Inflation and the Gender Wage Gap
The Role of Belief Frictions

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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

$\Rightarrow$ **It depends on inflation, not output!**

What's the mechanism behind?

Stylized Fact I: Adjusted GWGs comove with inflation

- In line with micro-evidence on lower willingness to bargain for wages[a]

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New Keynesian Search and Match Model[a] with Male and Female Workers[b]

- Test role of bargaining power and wage rigidity on GWG with discrimination

$\Rightarrow$ Wage rigidities are key

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- Perceived deterioration in labor market conditions could lower perceived gains of wage re-negotiation

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and Incomplete Information[a]

- Wage-reset-probability is based on beliefs about shocks

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

[a] [Erceg et al., 2025]

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].

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Data: Monthly CPS from 1982-2020

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

1. Estimate

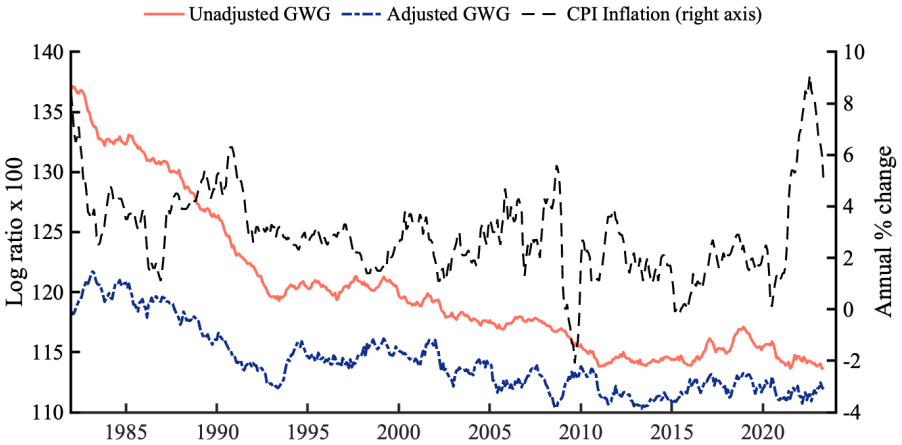
$$Y_m = X_m B_m + \gamma_m OCC1990_m + \zeta_m IND1990_m + u_m$$
$$Y_f = X_f B_f + \gamma_f OCC1990_f + \zeta_f IND1990_f + u_f$$

2. Predict

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

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

Adjusted GWGs over time



GWGs for different demographics | GWGs measured differently

Structural VAR Model with Zero and Sign Restrictions

Reduced form:

$$Y_t = c + A_1 Y_{t-1} + A_2 Y_{t-2} + A_3 Y_{t-3} + u_t, \quad u_t \sim N(0, \Sigma)$$

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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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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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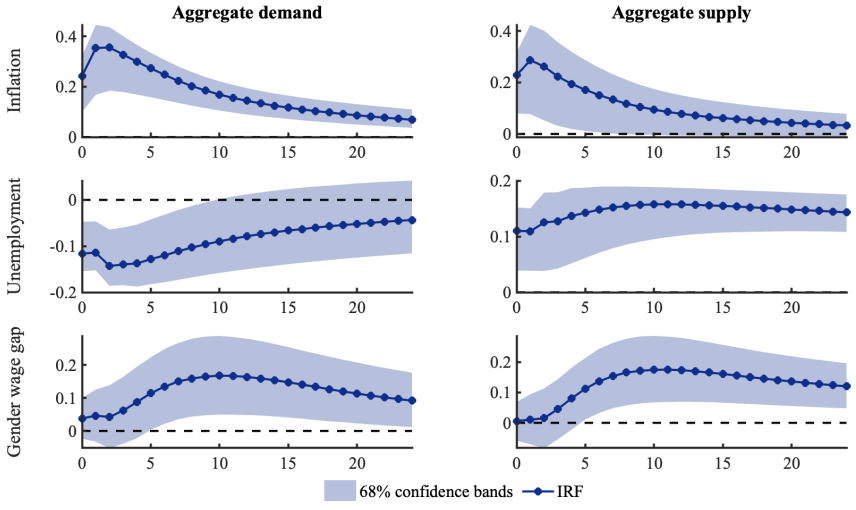
	Demand	**Supply**	**Residual**
π	$+$	$+$	0
U	$-$	$+$	0
GWG	?	?	$+$

GWG response to Supply and Demand Shocks



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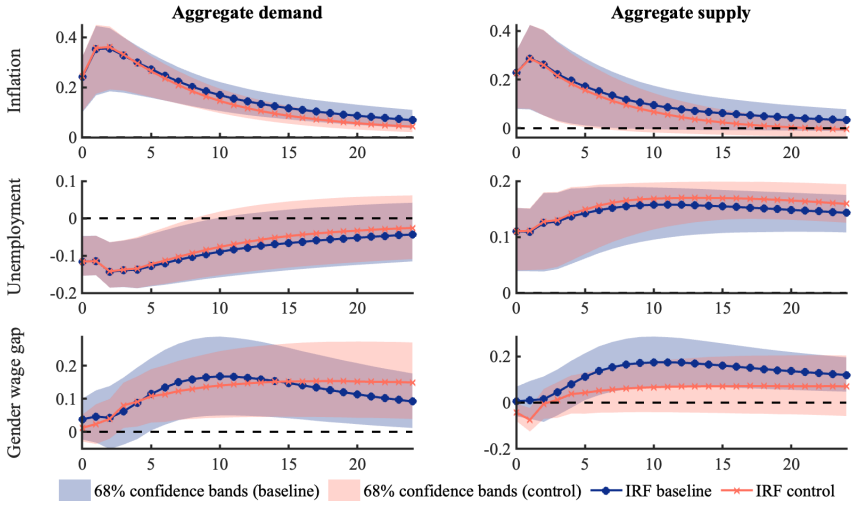

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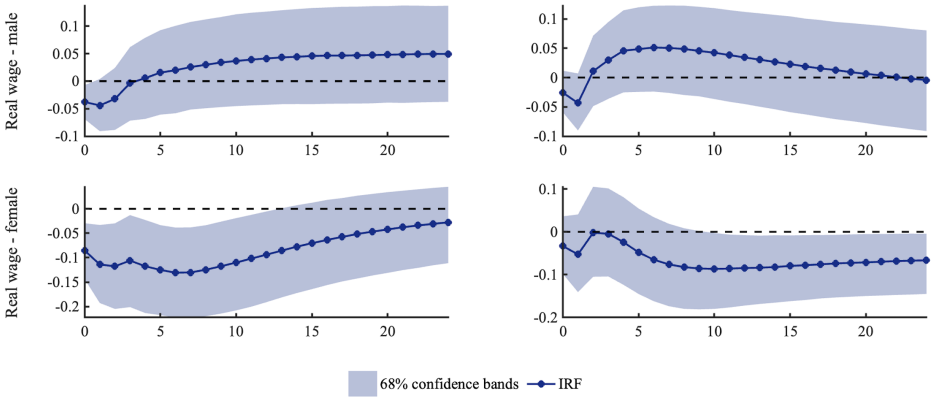

Adjusted real wages (January 1982 - February 2020, 3 months moving average)

Mitigation though working hours?

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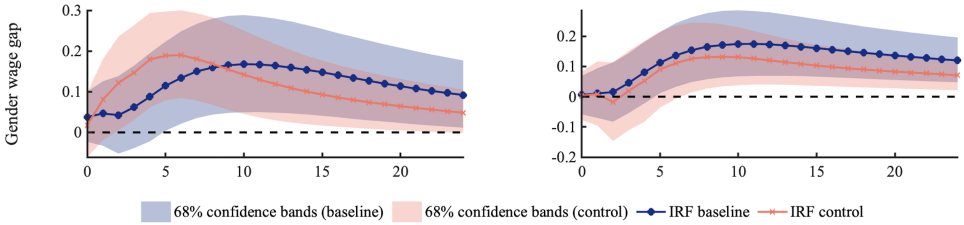

Adjusted GWG in weekly wages (January 1982 - February 2020, 3 months moving average)

Robustness

- Number of lags
  - → BIC suggests 3 lags
  - p=6
- Bigger VAR
  - Unemployment gap as control
- Alternative measures of output
  - Industrial production
- Including Covid period
  - 1982-2023
- Moving jobs
  - old job vs new job
- Alternative measures of GWGs
  - Raw gaps
  - Men's wages with female characteristics
  - Median
  - Penner et al., 2022
- Demographic subgroups
  - Below 30
  - Above 30
  - Above 40
  - Above 50
  - Children below age 5
- Coefficients
  - KOB coefficients

