Matching and Inequality in the World Economy

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March 2009

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  2. Large changes occurring at low levels of disaggregation (e.g. skill premium) reflect average changes over a large number of factors

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  2. Predictions are **weak**, e.g. Jones and Scheinkman's (1977) "Friends and Enemies" result states that a rise in the price of *some* good causes an even larger proportional increase in the price of *some* factor

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     - *Utility function*, e.g. Teulings (2005), Blanchard and Willman (2008), Tervyo (2008)

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     - Go from weak to strong predictions even in such environments
     - Offer a unifying perspective on North-South trade, North-North trade, and offshoring
     - Broaden the scope of standard trade theory to discuss phenomena such as pervasive changes in inequality and wage and job polarization

Roadmap of the Talk

1. The Closed Economy
2. Comparative Statics in the Closed Economy
3. The World Economy
4. Technological Change in the World Economy

The Basic Environment

- A set of intermediate goods/tasks with skill-intensity $\sigma \in \Sigma \equiv [\underline{\sigma}, \overline{\sigma}]$
- A set of workers with skill $s \in S \equiv [\underline{s}, \overline{s}]$
- $V(s) > 0$ is the inelastic supply of workers with skill s
- Good and labor markets are perfectly competitive

The Basic Environment (Cont.)

- Workers are perfect substitutes in the production of each task:

$$Y(\sigma) = \int_{s \in S} A(s, \sigma) L(s, \sigma) \, ds$$

- $A(s, \sigma) > 0$ is strictly log-supermodular:

$$\frac{A(s, \sigma)}{A(s, \sigma')} > \frac{A(s', \sigma)}{A(s', \sigma')}, \text{ for all } s > s' \text{ and } \sigma > \sigma'$$

- Output of the final good is given by the following CES aggregator:

$$Y = \left\{ \int_{\sigma \in \Sigma} B(\sigma) [Y(\sigma)]^{\frac{\varepsilon - 1}{\varepsilon}} \, d\sigma \right\}^{\frac{\varepsilon}{\varepsilon - 1}}$$

- $B(\sigma) > 0$ is an exogenous technological parameter

Definition of a Competitive Equilibrium

A competitive equilibrium is a set of functions (Y, L, p, w) such that:

1. Final good producers maximize profit

$$Y(\sigma) = I \times [p(\sigma) / B(\sigma)]^{-\varepsilon}$$

2. Intermediate good producers maximize profit

$$p(\sigma) A(s, \sigma) - w(s) \leq 0, \text{ for all } s \in S$$
$$p(\sigma) A(s, \sigma) - w(s) = 0, \text{ for all } s \in S \text{ such that } L(s, \sigma) > 0$$

3. The intermediate market clears

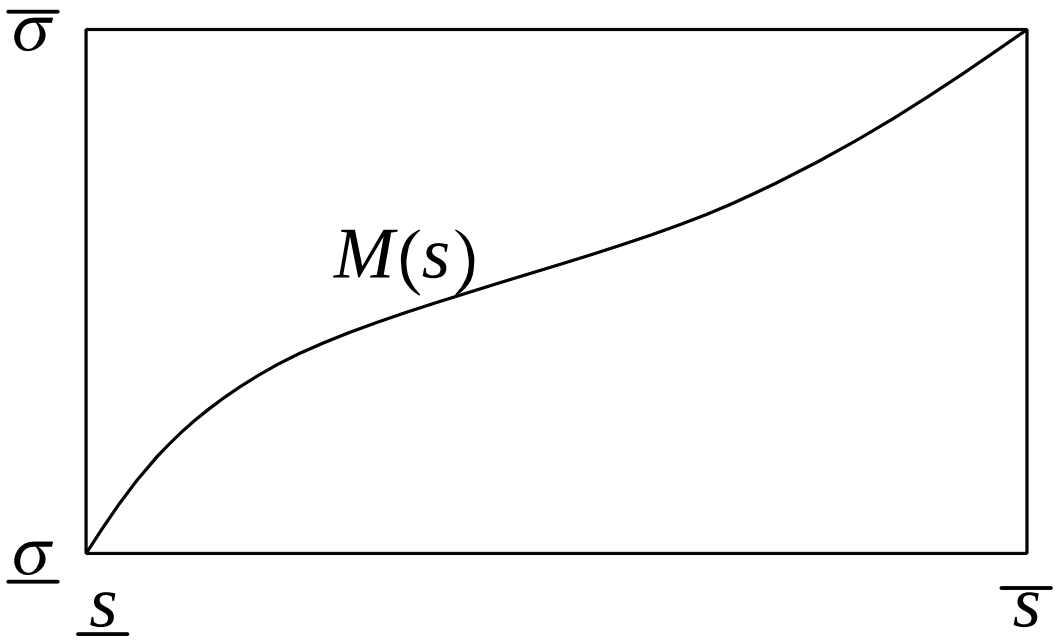
$$Y(\sigma) = \int_{s \in S} A(s, \sigma) L(s, \sigma) \, ds, \text{ for all } \sigma \in \Sigma$$

