

14.54 International Trade
— Lecture 7: "Standard" Trade Model (II) —
Changes in Terms of Trade

Today's Plan

- ① Changes in Terms of Trade: Small Open Economy
- ② Terms of Trade and Welfare
- ③ Changes in Terms of Trade: World Economy
- ④ Trade Protection and the Terms of Trade

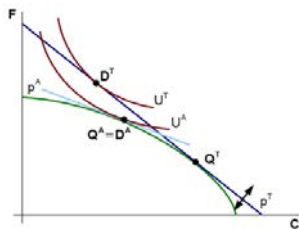
The small graphs on slides 5-9, 11, 12, 14, 25, 27-29, 31-34, 36, 39-41 were created by Marc Melitz. Used with permission.

1. Changes in Terms of Trade: Small Open Economy

Changes in Terms of Trade

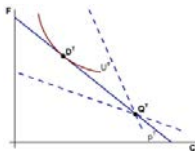
- A country is open to trade at world trade price p^T
- So, this country can be affected by changes in the rest of the world
- In a competitive model, those changes are transmitted only through their effect on p^T (and hence the country's terms of trade)
- How do changes in the terms of trade, p^T , affect a country?
- For expositional clarity, we will assume that this country exports C so that an increase in p^T represents a terms of trade increase
- We will start by looking at this impact in the short run, when production Q does not respond
- ... and then look at the long run impact when Q responds to the change in p^T

Recall the Open Economy Equilibrium



Changes in the Terms of Trade in the Short Run

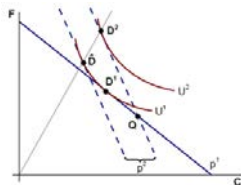
- Production remains fixed at Q^T : What happens as p^T changes?
 - Assume that changes in p^T are not so extreme that this country no longer exports C



- An increase in p^T shifts out the relevant portion of the budget constraint (and conversely for a decrease in p^T)
- $p^T \nearrow$: positive income effect. $p^T \searrow$: negative income effect

Income and Substitution Effects of Price Changes

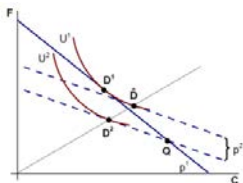
- **Case 1:** $p^T \nearrow$



- Substitution effect: $\mathbf{D}^1 \longrightarrow \widehat{\mathbf{D}}$ Income effect: $\widehat{\mathbf{D}} \rightarrow \mathbf{D}^2$
- How do D_C and D_F respond to an increase in p^T ?
 - D_F must increase (reinforcing income and substitution effects)
 - Change in D_C is ambiguous (opposite income and substitution effects)

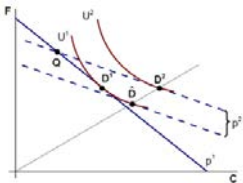
Income and Substitution Effects of Price Changes

- **Case 2:** $p^T \searrow$



- Substitution effect: $\mathbf{D}^1 \longrightarrow \widehat{\mathbf{D}}$ Income effect: $\widehat{\mathbf{D}} \rightarrow \mathbf{D}^2$
- How do D_C and D_F respond to a decrease in p^T ?
 - D_F must decrease (reinforcing income and substitution effects)
 - Change in D_C is ambiguous (opposite income and substitution effects)

What if a Country Exports F when Trade Price Decreases

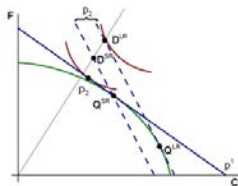


- Substitution effect of demand must go in same direction but income effect is reversed
 - D_C must increase (reinforcing income and substitution effects)
 - Change in D_F is ambiguous (opposite income and substitution effects)

Income and Substitution Effects: Summary

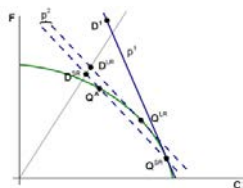
- Substitution effect:
 - $p^T \nearrow$ then $D_C \searrow$ and $D_F \nearrow$ (and conversely when $p^T \searrow$)
- Income effect: Depends on good that is exported
 - If relative price of export good rises (terms of trade improvement)
 - Then D_C and D_F both increase (positive income effect)
 - If relative price of import good rises (terms of trade deterioration)
 - Then D_C and D_F both decrease (negative income effect)

