Labor Demand Management in Search Equilibrium

Cynthia L. Doniger David López-Salido

Federal Reserve Board

June 16, 2016

The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of anyone else associated with the Federal Reserve System.

Introduction

- Recessions are often portrayed as short-term events.
- However, a substantial body of empirical literature shows that high unemployment, stalled or falling wages, and reduced economic activity can have long-lasting consequences: hysteresis.
- A recession can lead to scarring: the economy's output shrinks relative to fundamentals.
- We build a Keynesian model of the labor market based on coordination failures between workers and firms as wages and participation are jointly determined.

Theoretical Literature

- "Fragile" equilibria as in Blanchard & Summers (1986, 1987)
  - Very flat supply and demand curves.
  - "Wrong" sloped supply or demand curves.
- Demand side vs Supply side.
  - Supply side: insider/outsider, Blanchard & Summers (1986, 1987)
  - Demand side: strategic complementarities, Diamond (1982)
- Multiplicity and Dynamics.
  - Global games: Morris & Shin (2000)
  - Limit cycle: Beaudry, Galizia & Portier (2015)
  - Correlated randomization: Golosov & Menzio (2015)
  - Best-response dynamics: Vives (2005); Eeckhout & Lindenlaub (2015)

Theoretical Literature

- "Fragile" equilibria as in Blanchard & Summers (1986, 1987)
  - Very flat supply and demand curves.
  - "Wrong" sloped supply or demand curves.
- Demand side vs Supply side.
  - Supply side: insider/outsider, Blanchard & Summers (1986, 1987)
  - Demand side: strategic complementarities, Diamond (1982)
- Multiplicity and Dynamics.
  - Global games: Morris & Shin (2000)
  - Limit cycle: Beaudry, Galizia & Portier (2015)
  - Correlated randomization: Golosov & Menzio (2015)
  - Best-response dynamics: Vives (2005); Eeckhout & Lindenlaub (2015)
- Amplification
  - Wage rigidity: Shimer (2005), Hall (2005), Gertler & Trigari (2009)

Empirical Literature

Medium Run Trends with a Bust-Bust Feature.

- Match Efficiency. ▸ Data
  - Shifting Beveridge curve and declining match efficiency.
  - Diamond & Şahin (2014), Barnichon & Figura (2015).
- Labor Force Participation. ▸ Data
  - Contraction in busts and insufficiently robust expansion in booms.
  - Leading to secular decline in since 1970 for males (2000 for females).
  - Juhn, Murphy, & Topel (1991, 2002), Elsby & Shapiro (2012).
- Labor Share. ▸ Data
  - Reaches new lows in each boom (wage erosion).
  - Elsby, Hobijn, & Şahin (2013).

Empirical Literature

Medium Run Trends with a Bust-Bust Feature.

- Match Efficiency. ▸ Data
  - Shifting Beveridge curve and declining match efficiency.
  - Diamond & Şahin (2014), Barnichon & Figura (2015).
- Labor Force Participation. ▸ Data
  - Contraction in busts and insufficiently robust expansion in booms.
  - Leading to secular decline in since 1970 for males (2000 for females).
  - Juhn, Murphy, & Topel (1991, 2002), Elsby & Shapiro (2012).
- Labor Share. ▸ Data
  - Reaches new lows in each boom (wage erosion).
  - Elsby, Hobijn, & Şahin (2013).

Intertemporal Monopsony

- Card & Krueger (1993), Manning (2003)
- Diamond (1971), Barro (1977)

Road map

- Two Player Game
- Two-sided Frictional Labor Market
- Stochastic Economy
- Macroeconomic Implications
- Policy
- Revisiting the data
- Conclusions and Further Research

A Two Player Game

One worker and one firm may match and produce output p.

- Worker:
  - Draws flow value of non-employment, b, from known distribution $H(b)$.
  - May exit the game–with probability $(1-i)$–after the realization of b.*
  - If continuing, meets the firm with probability $(1-u)$.
  - Form a match if the wage is acceptable.

* Under the optimal threshold strategy the worker is indifferent between participation and inactivity whenever her realization of b is above the threshold. We allow the worker to randomize between participation and inactivity in this region, assigning weight i to pure strategy "participate."

- Firm:
  - Posts a non-negotiable wage offer with knowledge of $H(b)$ but not b.
  - Meets with the worker with probability $(1-v)$
  - Form a match if the wage is acceptable.

The payoffs are $\{w, p-w\}$ if they match and $\{b, 0\}$ if they don't.

Worker's strategy: a reservation wage, b, and a participation threshold, r
Firm's strategy: a posted wage, w

Coordination Failures (Cooper and John (1988))

Games with **positive spillovers** and **strategic complementarities** may have multiple equilibria.

A game exhibits **positive spillovers** for player k when an increase in the other player's action increases the payoff to player k.

A game exhibits **strategic complementarities** for player k when an increase in the other player's action increases the best response of player k.

When multiplicity exists, equilibria can be ranked in terms of welfare.

Worker's Problem

Payoff ($r \leq w_0$):

$$V^W(r, w_0) = \underbrace{(1-u)w_0\left[H(r) + (1-i)[H(w_0) - H(r)]\right]}_{employed} + \underbrace{i\int_r^{\bar{b}} bh(b)db.}_{inactive}$$

$$+ \underbrace{u\Big[\int_{\underline{b}}^{r} bh(b)db + (1-i)\int_r^{w_0} bh(b)db\Big]}_{involuntarily\ unemployed} + \underbrace{(1-i)\int_{w_0}^{\bar{b}} bh(b)db}_{voluntarily\ unemployed}$$

Worker's Problem

Payoff ($r \leq w_0$):

$$V^W(r, w_0) = \underbrace{(1-u)w_0\left[H(r) + (1-i)[H(w_0) - H(r)]\right]}_{\textit{employed}} + \underbrace{i\int_r^{\bar{b}} bh(b)db.}_{\textit{inactive}}$$

$$+ \underbrace{u\Big[\int_{\underline{b}}^{r} bh(b)db + (1-i)\int_r^{w_0} bh(b)db\Big]}_{\textit{involuntarily unemployed}} + \underbrace{(1-i)\int_{w_0}^{\bar{b}} bh(b)db}_{\textit{voluntarily unemployed}}$$

Best response:

$$r^*(w_0) = \begin{cases} \underline{b} & \text{if } w_0 < \underline{b} \\ w_0 & \text{if } w_0 \in [\underline{b}, \bar{b}] \\ \bar{b} & \text{if } w_0 > \bar{b} \end{cases}$$

Worker's Problem

Payoff ($r \leq w_0$):

$$V^W(r, w_0) = \underbrace{(1-u)w_0\left[H(r) + (1-i)[H(w_0) - H(r)]\right]}_{\textit{employed}} + \underbrace{i\int_r^{\bar{b}} bh(b)db.}_{\textit{inactive}}$$

$$+ \underbrace{u\Big[\int_{\underline{b}}^{r} bh(b)db + (1-i)\int_r^{w_0} bh(b)db\Big]}_{\textit{involuntarily unemployed}} + \underbrace{(1-i)\int_{w_0}^{\bar{b}} bh(b)db}_{\textit{voluntarily unemployed}}$$

Best response:

$$r^*(w_0) = \begin{cases} \underline{b} & \text{if } w_0 < \underline{b} \\ w_0 & \text{if } w_0 \in [\underline{b}, \bar{b}] \\ \bar{b} & \text{if } w_0 > \bar{b} \end{cases}$$

Prop. 1 There are *positive spillovers* and *strategic complementarities* for the worker (firm's strategy imposes a pecuniary externality).

Firm's Problem

Payoff:

$$V^F(w, r_0) = \underbrace{(1-v)}_{\substack{\text{match} \\ \text{probability}}} \underbrace{(p-w)}_{\substack{\text{revenue} \\ \text{from} \\ \text{successful} \\ \text{hiring}}} \underbrace{\left[\frac{\mathbb{I}_{\{w \leq r_0\}} H(w) + \mathbb{I}_{\{w \geq r_0\}} \left[H(r_0) + i[H(w) - H(r_0)] \right]}{H(r_0) + i(1 - H(r_0))} \right]}_{\textit{expected labor supply schedule}},$$

Firm's Problem

Payoff:

$$V^F(w, r_0) = \underbrace{(1-v)}_{\substack{\text{match} \\ \text{probability}}} \underbrace{(p-w)}_{\substack{\text{revenue} \\ \text{from} \\ \text{successful} \\ \text{hiring}}} \underbrace{\left[\frac{\mathbb{I}_{\{w \leq r_0\}} H(w) + \mathbb{I}_{\{w \geq r_0\}} \left[H(r_0) + i[H(w) - H(r_0)] \right]}{H(r_0) + i(1 - H(r_0))} \right]}_{\textit{expected labor supply schedule}},$$

Best response:

$$w^*(w_0) = \begin{cases} \hat{w} & \text{if } r_0 < r^L \\ r_0 & \text{if } r_0 \in [r^L, r^C] \\ w^C & \text{if } r_0 > r^C \end{cases}$$

Firm's Problem

Payoff:

$$V^F(w, r_0) = \underbrace{(1-v)}_{\substack{\text{match} \\ \text{probability}}} \underbrace{(p-w)}_{\substack{\text{revenue} \\ \text{from} \\ \text{successful} \\ \text{hiring}}} \underbrace{\left[\frac{\mathbb{I}_{\{w \leq r_0\}} H(w) + \mathbb{I}_{\{w \geq r_0\}} \left[H(r_0) + i[H(w) - H(r_0)] \right]}{H(r_0) + i(1 - H(r_0))} \right]}_{\textit{expected labor supply schedule}},$$

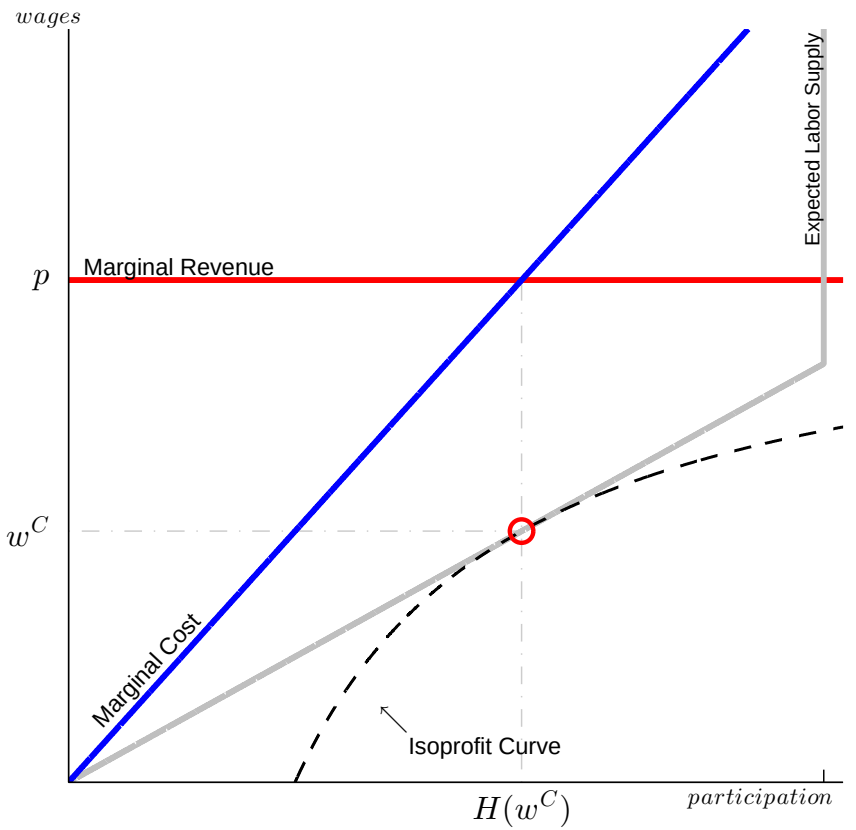
Best response:

$$w^*(w_0) = \begin{cases} \hat{w} & \text{if } r_0 < r^L \\ r_0 & \text{if } r_0 \in [r^L, r^C] \\ w^C & \text{if } r_0 > r^C \end{cases}$$

