# Assignment 1

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International Trade I at ITAM

1. **Patterns of trade (Data part)**

   (a) This exercises is meant to show the importance of trade in the Mexican economy. To proceed, go to the World Bank's World Development Indicators database[1]. For Mexico, download data on GDP (current US $), Merchandise exports (current US$), Merchandise imports (current US$), Exports of goods and services (current US$), and Imports of goods and services (current US$).

      i. Plot the ratio of Merchandise exports to GDP, Merchandise imports to GDP, and ratio of Merchandise trade (sum of merchandise exports and merchandise imports) to GDP on the same graph. How does the impact of NAFTA show up in this graph?

      ii. Compute the average of the three ratios above for 1960-1993 and 1994-2011. How large is the 1994-2011 average relative to the 1960-1993, i.e. how has the importance of merchandise exports, imports and trade changed between these two time period?

      iii. Compute (i) Exports of services as Exports of goods and services minus Merchandise exports to GDP, (ii) Imports of services as Imports of goods and services minus Merchandise imports, and (iii) Trade of services as Trade of good and services (sum of exports of goods and services and imports of goods and services) minus Merchandise trade (sum of merchandise exports and merchandise imports). Plot Exports of services to GDP ratio, Imports of services to GDP, and Trade of services to GDP? Explain how export,

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[1]The relevant data can be downloaded at http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators

import and trade in services relative to GDP has changed over time? What does this tell you about importance of services in Mexico's trade with the world? Is there something odd going in the graph?

(b) In this exercise we explore what does Mexico import and export in the world markets. To analyze this question go to the World Integrated Trade Solutions (WITS) webpage[2] and create your account (username and password). Once you login, under 'Advanced Query' select 'Trade Data (UN Comtrade)'. Fill out 'Query Name', 'Query Description', choose 'Comtrade' as Data Source and then press 'Proceed'. On the next page do the following: (1) for Reporters select Mexico; (2) under Products choose SITC Revision 3 as the 'Nomenclature', and then from 'Clusters' choose ALL3 – Group (3-digit); (3) for Partners choose World; (4) for Years choose 1993 and 2007; (5) for Trade Flows choose Exports and Imports. When you download the data you will have the option to select a file format (excel or csv is best), and also an option to add more columns. You should add 'Product Description' to Selected Columns. Then Download the data.

i. Rank the commodity groups, highest to lowest, according to their share in total exports in year 1993. Do the same for 2007. List the top 10 exported commodities of 1993 and compare their rank in 1993 with their rank in 2007. What are the top 10 exported commodities of 2007, and how does their 2007 rank compare with their 1993 rank. How has NAFTA affected the export composition of Mexico?

ii. Now do the exercise of the previous part for imports. How has NAFTA affected the import composition of Mexico?

iii. For each commodity group compute the percentage change in exports from 1993 to 2007. Rank them highest to lowest in terms of percentage change. What are the top 10 commodities that experienced greatest growth in exports? Now, repeat the exercise for imports.

iv. Make a scatter plot with share in total exports in year 1993 on the x-axis and the percentage change in exports from 1993 to 2007 on the y-axis. Interpret what you see in this graph. Compute the correlation between the share in total exports in year 1993 and the percentage change in exports from 1993 to 2007 across commodity groups.

[2]Which can be found on https://wits.worldbank.org/WITS/

v. Repeat the exercise of the previous part for imports.

2. **Export and import wedges (check the appendix for additional definitions and concepts)**

(a) This problem set is geared to get you to think about how to diagnose the source of movements in international trade. Obtain data from the OECD national quarterly accounts for GDP (Y), consumption (C), government spending (G), investment (I), exports of goods and services (EX), imports of goods and services (M) for the US, Canada, and Mexico[3]. Get nominal and real variables. There is data starting in 1993/4 for Mexico and going further back for the US and Canada.

i. Construct the import wedges using final demand, consumption, and gross fixed capital formation (use an HP filter with a smooth parameter of 1600 to detrend quarterly data). As you change the measure of demand make sure to adjust the relative price being used. Plot these measures around the great recession and another key recession (US 2001, Canada 2000, Mexico, 1995).

ii. Discuss some interpretations of the different behavior of the import wedge for Argentina and Mexico in their devaluations.

