# 14.54 International Trade
# —Lecture 9: Extensions of Ricardian Model —

# Today's Plan

1. Empirical Evidence
2. Extension 1: Non Traded Goods
3. Extension 2: Multiple Traded Goods
4. Overview Midterm

# Empirical Evidence: Do Wages Differences Across Countries Reflect Productivity Differences?

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# Empirical Evidence: Do Wages Changes Over Time Reflect Productivity Changes?

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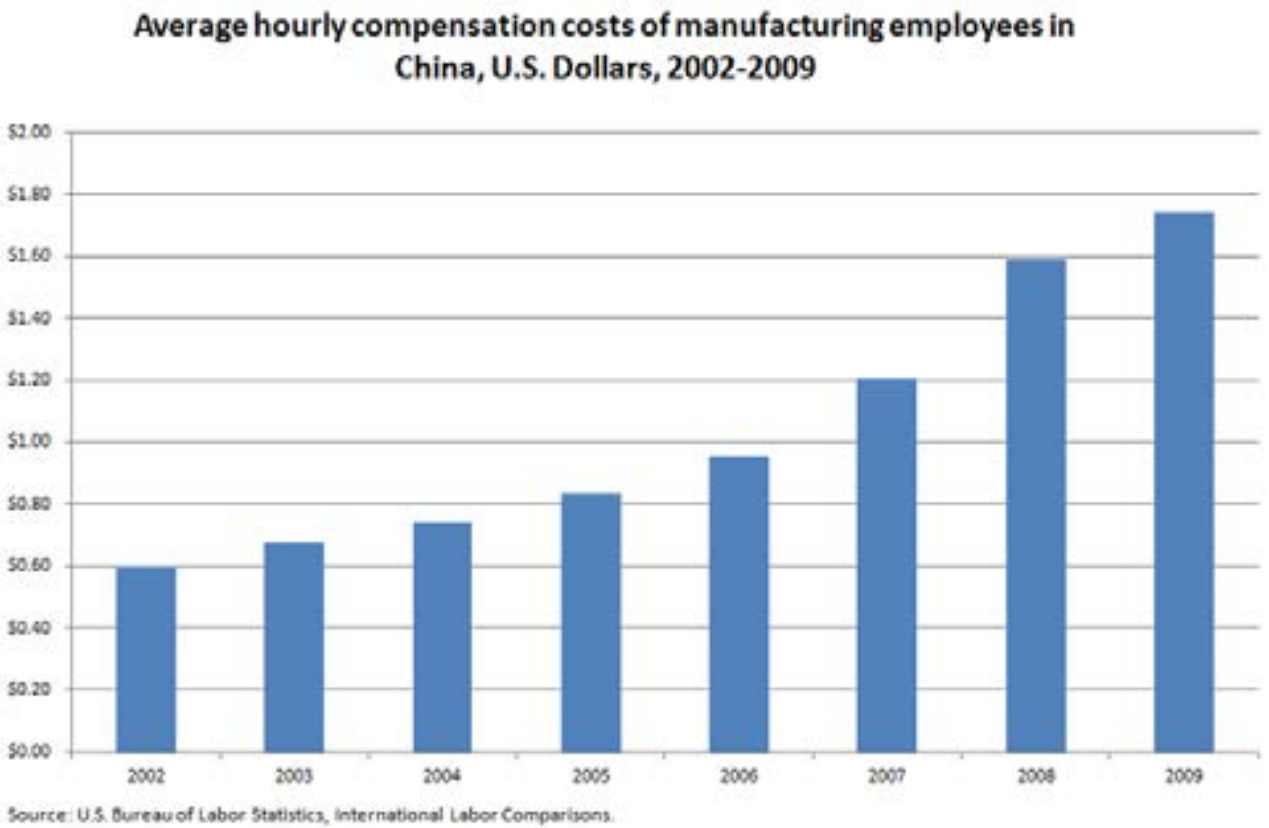
# Implications of Ricardo's Insights: Trade Between Developed and Developing Countries

- Can developed countries "compete" when trading with countries that pay substantially lower wages?
  - Ross Perot (1992 and 1996 presidential candidate) on NAFTA (debate with Al Gore on Larry King Live before passage of NAFTA): "You can't import a shirt made with 50c an hour labor without importing the wage that comes with it"
  - Donald Trump (2016 presidential candidate): "wages too high, we're not going to compete against the world"
- Why aren't all jobs moving to countries with lowest wages?
- What if foreign wages did not increase with productivity? Could a country be hurt by trading with another countries that is both more productive and pays lower wages?

