RIETI International Seminar Handout

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Speaker: Prof. Elhanan HELPMAN

http://www.rieti.go.jp/jp/index.html

Matching and Sorting in the Global Economy

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  3. Positive assortative matching (PAM) between workers and firms within industries
  4. Exporter wage premium, but trade/openness affects degree of PAM

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	2000		2007	
	5/1	9/5	5/1	9/5
Canada ↓ ↑	2.000	1.736	1.995	1.810
France ↓	1.561	2.112	1.521	2.093
Germany ↑ ↓	1.649	1.820	1.783	1.816
Ireland ↑	1.814	1.892	1.941	1.976
Japan ↑	1.592	1.730	1.618	1.774
Korea ↑	1.973	1.881	2.205	2.131
Norway ↑	1.440	1.495	1.577	1.548
Sweden ↑ ↓	1.402	1.742	1.422	1.721
UK ↓ ↑	1.828	1.891	1.826	2.023
U.S.A. ↑	2.137	2.240	2.146	2.397

Decile ratios of men's gross earnings.

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- Productivity of unit depends on factor types—with complementarity
- Extends the framework to (directed) search and unemployment

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- Overall CRS in quantities, competitive equilibrium

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- From FOCs: In interior of set of factors allocated to sector i,

$$\frac{m(q_H)\,\psi_{iL}[q_H, m(q_H)]}{\gamma_i \psi_i[q_H, m(q_H)]} = \varepsilon_w[m(q_H)]$$

$$\frac{q_H \psi_{iH}[q_H, m(q_H)]}{(1-\gamma_i)\,\psi_i[q_H, m(q_H)]} = \varepsilon_r(q_H)$$

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- Factor market clearing:

$$\bar{H}\int_{q_{Ha}}^{q_H} \frac{\gamma_i r(q)}{(1-\gamma_i)\,w[m(q)]}\phi_H(q)\,dq = \bar{L}\int_{m(q_{Ha})}^{m(q_H)} \phi_L[m(q)]\,dq \text{ for all } q_H$$

Equilibrium Requirements

- Three differential equations for $w(q_L)$, $r(q_H)$, $m(q_H)$
  - Differentiate factor market clearing condition wrt q_H :

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- Boundary conditions: depend on sorting pattern
- Continuity: $w(\cdot)$ and $r(\cdot)$ increasing and continuous at boundaries (and elsewhere)
- Slope conditions: At any boundary, slope of $w(q_L)$ to right of boundary greater than slope to left. Same for slope of $r(q_H)$.

Wage Inequality

- From the differential equation for wages:

$$\frac{w\left(q_L''\right)}{w\left(q_L'\right)} = \exp\left[\int_{q_L'}^{q_L''} \frac{\psi_{iL}\left[m^{-1}\left(z\right), z\right]}{\psi_i\left[m^{-1}\left(z\right), z\right]} dz\right] \quad \text{for} \quad \left(q_L', q_L''\right) \in Q_{iL}^{int}$$

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- Log supermodularity implies that better matches for workers raise wage inequality
- Similarly for salaries

Sorting I

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$$\frac{\psi_{1L}\left(q_{H\min}, q_L\right)}{\gamma_1 \psi_1\left(q_{H\min}, q_L\right)} > \frac{\psi_{2L}\left(q_{H\max}, q_L\right)}{\gamma_2 \psi_2\left(q_{H\max}, q_L\right)} \quad \text{for all } q_L \in S_L$$

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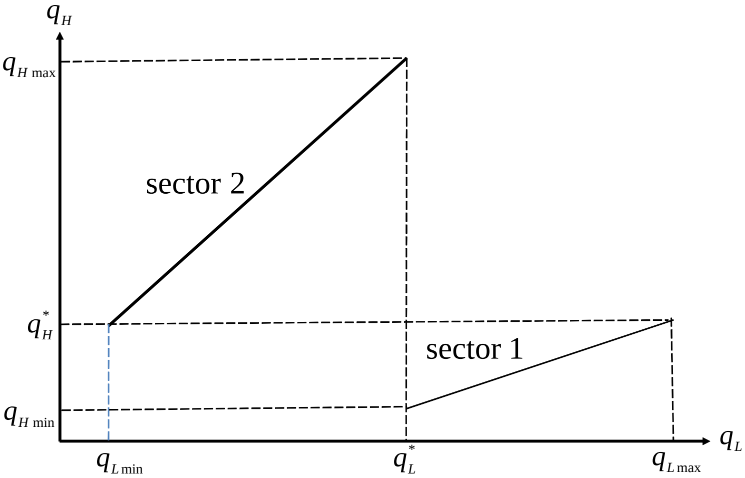
- Analogous condition for sorting of managers (better managers might go to sector 1 or sector 2)
- If both conditions satisfied, have "threshold" equilibrium: either *HH*/*LL* or *HL*/*LH*