3. **Heckscher-Ohlin (theoretical part)**

(a) Consider a world with 2 countries home ($h$) and foreign ($f$). Both countries produce final goods $x$ and $y$ using the following technologies ($i = h, f$):

$$\begin{aligned} x_i &= z_{xi} k_{ix}^{\alpha} l_{ix}^{1-\alpha} \\ y_i &= z_{yi} k_{iy}^{\beta} l_{iy}^{1-\beta} \end{aligned}$$

where $\beta > 0$, $\alpha > 0$, $\beta > \alpha$ and $k, l$ are factors of production. Assume that these factors of production are perfectly mobile across sectors.

i. Under autarky, set up firms maximization problem and obtain the first order conditions for countries $i = h, f$.

[3]The relevant data can be downloaded at http://stats.oecd.org

ii. Using the first order conditions, express the capital-labor ratio of each sector as a function of the ratio of the wage rate and rental rate of capital $(w_i/r_i)$.

iii. Under the same assumptions what are the equilibrium price ratios $p_{xi}/p_{yi}$ as a function of the ratio of the wage rate and rental rate of capital?

iv. What forces explain the differences in comparative advantage between these two countries?

v. Under free trade and when both countries produce both goods, will factor price equalization hold? Why or why not?

# Appendix - Import wedges

This note describes an approach to diagnose the source of cyclical and long-run movements in international trade by constructing trade wedges (or trade costs). Wedges in macroeconomics have become popular since the accounting methodology proposed by Chari, Kehoe, and McGrattan (2007). The wedges essential accounts for the difference between what is observed in the data and predictions from a prototype macro model on key variables such as consumption, investment, labor supply, imports, and exports. A large gap between the data and theory implies a a large wedge. This can be indicative of With particular interest in international economics, trade wedges are useful for identifying the movements in trade that are unusual from either a historical or theoretical perspective. Levchenko, Lewis, and Tesar (2010), Eaton, Kortum, Neiman, and Romalis (2011), Alessandria, Kaboski, and Midrigan (2013) are different examples that use this approach.

A large class of international trade models have an Armington (1969) structure. These models imply consumption problem where consumers value goods produced in both the home and foreign economy accordingly to a constant elasticity of substitution utility function[4]:

$$U_t = \left(\alpha^{1/\sigma} X_t^{\frac{\sigma-1}{\sigma}} + \alpha_m^{1/\sigma} X_{t,m}^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}$$

where $x_t$ is consumption of goods produced at home at time $t$ and $x_{t,m}$ for goods produced abroad. Assuming prices $P_h$ and $P_f$ and the consumer solves a simple minimization problem of $P_{t,h}X_{t,h} + P_{t,m}X_{t,m} = P_tY_t$ (where $P_t$ is the price index of the economy and $Y_t$ the real output) it is possible to show that the demand function for imports assumes the following shape:

$$X_m = \alpha_m \left(\frac{P_{t,m}}{P_t}\right)^{-\sigma} Y_t$$

using the notation $x = \log X$, the previous expression becomes:

$$x_{tm} = \log \alpha_m - \sigma \left(p_{t,m} - p_t\right) + y_t$$

that is, $x_{tm}$ is the model prediction of (log) imports whenever we have that the (log) price of imports equal $p_{t,m}$, the (log) general price index $p_t$, and the (log) aggregate demand $y_t$.

[4]It will become apparent below why we use the notation $C_i$ to denote total utility instead of the traditional $U_i$.

We can then define the import wedge as:

$$\begin{aligned}\tau_t &= x_{tm}^{data} - x_{tm} \\ &= x_{tm}^{data} - (\log \alpha_m - \sigma (p_{t,m} - p_t) + y_t) \end{aligned} \tag{1}$$

There are many different ways of computing these import wedges. A common approach proxies the consumption of the rest of the world ($x_{tm}^{data}$) as the imports in volume, the price of that consumption ($p_m$) as the imports deflator, the perfect price index ($p$) as the GDP deflator or CPI, and aggregate demand ($y_t$) as the GDP in volume or private and public consumption also in volume.

