Regulation of Wages and Hours

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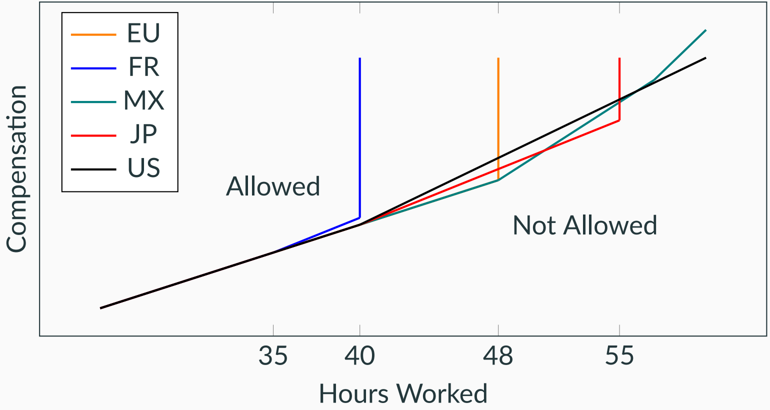
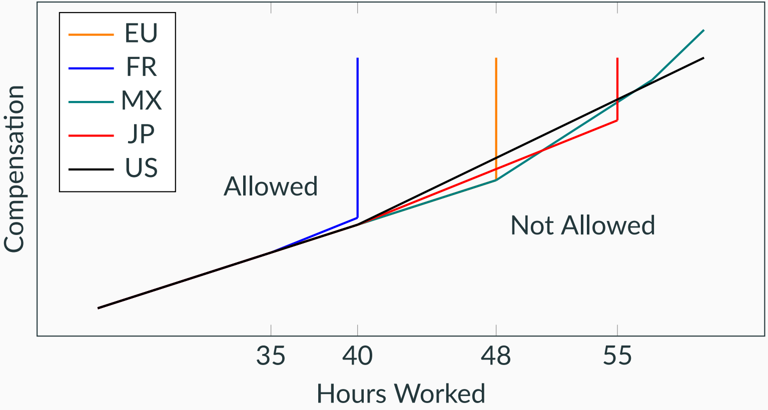
Introduction

Overtime and hours caps



Regulations intended to reduce workers' hours

Overtime and hours caps: understand and refine



Such regulations are common and heterogeneous: **Why? What is optimal?**

Regulating wages and hours

Hours contracting neglected in theoretical study of regulation; consider

- *Pareto efficient* joint bargaining of hours and wages
- *Redistributive* regulation that restricts bargaining space

Overtime, hours caps, and minimum wage are examples of such regulations

Preview and example

Jardim et al. (2022) study effects of 2014 minimum wage increase in Seattle[1]

- Find significant reductions in hours for individual workers
- Hours reductions are considered *bad*
- *In some cases, workers may want their hours to be reduced*

[1] Pandit (2023) finds similar effects for other minimum wage increases

Outline

1. **Complete information: minimum wage optimal**
    - Efficient joint contracting $\implies$ labor often not on supply or demand curve
    - Labor hours may exceed total surplus maximizing level
    - Alters intuition about relationship between labor hours and total surplus

Outline

1. Complete information: minimum wage optimal
2. **Robust setting: optimal minimum wage, overtime, and hours cap**
   - No exogenous bounds are enforced on parameters
   - Instead, *endogenous* bounds from individual rationality of **preexisting market state**

Related literature

Optimal minimum wage regulation without contracted hours

- Berger et al. (2022), Flinn (2006), and Stigler (1946)

