Question: How do changes in factor supply or factor demand affect factor prices and factor allocation in high-dimensional environments?
Question: How do changes in factor supply or factor demand affect factor prices and factor allocation in high-dimensional environments?

Why do we care about high-dimensional environments?
Question: How do changes in factor supply or factor demand affect factor prices and factor allocation in high-dimensional environments?

Why do we care about high-dimensional environments?

1. Large changes in inequality and in factor allocation occur at high levels of disaggregation.
**Question:** How do changes in factor supply or factor demand affect factor prices and factor allocation in high-dimensional environments?

**Why do we care about high-dimensional environments?**

1. Large changes in inequality and in factor allocation occur at high levels of disaggregation
   
   - *Top income inequality*, e.g. Piketty and Saez (2003)
Question: How do changes in factor supply or factor demand affect factor prices and factor allocation in high-dimensional environments?

Why do we care about high-dimensional environments?

1. Large changes in inequality and in factor allocation occur at high levels of disaggregation
   
   1. Top income inequality, e.g. Piketty and Saez (2003)
Question: How do changes in factor supply or factor demand affect factor prices and factor allocation in high-dimensional environments?

Why do we care about high-dimensional environments?

1. Large changes in inequality and in factor allocation occur at high levels of disaggregation
   1. *Top income inequality*, e.g. Piketty and Saez (2003)
Question: How do changes in factor supply or factor demand affect factor prices and factor allocation in high-dimensional environments?

Why do we care about high-dimensional environments?

1. Large changes in inequality and in factor allocation occur at high levels of disaggregation

1. Top income inequality, e.g. Piketty and Saez (2003)
4. Within and between- inequality, e.g. Juhn, Murphy, and Pierce (1993)
**Question:** How do changes in factor supply or factor demand affect factor prices and factor allocation in high-dimensional environments?

**Why do we care about high-dimensional environments?**

1. Large changes in inequality and in factor allocation occur at high levels of disaggregation
   - *Top income inequality*, e.g. Piketty and Saez (2003)
   - *Job polarization*, e.g. Goos and Manning (2003)
   - *Within and between- inequality*, e.g. Juhn, Murphy, and Pierce (1993)

2. Large changes occurring at low levels of disaggregation (e.g. skill premium) reflect average changes over a large number of factors
Approach #1: Start from a standard neoclassical model with low dimensionality (e.g. Heckscher-Ohlin) and increase it
How to Answer this Question?
Weak assumptions, weak results

- **Approach #1**: Start from a standard neoclassical model with low dimensionality (e.g. Heckscher-Ohlin) and increase it.

- **Problems with Approach #1**: 
  
  1. Predictions are unintuitive: Is the number of goods greater than the number of factors in the economy?
  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.

Costinot & Vogel (MIT & Columbia)  Matching and Inequality  June 2009
How to Answer this Question?
Weak assumptions, weak results

- **Approach #1**: Start from a standard neoclassical model with low dimensionality (e.g. Heckscher-Ohlin) and increase it.

- **Problems with Approach #1**:
  - Predictions are **unintuitive**: Is the number of goods greater than the number of factors in the economy?
How to Answer this Question?
Weak assumptions, weak results

- **Approach #1**: Start from a standard neoclassical model with low dimensionality (e.g. Heckscher-Ohlin) and increase it

- **Problems with Approach #1:**
  1. Predictions are **unintuitive**: Is the number of goods greater than the number of factors in the economy?
  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.
Approach #2: Directly start from an assignment model with high dimensionality (e.g. Roy)
How to Answer this Question?
Strong assumptions, strong results

- **Approach #2:** Directly start from an assignment model with high dimensionality (e.g. Roy)
- **Problems with Approach #2:**
Approach #2: Directly start from an assignment model with high dimensionality (e.g. Roy)

Problems with Approach #2:

How to Answer this Question?
Strong assumptions, strong results

- **Approach #2**: Directly start from an assignment model with high dimensionality (e.g. Roy)

- **Problems with Approach #2**:
  2. Comparative statics use strong functional form assumptions on:
How to Answer this Question?
Strong assumptions, strong results

- **Approach #2:** Directly start from an assignment model with high dimensionality (e.g. Roy)

- **Problems with Approach #2:**
  1. General results focus on **cross-sectional predictions:** PAM (Becker 1973, Shimer and Smith 2000, Legros and Newman 2002)
  2. Comparative statics use **strong functional form assumptions** on:
How to Answer this Question?
Strong assumptions, strong results

