

Globalization

University of California San Diego (UCSD)

Econ 102

Catherine Laffineur

c.laffineur@hotmail.fr

<http://catherinelaffineur.weebly.com>

Introduction

- ▶ In the Ricardian model, trade patterns come from differences in the relative productivity of labor across sectors exclusively
- ▶ In the HOS model, differences come from countries' endowment
- ▶ In the Ricardian model, there is one factor of production → full specialization & does not affect the distribution of income
- ▶ The HOS model extends the notion of comparative advantage to more than one factor
 - Other factors obviously play a role. e.g. climate for producing wine, machines for producing cars, etc

Heckscher-Ohlin-Samuelson



Eli Heckscher
(1879-1952)



Bertil Ohlin
(1899-1979)



Paul Samuelson
(1915-)

Overview

▶ Results

- Comparative advantage based on factor abundance ('factor proportions')
- Specialization raises social welfare in each country, but some groups may lose from trade

▶ Assumptions

- 2 countries, 2 goods, 2 production factors ($2 \times 2 \times 2$)
- Factors are mobile across sectors but immobile across countries
- Free trade, no transportation costs
- Pure and perfect competition exists, no firms are price makers
- Constant returns to scale but decreasing marginal returns
- Identical preferences in both countries

The model (1/2)

- ▶ 2 countries: Home (US) and Foreign (ROW)
- ▶ 2 goods: Cotton and Wheat
- ▶ 2 factors: high-skilled labor and low-skilled labor. Perfectly mobile across sectors and immobile across countries:

$$Y_W = H^{\frac{1}{2}} L^{\frac{1}{2}}$$

$$Y_C = H^{\frac{1}{3}} L^{\frac{2}{3}}$$

- ▶ Same production functions in both countries. Constant returns to scale but decreasing marginal returns → Proof?
- ▶ Perfectly integrated goods and factor markets → implication?

The model (2/2)

- ▶ The technology used to produce the two goods are different between sectors but identical between countries
 - The production of wheat is high-skilled intensive
 - The production of cotton is low-skilled intensive

$$\frac{H_W}{L_W} > \frac{H_C}{L_C}$$

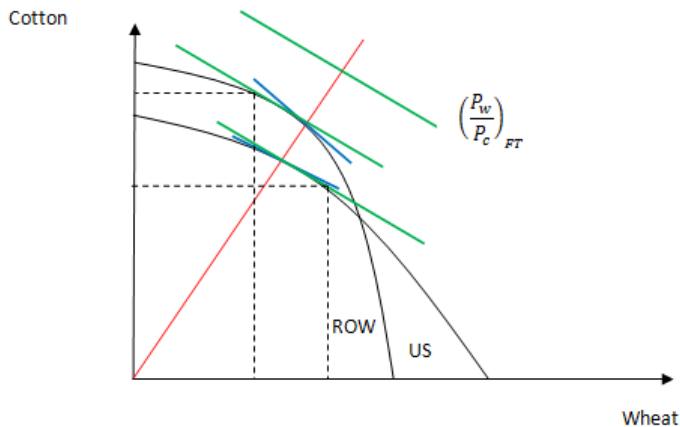
- ▶ Each country has different factors' endowments
 - Home is abundant in high-skilled workers relative to Foreign

