Solution to Homework 1

Gains from Trade and The Ricardian Trade Model

ECO-13101 Economia Internacional I (International Trade Theory)*

Question 2: Basics of Ricardian Model

1. The opportunity cost of cheese in terms of wine is given by:

   Home: $\frac{a^h_{LC}}{a^h_{LW}} = \frac{1}{2}$,

   Foreign: $\frac{a^f_{LC}}{a^f_{LW}} = \frac{6}{3} = 2$.

2. Since the world price ratio is $p^*_C/p^*_W = 1$, the price of cheese relative to wine, as captured by the opportunity cost of cheese in terms of wine, is lower in home than in foreign. Therefore, home will specialize in cheese and foreign will specialize in wine. Since production functions are CRS with only one factor of production countries will specialize completely.

3. Given the pattern of specialization, the wage in each country is given by

   Home: $a^h_{LC} w^h = p^*_C \Rightarrow w^h = 12$,

   Foreign: $a^f_{LW} w^f = p^*_W \Rightarrow w^f = 4$.

   Therefore, the wage of home relative to that of foreign, $w^h/w^f = 3$. Notice that home is 6 times as productive as foreign in cheese, but only 1.5 times as productive in wine.

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It is because the relative wage is between the relative productivities that each country ends up with a a cost advantage in one good. Because of its lower wage, foreign has a cost advantage in wine, even though it has lower productivity. Home has a cost advantage in cheese, despite its higher wage rate, because the higher wage rate is more than offset by its higher productivity.

Question 3: Incomplete Specialization Due to Trade Costs

1. The cost of producing one unit of good i in country j is given by $w_j\alpha_i^j$.
   Then the cost of transporting this one unit of good i from country j to the other country is $(1+D)w_j\alpha_i^j$. As the hint says in the question, a country imports a good if importing it is cheaper than producing it in that country. Therefore,
   (a) Good i is imported by country h if $w_h\alpha_i^h > (1+D)w_f\alpha_i^f$
   (b) Good i is imported by country f if $w_f\alpha_i^f > (1+D)w_h\alpha_i^h$
   (c) Good i is not traded if neither country imports it, which happens if $w_h\alpha_i^h < (1+D)w_f\alpha_i^f$ and $w_f\alpha_i^f < (1+D)w_h\alpha_i^h$
2. We use these rules to compare the costs of production with the costs of importing.

Table 1: Pattern of Trade

Good (i)	α_i^h	α_i^f	$w_h\alpha_i^h$	$w_f\alpha_i^f$	$(1+D)w_f\alpha_i^f$	$(1+D)w_h\alpha_i^h$	Status
Guns	1	10	3	10	20	6	Imported by f
Wheat	5	40	15	40	80	30	Imported by f
Cotton	3	12	9	12	24	18	Not Traded
Cars	6	12	18	12	24	36	Not Traded
Diamonds	12	9	36	9	18	72	Imported by h

Question 4: Multiple Goods and Pattern of Trade

1. A country exports the good if it produces it at a lower cost than the other country. Home country requires α^h units of labor to produce one unit of the good. Therefore, the cost of producing one unit of the good in home country is $w_h\alpha^h$. Similarly, the cost of producing one unit of the good in foreign country is $w_f\alpha^f$. Therefore,

   (a) Home country exports the good if

   $$w_h\alpha^h < w_f\alpha^f \Rightarrow \frac{w_h}{w_f} < \frac{\alpha^f}{\alpha^h} \quad .$$

   (b) Foreign country exports the good if

   $$w_f\alpha^f < w_h\alpha^h \Rightarrow \frac{w_h}{w_f} > \frac{\alpha^f}{\alpha^h} \quad .$$

