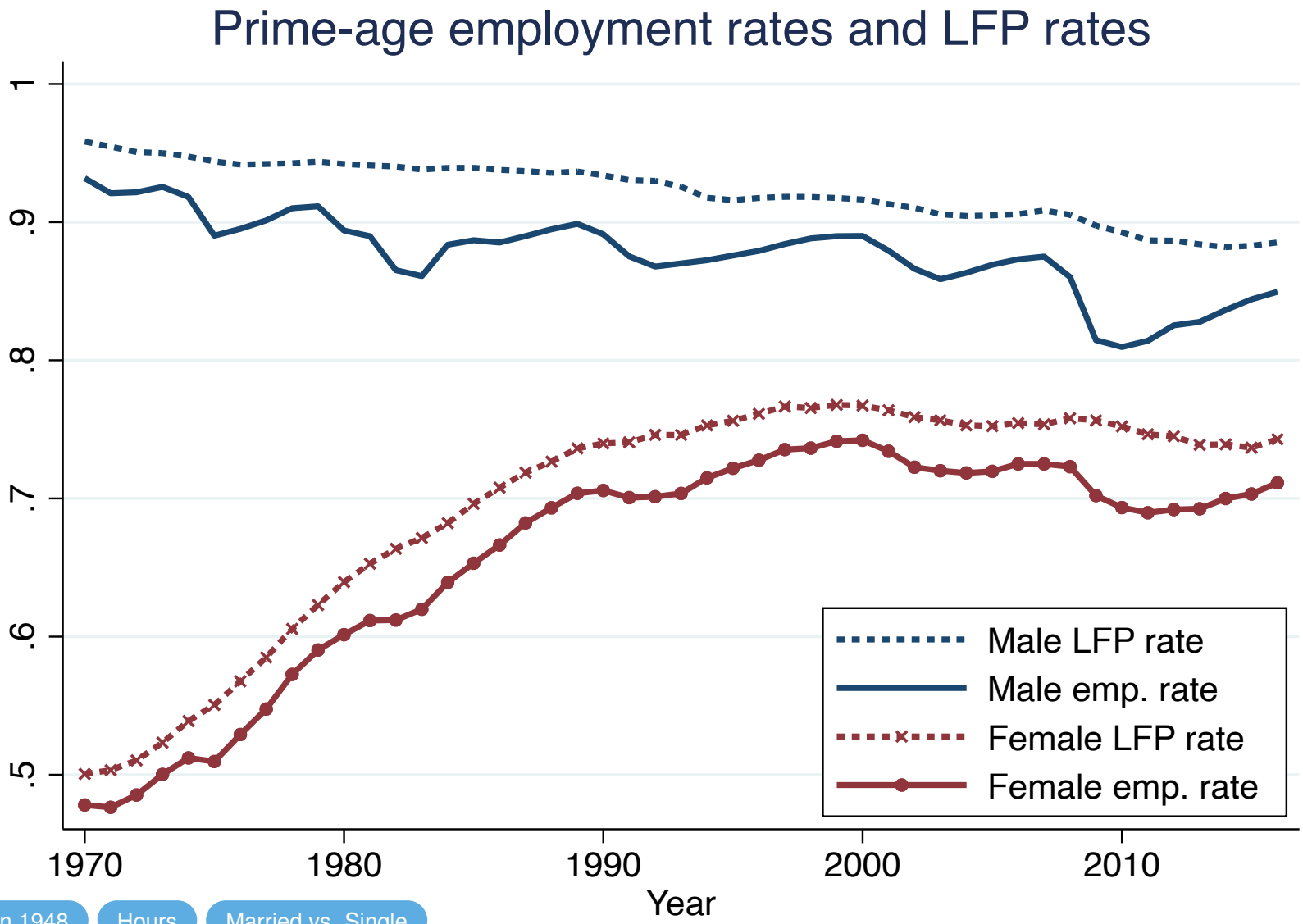
20th century saw a "Grand Gender Convergence" (Goldin 06, 14):

- Rate of convergence peaked for employment in 1970s
- Has slowed sharply since, to virtual plateau after 2000

Female Employment Converging to Male



Starting in 1948 | Hours | Married vs. Single

Jobless Recoveries Due to Changing Trends?

- If you superimpose a recovery on an upward trend, it will look fast
- If you superimpose a recovery on a downward trend, it will look slow

- Rapid rise in female employment in 1970s-80s may have contributed to fast recoveries
- Slower growth of female employment since 1990 may have contributed to slower recoveries

(Juhn-Potter 06, Albanesi 17, Kreuger 17, CEA 17)

Accounting vs. Economics

- Gender Revolution is a big macro shock
- Can't assume that all else is held constant
  - Entry of women may have affected men
  - Accounting exercise assumes zero effect on men
- Magnitude of GE effects crucial in determining whether gender convergence can explain slowing overall recoveries

Crowding Out as a Sufficient Statistic

- Identity:

$$L = \frac{1}{2} L_f + \frac{1}{2} L_m$$

- Effects of a "female-biased shock":

$$\frac{dL}{d\theta} = \frac{1}{2}\frac{dL_f}{d\theta} + \frac{1}{2}\frac{dL_m}{d\theta}$$

$$\frac{dL/d\theta}{dL_f/d\theta} = \underbrace{\frac{1}{2}}_{\text{Accounting}} + \frac{1}{2}\underbrace{\frac{dL_m/d\theta}{dL_f/d\theta}}_{\text{Crowding Out}}$$

- Effect of Gender Revolution on total employment differs from accounting exercise by crowding out

What We Do: Empirics

- Estimate *regional* crowding out using evidence from US states
  - Identification challenge: "gender-neutral" shocks
- Instrument for female-biased shocks using:
  - Gender gap in 1970
  - "Job Opportunity Index"
- Find that regional crowding out is small
  - Declining male employment is not women's fault

What We Do: Theory

- Relate regional to aggregate crowding out
  - Develop quantitative theoretical model with multiple regions
  - Crucial feature: home production
- Counterfactual exercise:
  - How would recent recoveries look different if rate of female convergence had not slowed since 1970s?
  - Explains 60-75% of slowdown in recoveries

Related Literature

- Huge literature on other explanations for slow recoveries
- Role of women in slow recoveries

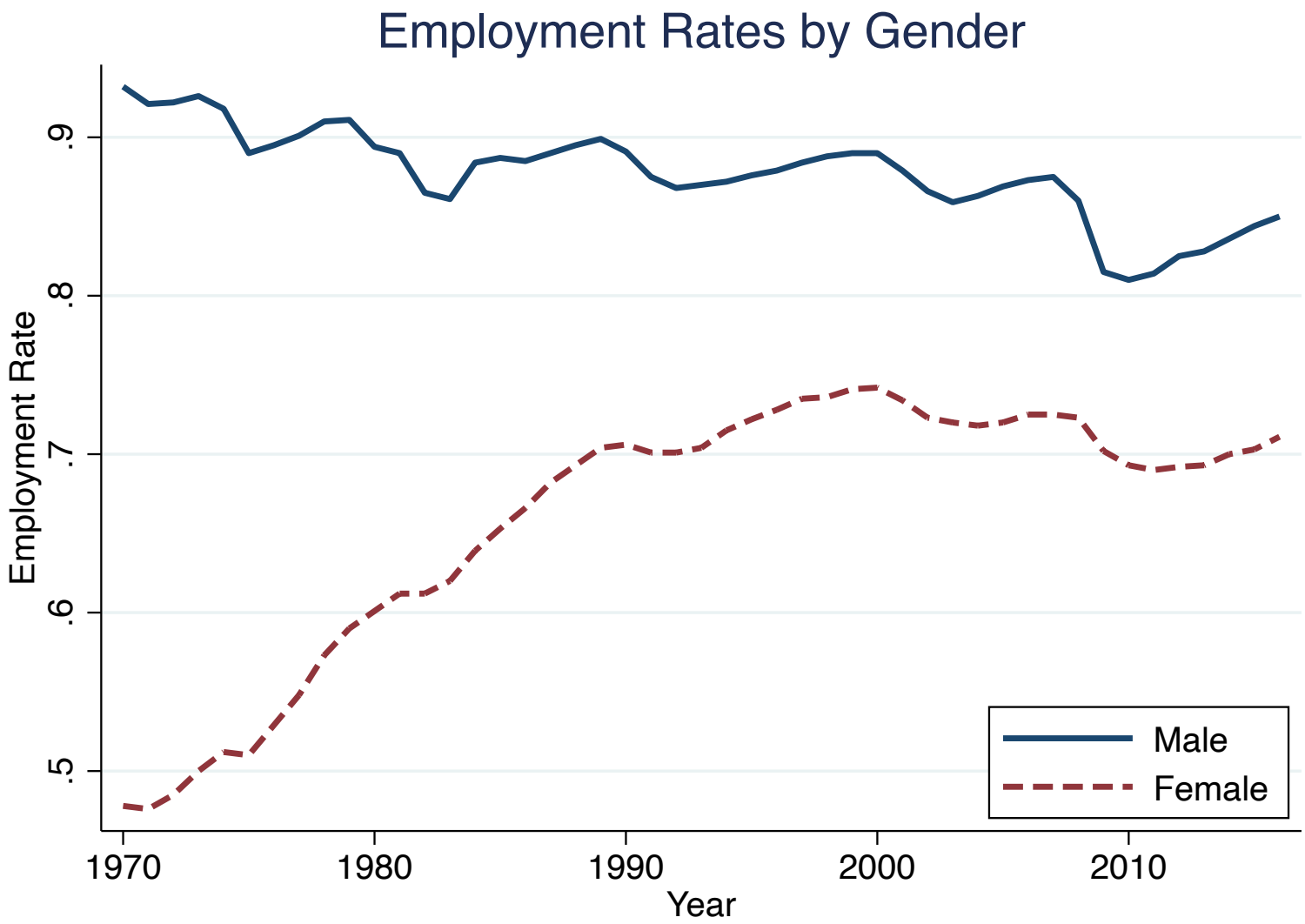
  (Juhn-Potter 06, Albanesi 17, Krueger 17, CEA 17)
- Family labor supply (McGrattan-Rogerson 08; Knowles 13; Jones-Manuelli-McGrattan 15; Heathcoate-Storesletten-Violante 17)
  - However, we force our model to fit estimated "crowding out"
- Empirical evidence:
  - Crowding out (Acemoglu-Auto-Lyle 04, Blank-Gelbach 06)
  - Gender Revolution (Goldin-Katz 02 and many others)

The Gender Revolution in Employment

Data

- The main data we use come from the Census, ACS, and CPS.
- Main variable: Employment-to-population ratio.
- Focus on prime age workers (aged 25-54)
- Sample period: 1970-2016
- Aggregate and state level data by gender.

The Gender Revolution in Employment



Simple Statistical Model of Convergence

Define gender gap as:

$$gap_t = epop_t^F - epop_t^M$$

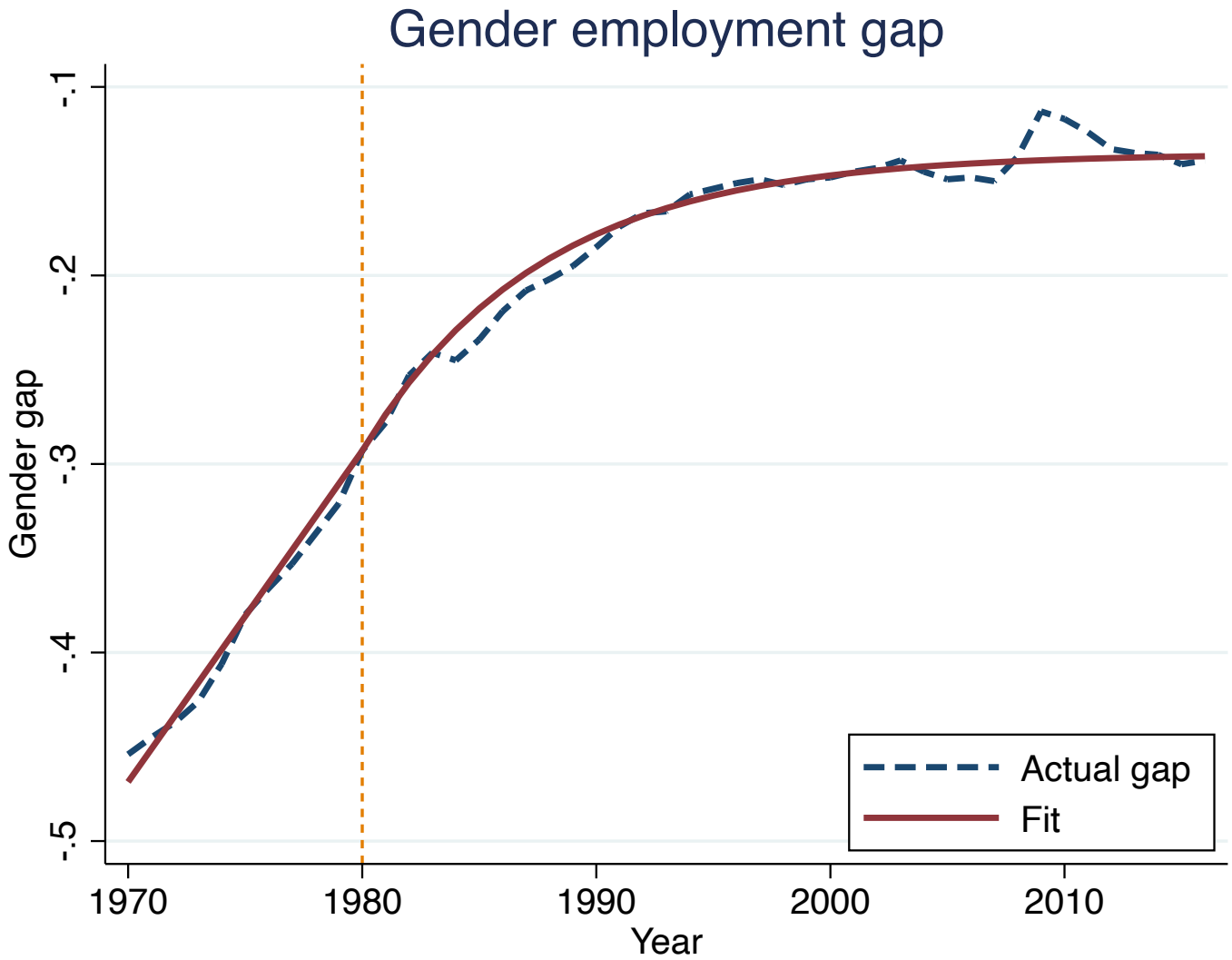
- Post-1980: Model closing of gender gap as AR(1) with a constant:

$$gap_t = \alpha + \beta gap_{t-1} + \epsilon_t$$

  - β governs speed of convergence
  - $\alpha/(1-\beta)$ represents permanent gap

- 1970-1980: Extend backward linearly

Gender Gap: Actual vs. AR(1)



$\beta = 0.88$ and $\alpha/(1-\beta) = -0.135$

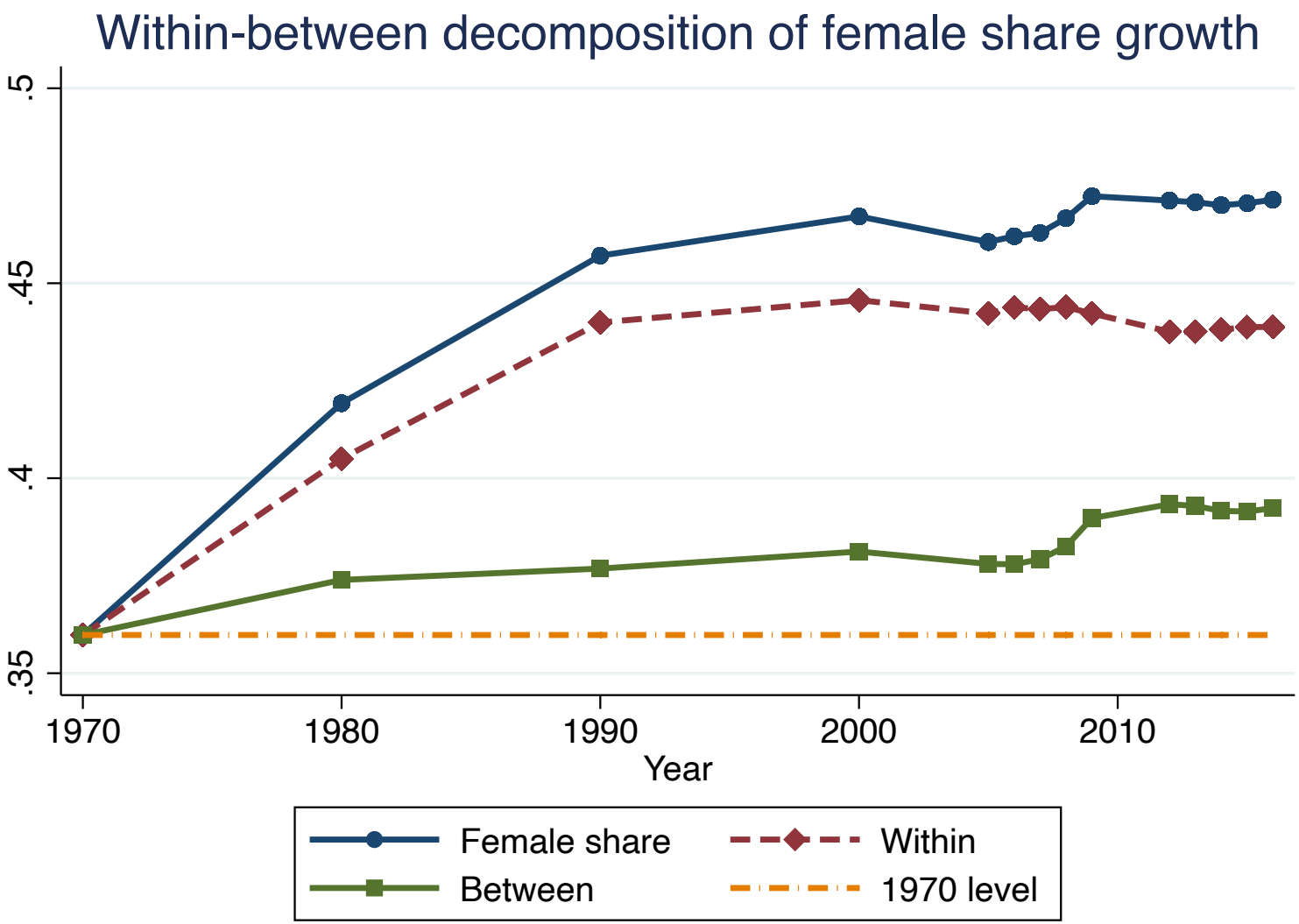
Regression Table | Within Skill | Marital Status