4. The labor market clears

$$V(s) = \int_{\sigma \in \Sigma} L(s, \sigma) \, d\sigma, \text{ for all } \sigma \in S$$

Properties of a Competitive Equilibrium

Lemma 1 In a competitive equilibrium, there exists an increasing bijection $M : S \to \Sigma$ such that $L(s, \sigma) > 0$ if and only if $M(s) = \sigma$



Properties of a Competitive Equilibrium (Cont.)

- **Lemma 2** In a competitive equilibrium, M and w satisfy

$$\frac{dM}{ds} = \frac{A\left[s, M\left(s\right)\right] V\left(s\right)}{I \times \left\{p\left[M\left(s\right)\right] / B\left[M\left(s\right)\right]\right\}^{-\varepsilon}} \tag{1}$$

$$\frac{d \ln w\left(s\right)}{ds} = \frac{\partial \ln A\left[s, M\left(s\right)\right]}{\partial s} \tag{2}$$

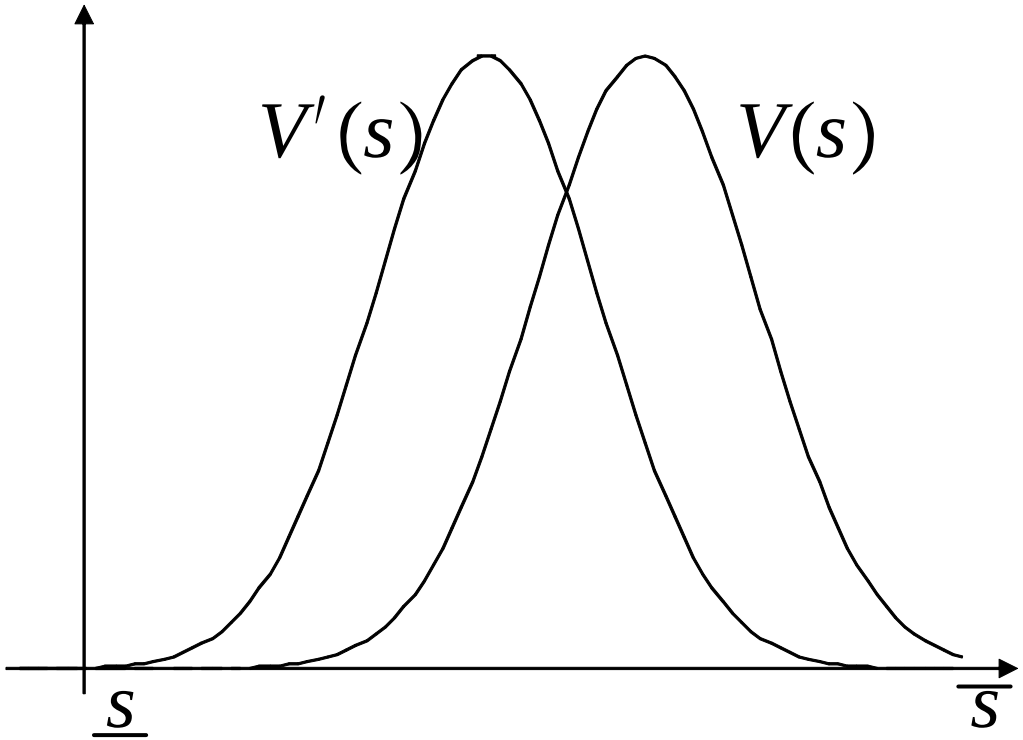
with $M\left(\underline{s}\right) = \underline{\sigma}$, $M\left(\overline{s}\right) = \overline{\sigma}$, and $p\left[M\left(s\right)\right] = w\left(s\right) / A\left[s, M\left(s\right)\right]$.