An Equilibrium with HL/LH Sorting



Sorting II: Sufficient Condition for HH/LL

Suppose that:

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Then high-ability managers and workers are employed in sector 1 and low-ability managers and workers are employed in sector 2, for some pair of cut-points, q_H^* and q_L^*.

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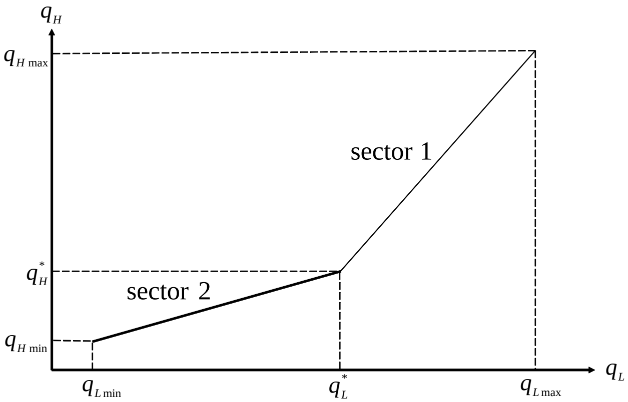
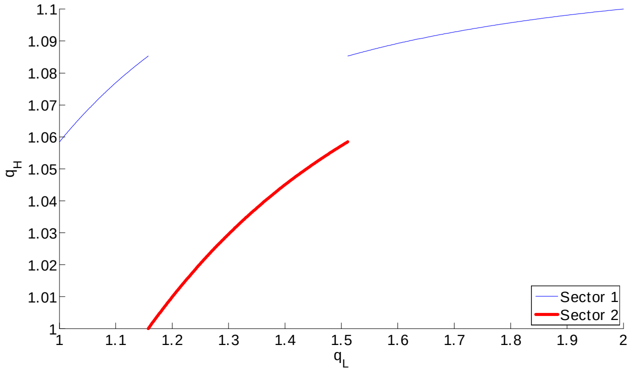


Sorting III: Sorting Reversals



Sweden 2004

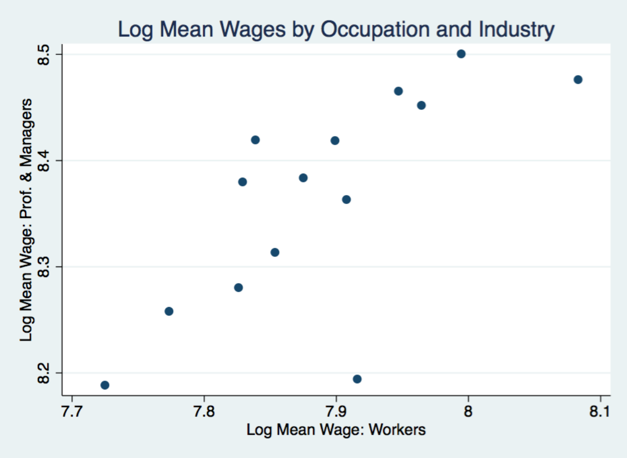


Figure: Variation across manufacturing industries of log mean salary of managers and log mean wage of workers in Sweden: 2004. Source: private communication, Anders Akerman.

Brazil 1994

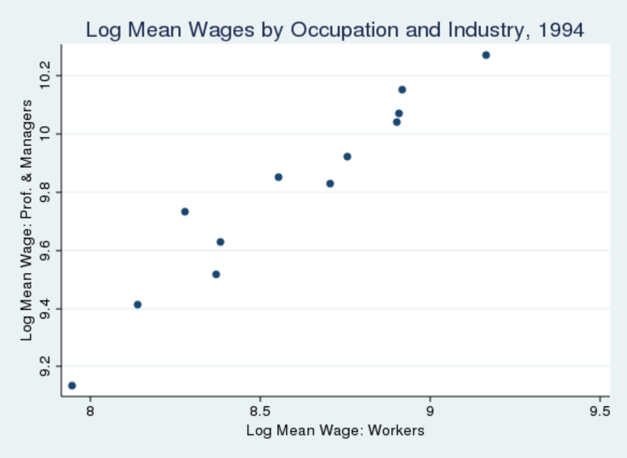


Figure: Variation across manufacturing industries of log mean salary of managers and log mean wage of workers in Brazil: 1994. Source: own calculations.