Overview

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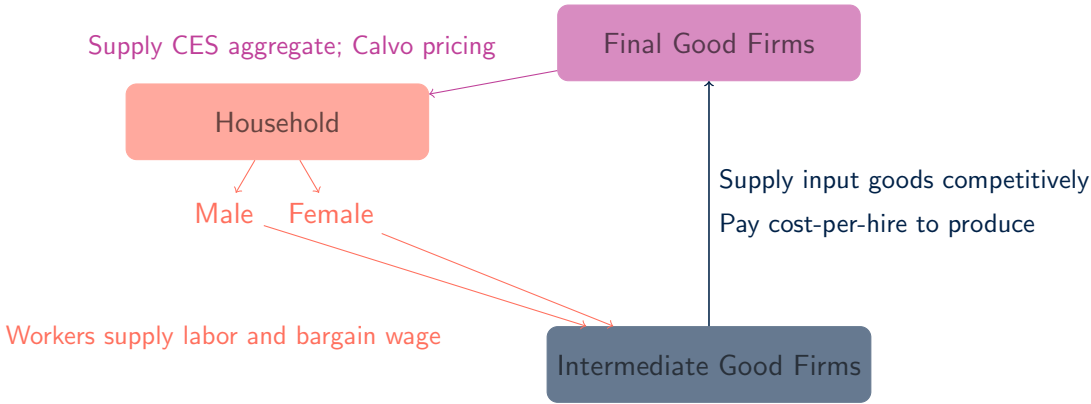
Supply CES aggregate; Calvo pricing
Final Good Firms
Household
Male
Female
Supply input goods competitively
Pay cost-per-hire to produce
Workers supply labor and bargain wage
Intermediate Good Firms

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

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

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

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

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$$\Rightarrow Q_t = \beta \mathbf{E}_0 \Big\{ \frac{C_t}{C_{t+1}} \frac{P_t}{P_{t+1}} \Big\} Z_t$$

Intermediate goods firms

CES production function that aggregates male and female labor with relative bias towards female labor ζ and the elasticity of substitution between men and women σ

$$X_t(j) = A_t \left[\zeta \cdot N_{f,t}(j)^{\frac{\sigma-1}{\sigma}} + (1-\zeta) \cdot N_{m,t}(j)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{(1-\alpha)\sigma}{\sigma-1}}$$

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Firms incur a cost-per-hire...

$$G_{g,t} = \Gamma x_{g,t}^{\gamma},$$

...which depends on the job finding rate.

$$x_{g,t} \equiv \frac{H_{g,t}}{U_{g,t}}.$$

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Optimality requires

$$\frac{P_t^I}{P_t} MPN_{g,t} = w_{g,t} + G_{g,t} - \beta(1-\delta)\mathbf{E}_t \left\{ \frac{C_t}{C_{t+1}} \frac{P_{t+1}}{P_t} G_{g,t+1} \right\} - d_g MPN_{g,t}$$

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Taste based discrimination[Becker, 1971, Black, 1995, Charles and Guryan, 2008, Neyer and Stempel, 2021] supported by evidence in [Flabbi, 2010, Maloney and Neumark, 2025, Goldin and Rouse, 2000, Bertrand and Mullainathan, 2004]

Nash bargaining with Calvo frictions

The target wage k periods ahead:

$$\Omega^{tar}_{g,t+k|t} \equiv \xi_g \frac{C_{t+k}}{\chi L^{\varphi}_{g,t+k}} + (1-\xi_g)\left(\frac{P^I_t}{P_t} - d_g\right) MPN_{g,t+k|t}$$

The log-linearized wage setting rule:

$$w^*_{g,t} = \beta(1-\delta)(1-\theta^w_g)\mathbb{E}_t\left[w^*_{g,t+1}\right] - \frac{1-\beta(1-\delta)(1-\theta^w_g)}{1-(1-\Upsilon_g)\Phi_g}\left(\hat{w}_{g,t} - \hat{w}^{\text{tar}}_{g,t}\right) + (1-\beta(1-\delta)(1-\theta^w_g))\hat{w}_{g,t}$$

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2. Test $\xi_m < \xi_f$: Women have lower bargaining power
3. Test $\theta^w_m > \theta^w_f$: Women are less likely to renegotiate

Calibration

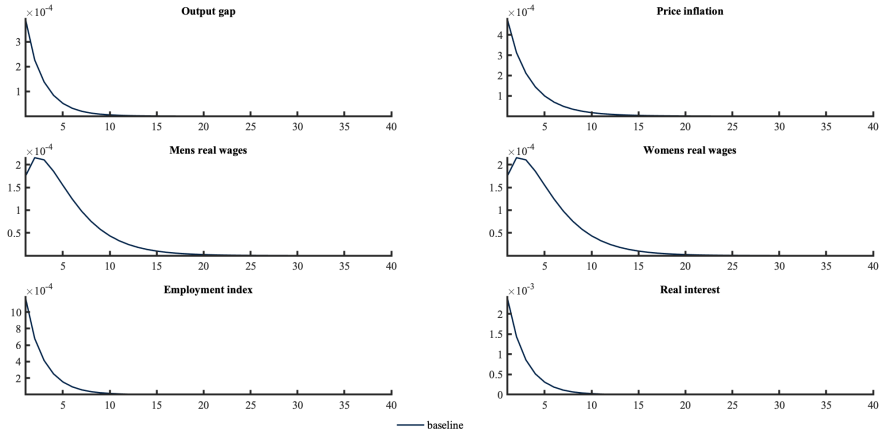
Parameter	Value	Description	
β	0.990	Discount rate	
φ	5.000	Frisch elasticity	
θ^p	0.250	Price rigidity	
$\delta_{m,f}$	0.233	Separation rate (men, women)	$\Rightarrow$ match unemployment and job finding[0]
α	0.667	Exponent of labor in production	$\Rightarrow$ labor share of 1/3
γ	1.000	Coefficient of hiring cost	$\Rightarrow$ eqvl to matching function approach[1]
Γ	0.020	Coefficient of hiring cost	$\Rightarrow$ match empirical hiring cost[2]
ρ_u	0.900	Autocorrelation cost push shock	
ρ_z	0.600	Autocorrelation demand shock	
ρ_u	0.010	Standard deviation cost push shock	
ρ_z	0.0025	Standard deviation demand shock	
ϕ_π	1.500	Taylor rule: inflation	
$\phi_{u,m/f}$	-0.025	Taylor rule: unemployment (m/f)	$\Rightarrow$ Optimal policy with labor market frictions[3]

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

Calibration

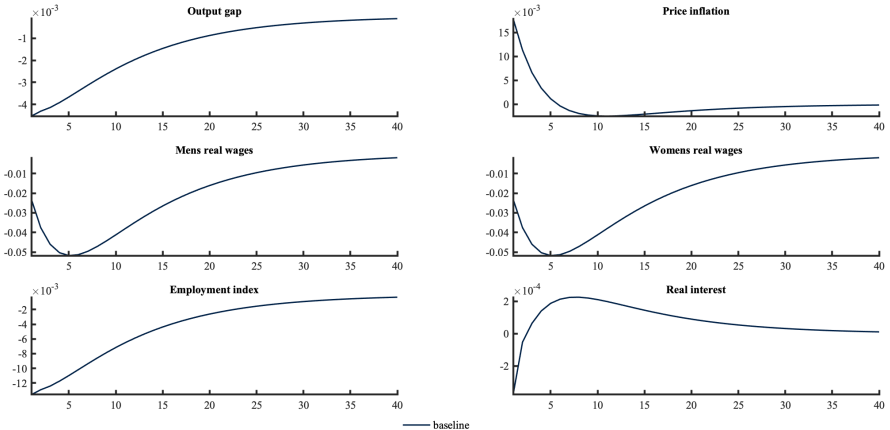
Parameter	Value	Description	
ζ	0.500	Relative productivity of women	$\Rightarrow$ Assume parity
σ	4.300	Elasticity of substitution (m/w)	$\Rightarrow$ Estimate from [Albanesi, 2019]
d_f	0.020	Discrimination against women	$\Rightarrow$ Steady state GWG of 17%
$\xi_{m,f}$	0.600	Bargaining power	$\Rightarrow$ Estimate from [Flinn, 2006]
$\theta^w_{m,f}$	0.250	Wage rigidity	$\Rightarrow$ Wages are reset annually