Contracted hours without regulation

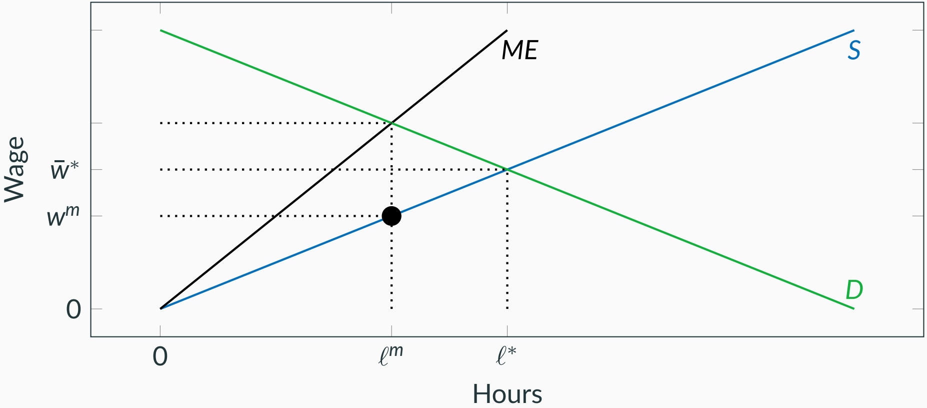
- Altonji and Paxson (1988), Feather and Shaw (2000), and Manning (2013)

Empirical: effects of hours-based regulation

- Crépon and Kramarz (2002), Hamermesh and Trejo (2000), and Trejo (1991)

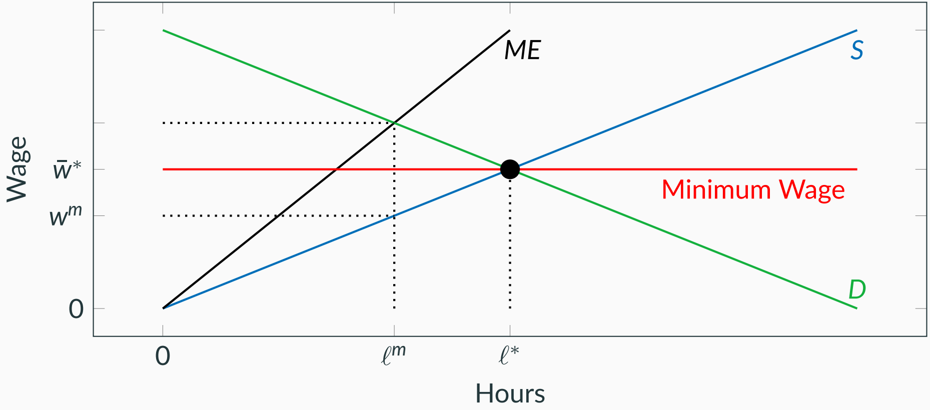
“Flexible-hours” model

Canonical flexible-hours model of monopsony



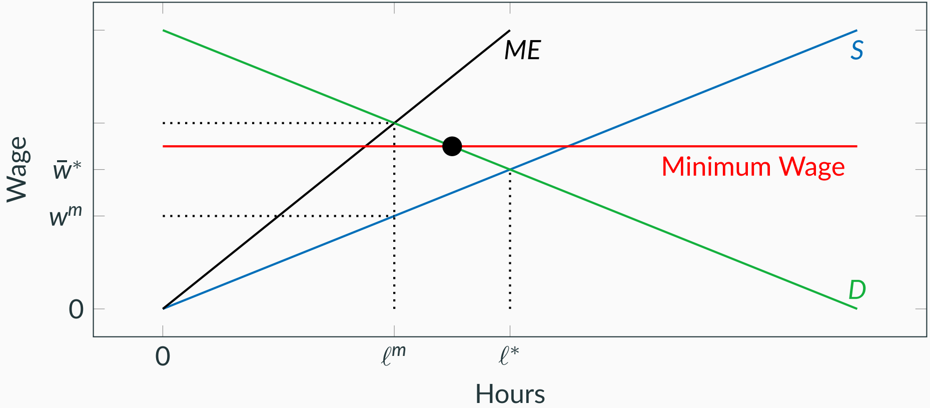
Worker chooses hours at posted wage: *hours not contractible*