Long Run Effects of Increase in Terms of Trade



- No change in substitution effect
- Positive income effect is reinforced by response in production

Long Run Effects of Decrease in Terms of Trade

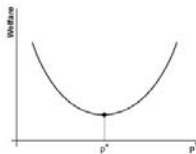


- No change in substitution effect
- Negative income effect is lessened by response in production
- Note that overall welfare effect is still negative
 - Welfare effect of production response can never overturn direction of income effect (unless pattern of trade is reversed)

2. Terms of Trade and Welfare

Terms of Trade and Welfare

- A decrease in the terms of trade will induce a welfare loss until the autarky point is reached



- Very large changes in p^T can reverse the pattern of trade (and hence the direction of the income effect)
- Empirically, this type of change can only occur over a span of many years

Quantitative Effect of Terms of Trade Changes on Welfare

- Empirically, how large are the welfare effects driven by changes in terms of trade?
- How much have developed countries been hurt by increased trade with developing countries?
 - Fear: as developing countries industrialize, world supply of manufactured goods exported by developed countries increases and drives down the relative price of those goods
- Question 1: Empirically, how big are changes in the terms of trade?

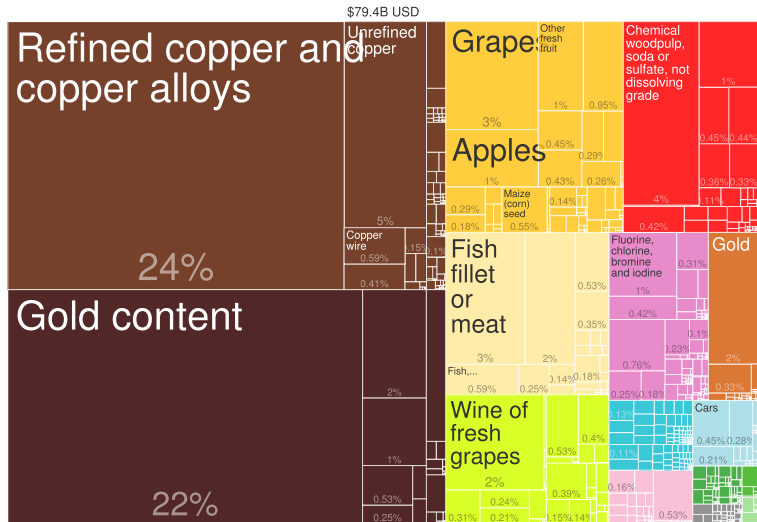
Changes in the Terms of Trade for Developed Economies

Table 5-1 from *International Economics* removed due to copyright restrictions.

Changes in the Terms of Trade for Primary Products

Figure 2-12 from *International Macroeconomics* removed due to copyright restrictions.

Take Chile (in 2013)

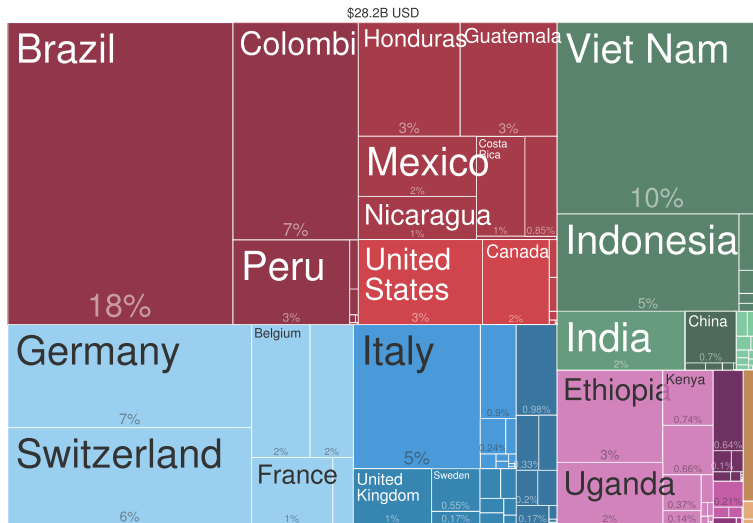


Courtesy of AJG Simoes, CA Hidalgo. The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development. Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence. (2011) Used with permission.

Changes in the World Price of Coffee

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Who Are the Big Coffee Exporters?



Courtesy of AJG Simoes, CA Hidalgo. The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development. Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence. (2011) Used with permission.

