INTERNATIONAL ECONOMICS

Lecture 9 — January 10, 2023

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Last week: Heckscher-Ohlin Model of Trade

- Trade because of differences in factor endowments and intensities

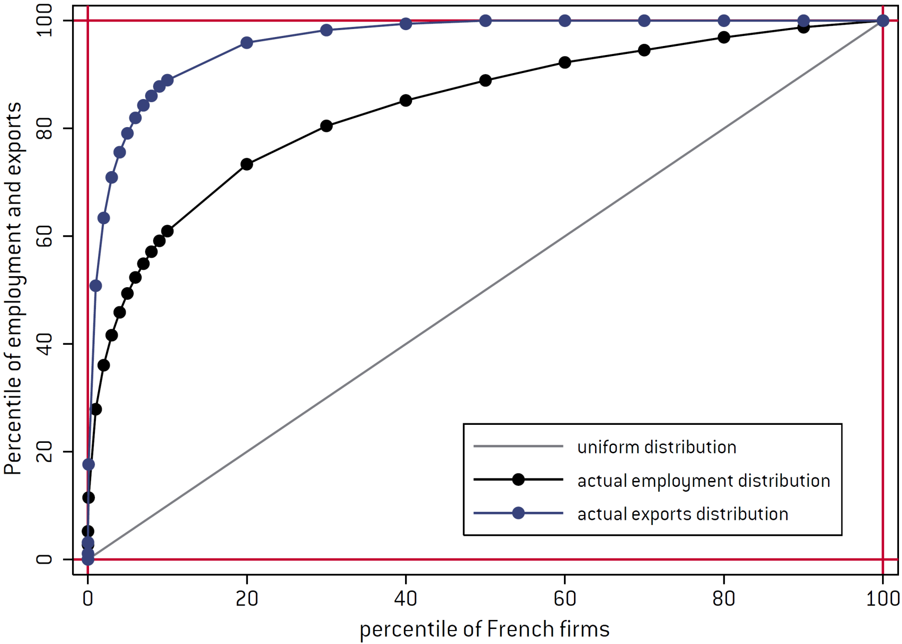
  $\rightarrow$ comparative advantage!

- Distributional consequences within countries

- No perfect specialization

This week

- Export decisions of heterogeneous firms
- Factor allocation in the open economy
- Marginal trade liberalization and factor reallocation


Percentile of employment and exports
percentile of French firms
0
20
40
60
80
100
uniform distribution
actual employment distribution
actual exports distribution

NAICS industry	*Percent of all firms*	*Percent of firms that export*	*Percent of firms that import*	*Percent of firms that import & export*
311 Food Manufacturing	7	17	10	7
312 Beverage and Tobacco Product	1	28	19	13
313 Textile Mills	1	47	31	24
314 Textile Product Mills	2	19	13	9
315 Apparel Manufacturing	6	16	15	9
316 Leather and Allied Product	0	43	43	30
321 Wood Product Manufacturing	5	15	5	3
322 Paper Manufacturing	1	42	18	15
323 Printing and Related Support	13	10	3	2
324 Petroleum and Coal Products	0	32	17	14
325 Chemical Manufacturing	3	56	30	26
326 Plastics and Rubber Products	5	42	20	16
327 Nonmetallic Mineral Product	4	16	11	7
331 Primary Metal Manufacturing	1	51	23	21
332 Fabricated Metal Product	20	21	8	6
333 Machinery Manufacturing	9	47	22	19
334 Computer and Electronic Product	4	65	40	37
335 Electrical Equipment, Appliance	2	58	35	30
336 Transportation Equipment	3	40	22	18
337 Furniture and Related Product	6	13	8	5
339 Miscellaneous Manufacturing	7	31	19	15
Aggregate manufacturing	**100**	**27**	**14**	**11**

Sources: Data are for 1997 and are for firms that appear in both the U.S. Census of Manufactures and the Linked-Longitudinal Firm Trade Transaction Database (LFTTD).
Notes: The first column of numbers summarizes the distribution of manufacturing firms across three-digit NAICS industries. Remaining columns report the percent of firms in each industry that export, import, and do both.

