Divergent Perceptions, Divergent Pay: Inflation and the Gender Wage Gap

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The views expressed in this presentation are those of the authors and do not necessarily reflect those of Norges Bank.

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2. SVAR differentiates supply and demand shocks

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What we find:

- Procyclical for demand shocks
- Countercyclical for supply shocks

⇒ **It depends on inflation, not output!**

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Inflation widens GWG when industry and occupation are controlled for

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New Keynesian Search and Match Model
[Blanchard and Galí, 2010, Christiano et al., 2016]
with Male and Female Workers
[Mankart and Oikonomou, 2017, Neyer and Stempel, 2021]

- Test role of bargaining power, wage rigidity, elasticity of labor supply and taste-based and statistical discrimination on GWG

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Stylized Fact II:
Women perceive inflation as supply, men as demand shock

Incomplete Information [Erceg et al., 2025] with Ambiguity Aversion [Bhandari et al., 2025]

- Wage bargaining is based on beliefs about shocks

$\Rightarrow$ Supply-biased beliefs lead to real wage losses of women

Contributions

Gender Wage Gaps...
[Goldin, 2014, Blau and Kahn, 2017, Biasi and Sarsons, 2022, Card et al., 2016, Olivetti and Petrongolo, 2016, Azmat and Petrongolo, 2014]
$\Rightarrow$ are not only trending but also cyclical

... and beyond:

Inflation and Labor
[Pilossoph and Ryngaert, 2024, Guerreiro et al., 2024, Hajdini et al., 2023, Baek and Yaremko, 2024, Stantcheva, 2024] $\Rightarrow$ Effect of inflation is not homogeneous for all

Inflation and Inequality
[Auclert, 2019, Kaplan et al., 2018, Cloyne et al., 2020, Doepke and Schneider, 2006]
$\Rightarrow$ Inequality also emerges through wage response

Narratives of Inflation
[Candia et al., 2020, Andre et al., 2025, Andre et al., 2022, Weber et al., 2022, D'Acunto and Weber, 2024, Kamdar and Rey, 2025] $\Rightarrow$ Narratives matter for wage-rebargaining

Overview

Computing a series of Adjusted GWGs

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Data: Monthly CPS from 1982-2020[1]

- US consumers in full-time employment
- Sample size 9 000 - 15 000/month
- Observation of weekly + hourly earnings, age, education, fip-code, race, occupation (389 categories, 1990 census) and industry code (247 categories, 1990 census)

[1] Excluding Covid due to evidence in [Albanesi and Kim, 2021].

Computing a series of Adjusted GWGs

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Data: Monthly CPS from 1982-2020

Method: Kitagawa-Oaxaca-Blinder decomposition following [Blau and Kahn, 2017]

1. **Estimate**

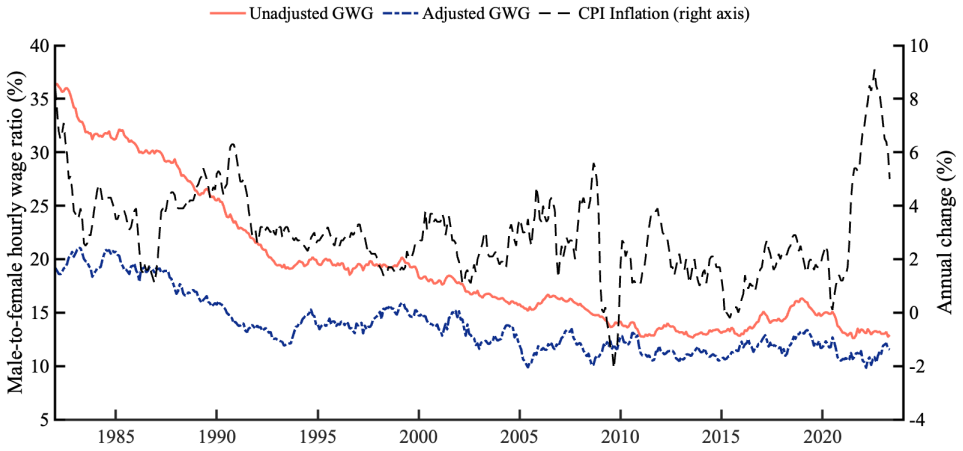
$$Y_m = X_m B_m + \gamma_m OCC1990_m + \zeta_m IND1990_m + u_m$$
$$Y_f = X_f B_f + \gamma_f OCC1990_f + \zeta_f IND1990_f + u_f$$

2. **Predict**

$$\hat{Y}_{mm} = X_m \hat{B}_m + \hat{\gamma}_m OCC1990_m + \hat{\zeta}_m IND1990_m$$
$$\hat{Y}_{mf} = X_m \hat{B}_f + \hat{\gamma}_f OCC1990_m + \hat{\zeta}_f IND1990_m$$

$$\Rightarrow \textbf{Adjusted GWG} = \left[\exp\left(\sum_i \hat{Y}_{mm,i} \omega_i - \sum_i \hat{Y}_{mf,i} \omega_i \right) - 1 \right] \times 100$$

Adjusted GWGs over time



GWGs for different demographics | GWGs measured differently

Structural VAR Model with Zero and Sign Restrictions

Reduced form:

$$Y_t = c + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + u_t, \quad u_t \sim N(0, \Sigma)$$

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Sign Restrictions: Restrict the sign of the response of certain variables to shocks
$\Rightarrow$ identify response of GWG in response to supply or demand shock

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$\Rightarrow$ identify response of GWG in response to supply or demand shock

Zero Restrictions: Some elements of the impact matrix are set to zero
$\Rightarrow$ required to distinguish the residual shock from supply and demand
$\Rightarrow$ assume that GWG has no instantaneous effect on inflation and unemployment

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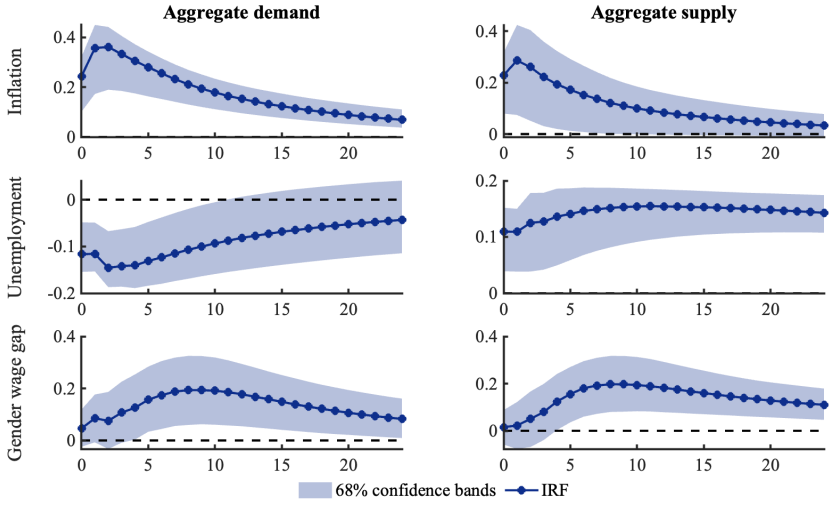
	Demand	**Supply**	**Residual**
Inflation	+	+	0
Unemployment rate	−	+	0
GWG	?	?	+

