Group Project #4: Labor and Trade

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1. *Labor market theory.* As background to a consulting assignment, you have been asked to work through an example to illustrate the impact of minimum wage legislation and payroll taxes on employment and unemployment. You decide to adapt the framework of your Global Economy class notes, working through the demand for labor of a single firm producing widgets according to the production function $Y = AK^{1/3}L^{2/3}$. For simplicity, you assume that $A = K = 1$ and that the price of widgets is 1, too. The supply of labor rises with the wage w: $L^s = w^2$.

   (a) Describe, first, how the labor market might work in this economy if there were no labor market restrictions. What is the wage? Employment? Unemployment? (10 points)

   (b) Now consider the effect of introducing a minimum wage w_m. What are the employment and unemployment rates if $w_m = 1$? If $w_m = 0.5$? If $w_m = 1$, describe qualitatively how much an unemployed person be willing to pay a recruiter to find a job. (10 points)

   (c) Suppose workers differ in productivity, with some contributing effectively 1.5 units of labor per unit paid, and others contributing only 0.5 units. Describe qualitatively how you would expect a minimum wage to affect the two types of workers. (10 points)

   Answer. The firm's optimal level of labor (its labor demand) is such that the gain of adding one more worker is equal to its cost. The marginal gain is the derivative of sales with respect to labor: $\frac{2}{3}pAK^{1/3}L^{-1/3}$. The marginal cost is simply the wage w. Therefore, since $p = K = A = 1$, the demand for labor is

   $$L^d = \left(\frac{3}{2}w\right)^{-3}.$$

   (a) The equilibrium is reached when demand equals supply. That is:

   $$\left(\frac{3}{2}w\right)^{-3} = w^2.$$

   Solving for w, we obtain that the equilibrium wage is

   $$w^* = \left(\frac{3}{2}\right)^{-3/5} = .78.$$

The level of employment is

$$L^* = \left(\frac{3}{2}w^*\right)^{-3} = w^{*2} = .61.$$

The unemployment rate is 0. Since there is no distortion, all individuals that would like to work at the equilibrium wage rate get a job.

(b) If $w_m = 1$, the demand for labor is $L^d = \left(\frac{3}{2} \times 1\right)^{-3} = .30$. Instead the supply is $L^s = 1^2 = 1$. Therefore the level of employment is .30. The unemployment rate is $\frac{1-.3}{1} = 70\%$. Every unemployed will be willing to pay a recruiter up to the difference between the ongoing wage (1) and his/her reservation wage. The reservation wage is different across unemployed, and can be read off the labor supply curve.
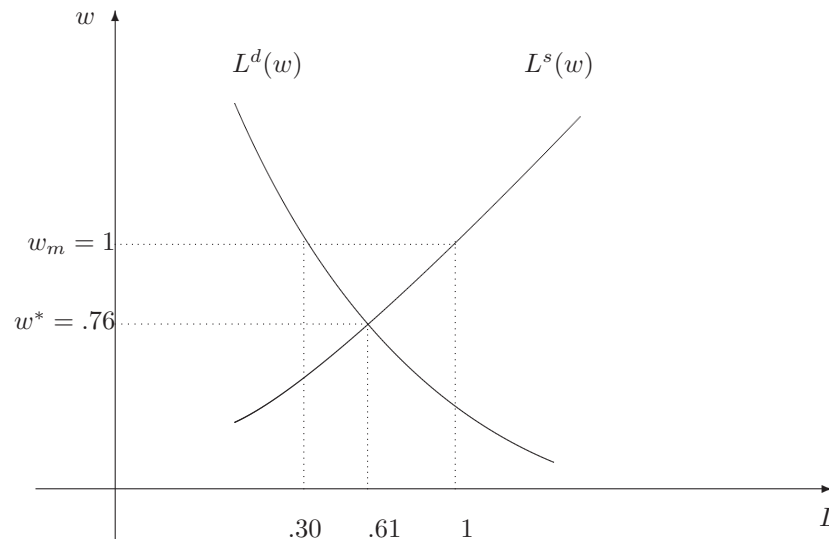

Figure 1: With and without unemployment.

The wage $w_m = .5$ is below the equilibrium rate. This means that the minimum wage is not binding. The outcome in terms of wage and employment is going to be the same as in part (a).

(c) You might guess that the minimum wage would affect the low-skilled workers more than the high-skilled. Why? Because the high-skilled are worth more than the minimum wage, so they will be hired (presumably) something close to their productivity. But if the productivity of the low-skilled is below the minimum wage, they won't be hired. The result is that the unemployed will consist predominantly (perhaps entirely in this setup) of the low-skilled.

2. *Labor market practice.* Your first day on the job at General Electric, you are given 4 hours to collect the information for a 5-minute presentation to your

group summarizing the labor market issues a manufacturer would face in Brazil, Poland, and Singapore. Once you get over your initial panic, you contact your Global Economy professor, who suggests you look at The Global Economy resource page, including

- The Bureau of Labor Statistics' Foreign Labor Statistics;
- The World Bank's Doing Business;
- The Economist Intelligence Unit's various reports and databases.

You quickly turn this information into a series of charts and bullet points that highlight the salient differences across these countries. (40 points)

Answer. Here's a quick sketch of the kind of data you might collect, with the US included for comparison:

Indicator	Brazil	Poland	Singapore	US
Hourly total comp (USD)	4.91	4.99	8.55	23.82
Employment rigidity (index)	46	37	4	0
Firing costs (weeks of pay)	37	13	0	0
Education of adults (yrs)	4.9	9.8	7.0	12

Sources: BLS, Doing Business, and NationMaster.com. Most recent year available.