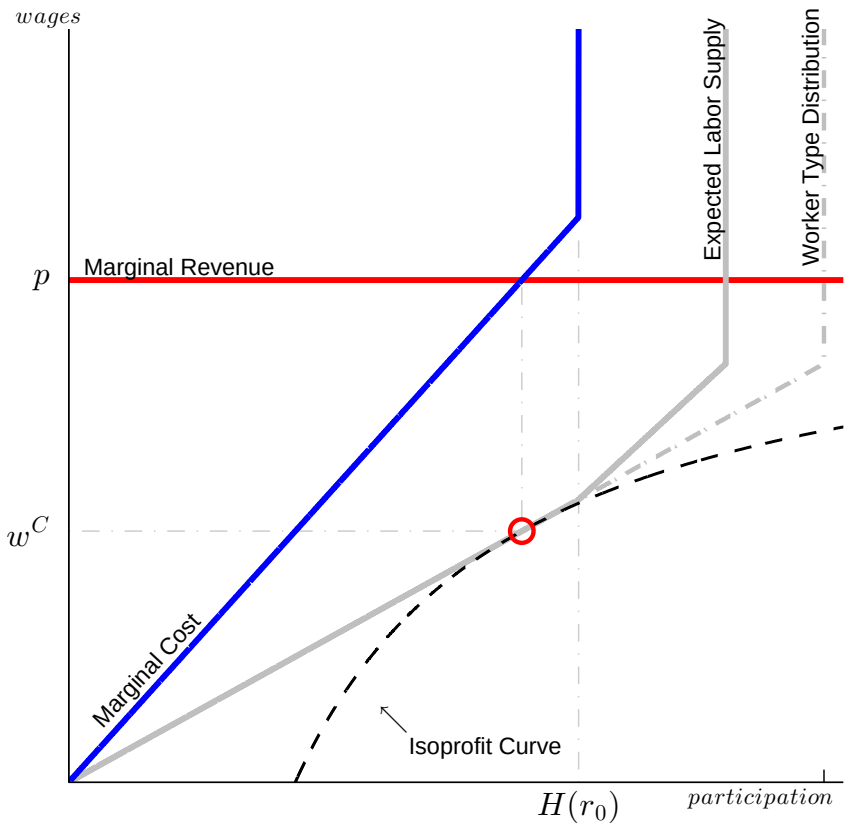
Prop. 2 For $r_0 \in [r^L, r^C]$, there are *positive spillovers* and *strategic complementarities* for the firm (worker's threshold denies a thick market externality to the firm).

Firm's Wage Choice given a Participation Threshold

Monopsony



Constrained Monopsony

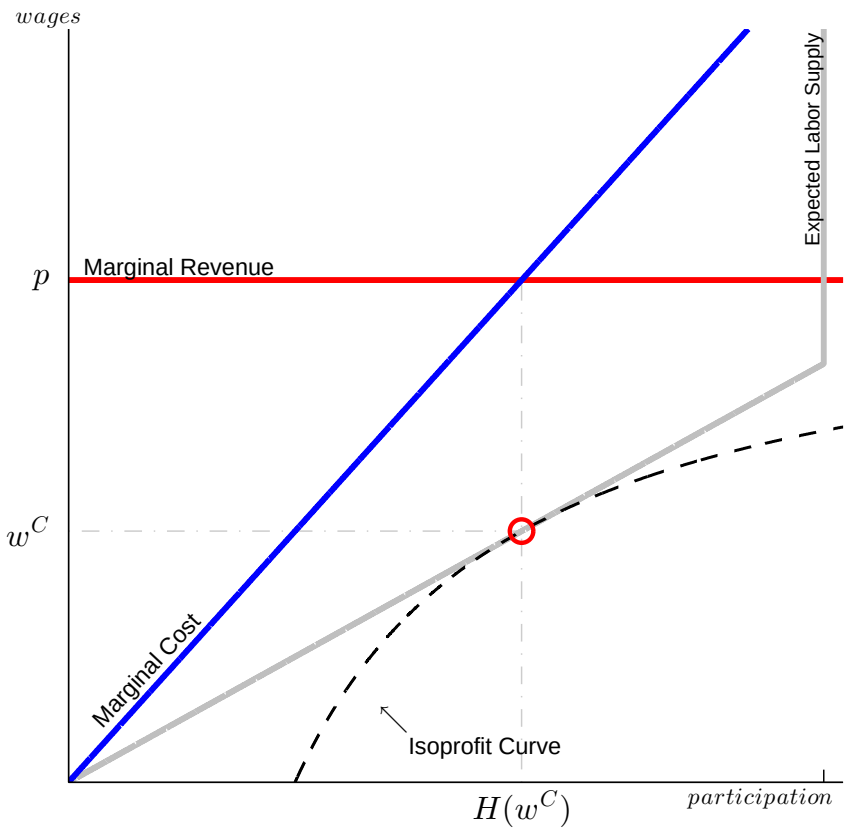


Note: The location of the kink in the labor supply curve and the jump in the marginal cost is determined by the quantity of the labor supply at the expected participation threshold ($H(r_0)$).

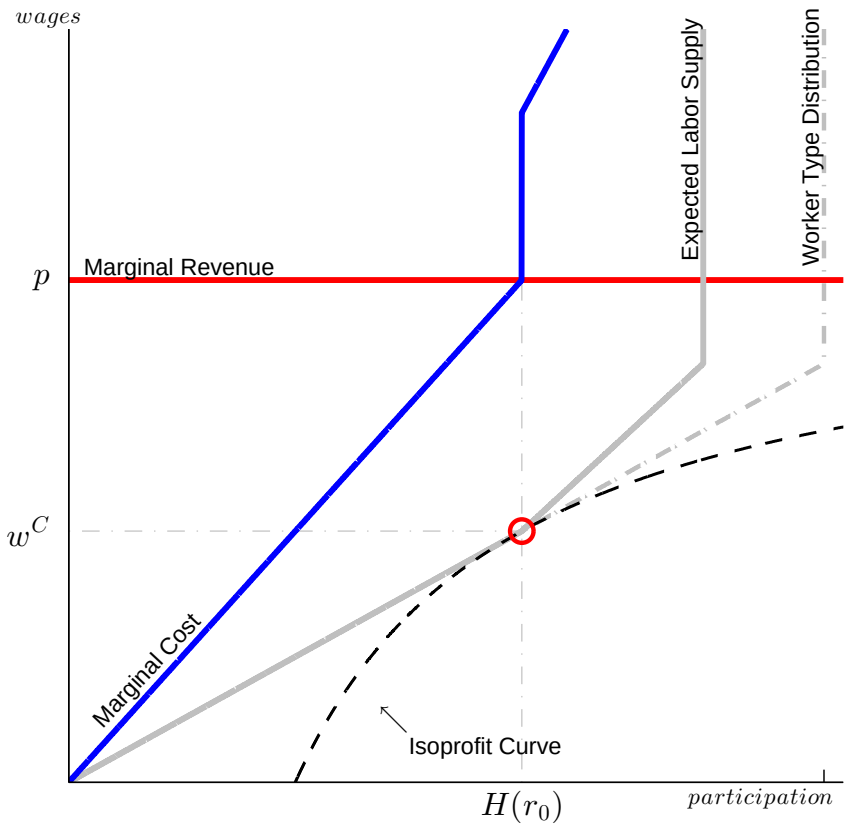
Note: The increase in the slope in the thin side of the market of both expected labor supply and marginal cost is determined by i. The closer i is to 1, the less severe is the kink.

Firm's Wage Choice given a Participation Threshold.

Monopsony



Constrained Monopsony

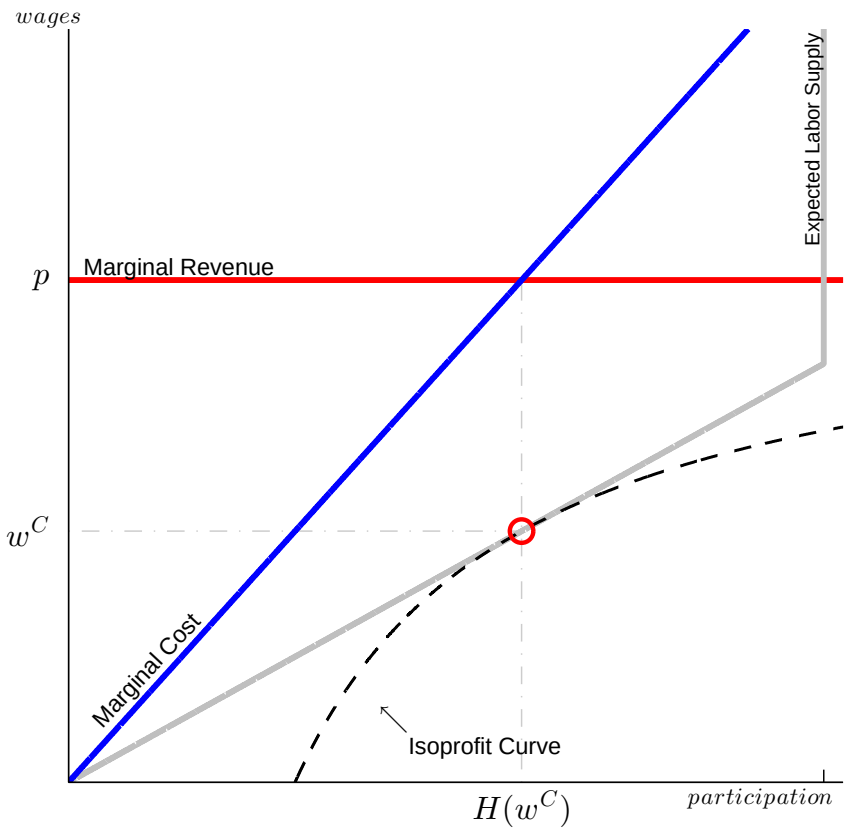


Note: The location of the kink in the labor supply curve and the jump in the marginal cost is determined by the quantity of the labor supply at the expected participation threshold, $H(r_0)$.

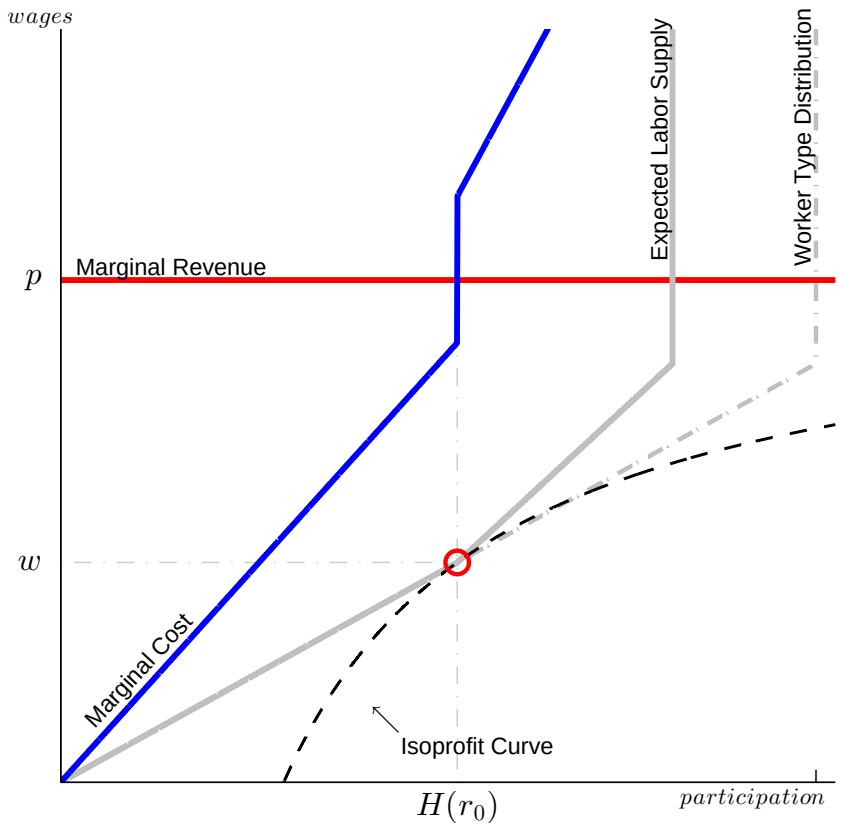
Note: The increase in the slope in the thin side of the market of both expected labor supply and marginal cost is determined by i. The closer i is to 1, the less severe is the kink.

Firm's Wage Choice given a Participation Threshold.