GWG response to Supply and Demand Shocks



Robustness

- Number of lags
  - p=6
- Larger VAR
  - Unemployment gap
- Alternative cycle measures
  - Industrial production
- Including Covid period
  - 1982-2023
- Moving jobs
  - old job vs new job
- Alternative measures of GWGs
  - Raw gaps
  - Nearest-neighbor matching
  - Female characteristics
  - Female dummy
  - Median
- Demographic subgroups
  - Below 30
  - Above 30
  - Above 40
  - Above 50
  - Children below age 5
- Coefficients
  - KOB coefficients
- Who's wages are moving in real terms?
  - Women lose in real terms
- Different identification of inflationary shocks
  - Inflation shock

Overview

Survey of Consumer Expectations

Data: Monthly SCE from 2013 - 2020

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- US consumers in full-time employment
- Sample size 1000/month
- Observation of age, education, region, income, industry, numeracy and expectations

Survey of Consumer Expectations

Data: Monthly SCE from 2013 - 2020

Unemployment

What do you think is the percent chance that 12 months from now the unemployment rate in the U.S. will be higher than it is now?

Job Finding

Suppose you were to lose your main job this month. What do you think is the percent chance that within the following 3 months, you will find a job that you will accept, considering the pay and type of work?

Earnings

Please think ahead to 12 months from now. Suppose that you are working in the exact same job at the same place you currently work, and working the exact same number of hours. By about what percent do you expect your earnings to have increased/decreased? Please give your best guess.

Survey of Consumer Expectations

Data: Monthly SCE from 2013 - 2020
Method: Kitagawa-Oaxaca-Blinder decomposition + SVAR with Zero and Sign Restrictions SVAR method

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2. **Predict**

$$\hat{Y}_{mm} = X_m \hat{B}_m + \hat{\zeta}_m IND_m$$

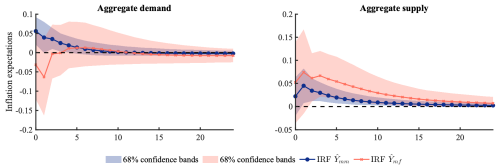
$\Rightarrow$ Individuals with mens characteristics behaving like men: "men"

$$\hat{Y}_{mf} = X_m \hat{B}_f + \hat{\zeta}_f IND_m$$

$\Rightarrow$ Individuals with mens characteristics behaving like women: "women"

Beliefs in response to inflationary shocks

Method II: KOB decomposition + SVAR with Zero and Sign Restrictions SVAR method



(a) Inflation Expectations

Beliefs in response to inflationary shocks

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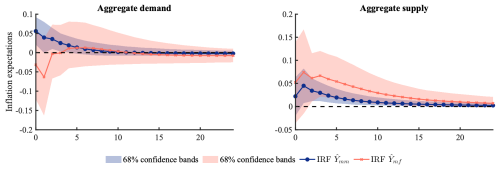

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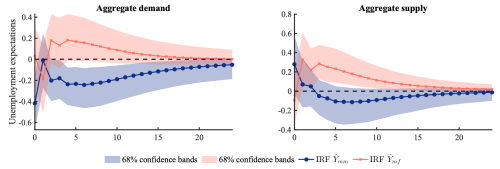

(b) Unemployment Expectations

Beliefs in response to inflationary shocks

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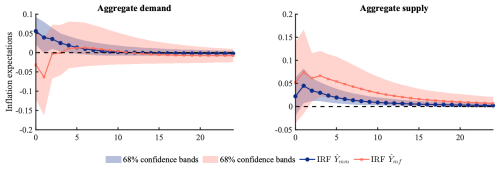

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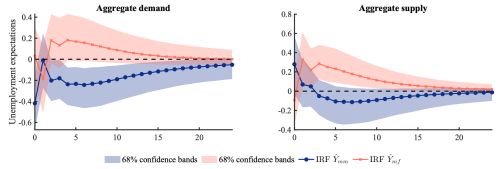

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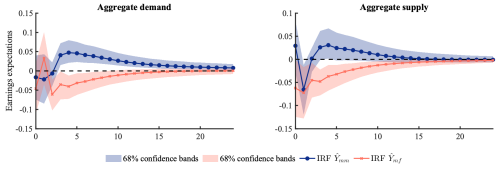

(c) Earnings Growth Expectations

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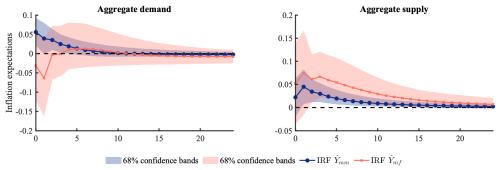

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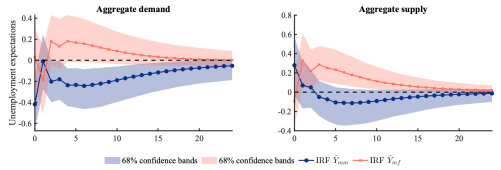

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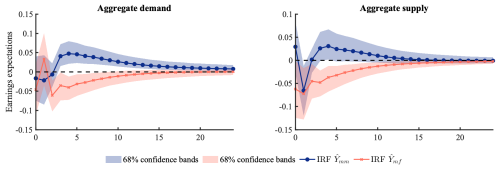

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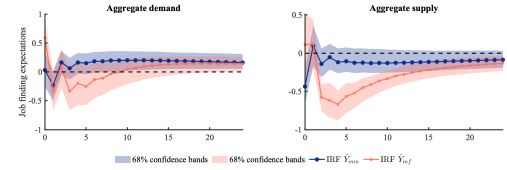

(d) Job Finding Expectations

Overview

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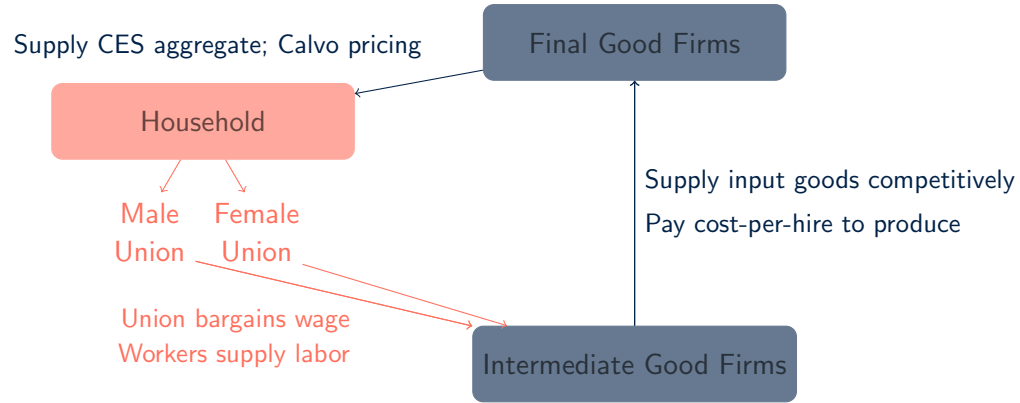