2. Given that

   $$\alpha_i^h = \frac{i}{Z_h} \quad ,$$
   $$\alpha_i^f = \frac{(100-i)}{Z_f} \quad ,$$

   where $i = 1, 2, 3, \ldots, 97, 98, 99$, we have that

   $$\frac{\alpha_1^f}{\alpha_1^h} > \frac{\alpha_2^f}{\alpha_2^h} > \frac{\alpha_3^f}{\alpha_3^h} > \ldots > \frac{\alpha_{97}^f}{\alpha_{97}^h} > \frac{\alpha_{98}^f}{\alpha_{98}^h} > \frac{\alpha_{99}^f}{\alpha_{99}^h} \quad .$$

   Thus, all we need to find is the good for which $w_h/w_f = \alpha^f/\alpha^h$. Let us call this good M. Then all goods for which $i < M$, we will have that

   $$\frac{\alpha_i^f}{\alpha_i^h} > \frac{\alpha_M^f}{\alpha_M^h} \Rightarrow \frac{\alpha_i^f}{\alpha_i^h} > \frac{w_h}{w_f} \quad ,$$

   which implies that these goods will be exported by home country. By the same logic, all goods for which $i > M$, we will have that

   $$\frac{\alpha_i^f}{\alpha_i^h} < \frac{\alpha_M^f}{\alpha_M^h} \Rightarrow \frac{\alpha_i^f}{\alpha_i^h} < \frac{w_h}{w_f} \quad ,$$

   which implies that these goods will be exported by foreign country. Good M will be exported by home or foreign country.

   Given the values of w_h and w_f, $w_h/w_f = 1$. Therefore, good M is the good for which $\alpha^f/\alpha^h = 1$, which implies that

   $$\frac{\frac{(100-M)}{Z_f}}{\frac{M}{Z_h}} = 1 \quad .$$

Substituting $Z_h = Z_f = 1$, we solve for the value of M, and we get $M = 50$. This means that goods 1 to 49 will be exported by home country and goods 51 to 99 are exported by foreign country. Let us assume that the 50^{th} good is also exported by home country.

3. With $w_f = 0.25$ and $w_h = 1$, $w_h/w_f = 4$. Then good M is the good that satisfies the following relation:

$$\frac{\frac{(100-M)}{Z_f}}{\frac{M}{Z_h}} = 4 \quad .$$

With $Z_h = Z_f = 1$, now we get that $M = 20$. Therefore, goods 1 to 19 are exported by home and goods 21 to 99 are exported by foreign. We will assume that home country exports the 20^{th} good. Thus we see that foreign country exports a larger fraction of the goods. This is because the cost of labor in foreign country, i.e wage rate w_f, is much lower due to an increase in the labor supply. Thus, foreign country becomes the cheapest producer for a larger fraction of goods.

4. Due to technological improvements, the productivity level of the home country increases to $Z_h = 3$, which means that the home country will require fewer units of labor to produce one unit of any good i. We identify good M in this scenario, keeping everything else unchanged, i.e. $w_h = w_f = 1$ and $Z_f = 1$. This will mean that

$$\frac{\frac{(100-M)}{Z_f}}{\frac{M}{Z_h}} = 1 \quad .$$

Substituting the values of Z_h and Z_f, we get that $M = 75$. Therefore, now home country will export goods 1 to 74 and foreign country will export goods 76 to 99. We will assume that home country exports the 75^{th} good. In this case home country exports a larger fraction of goods. An increase in Z_h results in a decline in the unit labor requirement of all goods (i.e. decline in $\alpha_i^h \ \forall \ i$). Since every goods requires fewer units of labor, with the same wage rate ($w_h = 1$), the cost of producing one unit of any good is now lower. Thus, home country becomes the cheaper producer for a larger fraction of the goods.