Limiting Case: C-D

- Production functions:

$$\psi_i\left(q_H, q_L\right) = q_H^{\beta_i} q_L^{\alpha_i} \text{ for } i = 1, 2;\ \alpha_i, \beta_i > 0$$

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- Sectoral wage and salary functions:

$$w\left(q_L\right) = w_i q_L^{\alpha_i/\gamma_i} \quad \text{for } q_L \in Q_{Li}^{int}$$

$$r\left(q_H\right) = r_i q_H^{\beta_i/(1-\gamma_i)} \quad \text{for } q_H \in Q_{Hi}^{int}$$

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  where w_i and r_i are wage and salary anchors in sector i
- Rise in price of good 2, say due to trade, does not affect wage nor salary inequality within sectors; Ricardo-Viner plus Heckscher-Ohlin effects only

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  2. worsens the matching of all workers except those who switch from sector 1 to sector 2;
  3. improves the matching of all managers except those who switch from sector 1 to sector 2;
  4. reduces inequality of wages everywhere; and

Distribution of Earnings: HL/LH Equilibrium

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  2. worsens the matching of all workers except those who switch from sector 1 to sector 2;
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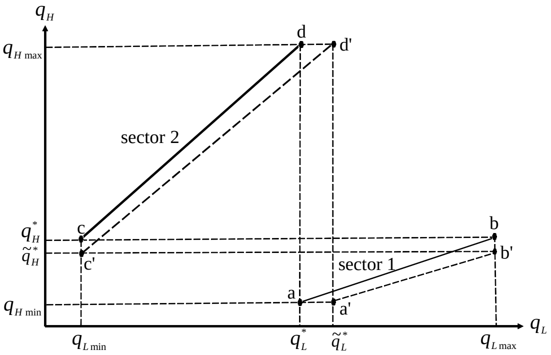
- An increase in the price of good 1 has opposite effects

Sorting and Matching Response in HL/LH Equilibrium

- Increase p_2 $\Rightarrow$raises cut-off q_L^* and reduces cut-off q_H^*, so that more workers and managers employed in sector



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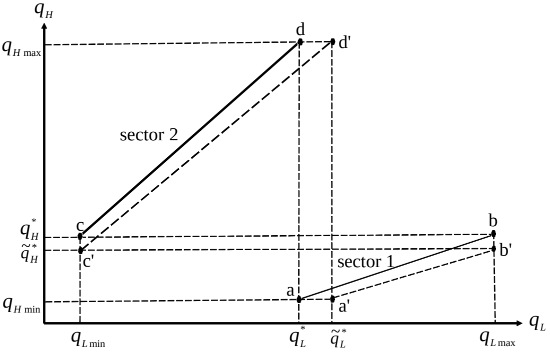

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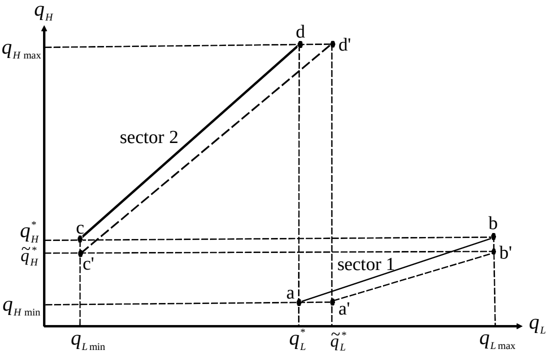
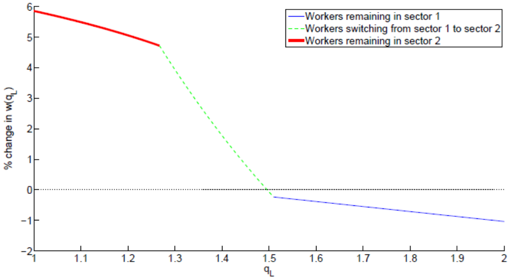
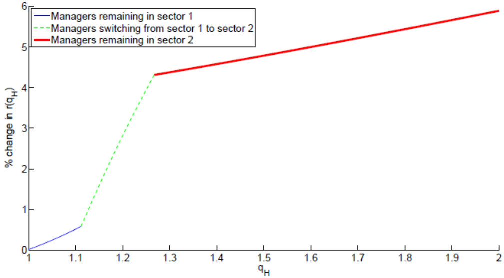


- Worsens matching for all workers and improves matching for all managers except those that switch sectors.