Skip

Reset and Target Wage

Reset Wage:

$$\mathbb{E}_t \sum_{k=0}^{\infty} ((1-\delta)(1-\theta_g^w))^k \Lambda_{t,t+k} \left(\frac{W_{g,t}^*}{P_{t+k}} - \Omega_{g,t+k|t}^{\text{tar}} \right) = 0$$

Target Wage:

$$\Omega_{g,t+k|t}^{\text{tar}} \equiv \xi_g \frac{C_{t+k}}{\chi L_{g,t+k}^{\varphi_g}} + (1-\xi_g) \frac{P_t^I}{P_t} MPN_{g,t+k|t}$$

$MPN_{g,t+k|t}$: Taste-based discrimination $d_f > 0$ or statistical discrimination $\zeta_f = 0.375 < 0.5$

Calibration

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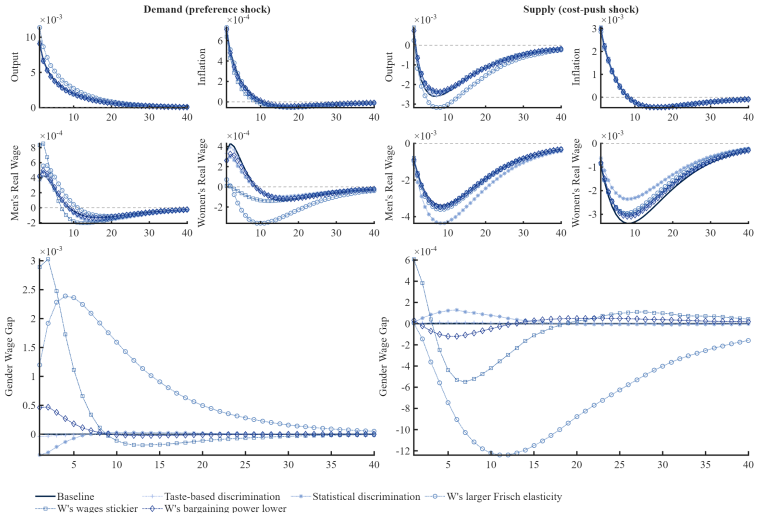
φ_g: Women's Frisch elasticity higher — $\varphi_f = 0.8 < 2 < \varphi_m = 2.399$ Calibration

Testing standard mechanisms



Introducing ambiguity aversion - Timeline

Standard Model

Shocks realized

↓

Wage bargaining

Price setting

Households choose C, L

Central bank sets i_t

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Pre-Shock Wage Setting

Noisy signal received by unions

↓

Union forms beliefs and

solves model following beliefs

↓

Shocks revealed

↓

Wage bargaining (based on unions beliefs)

Price setting

Households choose C, L

Central bank sets i_t

Ambiguity aversion

Each union $g \in \{m, f\}$ evaluates the continuation value $V_{s,t}$ of the representative household under each aggregate shock $s \in \{z, u\}$:

- z: demand (preference) shock
- u: cost-push (supply) shock

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Ambiguity aversion modeled via robust control [Hansen and Sargent, 2001]

$$m_g^s = p_s \exp\left(-\frac{V_{s,t}}{\lambda_g}\right)$$

$$w_g^s = \frac{m_g^s}{\sum_{s' \in \{z,u\}} m_g^{s'}}$$

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λ_g: governs belief distortion

- Small $|\lambda_g| \Rightarrow$ stronger sensitivity to adverse outcomes
- $\lambda_m < 0$: *optimism* (overweights favorable states)
- $\lambda_f > 0$: *pessimism* (overweights unfavorable states)

Belief updating

Both unions observe noisy composite signal:

$$s_t = \varepsilon_t^u + \varepsilon_t^z.$$

Let $\tilde{\mathbb{E}}_{g,t}[\cdot]$ denote the conditional expectation operator of union g under its ambiguity-distorted beliefs. Unions use these beliefs to infer the expected realizations of the latent shocks:

$$\tilde{\varepsilon}_{g,t}^z = w_g^z \, s_t, \tag{1}$$

$$\tilde{\varepsilon}_{g,t}^u = w_g^u \, s_t. \tag{2}$$

Subjective expectations about the underlying state variables evolve according to the perceived laws of motion:

$$\tilde{\mathbb{E}}_{g,t}[z_t] = \rho_z \, \tilde{\mathbb{E}}_{g,t-1}[z_{t-1}] + \tilde{\varepsilon}_{g,t}^z, \tag{3}$$

$$\tilde{\mathbb{E}}_{g,t}[u_t] = \rho_u \, \tilde{\mathbb{E}}_{g,t-1}[u_{t-1}] + \tilde{\varepsilon}_{g,t}^u. \tag{4}$$

Wage Bargaining and labor participation

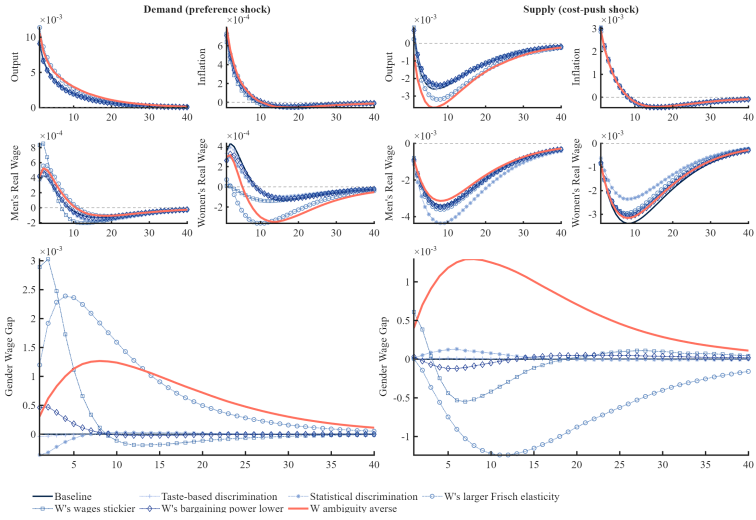
The optimal labor participation decision for each gender $g \in \{m, f\}$ is determined by equating the marginal disutility of labor with its expected marginal benefit:

$$\psi_g \, \chi_g L_g^{\varphi_g} \frac{C_t}{Z_t} = \frac{x_g}{1 - x_g} \left[\frac{1 - \xi_g}{\xi_g} G_g - \pi_g^w \frac{\theta_g^w}{1 - \theta_g^w} \omega_{g,t-1} Q_g \right],$$

where

$$Q_g = 1 + \theta_g^w (1 - \delta_g) \beta \frac{\tilde{\mathbb{E}}_{g,t}[Z_{t+1}]}{Z_t} \frac{C_t}{\tilde{\mathbb{E}}_{g,t}[C_{t+1}]} \frac{\tilde{\mathbb{E}}_{g,t}[Q_{g,t+1}]}{1 + \pi_t^p}.$$

Impulse responses in the theoretical model



Conclusion

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   - Adjusted GWGs increase in response to both inflationary supply and demand shocks

$\Rightarrow$ Evidence in support of a re-nogiation channel that determines the cyclicality of the GWG beyond exposure

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   $\Rightarrow$ Renegotiation differential may be driven by differing beliefs

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   $\Rightarrow$ Evidence in support of a re-nogiation channel that determines the cyclicality of the GWG beyond exposure

2. Women interpret inflationary shocks as deteriorating labor market conditions, while men don't

   $\Rightarrow$ Renegotiation differential may be driven by differing beliefs

3. Belief frictions can explain different renegotiation for women

   $\Rightarrow$ Mechanism that replicates the movement of the adjusted GWG in an NKSM framework

Thank you!