$$\frac{H_{US}}{L_{US}} > \frac{H_{ROW}}{L_{ROW}}$$

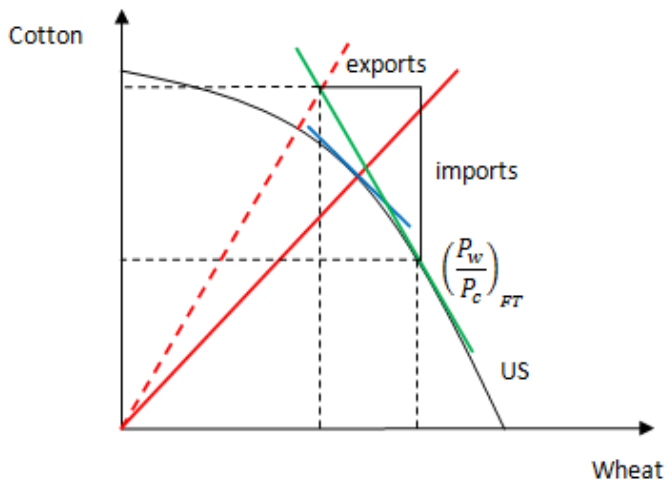
Curved production possibility frontier

- ▶ In the Ricardian model, the PPF is a straight line
- ▶ With more than one factor of production the PPF are belly-shaped
 - The opportunity cost corresponds to the slope of the PPF
 - The slope of the PPF is equal to the marginal rate of transformation
- ▶ The more you move on the right along the PPF, the more the opportunity cost increases
- ▶ The opportunity cost of wheat is higher in the ROW

The Heckscher-Ohlin theorem (1/2)



The Heckscher-Ohlin theorem (2/2)



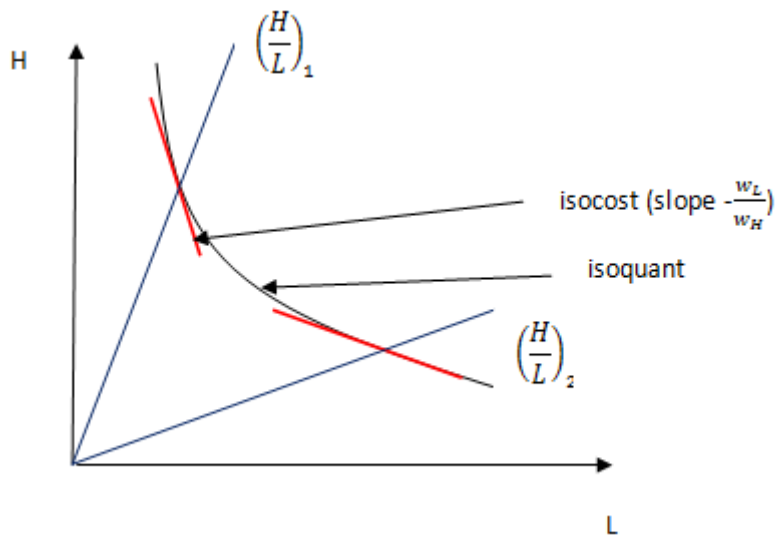
The HOS theorem

- ▶ Heckscher-Ohlin theorem: If there are two sectors, two countries and two factors that are mobile between sectors but not countries, then a country exports the good that intensively uses the economy's abundant factor in production and imports the good that intensively uses the economy's scarce factor of production
- ▶ The terms of trade in each country increases
- ▶ There is a clear gain from trade, but we will see that in the HOS model there are losers and winners after free trade

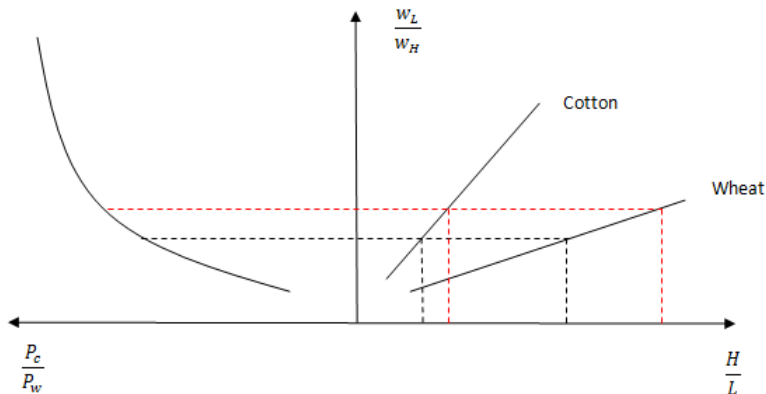
Factor price equalization theorem

- ▶ The HO theorem says nothing about the distribution of income
- ▶ To know the distribution of income we first need to find out the relation between the relative price of factors and the relative intensity of factors
- ▶ We first need to analyze all combinations of skilled and unskilled workers depending on their costs.
 - Isocost & Isoquant