Impulse responses of the baseline model



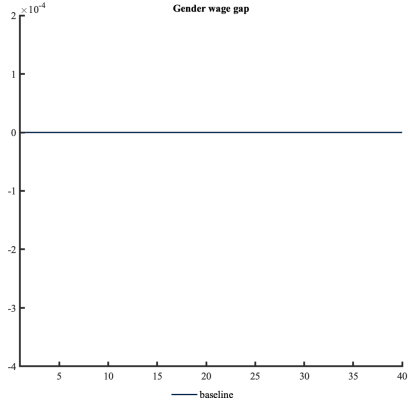
Response to an expansionary demand shock

Impulse responses of the baseline model



Response to a contractionary supply shock

Response of the GWG



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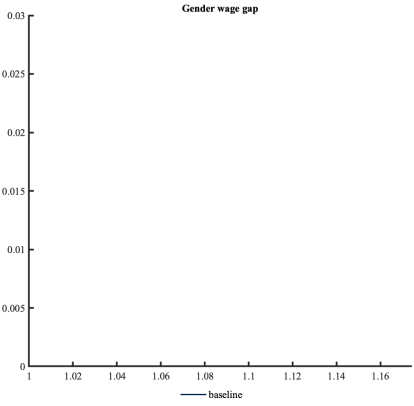
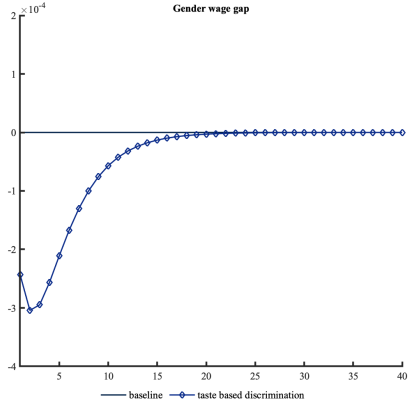


(b) Contractionary supply shock

Response of the GWG



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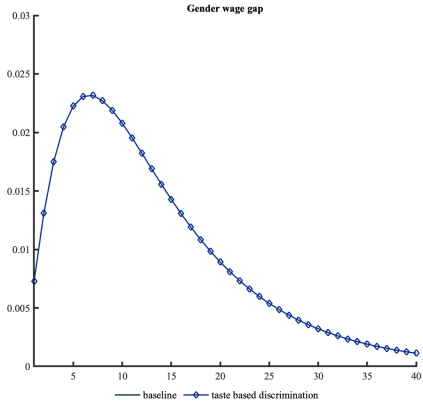
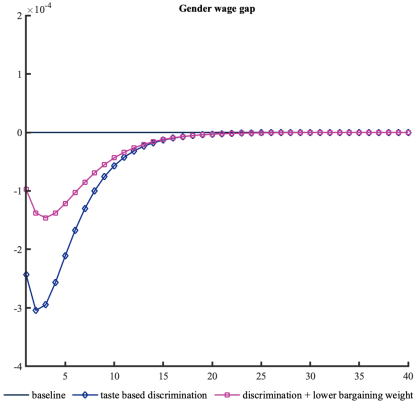


(b) Contractionary supply shock

Response of the GWG



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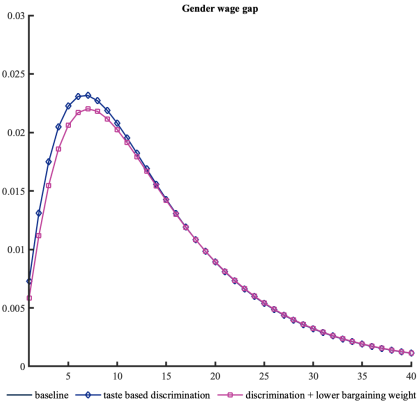
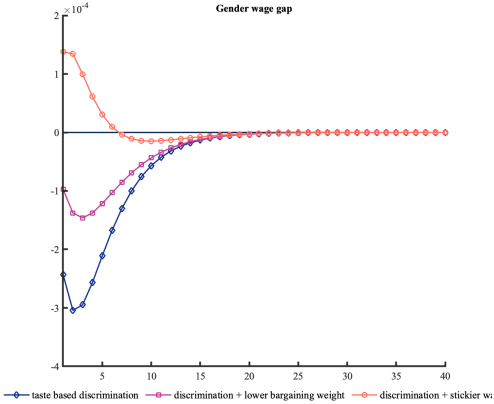
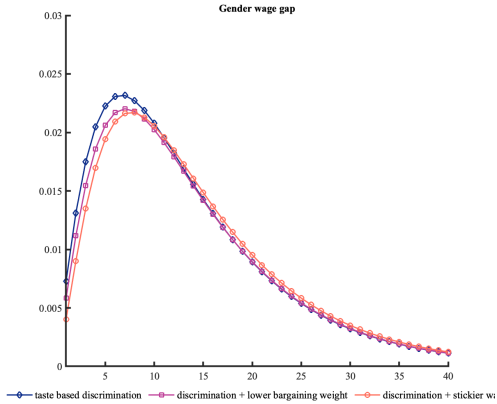


(b) Contractionary supply shock

Response of the GWG



(a) Expansionary demand shock



(b) Contractionary supply shock

More IRFs

Overview

Survey of Consumer Expectations

Data: Monthly SCE from 2013 - 2020

Survey of Consumer Expectations

Data: Monthly SCE from 2013 - 2020

- 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

1. **Estimate**

$$Y_m = X_m B_m + \zeta_m IND_m + u_m$$
$$Y_f = X_f B_f + \zeta_f IND_f + u_f$$

2. **Predict**

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

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

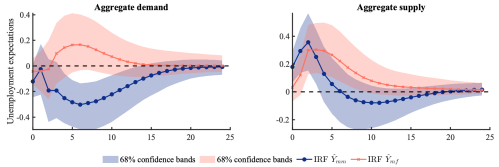
$$\hat{Y}_{mf} = X_m \hat{B}_f + \hat{\zeta}_f IND_m$$

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

Timeseries

Beliefs in response to inflationary shocks

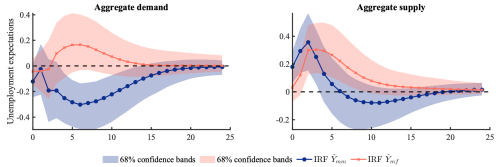
Method II: Kitagawa-Oaxaca-Blinder decomposition + SVAR with Zero and Sign Restrictions SVAR method



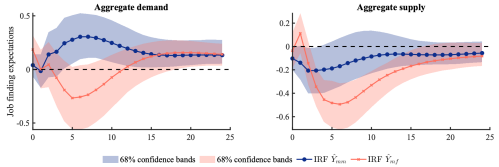
(a) Unemployment Expectations

Beliefs in response to inflationary shocks

Method II: Kitagawa-Oaxaca-Blinder decomposition + SVAR with Zero and Sign Restrictions SVAR method



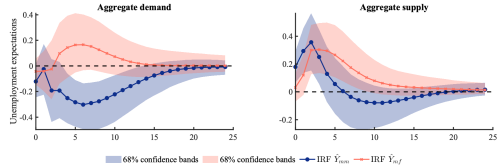
(a) Unemployment Expectations



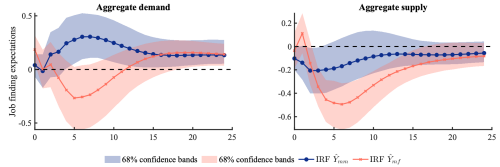
(b) Job Finding Expectations

Beliefs in response to inflationary shocks

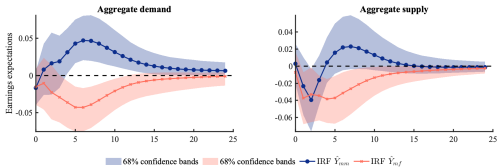
Method II: Kitagawa-Oaxaca-Blinder decomposition + SVAR with Zero and Sign Restrictions SVAR method



(a) Unemployment Expectations



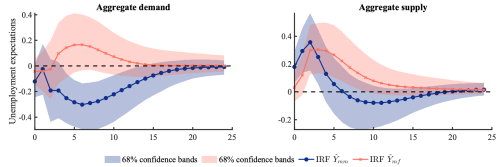
(b) Job Finding Expectations



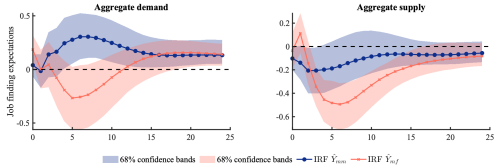
(c) Earnings Growth Expectations

Beliefs in response to inflationary shocks

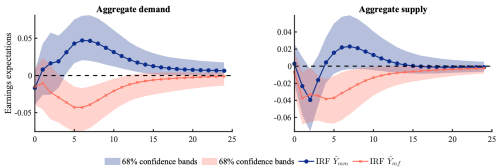
Method II: Kitagawa-Oaxaca-Blinder decomposition + SVAR with Zero and Sign Restrictions SVAR method