Overview

4. Appendix

References I


Albanesi, S. (2025).
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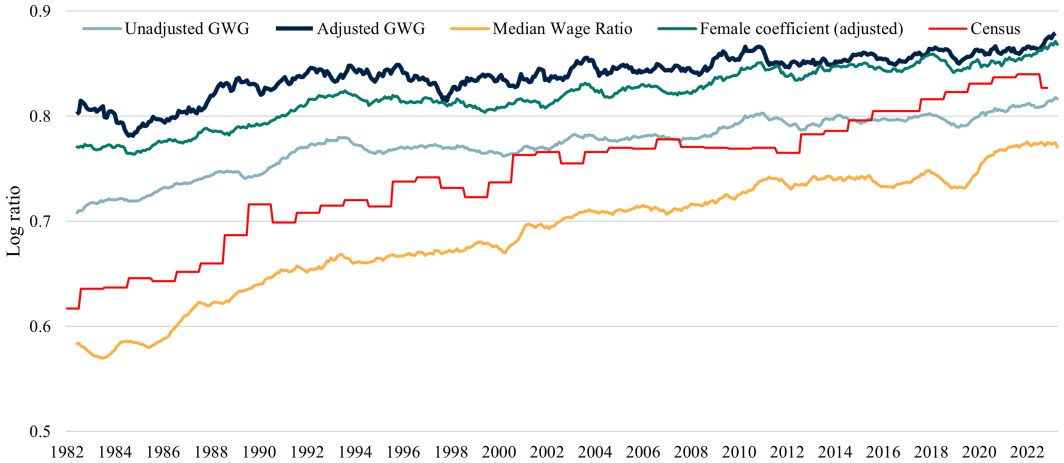
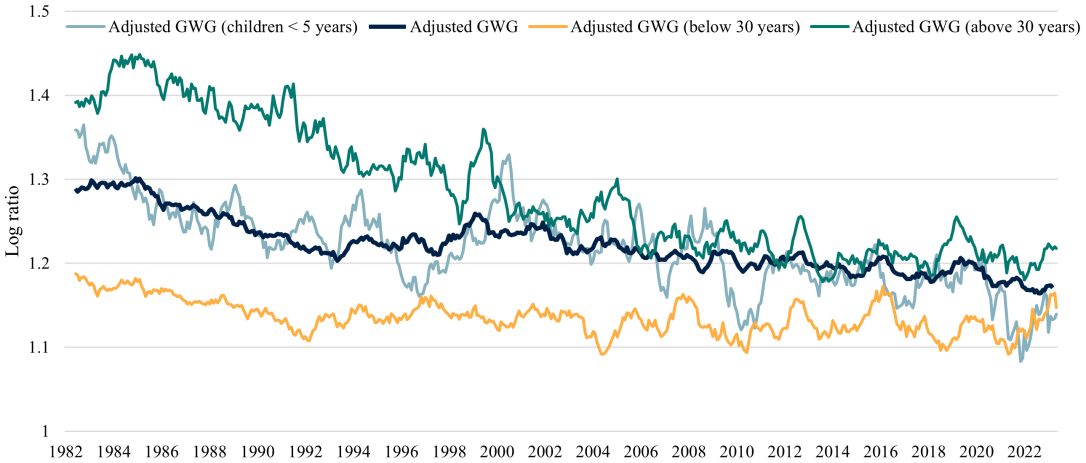
Alternative measures of the GWG



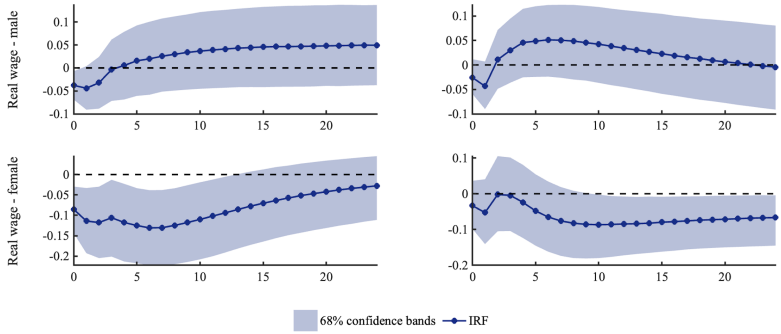
Baseline timeseries

Adjusted GWGs over time by demographic group



Baseline timeseries

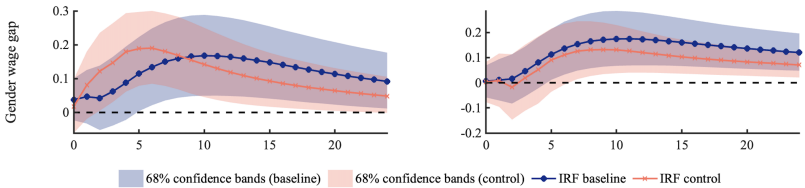
Who's wages are moving in real terms?



Adjusted real wages (January 1982 - February 2020, 3 months moving average)

Robustness Overview

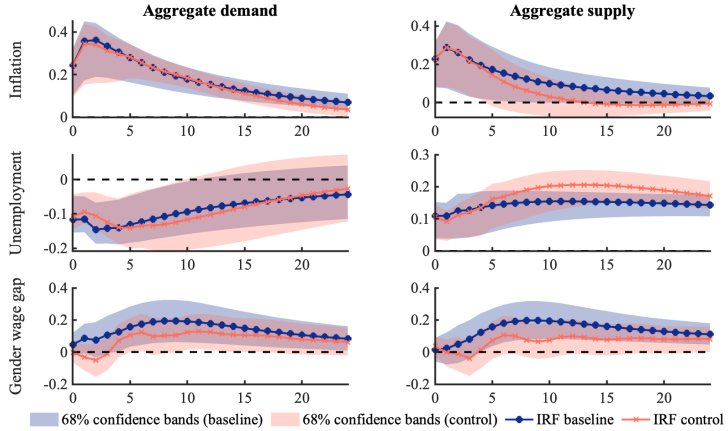
Mitigation though working hours?