Gender Share: Between vs. Within Analysis

$$\Delta\alpha = \underbrace{\sum_{\omega} \bar{v}(\omega)\,\Delta\alpha(\omega)}_{\text{within}} + \underbrace{\sum_{\omega} \Delta v(\omega)\,\bar{\alpha}(\omega)}_{\text{between}},$$

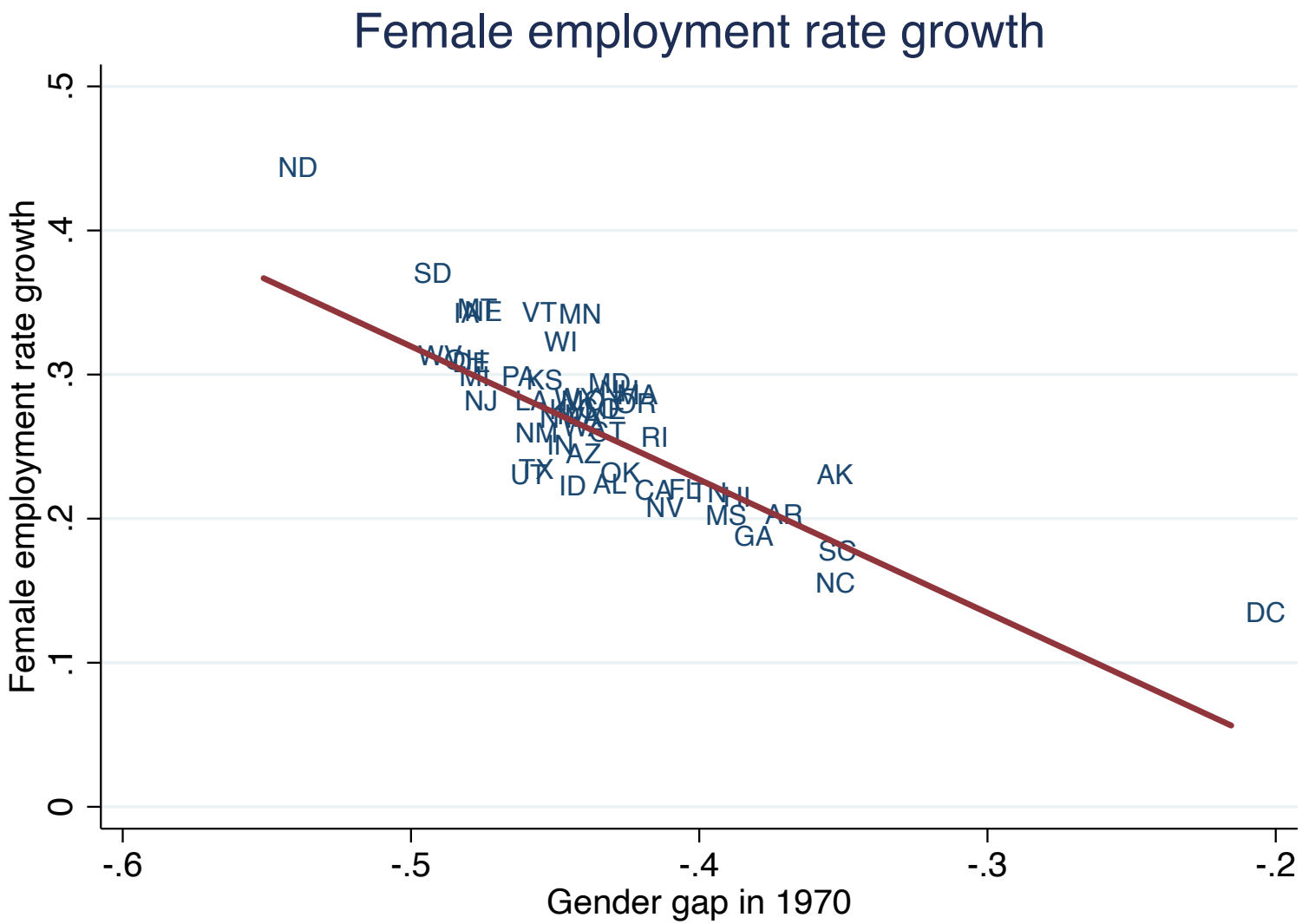
- α: female share
- $\alpha(\omega)$: female share in occupation ω
- $v(\omega)$: occupational employment share

Gender Share: Between vs. Within Analysis



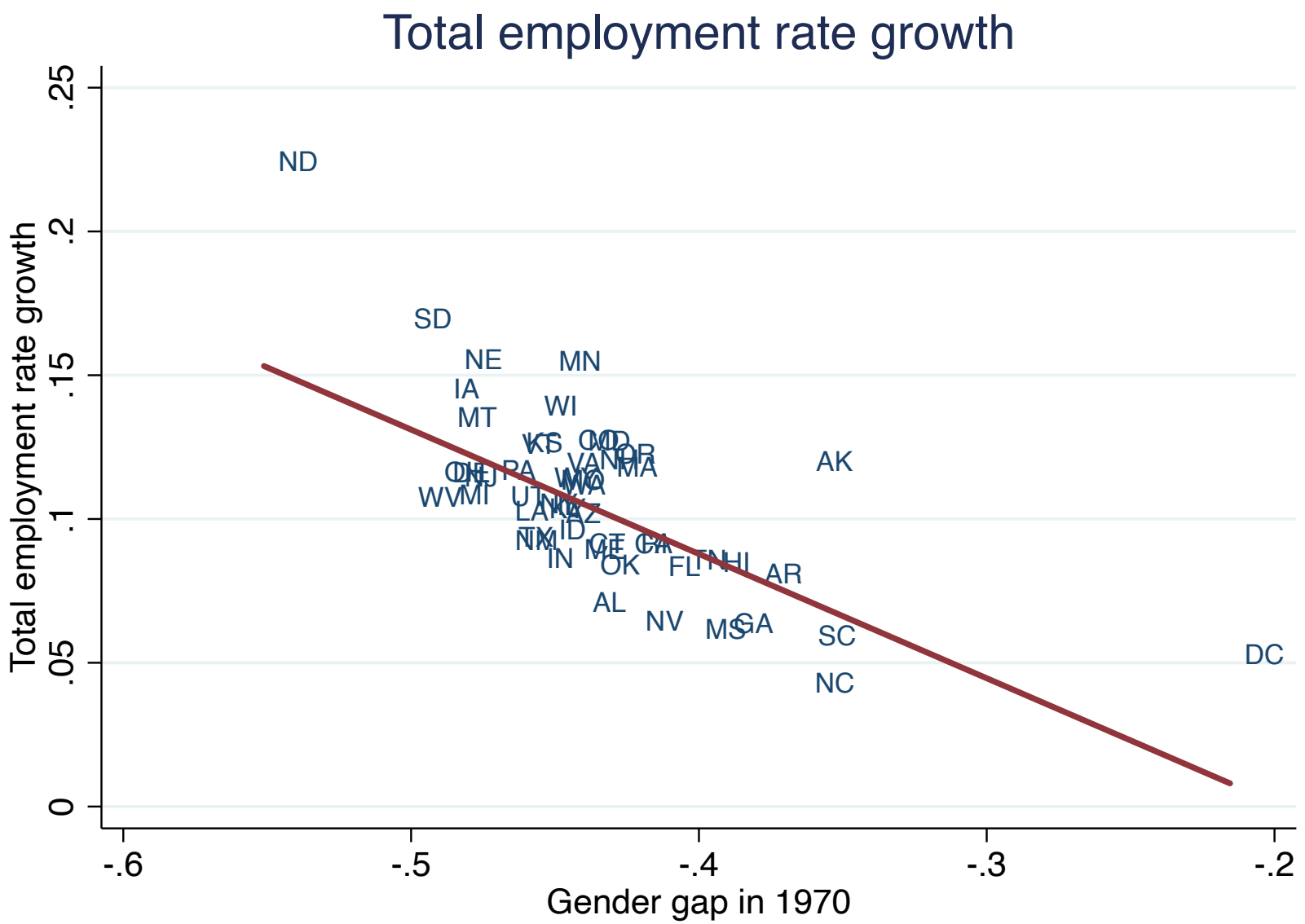
Cross-State Evidence on Crowding Out

Female Employm. Growth vs. 1970 Gender Gap



Male Employment Growth vs 1970 Gender Gap

Total Employment Growth vs. 1970 Gender Gap



CZ

IV Estimates of Crowding Out

- Want to estimate:

$$\Delta epop_i^M = \alpha + \beta \Delta epop_i^F + X_i' \gamma + \epsilon_i$$

- Challenges:
  - Cross-sectional vs. aggregate variation
  - Gender-neutral shocks (bias toward less crowding out)

Empirical strategy: Instrument for female-biased shocks

Instruments for Female-Biased Shocks

1. Gender gap in 1970
   - 1970 gender gap (exploit cross-state convergence)
   - Differences out gender-neutral business cycle shocks
2. "Job Opportunity Index" instrument
   (Nakamura, Nakamura and Cullen, 1979)
   - Shift-share instrument

1970 Gender Gap

	Gender gap growth		Female emp. rate growth	
	(1)	(2)	(3)	(4)
Gender gap in 1970	-0.991	-1.060	-0.925	-0.900
	(0.135)	(0.101)	(0.174)	(0.0834)
Skill premium in 1970		0.00402		-0.0483
		(0.0527)		(0.0411)
Log per-capita GDP in 1970		-0.0115		0.0156
		(0.0266)		(0.0271)
Non-white share in 1970		-0.0590		-0.120
		(0.0308)		(0.0292)
Bartik shock		0.0417		-0.0149
		(0.0896)		(0.0821)
Singles share in 1970		1.338		1.284
		(0.241)		(0.228)
Sectoral controls		✓		✓
Obervations	51	51	51	51
Adjusted R^2	0.687	0.739	0.659	0.827

JOI Instrument

$$JOI_{i,1970} = \sum_{\omega} \alpha_{-i,1970}(\omega)\pi_{i,1970}(\omega)$$

- ω: occupation
- $\alpha_{-i,1970}(\omega)$: National (leave-out) female share of ω
- $\pi_{,1970i}(\omega)$: local occupational share of ω

IV Regression

	Panel A. Δ(Male Employment)			
	2SLS (gap)		2SLS (JOI)	
Δ(Female Employment)	-0.07	-0.18	0.04	0.06
	(0.11)	(0.08)	(0.13)	(0.11)
Controls		✓		✓
	Panel B. Δ(Total Employment)			
	2SLS (gap)		2SLS (JOI)	
Δ(Female Employment)	0.47	0.45	0.50	0.53
	(0.05)	(0.04)	(0.05)	(0.05)
Controls		✓		✓
Observations	51	51	51	51
First-stage F stat	28.20	116.51	23.05	26.52

Crowding Out is Small (across states)

- 1 percentage point increase in female employment rate leads to (at most) 0.18 percentage point decrease in male employment rate
- 1 percentage point increase in female employment rate leads to (at least) 0.45 percentage point increase in total employment rate

- Results very similar excluding DC

Threats to Identification

Key Identifying assumption:

- Instruments do not predict gender neutral shocks
- Threat: Positive gender-neutral shocks obscure large crowding-out

No "smoking guns":

- No differential pre-trends in 1960s
- "Usual suspects" not correlated with initial gap
  (Initial GDP, service sector share, China shocks etc.)
- Not just mean reversion
  (Initial gender gap positively corr. with initial male emp.)
- Petterson et al. (2021): Bounding argument

Pre-trends | Correlation | Male EPOP vs GAP in 1970 | China shock vs GAP in 1970

Crowding Out: Theory

Crowding Out: Simple Model

- Households made up of couples
- Men and women work in the market or enjoy leisure

  (No home production for now)
- Static model with competitive labor and product markets
- Female-biased shocks drive gender convergence

Production

Production function:

$$y = A(L_m + \theta_f L_f).$$

Shocks

- Gender-neutral productivity shock A
- Female biased productivity shock θ_f

Female biased shock:

- Female biased technical change (e.g., rise of services)
- Reduction in discrimination against women
  - Discrimination is modeled as men refusing to work with/promote women in the workplace. This makes women less productive

Gender Revolution: Supply or Demand

Household Preferences

- Preferences of representative household in region i:

$$U(C, L_m, L_f) = \frac{C^{1-\psi}}{1-\psi} - \frac{1}{\chi_m}\frac{L_m^{1+\nu^{-1}}}{1+\nu^{-1}} - \frac{1}{\chi_f}\frac{L_f^{1+\nu^{-1}}}{1+\nu^{-1}}$$

  - ψ controls wealth effect.
  - ν is Frisch elasticity of labor supply
- L_m and L_f: employment rates (not hours)
  - Heterogeneous disutility of labor in the background (Gali 11)

Employment rate microfoundation

Effect of Female-Biased Shock

$$\frac{d \log L_f}{d \log \theta_f} = \underbrace{\nu}_{\text{substituition effect}} \underbrace{-\frac{(1+\nu)\nu\psi}{1+\nu\psi}\Lambda_f}_{\text{income effect}}$$

$$\frac{d \log L_m}{d \log \theta_f} = \underbrace{-\frac{(1+\nu)\nu\psi}{1+\nu\psi}\Lambda_f}_{\text{income effect}}$$

- Λ_f denotes the fraction of income earned by women
- Men "crowded out" due to income effect.

Crowding Out in Simple Model

Crowding out:

$$\epsilon^{agg} \equiv \frac{\frac{dL_m}{d\theta_f}}{\frac{dL_f}{d\theta_f}},$$

With "balanced growth preferences" ($\psi = 1$):

$$\epsilon^{agg} = -\theta_f = \frac{w_f}{w_m}.$$

- Crowding out = -1 if women are equally productive as men!
- Reasonable calibration: -0.8
- Totally inconsistent with empirical estimates

Adding Home Production by Women

- Production function for women at home:

$$y_h = A\omega L_h(\omega)$$

- Women differ in productivity at home $\omega \sim G(\omega)$
- Women with $\omega > \theta_f$ work at home
- Increase in θ_f shifts women from home sector to market sector (Consistent with time use data)
- Preferences:

$$U = \frac{(c + c^h)^{1-\psi}}{1-\psi} - \frac{1}{\chi_m}\frac{L_m^{1+\nu^{-1}}}{1+\nu^{-1}} - \frac{1}{\chi_f}\int_{\underline{\omega}}^{\theta_f} \frac{L_f(\omega)^{1+\nu^{-1}}}{1+\nu^{-1}} dG(\omega) - \frac{1}{\chi_f}\int_{\theta_f}^{\bar{\omega}} \frac{L_f^h(\omega)^{1+\nu^{-1}}}{1+\nu^{-1}} dG(\omega),$$

Employment rate microfoundation

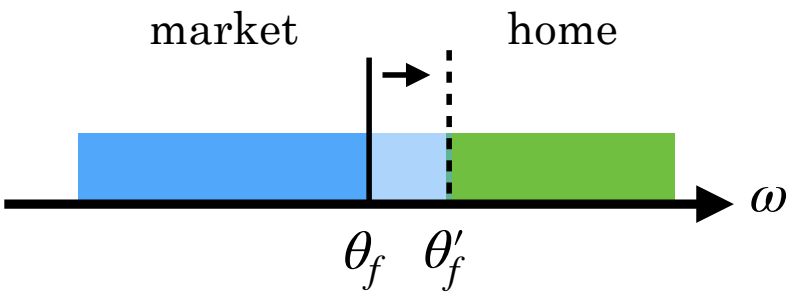
Crowding Out with Home Production

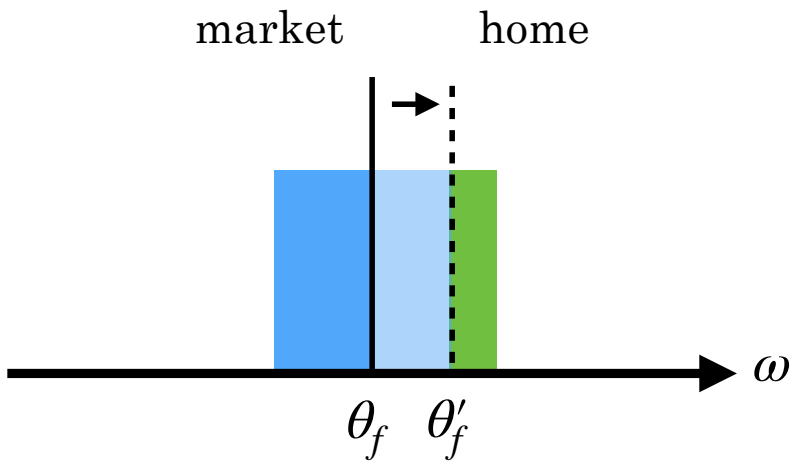
$$\frac{d \ln L_f}{d \ln \theta_f} = \underbrace{\nu}_{\text{substituition effect}} \underbrace{- \frac{(1+\nu)\nu\psi}{1+\nu\psi} \Lambda_f}_{\text{income effect}} + \underbrace{\frac{g(\theta_f)}{G(\theta_f)} \theta_f}_{\text{switching effect}}$$

$$\frac{d \ln L_m}{d \ln \theta_f} = \underbrace{- \frac{(1+\nu)\nu\psi}{1+\nu\psi} \Lambda_f}_{\text{income effect}}$$

- Λ_f denotes the fraction of household income earned by women **in the market**
- Size of crowd-out smaller with home production because:
  - Switching effect raises female response
  - Female market income less important (Λ_f smaller)

Switching Effect





Crowding Out with Home Production

Calibration:

- $\psi = 1.12$ (income effect slightly strong than substitution effect)
- $\chi_m = \chi_f = 1$
- θ_f to match $L_f/L_m = 0.7$
- $\omega \sim U[\bar{\omega} - \delta, \bar{\omega}]$. δ controls the strength of switching effect
- $\bar{\omega} = 1.38$ to match the home production to GDP ratio.