- **Approach #2**: Directly start from an assignment model with high dimensionality (e.g. Roy)

- **Problems with Approach #2**:
  2. Comparative statics use **strong functional form assumptions** on:
How to Answer this Question?
Strong assumptions, strong results

- **Approach #2**: Directly start from an assignment model with high dimensionality (e.g. Roy)
- **Problems with Approach #2:**
  2. Comparative statics use **strong functional form assumptions** on:
     - *Utility function*, e.g. Teulings (2005), Blanchard and Willman (2008), Tervyo (2008)
This Paper

**Contribution:**

1. Develop concepts and techniques to do robust monotone comparative statics in a Roy-like assignment model.
2. Deepen our understanding of an important class of models in the labor and trade literature.
3. Use results to revisit consequences of globalization on factor prices and factor allocation in high-dimensional environments.
4. Go from weak to strong predictions even in such environments.
5. Offer a unifying perspective on North-South trade, North-North trade, offshoring, and skill-biased technological change.
6. Broaden the scope of standard trade theory to discuss phenomena such as pervasive changes in inequality and wage and job polarization.

Costinot & Vogel (MIT & Columbia)
Contribution:

1. Develop concepts and techniques to do robust monotone comparative statics in a Roy-like assignment model.
**Contribution:**

- Develop concepts and techniques to do **robust monotone comparative statics** in a Roy-like assignment model

- Deepen our understanding of an important class of models in the labor and trade literature
Contribution:

1. Develop concepts and techniques to do robust monotone comparative statics in a Roy-like assignment model.
   - Deepen our understanding of an important class of models in the labor and trade literature.

2. Use results to revisit consequences of globalization on factor prices and factor allocation in high-dimensional environments.

Costinot & Vogel (MIT & Columbia)
This Paper

**Contribution:**

1. Develop concepts and techniques to do **robust monotone comparative statics** in a Roy-like assignment model
   - Deepen our understanding of an important class of models in the labor and trade literature

2. Use results to **revisit consequences of globalization** on factor prices and factor allocation in high-dimensional environments
   - Go from weak to strong predictions even in such environments
**Contribution:**

1. Develop concepts and techniques to do **robust monotone comparative statics** in a Roy-like assignment model
   - Deepen our understanding of an important class of models in the labor and trade literature

2. Use results to **revisit consequences of globalization** on factor prices and factor allocation in high-dimensional environments
   - Go from weak to strong predictions even in such environments
   - Offer a unifying perspective on North-South trade, North-North trade, offshoring, and skill-biased technological change
Contribution:

1. Develop concepts and techniques to do robust monotone comparative statics in a Roy-like assignment model
   - Deepen our understanding of an important class of models in the labor and trade literature

2. Use results to revisit consequences of globalization on factor prices and factor allocation in high-dimensional environments
   - Go from weak to strong predictions even in such environments
   - Offer a unifying perspective on North-South trade, North-North trade, offshoring, and skill-biased technological change
   - 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 $\sigma \in \Sigma \equiv [\sigma, \bar{\sigma}]$
- A set of workers with skill $s \in S \equiv [s, \bar{s}]$
- $V(s) > 0$ is the inelastic supply of workers with skill $s$
- Good and labor markets are perfectly competitive
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:

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

- $B (\sigma) > 0$ 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
   \[ Y(\sigma) = I \times \left[ \frac{p(\sigma)}{B(\sigma)} \right]^{-\epsilon} \]

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
   \[ V(s) = \int_{\sigma \in \Sigma} L(s, \sigma) \, d\sigma, \text{ for all } s \in S \]
Lemma 1 In a competitive equilibrium, there exists an increasing bijection $M : S \rightarrow \Sigma$ such that $L(s, \sigma) > 0$ if and only if $M(s) = \sigma$.
Lemma 2 In a competitive equilibrium, $M$ and $w$ satisfy

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

(1)

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

(2)

with $M(s) = \sigma$, $M(\bar{s}) = \bar{\sigma}$, and $p[M(s)] = w(s) / A[s, M(s)]$. 
Definition \( V \) is \textit{skill-abundant} relative to \( V' \), denoted \( V \succeq_a V' \), if

\[
\frac{V(s)}{V(s')} \geq \frac{V'(s)}{V'(s')}, \text{ for all } s > s'
\]
Lemma 3 Suppose $V \succeq_a V'$. Then $M'(s) \geq M(s)$ for all $s \in S$.