Factor price equalization theorem



Factor price equalization theorem



Factor price equalization theorem: The law of one price after free trade implies equalization of factor prices between countries. Simply stated: When the prices of the goods are equalized between countries after free trade, the prices of factors will also be equalized

Stolper-Samuelson theorem

- ▶ In the US, a decrease in $\frac{P_C}{P_W}$ reduces $\frac{H}{L}$ in both sectors and reduces $\frac{w_L}{w_H}$
- ▶ In the ROW, an increase in $\frac{P_C}{P_W}$ raises $\frac{H}{L}$ in both sectors and raises $\frac{w_L}{w_H}$

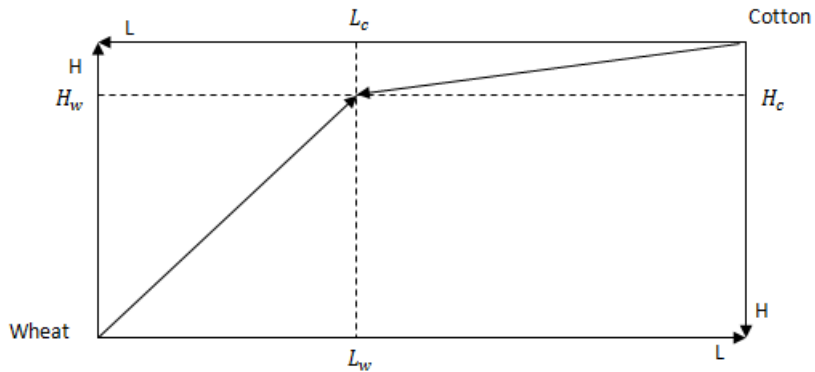
Stolper-Samuelson theorem: An increase in the relative price of a good will increase the real return to the factor used intensively in the production of that good, and will decrease the real return to the other factor.

If the world price of skilled-intensive goods increases, it will increase the relative wage of high-skilled workers. Also if the price of low-skilled-intensive goods increases, it will increase the relative wage of low-skilled workers.

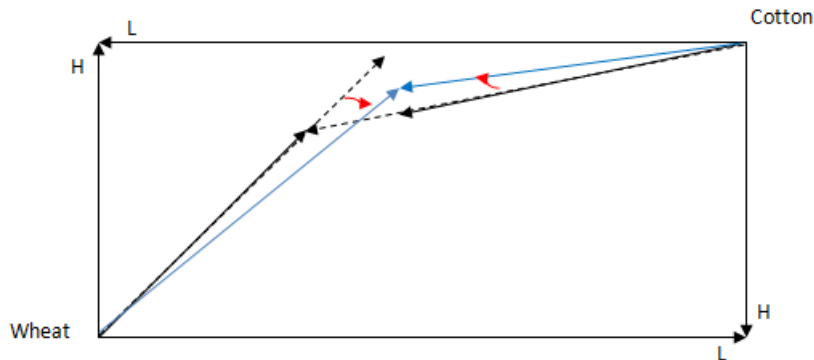
Understanding the sources of the Stolper-Samuelson theorem

- ▶ An Edgeworth box is a convenient graphical tool used to show how factors are allocated in an economy
 - The sides of the Edgeworth box show the country's factor endowment
 - The slopes of the arrows show the relative intensity of factors
 - The lengths of the arrows show the output in that sector
- ▶ There are two different Edgeworth box in the US and the ROW because their endowments are different.