Adjusted GWG in weekly wages (January 1982 - February 2020, 3 months moving average)

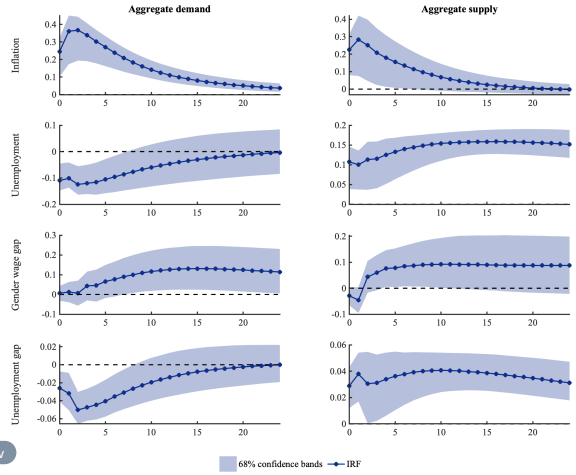
Robustness Overview

Increasing lags: p=6



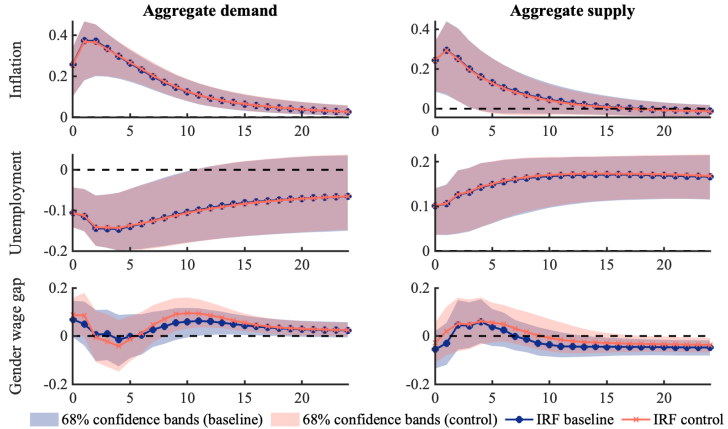
Robustness Overview

Unemployment gap instead of adjustment



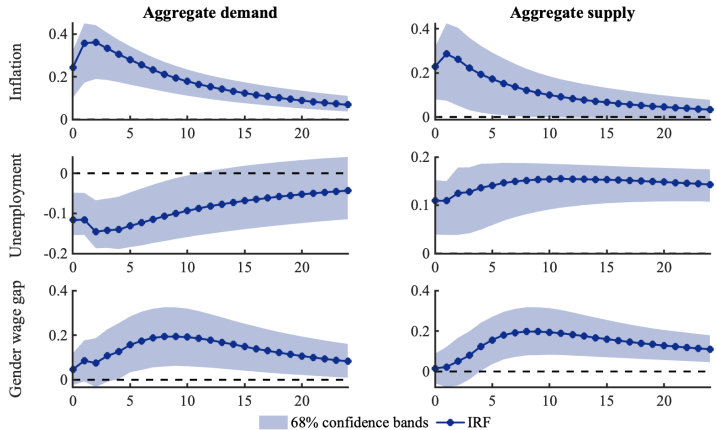
Baseline | Robustness Overview

Rebargaining or Moving?



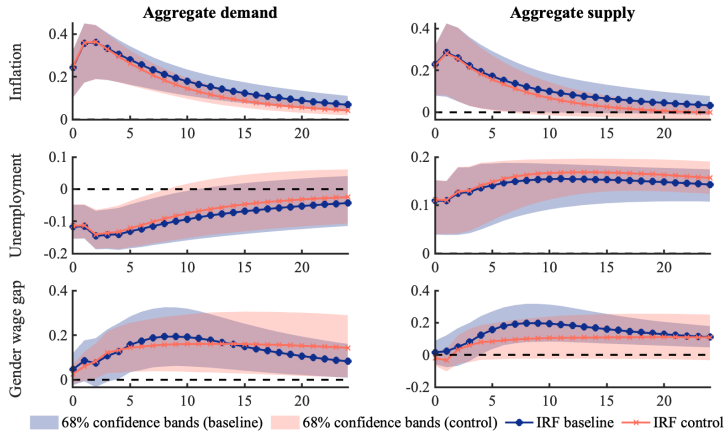
Robustness Overview

GWG response to Supply and Demand Shocks



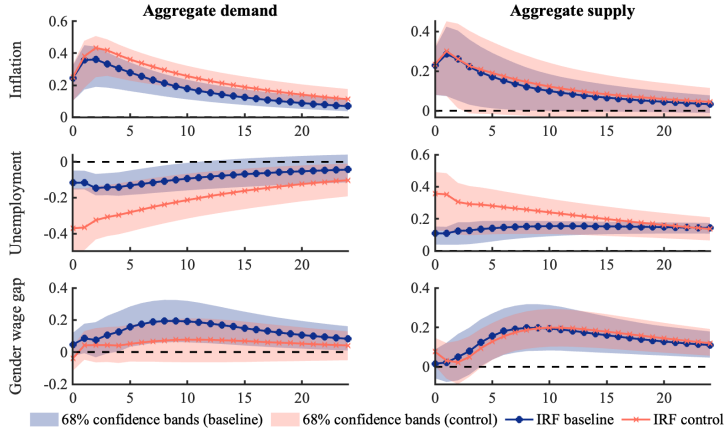
Adjusted GWGs (January 1982 - February 2020, 3 months moving average)

GWG response to Supply and Demand Shocks



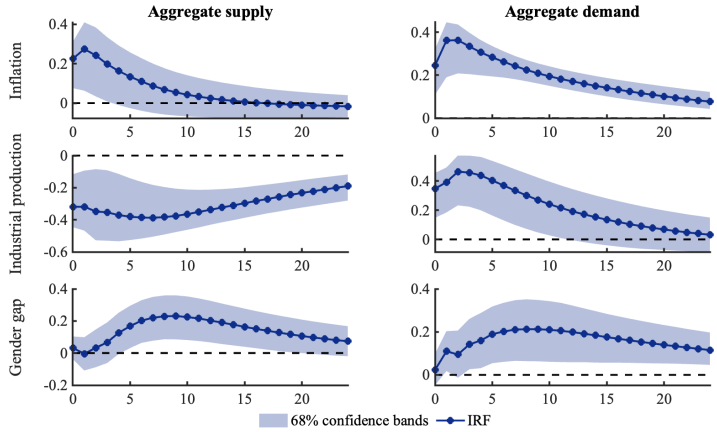
Undjusted GWGs (January 1982 - February 2020, 3 months moving average)