Quantitative Effect of Terms of Trade Changes on Welfare

- Question 1: Empirically, how big are changes in the terms of trade?
- Question 2: Quantitatively, how do changes in terms of trade translate into changes in welfare?
- Mathematical postscript to textbook shows how to derive changes in welfare (measured in terms of 'real' income) as a function of changes in the terms of trade:

$$\begin{aligned}\Delta \text{Welfare } (\$) &= \text{Value of Trade } (\$) \times \% \Delta p^T \\ \Leftrightarrow \Delta \frac{\text{Welfare}}{\text{GDP}} &= \frac{\text{Trade}}{\text{GDP}} \times \% \Delta p^T\end{aligned}$$

Note: Value of trade is value of balanced exports or imports (not the sum)

Quantitative Effect of Terms of Trade Changes on Welfare (cont.)

- Recall:

$$\Delta \frac{\text{Welfare}}{\text{GDP}} = \frac{\text{Trade}}{\text{GDP}} \times \% \Delta p^T$$

Note: Value of trade is value of balanced exports or imports (not the sum)

- Developed countries:**

- Trade is 20% of GDP (on average, lower for U.S.) and changes in terms of trade are less than 1% per year
- Welfare effect of TOT: $20\% \times 1\% = .2\%$ GDP (max)

- Developing countries (big exporters of primary products)**

- Trade can be 20-50% of GDP and changes in terms of trade can be 10-25% per year
- Welfare effect of TOT: 2%-12.5% of GDP
- Nonetheless, recall that TOT shocks can never reduce welfare below autarky levels

How Do Exports and Imports Respond to Changes in Trade Price?

- Assume that a country exports C and p^T increases (TOT increase)
- Demand: $D_F \nearrow$ and $D_C \searrow$ or \nearrow (if income effect dominates)
- Production: $Q_C \nearrow$ and $Q_F \searrow$ (movement along PPF)
- Implications for trade:
 - $D_F \nearrow$ and $Q_F \searrow$ so $IM_F = D_F - Q_F \nearrow$
 - $D_C \searrow$ or \nearrow and $Q_C \nearrow$
 - Change in $EX_C = Q_C - D_C$ is ambiguous, though $EX_C \nearrow$ is the typical case
- Summary:
 - Import demand curves are always downward sloping
 - Export supply curves are typically upward sloping but can be backward bending when the income effect from a price change is very large (dominates both the substitution effect in consumption and the production response)

3. Changes in Terms of Trade: World Economy

What Drives Changes in World Prices?

- Changes within a country can only affect world prices when that country is a large exporter or importer of a good (relative to the rest of the world)
- If a country is relatively small, then changes in that country will not affect world prices
 - **Small open economy:** affected by changes in p^T but no feedback effect to p^T
- In general, equilibrium p^T is affected by changes in RD^W or RS^W

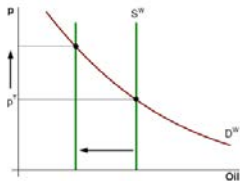


Changes in World Relative Demand

- Driven by changes in consumer tastes or by changes in income per capita (if preferences are not homothetic)
- If changes are driven by increases in income per capita, then this will tend to benefit the terms of trade for developed countries (and hurt the terms of trade for the poorest countries)
- Empirically, the evidence for such terms of trade changes are limited
- Especially relative to the large effects of changes in world relative supply
 - These changes are quantitatively much larger than shifts in demand

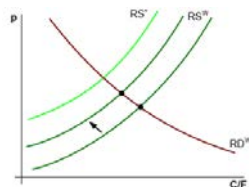
Changes in World Relative Supply

- Example 1: Imperfect competition
- OPEC cartel increases world price of oil by reducing world supply



Changes in World Relative Supply (Cont.)

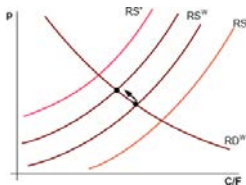
- New countries 'open up' to international trade



- Recall that this country must be large relative to the rest of the world

Changes in World Relative Supply: Country Growth

- Assume that foreign is growing
- First assume that growth is unbiased so RS^* is unaffected by growth:



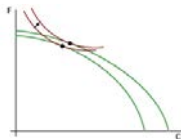
- Unbiased growth will decrease foreign's terms of trade and increase home's terms of trade

Changes in World Relative Supply: Country Growth (Cont.)

