Robust Regulation of Wages and Hours

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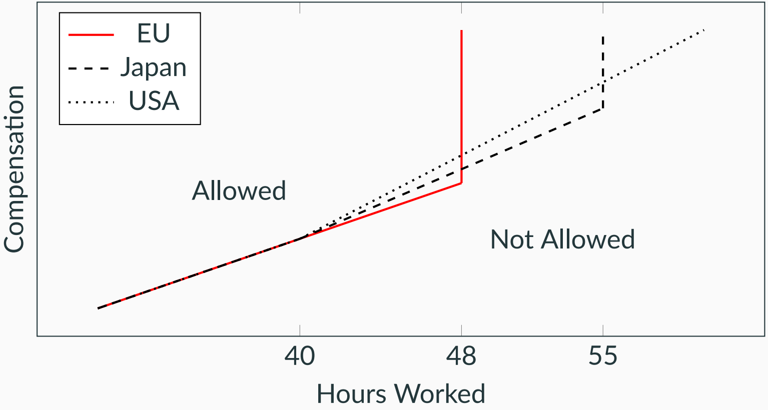
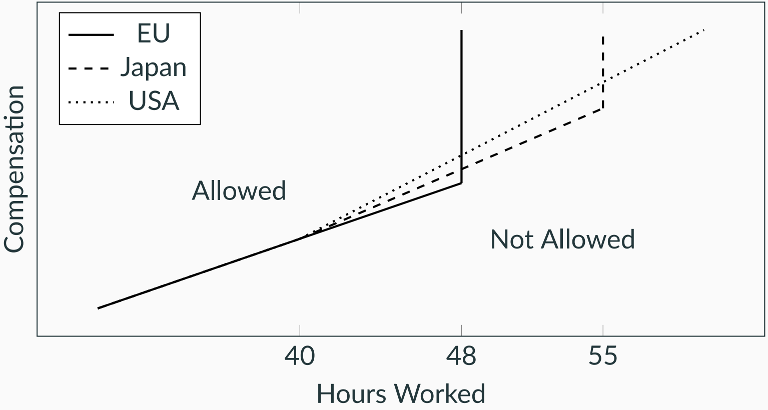
Introduction

Overtime and hours caps



These policies exist to reduce workers' hours.

Overtime and hours caps: understand and refine



These policies are popular: **Why? Can we do better?**

Regulating Pareto efficient bargaining

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

- no evidence of change in unemployment (extensive margin)
- significant reductions in hours (intensive margin)

Hours reductions are considered *bad*

In some models, workers may want their hours to be reduced?

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 labor 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

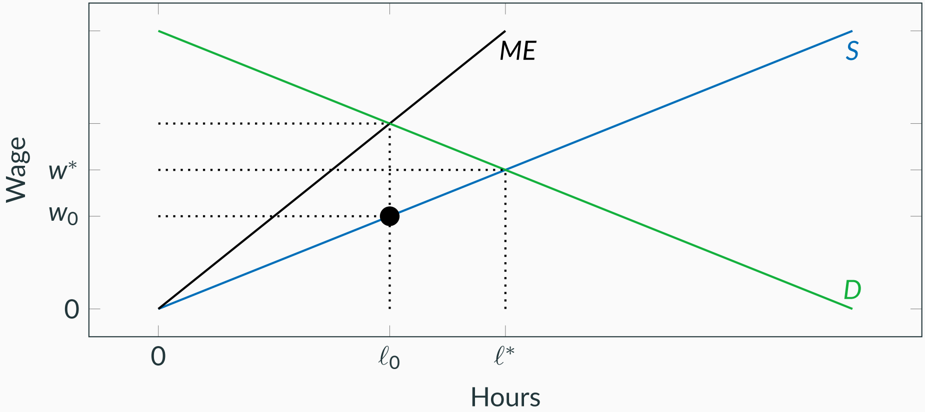
- Altonji and Paxson (1988), Feather and Shaw (2000), and Manning (2013)