Monopsony



Constrained Monopsony

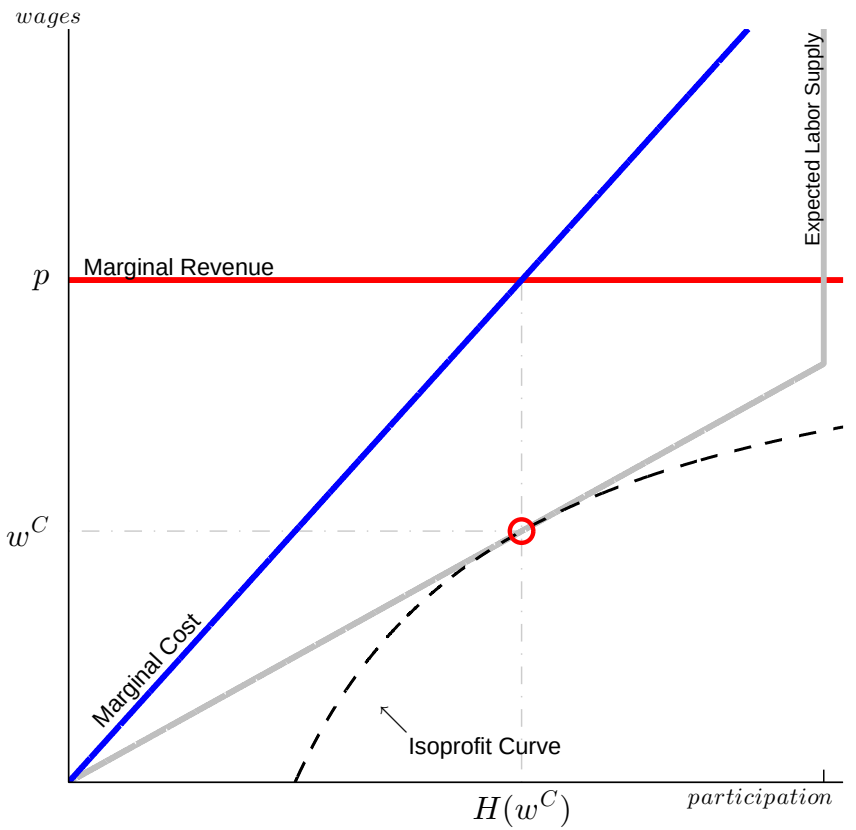


Note: The location of the kink in the labor supply curve and the jump in the marginal cost is determined by the quantity of the labor supply at the expected participation threshold, $H(r_0)$.

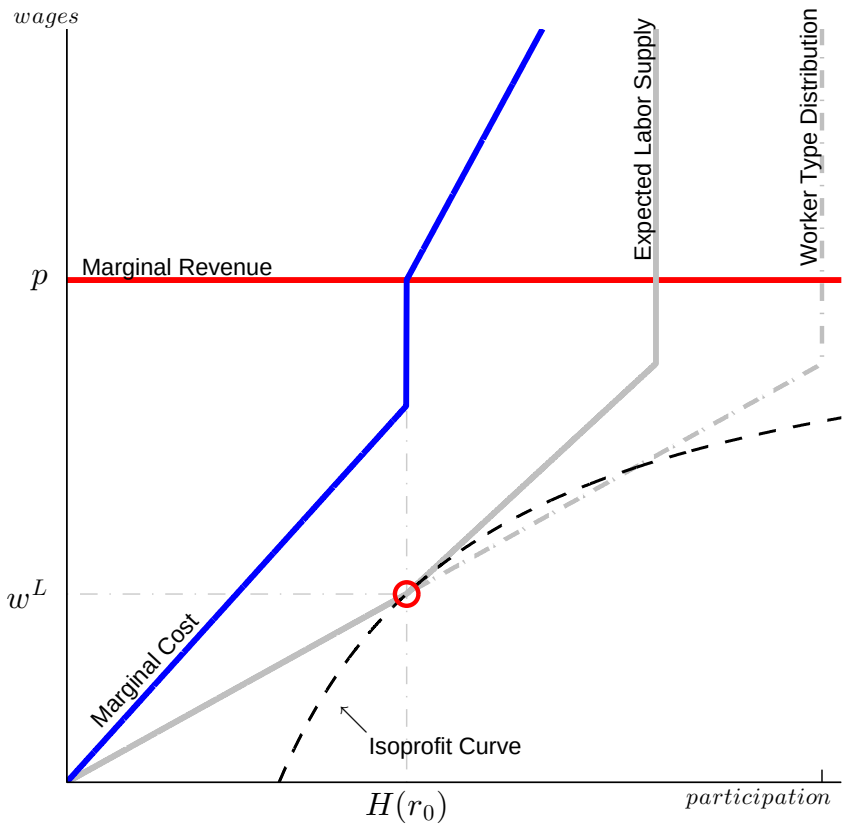
Note: The increase in the slope in the thin side of the market of both expected labor supply and marginal cost is determined by i. The closer i is to 1, the less severe is the kink.

Firm's Wage Choice given a Participation Threshold.

Monopsony



Constrained Monopsony

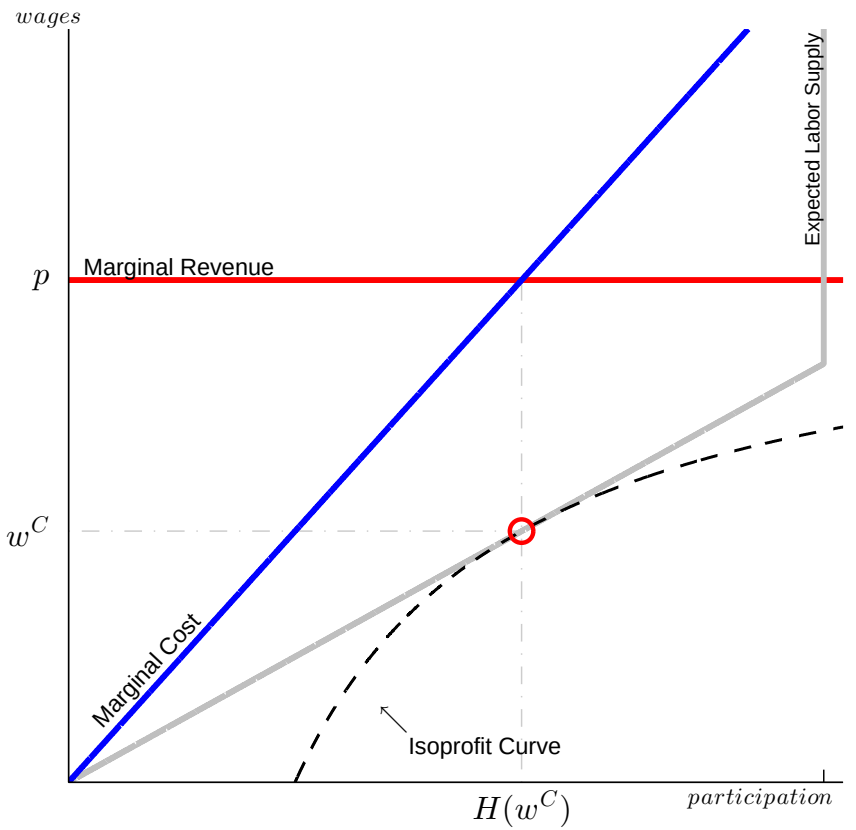


Note: The location of the kink in the labor supply curve and the jump in the marginal cost is determined by the quantity of the labor supply at the expected participation threshold, $H(r_0)$.

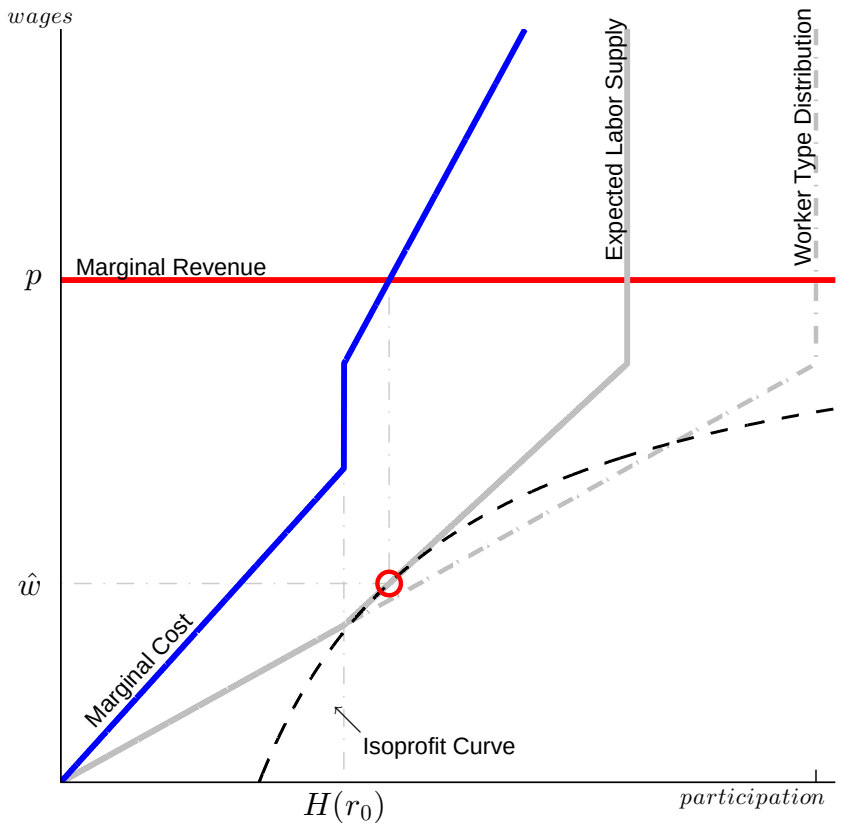
Note: The increase in the slope in the thin side of the market of both expected labor supply and marginal cost is determined by i. The closer i is to 1, the less severe is the kink.

Firm's Wage Choice given a Participation Threshold.

Monopsony



Constrained Monopsony



Note: The location of the kink in the labor supply curve and the jump in the marginal cost is determined by the quantity of the labor supply at the expected participation threshold, $H(r_0)$.

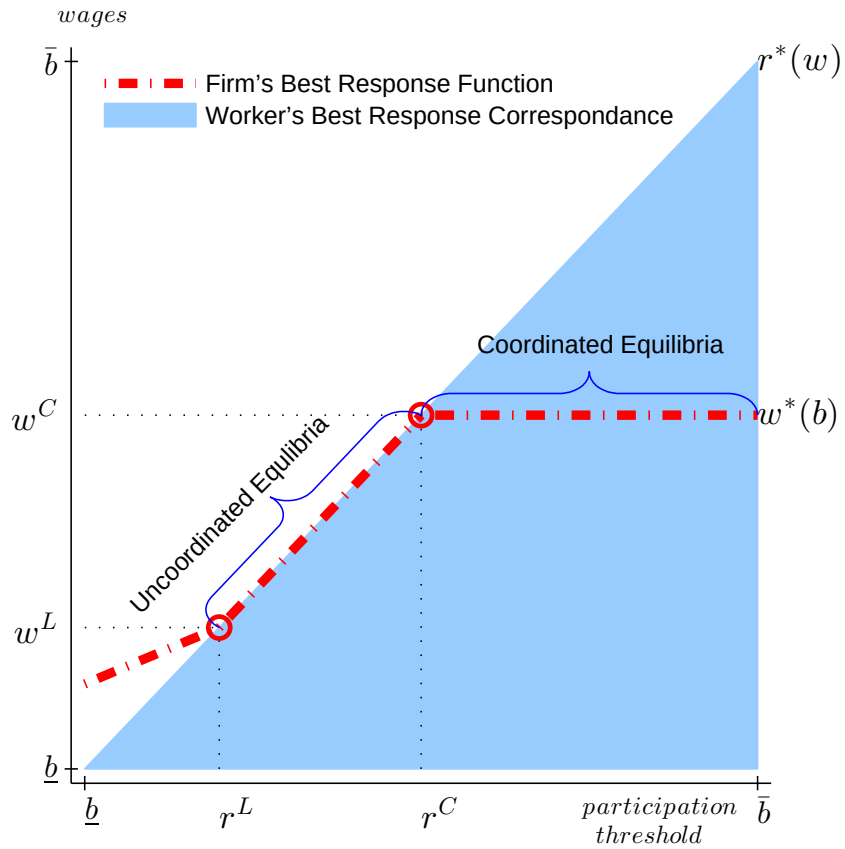
Note: The increase in the slope in the thin side of the market of both expected labor supply and marginal cost is determined by i. The closer i is to 1, the less severe is the kink.

Equilibria

Definition An equilibrium of the two-player game is a double – **wage level**, **participation threshold** – such that the wage level of the firm and participation threshold of the worker are mutual best responses.

Prop. 3 A continuum of equilibria exist – wage levels in the interval $[w^L, w^C]$ – with higher welfare for higher wage levels.

Mutual Best Response



▸ Multiple uncoordinated *and* coordinated Equilibria

A Two Sided Frictional Labor Market

Assumptions: (1) *pairwise random matching*, (2) *atomistic agents* imply that no single worker or single firm can alter the average wage or participation threshold through unilateral deviation.