From a task standpoint: *worker/skill downgrading*

From a worker standpoint: *task upgrading*
$M'(s_1) = M(s_1) = \sigma_1$, $M'(s_2) = M(s_2) = \sigma_2$, and $\frac{M'(s_1)}{M'(s_2)} < \frac{M(s_1)}{M(s_2)}$
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 $\frac{M'(s_1)}{M'(s_2)} < \frac{M(s_1)}{M(s_2)}$

2. Equation (1) $\implies \frac{V'(s_2)}{V'(s_1)} \frac{Y'(\sigma_1)}{Y'(\sigma_2)} > \frac{V(s_2)}{V(s_1)} \frac{Y(\sigma_1)}{Y(\sigma_2)}$
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 \( \frac{M'(s_1)}{M'(s_2)} < \frac{M(s_1)}{M(s_2)} \)

2. Equation (1) \( \implies \frac{V'(s_2)}{V'(s_1)} \frac{Y'(\sigma_1)}{Y'(\sigma_2)} > \frac{V(s_2)}{V(s_1)} \frac{Y(\sigma_1)}{Y(\sigma_2)} \)

3. \( V' \preceq_a V \implies \frac{V'(s_2)}{V'(s_1)} \geq \frac{V(s_2)}{V(s_1)} \)
1. \( M'(s_1) = M(s_1) = \sigma_1, \ M'(s_2) = M(s_2) = \sigma_2, \) and \( \frac{M'_s(s_1)}{M'_s(s_2)} < \frac{M_s(s_1)}{M_s(s_2)} \)

2. Equation (1) \( \iff \frac{V'(s_2)}{V'(s_1)} \frac{Y'(\sigma_1)}{Y'(\sigma_2)} > \frac{V(s_2)}{V(s_1)} \frac{Y(\sigma_1)}{Y(\sigma_2)} \)

3. \( V' \preceq_a V \iff \frac{V(s_2)}{V(s_1)} \geq \frac{V'(s_2)}{V'(s_1)} \)

4. Equation (2) + zero profits \( \iff \frac{d\ln p}{d\sigma} = -\frac{\partial \ln A[M^{-1}(\sigma),\sigma]}{\partial \sigma} \)
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 \( \frac{M'(s_1)}{M'(s_2)} < \frac{M(s_1)}{M(s_2)} \)

2. Equation (1) \( \implies \frac{V'(s_2)}{V'(s_1)} \frac{Y'(\sigma_1)}{Y'(\sigma_2)} > \frac{V(s_2)}{V(s_1)} \frac{Y(\sigma_1)}{Y(\sigma_2)} \)

3. \( V' \leq_a V \implies \frac{V(s_2)}{V(s_1)} \geq \frac{V'(s_2)}{V'(s_1)} \)

4. Equation (2) + zero profits \( \implies \frac{d \ln p}{d \sigma} = -\frac{\partial \ln A[M^{-1}(\sigma),\sigma]}{\partial \sigma} \)

5. \( M^{-1}(\sigma) < M'^{-1}(\sigma) \) for \( \sigma \in (\sigma_1, \sigma_2) + A \) log-spm \( \implies \frac{p(\sigma_1)}{p(\sigma_2)} \leq \frac{p'(\sigma_1)}{p'(\sigma_2)} \)
Change in Factor Supply (I): Skill Abundance

Sketch of Proof

\[ M'(s_1) = M(s_1) = \sigma_1, \quad M'(s_2) = M(s_2) = \sigma_2, \quad \text{and} \quad \frac{M'_s(s_1)}{M'_s(s_2)} < \frac{M_s(s_1)}{M_s(s_2)} \]

Equation (1) \[ \implies \frac{V'(s_2)}{V'(s_1)} \cdot \frac{Y'(\sigma_1)}{Y'(\sigma_2)} > \frac{V(s_2)}{V(s_1)} \cdot \frac{Y(\sigma_1)}{Y(\sigma_2)} \]

\[ V' \leq_a V \implies \frac{V(s_2)}{V(s_1)} \geq \frac{V'(s_2)}{V'(s_1)} \]

