The Rat Race Revisited

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Motivation

High-skill, high-wage industries (consulting, investment banking, law)

- High wages
- Long hours
- Mobility

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Akerlof (1976) rat race: firms screen workers through costly task

- matching between firms and workers
- contract reveals type
- outsiders can free-ride on screening
- drives up outside option
- drives up wages
- more need for screening features

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Anecdotal...

Preliminary

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Junior Goldman Sachs bankers complain of 95-hour week

Group of first-year analysts send slide deck to management calling for reforms to reduce workload

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Goldman Sachs boosts junior pay after burnout complaints

First-year analysts to start on $110,000 a year amid pandemic-driven M&A boom

Literature

Various papers study free-riding on information revealed by job positions and contracts (Milgrom and Oster, 1987; Ricart i Costa, 1988; Waldman, 1984)

- Generally predict a levelling of wages and underemployment of skilled workers
- Yet, increase in mobility (Bender and Bauer, 2004) and wage inequality (Piketty and Saez, 2006)
- Longer hours by top earners (Kuhn and Lozano, 2008)

Literature (2)

Dynamic models (Postel-Vinay and Robin, 2002; Harris and Holmström, 1982): mobility causes dispersion of wages over career path

- Smith (2018): over half of increased wage inequality in West Germany is explained by starting wages
- Nagler et al. (Forthcoming): *wage compensation* present for private sector, not civil servants

Outline

Simple model: compare no mobility to high-mobility

- Solve for two firms
- Show equilibria for three firms
- Remark on n firms

Extensions

- Generalize production function
- Continuous switching cost
- Repeated game

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Simple model

Players

- Two firms of *sizes* $l_1 > l_2$, each with a single vacancy
- Number $m > 2$ of workers of skills $\vartheta_1 > \vartheta_2 > \ldots > \vartheta_m$, with reservation utility $\underline{u}$

Contracts specify a wage w and a task of difficulty e.

Firm of size l employs a worker of skill ϑ at a contract (w, e)

Worker

$$u(w, e|\vartheta) = w - \frac{e}{\vartheta}$$

Firm

$$\Pi(w, e, \vartheta|l) = \vartheta l - w$$

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Timing

No mobility

- Both firms offer contracts (w_i, e_i)
- Workers accept or reject
- Utilities are realized

High mobility

- Both firms offer contracts (w_i, e_i)
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- Second round: firms can offer *poaching* contracts
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Reduced form of bidding game

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Low mobility - solution

Matched equilibrium: determine the "market price" of ϑ_1-worker.

Firm 2 chooses between employing the ϑ_2-worker making

$$\Pi(\underline{u}, 0, \vartheta_2 | l_2) = \vartheta_2 l_2 - \underline{u}$$

And screening to hire the ϑ_2 worker

- For a given market price $\tilde{u}$, find potential profits from ϑ_1
- Equate that to $\Pi(\underline{u}, 0, \vartheta_2 | l_2)$

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Low mobility - firm 2's problem

To be sure to hire a ϑ_1-worker

$$w - \frac{e}{\vartheta_1} \geq \tilde{u},$$

Non-participation (screening) constraint for lower type workers

$$w - \frac{e}{\vartheta_2} \leq \underline{u}.$$

Subtracting gives

$$e\left(\frac{1}{\vartheta_1} - \frac{1}{\vartheta_2}\right) \geq \tilde{u} - \underline{u}$$

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Hiring the good worker - solution

Both constraints bind, giving a task difficulty

$$e(\tilde{u}) = \vartheta_1 \vartheta_2 \frac{\tilde{u} - \underline{u}}{\vartheta_1 - \vartheta_2}$$

a wage

$$w(\tilde{u}) = \underline{u} + \vartheta_1 \frac{\tilde{u} - \underline{u}}{\vartheta_1 - \vartheta_2}$$

Firm 2 is willing to offer ϑ_1-worker up to

$$\overline{u} = \underline{u} + \frac{(\vartheta_1 - \vartheta_2)^2}{\vartheta_1} l_2$$

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Firm 1 must offer ϑ_1-worker at least $\overline{u}$, but screen out ϑ_2-worker.