- Worker:
  - Heterogeneous w.r.t. the flow value of non-employment, $b \sim H(b)$.
  - Can flexibly move in and out of the labor force.
  - Aware of the average wage level.
- Firm:
  - Post a non-negotiable wage offer.
  - Aware of $H(b)$ and the average participation threshold.

Worker's strategy: reservation participation threshold, r. (as before)
Firm's strategy: a posted wage, w. (as before)

Matching Technology and Congestion

Standard CRS matching function:

$$matches = m(U, V); \qquad job\ finding = f(\theta) \equiv \frac{m}{U};$$

U mass unemp.; V mass vac.; $\theta = \frac{V}{U}$ market tightnesss; $\frac{df(\theta)}{d\theta} > 0$; and $\frac{df^2(\theta)}{d\theta^2} < 0$.

Unemployment, and congestion:

- Mass of unemployed: $U = uH(w_0) + i(1 - H(w_0))$
- Vacancy filling rate: $\frac{H(w^*)}{H(w^*)+i(1-H(w^*))}\frac{M}{V} = \Lambda(w^*)q(\theta)$

Assumptions: (1) *pairwise random matching*, (2) *atomistic agents* imply that no single worker or single firm can alter the job finding or vacancy filling rate through unilateral deviation.

Production, Free Entry, and Job Creation Condition

Assumptions: (3) *production is linear in labor*, (5) *free entry into vacancy creation* (at flow cost c) imply that the payoffs isomorphic to the two player game (up to the discount factor).

Production, Free Entry, and Job Creation Condition

Assumptions: (3) *production is linear in labor*, (5) *free entry into vacancy creation* (at flow cost c) imply that the payoffs isomorphic to the two player game (up to the discount factor).

Definition An equilibrium of the two-sided game is a triple – **wage level**, **participation threshold**, **labor market tightness** – such that the wage level of each firm and participation threshold of workers are mutual best responses and tightness satisfies the job creation condition:

$$\frac{c}{q(\theta(w^*))\Lambda(w^*)} = \frac{p - w^*}{\rho + \delta}.$$

Production, Free Entry, and Job Creation Condition

Assumptions: (3) *production is linear in labor*, (5) *free entry into vacancy creation* (at flow cost c) imply that the payoffs isomorphic to the two player game (up to the discount factor).

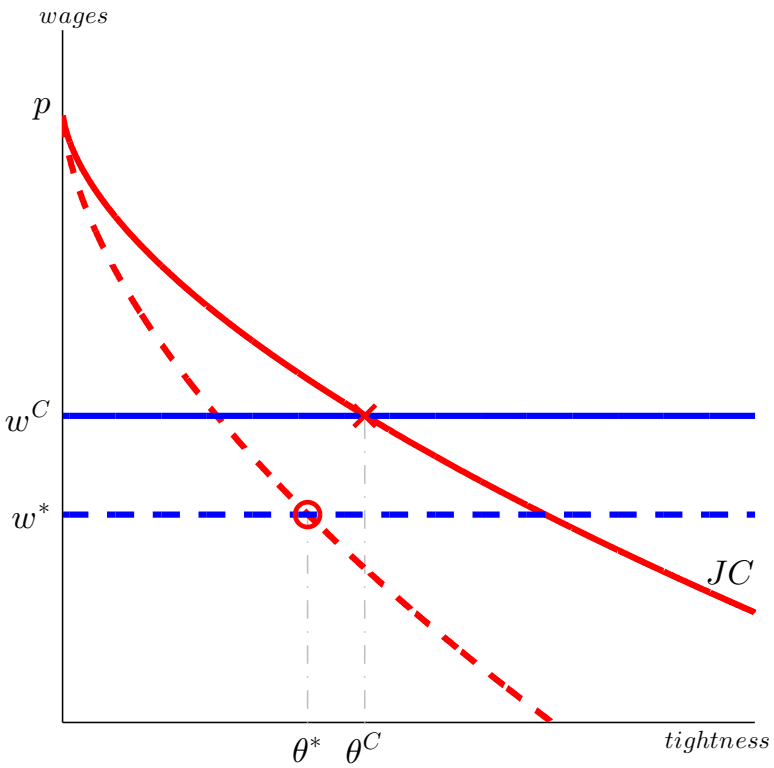
Definition An equilibrium of the two-sided game is a triple – **wage level**, **participation threshold**, **labor market tightness** – such that the wage level of each firm and participation threshold of workers are mutual best responses and tightness satisfies the job creation condition:

$$\frac{c}{q(\theta(w^*))\Lambda(w^*)} = \frac{p - w^*}{\rho + \delta}.$$

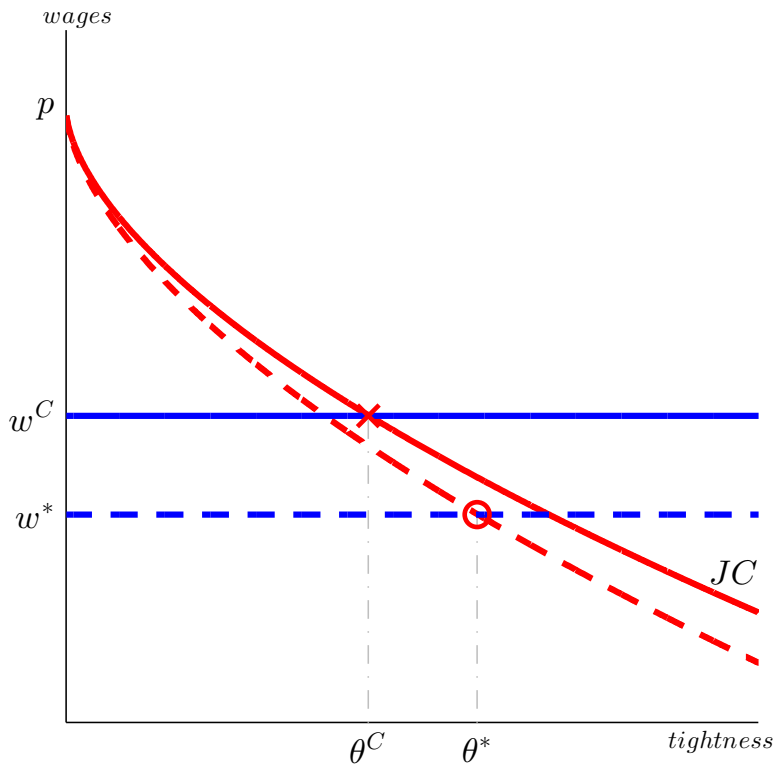
Prop. 4 A continuum of equilibria exist – wage levels in the interval $[w^L, w^C]$ – with higher welfare for higher wage levels.

Comparative Statics: Non-monotonic link of W (Y) and U

Congestion Effect Dominates



Wage Effect Dominates



Job creation condition: $\frac{c}{q(\theta(w^*))\Lambda(w^*)} = \frac{p-w^*}{\rho+\delta}$.

Shocks and Dynamic Best-Response

Stochastic Aggregate Productivity:

- The productivity level of firms, p, is a martingale.

Assumption 1: Unilaterally Optimal Deviation.

The aggregate wage level changes only if deviation from the old wage level to the new wage level would be unilaterally optimal for each firm.

(Vives, 1990, 2005; Cooper, 1994)

- In other words, the new wage level is each firm's best response to all other firms setting wages at the old wage level accompanied by the corresponding participation threshold of workers.

Dynamic Best-Response: Algorithm

1. A change in productivity occurs
2. Each firm unilaterally best responds (setting a new w^*) to the status-quo wage and participation and the new p
3. Each worker unilaterally best responds to the new w^* setting a new r^*
4. Each firm unilaterally best responds to the new r^* picking a new w^*
5. Repeat 3 and 4 until wage and participation threshold at repetition t are equal to those at $t-1$

The game is supermodular

The algorithm converges if there is monotonicity in the best-response functions. In words, when the participation increase, the wage will increase and viceversa (resembles the conditions for strategic complementarity.)

Endogenous Rigidity in Wages and Participation

Prop 5: For each wage and participation threshold pair, $\{w_0, r_0\}$:

- There is a consistent interval of productivity levels – (p^L, p^H) – for which no firm wishes to unilaterally deviate to a different wage:

$$p^L = w_0 \left(1 + \frac{H(w_0)}{h(w_0)w_0}\right) \qquad p^H = w_0 \left(1 + \frac{H(w_0)}{ih(w_0)w_0}\right).$$

- There is a consistent interval of labor market tightness – (θ^L, θ^H) – where the lower bound solves the free entry condition, for p^L and the upper bound for p^H.

Endogenous Rigidity in Wages and Participation

Prop 5: For each wage and participation threshold pair, $\{w_0, r_0\}$:

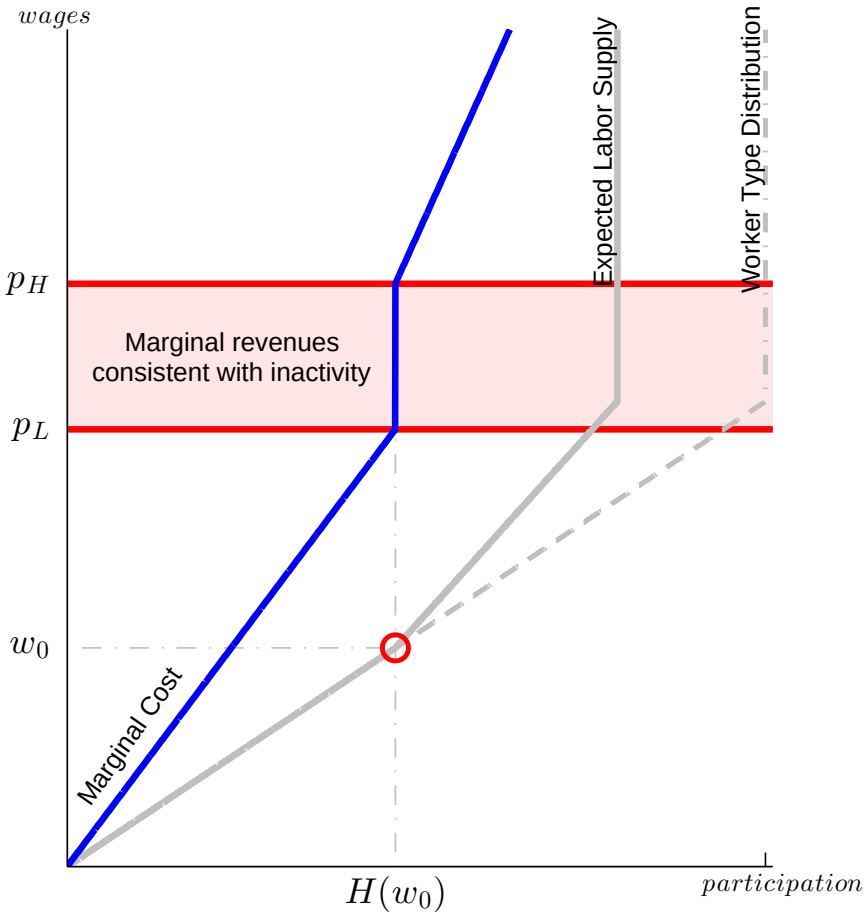
- There is a consistent interval of productivity levels – (p^L, p^H) – for which no firm wishes to unilaterally deviate to a different wage:

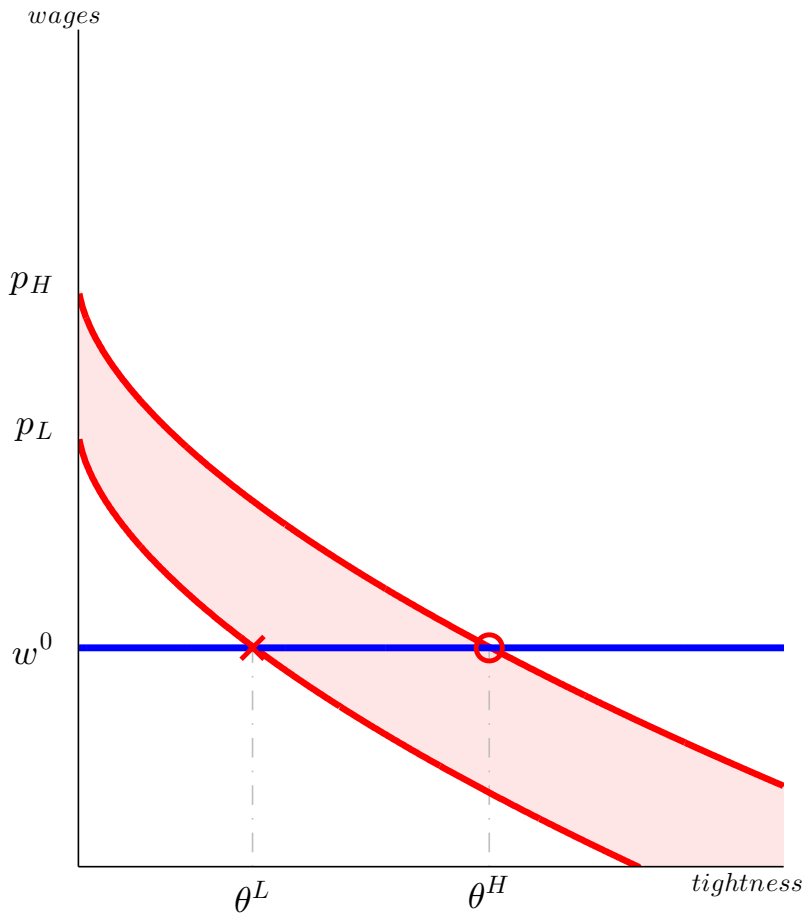
$$p^L = w_0 \left(1 + \frac{H(w_0)}{h(w_0)w_0}\right) \qquad p^H = w_0 \left(1 + \frac{H(w_0)}{ih(w_0)w_0}\right).$$

- There is a consistent interval of labor market tightness – (θ^L, θ^H) – where the lower bound solves the free entry condition, for p^L and the upper bound for p^H.