	Crowding Out
Without home production	-0.76
With Home production:	
$\delta = 0.4$	-0.02
$\delta = 0.88$	-0.19
$\delta = 1.2$	-0.23

Multi-Region Model

- Extend the previous model to have n regions
- Each region produces a distinct tradable good
- Household consume CES aggregator of all n goods:

$$C_i = \left((c_{ii} + c_i^h)^{\frac{\eta-1}{\eta}} + \sum_{j \neq i} (c_{ij})^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}},$$

  where $\eta > 1$, c_{ij}: tradable market goods, c_i^h: non-tradable home production goods

- $\tau_{ij} > 1$ of iceberg trade costs

Regional Female-Biased Shock

$$\frac{d \log L_{fi}}{d \log \theta_{fi}} = \underbrace{\nu}_{\text{substituition effect}} \underbrace{-\frac{(1+\nu)\nu\psi}{1+\nu\psi}\Lambda_{fi}}_{\text{income effect}} + \underbrace{\frac{g(\theta_{fi})}{G(\theta_{fi})}\theta_{fi}}_{\text{switching effect}} + \underbrace{\frac{\nu(1-\psi)}{1+\nu\psi}\frac{d \log(p_i/P_i)}{d \log \theta_{fi}}}_{\text{terms-of-trade effect}}$$

$$\frac{d \log L_{mi}}{d \log \theta_{fi}} = \underbrace{-\frac{(1+\nu)\nu\psi}{1+\nu\psi}\Lambda_{fi}}_{\text{income effect}} + \underbrace{\frac{\nu(1-\psi)}{1+\nu\psi}\frac{d \log(p_i/P_i)}{d \log \theta_{fi}}}_{\text{terms-of-trade effect}}$$

- Difference between regional and aggregate crowding out due to terms-of-trade effect: $\theta_f^i \uparrow$ implies $p_i/P \downarrow$ implies $w_i/P \downarrow$
- If $\psi < 1$, regional crowd-out larger (substitution effect dominates)
- If $\psi > 1$, regional crowd-out smaller (income effect dominates)
- For ψ close to one, difference small

Terms-of-trade effect

Regional vs. Aggregate Crowding Out

	Crowding Out	
	Aggregate	Regional
Without home production	-0.76	-0.76
With Home production:		
$\delta = 0.4$	-0.02	-0.02
$\delta = 0.88$	-0.19	-0.18
$\delta = 1.2$	-0.24	-0.23

Notes: Calibration for additional parameters: $\eta = 5$, and trade costs τ_{ij} to match 70% of domestic expenditure share.

Business Cycle Model

More General Preferences

Generalization of preferences:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{(C_{it})^{1-\psi}}{1-\psi} - \Theta_{it} v(L_{mit}, L_{fit}, \{L_{fit}^h\}) \right],$$

- where $\Theta_{it} = C_{it}^{-\psi} X_{i,t}^{\psi}$, and $X_{it} = X_{i,t-1}^{1-\gamma} C_{it}^{\gamma}$
- Households take Θ_{it} as given
- Hybrid of Jaimovich-Rebelo 09 and Bopart-Krusell 16
  - Can allow for substantial income effects in the long-run but not the short-run ($\psi > 1$, $\gamma < 1$)

Productivity and Gender Gap

- Gender gap in productivity:
  - Follows AR(1) after 1980:

$$\theta_{f,t+1} = (1 - \rho_f)\bar{\theta}_f + \rho_f \theta_{f,t}$$

  - Extend backward linearly in 1970s:

$$\theta_{f,t+1} = \theta_{f,t} + \Delta_{\theta,70s}$$

Calibration: Crowding Out

- Regional crowding out "almost" sufficient statistic for aggregate crowding out
- Choose δ in model to match $\epsilon^{reg} = -0.18$
  - Simulate model's response to change in $\theta_{fi,t}$
  - Run:

$$\Delta L_{mi} = \alpha + \epsilon^{reg} \Delta L_{fi} + \epsilon_i,$$

on model-generated data

Size of Shocks

Calibration: Other Parameters

- Standard parameters: $(\sigma, \nu, \beta, \eta) = (1, 1, 0.96, 2)$.
- Long-run parameters:
  - g_A to match long-run real GDP growth rate.
  - ψ to match long-run decline in male labor.
- Female convergence parameters $(\rho_f, \bar{\theta}_f, \Delta_{\theta,70s})$:
  - Directly calibrated from dynamics of L_{mt}/L_{ft} conditional on δ.
- Short-run parameters:
  - Set $\gamma = 0.1$ (middle of the values used in Jaimovich-Rebelo (2009))
  - Choose the path of agg. productivity to match the path of L_{mt}

Family Income | Calibration Detail | parameter

Model Fit

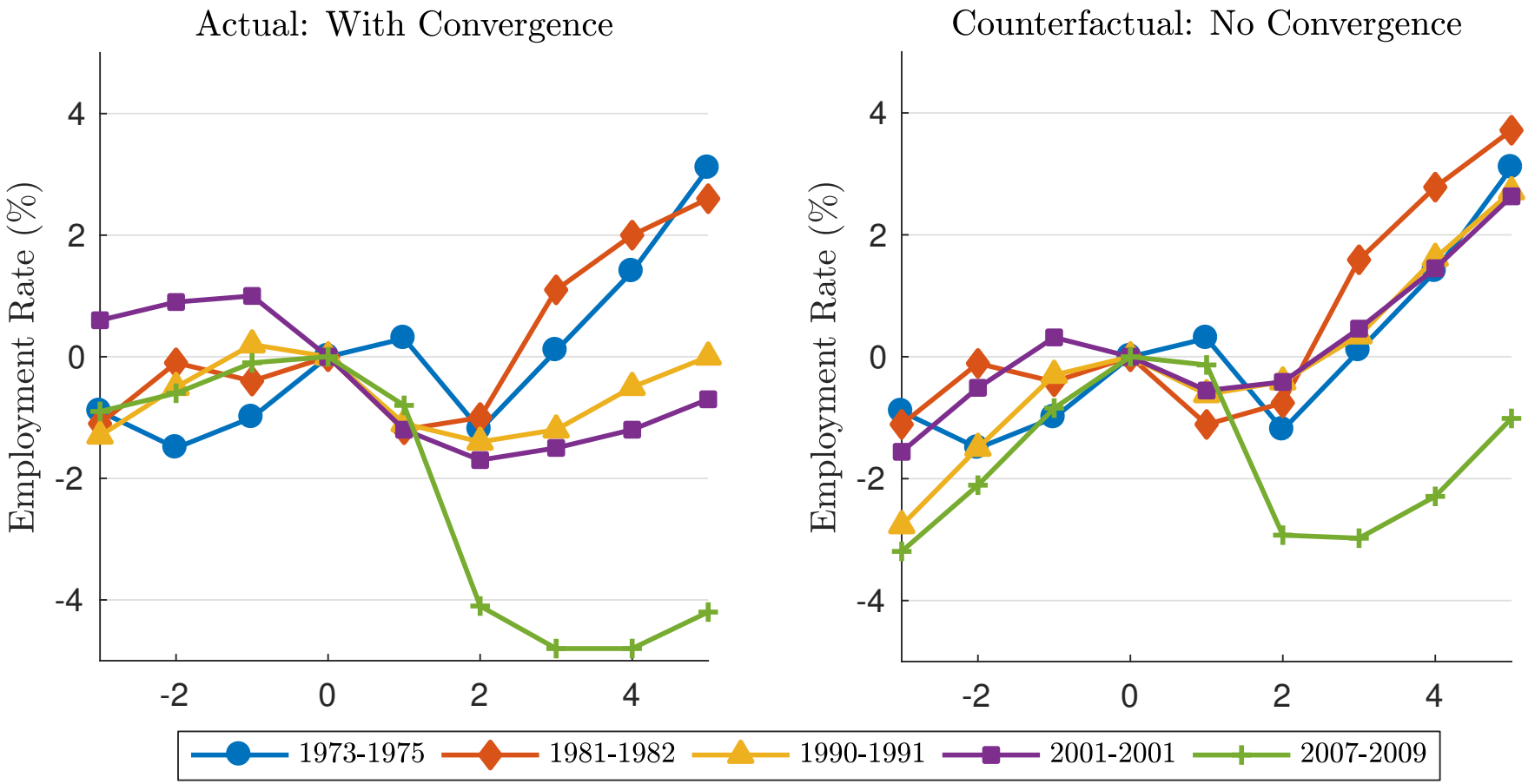

Male and Female Employment Rates (L_m and L_f)
Male
Female
1
0.9
0.8
0.7
0.6
0.5
0.4
1970
1980
1990
2000
2010
Female-to-Male Employment Rates Ratio (L_f/L_m)
0.9
0.8
0.7
0.6
0.5
0.4
Gender-Neutral Productivity ($\log A$)
1.2
1
0.8
0.6
0.4
0.2
0
Female-Biased Productivity (θ_f)
1.15
1.1
1.05
1
0.95
Model
Data

A Counterfactual: No Female Convergence

Counterfactual

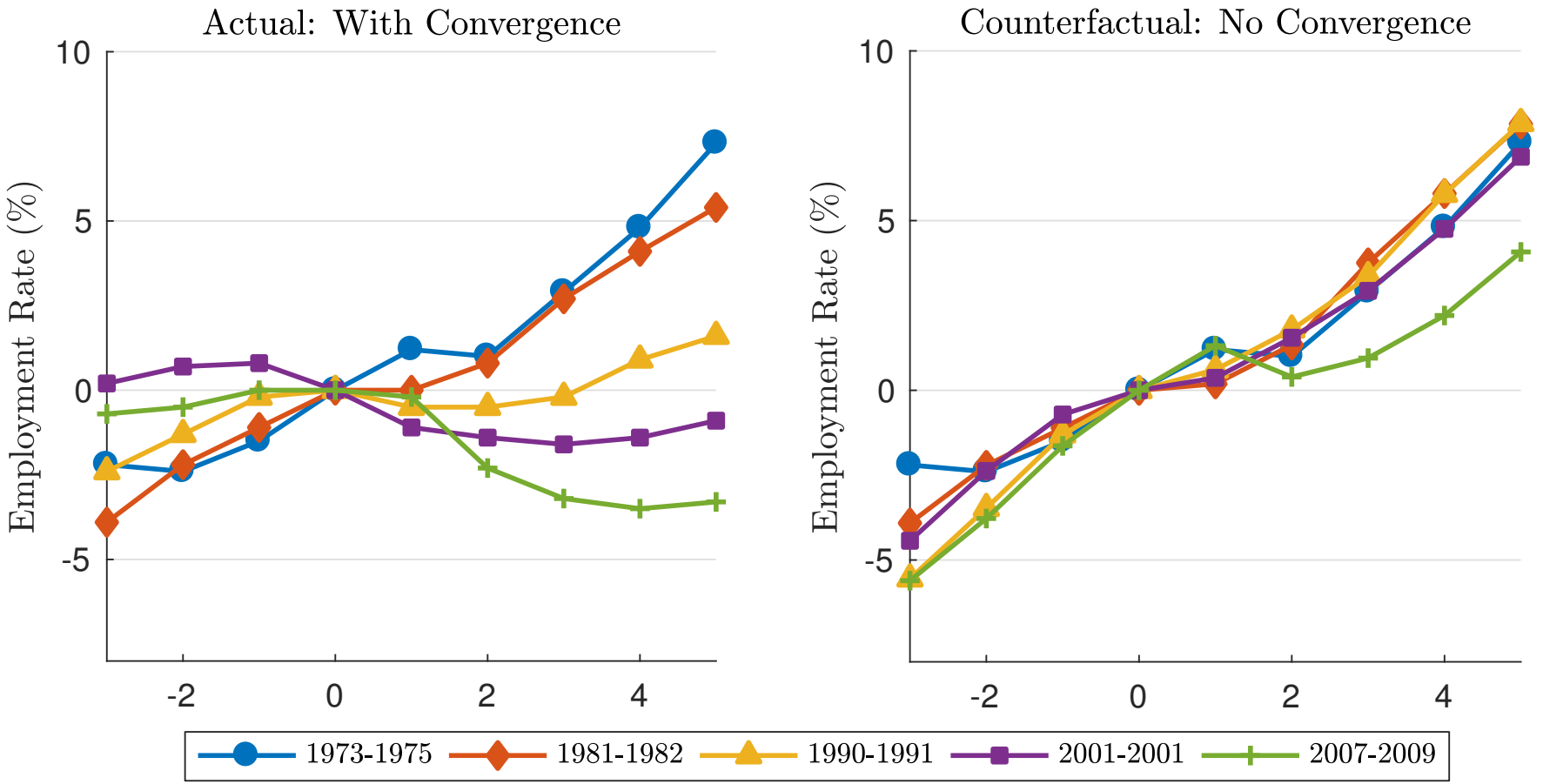
- Assume $\theta_{f,t}$ grows at 1970s rate around each recession in our sample
- What would more recent recoveries have looked like if rapid female convergence of 1970s was still ongoing?

Counterfactual without Female Convergence



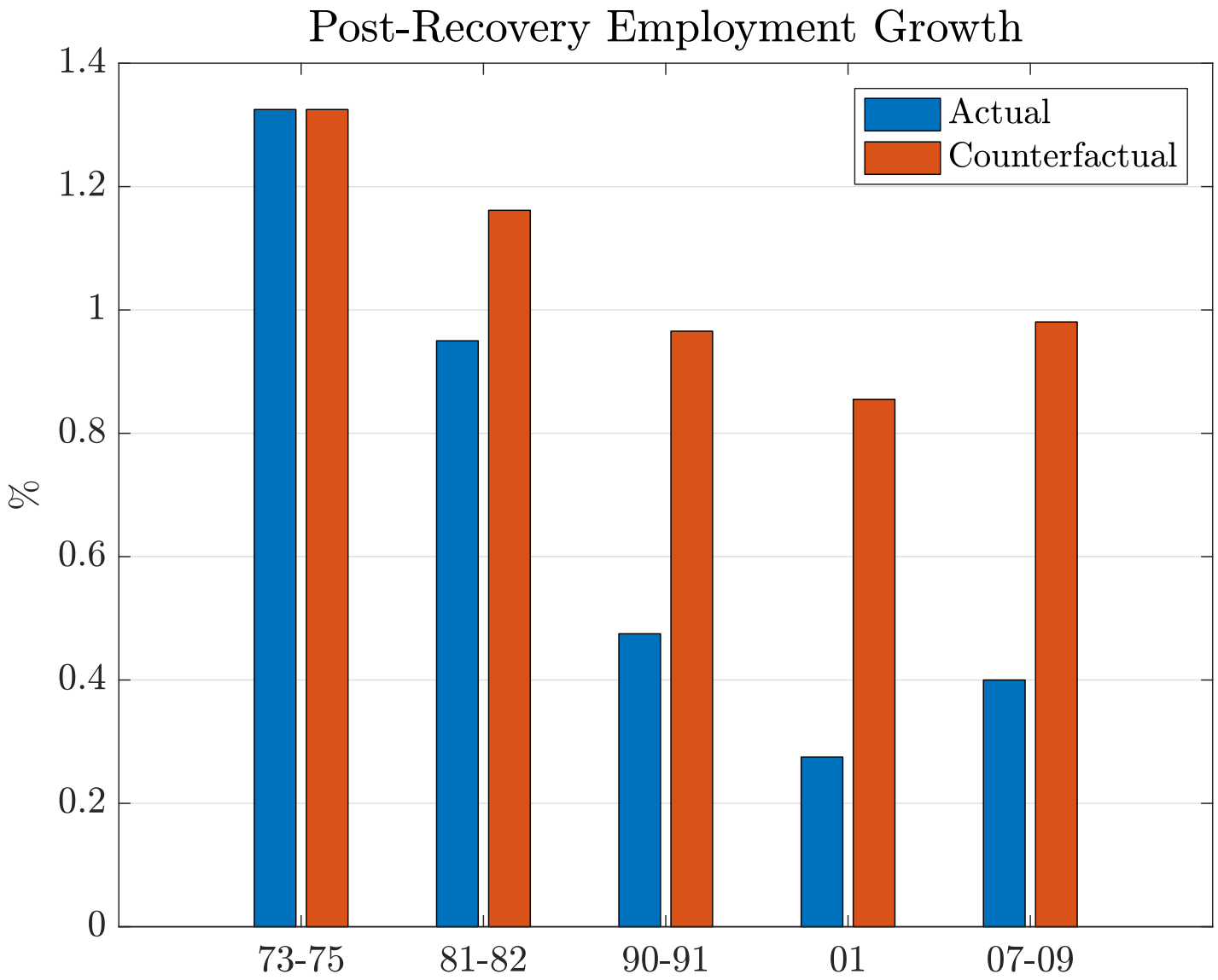
Counterfactual: Assumes θ_f grows at 1970s rate throughout