Empirical: effects of hours-based regulation

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

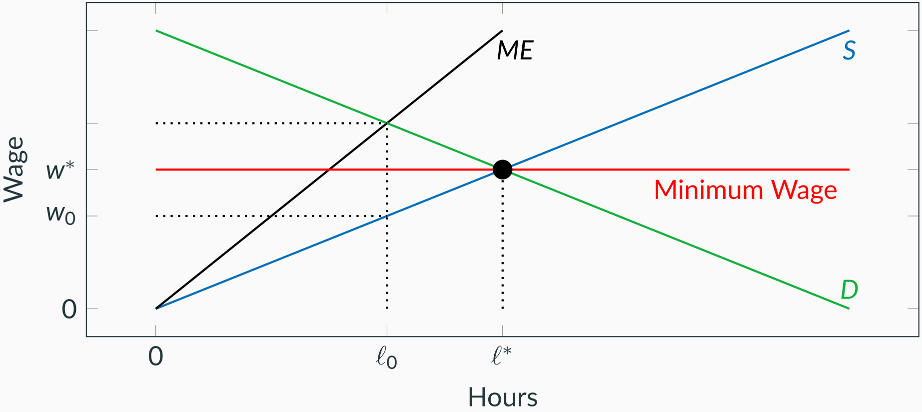
“Flexible-hours” model

Canonical flexible-hours model of monopsony



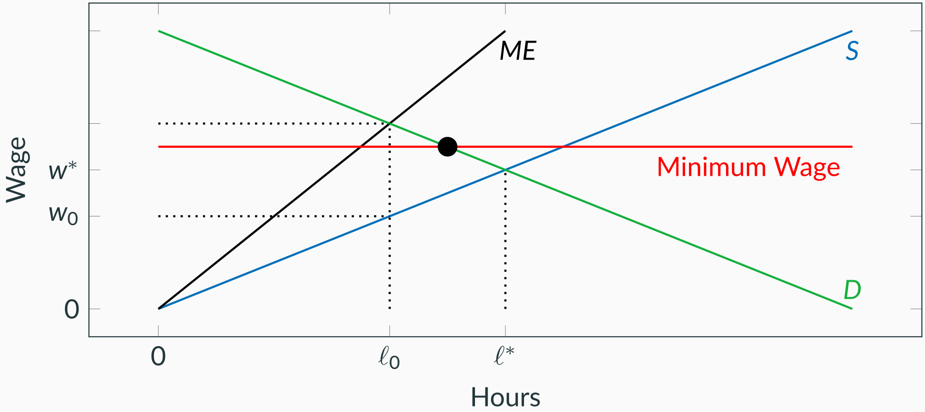
Worker chooses hours at posted wage: *hours not contractible*

Canonical flexible-hours model of monopsony



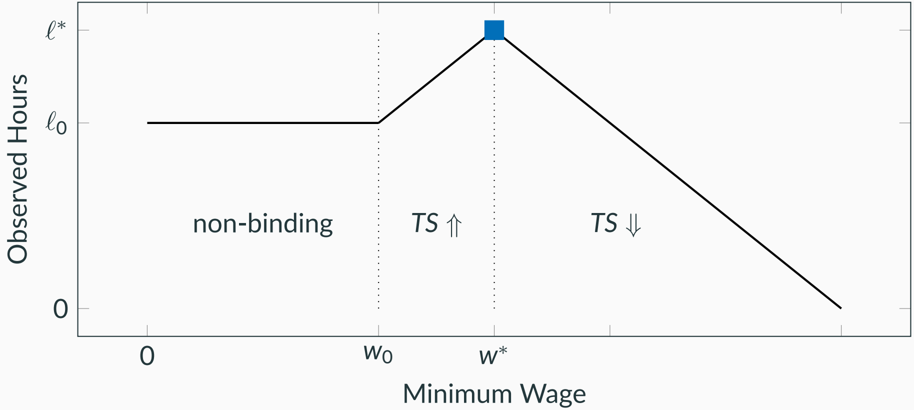
Minimum wage can increase labor to TS maximizing level

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[1] under complete information
- Firm profits

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

worker payoff

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

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

Ultimatum framework

- Firm makes "take it or leave it" offer[1] under complete information
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$$\pi(\ell, \tau) = f(\ell) - \tau,$$

worker payoff

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

Assume:

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

[1] 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:

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

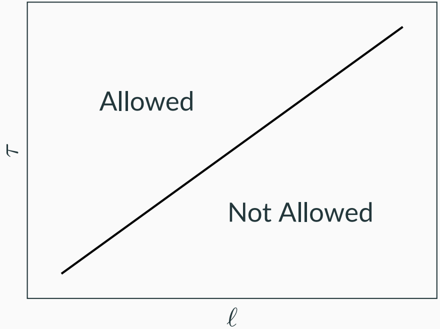
Regulation/delegation

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[2]

[2] More aggressive redistribution considered later

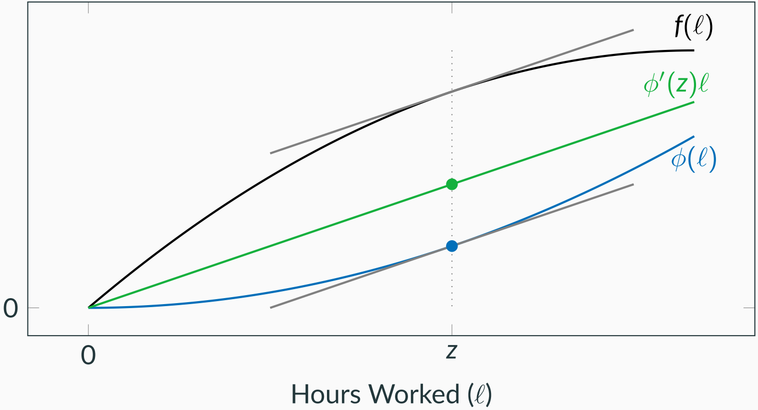
Results

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)

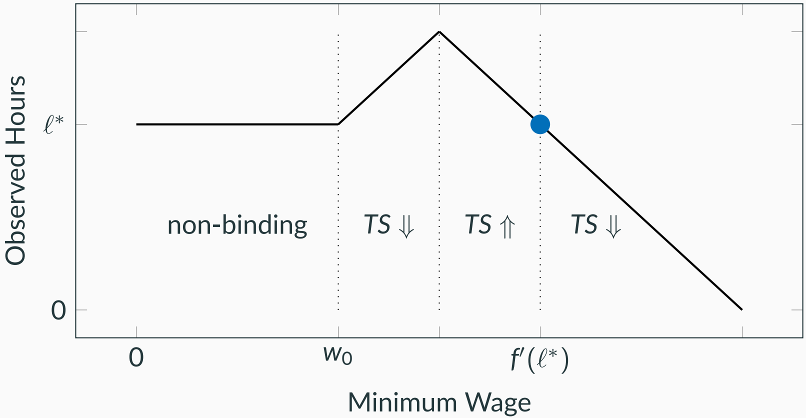
Minimum wage maximizes worker utility



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”

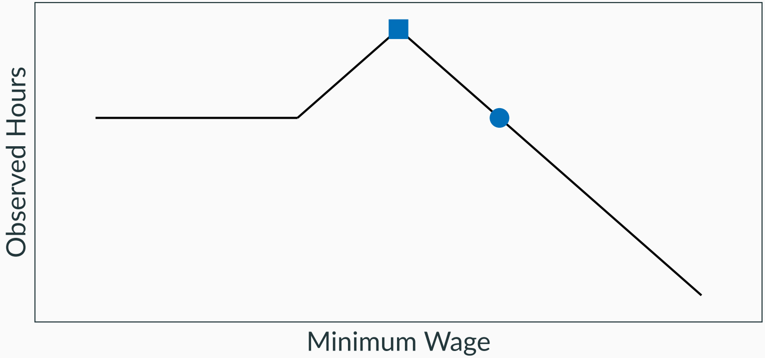
Remark

Flexible-hours model generates same labor curve[3] 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

[3] In fact, the firm’s problem is identical

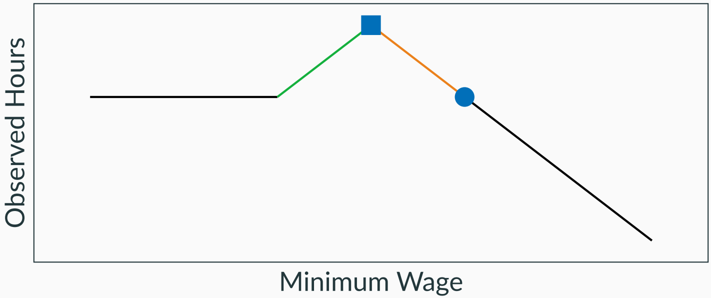
Optimal policy sensitivity



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)