Change in Factor Supply (I): Skill Abundance

Definition

Definition V is *skill-abundant* relative to V', denoted $V \succeq_a V'$, if

$$\frac{V(s)}{V(s')} \geq \frac{V'(s)}{V'(s')}, \text{ for all } s > s'$$



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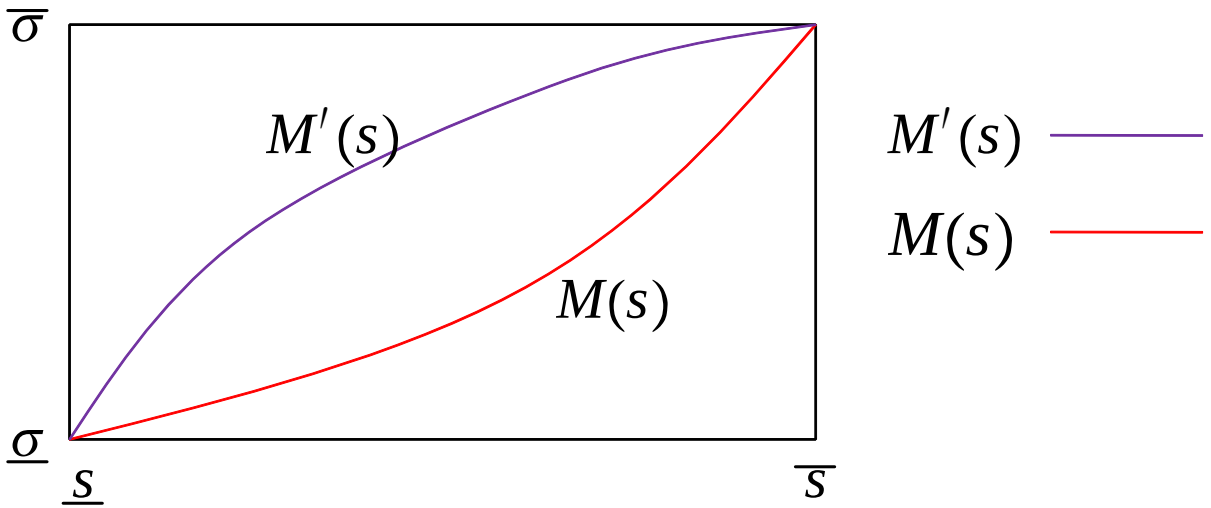
Matching

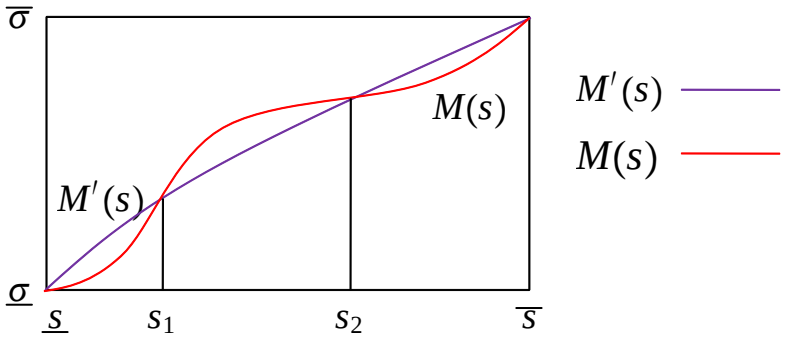
- **Lemma 3** Suppose $V \succeq_a V'$. Then $M'(s) \geq M(s)$ for all $s \in S$



- From a task standpoint: *worker downgrading*
- From a worker standpoint: *task upgrading*

Change in Factor Supply (I): Skill Abundance

Sketch of Proof



1. $M'(s_1) = M(s_1) = \sigma_1$, $M'(s_2) = M(s_2) = \sigma_2$, and $\frac{M'_s(s_1)}{M'_s(s_2)} < \frac{M_s(s_1)}{M_s(s_2)}$