Edgeworth box before free-trade



Edgeworth box after free-trade



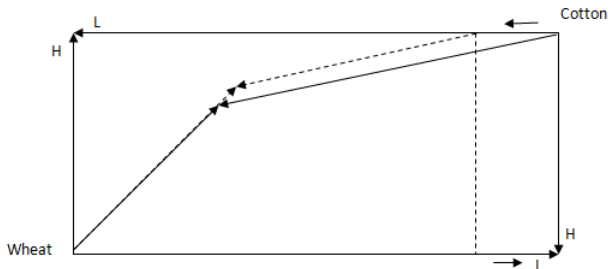
- ▶ Increasing the terms of trade reduces the relative use of the factor used intensively in the production of the comparative advantage sector.
- ▶ How can $\frac{H}{L}$ be reduced in both sectors? By increasing $\frac{w_H}{w_L}$

The Rybczynski theorem (1/3)

- ▶ What is the consequence of migration in a globalized world with free trade in goods?
- ▶ What happens to employment and which economic sector shrinks or expands?
- ▶ Suppose that low skilled labor migrates from abroad to the home economy.
 - The frame of the Edgeworth box expands horizontally
 - The height of the box remains unaltered
 - The slope of the arrows does not change

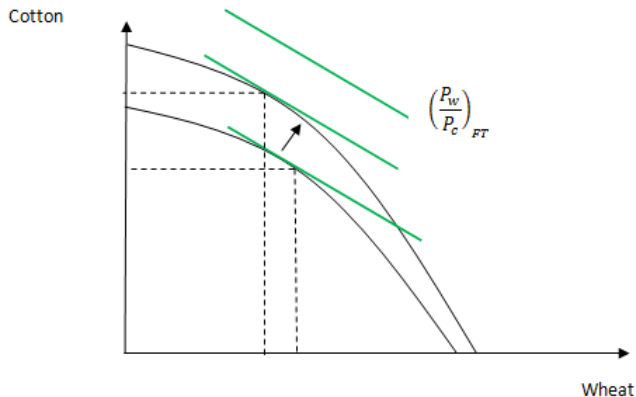
Rybczynski theorem: Given relative prices, an increase in a factor endowment will increase output in the sector that uses that factor intensively, and will decrease output in the other sector.

Rybczynski theorem (2/3)



- ▶ The Rybczynski theorem tells us that migration doesn't affect factor prices and the proportion of factor inputs but changes the location of production.
- ▶ The sector that intensively uses the migrating factor will shrink in the country from which the factor migrated but will expand in the country in which the factor migrated.

Rybczynski theorem (3/3)

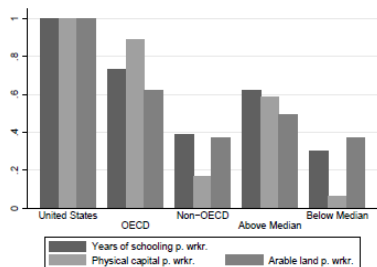


- ▶ The international trade line is not affected by migration, so it does not change the relative wage and the relative factor intensity
- ▶ But increases the production of cotton and decreases the production of wheat

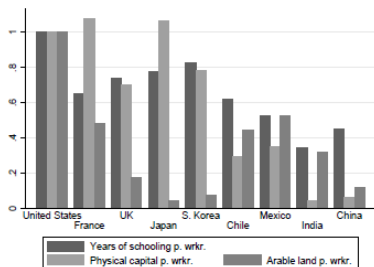
Hecksher-Ohlin theorem: What's the evidence?

- ▶ Is differences in relative factor endowments and differences in relative factor use really a source of comparative advantage?

Relative Factor Endowments by Income Group



Relative Factor Endowments by Country

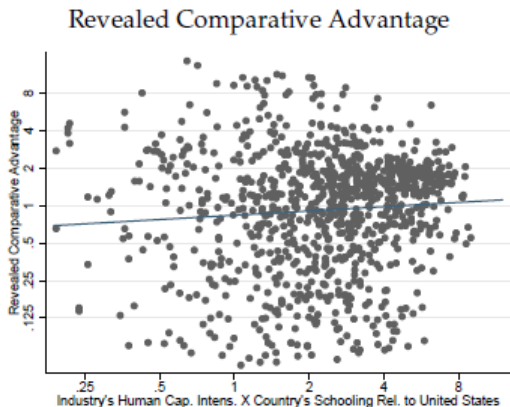


Source: Francesco Caselli (2005) based on Robert J. Barro and Jong Wha Lee (2001) and Penn World Table 6.1 (personal.lse.ac.uk/caselli/f/data/handbook2005.zip, accessed June 26, 2013).