This gives the *unique* equilibrium

Proposition

In the equilibrium of the low mobility market, firm 2 employs the ϑ_2 worker at $(w_2, e_2) = (\underline{u}, 0)$ and firm 1 employs the ϑ_1 worker at a contract

$$\left(w_1^{LM}, e_1^{LM}\right) = \left(\underline{u} + (\vartheta_1 - \vartheta_2)\, l_2, \vartheta_2\, (\vartheta_1 - \vartheta_2)\, l_2\right)$$

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High mobility - matched equilibrium

In a matched equilibrium, firm 2 must believe that firm 1's worker is of type ϑ_1,

- If worker gets a utility of $\tilde{u}$, poach with $(\tilde{u} + \varepsilon, 0)$
- No need to screen anymore.

Raises firm 2's willingness to pay, giving a new market price of

$$\overline{u}^M = \underline{u} + (\vartheta_1 - \vartheta_2)\, l_2$$

- larger than $\underline{u} + \frac{(\vartheta_1 - \vartheta_2)^2}{\vartheta_1} l_2$

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Both inequality and rat race exacerbated w.r.t. low mobility

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Alternative - pooled equilibrium

Screening ex ante becomes expensive, alternative:

- Both firms offer $(\underline{u}, 0)$
- Both firms get ϑ_1 or ϑ_2 worker with equal probability

Inefficient allocation, but no wasteful effort.

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Equilibrium selection

Which equilibrium prevails depends on parameters

Matched equilibrium unique if

$$\frac{1}{2}\frac{l_1}{l_2} > \frac{\vartheta_2}{\vartheta_1 - \vartheta_2}$$

Pooled equilibrium prevails otherwise.

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Inequality and the rat race

Comparing high to low mobility

- Pooled equilibrium: no rat race, no inequality. Akin to Milgrom and Oster (1987) and Ricart i Costa (1988).
- New result: both rat race and inequality exacerbated in matched equilibrium.
- Effect more likely with more complementarity in matching.

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Empirical predictions

- Lower barriers to mobility should raise inequality and hours worked in skill-intensive industries
- More likely when some firms are very large and dominant
- Lead to higher wages on average (Garmaise 2011; Johnson et al. 2020; Starr et al. 2021)

Equilibria with three firms

Low mobility: positive assortative matching.

Potential equilibria with three firms - various degrees of pooling and matching

- Fully pooled: firms 1, 2, and 3 hire top three workers
- Pooled at the bottom: firms 2 and 3 pool together, firm 1 hires ϑ_1 worker
- Fully matched

Latter two equilibria are more unequal and have higher task levels than low mobility

- arise whenever $\frac{I_1}{I_2}$ and $\frac{\vartheta_1}{\vartheta_2}$ are large.

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Why no pooling at the top?

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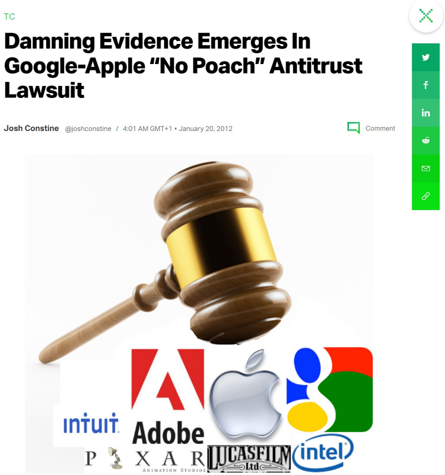

Equilibria for N firms

As for three firms, some $\tilde{n} < N$

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Repeated game - players

- Again, two firms of sizes $I \in \{I_1, I_2\}$, infinitely lived
- New generation of workers is born and dies every period
- Workers maximize end of period utility

$$w - \frac{e}{\vartheta}$$

- Firms consume end-of-period dividend

$$D_t(w, e, \vartheta, I) = \vartheta I - w$$

- Maximize sum of discounted dividends

$$\sum_{\tau=0}^{\infty} \delta^{\tau} D_{t+\tau}$$

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Repeated game - timing

1. Workers are born and observe history of contracts of both firms
2. Contracting stage
   - Low mobility: one time simultaneous offers
   - High mobility: bidding war
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Repeated game - low mobility

Each period precisely as the simultaneous-offer version

Proposition

There exists an equilibrium in which, in each period, the ϑ_1-type works for firm 1 at a contract (w_1^{LM}, e_1^{LM}).