Including Covid period



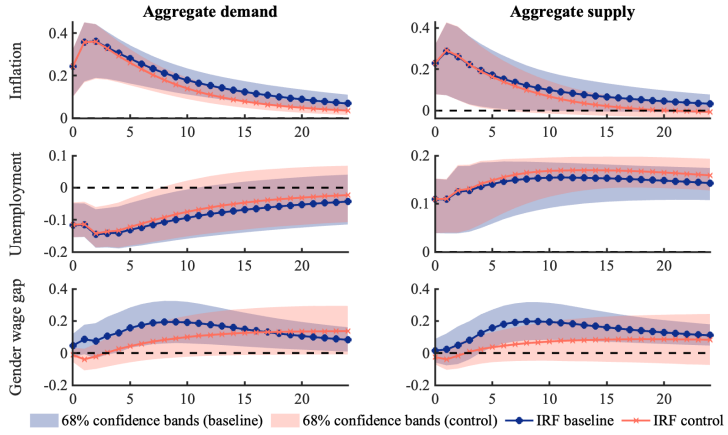
Robustness Overview

Alternative business cycle measures: Industrial production



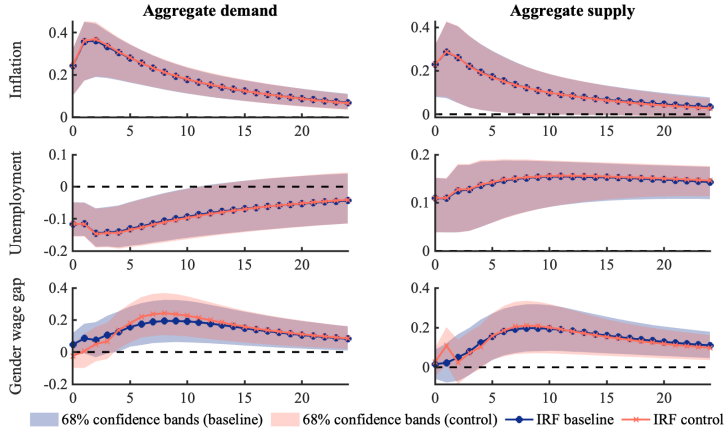
Robustness Overview

Alternative GWG measures: Raw gaps



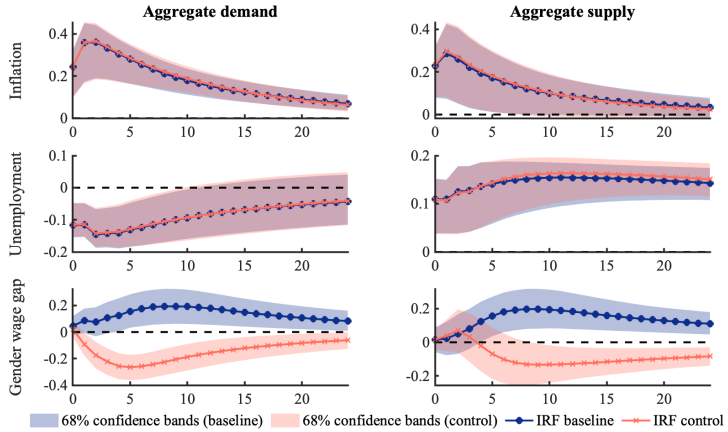
Baseline | Robustness Overview

Alternative GWG measures: Nearest-neighbor matching



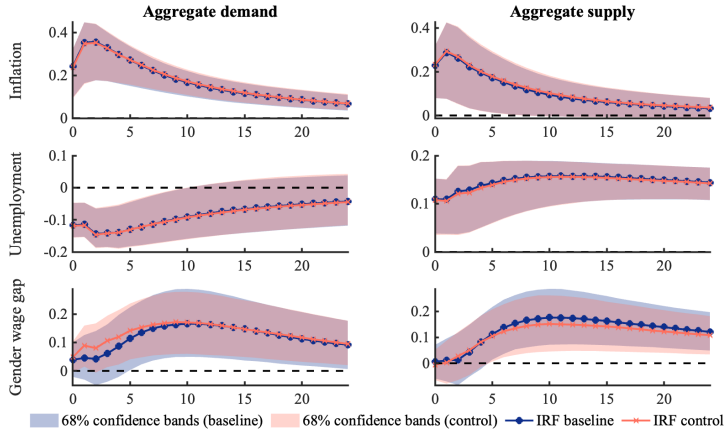
Baseline | Robustness Overview

Alternative GWG measures: Female characteristics



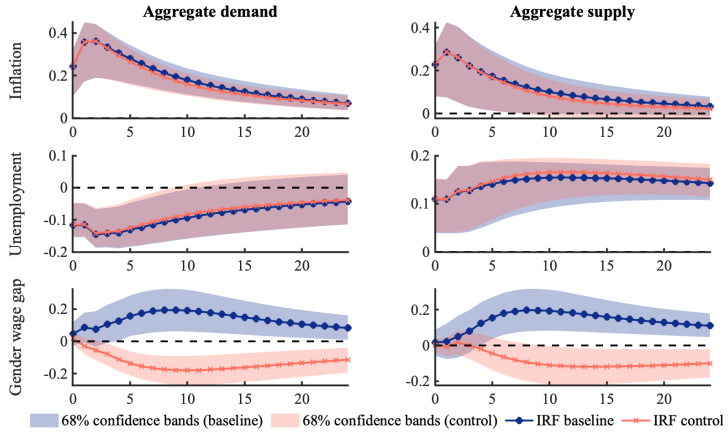
Robustness Overview

Alternative GWG measures: Median



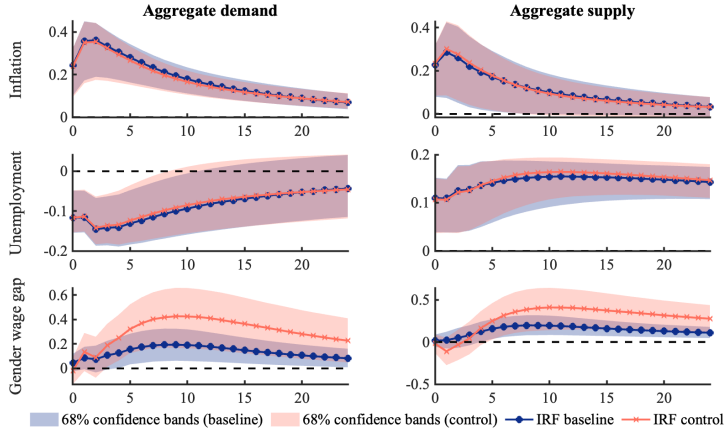
Robustness Overview

Alternative GWG measures: [Penner et al., 2022]