model assumptions

- Continuum of firms, differ by productivity φ
- Monopolistic competition, each firm produces one product variant
- International trade between symmetric countries: $Y = Y_d = Y_x$
- Fixed production costs $f_d > 0$, fixed trade costs $f_x > 0$
- variable iceberg trade costs $\tau \geq 1$

Optimization problem in home market

- CES leads to isoelastic demand for each variant

$$q(\varphi) = p(\varphi)^{-\sigma} Y \quad \text{with normalized price level } P = 1$$

- Fixed production costs lead to constant markup on marginal cost $c(\varphi)$

$$\begin{aligned} p(\varphi) &= \frac{\sigma}{\sigma - 1} c(\varphi) \\ &= \frac{1}{\rho} \frac{w}{\varphi} \quad \text{with} \quad \rho \equiv \frac{(\sigma - 1)}{\sigma} \in (0, 1) \quad \text{and} \quad c(\varphi) = \frac{w}{\varphi} \end{aligned}$$

Operating profit in home market

Operating profit, i.e. excluding fixed production costs f_d

$$\pi_d(\varphi) = p(\varphi)q(\varphi) - c(\varphi)q(\varphi)$$
$$= \frac{1}{\sigma}\left(\frac{1}{\rho}\frac{w}{\varphi}\right)^{1-\sigma} Y$$

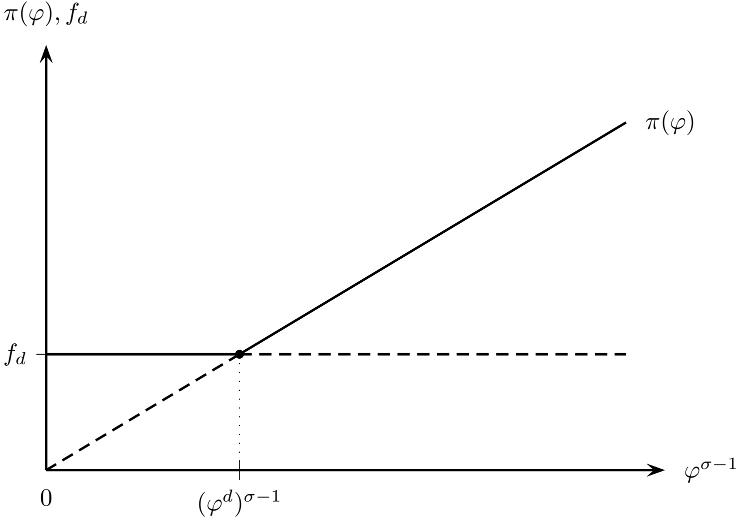
Heterogeneous firms

$$p(\varphi) = \frac{1}{\rho}\frac{w}{\varphi}, \quad q(\varphi) = \left(\frac{1}{\rho}\frac{w}{\varphi}\right)^{-\sigma} Y \quad \text{and} \quad \pi_d(\varphi) = \frac{1}{\sigma}\left(\frac{1}{\rho}\frac{w}{\varphi}\right)^{1-\sigma} Y$$

Companies differ on the basis of their productivity, e.g. for $\varphi_1 > \varphi_2$

$$\frac{p(\varphi_1)}{p(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{-1} < 1, \quad \frac{q(\varphi_1)}{q(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{\sigma} > 1 \quad \text{and} \quad \frac{\pi_d(\varphi_1)}{\pi_d(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{\sigma-1} > 1$$

Home market



Optimization problem in foreign market

To sell $q_x(\varphi)$ $\tau q_x(\varphi)$ must be produced

$$
\begin{aligned}
\max_{p_x(\varphi)} \overline{\pi}_x(\varphi) &= \pi_x(\varphi) - f_x \\
&= p_x(\varphi) q(\varphi) - \tau c(\varphi) q_x(\varphi) - f_x \\
&= (p_x(\varphi) - \tau c(\varphi))\, p_x(\varphi)^{-\sigma} Y - f_x
\end{aligned}
$$