Equation (2) + zero profits \[ \implies \frac{d \ln p}{d \sigma} = -\frac{\partial \ln A[M^{-1}(\sigma),\sigma]}{\partial \sigma} \]

\[ M^{-1}(\sigma) < M'^{-1}(\sigma) \quad \text{for} \quad \sigma \in (\sigma_1, \sigma_2) + A \log\text{-spm} \implies \frac{p(\sigma_1)}{p(\sigma_2)} \leq \frac{p'(\sigma_1)}{p'(\sigma_2)} \]

\[ \frac{p(\sigma_1)}{p(\sigma_2)} \leq \frac{p'(\sigma_1)}{p'(\sigma_2)} \quad + \quad \text{CES} \implies \frac{Y(\sigma_1)}{Y(\sigma_2)} \geq \frac{Y'(\sigma_1)}{Y'(\sigma_2)} \]
Moving from $V$ to $V' \leq_a V$ implies pervasive rise in inequality:

$$\frac{w'(s)}{w'(s')} \geq \frac{w(s)}{w(s')}, \text{ for all } s > s'$$
Moving from $V$ to $V' \leq_a V$ implies \textit{pervasive rise in inequality}:

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

The mechanism is simple:
Moving from $V$ to $V' \leq_a V$ implies *pervasive rise in inequality*:

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

The mechanism is simple:

Profit-maximization implies

$$\frac{d \ln w}{ds} = \frac{\partial \ln A[s, M(s)]}{\partial s} \quad \text{and} \quad \frac{d \ln w'}{ds} = \frac{\partial \ln A[s, M'(s)]}{\partial s}$$
Moving from $V$ to $V' \leq_a V$ implies pervasive rise in inequality:

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

The mechanism is simple:

1. Profit-maximization implies

$$\frac{d \ln w}{ds} = \frac{\partial \ln A[s, M(s)]}{\partial s}$$ and $$\frac{d \ln w'}{ds} = \frac{\partial \ln A[s, M'(s)]}{\partial s}$$

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

$$\frac{d \ln w'}{ds} \geq \frac{d \ln w}{ds}$$
**Definition**  
$V$ is *more diverse* than $V'$, denoted $V \succeq_d V'$, if there exists an $\hat{s} \in (s, \bar{s})$ such that

\[
\begin{align*}
V' &\succ_a V, \text{ for all } s < \hat{s} \\
V &\succ_a V', \text{ for all } s \geq \hat{s}
\end{align*}
\]
Moving from $V$ to $V' \leq_d V$ implies:

1. **Skill upgrading** for low-$\sigma$ tasks (task downgrading for low $s$):
   \[
   M'(s) \leq M(s), \text{ for all } s < s^*
   \]

2. **Skill downgrading** for high-$\sigma$ tasks (task upgrading for high $s$):
   \[
   M'(s) \geq M(s), \text{ for all } s^* < s
   \]
Moving from $V$ to $V' \preceq_d V$ implies:

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

$$\frac{w'(s)}{w'(s')} \leq \frac{w(s)}{w(s')}, \text{ for all } s' < s \leq s^*$$
Moving from $V$ to $V' \leq_d V$ implies:

1. **Pervasive fall in inequality** among low-skilled workers:
   \[
   \frac{w'(s)}{w'(s')} \leq \frac{w(s)}{w(s')}, \text{ for all } s' < s \leq s^*
   \]

2. **Pervasive rise in inequality** among high-skilled workers:
   \[
   \frac{w'(s)}{w'(s')} \geq \frac{w(s)}{w(s')}, \text{ for all } s^* \leq s' < s
   \]
Definition \( B' \) is skill-biased relative to \( B \), denoted \( B' \succeq_s B \), if

\[
\frac{B' (\sigma)}{B' (\sigma')} \geq \frac{B (\sigma)}{B (\sigma')}, \quad \text{for all} \quad \sigma > \sigma'
\]
Moving from $B$ to $B' \succeq_s B$ implies:

1. *Skill downgrading:*

\[ M'(s) \geq M(s), \text{ for all } s \]
Moving from $B$ to $B' \succeq_s B$ implies:

1. **Skill downgrading:**

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

2. **Pervasive rise in inequality:**

   $$\frac{w'(s)}{w'(s')} \geq \frac{w(s)}{w(s')}, \text{ for any } s > s'.$$
Definition $B'$ is extreme-biased relative to $B$, denoted $B' \succeq_e B$, if there exists an $\hat{\sigma} \in (\underline{\sigma}, \bar{\sigma})$ such that

\[
\begin{align*}
B & \succeq_s B' \text{ for all } \sigma < \hat{\sigma} \\
B' & \succeq_s B \text{ for all } \sigma \geq \hat{\sigma}
\end{align*}
\]
Moving from $B$ to $B' \succeq_e B$ implies:

1. **Job Polarization:**

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

   and

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

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

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

where:

\[M_T(s) = \sigma \text{ and } M_T(\bar{s}) = \bar{\sigma}\]

\[p_T[M_T(s)] = \frac{w_T(s)}{\gamma H A[s, M_T(s)]}\]

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

\[V_W \equiv V_H + V_F\]
Consequences of North-South Trade
The Role of Cross-Country Differences in Factor Endowments

Assumption: $V_H \succeq_a V_F$ and $B_H = B_F$
Consequences of North-South Trade
The Role of Cross-Country Differences in Factor Endowments

- Assumption: $V_H \succeq_a V_F$ and $B_H = B_F$
- If $V_H \succeq_a V_F$, then $V_H \succeq_a V_W \succeq_a V_F$
Consequences of North-South Trade
The Role of Cross-Country Differences in Factor Endowments

- Assumption: $V_H \succeq_a V_F$ and $B_H = B_F$
- If $V_H \succeq_a V_F$, then $V_H \succeq_a V_W \succeq_a V_F$
- Continuum-by-continuum extensions of two-by-two HO results
Consequences of North-South Trade

The Role of Cross-Country Differences in Factor Endowments

- Assumption: $V_H \succeq_a V_F$ and $B_H = B_F$
- If $V_H \succeq_a V_F$, then $V_H \succeq_a V_W \succeq_a V_F$
- Continuum-by-continuum extensions of two-by-two HO results

Changes in skill-intensities:

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

Diagram with graphs of $M_H$, $M_W$, and $M_F$. The axes are labeled with $\sigma$ and $s$. The graphs show increasing functions with $M_H$ above $M_W$ and $M_W$ above $M_F$.
Consequences of North-South Trade
The Role of Cross-Country Differences in Factor Endowments

- Assumption: $V_H \succeq_a V_F$ and $B_H = B_F$
- If $V_H \succeq_a V_F$, then $V_H \succeq_a V_W \succeq_a V_F$
- Continuum-by-continuum extensions of two-by-two HO results
  1. Changes in skill-intensities:
     \[ M_H(s) \leq M_T(s) \leq M_F(s), \text{ for all } s \]

  ![Graph showing changes in skill-intensities](image)

  2. Strong Stolper-Samuelson effect:
     \[ \frac{w_H(s)}{w_H(s')} \leq \frac{w_T(s)}{w_T(s')} \leq \frac{w_F(s)}{w_F(s')}, \text{ for all } s > s' \]
Assumption: $V_H = V_F$ and $B_H \succeq s B_F$
Assumption: \( V_H = V_F \) and \( B_H \succeq_s B_F \)

If \( B_H \succeq_s B_F \), then \( B_W \) satisfies \( B_H \succeq_s B_W \succeq_s B_F \)
Assumption: $V_H = V_F$ and $B_H \succeq_s B_F$

If $B_H \succeq_s B_F$, then $B_W$ satisfies $B_H \succeq_s B_W \succeq_s B_F$

Exact same logic leads to the exact opposite conclusion
Consequences of North-South Trade (Cont.)
The Role of Cross-Country Differences in Skill Biases

- Assumption: $V_H = V_F$ and $B_H \succeq_s B_F$
- If $B_H \succeq_s B_F$, then $B_W$ satisfies $B_H \succeq_s B_W \succeq_s B_F$
- Exact same logic leads to the exact opposite conclusion
  - Matching:
    
    $$M_H(s) \geq M_T(s) \geq M_F(s), \text{ for all } s$$
Assumption: $V_H = V_F$ and $B_H \geq_s B_F$

If $B_H \geq_s B_F$, then $B_W$ satisfies $B_H \geq_s B_W \geq_s B_F$

Exact same logic leads to the exact opposite conclusion

1. **Matching:**
   $$M_H (s) \geq M_T (s) \geq M_F (s), \text{ for all } s$$

2. **Inequality:**
   $$\frac{w_H (s)}{w_H (s')} \leq \frac{w_T (s)}{w_T (s')} \leq \frac{w_F (s)}{w_F (s')}, \text{ for all } s > s'$$
Summary

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

- **Conclusion #1:** Similar countries may have different globalization experiences depending on which of these two forces, supply or demand, dominates.