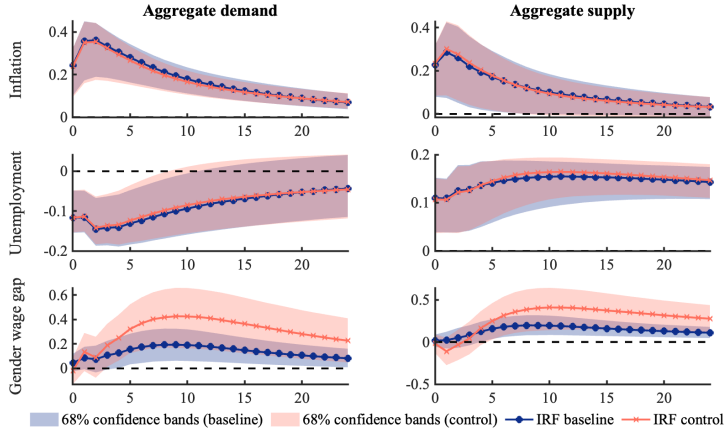
Robustness Overview

Demographic groups: Above 30



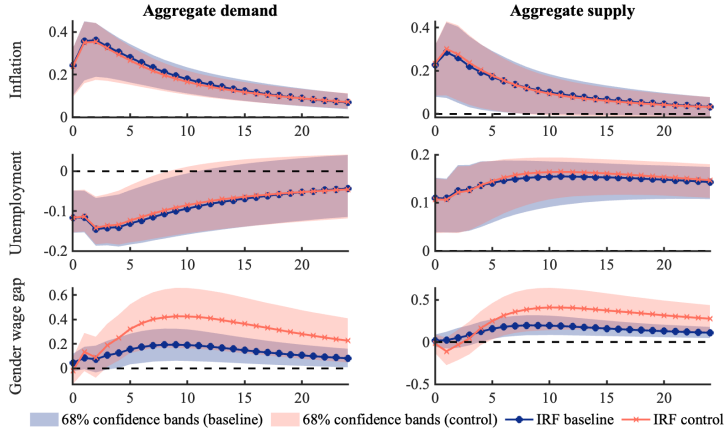
Robustness Overview

Demographic groups: Above 40



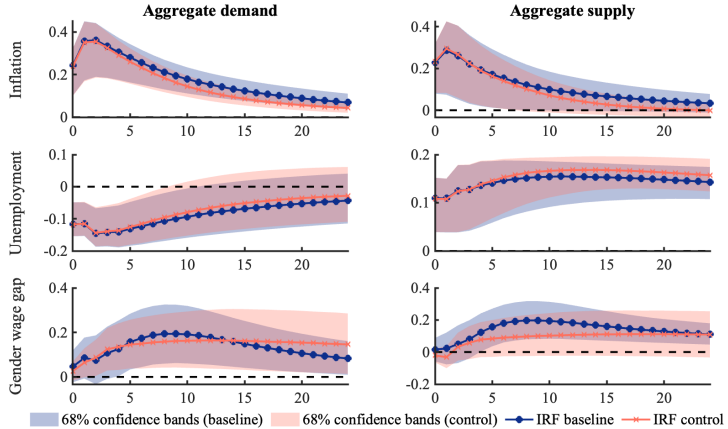
Robustness Overview

Demographic groups: Above 50



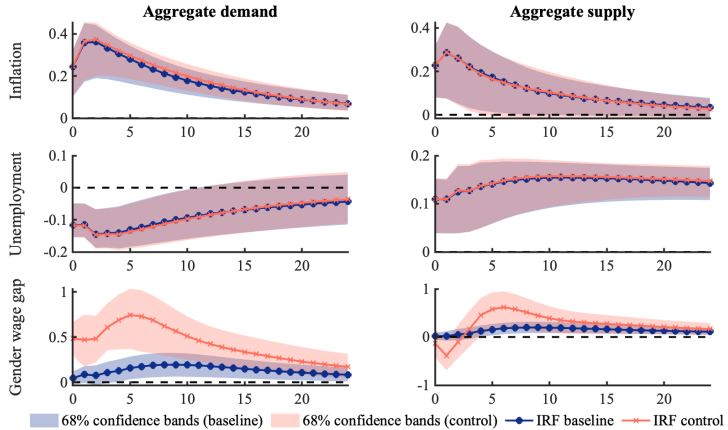
Robustness Overview

Demographic groups: Below 30



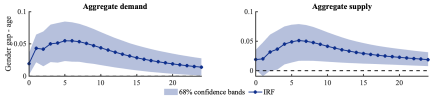
Robustness Overview

Demographic groups: Children below 5 years

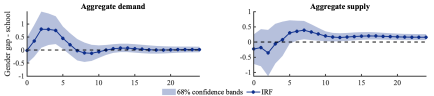


Robustness Overview

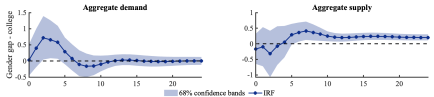
Coefficients - demographics



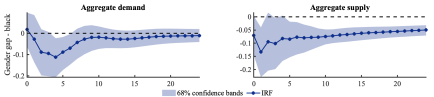
(a) Age



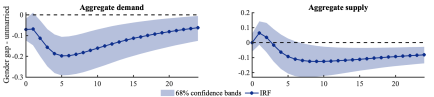
(b) School



(c) College



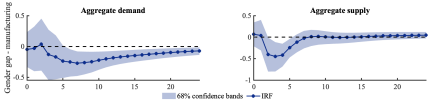
(d) Black



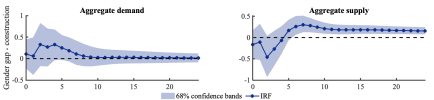
(e) Unmarried

Robustness Overview

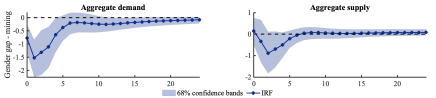
Coefficients - industry I



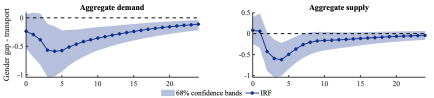
(a) Manufacturing



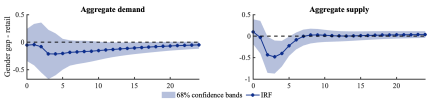
(b) Construction



(c) Mining



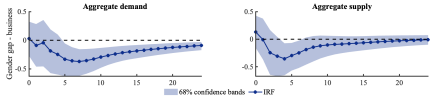
(d) Transport



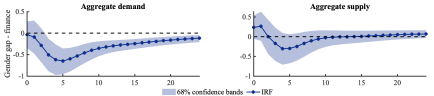
(e) Retail

Robustness Overview

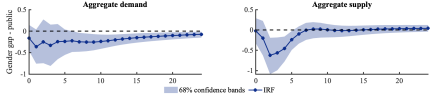
Coefficients - industry II



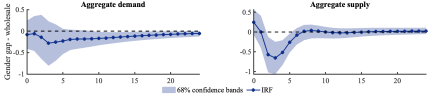
(a) Business



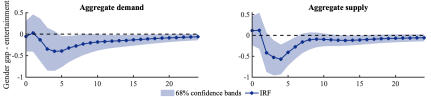
(b) Finance



(c) Public



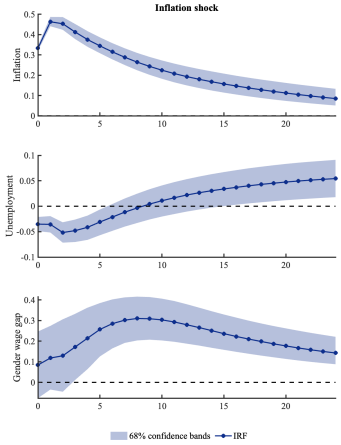
(d) Wholesale



(e) Entertainment

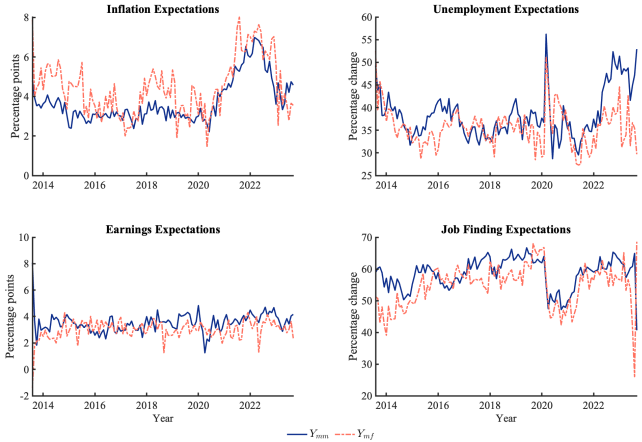
Robustness Overview

Inflation shock - Max-share approach



Robustness Overview

Beliefs of men and women over time



SVAR

Household

- Two representative members, one agent of type f and one agent of type m
- Assume identical preferences, equal intra-household bargaining weight, no domestic labor, complete financial markets and perfect insurance setup

$$\max \mathbf{E}_0 \sum_{t=0}^{\infty} \beta^t U(C_t, L_{m,t}, L_{f,t}; Z_t)$$

$$\text{subject to } P_t C_t + Q_t B_t \leq B_{t-1} + W_{f,t} N_{f,t} + W_{m,t} N_{m,t} + \Pi_t$$

$$\text{where } U_t = (\ln C_t - \frac{\chi L_{m,t}^{1+\varphi_m}}{1+\varphi_m} - \frac{\chi L_{f,t}^{1+\varphi_f}}{1+\varphi_f}) Z_t \text{ and } L_{g,t} = N_{g,t} + \psi U_{g,t} \text{ for } g = f, m$$

Household

- Two representative members, one agent of type f and one agent of type m
- Assume identical preferences, equal intra-household bargaining weight, no domestic labor, complete financial markets and perfect insurance setup

$$\max \mathbf{E}_0 \sum_{t=0}^{\infty} \beta^t U(C_t, L_{m,t}, L_{f,t}; Z_t)$$

$$\text{subject to } P_t C_t + Q_t B_t \leq B_{t-1} + W_{f,t} N_{f,t} + W_{m,t} N_{m,t} + \Pi_t$$

$$\text{where } U_t = (\ln C_t - \frac{\chi L_{m,t}^{1+\varphi_m}}{1+\varphi_m} - \frac{\chi L_{f,t}^{1+\varphi_f}}{1+\varphi_f}) Z_t \text{ and } L_{g,t} = N_{g,t} + \psi U_{g,t} \text{ for } g = f, m$$

$$Q_t = \beta \mathbf{E}_t \Big\{ \frac{C_t}{C_{t+1}} \frac{P_t}{P_{t+1}} \frac{Z_{t+1}}{Z_t} \Big\}.$$