For an innovation in p within this range, no firm will have unilateral incentive to deviate, therefore wages do not move. Thus, no worker will have unilateral incentive to deviate, therefore participation will not move.

Endogenous Rigidity in Wages and Participation

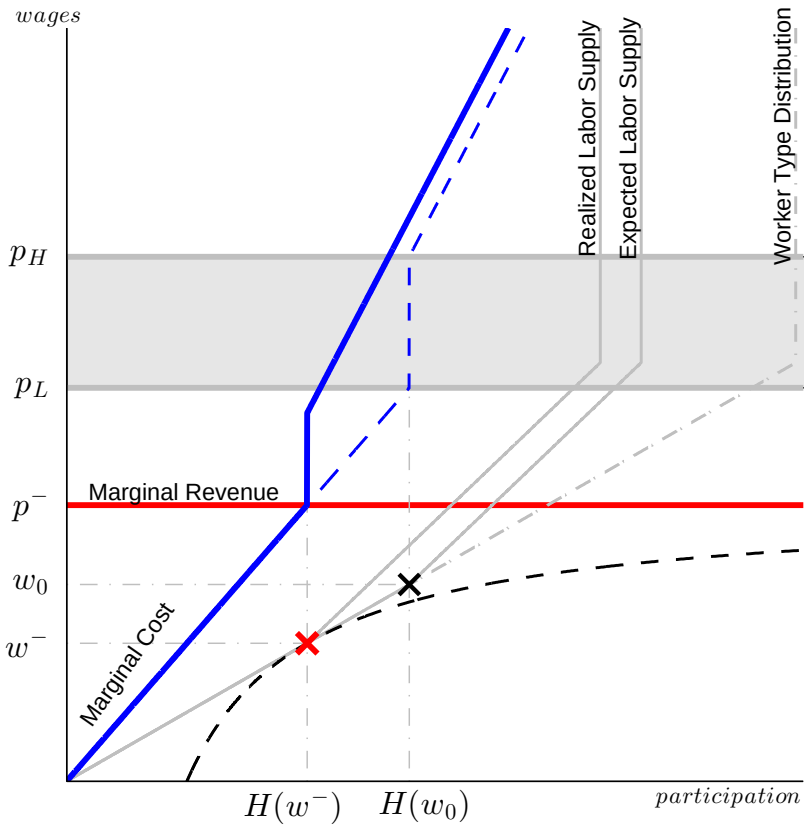




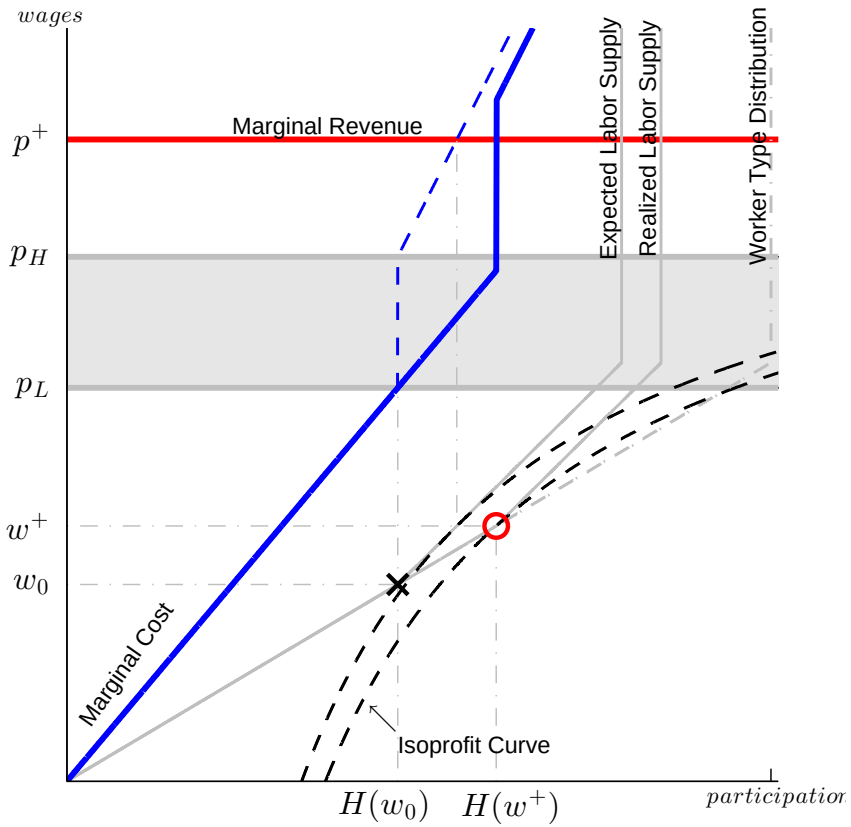
Note: For an innovation in p within the inaction range, no firm will have unilateral incentive to deviate, therefore wages do not move. Thus, no worker will have unilateral incentive to deviate, therefore participation will not move.

Revision in the Equilibrium Wage and Participation

Negative Shock



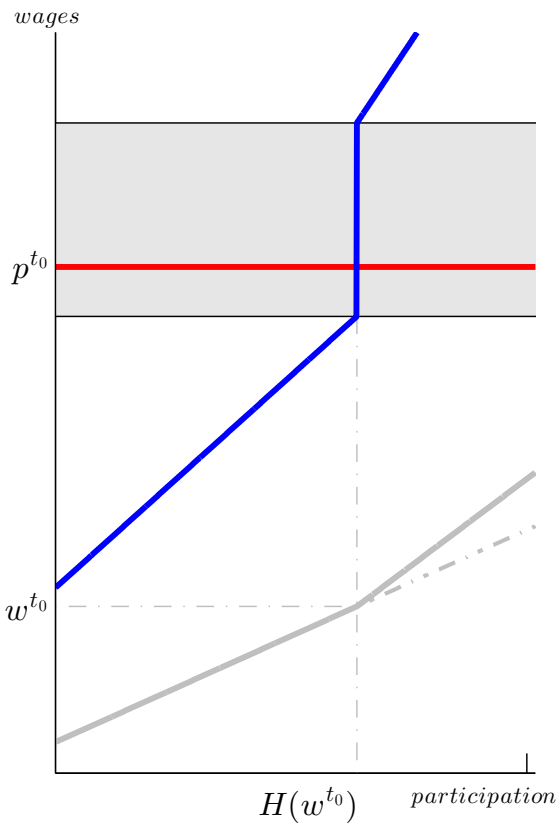
Positive Shock



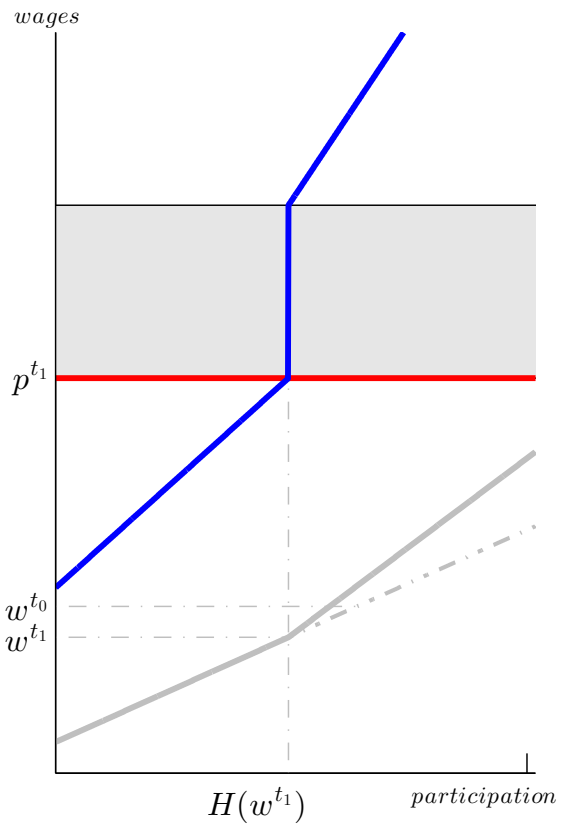
Note: The pre-shock marginal cost is the dashed-blue line, and the marginal cost that prevails at the conclusion of best-response dynamics is the solid-blue line.

Hysteresis

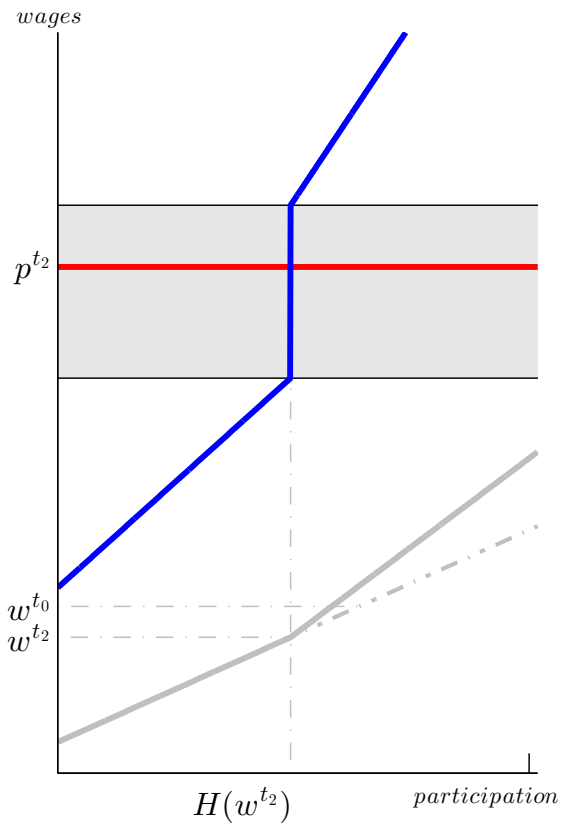
Pre-Shock Steady State



Negative Productivity Shock



Recovery of Labor Productivity



Note: A contraction arrives at t_1 and labor productivity recovers back to the pre-shock level at time t_2.

Inefficient Expansions

Prop 6: Even after an arbitrarily long or steep expansion, employment and total output fall short of their constrained efficient levels whenever not all workers decide to participate ($i < 1$).

Note: This is abstracting from the trivial case in which workers type are bounded above and p is high enough so the firms hire all the types.