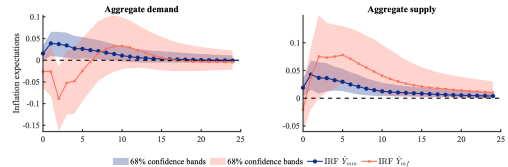
(a) Unemployment Expectations



(b) Job Finding Expectations



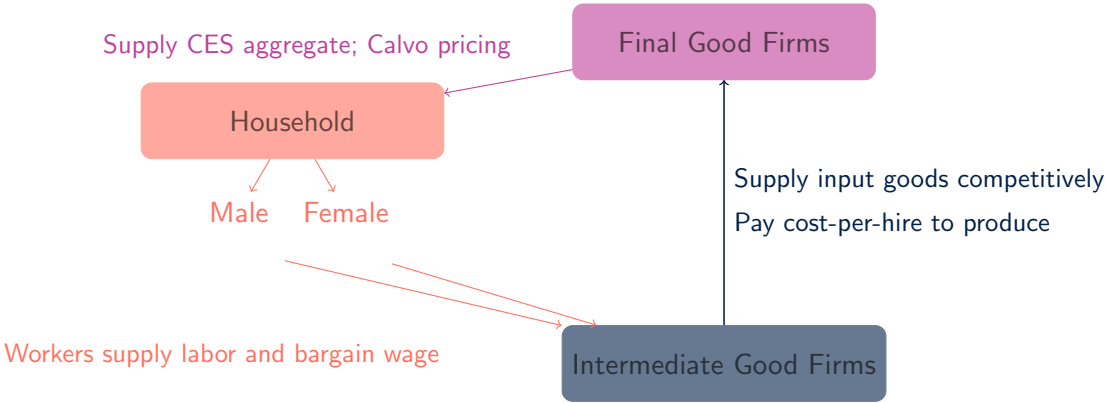
(c) Earnings Growth Expectations



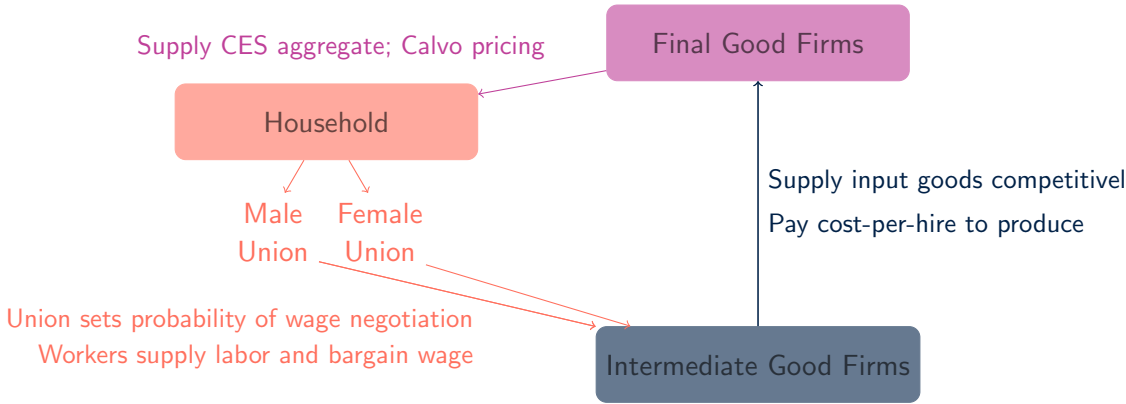
(d) Inflation Expectations

Overview

Overview II


Supply CES aggregate; Calvo pricing
Final Good Firms
Household
Male
Female
Supply input goods competitively
Pay cost-per-hire to produce
Workers supply labor and bargain wage
Intermediate Good Firms

Overview II


Supply CES aggregate; Calvo pricing
Final Good Firms
Household
Male Union
Female Union
Supply input goods competitively
Pay cost-per-hire to produce
Union sets probability of wage negotiation
Workers supply labor and bargain wage
Intermediate Good Firms

Timeline

Standard Model

Shocks realized

$\downarrow$

Wage bargaining

Price setting

Households choose C, L

Central bank sets i_t

Timeline

Standard Model

Shocks realized

↓

Wage bargaining

Price setting

Households choose C, L

Central bank sets i_t

Pre-Shock Wage Setting

Noisy signal received by unions

↓

Union forms beliefs and sets $\theta^w_{g,t}$

↓

Shocks revealed

↓

Wage bargaining

Price setting

Households choose C, L

Central bank sets i_t

Belief Friction

Noisy Signal

Before setting negotiation probability $\theta^w_{g,t}$, the union observes a composite signal of i.i.d. shocks:

$$s_t = \varepsilon^u_t + \varepsilon^z_t$$

where ε^u_t: cost-push and ε^z_t: demand shock

Belief Friction

Noisy Signal

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

Belief Updating (Kalman Filter with Bias)
Conditional expectations based on $\mathcal{I}_t^U = \{s_t, s_{t-1}, \dots\}$:

$$\hat{\varepsilon}_t^z = (1 - \text{bias})\,\kappa_z\, s_t, \qquad \kappa_z = \frac{\sigma_z^2}{\sigma_z^2 + \sigma_u^2}$$

$$\hat{\varepsilon}_t^u = (1 + \text{bias})\,\kappa_u\, s_t, \qquad \kappa_u = \frac{\sigma_u^2}{\sigma_z^2 + \sigma_u^2}$$

Given beliefs $\mathcal{I}_t^U$, the union solves for the expected paths $\mathbb{E}_t^U\{\pi_{t+k}, \tilde{y}_{t+k}, \tilde{w}_{t+k}, ...\}_{k\geq 0}$ that satisfy the system of equations, and chooses the reset probability $\theta_{g,t}^w$ based on perceived gain of renegotiation.

Endogenous Calvo wage frictions

Perceived gain

$$D_{g,t} = (\tilde{\mathbb{E}}_{g,t} W^*_{g,t} - \tilde{\mathbb{E}}_{g,t} W_{g,t}) + S_{g,t} + \beta(1-\delta)(1-\theta^w_{g,t}) D_{g,t+1}$$

Endogenous Calvo wage frictions

Perceived gain

$$D_{g,t} = (\tilde{\mathbb{E}}_{g,t} W^*_{g,t} - \tilde{\mathbb{E}}_{g,t} W_{g,t}) + S_{g,t} + \beta(1-\delta)(1-\theta^w_{g,t}) D_{g,t+1}$$

Renegotiation probability

$$f(D_{g,t};\tau) = \frac{\bar{\theta}^w_g h(D_{g,t})^\tau}{\bar{\theta}^w_g h(D_{g,t})^\tau + h(\bar{D}_g)^\tau (1-\bar{\theta}^w_g)}$$

S-function approach in the spirit of [Caballero and Engel, 1999, Caballero and Engel, 2007] and more recently [Costain and Nakov, 2011]

Endogenous Calvo wage frictions

Perceived gain

$$D_{g,t} = (\tilde{\mathbb{E}}_{g,t} W^*_{g,t} - \tilde{\mathbb{E}}_{g,t} W_{g,t}) + S_{g,t} + \beta(1-\delta)(1-\theta^w_{g,t}) D_{g,t+1}$$

Renegotiation probability

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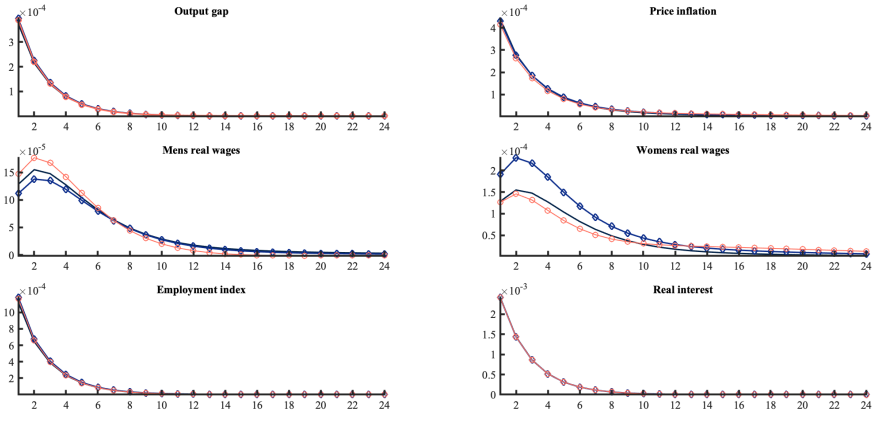
- Normalized: $f(D_{g,t} \leq 0;\tau) = 0$, no positive gain means no renegotiation
- Reference gain $\bar{D}_g \neq 0$: $f(D_{g,t} = \bar{D}_g;\tau) = \bar{\theta}^w_g \in (0,1)$
- As $\tau \to 0$: $f \to \bar{\theta}^w_g$ (Calvo wage rigidity setup) and as $\tau \to \infty$: $f \to \mathbf{1}_{\{D_{g,t}>0\}}$ (step function)
- Strictly increasing in $D_{g,t}$; bounded $f \in (0,1)$.