Repeated game - bidding war

- Starts with both firms posting contracts
- Next rounds: firms can hire and fire specific workers at will
- Firms always observe bidding history
- Ends when neither firm thinks they can do better

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Looking to establish matched equilibrium from high mobility version before

- At the end of the bidding war, firm 1 would employ ϑ_1-worker at (w_1^M, e_1^M)
- Worker gets $\overline{u}^{HM}$
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High mobility - equilibrium

Proposition

If

$$\frac{l_1}{l_2} \geq \frac{\vartheta_1 + \frac{1-\delta}{\delta}\vartheta_2}{\vartheta_1 - \mathbf{E}\vartheta}$$

There exists a stationary equilibrium in which the ϑ_1-type works for firm 1 at a contract (w^M, e^M).

Continuous switching cost

Until now, mobility was captured by a binary variable.

Instead, consider the high mobility version from before, but

- if the worker decides to switch after poaching offer, pays cost c
- needs to be compensated by poaching firm
- extreme: $c = 0$ corresponds to high mobility
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Switching cost - solution

Firm 2, when poaching a worker enjoying a wage $\tilde{u}$, can offer $(\tilde{u} + c, 0)$.
Would do so as long as

$$\vartheta_1 l_2 - (\tilde{u} + c) > \vartheta_2 l_2,$$

giving a market price

$$\overline{u}(c) = (\vartheta_1 - \vartheta_2)\, l_2 - c.$$

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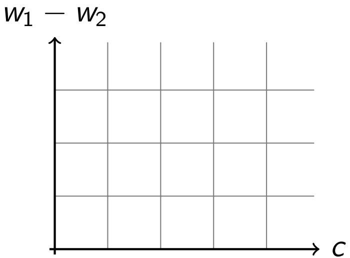
Switching cost - dependence on c

Both inequality and task exhibit same pattern. Two cases



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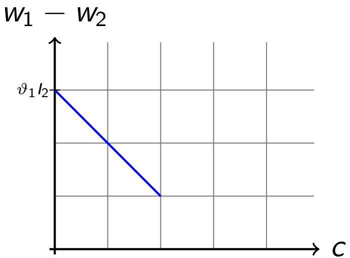

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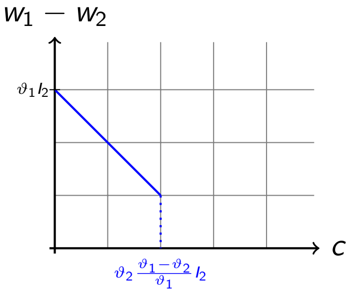

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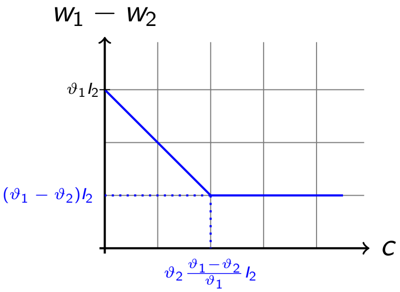

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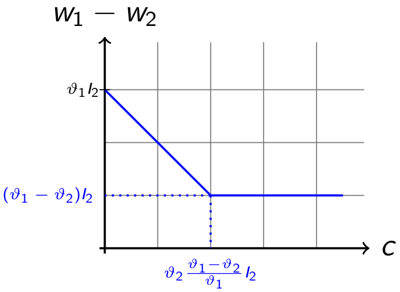

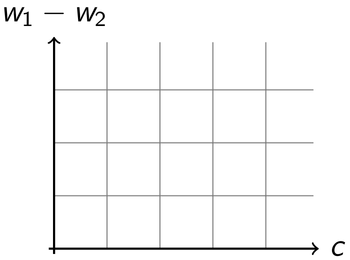

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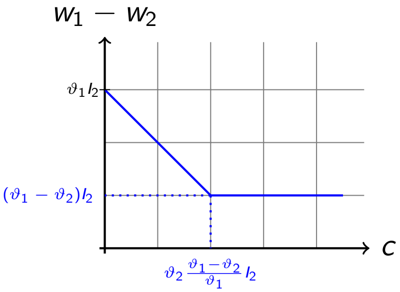

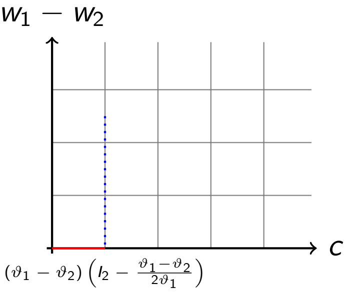

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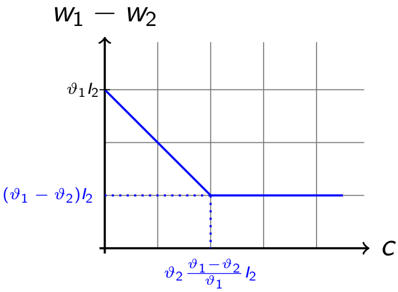