- regulators are 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_0, τ_0)
- Reduced hours, $\hat{\ell} < \ell_0$, preferred by worker at same wage: $(\hat{\ell}, w_0\hat{\ell})$

Regulator knows (ℓ_0, τ_0) is equilibrium of ultimatum game.[4]

Political mandate: workers get this 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 mandated contract:

$$\begin{aligned} \inf_{(f,c)\in I(\ell_0,\tau_0)} \quad & (\tau - c(\ell)) - (w_0\hat{\ell} - c(\hat{\ell})) \geq 0 \\ \text{s.t.} \quad & \ell = \arg\max_x (f(x) - \max\{c(x), \phi(x)\}) \\ & \tau = \max\{c(x), \phi(x)\} \end{aligned}$$

$I(\ell_0, \tau_0)$ is regulator's information: $\{(f, c) : f'(\ell_0) = c'(\ell_0) \text{ and } c(\ell_0) = \tau_0\}$

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 $(f, c) \in I(\ell_0, \tau_0)$ and all satisficing ψ,

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

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

(this will be the least restrictive one)

Representation of satisficing policies

Theorem

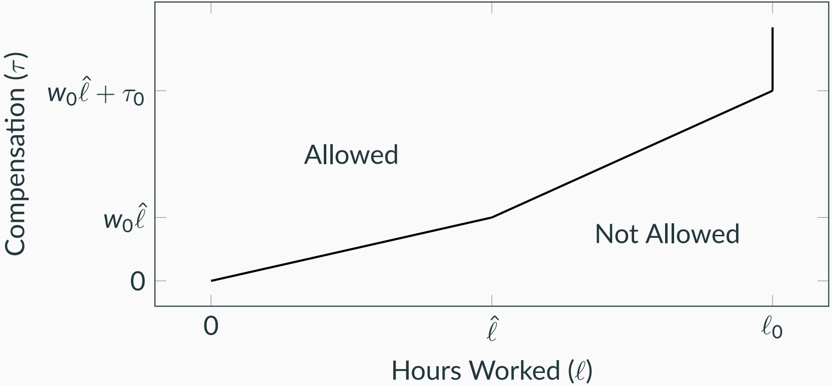
A policy, ϕ, is satisficing if and only if $\phi(\hat{\ell}) = w_0\hat{\ell}$ and

$$\phi(x) \geq \phi_*(x) \equiv \begin{cases} w_0 x & \text{if } x \leq \hat{\ell} \\ w_0\hat{\ell} + w_0 \frac{\ell_0}{\ell_0 - \hat{\ell}}(x - \hat{\ell}) & \text{if } \hat{\ell} < x \leq \ell_0 \\ \infty & \text{if } x > \ell_0. \end{cases}$$

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

- hour cap and overtime pay with wage multiplier of $\frac{\ell_0}{\ell_0 - \hat{\ell}}$

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

- Cost function that maximizes cost of additional hours: $c(x) - c(\hat{\ell})$
- Bound comes from convexity of c and IR of ● Aside

Extensions

More general bargaining

Results More

More general bargaining including Nash and proportional bargaining:

- Minimum wage without loss of optimality
- Binding efficient (tightening of) regulation exists iff there is overwork
- Hours maximum locally minimizes TS iff in absence of regulation, there is overwork

Future work

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 Return

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, $S_k \to S \implies C(S_k) \to C(S)$

Overwork is necessary and sufficient for there to exist a weekly convex binding efficient policy. Therefore, convex regulation without overwork always comes at the cost of efficiency.

Theorem

Let τ_0 be the compensation to the worker under weakly convex policy ϕ_0 which implements the efficient level of labor. There exists a weakly convex policy, ϕ, that also implements the efficient level of labor, ℓ^*, and larger compensation, $\phi(\ell^*) > \tau_0$, if and only if $\frac{\tau_0}{\ell^*} < c'(\ell^*)$.