Counterfactual: Female



Male

Post-Recovery Employment Growth



Actual vs. Counterfactual Growth

	Post-Recovery Employment Rate Growth				
	73-75	81-82	90-91	01	07-09
Actual	1.33%	0.95%	0.48%	0.28%	0.40%
Relative to 1973 Recession	100%	72%	36%	21%	30%
Counterfactual	1.32%	1.16%	0.97%	0.86%	0.98%
Relative to 1973 Recession	100%	88%	73%	65%	74%

- Explains 60% of slowdown
  (75% explained for no crowding out)

Male and Female

Robustness: "Almost" a Sufficient Statistic

	Employment Growth Relative to 1973 Recession				
	1973-75	1981-82	1990-91	2001-01	2007-09
Actual	100%	72%	36%	21%	30%
Benchmark Counterfactual	100%	88%	73%	65%	74%
A. Model extensions					
Female Labor Supply Shocks	100%	89%	77%	69%	79%
Male & Female Labor Imperfect Sub.	100%	87%	71%	63%	72%
+ Home & Market Goods Imperfect Sub.	100%	84%	65%	56%	65%
Leisure Complementarity	100%	88%	74%	66%	76%
Non-Unitary Household	100%	86%	73%	66%	76%
Task-based model	100%	92%	81%	74%	83%
Gender-specific labor supply elasticity	100%	90%	72%	64%	74%
B. Alternative Parameterization					
Balanced Growth Preferences	100%	88%	73%	65%	75%
Weak Income Effects	100%	89%	75%	68%	77%
Low labor supply elasticity	100%	86%	71%	62%	72%
No Habit	100%	88%	73%	65%	74%
Median Income Instead of GDP	100%	88%	73%	65%	74%

Conclusion

- Gender revolution led to dramatic growth in female employment in 1970's, followed by substantial slowdown
- Crowding out sufficient statistic for aggregate effects
- Cross-state analysis suggests crowding out is small!
- Cross-sectional crowding out very informative about aggregate in benchmark model (home production needed to fit facts)
- Can explain 60-75% of slowdown of recoveries

Appendix

Slow Recoveries: Prime Age Employment

Table: Average Growth Rate over 4 Years Following Trough

	Panel A. Prime Age Population				
	73-75	81-82	90-91	01	07-09
Employment Rate	1.32%	1.18%	0.48%	0.28%	0.40%
LFP Rate	0.94%	0.61%	-0.04%	-0.07%	-0.40%
Unemployment Rate	-0.55%	-0.73%	-0.53%	-0.32%	-0.85%
Log Labor Productivity	1.18%	1.73%	1.17%	1.86%	0.77%

Back

Five Recessions: Prime Age Employment

Table: Average Growth Rate over 4 Years Following Trough

	Prime Age Men and Women				
	73-75	81-82	90-91	01	07-09
Emp Rate (Male)	0.52%	0.73%	0.28%	0.40%	0.65%
Emp Rate (Female)	2.00%	1.55%	0.68%	0.12%	0.18%
Unemp Rate (Male)	-0.58%	-0.80%	-0.62%	-0.38%	-1.03%
Unemp Rate (Female)	-0.57%	-0.65%	-0.40%	-0.25%	-0.62%

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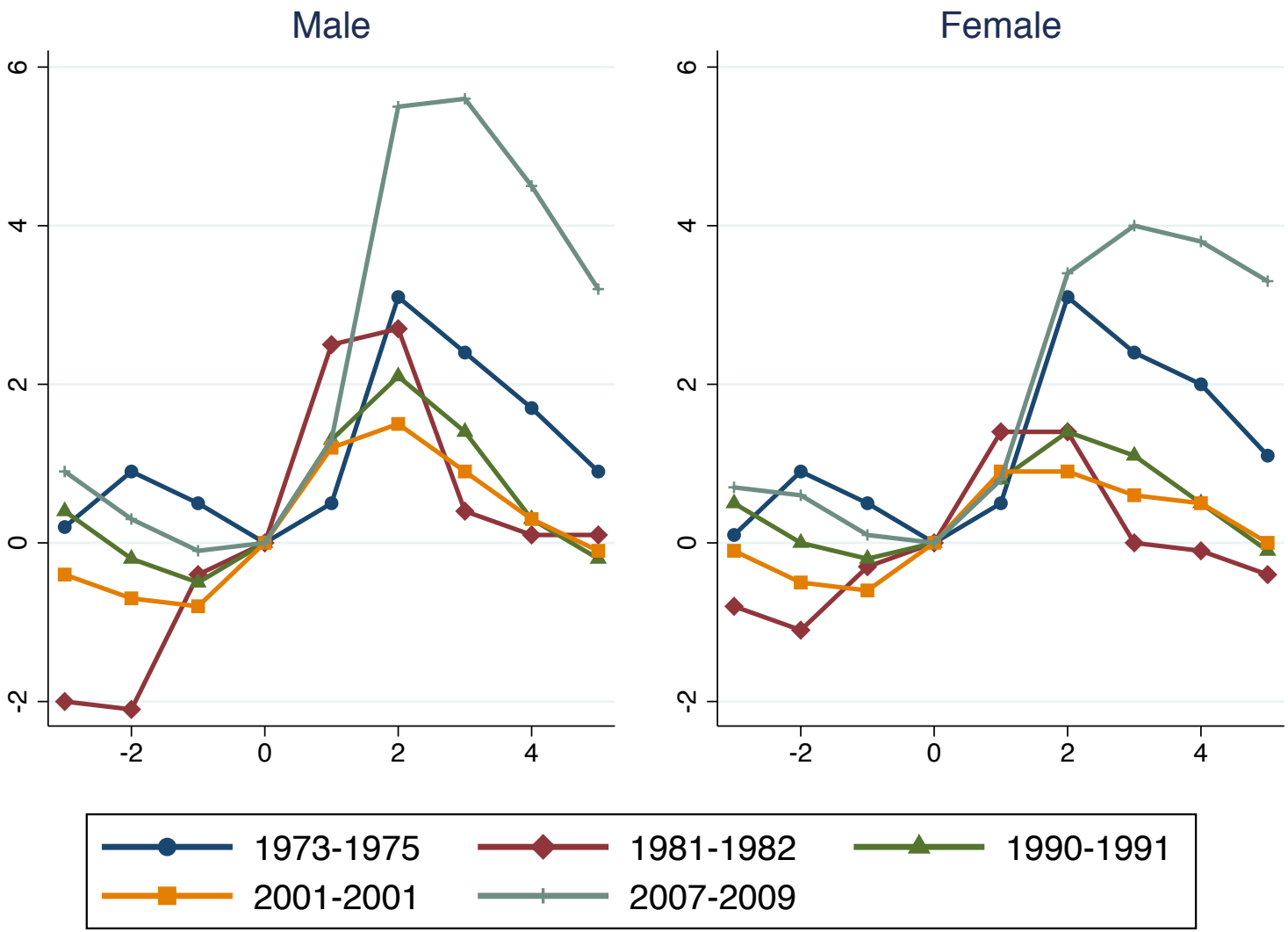
Slow Recoveries: Prime Age Unemployment



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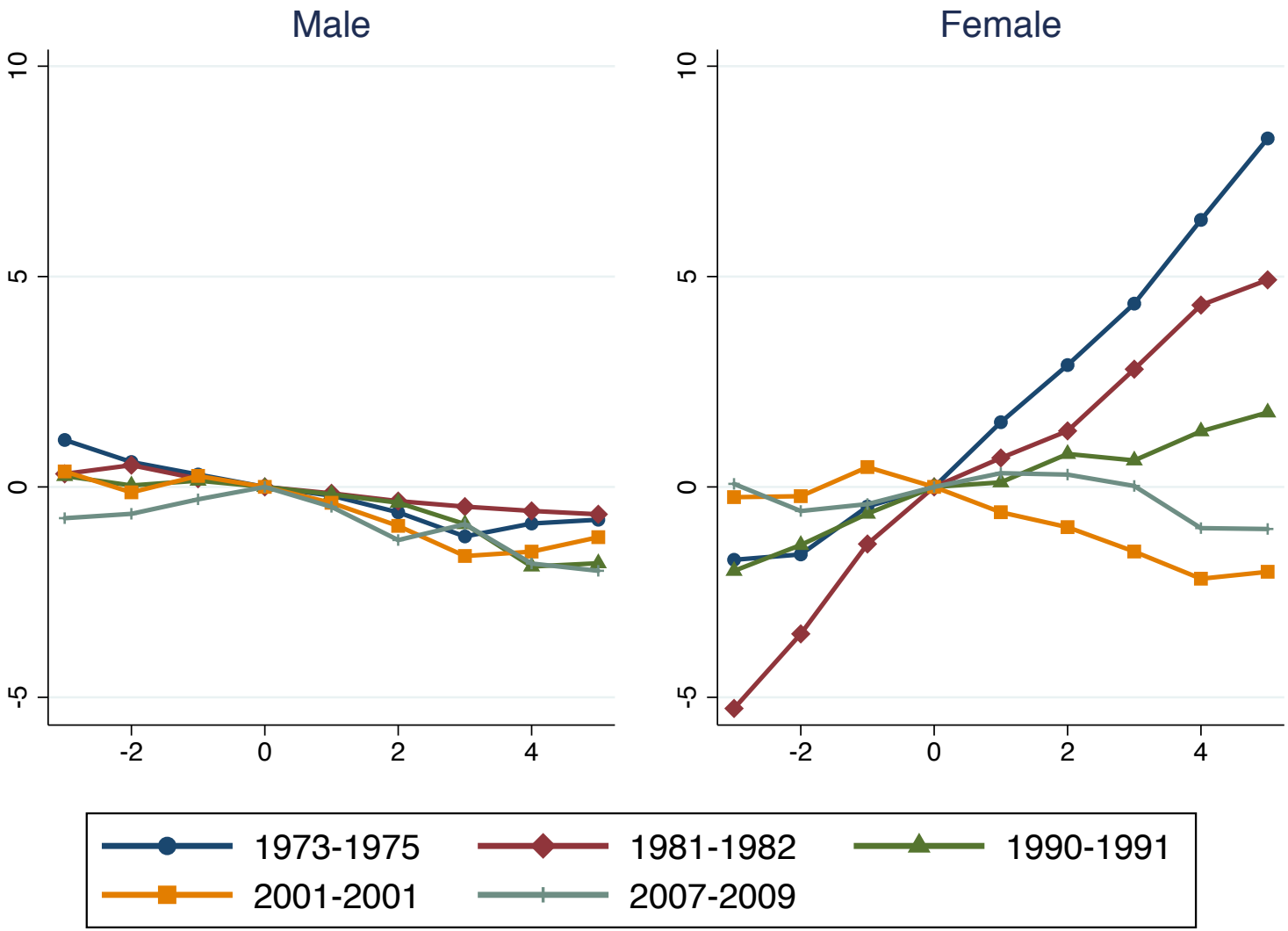
Slow Recoveries: Prime Age LFP



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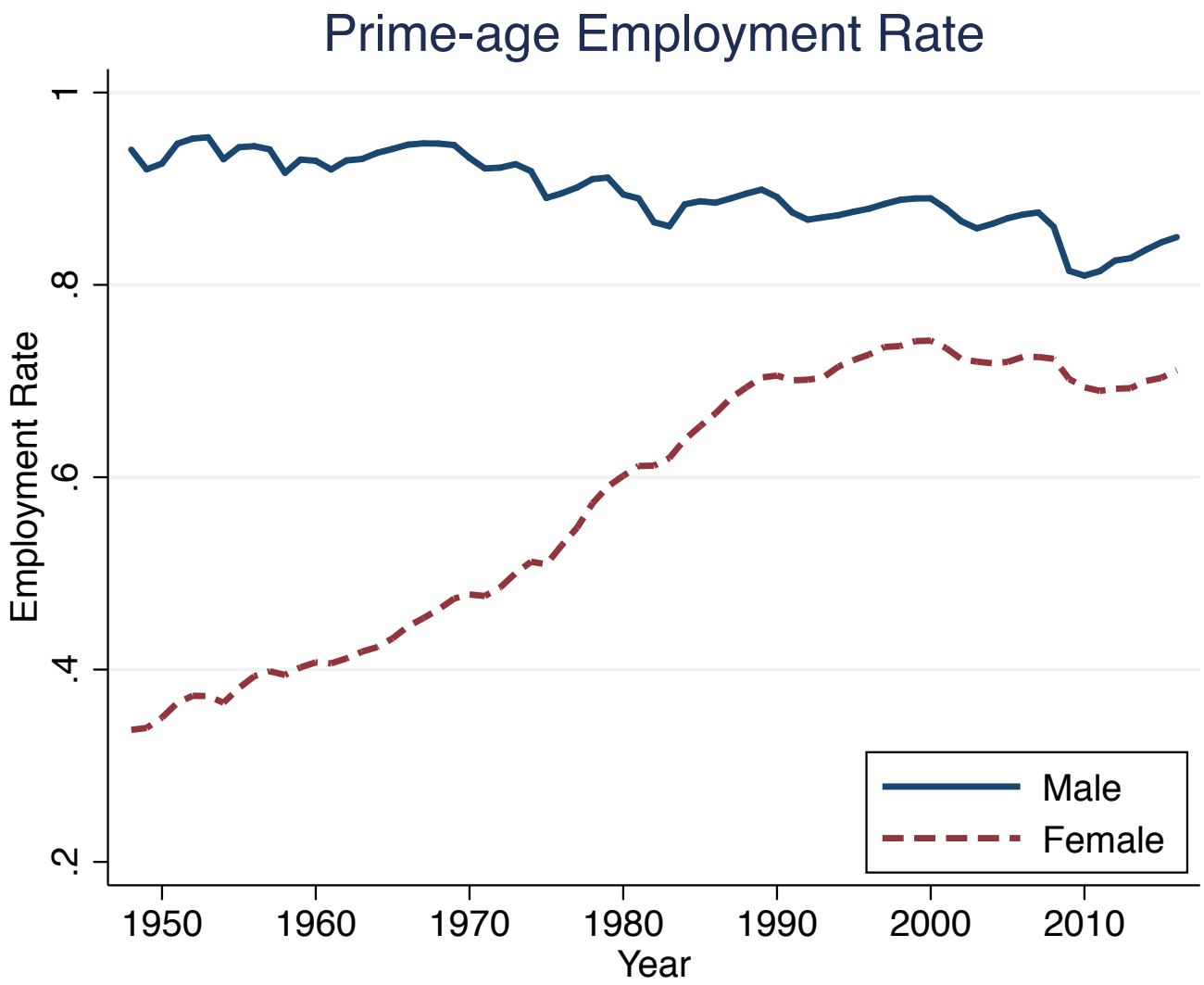
Longer Horizon



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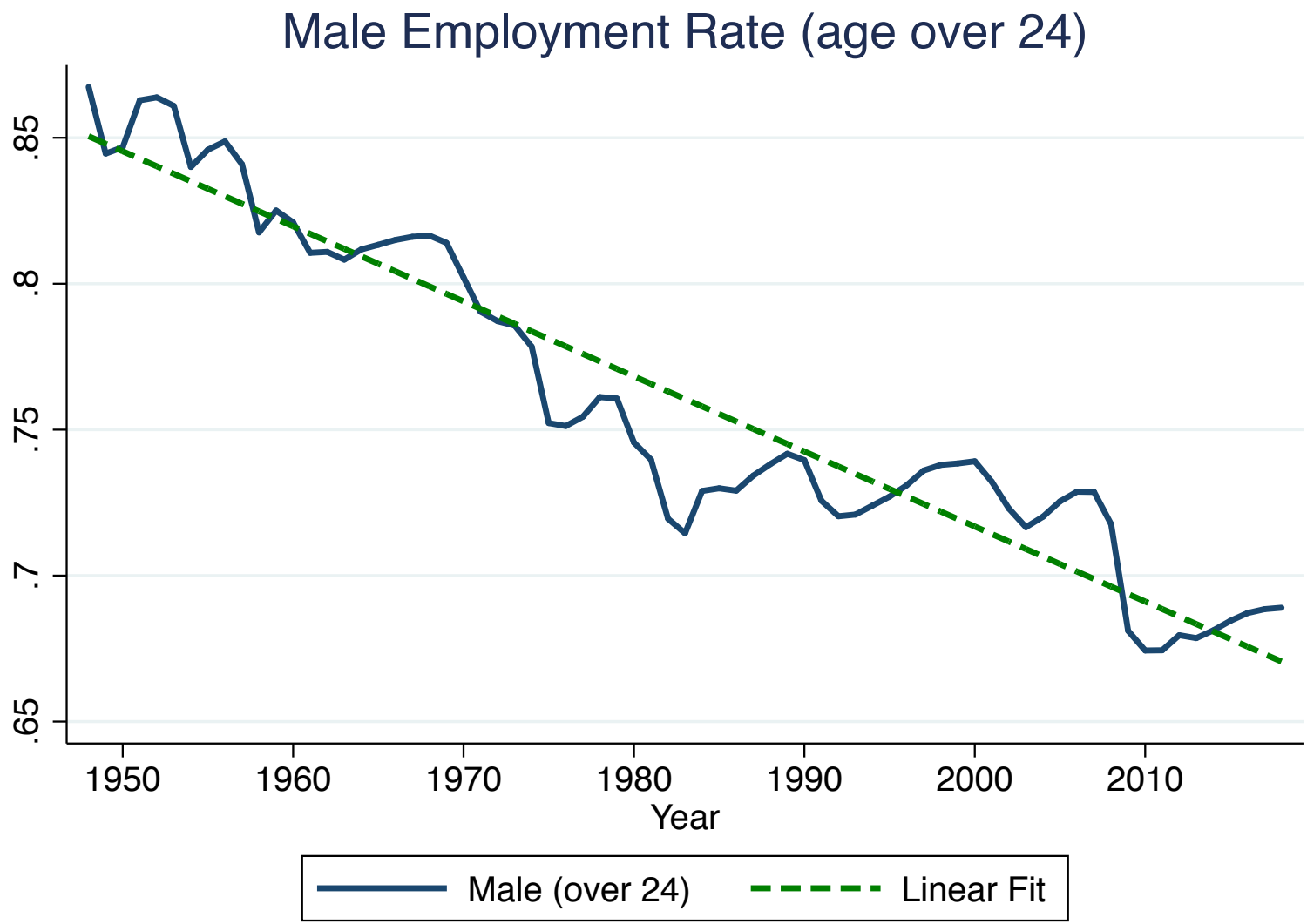
Longer Horizon: Age Over 24