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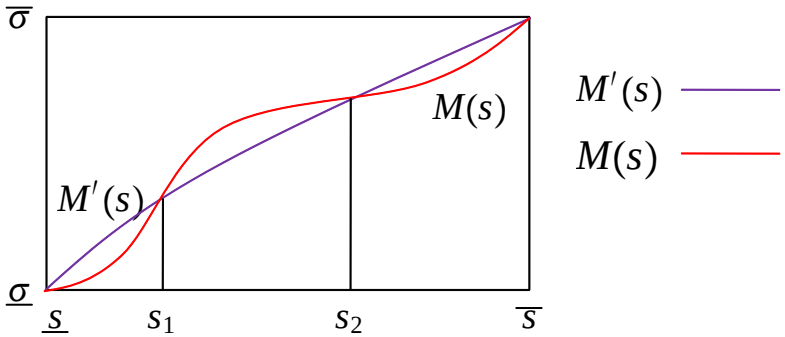

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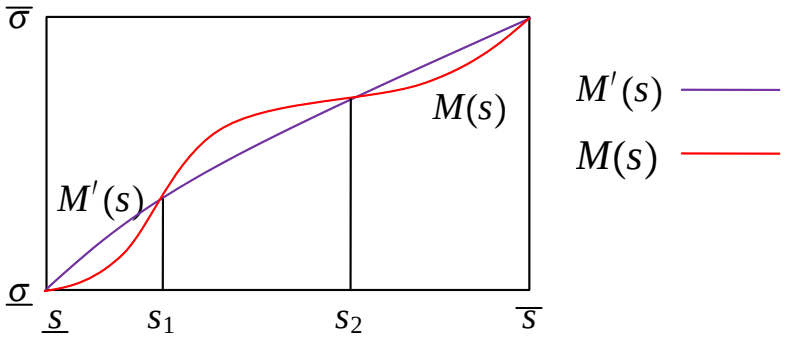

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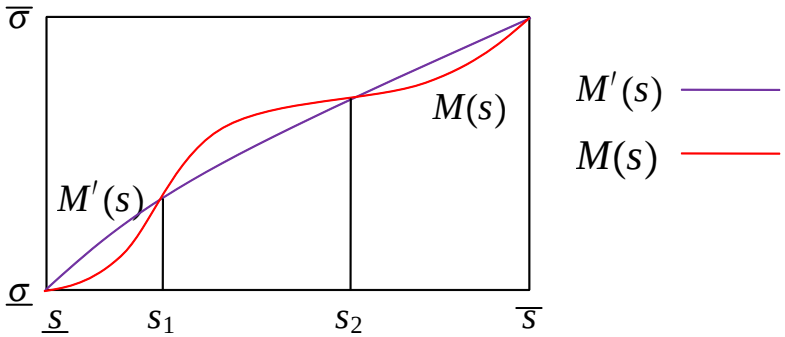

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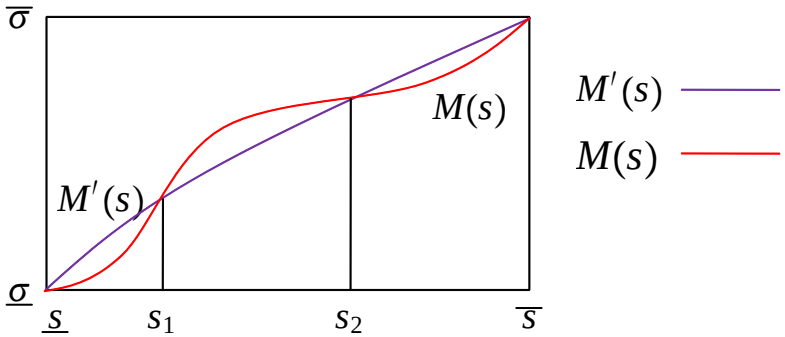

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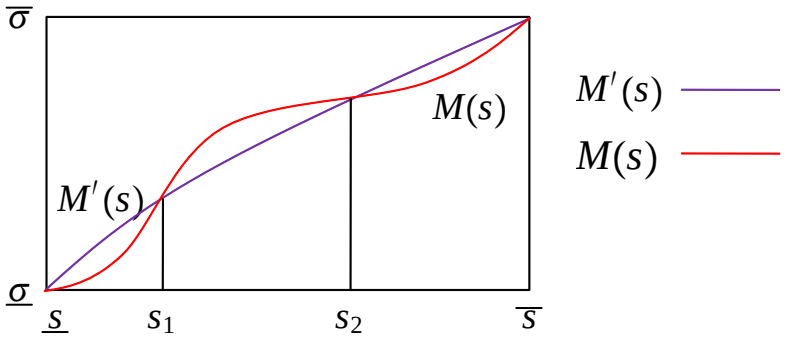