# Is There Something Special About China?



# Frédéric Bastiat: "Petition of the Candle Makers" (1845)

- Addressing (satirically) French protection on imports based on their low prices relative to French production costs
- "We are suffering from the ruinous competition of a foreign rival who apparently works under conditions so far superior to our own for the production of light that he is flooding the domestic market with it at an incredibly low price"
- "We ask you to be so good as to pass a law requiring the closing of all windows, dormers, skylights, inside and outside shutters, curtains, casements, bull's-eyes, deadlights, and blinds— in short, all openings, holes, chinks, and assures through which the light of the sun is wont to enter houses, to the detriment of the fair industries with which, we are proud to say, we have endowed the country, a country that cannot, without betraying ingratitude, abandon us today to so unequal a combat."

# Do Patterns of Bilateral Exports Reflect Bilateral Differences in Relative Productivity?

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# Do Patterns of Bilateral Exports Reflect Bilateral Differences in Relative Productivity?

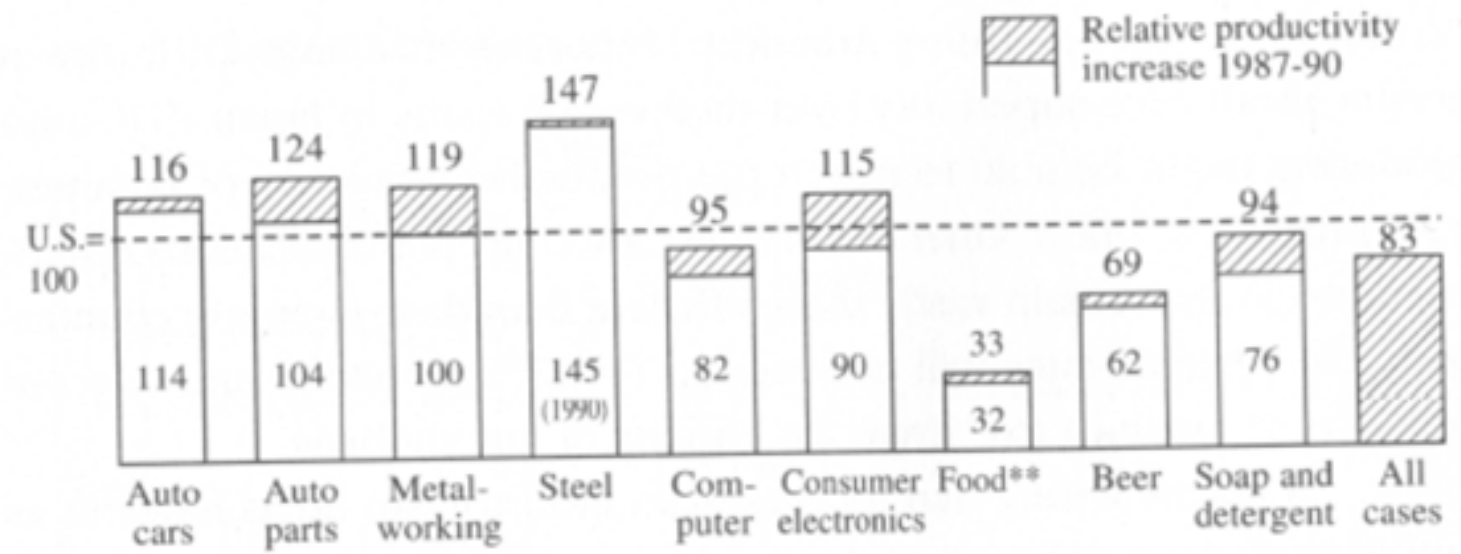


***Figure 2.1***

Relative productivity, United States and Japan, by industry, 1990. (*Source:* McKinsey Global Institute 1993, exhibit S-1.)