- **Conclusion #2:** Overall effect of trade liberalization on factor allocation and factor prices may be small in practice.

---

Costinot & Vogel (MIT & Columbia)
Summary

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


Conclusion #1: Similar countries may have different globalization experiences depending on which of these two forces, supply or demand, dominates.

Conclusion #2: Overall effect of trade liberalization on factor allocation and factor prices may be small in practice.
Summary

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

- **Observation #2:**

- **Conclusion #1:**
  Similar countries may have different globalization experiences depending on which of these two forces, supply or demand, dominates.
Observation #1: Predictions regarding the impact of trade integration crucially depend on the correlation between supply and demand considerations.


Conclusion #1: Similar countries may have different globalization experiences depending on which of these two forces, supply or demand, dominates.

Conclusion #2: Overall effect of trade liberalization on factor allocation and factor prices may be small in practice.
Consequences of North-North Trade

Matching

Assumption: $V_H \succeq_d V_F$ and $B_H = B_F$
Consequences of North-North Trade

Matching

- Assumption: $V_H \succeq_d V_F$ and $B_H = B_F$
- If $V_H \succeq_d V_F$, then $V_W$ satisfies $V_H \succeq_d V_W \succeq_d V_F$
Consequences of North-North Trade

Matching

- Assumption: $V_H \succeq_d V_F$ and $B_H = B_F$
- If $V_H \succeq_d V_F$, then $V_W$ satisfies $V_H \succeq_d V_W \succeq_d V_F$
- Changes in matching: Job polarization at Home

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

and the converse in Foreign

\begin{tikzpicture}
\begin{axis}[
    axis lines=left,
    xlabel={$s$},
    ylabel={$\sigma$},
    xmin=-1, xmax=1,
    ymin=-1, ymax=1,
    xtick={-1,0,1},
    ytick={-1,0,1},
    xticklabels={$s$},
    yticklabels={$\sigma$},
]
\addplot[red, thick] coordinates {(-1,0) (1,0)};
\addplot[violet, thick] coordinates {(0,-1) (0,1)};
\addplot[black, thick] coordinates {(-1,-1) (1,1)};
\addplot[green, thick] coordinates {(-1,1) (1,-1)};
\end{axis}
\end{tikzpicture}
Consequences of North-North Trade (Cont.)

Inequality

- Changes in Inequality:

\[ w_T(s) - w_T(s_0) > w_H(s) - w_H(s_0), \text{ for all } s_0 < s < s_H \]

\[ w_T(s) - w_T(s_0) > w_F(s) - w_F(s_0), \text{ for all } s_0 < s < s_F \]
Consequences of North-North Trade (Cont.)

Inequality

- Changes in Inequality:
  - Wage polarization in the more diverse country

\[
\frac{w_T(s)}{w_T(s')} \leq \frac{w_H(s)}{w_H(s')}, \text{ for all } s' < s \leq s_H
\]

\[
\frac{w_T(s)}{w_T(s')} \geq \frac{w_H(s)}{w_H(s')}, \text{ for all } s_H \leq s' < s
\]
Changes in Inequality:

1. **Wage polarization** in the more diverse country

\[
\frac{w_T(s)}{w_T(s')} \leq \frac{w_H(s)}{w_H(s')}, \text{ for all } s' < s \leq s_H
\]
\[
\frac{w_T(s)}{w_T(s')} \geq \frac{w_H(s)}{w_H(s')}, \text{ for all } s_H \leq s' < s
\]

2. **Wage convergence** in the less diverse country

\[
\frac{w_T(s)}{w_T(s')} \geq \frac{w_F(s)}{w_F(s')}, \text{ for all } s' < s \leq s_F
\]
\[
\frac{w_T(s)}{w_T(s')} \leq \frac{w_F(s)}{w_F(s')}, \text{ for all } s_F \leq s' < s
\]
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
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.