Notes: Average years of schooling are for the country's population over 25 years old; physical capital in international (Geary-Khamis) dollars; arable land in hectares. All three endowment measures are per worker (Penn World Table 6.1) and divided by the measure for the United States. In the left panel, OECD countries exclude the United States, countries "above median" have real GDP per worker (in international Geary-Khamis dollars) at or above world median, those "below median" have strictly less. Right panel shows countries in descending order of real GDP per worker.

Hecksher-Ohlin theorem: What's the evidence?

- ▶ The HO theorem states that countries should export the good that intensively use the abundant factor in the economy.
- ▶ Is it observed in reality?



Source: Feenstra et al. (2005) trade data based on COMTRADE (1997)

Factor price equalization theorem: What's the evidence?

- ▶ The LOP implies convergence of factor prices between countries.
- ▶ The HOS model and more particularly the FPE theorem holds only if:
 - Both countries produce both goods.
 - Identical technologies across countries.
 - No barriers to trade.
- ▶ In practice the LOP fails badly → differences in transportation costs

Stolper-Samuelson theorem: What's the evidence?

- ▶ Regardless of the sector of employment, workers that have a country's relatively abundant skills will receive higher income when the economy opens to free trade.
- ▶ Workers with the relatively scarce skill will suffer a drop in real incomes from free trade and might be opposed to globalization.
- ▶ What are the solutions?
 - One way to compensate potential losers from globalization is to create a safety net against employment and income loss through the welfare state
 - help potential losers move on to better job opportunities is to offering training for new skills

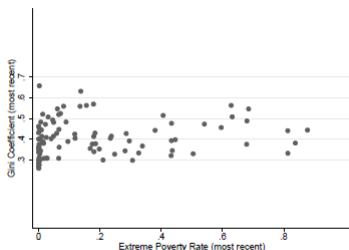
Stolper-Samuelson: Poverty and inequality (1/2)

- ▶ Poverty is conceptually distinct from inequality.
- ▶ To see how free trade in final goods may affect poverty and inequality, let's suppose that the relatively abundant production factor in a poor country earns an income around the poverty level.
- ▶ To see how free trade in final goods may affect poverty and inequality, let's suppose that the relatively scarce production factor in a poor country earns an income around the poverty level.

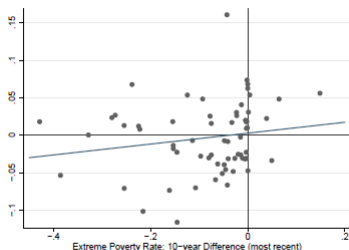
Stolper-Samuelson: Poverty and inequality (2/2)

► How does it fit to the data?

Current Inequality and Poverty Levels



Recent Inequality and Poverty Changes



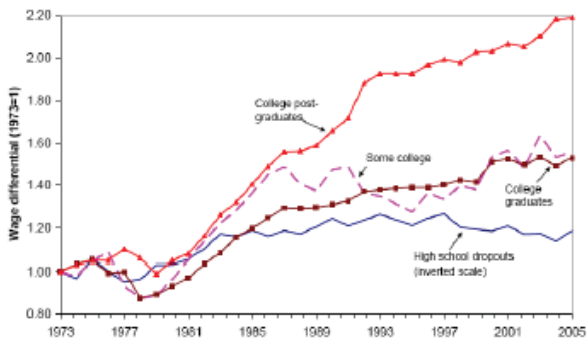
Source: World Development Indicators 2013 (data.worldbank.org/products/wdi, accessed May 2, 2013).

Notes: The extreme poverty rate is the fraction of population with income at or below US\$1.25 a day (PPP); inequality is measured with the Gini index (between 0 and 1).

- ### ► Another way to assess the Stolper-Samuelson theorem is to look how support for globalization varies between political groups in society and over time.

How is it working in the US?