- The marginal new hire in an expansion is hired from the thin side of the market.
- Thus, we have w^+ that satisfies

$$ih(w^+)(p^+ - w^+) = H(w_0) + i[H(w^+) - H(w_0)].$$

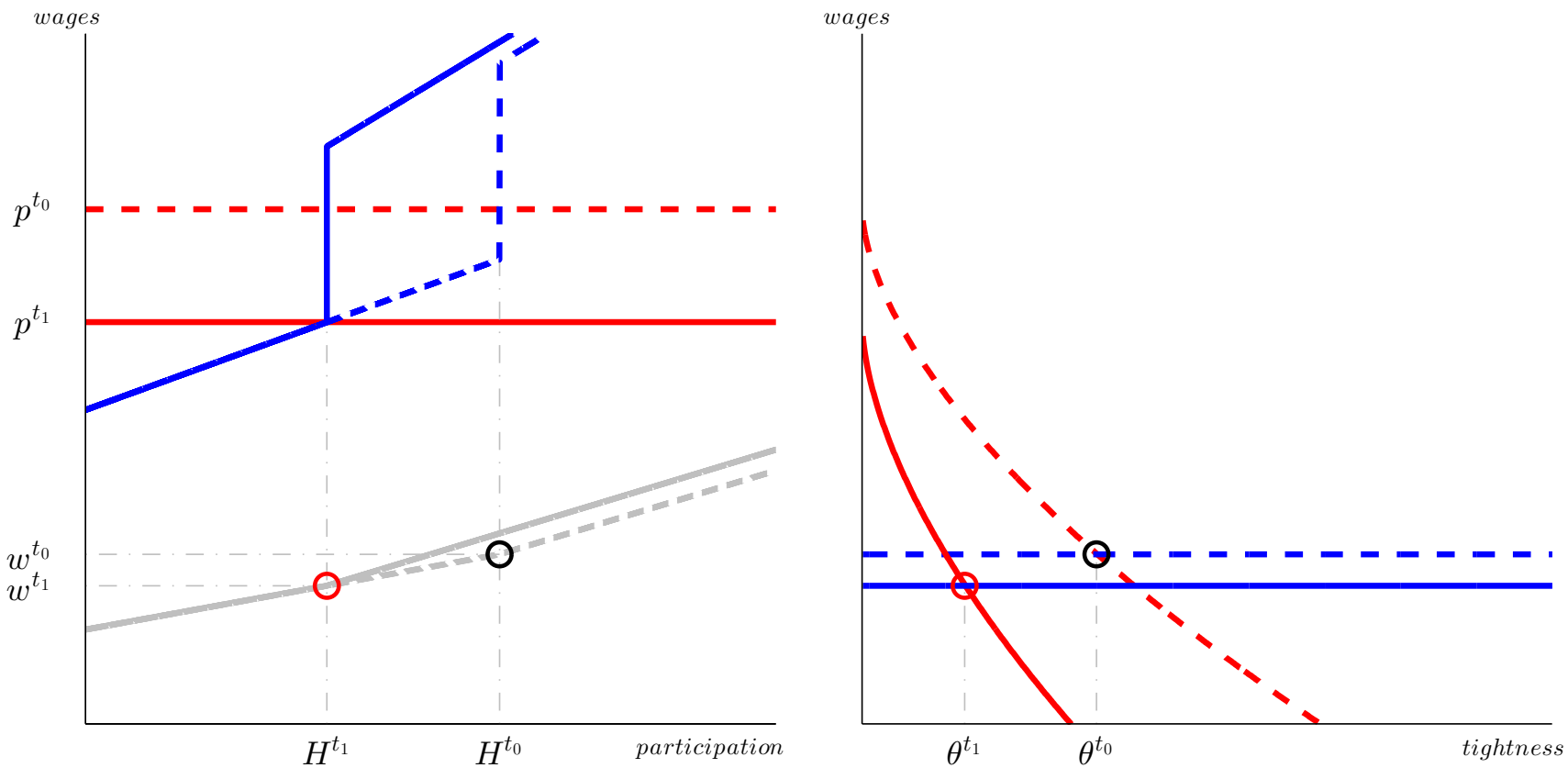
- Note the FOC for constrained efficiency is not satisfied by w^+:

$$h(w^+)(p^+ - w^+) > H(w^+).$$

- Thus, $\forall\ i < 1$, $w^+ < w^C(p^+)$.

A negative shock

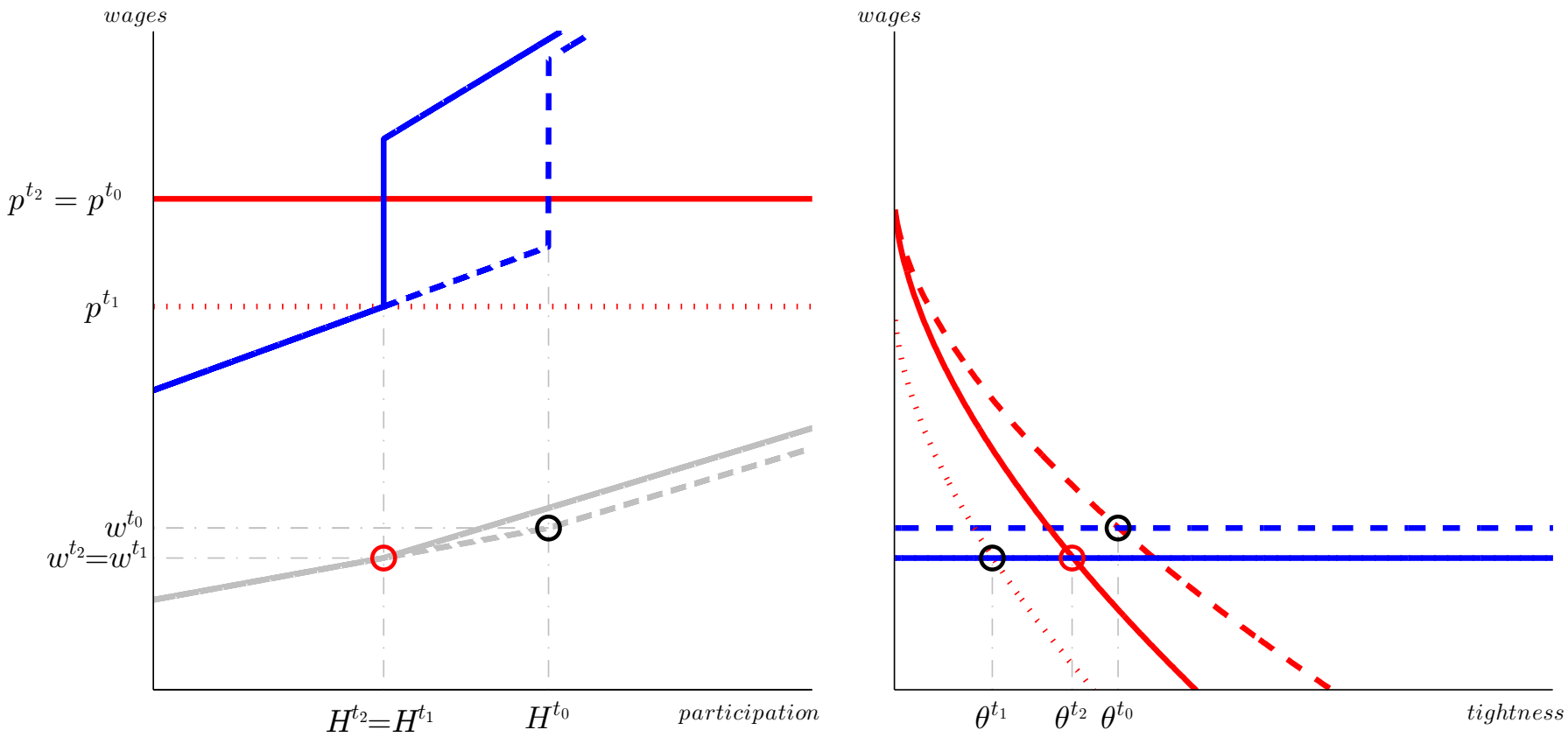
An economy is in steady state at t_0 and a contraction arrives at t_1.



Note: A contraction arrives at t_1 and labor productivity recovers back to the pre-shock level at time t_2.

Early Recovery: "Jobless"

Labor productivity recovers back to the pre-shock level at time t_2.

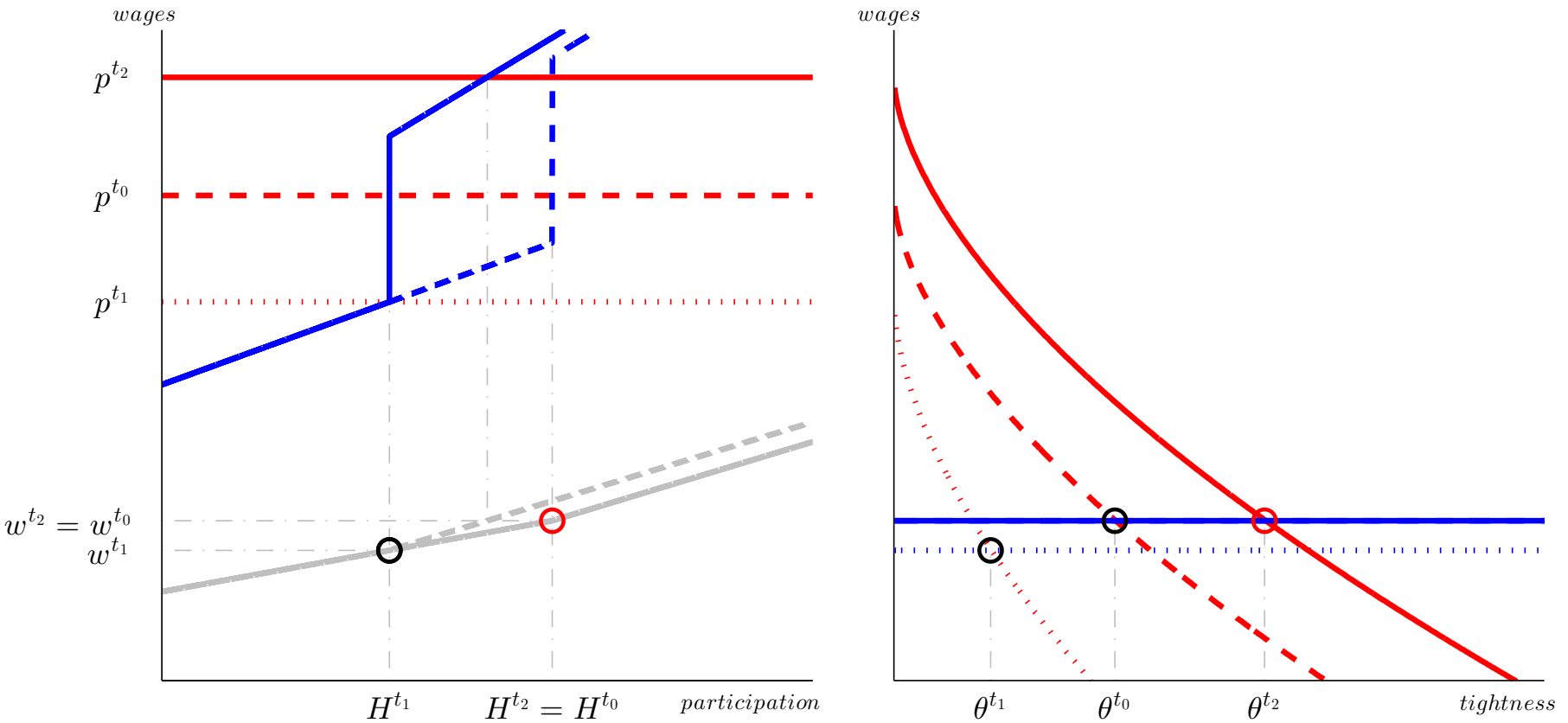


Note: When congestion is severe enough unemployment is persistently high after MPL recovers.

▸ low congestion.

Late Recovery: "Wageless"

At t_2 wages and participation rise to their pre-shock levels.



Note: Unemployment falls to unprecedentedly low levels before wages fully recover.

Conclusion

- A model of "fragile" equilibria due to strategic complementarities.
- Scarring effects in response to productivity shocks.
- "Wageless" recoveries and possibly "jobless" recoveries.