Prices in foreign market

First order condition

$$\frac{\partial \overline{\pi}_x(\varphi)}{\partial p_x(\varphi)} = (1-\sigma)p_x(\varphi)^{-\sigma}Y + \sigma\tau c(\varphi)p_x(\varphi)^{-\sigma-1}Y \overset{!}{=} 0$$

Prices then

$$\begin{aligned} p_x(\varphi) &= \frac{\sigma}{\sigma-1}\,\tau c(\varphi) \\ &= \frac{\sigma}{\sigma-1}\tau\frac{w}{\varphi} \\ &= \frac{1}{\rho}\tau\frac{w}{\varphi} \end{aligned}$$

Operating profits in foreign market

By substituting $p_x(\varphi)$ into $\overline{\pi}_x(\varphi)$ we get

$$\begin{aligned}\overline{\pi}_x(\varphi) &= \left(\frac{\sigma}{\sigma-1}\tau\frac{w}{\varphi} - \tau\frac{w}{\varphi}\right)\left(\frac{\sigma}{\sigma-1}\tau\frac{w}{\varphi}\right)^{-\sigma} Y - f_x \\ &= \frac{1}{\sigma}\left(\frac{1}{\rho}\frac{w}{\varphi}\right)\tau^{1-\sigma} Y - f_x \\ &= \tau^{1-\sigma}\pi_d(\varphi) - f_x\end{aligned}$$

International trade with heterogeneous firms

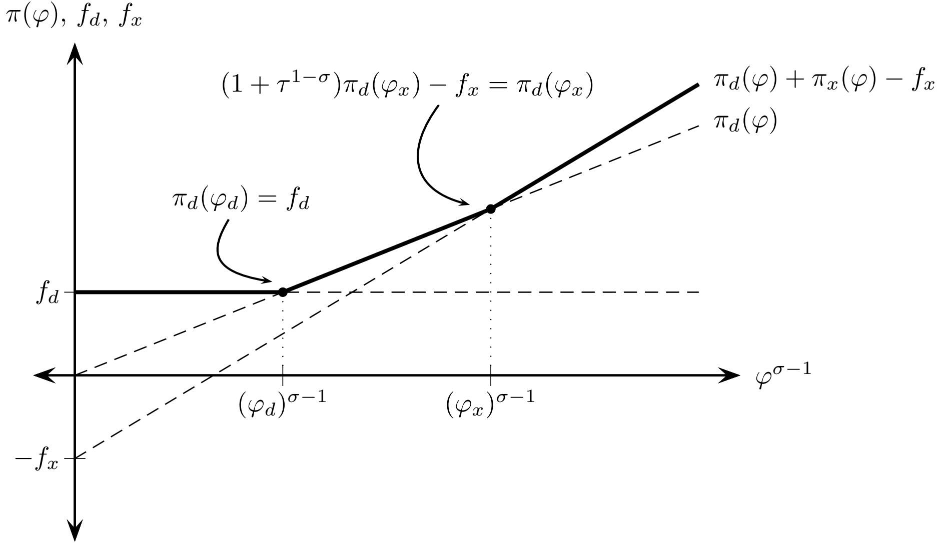
Operating profits in the home and export markets:

$$\pi_x(\varphi) = \tau^{1-\sigma}\pi_d(\varphi)$$

Critical exporter φ_x implicitly defined by

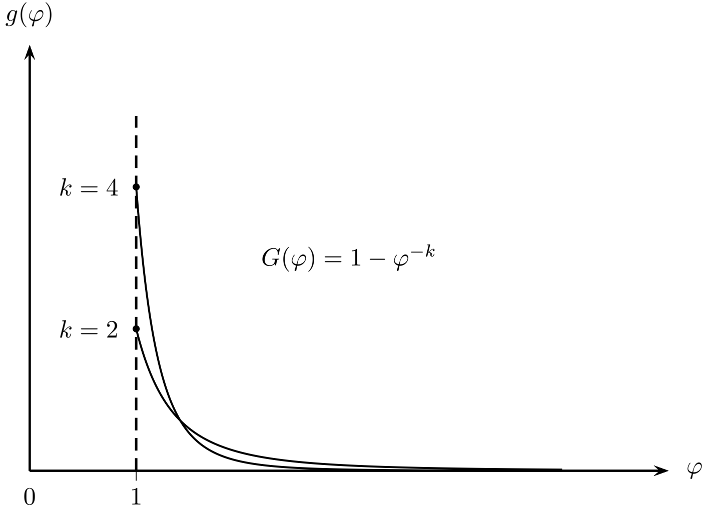
$$\begin{aligned} \pi_d(\varphi_x) + \pi_x(\varphi_x) - f_x &= \pi_d(\varphi_x) \\ \Leftrightarrow \quad \pi_x(\varphi_x) &= f_x \end{aligned}$$

Selection into exporting



Productivity distribution

- φ Pareto-distributed
- Interval $\varphi \in [1, \infty)$
- Single parameter *k*



Share of exporting firms

Share of exporting firms χ:

- probability of productivity above φ_x,
- given the productivity of the critical entrepreneur φ_d.

$$\chi \equiv \frac{1 - G(\varphi_x)}{1 - G(\varphi_d)} = \left(\frac{\varphi_x}{\varphi_d}\right)^{-k} = \left[\frac{\pi_x(\varphi_x)}{\pi_d(\varphi_d)}\right]^{-\frac{k}{\sigma-1}} = \left(\frac{1}{\tau}\right)^{k} \in [0,1]$$

$\rightarrow$ $\chi = 0$ for $\tau \rightarrow \infty$

$\rightarrow$ $\chi = 1$ for $\tau = 1$

Labor demand

Due to the constant price premium

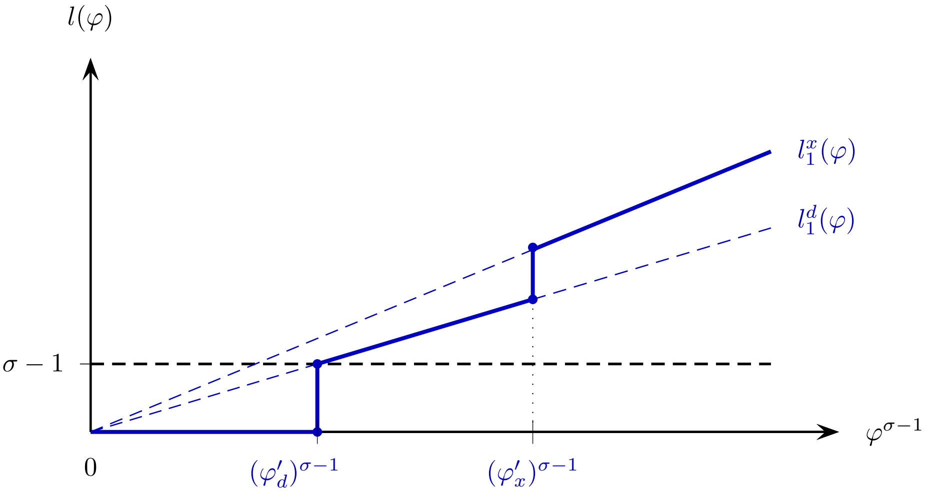
$$
\begin{aligned}
\pi &= p(\varphi)q(\varphi) - c(\varphi)q(\varphi) \\
&= r(\varphi) - \frac{w}{\varphi}q(\varphi) \\
&= r(\varphi) - wl(\varphi) \quad \text{with} \quad l(\varphi) = \frac{q(\varphi)}{\varphi} \\
\Leftrightarrow wl(\varphi) &= \rho r(\varphi) \cdot (1-\rho) r(\varphi)
\end{aligned}
$$