Question 5: Importance of Trade in Mexican Economy

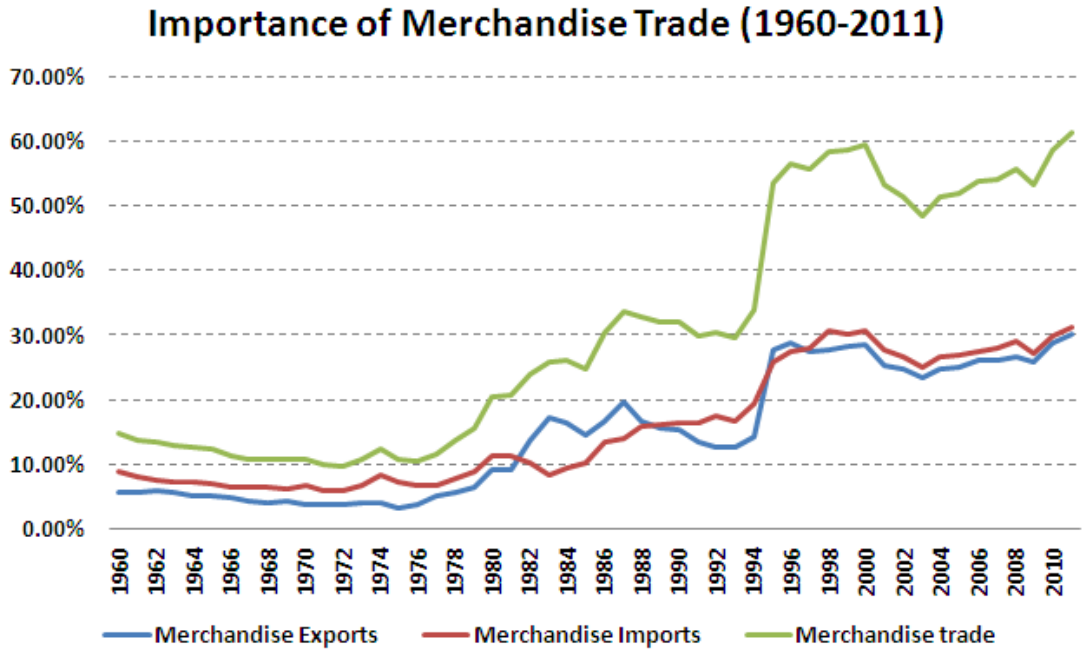


Figure 1: Merchandise Exports, Imports and Total Trade as ratio of GDP for Mexico

Table 2: Average Merchandise Exports, Imports and Trade-to-GDP ratios

	Avg. 1960-93 (in %)	Avg. 1994-2011 (in %)	% Change
Merchandise exports-to-GDP ratio	8.86	26.19	196
Merchandise imports-to-GDP ratio	9.82	27.74	183
Merchandise Trade-to-GDP ratio	18.67	53.93	189

1. From Figure 1 it is clear that NAFTA lead to a big increase in the importance of trade - exports, imports and total trade (exports plus imports) - as a fraction of GDP.

2. Table 2 shows that average merchandise exports, imports and total trade-to-GDP ratios are much higher in the post-NAFTA period (1994-2011) then in the pre-NAFTA period (1960-93). The percentage increase in these averages from the pre to the post-NAFTA period is almost as high as 200%.

3. Figure 2 shows the evolution of trade in services - exports, imports, and total trade in services (exports plus imports). The importance of trade in services - exports, imports, and total trade in services - has declined over time especially after late 1970s. Moreover, as compared to mershandise trade, services trade is significantly smaller (less than 10%