Policy: ▸ Bonus

- Minimum Wage and Public Employment
- Search-contingent unemployment insurance

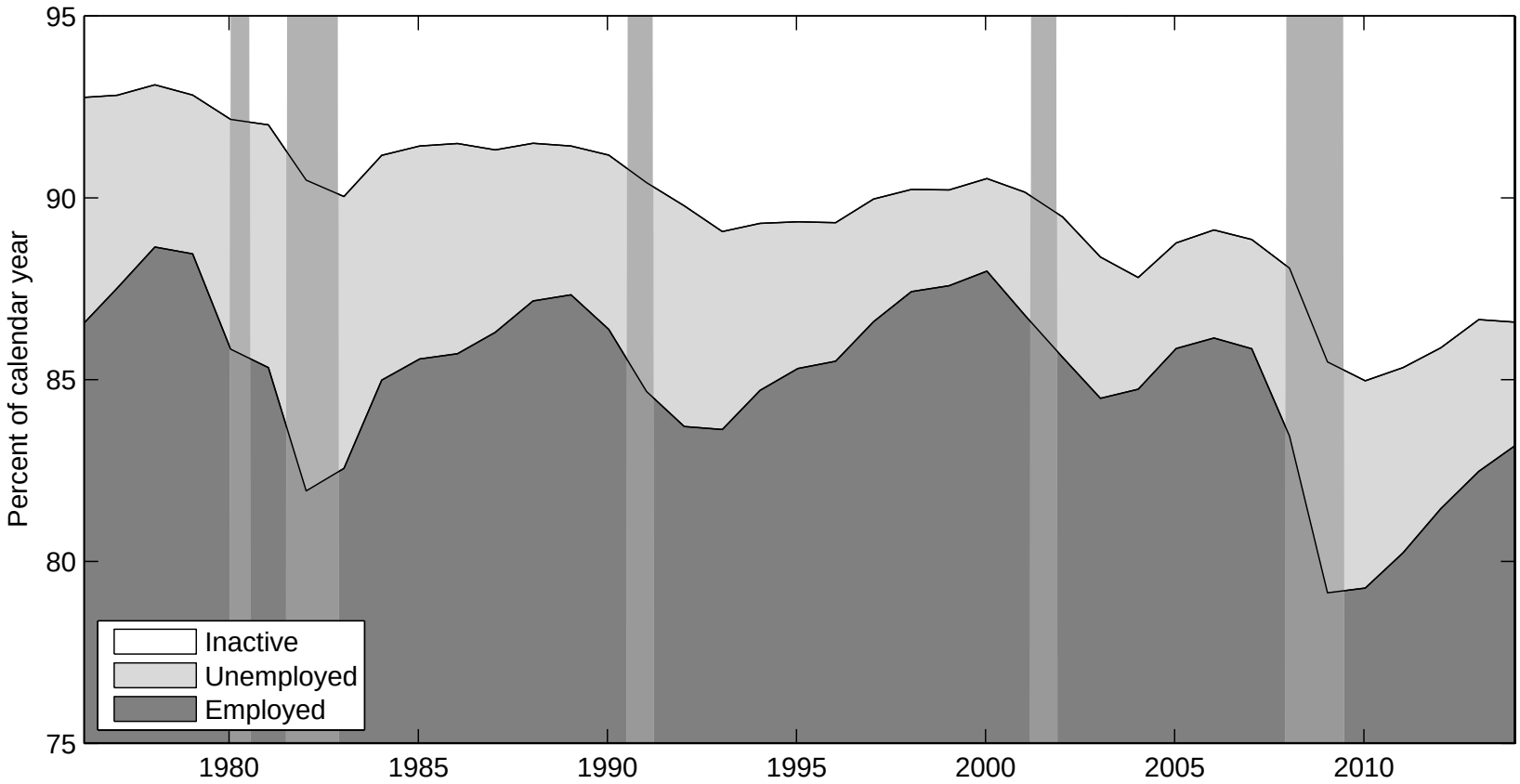
Ongoing:

- Accounting for shifts in match efficiency. ▸ Bonus
- Unemployment insurance (UI): when UI is duration dependent, recession duration increasing "scarring".
- Heterogenous p: productivity and wage dispersion.

Extensions:

- Monetary economy: nominal wages and Phillips curve.
- Capital investment – The choice of p.

Labor Force Participation



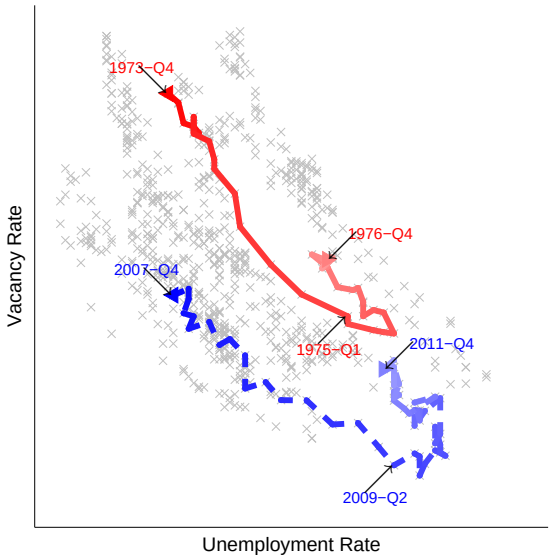
Source: Annual Demographic File of the Current Population Survey following the methodology of Juhn, Murphy, and Topel (1991,2002); Murphy and Topel (1997); Elsby and Shapiro (2012).

Sample: **Male** civilians with 1 to 30 years of potential experience. Individuals who report being students, retired, or ill/disabled are excluded.

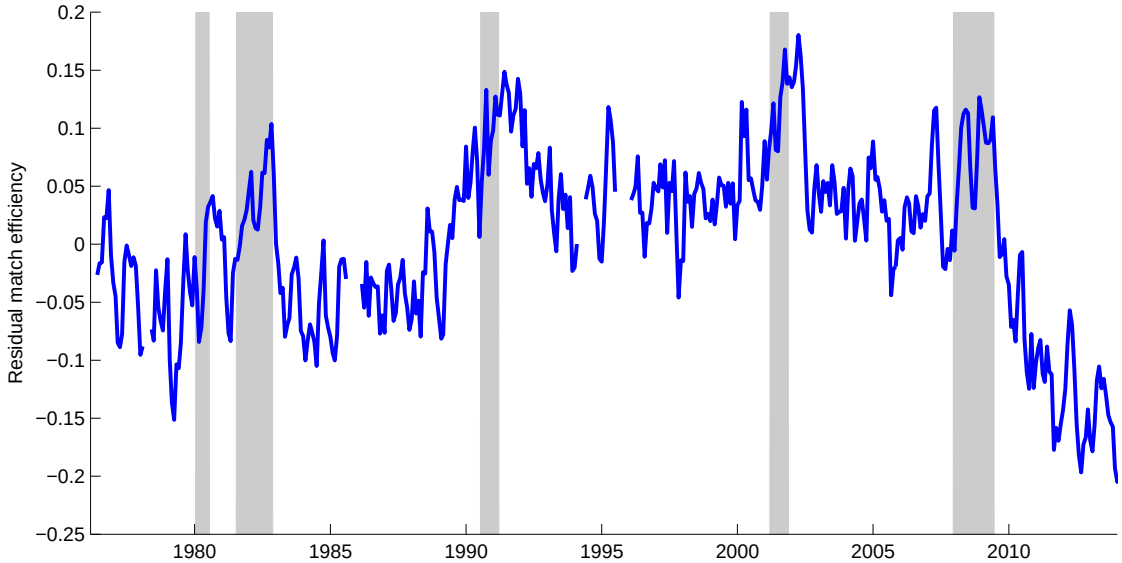
Back

Changes in Match Efficiency

The Beveridge curve.
(Two cyclical episodes)



Estimated Match Efficiency.
(Sample Period: 1967–2014)

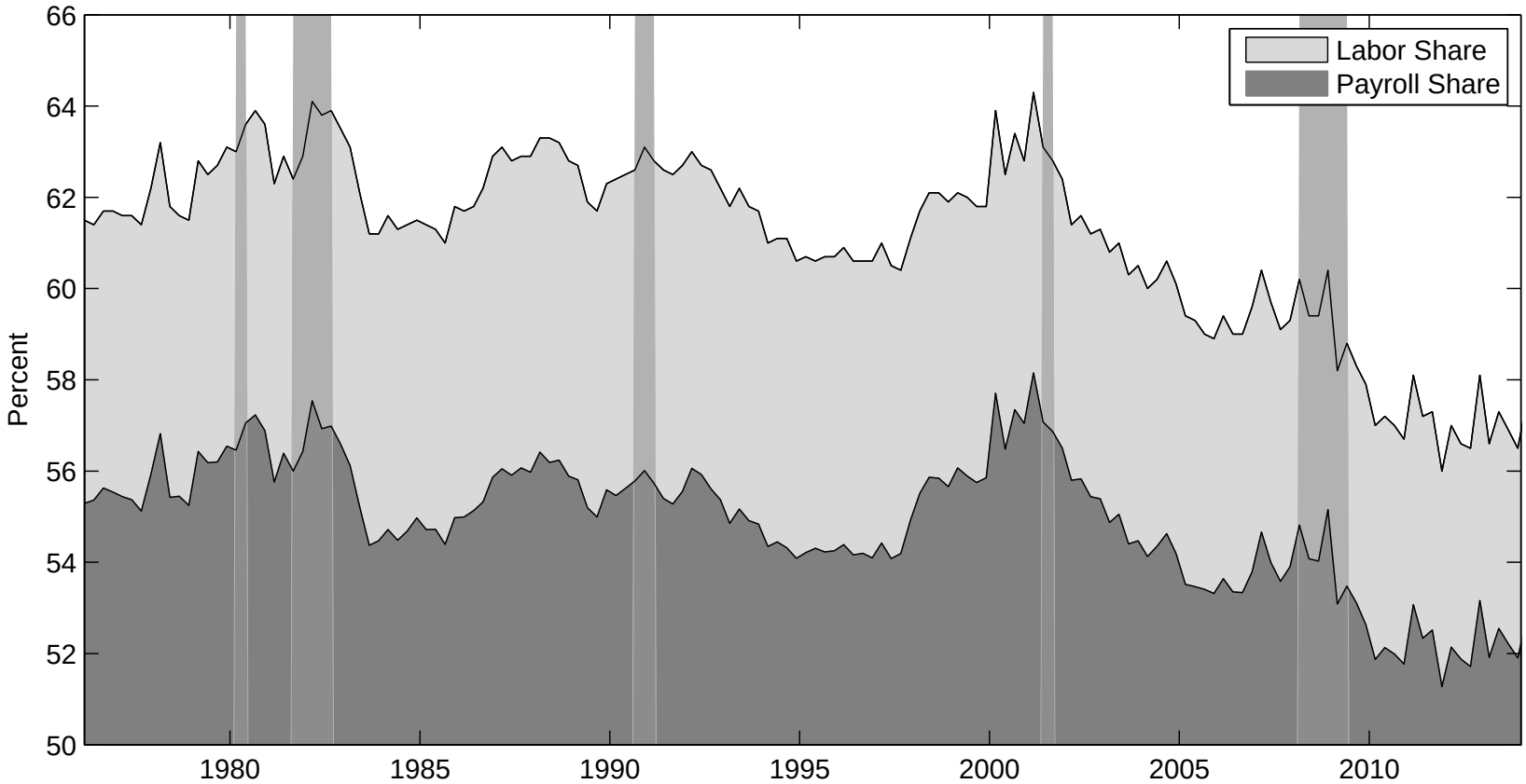


Source (left): Bureau of Labor Statistics, Current Population Survey; Conference Board, Help Wanted Index and Help Wanted Online Index; Bureau of Labor Statistics, Job Openings and Labor Turnover Survey. Vacancies are constructed from the Conference Board data as in Barnichon (2010) prior to 2001 and follow the Job Opening and Labor Turnover Survey thereafter. The figure is constructed as in Diamond and Şahin (2014)

Source (right): Authors calculations based on Bureau of Labor Statistics, Current Population Survey; Conference Board, Help Wanted Index and Help Wanted Online Index; Bureau of Labor Statistics, Job Openings and Labor Turnover Survey. Vacancies are constructed from the Conference Board data as in Barnichon (2010) prior to 2001 and follow the Job Opening and Labor Turnover Survey thereafter. The figure is constructed as in Barnichon and Figura (2015).

Back

Labor Share

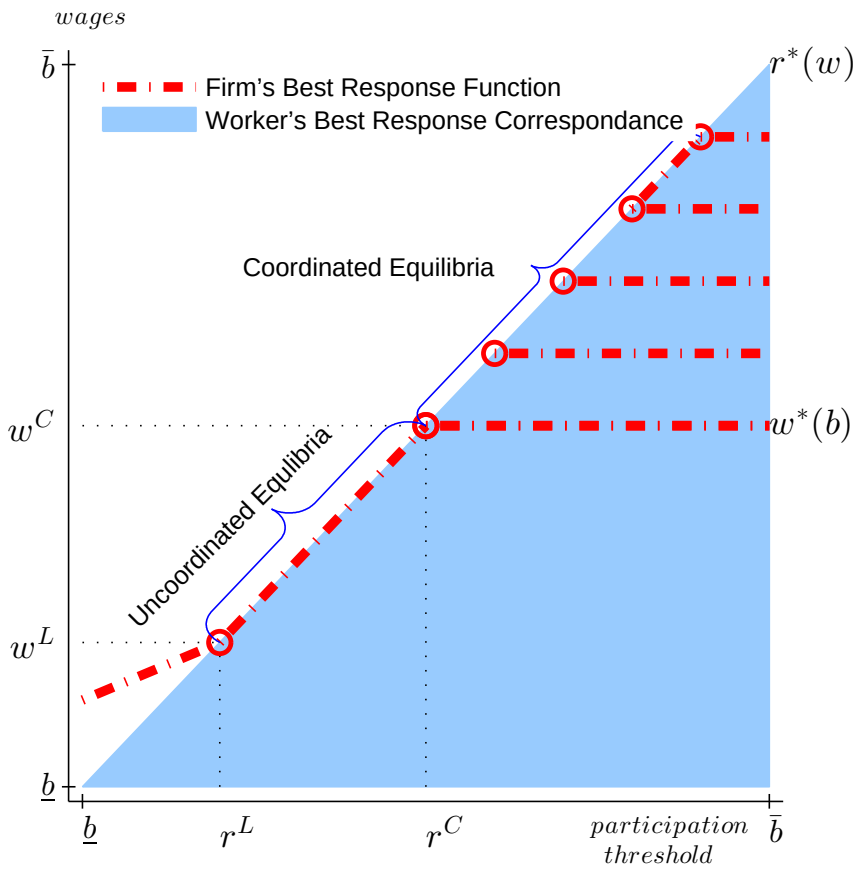


Source: Bureau of Labor Statistics, Bureau of Economic Analsis. Figure constructed as in Elsby, Hobijn, and Şahin (2013).