- What if growth is biased?
- If growth is biased towards the export good, then terms of trade effects are reinforced
- If growth is biased towards the import good, then the bias of growth works against the terms of trade effect
 - The bias could be so extreme that the terms of trade of the growing country improve

Welfare Effects of Growth on Growing Country

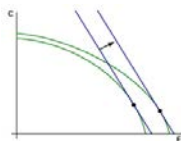
- Two effects:
 - Positive direct effect of growth (shift out of PPF)
 - Secondary effect through changes in terms of trade (if country is large)
- If a country is closed to trade, then only positive direct effect is present:



- This effect is irrespective of any bias of growth

Welfare Effects of Growth on Growing Country: Small Open Economy

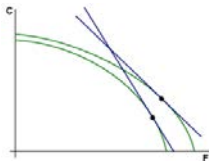
- Similarly, a growing small open economy will also only experience the positive direct effect from growth



- Note that the budget set for the aggregate consumer must shift out
- Again, this effect is irrespective of any bias of growth

Welfare Effects of Growth on Growing Country: Large Open Economy

- Growth will now affect terms of trade:

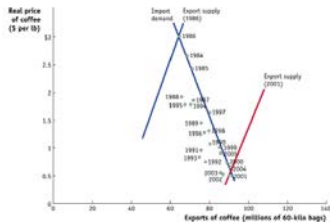


- If growth induces large decrease in terms of trade, it is then possible (but not likely) that the negative welfare effect from the terms of trade decrease dominates the positive direct effect from growth
 - This is called immiserizing growth

Immiserizing Growth

- This is an extreme case, but is nevertheless possible for very large exporters of primary goods
- When is immiserizing growth more likely to occur?
 - When growth is biased towards the export good
 - When relative demand is very inelastic (very little substitution between export good and other goods)
 - Then changes in export supply can have large effects on relative prices

Back to Coffee



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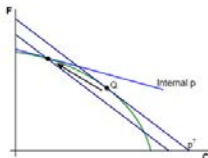
4. Trade Protection and the Terms of Trade

Import Restrictions and Subsidies

- An import restriction (import tariff or other barrier) or export subsidy induces different prices inside the country relative to the world trade prices
 - Both the import tariff and the export subsidy will raise the internal price of a good:
 - An import tariff on C (for a C importer) or an export subsidy on C (for a C exporter) raises p_C / p_F inside the country relative to p^T
 - Note the difference between an export subsidy and a production subsidy (which would lower the relative price of a good)
- If a country is small relative to the world, then this trade restriction will not induce any changes in RD^W or RS^W and hence in p^T
 - So only internal relative prices change

Import Barrier in a Small Open Economy

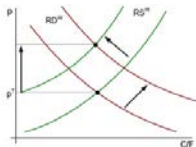
- Consider a small importer of F considering an import tariff on F
- ... which would lower p_C / p_F inside the country but would not affect p^T
- ... and shift demand from F to C and supply from C to F inside the country



- Such a restriction must generate welfare losses
- Similarly, an export subsidy will also generate welfare losses

Import Barrier in a Large Economy

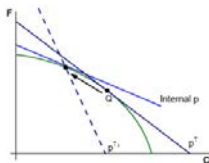
- Now consider a large importer of F considering an import tariff on F
- This will lower p_C/p_F inside the country and also will affect p^T
- The lower internal p_C/p_F will shift demand from F to C and supply from C to F inside the country
- Since this country is large, this will also affect RD^W and RS^W



- This generates a terms of trade improvement for the country

Import Barrier in a Large Economy: Welfare Effects

- The inefficiency from the distortion of the internal relative price still induces a negative welfare effect
- But this effect must now be weighed against the positive terms of trade effect



- For a 'small' tariff, the positive welfare effect from the terms of trade will dominate and welfare will rise but the effect is reversed for a 'large' tariff

Optimal Tariff for a Large Economy

- Welfare is maximized for a large economy by setting a small import tariff
- However, this welfare gain comes at the expense of all the other countries in the world
- ... and reduces world welfare
- Retaliation by other large countries would then make all countries worse off

- For a large economy, export subsidies are even more detrimental to welfare than for the small economy
 - Because the export subsidy generates a decrease in the large country's terms of trade
 - An export subsidy on C by a large C exporter will shift in RD^W and shift out RS^W

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