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Change in Factor Supply (I): Skill Abundance

Inequality

- Moving from V to $V' \preceq_a V$ implies *pervasive rise in inequality*:

$$\frac{w'(s)}{w'(s')} \geq \frac{w(s)}{w(s')}, \text{ for all } s > s'$$

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  2. Since A is log-supermodular, task upgrading implies

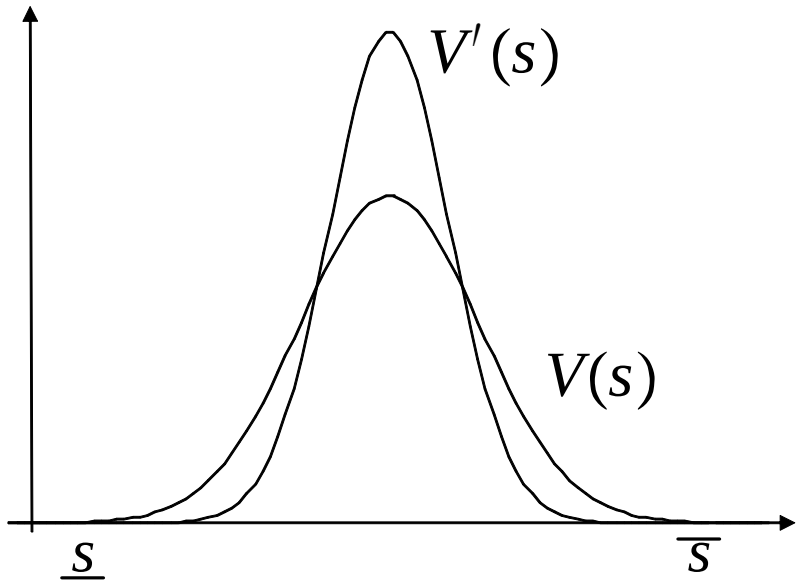
$$\frac{d \ln w'}{ds} \geq \frac{d \ln w}{ds}$$

Change in Factor Supply (II): Skill Diversity

Definition

Definition V is *more diverse* than V', denoted $V \succeq_d V'$, if there exists an $\widehat{s} \in (\underline{s}, \overline{s})$ such that

$$V' \succ_a V, \text{ for all } s < \widehat{s}$$
$$V \succ_a V', \text{ for all } s \geq \widehat{s}$$