Back

Multiple Coordinated Equilibria

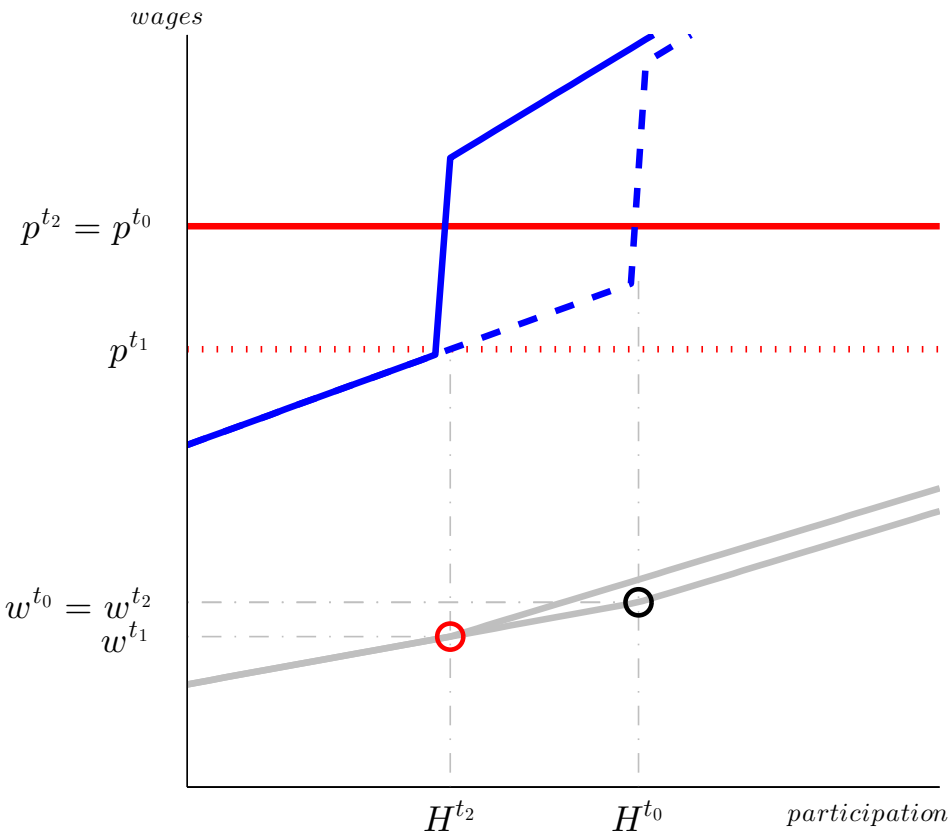
Mutual Best Response

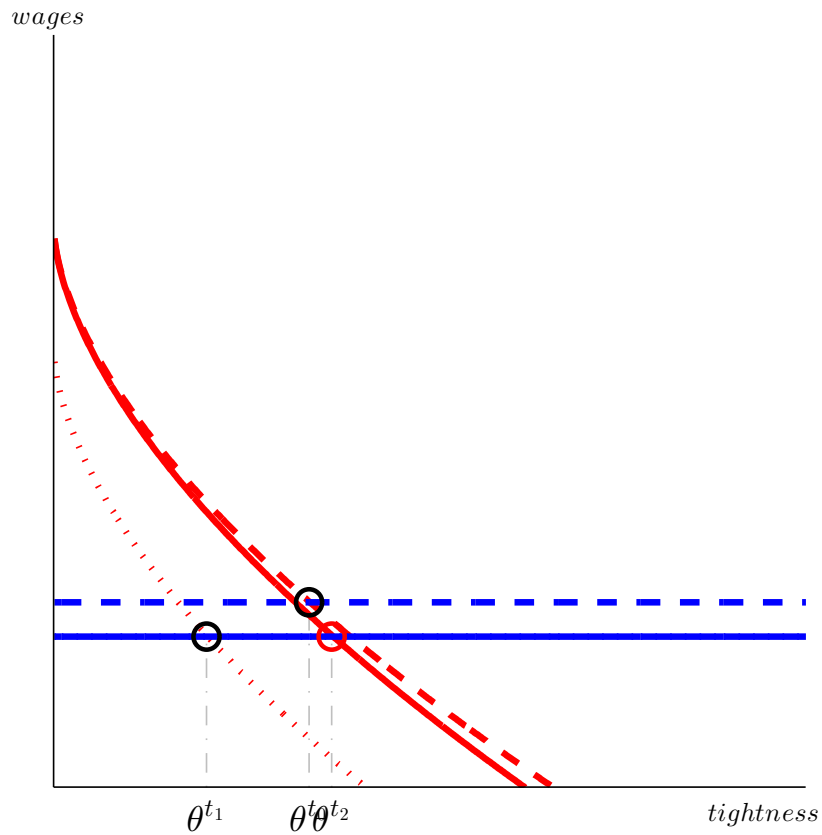


Back

"Wageless" Recovery throughout

When congestion is not severe, unemployment undershoots the pre-shock level when MPL recovers.





back

Policy: Minimum Wage

Prop 8:

The policy maker can attain higher levels of output by imposing minimum wages, $\underline{w} \in (w_0, w^C(p^+)]$ during the expansion.

- Rasing the minimum wage above the average wage level as productivity rises induces labor force participation to rise more quickly than firm's unilateral wage revisions.
- Keeping minimum wage weakly below w^C ensures that gain to firms from greater participation exceeds the cost of higher wages.
- New matches must compensate (firms in) existing matches.

back

Policy: Public Employment

- The planner can use public employment as a revealing mechanism for the constrained efficient wage.
- Necessary Assumption
  - Public sector posts a discrete mass of vacancies
- Revealing Algorithm
  - The public sector chooses $w^G = w_0 + \varepsilon$
  - Note: Workers with $b \in [w_0, w^G]$ will strictly prefer to participate since they have a non-zero probability of matching with the public sector.
  - Note: For all $w^G \leq w^C$, each firm will best respond by setting $w^* = w^G$, taking advantage of the thicker market between w_0 and w^G.
  - Incrementally increase ε until the private sector no longer matches the public sector wages.

back

Policy: Search-contingent Unemployment Insurance

- A payment to search will break the indifference between voluntary unemployment and inactivity (as the subsidy is targeted to the whole population, then $i \nearrow 1$)
- In steady state this increase congestions with reduce efficiency, but
- it also makes the thin side of the market thicker and hence the decentralized wage is closer to the social planner wage – and this matter the most during an expansion.

back

Test: Congestion and Match Efficiency

$$\ln f_t = \ln(A) + \ln(\Lambda_t) + (1-\eta)\ln\theta_t + \varepsilon_t$$

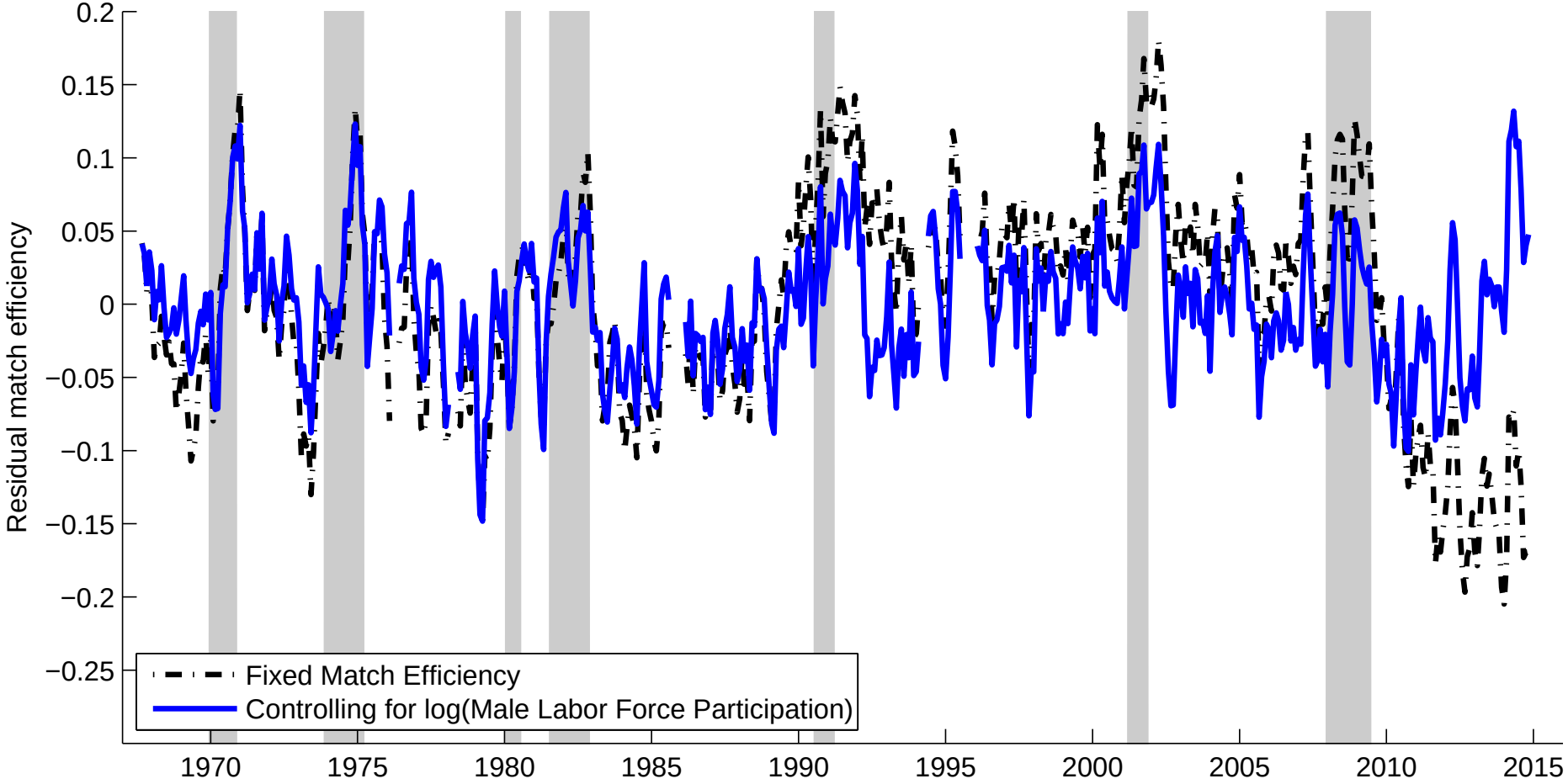
	(1)	(2)
$\ln(A)$	-1.08***	0.37***
	(.008)	(0.080)
$(1-\eta)$	0.34***	0.26***
	(.010)	(0.009)
$\ln(\Lambda_t)$		6.673***
		(0.366)
R^2	0.77	0.86
Sample (monthly frequency)	1967-2014	1967-2014

Note: All regressions control for a linear time trend.

Note: We proxy Λ_t with the male labor force participation rate.

Source: Bureau of Labor Statistics, Current Population Survey; Conference Board, Help Wanted Index and Help Wanted Online Index; Bureau of Labor Statistics, Job Openings and Labor Turnover Survey. Vacancies are constructed from the Conference Board data as in Barnichon (2010) prior to 2001 and follow the Job Opening and Labor Turnover Survey thereafter. Male labor force participation is calculated from the Current Population Survey restricted to males between 25 and 55. Labor flows are calculated from the Current Population Survey monthly data using the matching procedure of Shimer (2012).

Residual Match Efficiency. (Sample Period: 1967–2015)



back