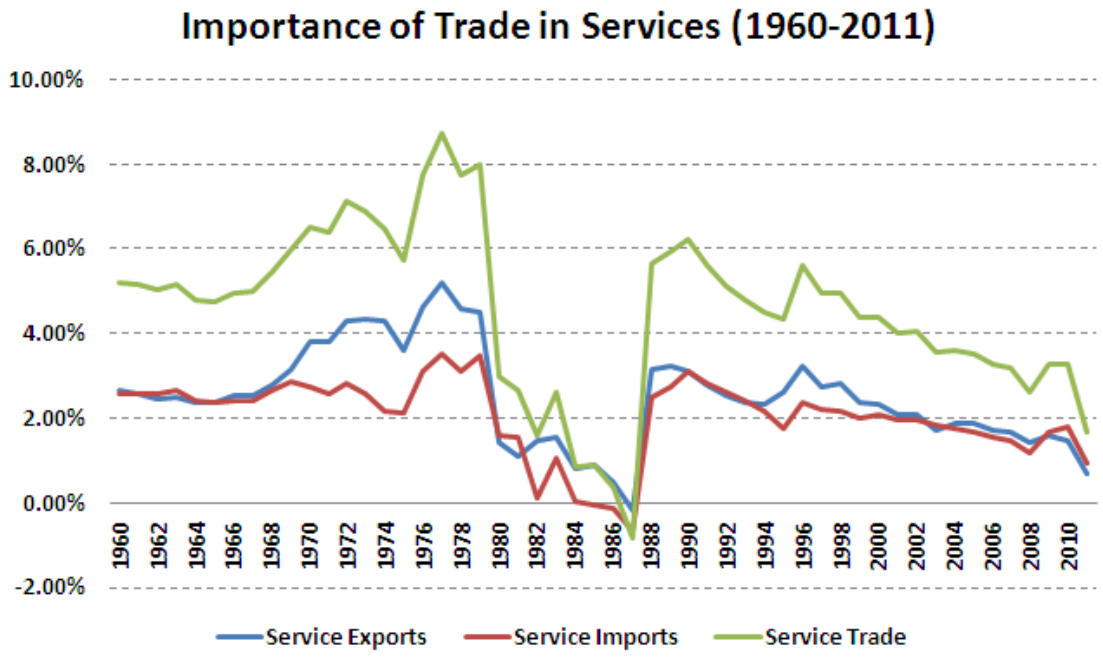
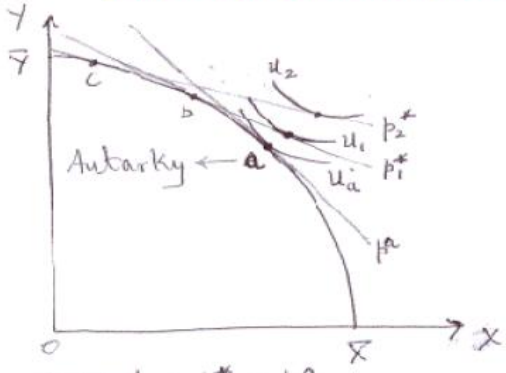


Figure 2: Services Exports, Imports and Total Trade as ratio of GDP for Mexico

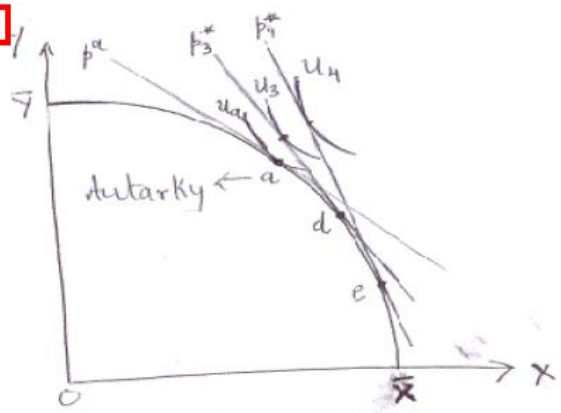
of GDP). Interestingly, for a brief period of time - 1985 to 1987 - exports, imports and total trade in services turned negative. This is simply because the exports, imports and total trade in goods and services during these years is smaller than the merchandise exports, imports and total trade. This points to a problem with the data.

Answer to Question 1 of Homework 1

(a)



Case 1: $p^* < p^a$



Case 2: $p^* > p^a$

In both cases, the more p^* deviates from p^a the higher is the utility level attained by the country.

(b) Consider a concave production possibility set OR a convex production possibility frontier. What we want to show is that there exists a price ratio, p^*, which is not equal to the autarky price ratio, p^a, at which the country obtains a lower utility level than in autarky.