Change in Factor Supply (II): Skill Diversity

Matching

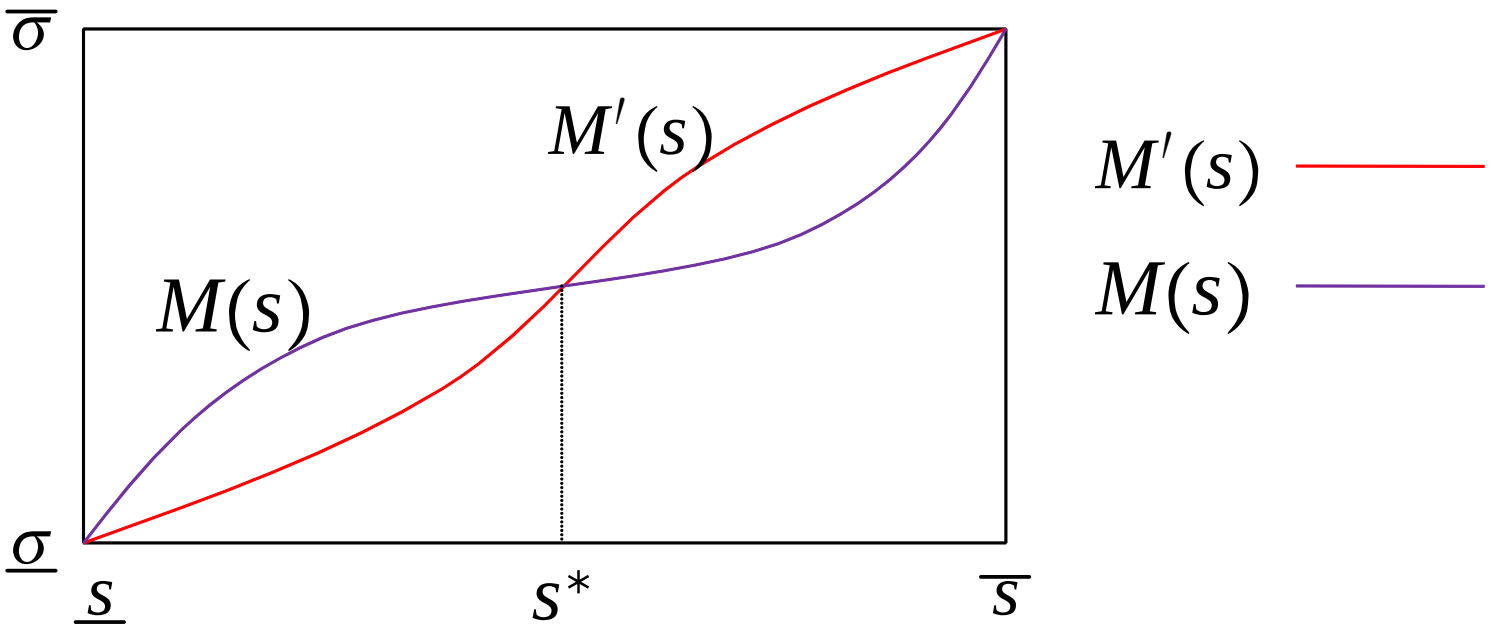
Moving from V to $V' \preceq_d V$ implies:

1. *Skill upgrading* for low-σ tasks (task downgrading for low s):

$$M'(s) \leq M(s), \text{ for all } s < s^*$$

2. *Skill downgrading* for high-σ tasks (task upgrading for high s):

$$M'(s) \geq M(s), \text{ for all } s^* < s$$



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1. *Pervasive fall in inequality* among low-skilled workers:

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2. *Pervasive rise in inequality* among high-skilled workers:

$$\frac{w'(s)}{w'(s')} \geq \frac{w(s)}{w(s')}, \text{ for all } s^* \leq s' < s$$

Change in Factor Demand (I): SBTC

Definition

- **Definition** B' is skill-biased relative to B, denoted $B' \succeq_s B$, if

$$\frac{B'(\sigma)}{B'(\sigma')} \geq \frac{B(\sigma)}{B(\sigma')}, \text{ for all } \sigma > \sigma'$$

Moving from B to $B' \succeq_s B$ implies:

1. *Skill downgrading*:

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Change in Factor Demand (II): EBTC

Definition

- **Definition** B' is extreme-biased relative to B, denoted $B' \succeq_e B$, if there exists an $\widehat{\sigma} \in (\underline{\sigma}, \overline{\sigma})$ such that

$$B \succeq_s B' \text{ for all } \sigma < \widehat{\sigma}$$
$$B' \succeq_s B \text{ for all } \sigma \geq \widehat{\sigma}$$

Moving from B to $B' \succeq_e B$ implies:

1. *Job Polarization*:

$$M'(s) \leq M(s), \text{ for all } s < s^*$$

and

$$M'(s) \geq M(s), \text{ for all } s^* < s$$

Change in Factor Demand (II): EBTC

Matching and Inequality

Moving from B to $B' \succeq_e B$ implies:

1. *Job Polarization*:

$$M'(s) \leq M(s), \text{ for all } s < s^*$$

and

$$M'(s) \geq M(s), \text{ for all } s^* < s$$

2. *Wage Polarization:*

$$\frac{w'(s)}{w'(s')} \leq \frac{w(s)}{w(s')}, \text{ for all } s' < s \leq s^*$$

and

$$\frac{w'(s)}{w'(s')} \geq \frac{w(s)}{w(s')}, \text{ for all } s^* \leq s' < s$$

- Two countries, Home (H) and Foreign (F)
- Workers are internationally immobile, final good is not traded, and all intermediate goods are freely traded
- Factor productivity differences across countries are Hicks-neutral:

$$A_i(s,\sigma) \equiv \gamma_i A(s,\sigma) \text{ for } i = H, F$$

- A competitive equilibrium in the world economy under free trade is s.t.