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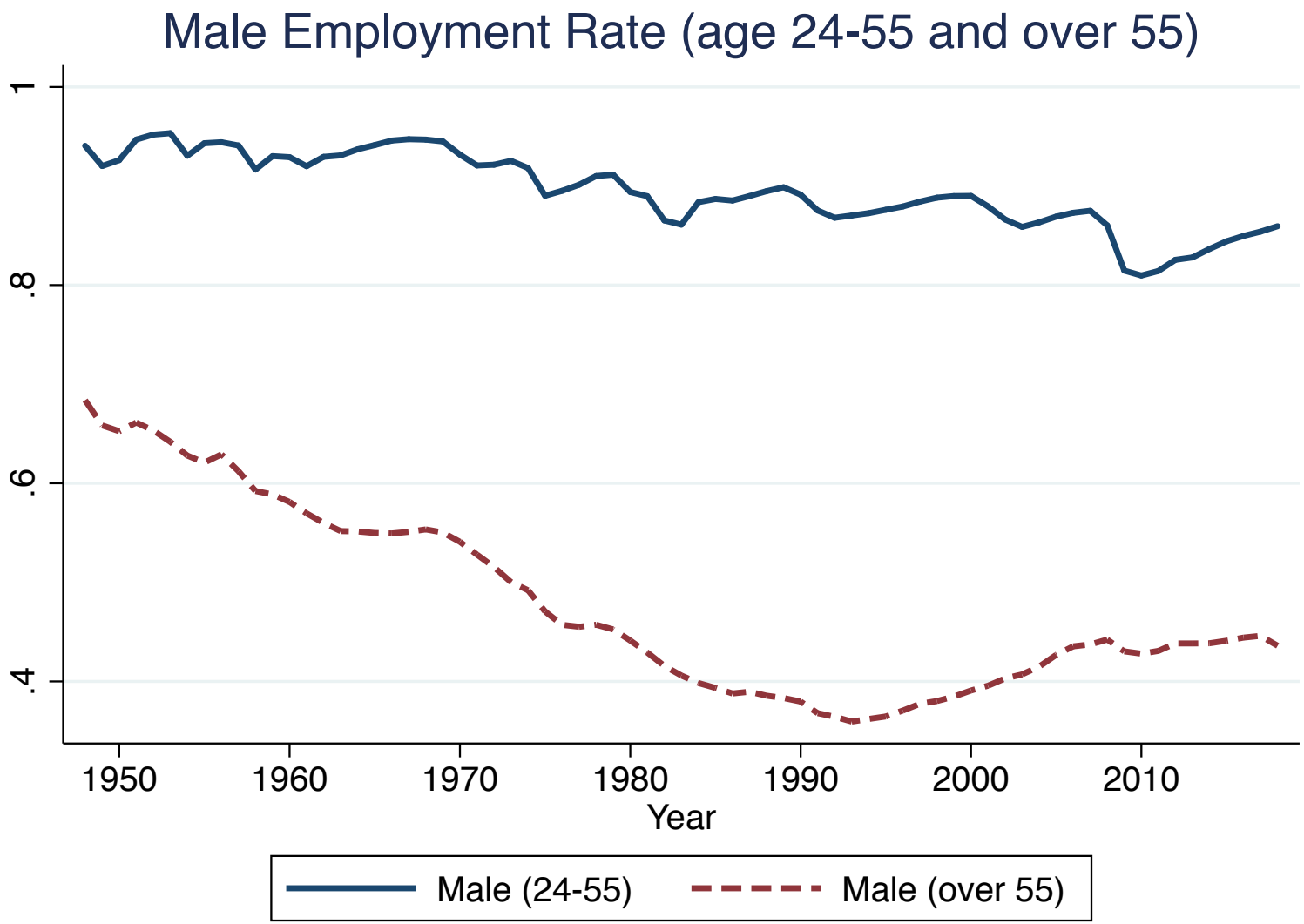
Longer Horizon: Prime-Age and 55 Above



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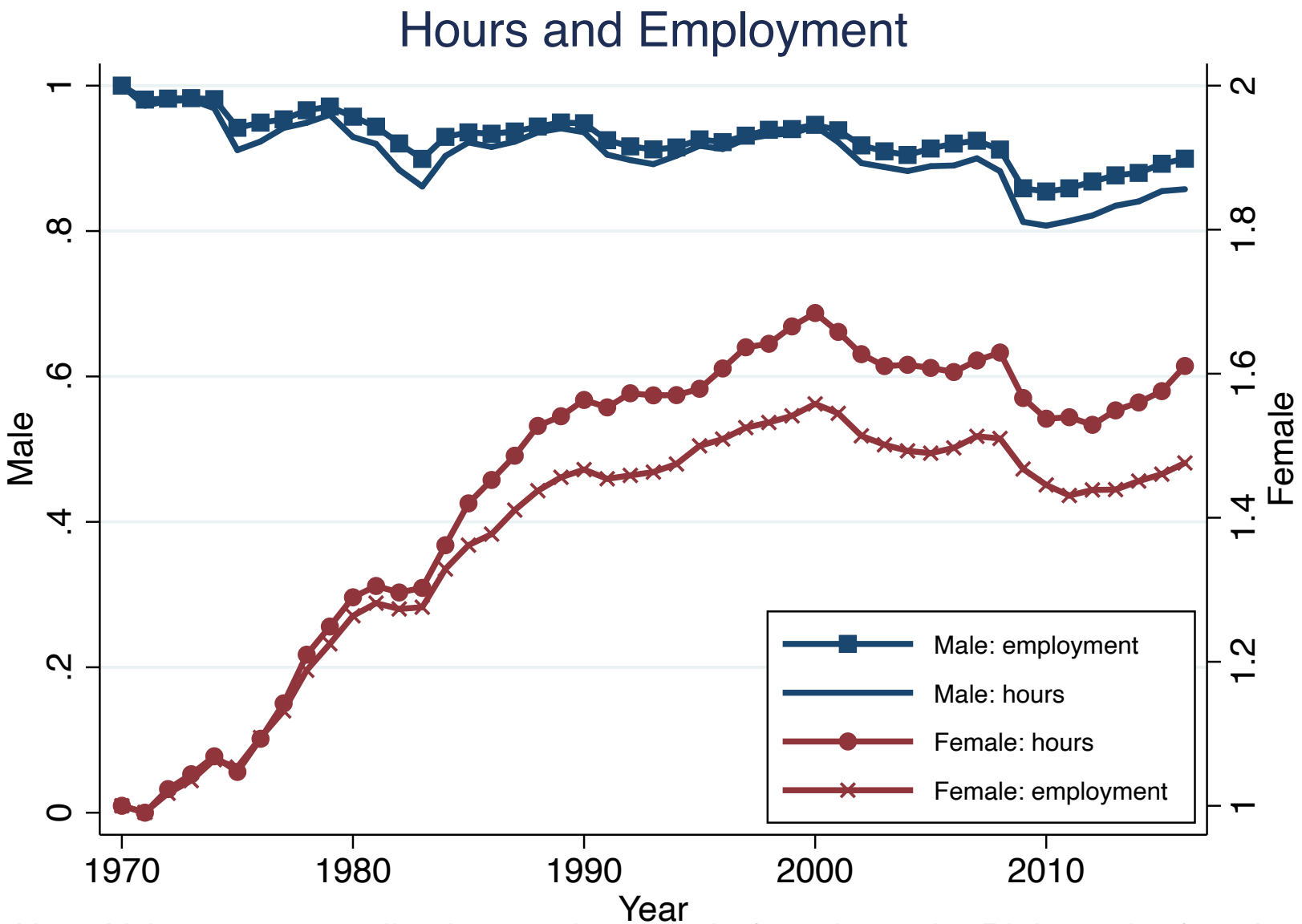
Hours vs. Employment



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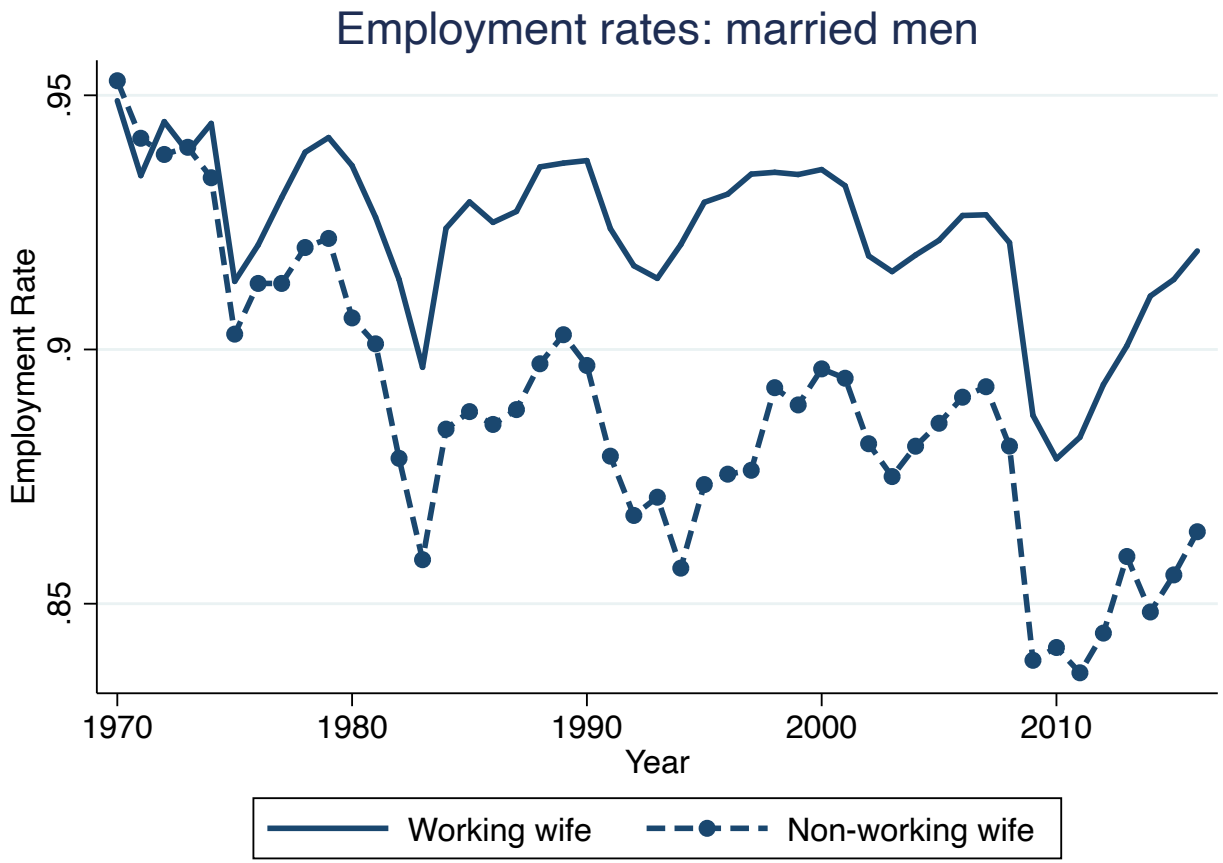
Married vs. Single



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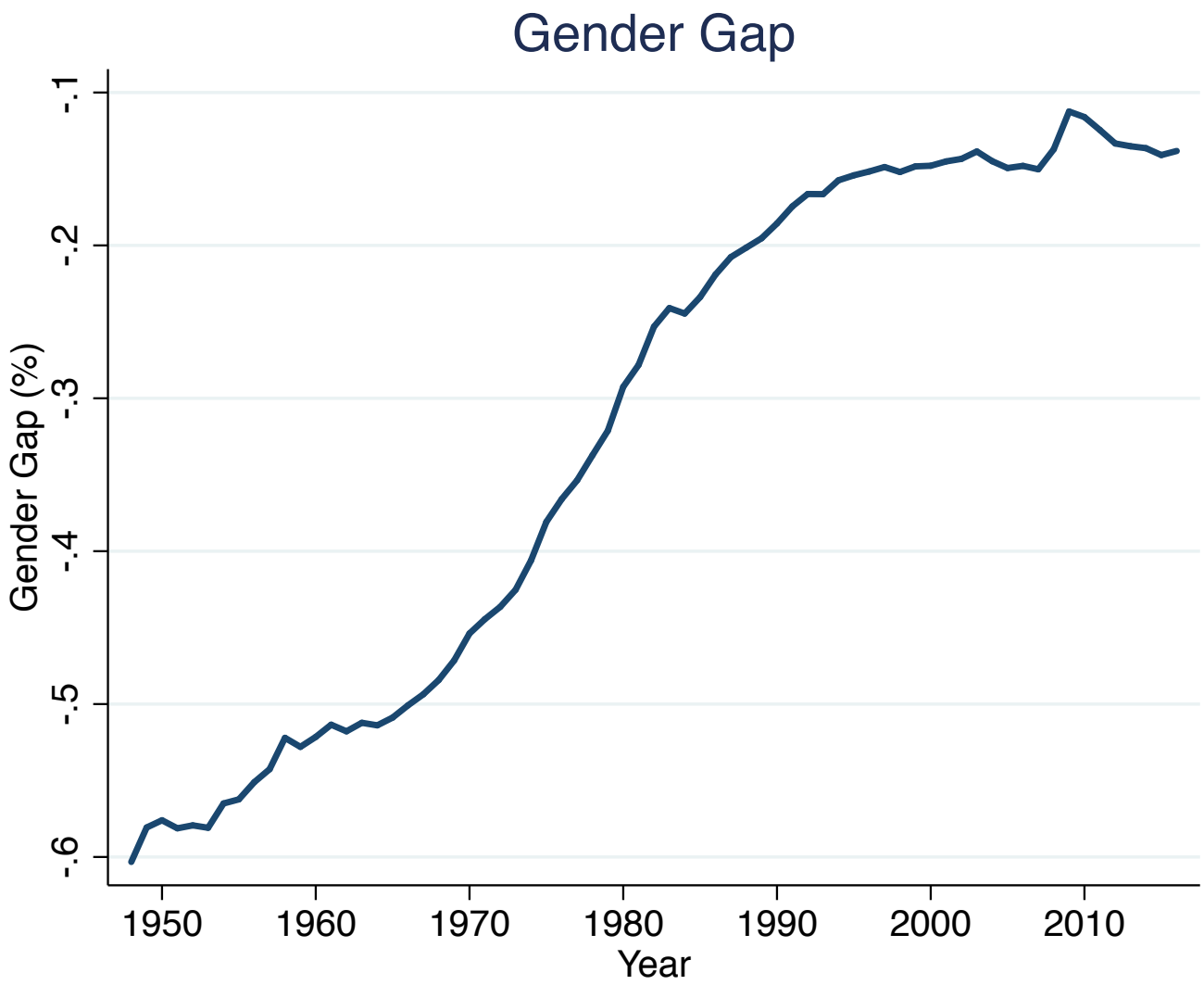
Gender Gap: Longer Horizon



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AR(1) Model Estimates

	(1) Aggregate	(2) State
Lag Gap	0.878***	0.742***
	(0.0216)	(0.0144)
Constant	-0.0165***	
	(0.00396)	
State FE	No	Yes
Observations	37	1836
Adjusted R^2	0.981	0.957
Half-life	5.320	2.328
	(1.006)	(0.152)

Notes: Sample period 1980-2016. Newey-West standard errors in parenthesis.

$$\text{Half-life} = -\log 2 / \log \beta$$

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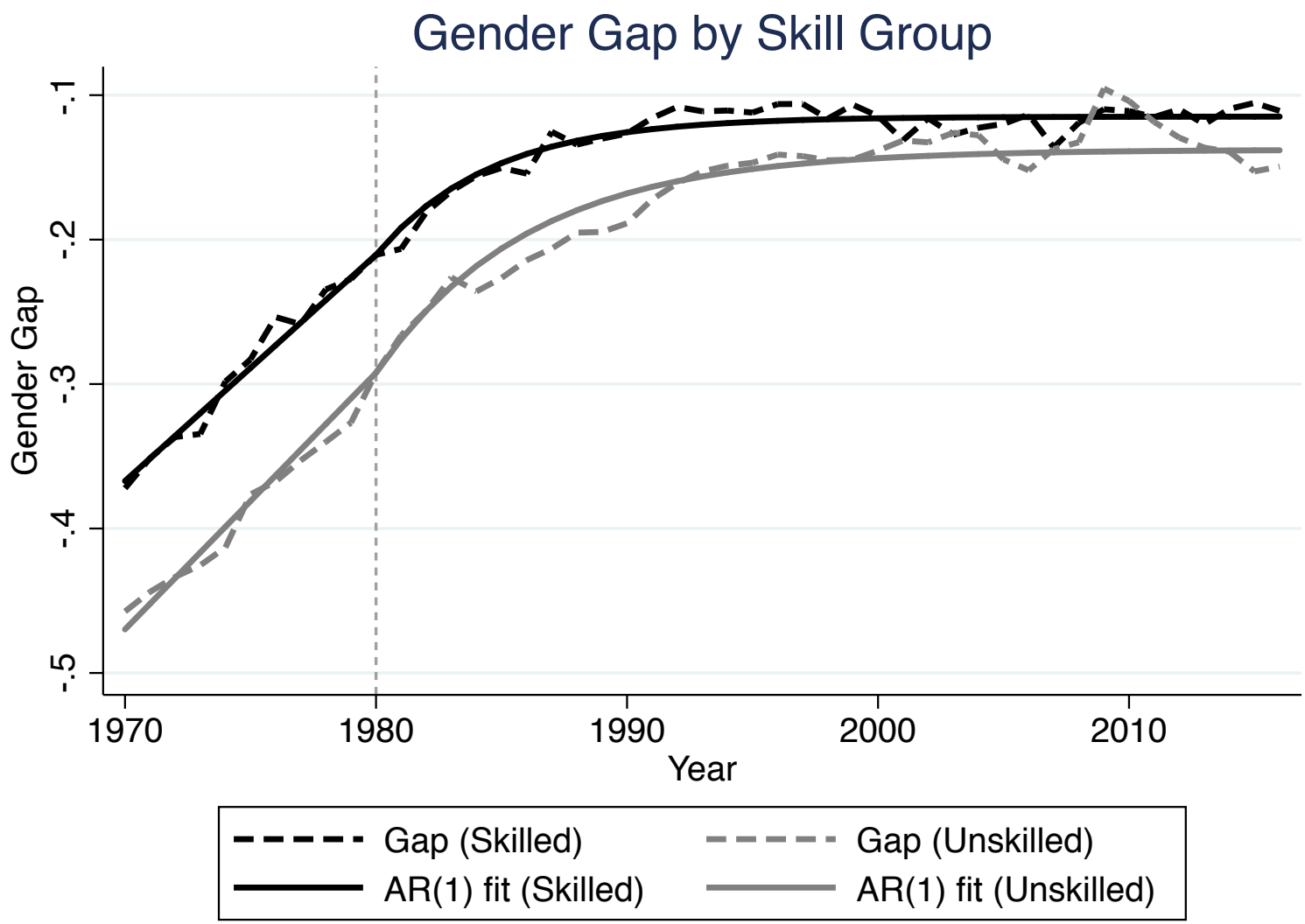
Convergence within Skill Group