Calibration

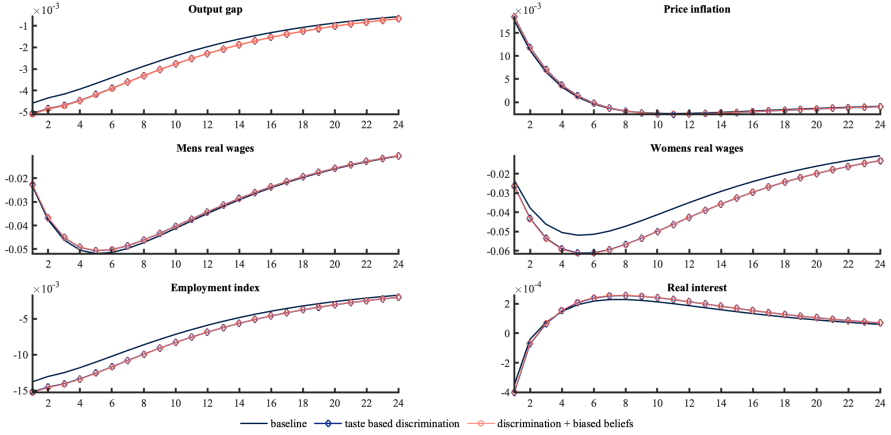
Parameter	Value	Description	
ζ	0.500	Relative productivity of women	$\Rightarrow$ Assume parity
σ	1.500	Elasticity of substitution (m/w)	$\Rightarrow$ Estimate from [Acemoglu et al., 2004]
d_f	0.020	Discrimination against women	$\Rightarrow$ Steady state GWG of 17%
$\xi_{m,f}$	0.600	Bargaining power	$\Rightarrow$ Estimate from [Flinn, 2006]
$\bar{\theta}^w_{m,f}$	0.250	Wage rigidity	$\Rightarrow$ Wages are reset annually
S	0.010	Surplus of wage renegotiation	$\Rightarrow$ Ensure positive gain
τ	1.000	Parameter in S-function	$\Rightarrow$ Assumes linearity
$\bar{\pi^p} = \bar{\pi^w}$	0.02	Steady state inflation	$\Rightarrow$ Needed for endogenizing wage rigidities

Effect of imperfect information on the baseline model



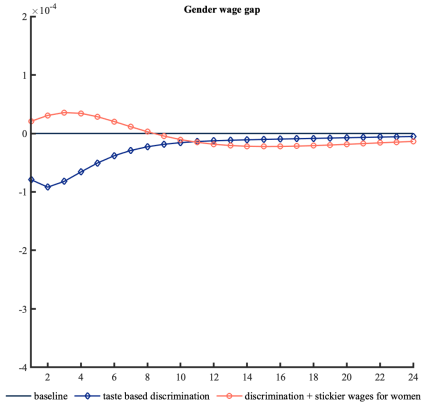
Response to an expansionary demand shock

Effect of imperfect information on the baseline model

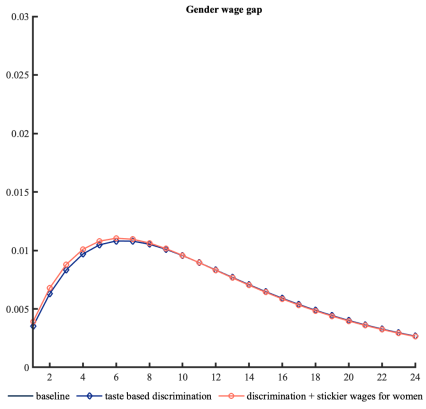


Response to a contractionary supply shock

Response of the GWG



(a) Expansionary demand shock



(b) Contractionary supply shock

Conclusion

1. Cyclicality of Gender Wage Gaps
   - Adjusted GWGs increase in response to both inflationary supply and demand shocks
   - Unadjusted GWGs increase in response to inflationary demand shocks but do not respond to inflationary supply 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 supply side narrative of the economy

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2. Women have a more supply side narrative of inflationary shocks

   $\Rightarrow$ Renegotiation differential may be driven by supply side narrative of the economy

3. Belief frictions can explain stickier wages for women which is a mechanism that replicates the movement of the adjusted GWG in an NKSM framework

Thank you!

Overview

5. Appendix

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Contributions

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→ Response of industry and occupation controlled gaps to macroeconomic shocks

→ Link of GWG to gender differences in expectation formation

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→ Gender differences in the response of labor market beliefs to inflation expectations

→ Novel method to analyze narratives of households

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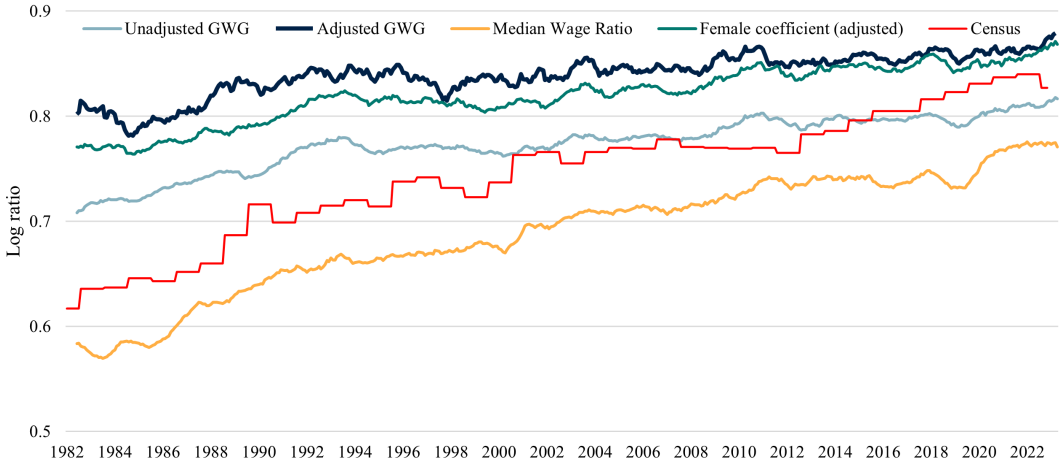
→ Gender differences in the response of labor market beliefs to inflation expectations

→ Novel method to analyze narratives of households

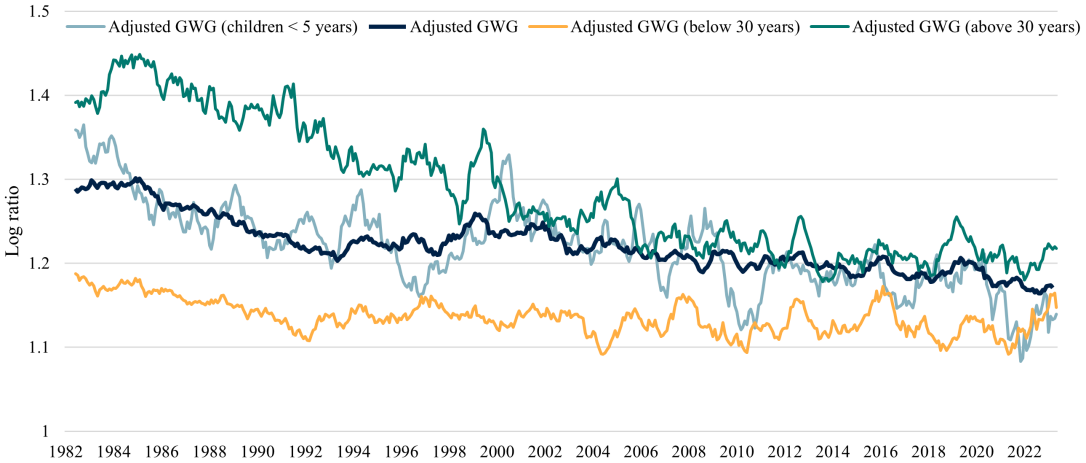
New Keynesian Models with Search and Match Frictions and Sticky Beliefs
[Blanchard and Galí, 2010, Galí, 2010, Christiano et al., 2016, Mankart and Oikonomou, 2017, Doepke and Tertilt, 2016, Neyer and Stempel, 2021, Erceg et al., 2025]