$$\frac{dM_T}{ds} = \frac{A\left[s, M_T\left(s\right)\right] V_W\left(s\right)}{I_W \times \left\{p_T\left[M_T\left(s\right)\right] / B_W\left[M_T\left(s\right)\right]\right\}^{-\varepsilon}},$$

$$\frac{d \ln w_T\left(s\right)}{ds} = \frac{\partial \ln A\left[s, M_T\left(s\right)\right]}{\partial s},$$

where:

$$M_T\left(\underline{s}\right) = \underline{\sigma} \text{ and } M_T\left(\overline{s}\right) = \overline{\sigma}$$

$$p_T\left[M_T\left(s\right)\right] = w_T\left(s\right) / \gamma_H A\left[s, M_T\left(s\right)\right]$$

$$B_W\left[M_T\left(s\right)\right] \equiv \left\{\left(I_H / I_W\right) B_H\left[M_T\left(s\right)\right]^{\varepsilon} + \left(I_F / I_W\right) B_F\left[M_T\left(s\right)\right]^{\varepsilon}\right\}^{1/\varepsilon}$$

$$V_W \equiv V_H + V_F$$

Consequences of North-South Trade

The Role of Cross-Country Differences in Factor Endowments

- Assumption: $V_H \succeq_a V_F$ and $B_H = B_F$

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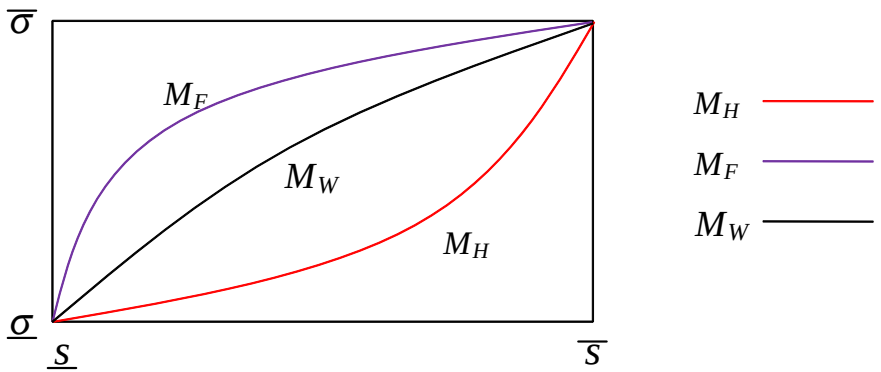
  1. *Changes in skill-intensities:*

$$M_H(s) \leq M_T(s) \leq M_F(s), \text{ for all } s$$



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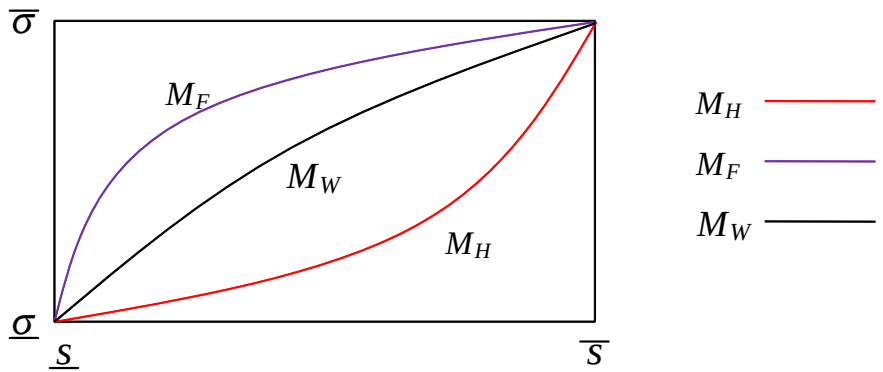

  2. *Strong Stolper-Samuelson effect:*

$$\frac{w_H(s)}{w_H(s')} \leq \frac{w_T(s)}{w_T(s')} \leq \frac{w_F(s)}{w_F(s')}, \text{ for all } s > s'$$

Consequences of North-South Trade (Cont.)

The Role of Cross-Country Differences in Skill Biases

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Consequences of North-South Trade (Cont.)