In order to get scale free measurement for these wedges it is customary to detrend the data that is used to calculate the wedges. That is, if $x^{trend}$ is the trend of $\log x_t$, then subtracting (1) to the trend version of that equation, should give us the cyclical components of the equation evaluated in precent deviations from the trend:

$$\dot{\tau}_t = \dot{x}_{tm}^{data} + \sigma (\dot{p}_{t,m} - \dot{p}_t) - \dot{y}_t$$

where $\dot{x}_t = x_t - x_t^{trend} = \frac{X_t - X_t^{trend}}{X_t^{trend}}$.

A particular easy of calculating a trend for a variable consists in just using a regression line on the log transformed variable. For example, given $X_t$,

$$(\log X_t)^{trend} - \overline{(\log X_t)} = \hat{\beta} (t - \bar{t})$$

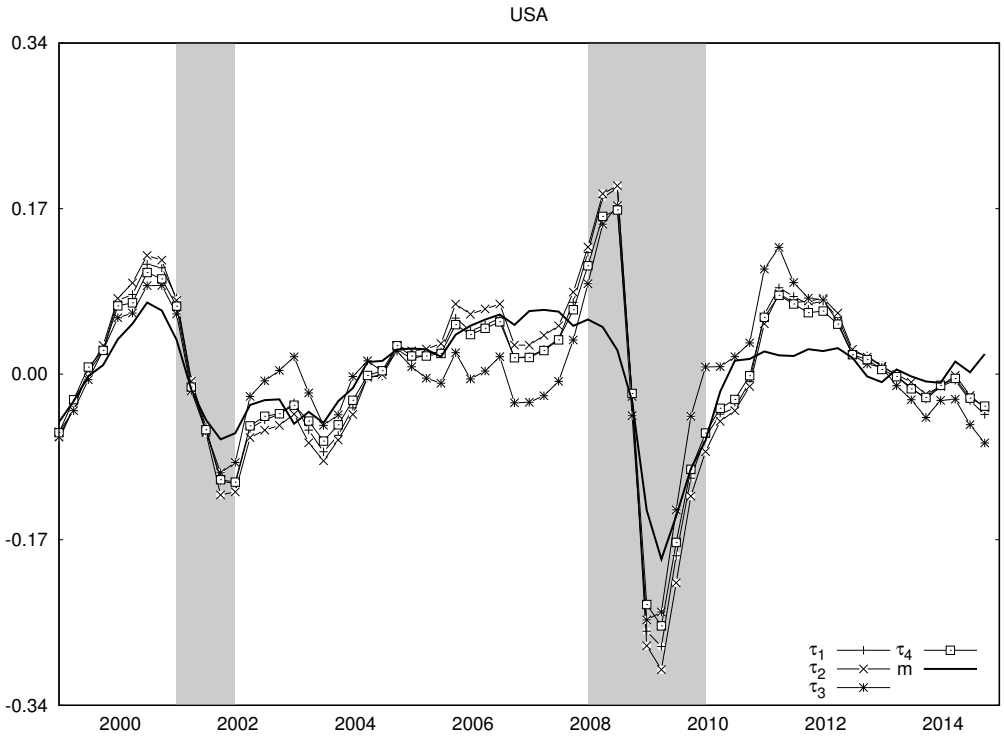
and

$$\hat{\beta} = \frac{cov \left[ (\log X_t)^{trend} - \overline{(\log X_t)}, (t - \bar{t}) \right]}{var \left[ (\log X_t)^{trend} - \overline{(\log X_t)} \right]}$$

However, a more common approach of economics makes uses of the Hodrick and Prescott (1997) filter (HP filter), where codes for using it are widely available over the internet.

As an example of the application of such techniques, the following figure plots import wedges under different assumptions for the US together with the cyclical component of imports.

Figure 1: Import wedge of the US under different assumptions aggregate and individual demands

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