What do we make of this? Labor is cheap in all of these countries relative to the US. Education is lowest in Brazil. Labor markets are most flexible in Singapore. In a real report, you'd want to flesh out what these factors mean to GE: how these factors and related ones would affect their business. Does education matter? Flexibility?

3. *Mexico and NAFTA.* Like many developing countries, Mexico followed a policy of "import substitution" after World War II, using high tariffs to help local industry "substitute" local products for imports. Trade policy changed dramatically in 1994, when Mexico signed the North American Free Trade Agreement (NAFTA) with Canada and the United States. Under NAFTA, tariffs between these countries fell on a wide range of products and the volume of trade expanded rapidly. The question is how the change in policy affected overall economic performance.

Looking at Figure 1, you decide to look at two periods, 1950-80 and 1994-2003, throwing out the lost decade of the 1980s (a story for another time). In the first period, tariffs were high, in the second, much lower. Using the data provided and your own analytical skills, you decide to examine the impact of trade policy and the performance of Mexico's economy.
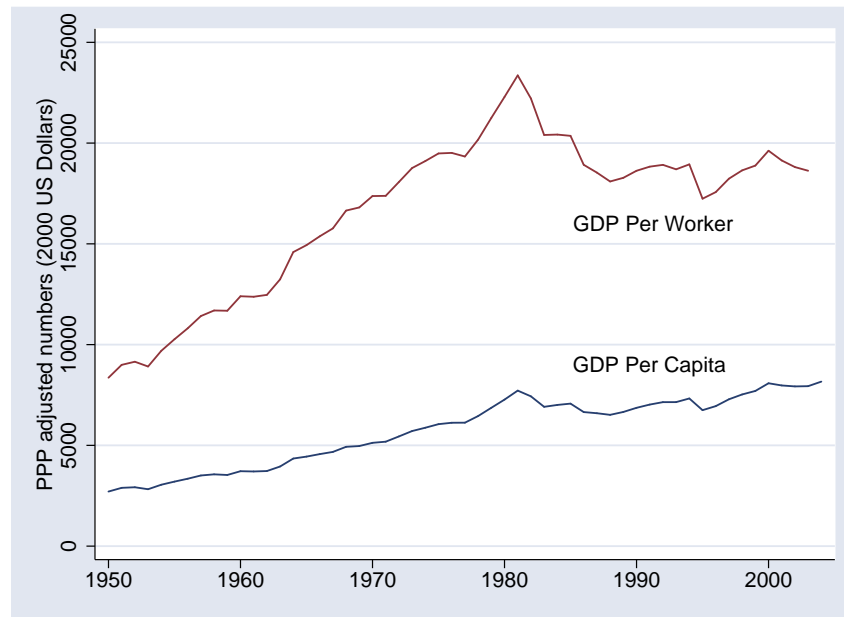
Figure 2: GDP Per Capita and GDP Per Worker in Mexico.

Year	Y/POP	Y/L	K/L
1950	2,709	8,358	10,066
1980	7,271	23,360	48,334
1994	7,328	18,943	45,444
2003	7,938	18,628	47,089

Table 1: Output and Capital in Mexico. Data from the Penn World Tables. Output (GDP) and capital are measured in 2000 US dollars.

(a) How do growth in GDP per capita (Y/POP) and GDP per worker (Y/L) differ between the two periods? What is the source of any differences between the two measures? (10 points)

(b) What are the sources of growth in GDP per worker in the two periods? Note specifically growth in (total factor) productivity. (10 points)

(c) How would you expect a reduction in trade barriers to affect productivity? Is that what you see? Speculate on why or why not. (10 points)

Answer.

(a) We compute continuously-compounded growth rates the usual way. For GDP per capita, the growth rates are 3.29 (1950-80) and 0.89 (1994-2003). Both are expressed as percentages. For GDP per worker, the growth rates are 3.43 and −0.19, respectively. With both measures, growth is much slower in the later period. The difference has to come from differences

in the growth rates of population and workers; equivalently, the ratio of
of workers to population must be changing. Evidently the relatively slow
growth in GDP post 1994 is worse than it looks: part of it is an increase
in the fraction of the population working.

(b) The usual growth accounting exercise. Our decomposition of the growth
rate of output per worker is

$$\gamma_{Y/L} \;=\; \gamma_A + \alpha\gamma_{K/L}$$

with $\alpha = 1/3$. The letter A stands for total factor productivity (TFP).
For the two periods, we get

$$1950\text{-}1980: \quad 3.43 \;=\; 1.68\ (\text{A}) + 1.74 = 5.23/3\ (\text{K/L})$$
$$1994\text{-}2003: \quad -0.19 \;=\; -0.32\ (\text{A}) + 0.13\ (\text{K/L}).$$

There's apparently a drop in TFP growth (γ_A).

(c) This is the issue: we have seen that reducing trade barriers is like increasing
TFP. But here we see that TFP fell during the period when trade barriers
were lowest and trade was highest. What went wrong? One possibility
is that the theory of trade is wrong: trade doesn't increase productivity.
Another is that it takes time for the reallocation suggested by trade to take
place. Yet another is that something else is going on: the crisis in 1994-95
evident in the figure, some problem that inhibits the reallocation called
for by trade, or anything else that crosses your mind. My own list would
include: frictions in labor and capital markets (it's relatively difficult for
small firms to borrow money) and restrictions on entry (in some industries,
business leaders use government connections to discourage competition).
Whether this is enough to explain what we see is hard to say.