# Testing Ricardo's Ideas in Agricultural Markets

## Costinot and Donaldson (2012)

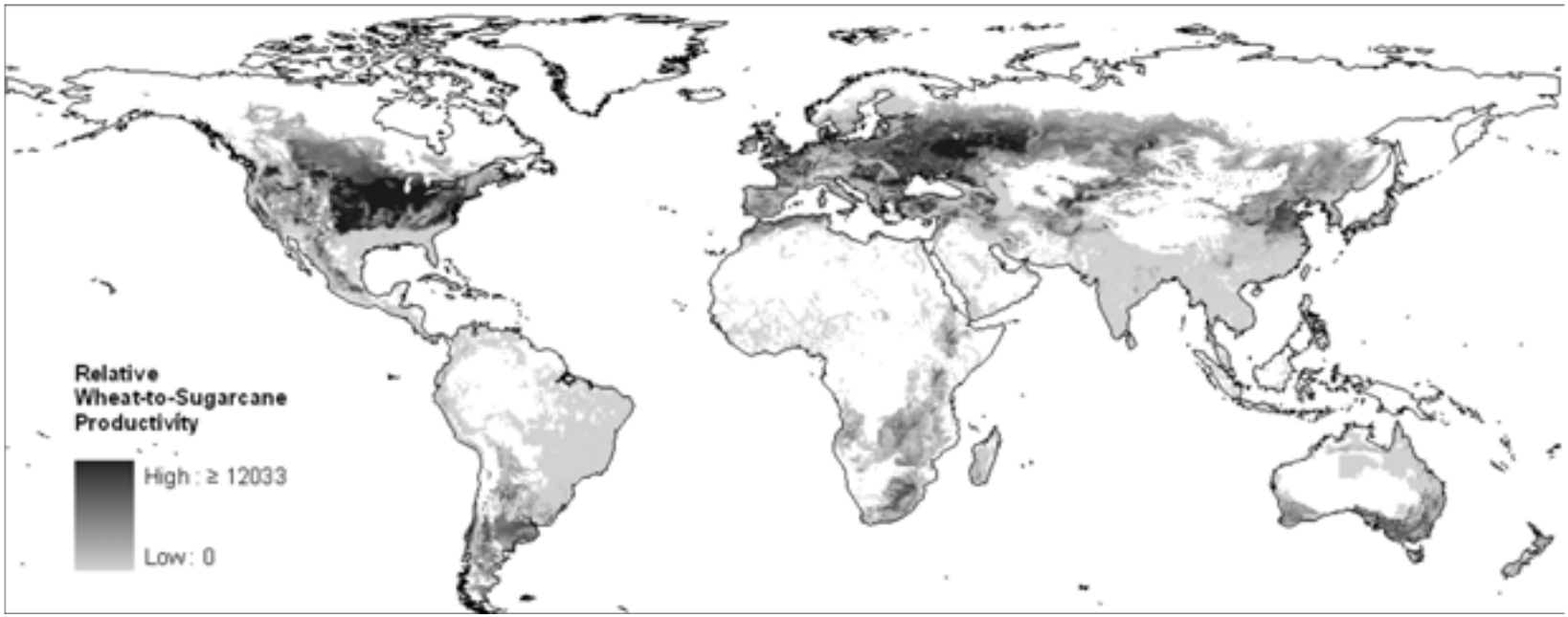


**Figure 1: An Example of Relative Productivity Differences.** Notes: Ratio of productivity in wheat (in tonnes/ha) relative to productivity in sugarcane (in tonnes/ha). Areas shaded white have either zero productivity in wheat, or zero productivity in both wheat and sugarcane. Areas shaded dark, with the highest value (">12,033"), have zero productivity in sugarcane and strictly positive productivity in wheat. Source: GAEZ project.

# Testing Ricardo's Ideas in Agricultural Markets

## Costinot and Donaldson (2012)

**Table 1: Comparison of Actual Output to Predicted Output**

| Dependent variable: | log (output) | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| log (predicted output) | 0.212*** | 0.244*** | 0.096** | 0.143** | 0.273*** |
| | (0.057) | (0.074) | (0.038) | (0.062) | (0.074) |
| sample | all | all | all | major countries | major crops |
| fixed effects | none | crop | country | none | none |
| observations | 349 | 349 | 349 | 226 | 209 |
| R-squared | 0.06 | 0.26 | 0.54 | 0.04 | 0.07 |

Notes: All regressions include a constant. Standard errors clustered by country are in parentheses. ** indicates statistically significant at 5% level and *** at the 1% level.

# Concluding Notes on Ricardian Model

- Empirically, the Ricardian model does a good job at:
  - Explaining how absolute differences in productivity translate into differences in wages
  - Explaining how relative differences in productivity determine trade flows
- But it also cannot address other important issues related to trade:
  - Distributional impact of trade in the long run
    - Some factors may be hurt by opening to trade, even in the long run
  - Comparative advantage based on differences in factor abundance (not technology differences)
  - Trade based on increasing returns to scale in production and product differentiation
    - Why do countries with very similar relative productivities engage in intra-industry trade?