Alternative measures of the GWG



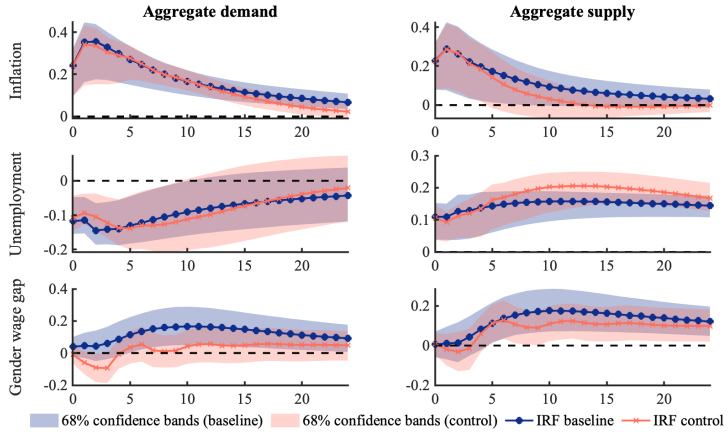
Baseline timeseries

Adjusted GWGs over time by demographic group



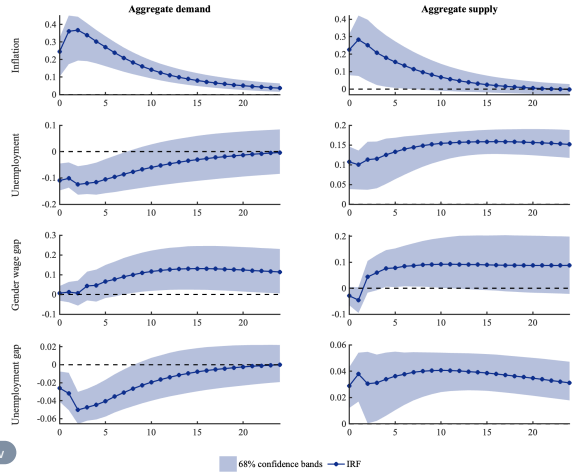
Baseline timeseries

Increasing lags: p=6



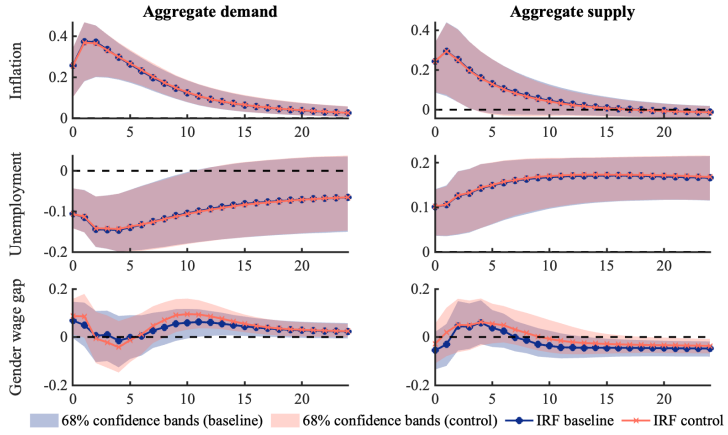
Baseline | Robustness Overview

Unemployment gap instead of adjustment



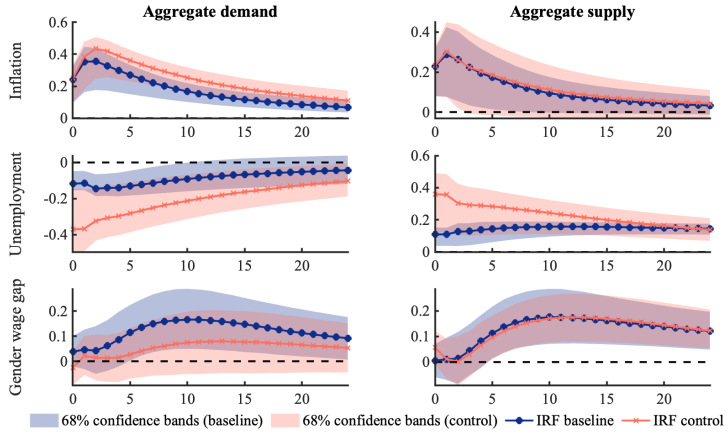
Baseline | Robustness Overview

Rebargaining or Moving?