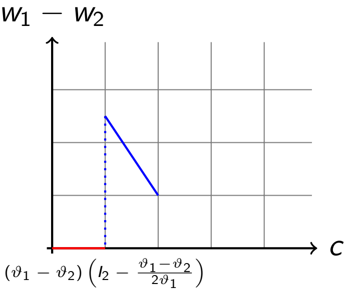

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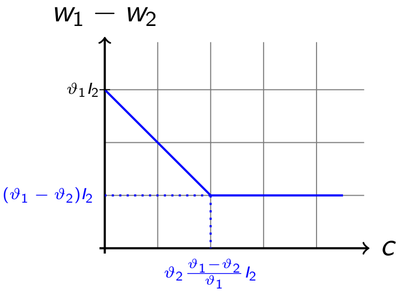

Generalized Production Function

Again, two firms and m workers of types $\vartheta_1 > \vartheta_2 > \ldots > \vartheta_m$. Worker utility unchanged

Firm profit

$$\Pi(w, e, \vartheta | I) = \pi(e, \vartheta) I - w$$

with $\pi(\cdot, \cdot)$

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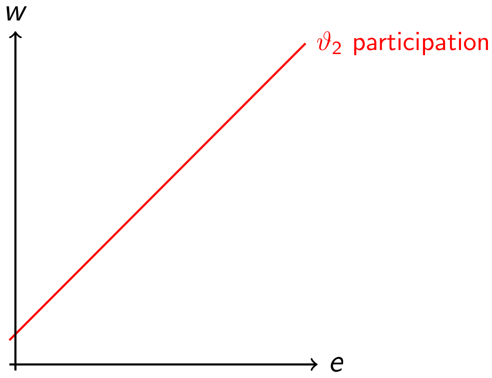

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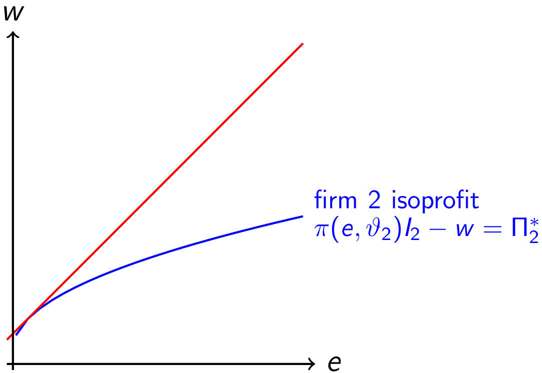

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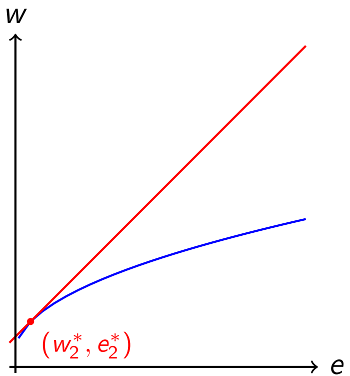

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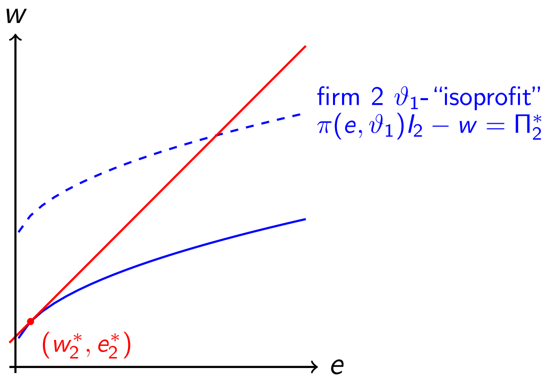

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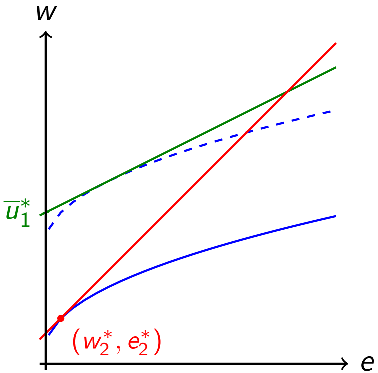