Compensation Response in HL/LH Equilibrium

5% rise in p_2

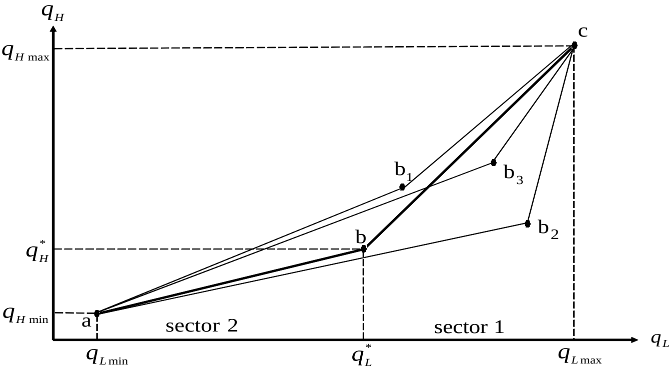




Evidence: Brazil 1986-1994

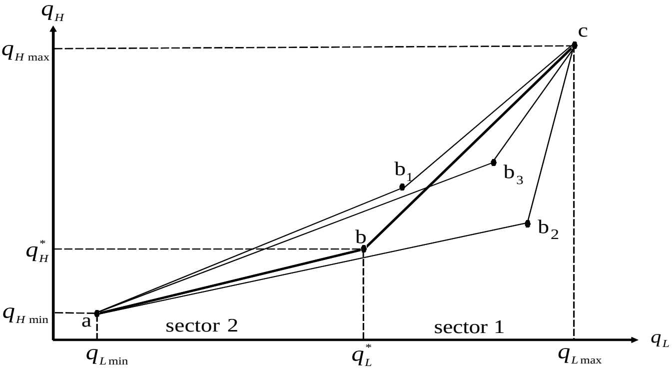
Sorting and Matching Response in HH/LL Equilibrium

- q_L^* and q_H^* rise



Sorting and Matching Response in HH/LL Equilibrium

- q_L^* and q_H^* rise
- Worker matching can improve (b_1), deteriorate (b_2), or improve in sector 1 and deteriorate in sector 2 (b_3)



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     4. only (a) or (b) are possible when factor intensities are the same in both sectors, i.e., when $\gamma_1 = \gamma_2$.

Earnings Response in HH/LL Equilibrium

- **Proposition** Suppose that the sorting conditions are satisfied for an HH/LL equilibrium in which the best workers and managers sort into sector 1. Then an increase in the price of good 2 has one of the following effects on inequality:

Earnings Response in HH/LL Equilibrium

- **Proposition** Suppose that the sorting conditions are satisfied for an HH/LL equilibrium in which the best workers and managers sort into sector 1. Then an increase in the price of good 2 has one of the following effects on inequality:
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  2. if for factor $F_{I,2}$ matching improves in sector 2 and deteriorate in sector 1 then inequality rises among its low ability inputs and declines among its high ability inputs, while for factor $F_{D,2}$, whose matching deteriorates in sector 2, the opposite holds for $F_{I,2}, F_{D,2} \in \{H, L\}$.

Compensation Response in HH/LL Equilibrium

20% rise in p_2

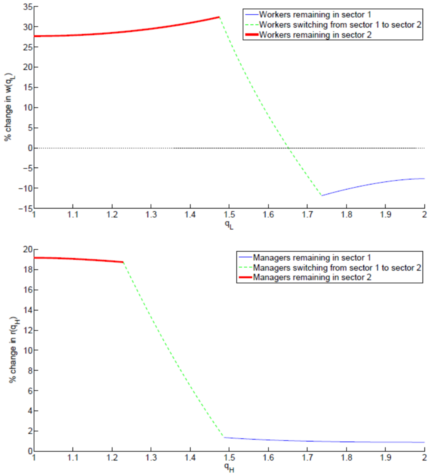

Figure: Cutoff shifts to b_1 in previous figure: Matching improves for all workers and worsens for all managers

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- Can incorporate factor heterogeneity into familiar trade models
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- Future research: Growth and inequality, efficiency and "mismatch"