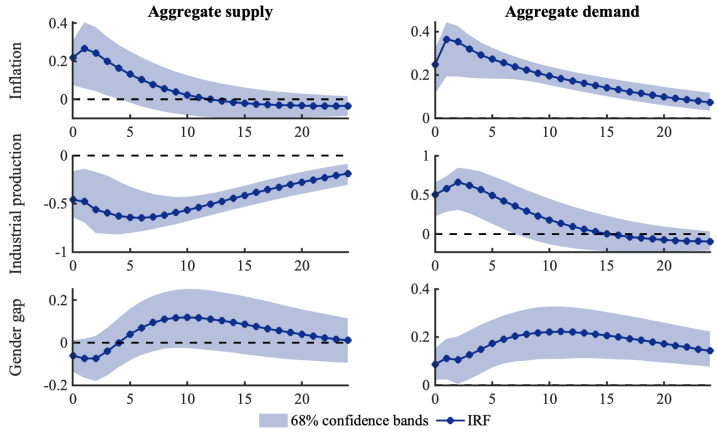
Baseline | Robustness Overview

Including Covid period



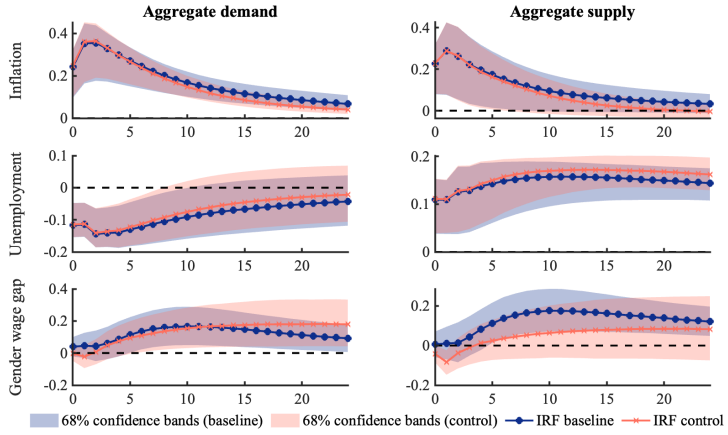
Baseline | Robustness Overview

Alternative business cycle measures: Industrial production



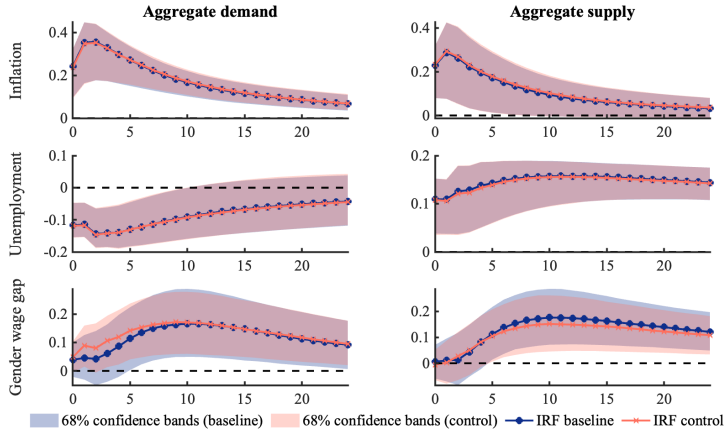
Baseline | Robustness Overview

Alternative GWG measures: Raw gaps



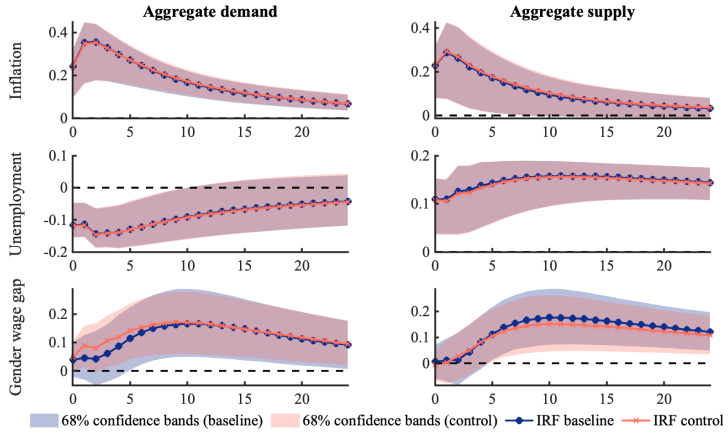
Baseline | Robustness Overview

Alternative GWG measures: Female characteristics



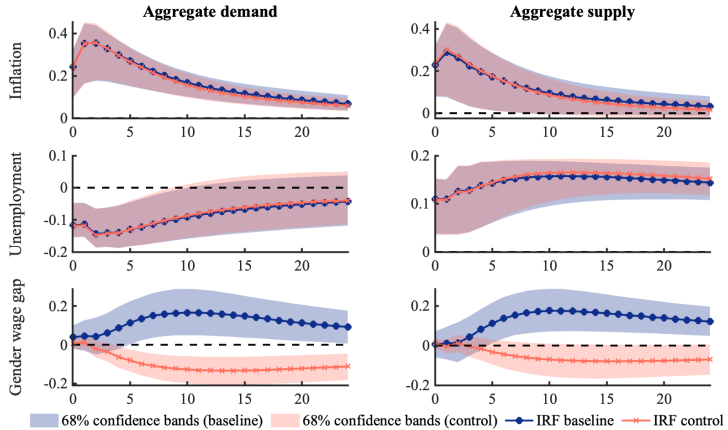
Baseline | Robustness Overview

Alternative GWG measures: Median



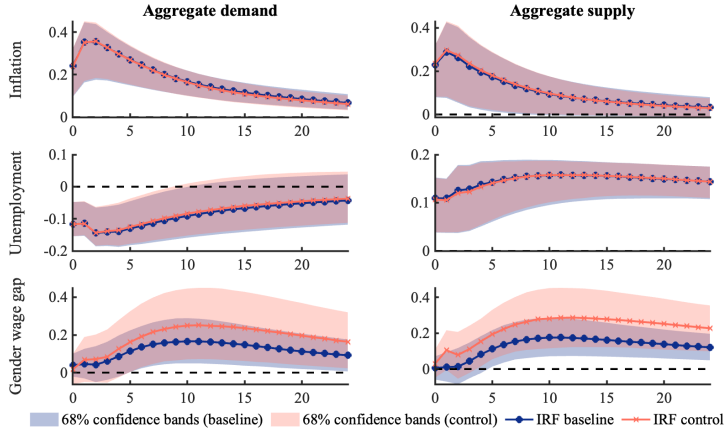
Baseline | Robustness Overview

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



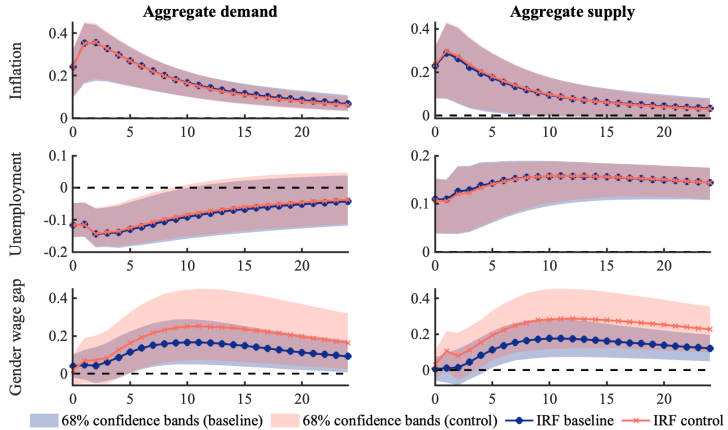
Baseline | Robustness Overview

Demographic groups: Above 30



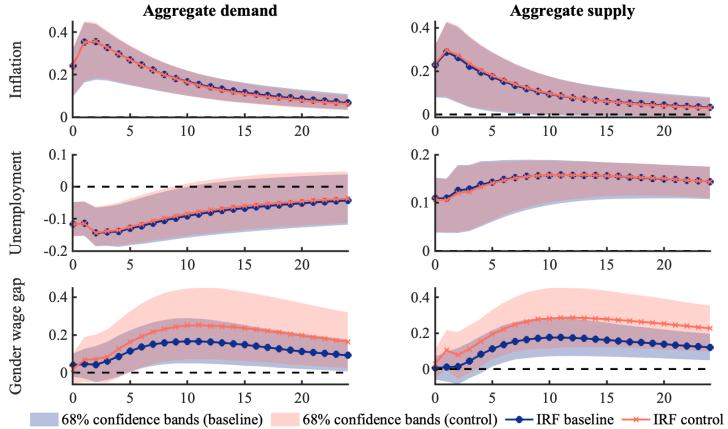
Baseline | Robustness Overview

Demographic groups: Above 40



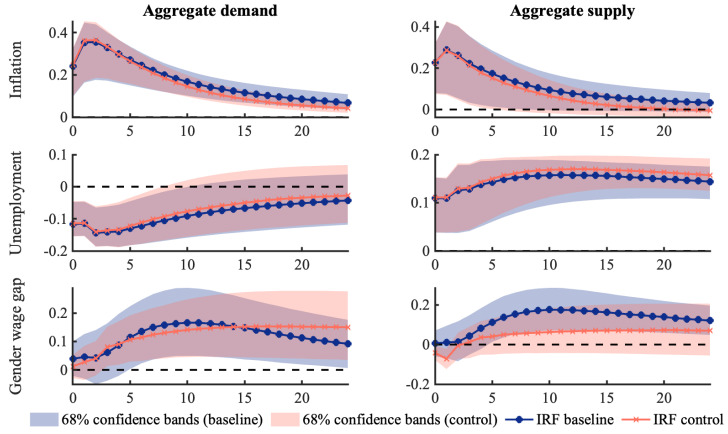
Baseline | Robustness Overview

Demographic groups: Above 50



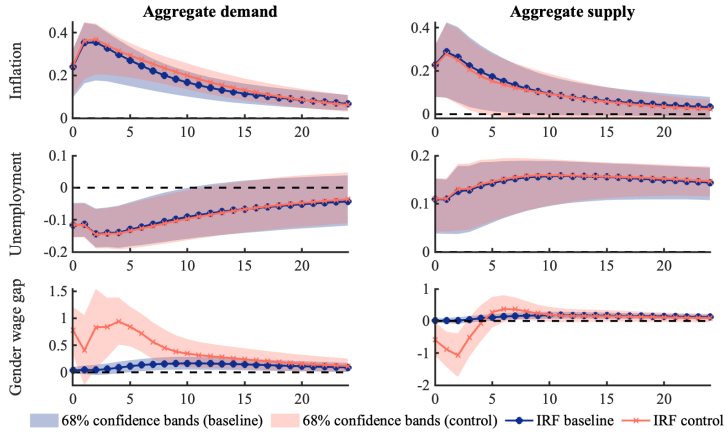
Baseline | Robustness Overview

Demographic groups: Below 30



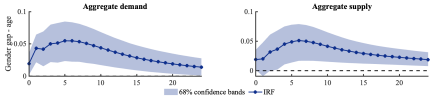
Baseline | Robustness Overview

Demographic groups: Children below 5 years

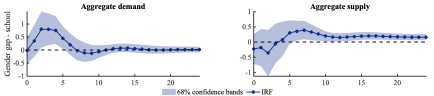


Baseline | Robustness Overview

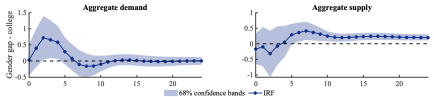
Coefficients - demographics



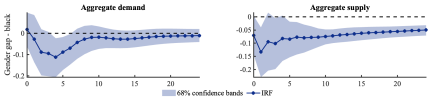
(a) Age



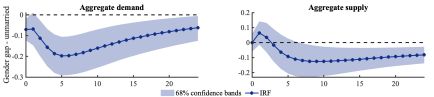
(b) School



(c) College