# Extension 1: Non Traded Goods

# Basic Setup

- Assume that there is a set $i = 1..N$ of traded goods
  - Produced with technology $a_{Li}$
- ... and a set $k = 1..K$ of non-traded goods
  - Produced with technology $a_{Lk}$
  - These goods must be produced in each country where they are consumed (cannot be imported)
- Given world trade prices $p_i^T$ for all traded goods (assume a small open economy)
  - A country will choose to produce only the good with the highest $p_i^T / a_{Li}$
  - This determines the wage $w = p_i^T / a_{Li}$
  - All the other traded goods can be imported at a lower price ($p_j^T$) than their production cost $wa_{Lj}$
- Although the prices of traded goods are fixed and do not depend on local wages, the prices of non-traded goods $p_k$ can adjust in each country to those wages

# Determining Non-Traded Goods Prices

- Since the non-traded goods must be produced in each country, their prices must adjust to country wages: $p_k = wa_{Lk}$ (marginal cost pricing)
- Recall that the wage is determined from the price of the produced-traded good $i$: $w = p_i^T / a_{Li}$
- So $p_k = p_i^T (a_{Lk} / a_{Li})$
- The price of the non-traded goods are tied to the price of the traded good and their relative productivities

# Implications for Price and Productivity Changes

- Now assume that there are productivity gains in the traded goods sectors but not in the non-traded goods sectors
  - Empirically, productivity has increased much more rapidly in the traded goods sectors
- Assume that $a_{Li} \searrow$ and $a_{Lk} \longrightarrow$
- Then $p_k = p_i^T \ (a_{Lk}/a_{Li}) \nearrow$ by same proportion as $a_{Li} \searrow$
  - Whereas $p_i^T \longrightarrow$ (small open economy assumption)
- Why do prices of non-traded goods increase even though productivity is not changing?
  - Because wages $w = p_i^T / a_{Li}$ are rising!
- This is what has been happening to relative prices of manufacturing (mostly traded) and services (mostly non-traded) goods
- What happens to production levels $X_i$ and $X_k$?
  - Depends on substitution between $D_i$ and $D_k$
  - If $U(D_i, D_k)$ is Leontief, then $X_i$ and $X_k$ both $\nearrow$
  - If $U(D_i, D_k)$ is Cobb-Douglas, then $X_i \nearrow$ and $X_k$ remains $\longrightarrow$

# Empirical Evidence on Price and Productivity Changes

- Recall the prediction that if $a_{Li} \searrow$ and $a_{Lk} \longrightarrow$
  - ... then $p_i^T / w = a_{Li} \searrow$ while $p_k / w = a_{Lk} \longrightarrow$
- Average price of goods in terms of # of hours of work at average wage
- Televisions
  - 1971: 174 hours
  - Today: 23 hours
- Cars
  - 1908 (Ford model T): 2 years
  - Today (Ford Taurus): 8 months
- Movie Ticket
  - 1926: 19 mins
  - Today: 23 mins

# Empirical Evidence on Price Levels Across Countries

- Recall that productivity growth in traded sector ($a_{Li} \searrow$) but not in the non-traded sector ($a_{Lk} \longrightarrow$) induces an increase in the prices of the non-traded goods but no change in the prices of traded goods (prices fixed on world markets): $p_k \nearrow$ while $p_i^T \longrightarrow$
- Overall, average prices in a country experiencing productivity growth (biased towards manufacturing/traded sector) will rise
- This would also imply that more developed countries have higher average prices than developing countries (for a similar bundle of traded and non-traded goods)
- This is known as the Balassa-Samuelson effect and is strongly verified in a cross-section of countries