- **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: $V_H \geq_a V_F$ and $\gamma_H \geq \gamma_F$
Assumption: $V_H \geq_a V_F$ and $\gamma_H \geq \gamma_F$

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

1. Skill downgrading/task upgrading in both countries:
   \[ M_T(s) \geq M_0 T(s), \text{ for all } s \]

2. Pervasive rise in inequality in both countries:
   \[ w_T(s) \geq w_{T}(s_0), \text{ for all } s > s_0. \]

3. An increase in inequality between countries:
   \[ I_H \geq I_F \geq I_H/I_F. \]
Assumption: $V_H \geq_a V_F$ and $\gamma_H \geq \gamma_F$

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

1. Skill downgrading/task upgrading in both countries:

$$M_T (s) \leq M'_T (s), \text{ for all } s$$
Assumption: $V_H \succeq a V_F$ and $\gamma_H \geq \gamma_F$

Moving from $B_W$ to $B'_W \succeq s B_W$ implies:

1. **Skill downgrading/task upgrading in both countries:**
   \[
   M_T(s) \leq M'_T(s), \text{ for all } s
   \]

2. **Pervasive rise in inequality in both countries:**
   \[
   \frac{w'_T(s)}{w'_T(s')} \geq \frac{w_T(s)}{w_T(s')}, \text{ for all } s > s'.
   \]
Assumption: $V_H \geq_a V_F$ and $\gamma_H \geq \gamma_F$

Moving from $B_W$ to $B_W' \geq_s B_W$ implies:

1. **Skill downgrading/task upgrading in both countries:**
   \[ M_T'(s) \leq M_T(s), \text{ for all } s \]

2. **Pervasive rise in inequality in both countries:**
   \[ \frac{w_T'(s)}{w_T'(s')} \geq \frac{w_T(s)}{w_T(s')}, \text{ for all } s > s'. \]

3. **An increase in inequality between countries:**
   \[ I'_H / I'_F \geq I_H / I_F \]
Technological Change in the World Economy

Offshoring Tasks

Assumption: \( V_H \geq a \ V_F \) and \( \gamma_H \geq \gamma_F \)

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.

Costinot & Vogel (MIT & Columbia)
Technological Change in the World Economy

Offshoring Tasks

- Assumption: $V_H \geq_a V_F$ and $\gamma_H \geq \gamma_F$
- Moving from $\gamma_F$ to $\gamma'_F \geq \gamma_F$ implies
Technological Change in the World Economy

Offshoring Tasks

- Assumption: $V_{H} \preceq_{a} V_{F}$ and $\gamma_{H} \geq \gamma_{F}$
- Moving from $\gamma_{F}$ to $\gamma'_{F} \geq \gamma_{F}$ implies
  - *Skill downgrading/task upgrading in both countries:*

  $$M_{T}(s) \leq M'_{T}(s), \text{ for all } s$$
Assumption: \( V_H \succeq_a V_F \) and \( \gamma_H \geq \gamma_F \)

Moving from \( \gamma_F \) to \( \gamma'_F \geq \gamma_F \) implies

1. **Skill downgrading/task upgrading in both countries:**

   \[ M_T (s) \leq M'_T (s), \text{ for all } s \]

2. **Pervasive rise in inequality in both countries:**

   \[ \frac{w'_T (s)}{w'_T (s')} \geq \frac{w_T (s)}{w_T (s')}, \text{ for all } s > s'. \]
Technological Change in the World Economy
Offshoring Tasks

- Assumption: $V_H \geq_a V_F$ and $\gamma_H \geq \gamma_F$
- Moving from $\gamma_F$ to $\gamma'_F \geq \gamma_F$ implies
  1. **Skill downgrading/task upgrading in both countries:**
     \[ M_T(s) \leq M'_T(s), \text{ for all } s \]
  2. **Pervasive rise in inequality in both countries:**
     \[ \frac{w'_T(s)}{w'_T(s')} \geq \frac{w_T(s)}{w_T(s')}, \text{ for all } s > s'. \]

- **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

- **Contribution (I):** Derive sufficient conditions for robust monotone comparative statics predictions—without functional form restrictions on the distribution of skills or worker productivity—in a Roy-like assignment model where goods neither have to be perfect substitutes nor perfect complements.
Conclusions

- **Contribution (I):** Derive sufficient conditions for robust monotone comparative statics predictions—without functional form restrictions on the distribution of skills or worker productivity—in a Roy-like assignment model where goods neither have to be perfect substitutes nor perfect complements.

- **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.