Canonical flexible-hours model of monopsony



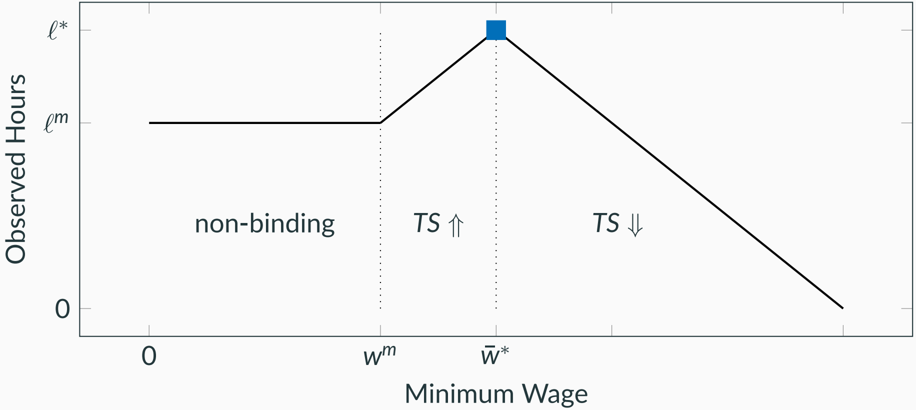
Minimum wage can increase labor to TS maximizing level

Canonical flexible-hours model of monopsony



Labor hours decrease in minimum wage after TS maximizing point

Effect of minimum wage on labor and total surplus



Increasing/maximizing hours and increasing/maximizing total surplus are equivalent

Ultimatum bargaining model

Ultimatum framework

- One firm contracts services of one worker
- Contract (ℓ, τ): worker works ℓ hours for total compensation τ
- Firm makes "take it or leave it" offer[2] under complete information
- Firm profits

$$\pi(\ell, \tau) = f(\ell) - \tau,$$

worker payoff

$$u(\ell, \tau) = \tau - c(\ell).$$

[2] In paper, allow for more general bargaining.

Ultimatum framework

- Firm makes "take it or leave it" offer[2] under complete information
- Firm profits

$$\pi(\ell, \tau) = f(\ell) - \tau,$$

worker payoff

$$u(\ell, \tau) = \tau - c(\ell).$$

Assume:

$f, -c, -c'(x)x$ strictly concave, differentiable, $f'(0) > c'(0) > 0 > \lim_{x \to \infty} f'(x) - c'(x)$

[2] In paper, allow for more general bargaining.

Wage and overwork

Definition (Wage)

Worker's wage is compensation per hour: $w \equiv \tau/\ell$

Definition (Overwork)

Worker is overworked if she would prefer to work fewer hours for the same wage:

$$\text{wage} \;<\; \text{marginal cost}$$

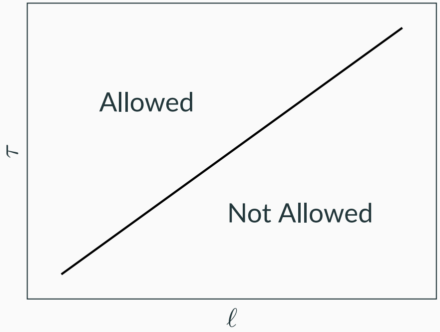
Regulation/delegation

Definition (Policy)

A convex function of hours, $\phi : \mathbb{R}_+ \to [0, \infty]$, s.t. contracts in $\{(\ell, \tau) : \tau < \phi(\ell)\}$ are forbidden.

Definition (Minimum wage)

The slope of a linear policy. That is, $\bar{w}$ is the minimum wage if $\phi(x) \equiv \bar{w}x$.



Objective of regulation

Regulator's objective:

Maximize total surplus and break ties in favor of the worker[3]

[3] More aggressive redistribution considered later

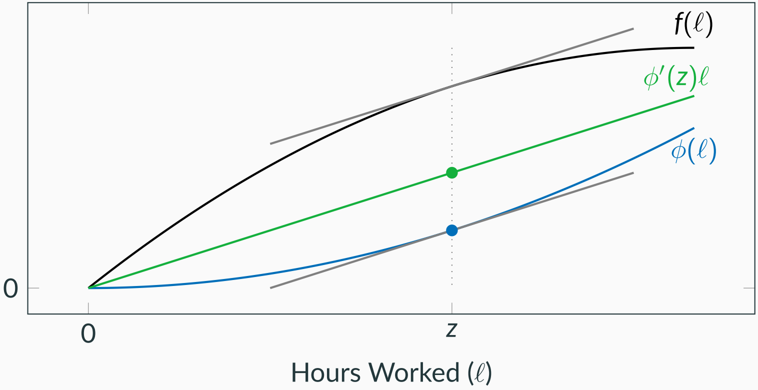
Results

Overwork

Ultimatum game without regulation:

- Firm extracts all surplus
- Total surplus is maximized
- Wage is worker's average cost
- Worker is overworked (average cost $<$ marginal cost)

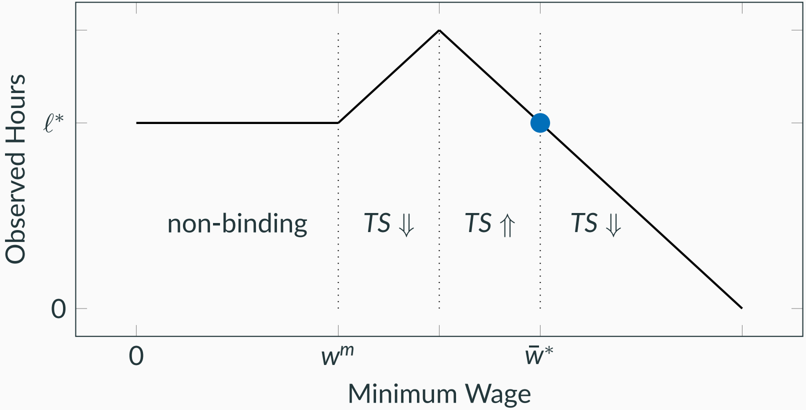
Minimum wage maximizes worker utility



Minimum wage is first best

If ϕ results in z hours, minimum wage $\phi'(z)$ results in z hours and more compensation

Effect of minimum wage on hours and total surplus in ultimatum model



Increasing/maximizing hours and increasing/maximizing total surplus **not** equivalent

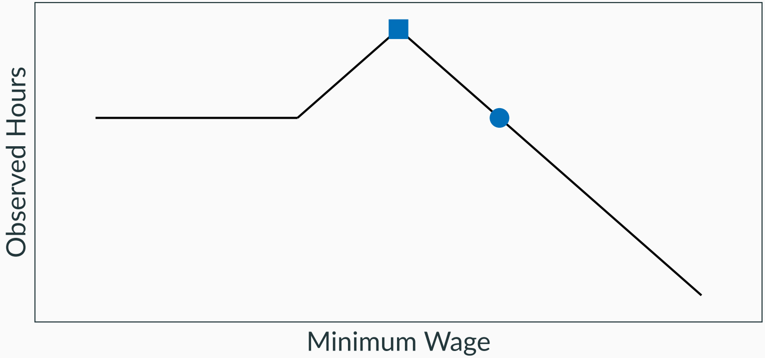
Models are “indistinguishable”

Remark

Flexible-hours model generates same labor curve as ultimatum model with same production and different cost

- Impossible to distinguish between models based on labor reaction to policy
- No result of ultimatum model hours empirically inconsistent with flexible-hours

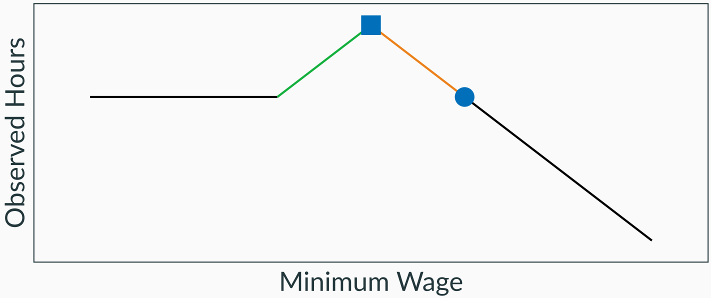
Optimal policy sensitivity



flexible-hours: ■ maximizes TS

ultimatum model: ● maximizes TS $\Longrightarrow$ ■ **is local TS minimum**

Policy effect sensitivity



Remark

If total surplus increasing in minimum wage at w in one model, it's decreasing in other.

Wrong model $\implies$ opposite effect of policy on total surplus!

Robust regulation

Why are many real policies nonlinear?