# Empirical Evidence on Price Levels Across Countries (Cont.)

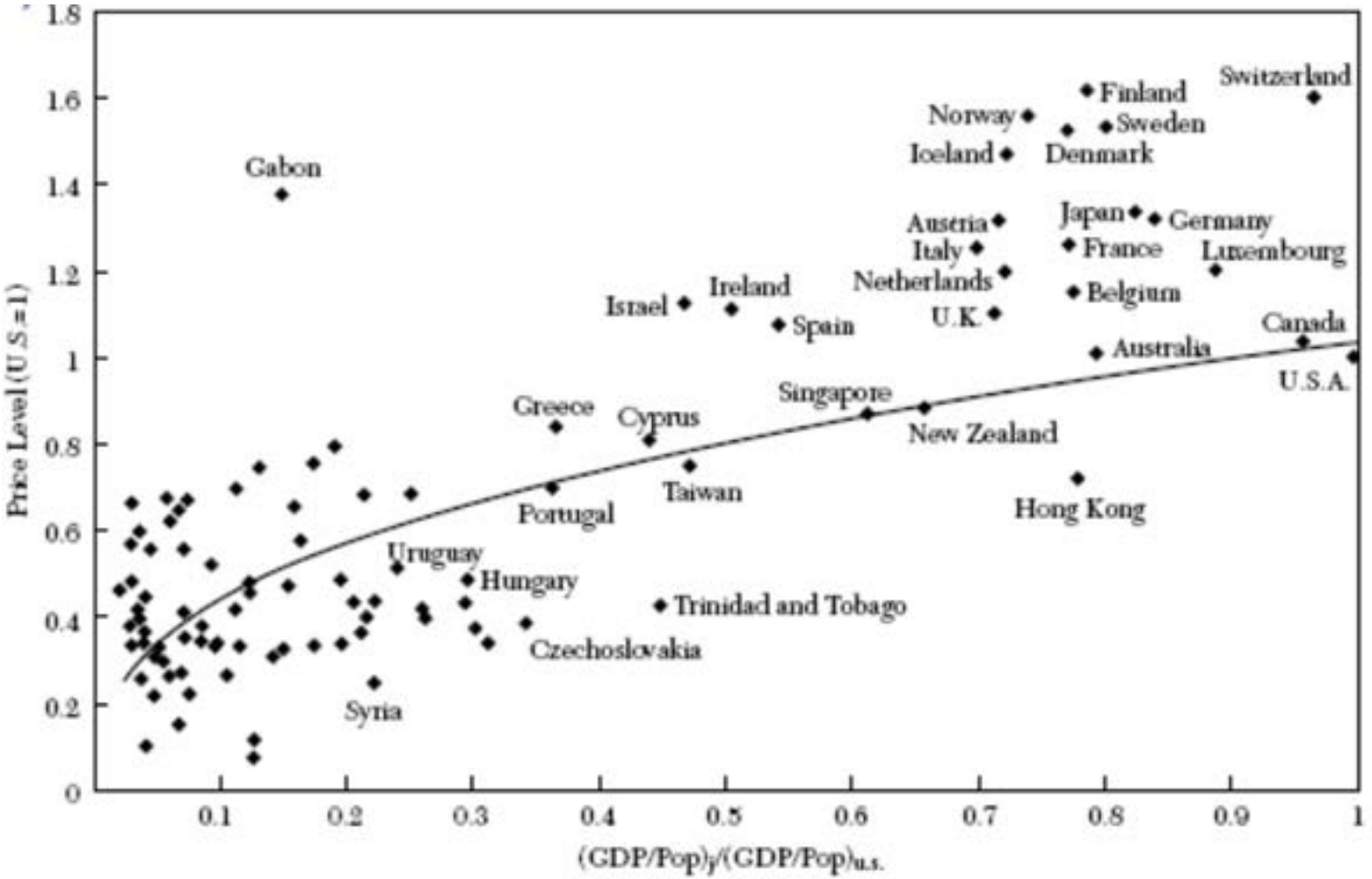


*Figure* 3. Price Level versus GDP per capita (U.S. = 1) 1990 $\log(P_j/P_{u.s.}) = \underset{(0.090)}{0.035} + \underset{(0.042)}{0.366} \log(Y_j/Y_{u.s.})$