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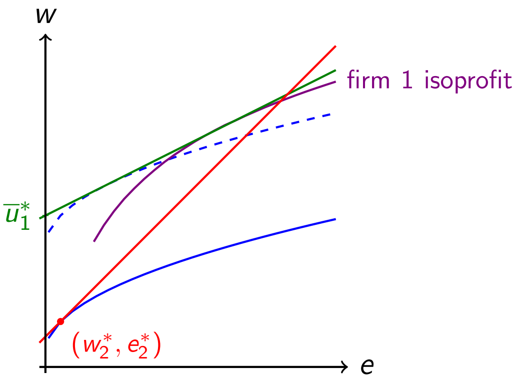

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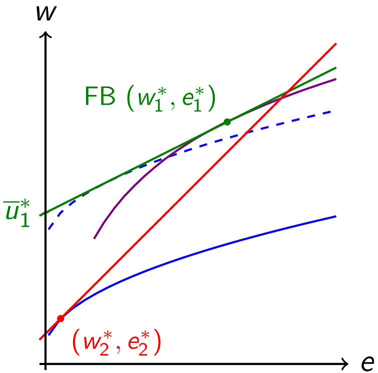

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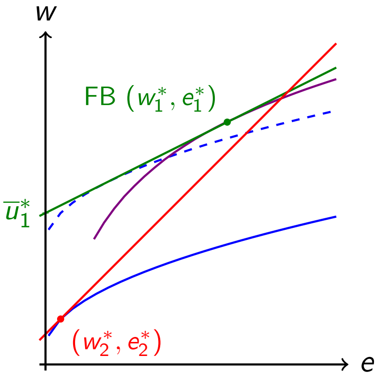

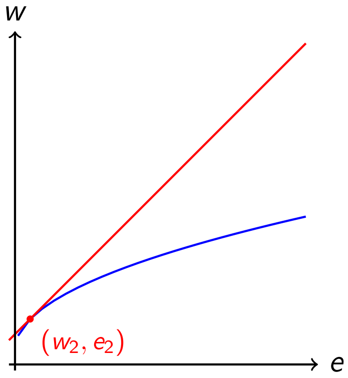

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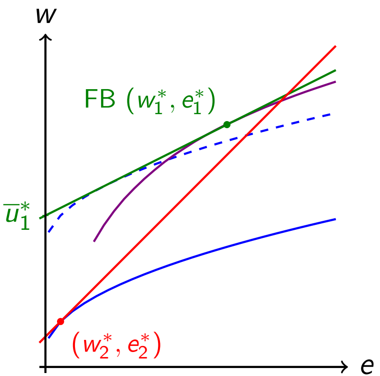

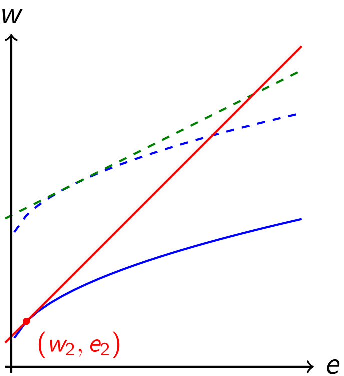

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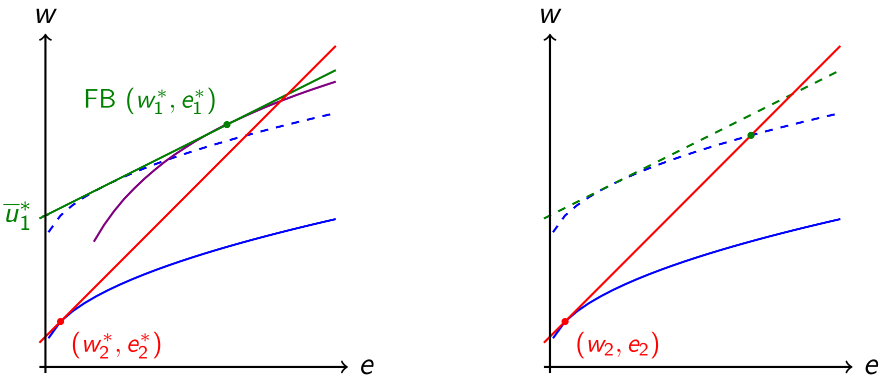

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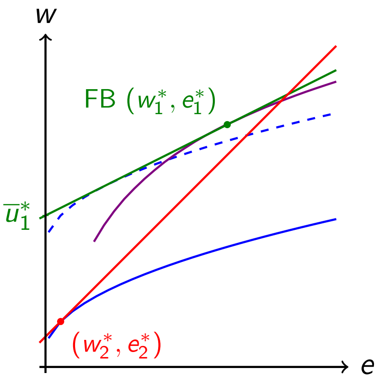