"Best" policy for worker is minimum wage, but **information is limited**

Consider case where regulator

- knows nothing about f, c, but knows *hours* and *compensation*
- knows some specific reduced hours that the worker prefers

Historical motivation

Similar to introduction of overtime pay in the US (1938 Fair Labor Standards Act)

- Regulator aware that workers want 40 hour workweek
- No existing regulation

Introducing the regulator

Regulator has no prior over f, c, but knows

- State of market pre-regulation: (ℓ^m, τ^m)
- Reduced hours, $\hat{\ell} < \ell^m$, preferred by worker at same wage: $(\hat{\ell}, w^m \hat{\ell})$

Regulator knows (ℓ^m, τ^m) is equilibrium of ultimatum game[4]

Workers get this known preferred contract or better

[4] Larger class of bargaining protocols in paper

Regulator's objective: TS maximizing satisficing contract

Satisficing

Offer at least as much utility to worker as known preferred contract:

$$\inf_{(f,c)\in I(\ell^m,\tau^m)} \quad (\tau - c(\ell)) - (w^m\hat{\ell} - c(\hat{\ell})) \geq 0$$

$$\text{s.t.} \quad \ell = \arg\max_x (f(x) - \max\{c(x), \phi(x)\})$$

$$\tau = \max\{c(x), \phi(x)\}$$

$I(\ell^m, \tau^m)$ is regulator's information: $\{(f, c) : f'(\ell^m) = c'(\ell^m) \text{ and } c(\ell^m) = \tau^m\}$

Regulator's objective: TS maximizing satisficing contract

Take satisficing contract that maximizes total surplus in every possible state

TS maximizing

Policy ϕ is TS maximizing if for all $(f, c) \in I(\ell^m, \tau^m)$ and all satisficing ψ,

$$f(\ell) - c(\ell) \geq f(\ell') - c(\ell')$$

$$\text{for } \ell = \arg\max_x (f(x) - \max\{c(x), \phi(x)\}) \text{ and } \ell' = \arg\max_x (f(x) - \max\{c(x), \psi(x)\})$$

This is the least restrictive one

Representation of satisficing policies

Theorem

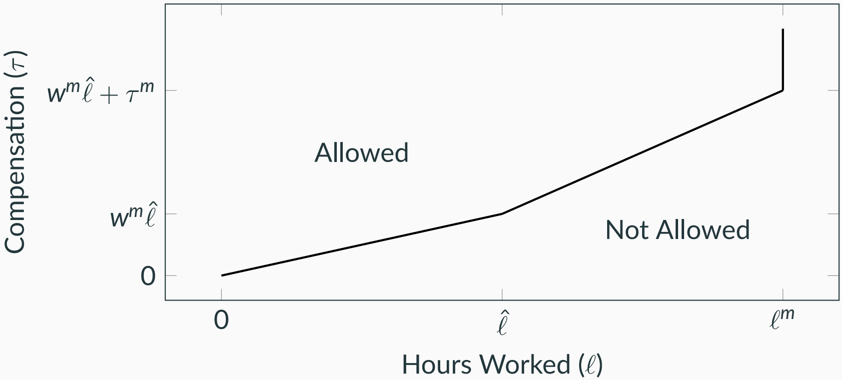
A policy, ϕ, is satisficing if and only if $\phi(\hat{\ell}) = w^m \hat{\ell}$ and

$$\phi(x) \geq \phi_*(x) \equiv \begin{cases} w^m x & \text{if } x \leq \hat{\ell} \\ w^m \hat{\ell} + w^m \frac{\ell^m}{\ell^m - \hat{\ell}}(x - \hat{\ell}) & \text{if } \hat{\ell} < x \leq \ell^m \\ \infty & \text{if } x > \ell^m. \end{cases}$$

Least restrictive satisficing regulation, ϕ_*, is TS maximizing:

- Overtime pay with wage multiplier of $\frac{\ell^m}{\ell^m - \hat{\ell}}$ and hours cap at ℓ^m

TS maximizing satisficing policy



- Left of $\hat{\ell}$ is never chosen by firm
- Right of $\hat{\ell}$ is upper bound on cost of additional hours: $c(x) - c(\hat{\ell})$

Intuition behind bound on costs

- Function maximizes disutility of additional hours: $c(x) - c(\hat{\ell})$
- Bound comes from convexity of c and IR of ●

Math BotE

Extensions and future work

- More general bargaining
- Other regulation objectives
- Heterogeneous workers
- Competition among firms
- Future work

Thank You!