Minimum wage Return

Theorem

Let ϕ be a convex policy that implements $\ell \leq \ell^*$. If the worker has greater welfare under ϕ than in the unregulated state, then there is a minimum wage, $\bar{w}$, that implements ℓ and $\bar{w}\ell \geq \phi(\ell)$.

Structure of data from overwork Return

Theorem

Let $\Psi : \mathbb{R}_+ \to \mathbb{R}_+$ define the level of labor at each minimum wage and $w_0 \in [c(\ell^*)/\ell^*, c'(\ell^*))$ be the wage in the absence of regulation. The following properties hold:

- *The data, Ψ, are continuous.*
- *For all $x \in [0, w_0]$, $\Psi(x) = \ell^*$.*
- *For all $x \in (w_0, f'(\ell^*))$, $\Psi(x) > \ell^*$ and $\Psi'_+(w_0) = \frac{\ell^*}{c'(\ell^*) - w_0}$.*
- *The minimum wage, $f'(\ell^*)$, is efficient. Therefore, $\Psi(f'(\ell^*)) = \ell^*$.*
- *There is no larger efficient minimum wage. So, $\Psi(x) < \ell^*$ for all $x > f'(\ell^*)$.*
- *The choke price is $f'(0)$. So, $\Psi(x) = 0$ for all $x > f'(0)$.*

Setting

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 Return

By assumption, the worker is overemployed in equilibrium. As the minimum wage increases above $w_0 \equiv \frac{f(\ell^*)+c(\ell^*)}{2\ell^*}$, 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_0 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 Return

By convexity, for all $x \in (\hat{\ell}, \ell_0)$

$$c(x) - c(\hat{\ell}) < \frac{x - \hat{\ell}}{\ell_0 - \hat{\ell}} \left[c(\ell_0) - c(\hat{\ell}) \right]$$

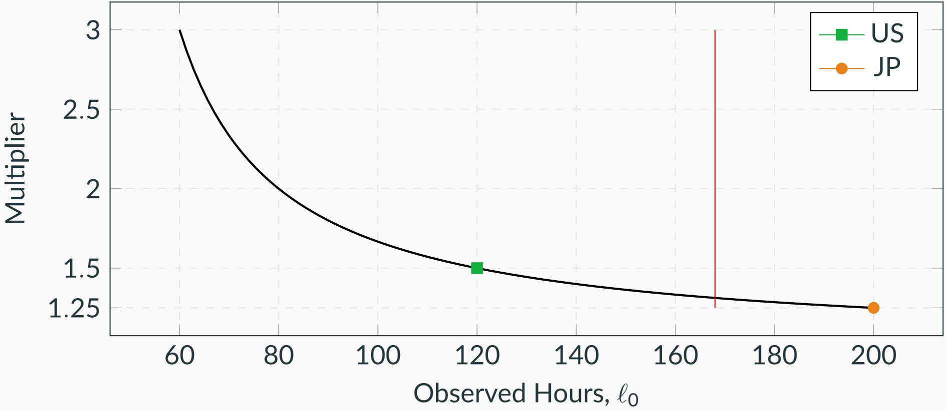
The worker accepted $(\ell_0, \tau_0) \implies \tau_0 \geq c(\ell_0)$

$$\frac{x - \hat{\ell}}{\ell_0 - \hat{\ell}} \left[c(\ell_0) - c(\hat{\ell}) \right] \leq \frac{x - \hat{\ell}}{\ell_0 - \hat{\ell}} \tau_0$$

Which we rearrange to yield

$$\frac{x - \hat{\ell}}{\ell_0 - \hat{\ell}} \tau_0 = w_0 \frac{\ell_0}{\ell_0 - \hat{\ell}} (x - \hat{\ell})$$

Existing policies are below least satisficing



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

BotE Calculation: Overtime in Japan

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, $\hat{\ell} = 40$, $\bar{\ell} = 55 \leq \Psi(w_0)$ and

$$1.25 \geq \frac{\Psi(w_0)}{\Psi(w_0) - \hat{\ell}}$$

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

$$\Psi(w_0) \geq 200.$$

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 Return

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

$$\frac{\Psi(w_0)}{\Psi(w_0) - \hat{\ell}} \leq 1.5$$

which implies

$$\Psi(w_0) \geq 120.$$

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.