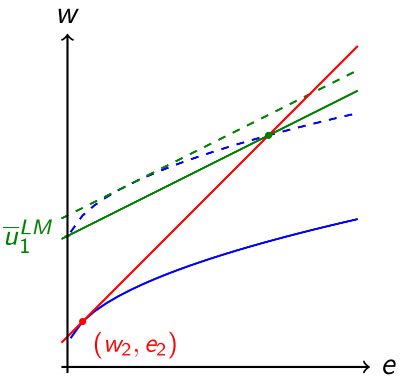

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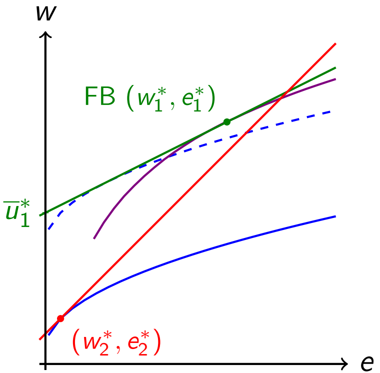

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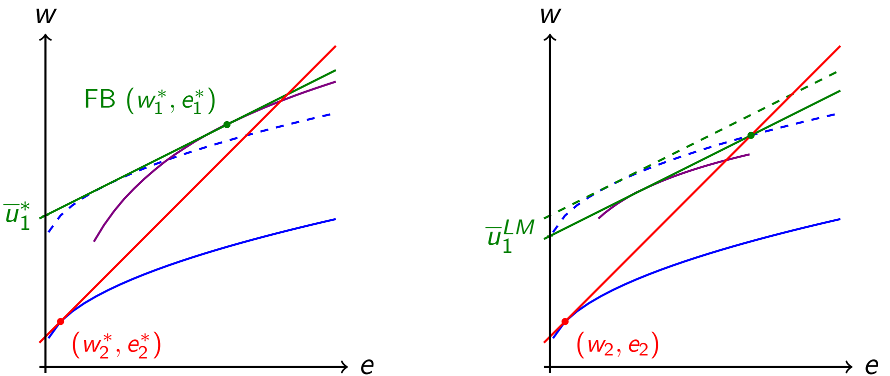

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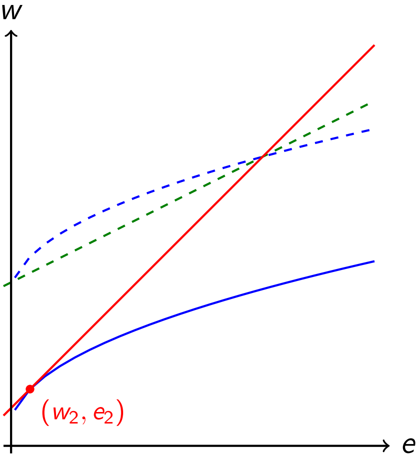

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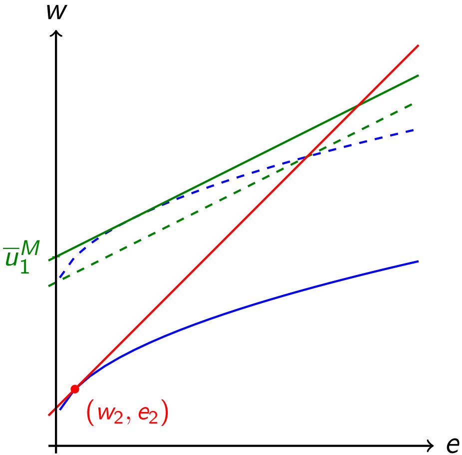

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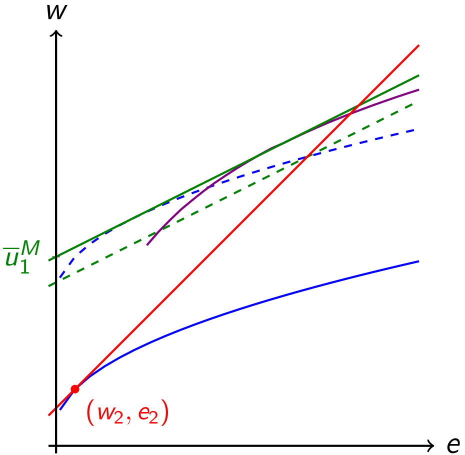

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