Extensions

More general bargaining

Back

Results

More Example

More general bargaining including Nash and proportional bargaining:

- Minimum wage without loss of optimality
- Efficient, redistributive regulation exists iff overwork in absence of regulation
- Maximizing hours locally minimizes TS iff overwork in absence of regulation

Broader objective for regulation

Back

Regulator maximizes weighted sum of surpluses

Regulator objective:

Maximize $\alpha u(\ell, w\ell) + (1-\alpha)\pi(\ell, w\ell)$ for $\alpha \in (0.5, 1]$ using ϕ.

Until now, we focused on $\alpha \to 0.5$

Heterogeneous workers

Back

Flexible-hours assumption traditionally made for ease of aggregation

- Each hour treated like individual worker
- Hours are fungible across workers

Sometimes it is easy to aggregate in ultimatum model too!

Heterogeneous workers: complete information

Back

Firm contracts workers individually with heterogeneous costs (c_i)

If regulator only cares about workers ($\alpha \to 1$):

- Representative worker exists
- Optimal policy for representative worker is overall optimal policy
- Representative worker has average costs of all workers affected by policy

Heterogeneous workers: representative worker intuition

Back

Firm's problem: $\max_{\ell,\tau} f(\ell) - \tau$ s.t. $\tau \geq \phi(\ell)$ and $\boxed{\tau \geq c_i(\ell)}$

Regulation benefits worker $\implies \tau > c_i(\ell) \implies$ contract does not depend on i

Every worker affected by regulation receives same contract!

Heterogeneous workers: robust

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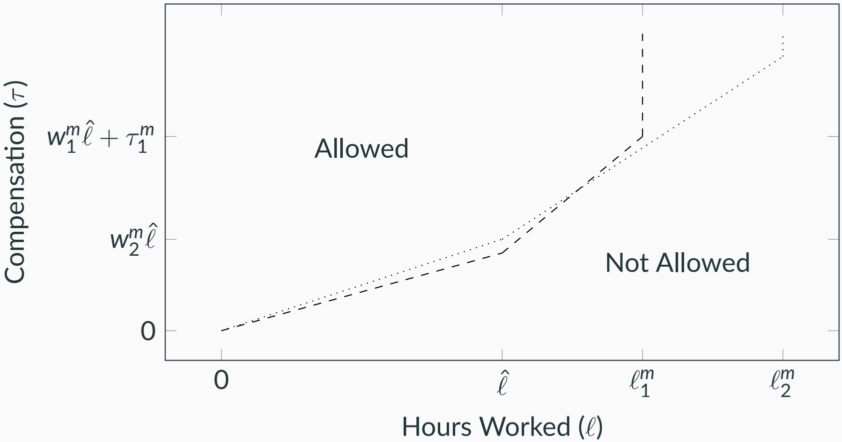
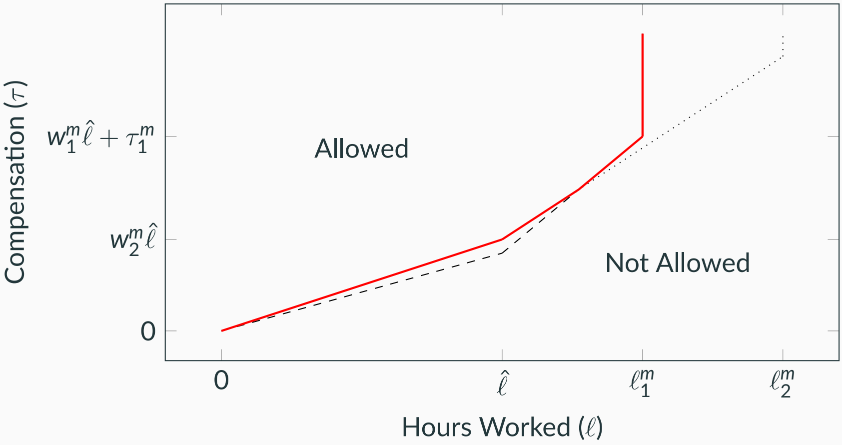