*Source*: The Penn World Table, Aug. 1994

# Extension 2: Multiple Traded Goods

# Basic Setup

- Goods $i = 1..N$ (potentially traded)
- Two countries with technologies $a_{Li}$ and $a^*_{Li}$ for all goods $i$
- If home produces $i$ then $w = p_i / a_{Li}$
- If foreign produces $i$ then $w^* = p^*_i / a_{Li}$
- In a free-trade equilibrium, $p_i = p^*_i = p^T_i$ for all $i$
- If $wa_{Li} < w^* a^*_{Li}$ then good $i$ must be produced by Home
- If $wa_{Li} > w^* a^*_{Li}$ then good $i$ must be produced by Foreign
- If $wa_{Li} = w^* a^*_{Li}$ then good $i$ could be produced by either $H$ or $F$
- To determine the pattern of production, one need only compare $a^*_{Li}/a_{Li}$ for each good with the constant relative wage $w/w^*$:
  - If $a^*_{Li}/a_{Li} > w/w^*$ then produce $i$ in Home
  - If $a^*_{Li}/a_{Li} < w/w^*$ then produce $i$ in Foreign
  - If $a^*_{Li}/a_{Li} = w/w^*$ then produce $i$ in either Home or Foreign
- $a^*_{Li}/a_{Li}$ captures the relative productivity of Home in producing good $i$
  - The higher it is, the more Home is productive in $i$ relative to Foreign

# Numeric Example

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- The equilibrium level of $w/w^*$ determines the pattern of production
- This also determines all relative prices $p_i^T/p_j^T$ for all $i, j$
  - $p_i^T/p_j^T = a_{Li}/a_{Lj}$ if $i$ and $j$ are both produced in Home
  - $p_i^T/p_j^T = a_{Li}^*/a_{Lj}^*$ if $i$ and $j$ are both produced in Foreign
  - $p_i^T/p_j^T = \frac{wa_{Li}}{w^* a_{Lj}^*}$ if $i$ is produced in Home and $j$ in Foreign

# Derived Demand for Labor

- Given $w/w^*$, we know all relative prices $p_i^T/p_j^T$ and hence all world relative demand levels $D_i^W/D_j^W = Q_i^W/Q_j^W$ (given common homothetic preferences)
- We can then also compute the total relative amount of Home and Foreign labor ($L/L^*$) needed to produce all those relative quantities of goods
- Numeric Example:
  - If $w/w^* > 10$ then $L/L^* = 0$
  - If $w/w^* = 10$ then apples could be produced in either $H$ or $F$
    - And all other goods are produced in $F$
  - If $w/w^* = 8$ then apples are produced in $H$, and bananas can be produced in either $H$ or $F$
    - And all other goods are produced in $F$
  - And so and so on...

# Derived Demand for Labor (Cont.)

- The equilibrium $w/w^*$ is such that the derived demand for labor $L/L^*$ is equal to its fixed supply

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- Assume $i$ is produced in $H$ and $j$ in $F$: As $w/w^* \searrow$, $p_i^T/p_j^T = (wa_{Li})/\left(w^* a_{Lj}^*\right) \searrow$ and $D_i^W/D_j^W \nearrow$ so $L_i^W/L_j^W \nearrow$

# Adding Transport Costs

- Now assume that it costs $t$% of the price of a good to ship one unit from one country to the other
- If good $i$ is produced in Home, then it sells for $p_i = wa_{Li}$ in Home and can be imported at price $p_i^* = (1+t)p_i$ in Foreign (to cover transport costs)
- If $w^* a_{Li}^* < (1+t)wa_{Li}$ then Foreign would not import the good, but produce it instead
- Thus, if $w^* a_{Li}^* < (1+t)wa_{Li}$ and $wa_{Li} < (1+t)w^* a_{Li}^*$
  - Then good $i$ will be produced in both Home and Foreign
- This is equivalent to

$$\frac{1}{1+t}\frac{w}{w^*} < \frac{a_{Li}^*}{a_{Li}} < \frac{w}{w^*}(1+t)$$

- There is now a range of goods that are produced in both countries
- The higher the transport cost $t$, the more goods will become non-traded (given a difference in relative productivities)

# Topics Covered

- Lecture notes 1-9:
  - Basic facts about globalization, Endowment trade model, Standard trade model, Ricardian trade model
- Textbook:
  - Chapters 2, 3, and 6
- Reading list:
  - Krugman: "What do Undergrads Need to Know about Trade?,"
  - Deardorff and Stern: "What the Public Should Know about Globalization and the World Trade Organization,"
  - Irwin: "The United States in A New Global Economy? A Century's Perspective,"
  - Irwin: Free Trade Under Fire, Chapter 1.
  - Deardorff: "Benefits and Costs of Following Comparative Advantage,"
  - Irwin: Free Trade Under Fire, Chapter 2
  - Krugman: "Ricardo's Difficult Idea," in The Economics and Politics of International Trade
  - Krugman: "In Praise of Cheap Labor,"
  - Bastiat: "Petition of the Candle Makers"

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