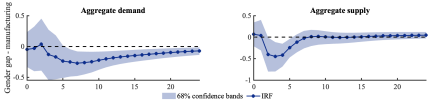
(d) Black



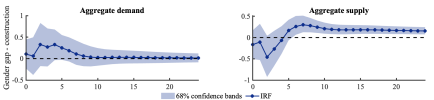
(e) Unmarried

Baseline | Robustness Overview

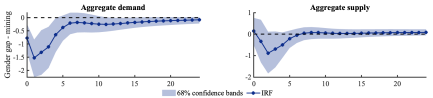
Coefficients - industry I



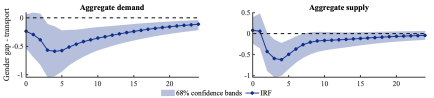
(a) Manufacturing



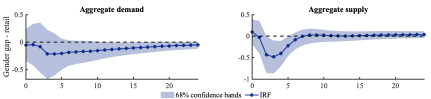
(b) Construction



(c) Mining



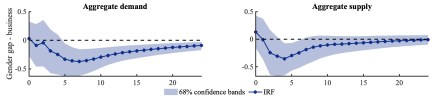
(d) Transport



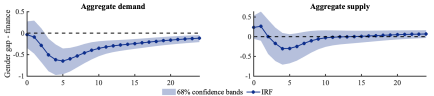
(e) Retail

Baseline Robustness Overview

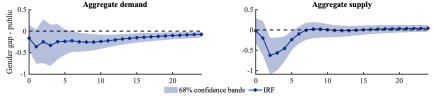
Coefficients - industry II



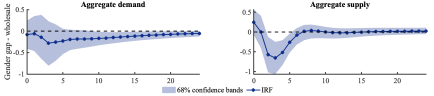
(a) Business



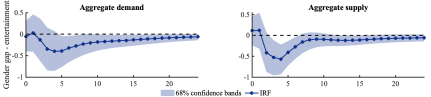
(b) Finance



(c) Public



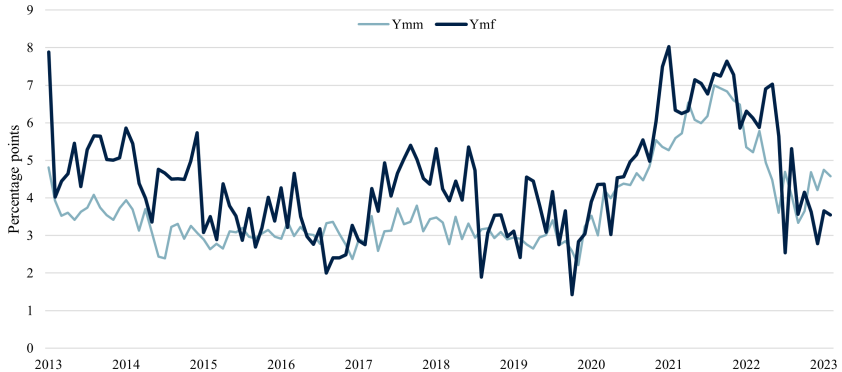
(d) Wholesale



(e) Entertainment

Baseline | Robustness Overview

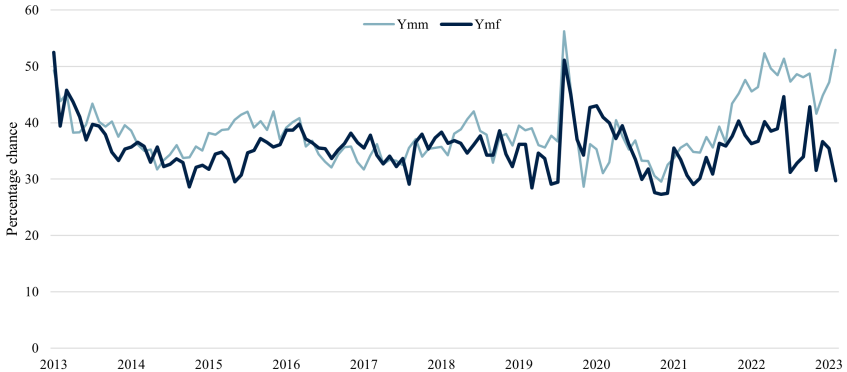
Beliefs of men and women over time



(a) Inflation Expectations

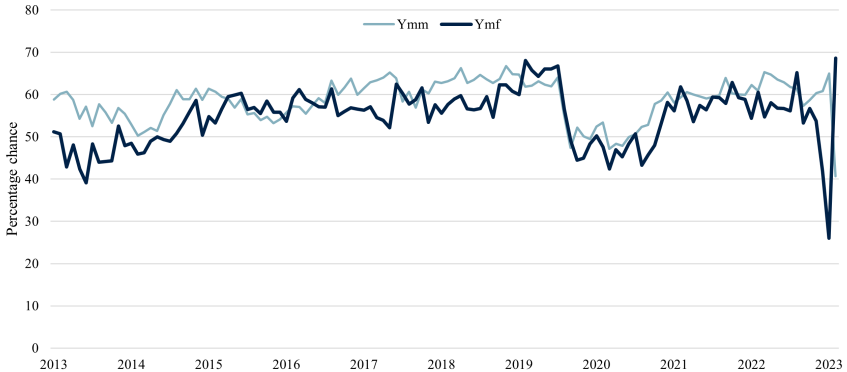
SVAR

Beliefs of men and women over time



(a) Unemployment Expectations

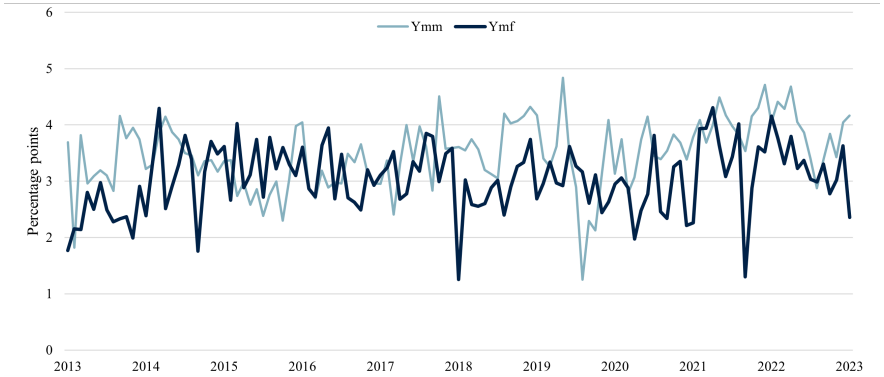
Beliefs of men and women over time



(a) Job Finding Expectations

SVAR

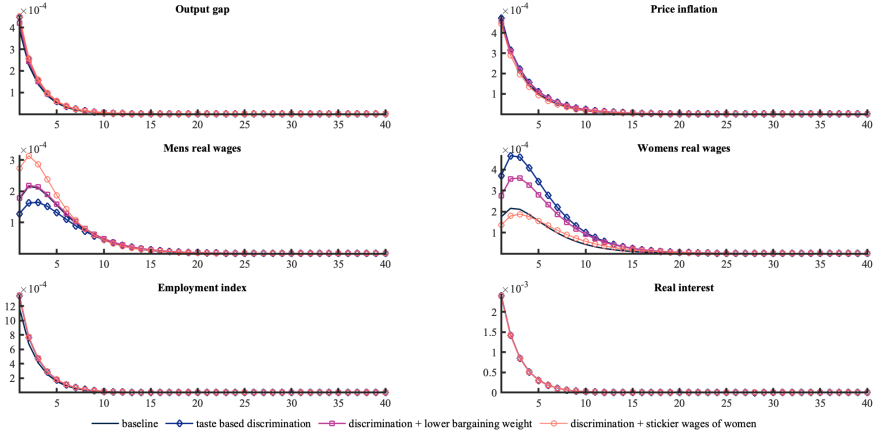
Beliefs of men and women over time



(a) Earnings Growth Expectations

SVAR

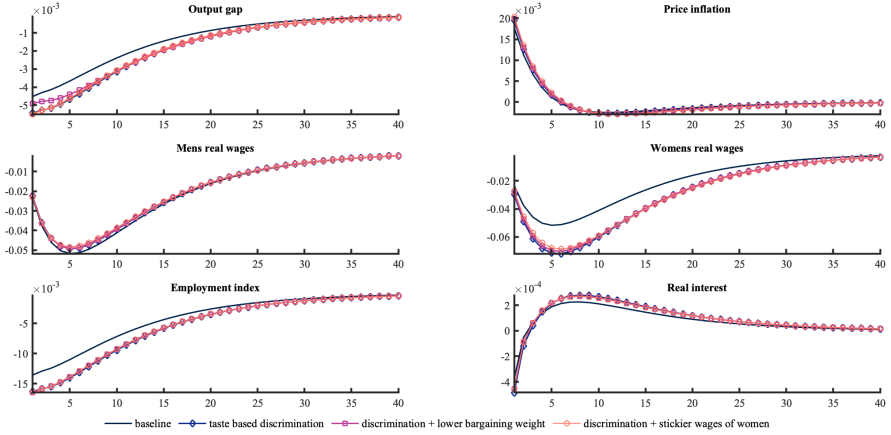
Impulse responses of the baseline model with 3 frictions



Baseline model

Response to an expansionary demand shock

Impulse responses of the baseline model with 3 frictions



Baseline model

Response to a contractionary supply shock