Labor demand

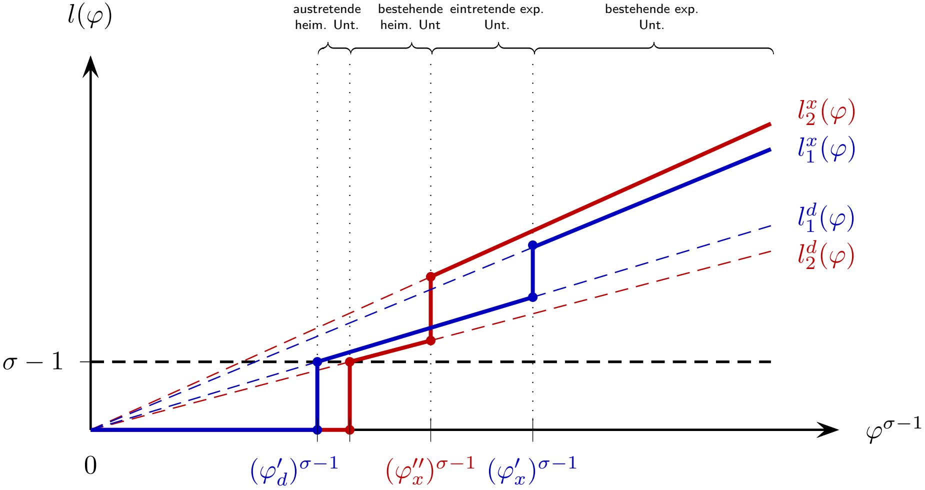
$$l_d(\varphi) = \frac{1}{\varphi}\left(\frac{1}{\rho}\frac{w}{\varphi}\right)^{-\sigma} Y$$

$$l_x(\varphi) = \frac{1}{\varphi}\left(\tau\frac{1}{\rho}\frac{w}{\varphi}\right)^{-\sigma} Y$$

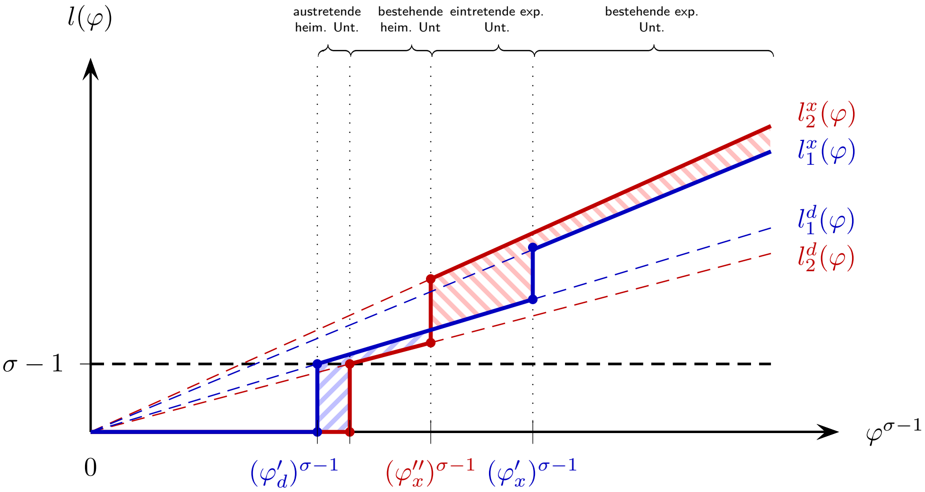
Marginal trade liberalization



Marginal trade liberalization



Marginal trade liberalization



Marginal trade liberalization

Effect of a reduction in trade costs τ:

- Share of exporting firms increases
- Exporters capture market share in foreign market
- Exporters expand domestic labor demand
- Higher labor demand leads to rising wages
- Higher wages force unproductive firms to exit the market
- New critical firm with productivity φ_d

$\rightarrow$ trade leads to resource reallocation from low productivity firms to high productivity firms

summary

- Trade leads to resource reallocation from low to high productivity firms
  $\rightarrow$ Trade gains through intra-industry resource reallocation
- Higher wages and higher average productivity

Next week

- Starting next class: Trade policy