US: Hourly wage differentials relative to high school graduates (men)

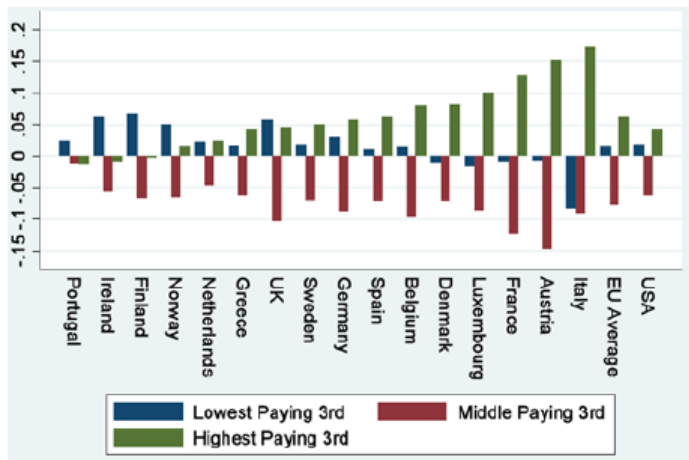


Source: Lemieux (2008)

Stolper-Samuelson theorem: What's the evidence (1/2)

- ▶ Let's now prove another aspect of the Stolper-Samuelson theorem which is the relative increase of the use of the relatively scarce factor after a positive shift of a country's terms of trade.
- ▶ The Brazilian example
 - Brazil is a relatively low-skill abundant country compared to its trading partners
 - The share of manufacturing employment by firms exporting products from Brazil increased from 45 percent to 54 percent of the country's total employment

Stolper-Samuelson theorem: What's the evidence (2/2)



Source: Goos, Manning and Salomon (2009)

	Country	Sample	Measure of offshoring	Results
Studies based on three levels of qualification				
<i>A) Effect on employment</i>				
Ekholm and Hakkala (2005)	Sweden	Industry level 1995-2003	Share of imported intermediates inputs	Negative on middle skilled workers Positive on skilled workers
Hijzen et al. (2005)	United-Kingdom	Industry level 1982-1996	Share of imported intermediates inputs	Negative on unskilled workers
Falk and Koebel (2002)	Germany	Industry level 1978-1990	Share of imported intermediates inputs	Negative on unskilled workers
Morrison and Siegel (2001)	USA	Industry level 1959-1989	Share of imports	Negative on unskilled and middle-skilled workers
Andersson and Karpaty (2007)	Sweden	Firm level 1997-2002	Share of imported intermediates inputs	Negative on middle skilled workers
Hakkala and Huttunen (2010)	Finland	Firm level 1999-2004	Share of imported intermediates inputs	Negative on low-skilled workers
<i>B) Effect on wages</i>				
Oldenski (2012)	USA	Firm level 2002-2008	Share of foreign affiliate sales in total firm's sales	Negative on workers earning the median wages
Baumgarten et al. (2010)	Germany	Industry level 1991-2006	Share of imported intermediates inputs	Negative on low-skilled and middle-skilled workers

Source: Laffineur (2014)

Rybczynski theorem: what's the evidence?

- ▶ Jose Tessada and Carolina Gonzalez-Velosa (2013) document that wheat production, which is not a labor-intensive crop, declined because more farmers were added per acre of land as a result of migration.
- ▶ Much economic evidences show that immigration has little impact on either wages or employment, just as the Rybczynski theorem predicts
- ▶ U.S. manufacturing plants invested heavily in automated machinery, and these investments happened mostly in metropolitan areas that did not receive much immigration of low-skilled labor.

Conclusion

- ▶ Differences between the Ricardian model and the HOS model
 - Two factor of productions → the distribution of income
 - Comparative advantage comes from differences in countries' endowments
- ▶ One model. Four theorems
 - Heckscher-Ohlin theorem
 - Factor price equalization theorem
 - Stolper-Samuelson theorem
 - Rybczinski theorem
- ▶ What's the evidence of the HOS model? Leontief (1953) paradox
 - US is the country with the world's highest capital-per worker ratio
 - US exports are labor intensive
 - US imports are capital intensive
 - Contradicts the theory of comparative advantage