Do procedure for each worker and take maximum

Heterogeneous workers: robust

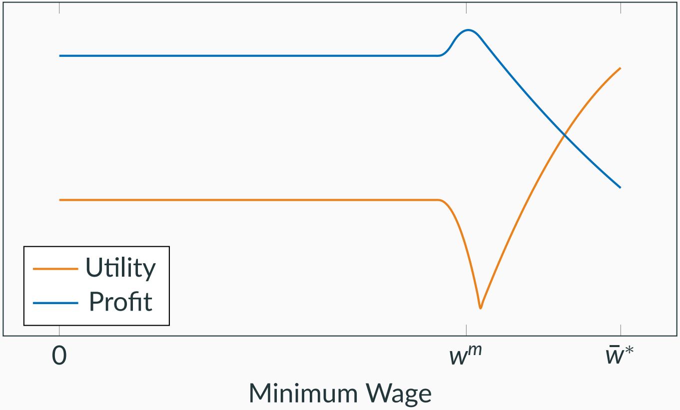
Back



Policy may have multiple levels of overtime – e.g., California and Mexico

Bertrand competition with potential entrant

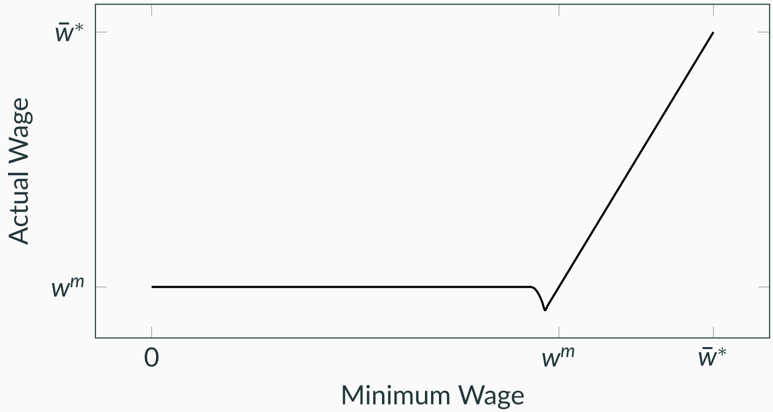
Back



Minimum wage weakens competitive pressure by regulating entrant

Bertrand competition with potential entrant

Back



If entrant's wage is lower, minimum wage can reduce incumbent's wage

Future work

Back

Information design by firms who resist

- hiring more than 40 hours
- paying more than minimum wage

Improving labor caps and overtime policies

- replace hours caps with something softer?

Bargaining design to achieve efficiency

- if contracts are not efficient, how best to improve TS through re-bargaining?

Thank You!

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Appendix

Efficient bargaining framework

Back

Bargaining according to

$$(\ell^*, \tau^*) \equiv \arg\max_{\ell,\tau} M\left(f(\ell) - \tau, \tau - c(\ell)\right) \text{ s.t. } \tau - c(\ell) \geq 0, f(\ell) - \tau \geq 0, \text{ and } \tau \geq \phi(\ell)$$

M continuous, weakly monotone, and strictly quasiconcave.

Alternatively, use Peters and Wakker (1991) to get the same representation using PO, IIA, and continuity.[5] However, properties of M are different.

[5] Choice function $C : \Sigma \to \mathbb{R}^2_+$ is continuous if for every sequence, $S_k \to S \implies C(S_k) \to C(S)$

Efficient bargaining example: Egalitarian bargaining

Back

Consider a model of Rubinstein bargaining with $\delta \to 1$ and $-c$ "more concave" than f on $[0, \ell^*]$ in the sense that $f(\ell^*) - f'(\ell^*)\ell^* < c'(\ell^*)\ell^* - c(\ell^*)$. This second condition is necessary and sufficient for overwork.

Because $\delta \to 1$, the worker and firm split the market surplus evenly. The market is described by

$$\max_{\ell,\tau} \min\{f(\ell) - \tau, \tau - c(\ell)\} \text{ s.t. } \tau \geq \phi(\ell).$$

Egalitarian bargaining: Small minimum wages are extra bad

Back

By assumption, the worker is overemployed in equilibrium. As the minimum wage increases above $w^m \equiv \frac{f(\ell^*)+c(\ell^*)}{2\ell^*}$, labor will increase to keep profits and worker welfare equal. This will occur until the minimum wage reaches $f'(z) \equiv \frac{f(z)+c(z)}{2z}$.