Model overview

Intermediate goods firms

CES production function that aggregates male and female labor with relative productivity ζ_m, ζ_f and the elasticity of substitution between male and female labor σ

$$X_t(j) = A_t \left[\zeta_f \cdot N_{f,t}(j)^{\frac{\sigma-1}{\sigma}} + \zeta_m \cdot N_{m,t}(j)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{(1-\alpha)\sigma}{\sigma-1}} \quad \text{where } 1 = \zeta_m + \zeta_f.$$

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Firms incur a cost-per-hire... ...which depends on the job finding rate.

$$G_{g,t} = \Gamma x_{g,t}^{\gamma}, \qquad x_{g,t} \equiv \frac{H_{g,t}}{U_{g,t}}.$$

Model overview

Nash bargaining with Calvo frictions

Households surplus of resetting wage for agent of gender g

$$\mathcal{S}_{t|t}^{H_g} = \mathbb{E}_t \left\{ \sum_{k=0}^{\infty} \left((1-\delta)\theta_g^w \right)^k \Lambda_{t,t+k} \left(\frac{W_{g,t}^*}{P_{t+k}} - MRS_{g,t+k} \right) \right\}$$
$$+(1-\theta_g^w)(1-\delta)\mathbb{E}_t \left\{ \sum_{k=0}^{\infty} \left((1-\delta_g)\theta_g^w \right)^k \Lambda_{t,t+k+1} \mathcal{S}_{t+k+1|t+k+1}^{H_g} \right\}$$

Firms surplus of resetting wage for agent of gender g

$$\mathcal{S}_{t|t}^{F_g} = \mathbb{E}_t \left\{ \sum_{k=0}^{\infty} \left((1-\delta)\theta_g^w \right)^k \Lambda_{t,t+k} \left((1-d_g) MRPN_{g,t+k|t} - \frac{W_{g,t}^*}{P_{t+k}} \right) \right\}$$
$$+(1-\theta_g^w)(1-\delta)\mathbb{E}_t \left\{ \sum_{k=0}^{\infty} \left((1-\delta)\theta_g^w \right)^k \Lambda_{t,t+k+1} \mathcal{S}_{t+k+1|t+k+1}^{F_g} \right\}$$

Nash Bargaining

$$\xi_g \mathcal{S}_{t|t}^{H_g} = (1-\xi_g)\mathcal{S}_{t|t}^{F_g}$$

Model overview

Calibration

Parameter	Value	Description	
β	0.990	Discount rate	
θ^p	0.750	Price rigidity	
$\delta_{m,f}$	0.233	Separation rate (men, women)	$\Rightarrow$ match unemployment and job finding[1]
α	0.333	Exponent of labor in production	$\Rightarrow$ labor share of 1/3
γ	1.000	Coefficient of hiring cost	$\Rightarrow$ equivalent to matching function approach[2]
$\Gamma_{m,f}$	0.013	Proportionality coefficient of hiring cost	$\Rightarrow$ match empirical hiring cost[3]
ρ_u	0.900	Autocorrelation cost-push shock	
ρ_z	0.900	Autocorrelation demand shock	
ϕ_π	2.000	Taylor rule: inflation	
$\phi_{u,m/f}$	-0.013	Taylor rule: unemployment (m/f)	$\Rightarrow$ Optimal policy with labor market frictions[4]

Model overview

[1] [Gertler and Trigari, 2009]
[2] [Blanchard and Galí, 2010]
[3] [Silva and Toledo, 2009]
[4] [Faia, 2008]

Calibration

Parameter	Value	Description	
ζ	0.500	Relative productivity of women	$\Rightarrow$ Assume parity
φ	2.000	Inverse Frisch elasticity (men and women)	
σ	4.300	Elasticity of substitution (m/w)	$\Rightarrow$ Estimate from [Albanesi, 2025]
d_f	0.100	Discrimination against women	$\Rightarrow$ Steady state GWG of $\approx$10%
$\xi_{m,f}$	0.600	Bargaining power	$\Rightarrow$ Estimate from [Flinn, 2006]
$\theta^w_{m,f}$	0.750	Wage rigidity	$\Rightarrow$ Wages are reset annually

Model overview