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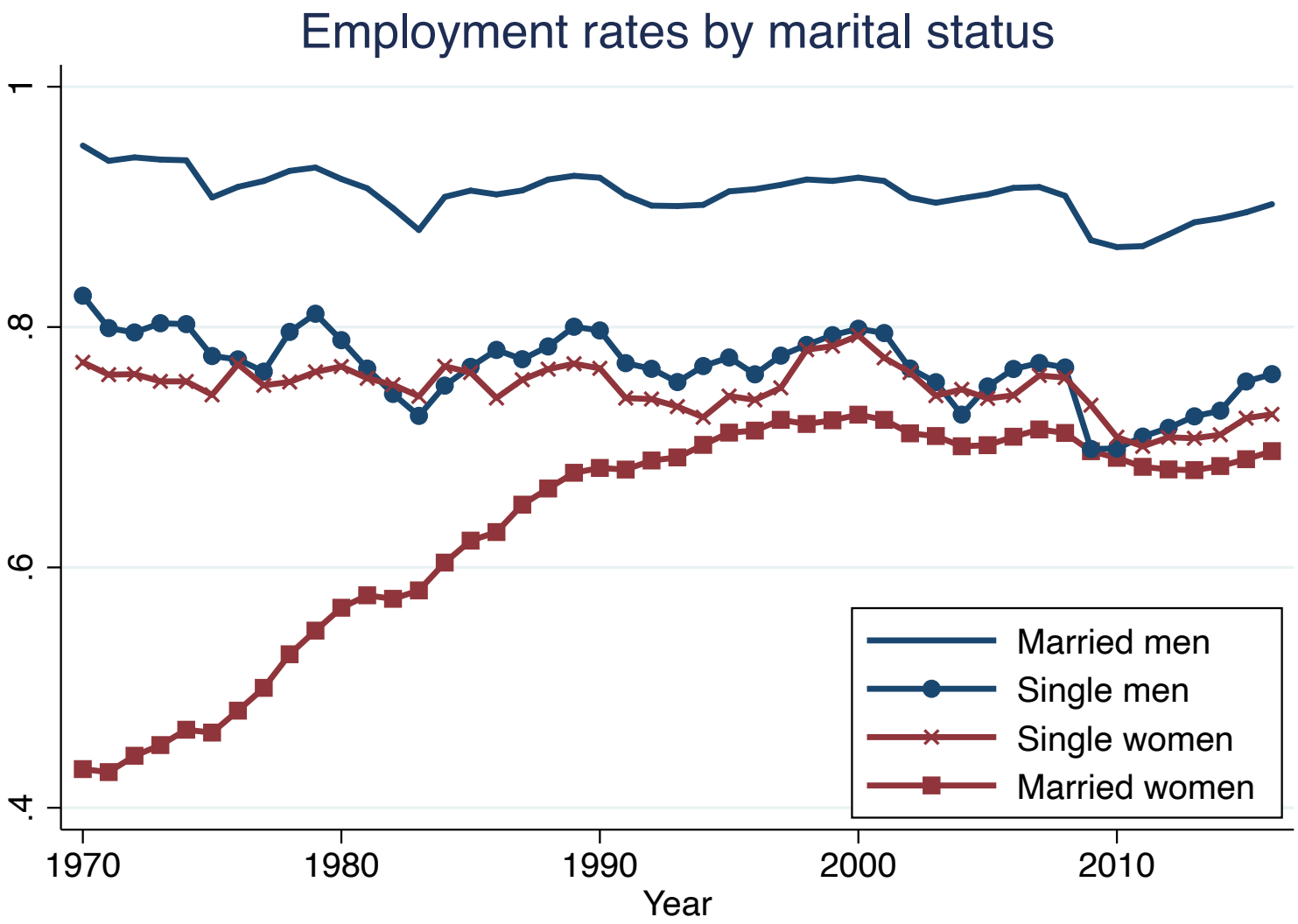
Convergence by Marital Status



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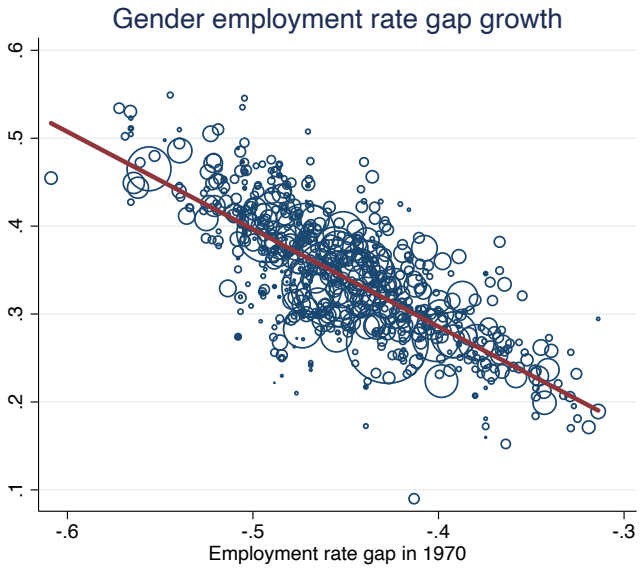
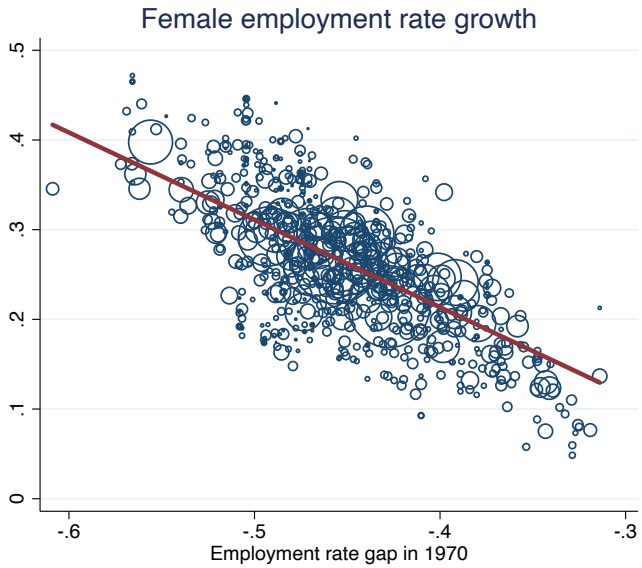
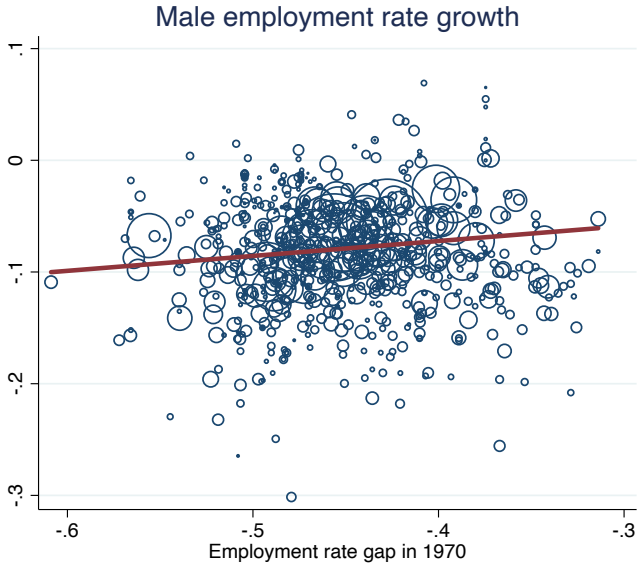
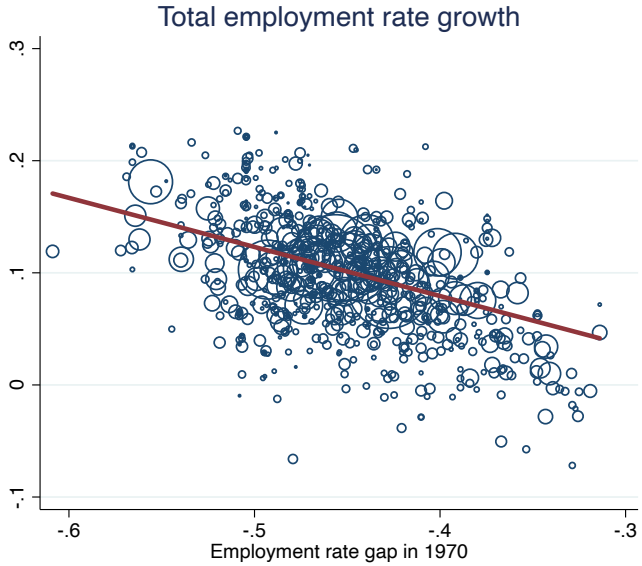
Convergence at the Commuting Zone level









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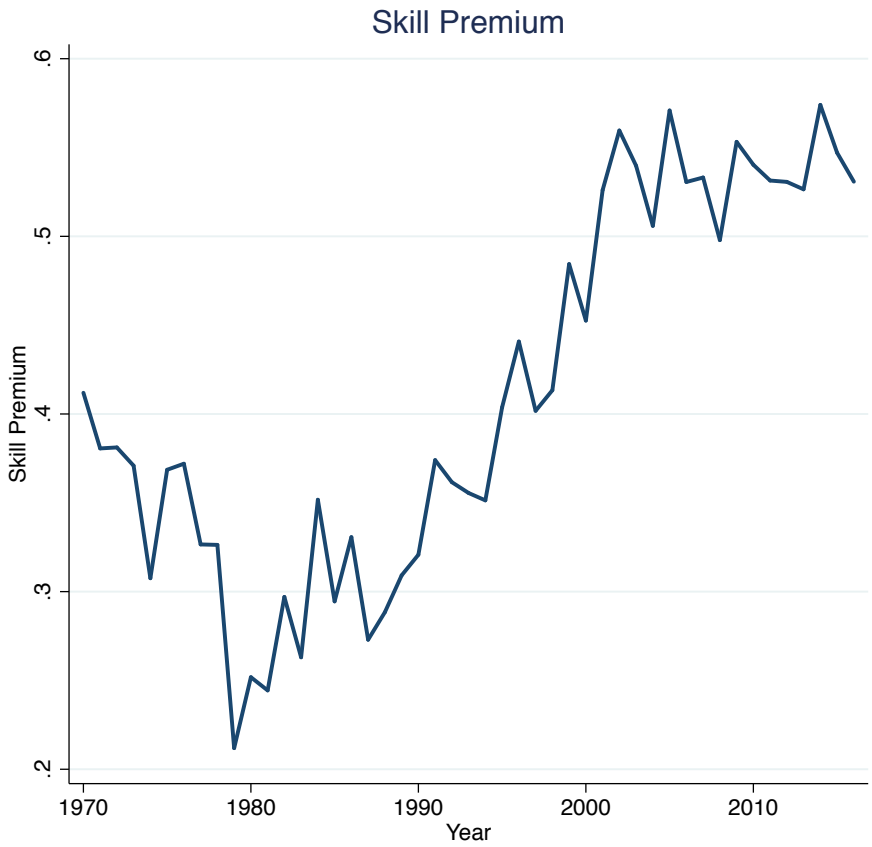
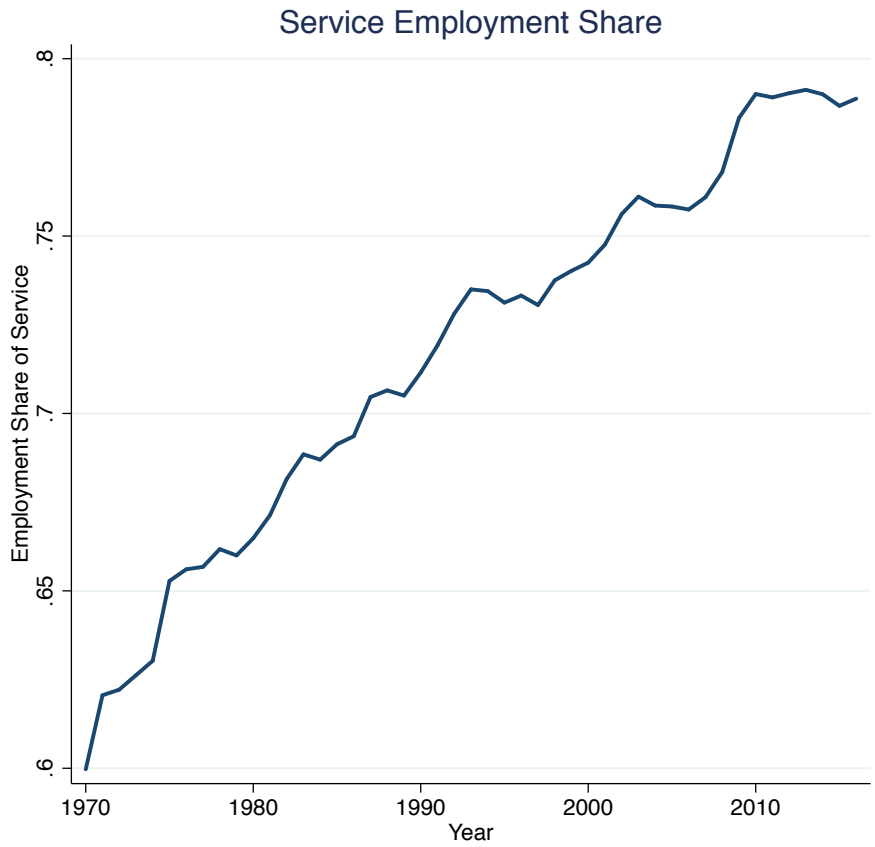
Skill Premium and Service Share: Time-Series





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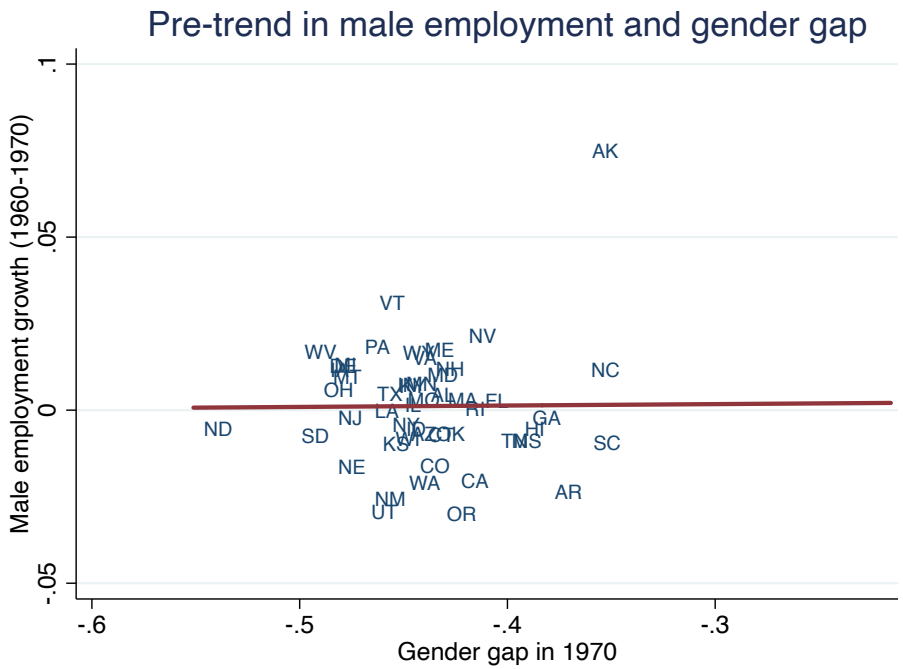
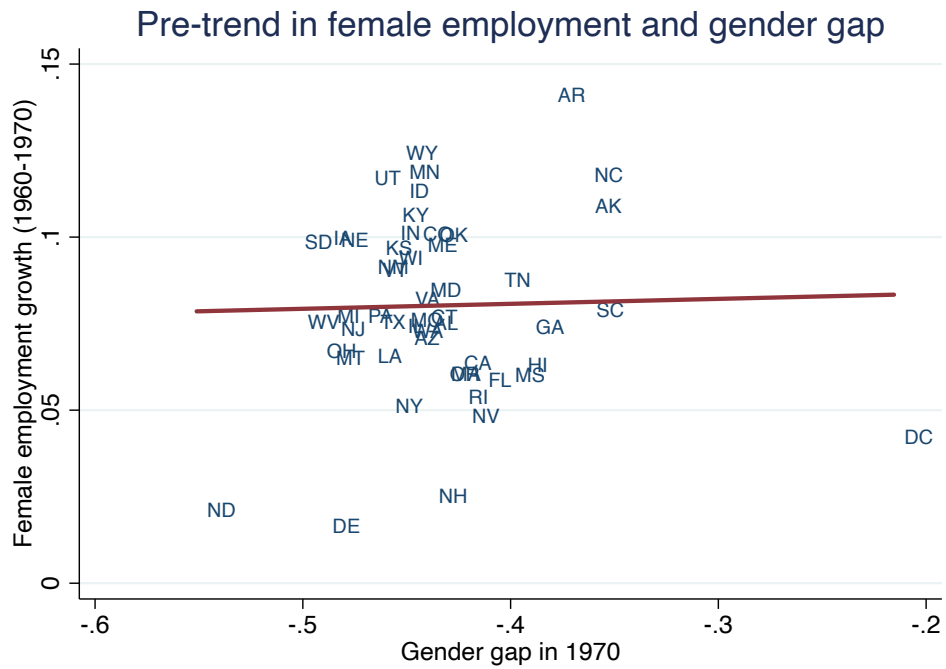
Pre-trends and Gender Gap in 1970