For all minimum wages between w^m and $f'(z)$, the worker's welfare and the profits of the firm are *both* strictly lower than in the unregulated state. This is because they are evenly dividing the total surplus and this total surplus is lower by inefficiency.

Further increasing the minimum wage to $f'(\ell^*)$ will, of course, make the worker better off than she was in the unregulated state.

Derivation of least satisficing regulation

Back

By convexity, for all $x \in (\hat{\ell}, \ell^m)$

$$c(x) - c(\hat{\ell}) < \frac{x - \hat{\ell}}{\ell^m - \hat{\ell}} \left[c(\ell^m) - c(\hat{\ell}) \right]$$

The worker accepted $(\ell^m, \tau^m) \implies \tau^m \geq c(\ell^m)$

$$\frac{x - \hat{\ell}}{\ell^m - \hat{\ell}} \left[c(\ell^m) - c(\hat{\ell}) \right] \leq \frac{x - \hat{\ell}}{\ell^m - \hat{\ell}} \tau^m$$

Which we rearrange to yield

$$\frac{x - \hat{\ell}}{\ell^m - \hat{\ell}} \tau^m = w^m \frac{\ell^m}{\ell^m - \hat{\ell}} (x - \hat{\ell})$$

Existing policies are below least satisficing

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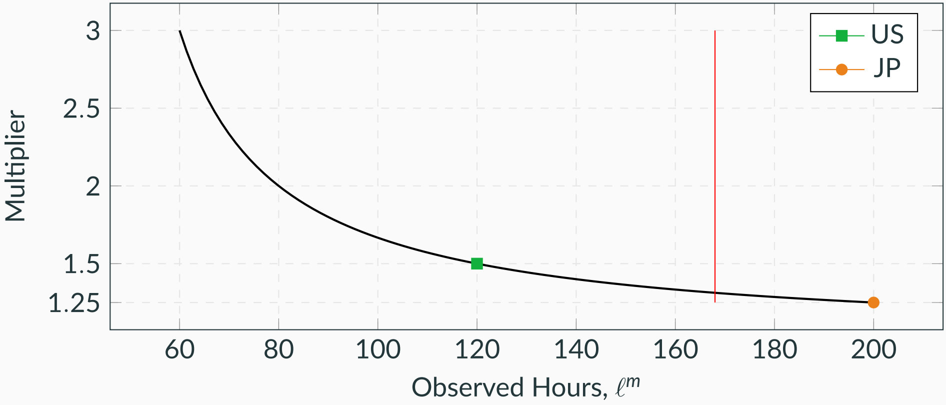

Satisficing policy with kink at 40 hours is above this curve
(there are 168 hours in a week)

BotE Calculation: Overtime in Japan

Back

Suppose that the overtime policy in Japan, which grants time and a quarter after 40 hours of work each week and a cap after 55 hours, is relative maxmin. In this case, $\hat{\ell} = 40$, $\bar{\ell} = 55 \leq \Psi(w^m)$ and

$$1.25 \geq \frac{\Psi(w^m)}{\Psi(w^m) - \hat{\ell}}$$

because the slope of this policy must be at least as large as the LRRM. Last inequality implies

$$\Psi(w^m) \geq 200.$$

We can reject that this policy is satisficing because there are only 168 hours in a week. Therefore, there are possible types of workers that prefer a strict 40 hour cap to this policy.

BotE Calculation: Overtime in the US

Back

Suppose that the overtime policy in the US, which grants time and a half after 40 hours of work, is relative maxmin (ignoring the lack of labor cap). In this case, $\hat{\ell} = 40$ and

$$\frac{\Psi(w^m)}{\Psi(w^m) - \hat{\ell}} \leq 1.5$$

which implies

$$\Psi(w^m) \geq 120.$$

The lack of an hour cap at such a number of hours is irrelevant. This leaves a little under 7 hours for sleep each day. Some workers do work 120 hours on occasion. It is, however, extremely rare.