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Consequences of North-South Trade (Cont.)

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  1. *Matching:*
  $$M_H(s) \geq M_T(s) \geq M_F(s), \text{ for all } s$$
  2. *Inequality:*
  $$\frac{w_H(s)}{w_H(s')} \leq \frac{w_T(s)}{w_T(s')} \leq \frac{w_F(s)}{w_F(s')}, \text{ for all } s > s'$$

Consequences of North-South Trade (Cont.)

Summary

- **Observation #1:**
  Predictions regarding the impact of trade integration crucially depend on the correlation between supply and demand considerations

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- **Conclusion #1:**
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- **Conclusion #2:**
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Consequences of North-North Trade

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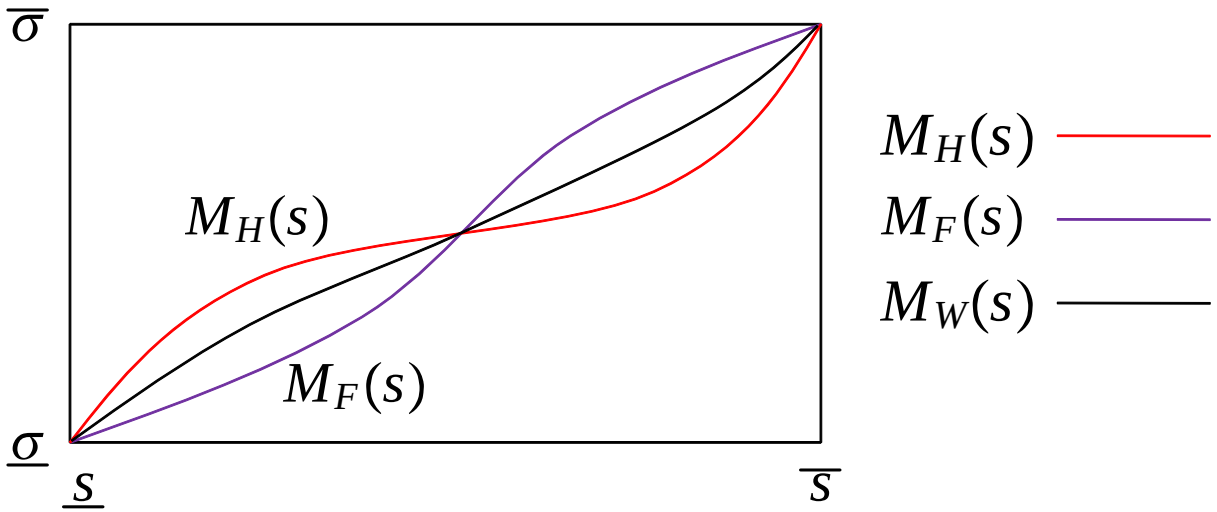
- Changes in matching: Job polarization at Home

$$M_T(s) \leq M_H(s), \text{ for all } s < s_H;$$
$$M_T(s) \geq M_H(s), \text{ for all } s_H < s.$$

and the converse in Foreign



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  1. *Wage polarization* in the more diverse country

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  2. *Wage convergence* in the less diverse country

$$\frac{w_T(s)}{w_T(s')} \geq \frac{w_F(s)}{w_F(s')}, \text{ for all } s' < s \leq s_F$$
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Summary

- **Conclusion #1:**
  North-North trade has no clear implications for overall inequality:
  Relative wage *between* high- and low-skill workers—as well as relative price of goods they produce—may either increase or decrease

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- **Conclusion #2:**
  Consequences of North-North trade are to be found at a higher level of disaggregation: changes in inequality occur *within* low- and high-skill workers, respectively

- Assumption: $V_H \succeq_a V_F$ and $\gamma_H \geq \gamma_F$

Technological Change in the World Economy

Global SBTC

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  3. *An increase in inequality between countries:*

$$I'_H / I'_F \geq I_H / I_F$$

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- **Intuition:** Offshoring makes the world relatively less skill-abundant, which leads to sector upgrading around the world, thereby increasing the marginal return to skill in all countries

Conclusions

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- **Contribution (II):** Show how these general results can be used to derive sharp predictions about the consequences of globalization in economies with an arbitrarily large number of both goods and factors, thereby broadening the scope of standard trade theory