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Correlations with the Instruments

	Gender gap in 1970	JOI in 1970
	(1)	(2)
Agricultural employment share in 1970	-0.41	-0.24
	(0.13)	(0.05)
Mining employment share in 1970	-0.21	-0.23
	(0.31)	(0.12)
Manufacturing employment share in 1970	-0.01	0.01
	(0.11)	(0.04)
Service employment share in 1970	0.19	0.10
	(0.19)	(0.07)
log GDP per capita in 1970	0.10	0.05
	(0.06)	(0.02)
College share in 1970	0.16	0.19
	(0.38)	(0.14)
Skill wage premium in 1970	0.00	0.06
	(0.08)	(0.03)
Singles share in 1970	1.10	0.60
	(0.40)	(0.08)
Non-white population share in 1970	0.26	0.11
	(0.07)	(0.03)
China shock (1990-2007)	0.00	0.00
	(0.01)	(0.00)
Bartik shock	0.12	0.07
	(0.11)	(0.04)

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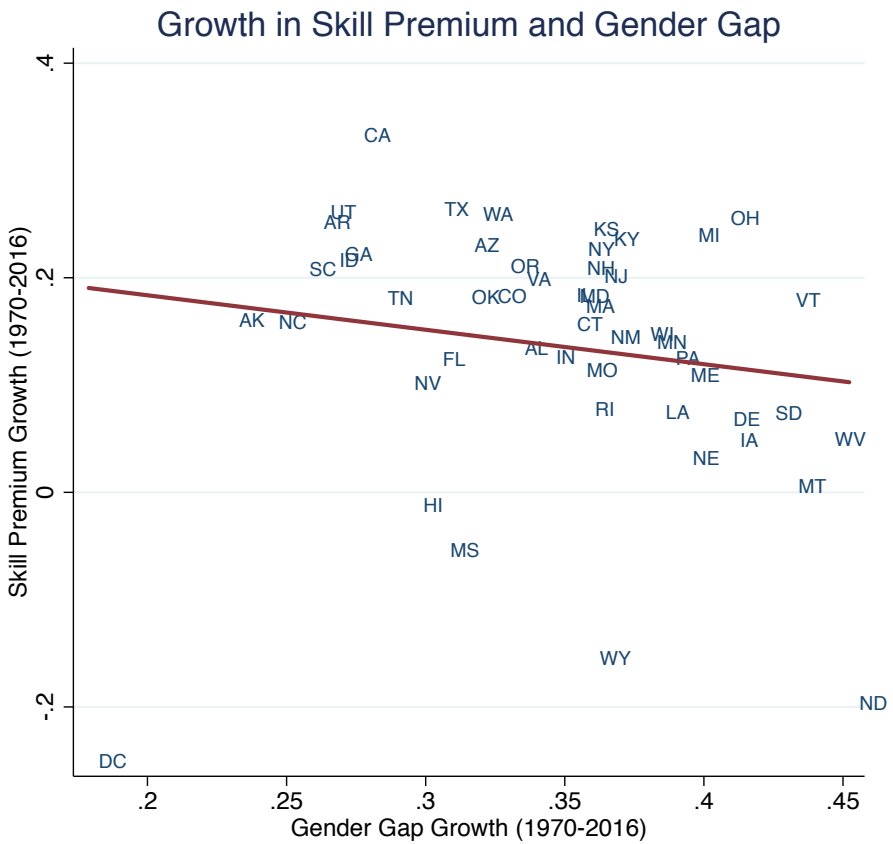
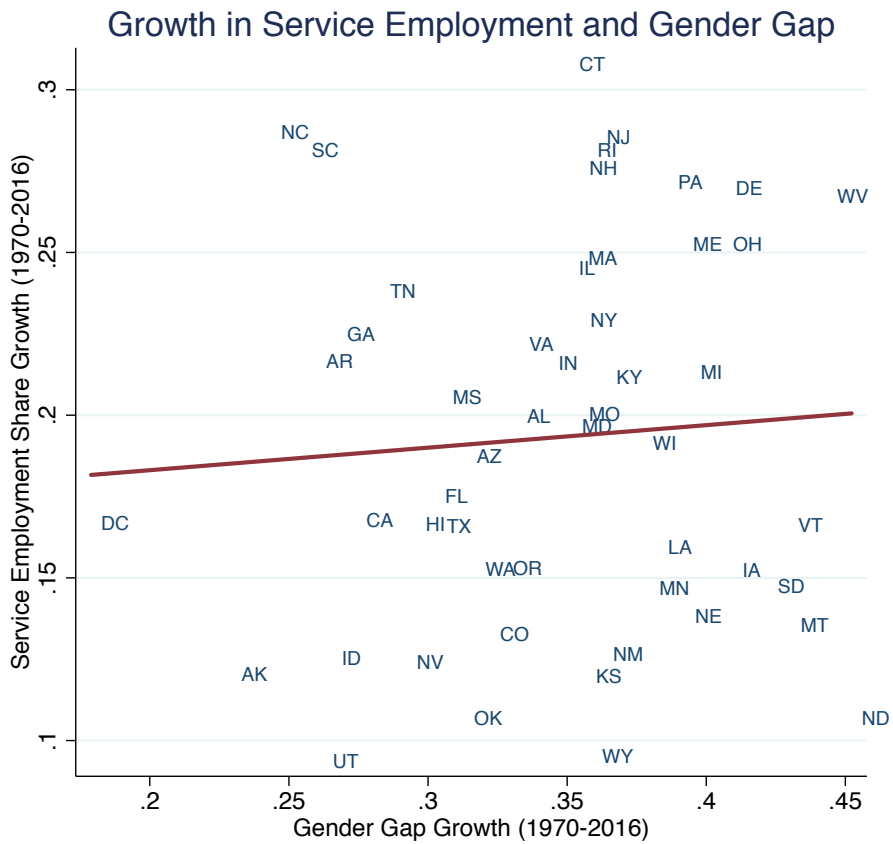
Skill Premium and Service Share: Cross-section





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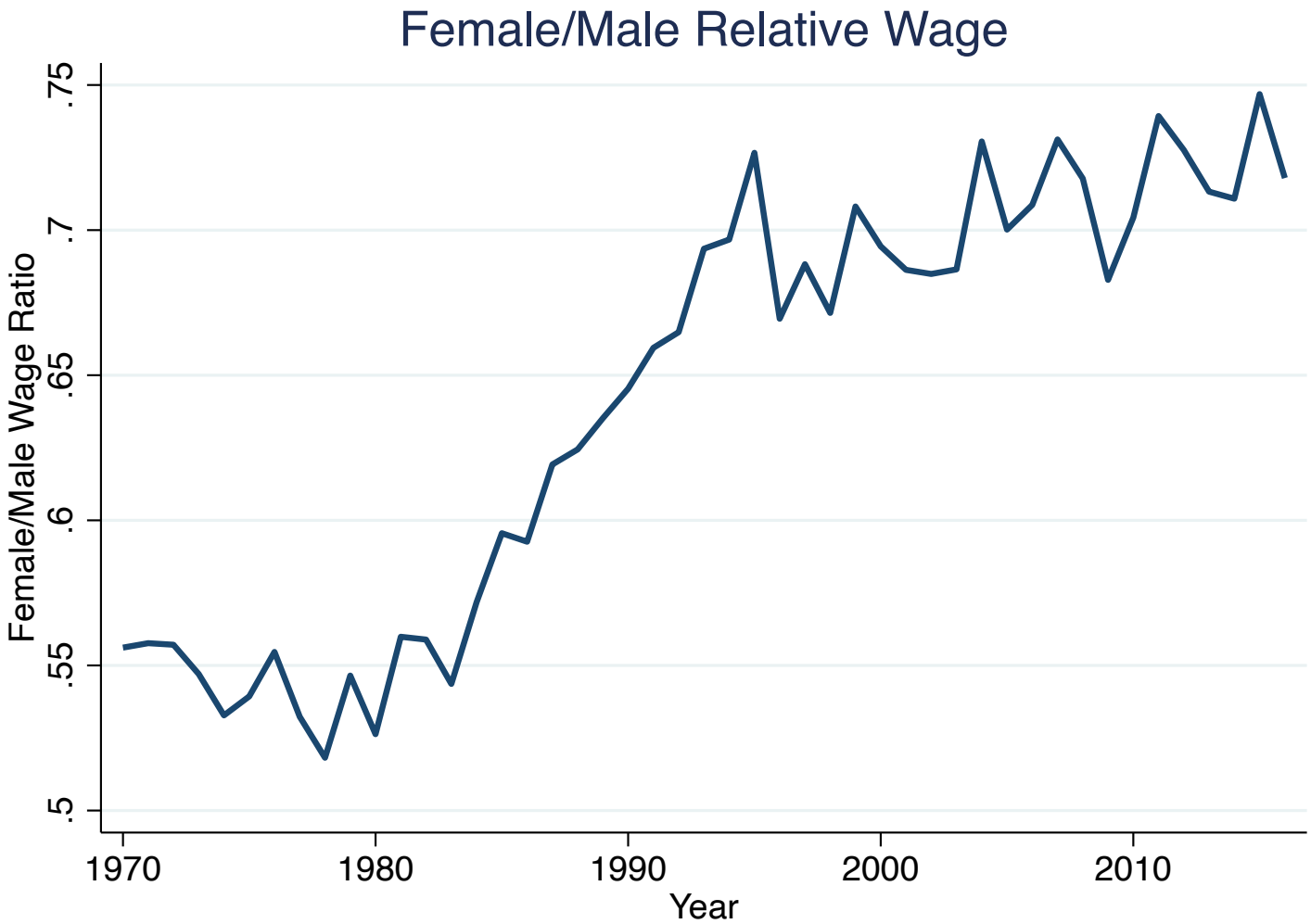
Gender Revolution: Supply or Demand

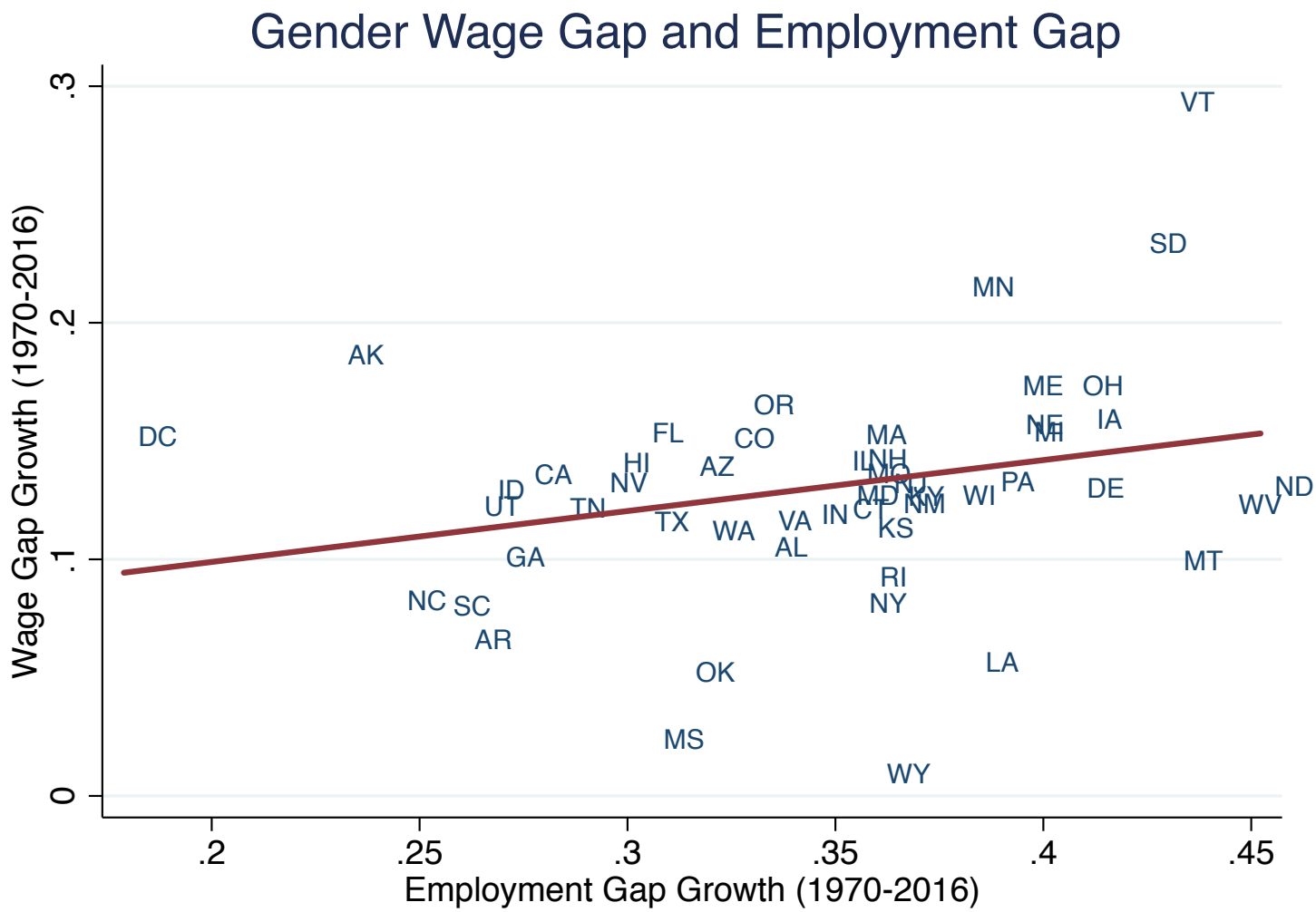
- We model gender revolution as an increase in demand for female labor
- Alternative model: Increase in supply of female labor
  - Less discrimination / cultural changes may have made it less costly for women to work in the market
- Two stories have different implications about relative female wages
  - Labor demand story: Relative female wages should rise
  - Labor supply story: Relative female wages should fall

Aggregate Relative Wages



Note: Wages are hourly and composition adjusted (age, education, race, whether born in foreign).

Cross Sectional Correlation



Note: Wages are hourly and composition adjusted (age, education, race, whether born in foreign).

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Labor Force Participation of Men

- L_m is fraction of men that work
- Household has continuum of male types $j \in [0, 1]$
- Each male faces discrete choice: Work or not
- Disutility of work for type j is $j^{\nu^{-1}}/\chi_m$
- Total disutility for men:

$$\int_0^{L_m} \frac{j^{\nu^{-1}}}{\chi_m} dj = \frac{1}{\chi_m} \frac{(L_m)^{1+\nu^{-1}}}{1+\nu^{-1}}$$

(same model of disutility of labor as in Gali (2011))

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Labor Force Participation of Women

- Household has continuum of female types $j \in [0, 1]$
- Each female type is made up of a continuum of subtypes $\omega \sim G(\omega)$
- Each woman faces discrete choice:
  i) work at home, ii) work in market, iii) enjoy leisure
- Disutility of work (home or market) for type j is $j^{\nu^{-1}}/\chi_f^i$
- Productivity at home is $A\omega$, productivity in market is $A\theta_f^i$
- Women with $\omega > \theta_f$ prefer home work to market work

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Labor Force Participation of Women

- Total disutility for women with $\omega \leq \theta_f$:

$$\int_0^{L_f} \frac{j^{\nu^{-1}}}{\chi_f} dj = \frac{1}{\chi_f} \frac{(L_f)^{1+\nu^{-1}}}{1+\nu^{-1}}$$

- Total disutility for women with $\omega > \theta_f$:

$$\int_0^{L^h(\omega)} \frac{j^{\nu^{-1}}}{\chi_f} dj = \frac{1}{\chi_f} \frac{(L_h(\omega))^{1+\nu^{-1}}}{1+\nu^{-1}}$$

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Terms-of-trade effect

$$\frac{d \ln(p_i/P)}{d \ln \theta_{fi}} = -\frac{1+\nu}{(1-\psi)\nu + \eta + \psi\eta\nu} \Lambda_{fi}(1-\lambda_{ii}) < 0,$$

- $\lambda_{ii} \equiv \frac{p_i(c_{ii}+c_i^h)}{PC_i}$ denotes the domestic expenditure share.
- Terms of trade effect larger if
  - η is smaller.
  - Female market work is more important (Λ_{fi} higher).
  - A region is more open (λ_{ii} lower).

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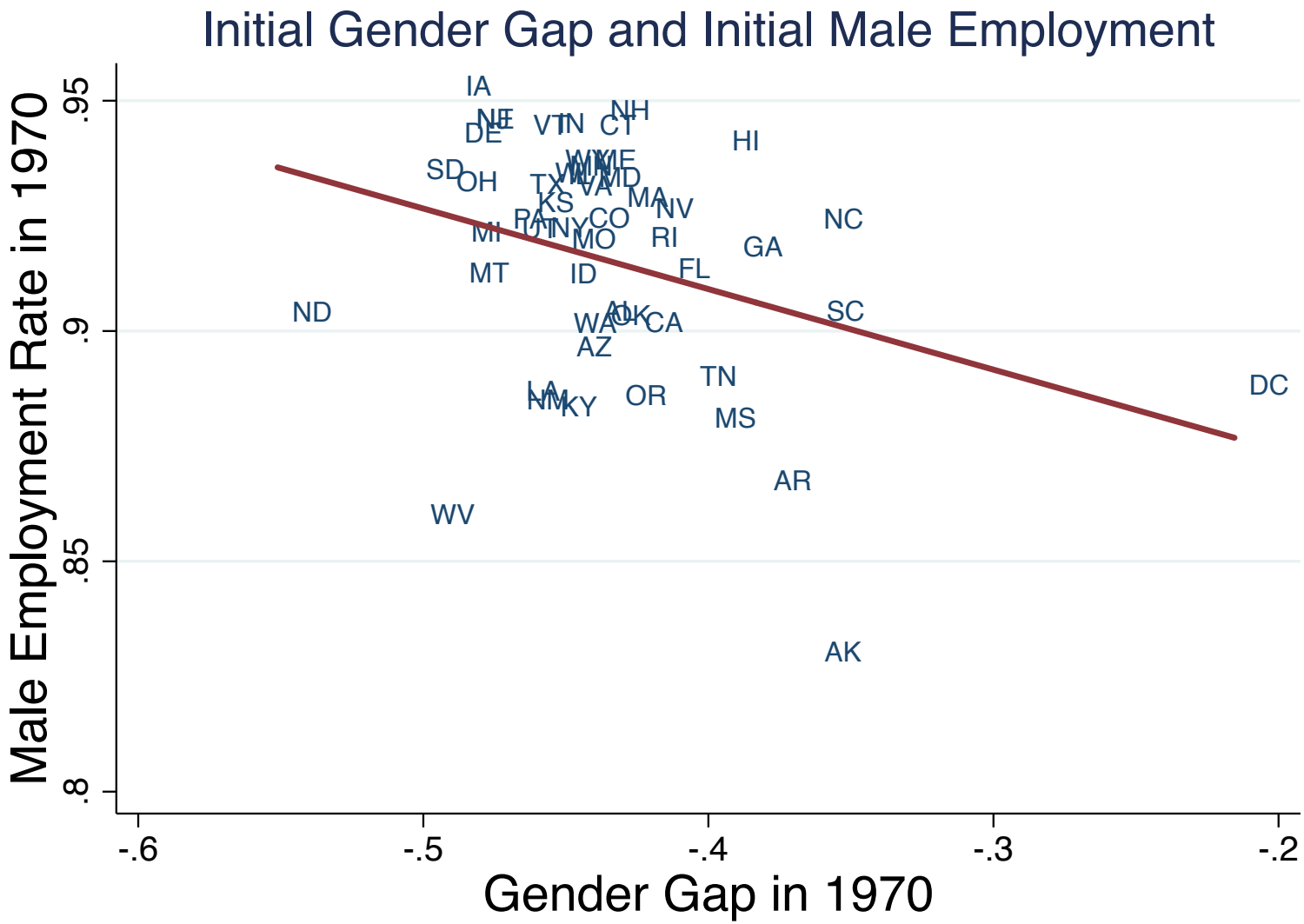
Male EPOP vs Gap in 1970



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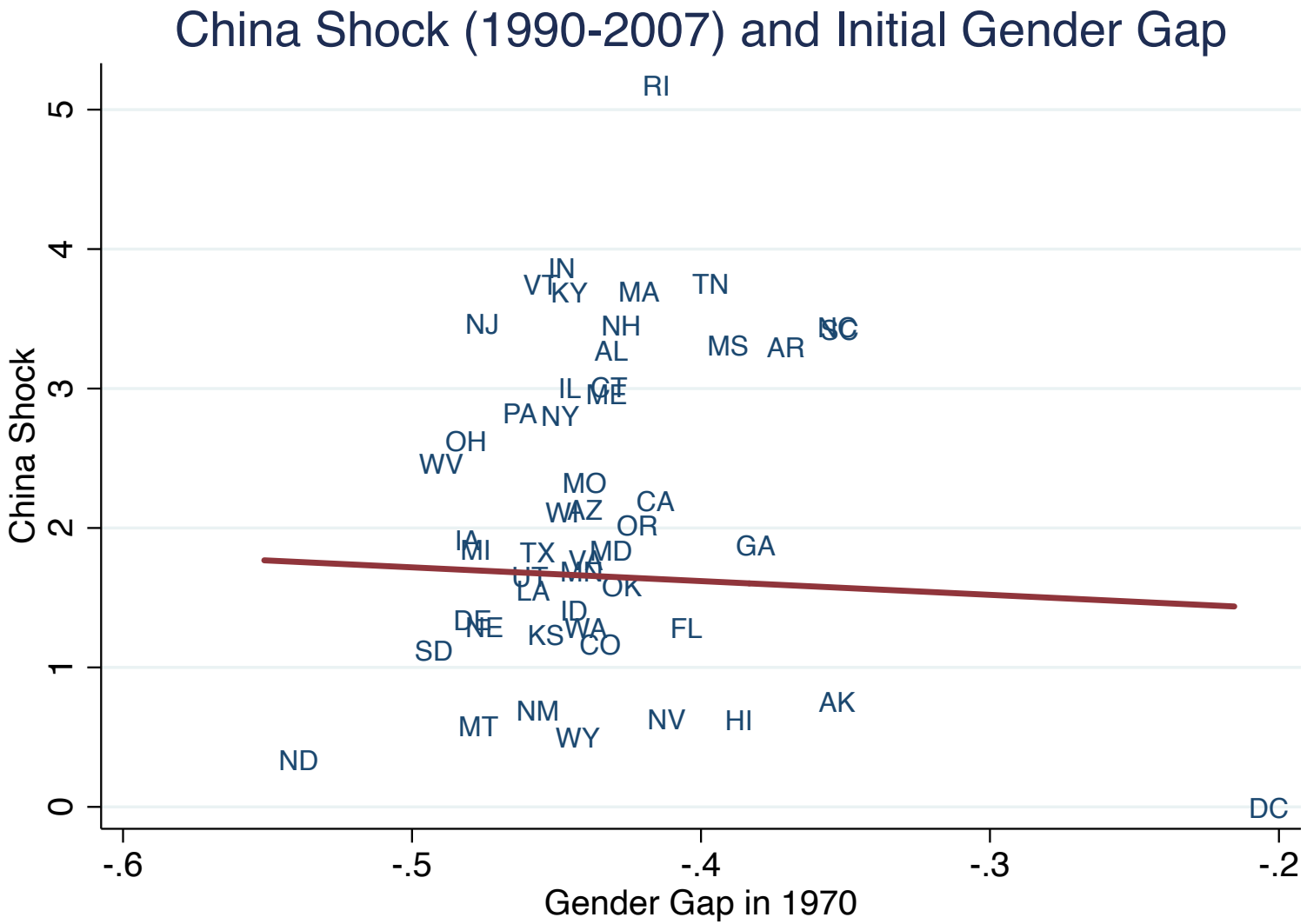
China Shock vs Gap in 1970



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Size of Shocks to θ_{fi}

- Female to male employment ratio in state i:

$$\frac{L_{fi}}{L_{mi}} = G(\theta_{fi}) \left(\frac{\theta_{fi}\chi_{fi}}{\chi_{mi}} \right)^{\nu}$$

  - Assuming $\chi_{mi} = \chi_{fi}$
  - Back out $\{\theta_{fi,1970}, \theta_{fi,2016}\}$ from observed L_{fit}/L_{mit}

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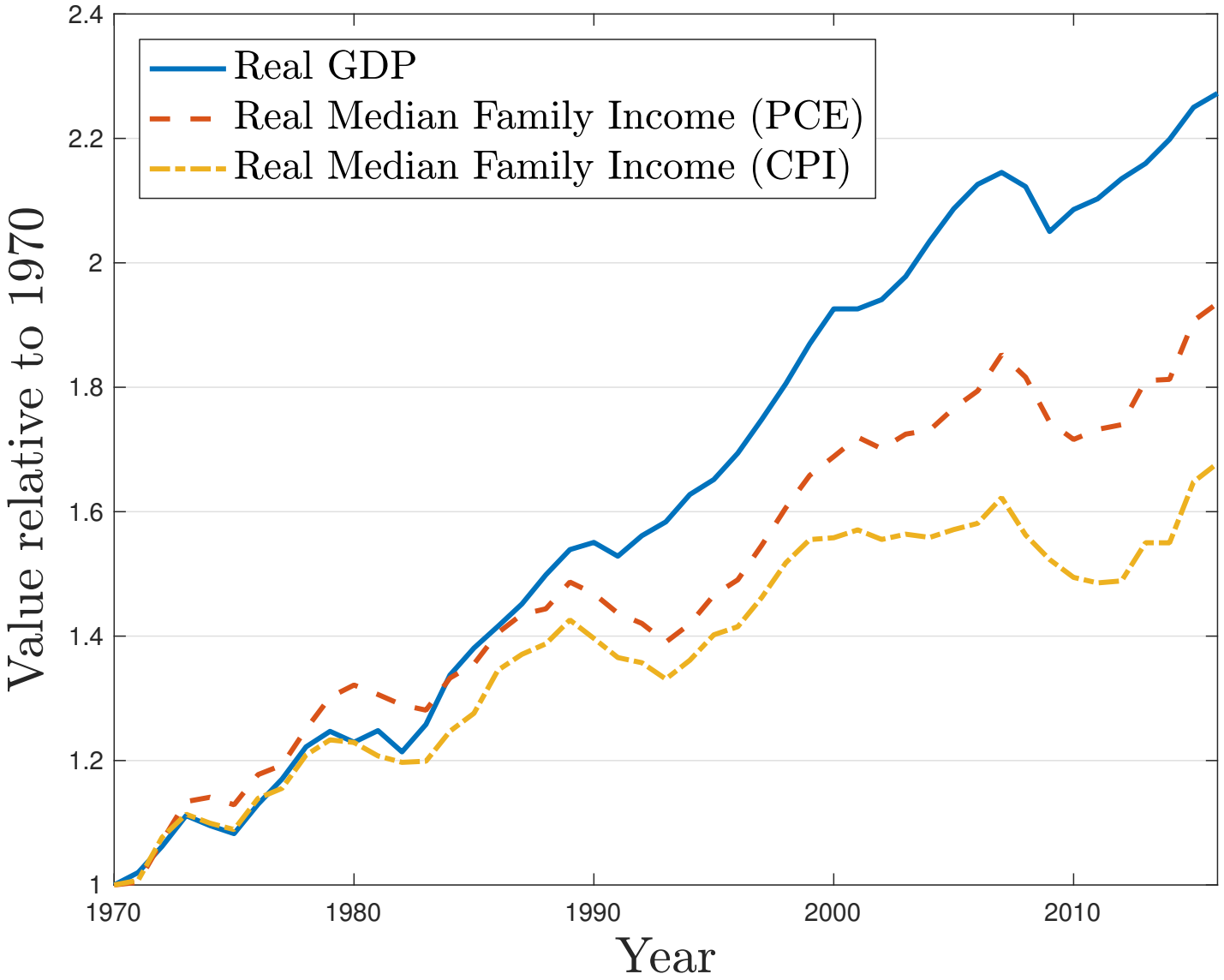
Family Income



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Calibration Detail

- Conditional on $(\beta, \sigma, \nu, \eta)$, long-run parameters $\{g_A, \psi, (\rho_f, \bar{\theta}_f, \Delta_{\theta,70s}), \delta\}$ jointly calibrated using BGP conditions to match
  1. Trend GDP growth. (GDP in the model is $Y_t = A_t(L_{m,t} + \theta_{f,t} L_{f,t})$).
  2. Trend male employment rate growth.
  3. Regional crowding out.
  4. Home production to GDP ratio
  5. Domestic expenditure share
- Convergence parameters $(\rho_f, \bar{\theta}_f, \Delta_{\theta,70s})$ calibrated directly from observable male to female employment ratio:

$$\frac{L_{ft}}{L_{mt}} = G(\theta_{ft}) \left(\frac{\theta_f \chi_f}{\chi_m} \right)^{\nu}$$

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Parameter Values

Parameters	Description	Values	Targets
δ	Support of home productivity	0.88	Regional crowding out estimates
$\bar{\omega}$	Upper bound of home productivity	1.38	Home production to GDP ratio
ν	Frisch elasticity of labor supply	1	Standard
η	Trade elasticity	5	Head and Mayer (2014)
$\bar{\tau}$	Trade costs	2.88	Domestic expenditure share 70%
$(\rho_f, \bar{\theta}_f, \Delta_{\theta,70s})$	Female-biased shocks	(0.89,1.15,0.0102)	Female to male labor ratio
g_A	Gender-neutral productivity growth	0.014	Per-capita real GDP growth
ψ	Long-run wealth effect	1.12	Trend male labor growth
γ	Short-run wealth effect	0.1	Jaimovich and Rebelo (2009)

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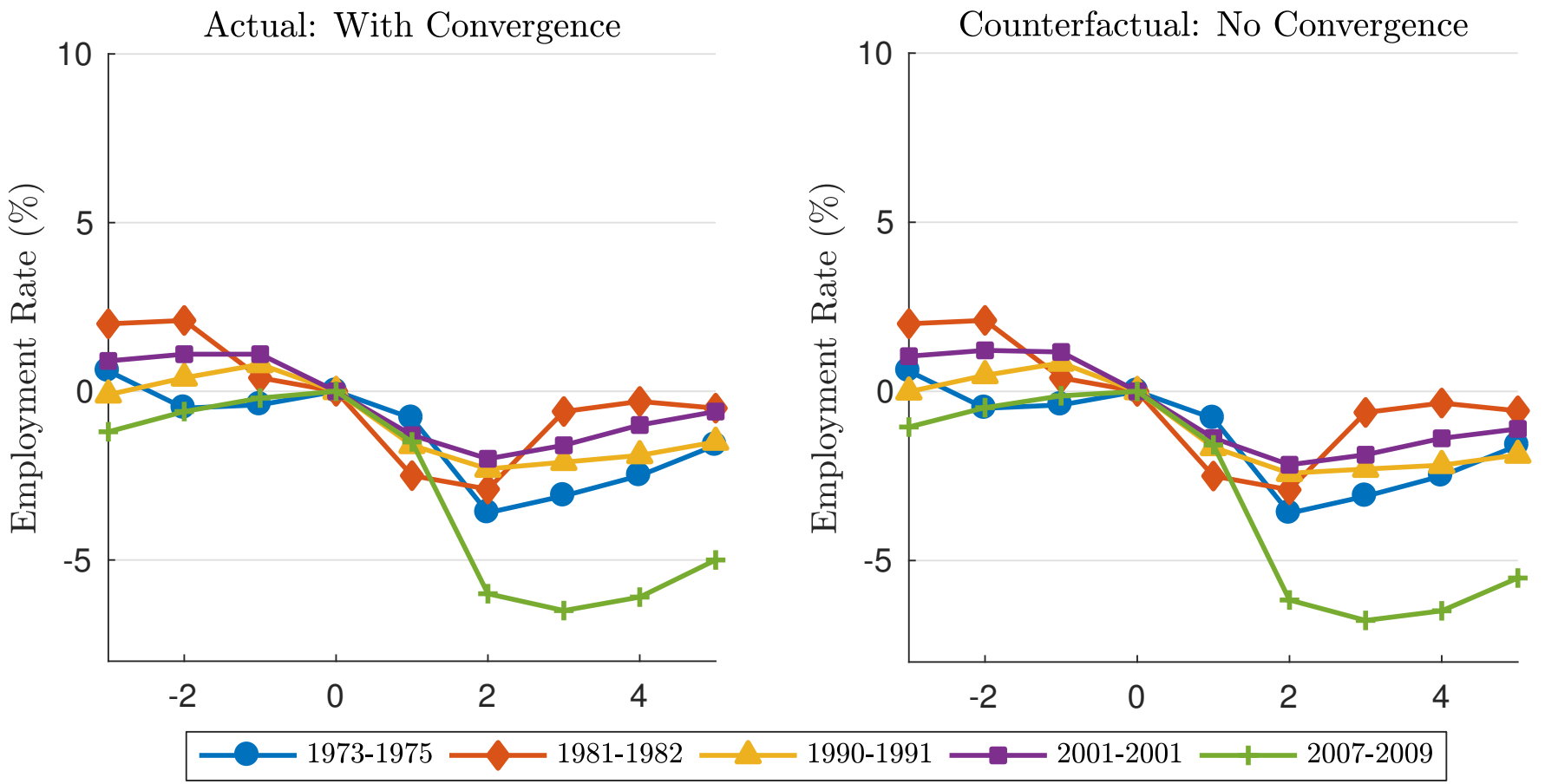
Counterfactual: Male



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Post-recovery Growth: Male and Female

	Employment Rate Growth in Recovery (Female)				
	73-75	81-82	90-91	01	07-09
Actual	2.00%	1.35%	0.68%	0.13%	0.18%
Relative to 1973	100%	67%	34%	6%	9%
Counterfactual	2.00%	1.91%	2.02%	1.73%	1.77%
Relative to 1973	100%	95%	101%	86%	89%

	Employment Rate Growth in Recovery (Male)				
	73-75	81-82	90-91	01	07-09
Actual	0.52%	0.50%	0.28%	0.40%	0.65%
Relative to 1973	100%	95%	52%	76%	124%
Counterfactual	0.52%	0.44%	0.13%	0.22%	0.45%
Relative to 1973	100%	84%	25%	41%	86%

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