ME2720 Macroeconomics for Business

Assignment 1
Economic Growth

Deadline: November 13, 2017 at 10:15[†]

General Comments & Instructions

In most empirical exercises it is hard to find the exact variable you are looking for. Presumably, you will need to make assumptions in order to solve questions[1]. Of course you should clearly state (and motivate!) your assumptions so that others can evaluate your work. Also, do not forget to document which methods and formulas were used to perform calculations, as we all know that different formulas yield different results! Finally, note that an important part of this exercise is to offer economic interpretations of your results.

All teams are required to solve at least 3 of the 5 exercises in Assignment 1. If it is your turn to present the solutions to a particular exercise in class then you need to send me your presentation slides a day in advance (November 12, before 10:15).

Last but not least, the solutions that you hand in must be comprised in ONE coherent *pdf*-file, supplemented with ONE Excel file, or alternatively with the code of the programming language you used, where all calculations must be easy to follow. The *pdf*-file should be easy to read, logically structured, and it must clearly show what you have done and which databases you have used.

[†]Submission to luis.perez@indek.kth.se.

[1]For instance, you are interested in the total number of workers in the economy but such data are not available. Then, it might be a good idea to look at the total population aged 18−64 as it represents the population that could *legally* work.

Presentations

(1) Growth accounting and TFP growth
Group 10: Lorenz Fuchs, Maximilian Goerges, Esko Nielson

(2) Convergence
Group 12: Viktor Charpentier, Johan Dahl

(3) The income league and GDP growth
Group 5: Laura Savolainen, David Driver, Claudio Cianciotta

(4) The income distribution in the rich part of the world
Group 13: Mikael Aredal, Bastien Large

1 Growth Accounting

Select (*randomly*) 5 OECD- and 5 African- countries. Then use the Cobb-Douglas production function in equation (1) to assess the amount of average annual real GDP growth that comes from capital accumulation, total factor productivity growth and from the contribution of labor growth for the periods $1970-1990$ and $1990-2010$ for the 10 countries. Calculate TFP growth as a residual.

$$Y = AK^{1/3}L^{2/3} \tag{1}$$

The variables Y, A, K and L denote GDP, TFP, physical capital stock and labor, respectively. Document what you are doing and clearly state any assumptions you make. How do you calculate average annual growth?[2] Present your results in a graph similar to the one in Figure 1 and provide comments. Are there differences between the two groups of countries? Are there differences between the two time periods?

[Figure 1 about here.]

2 Convergence

The convergence hypothesis states that poorer countries grow faster than richer countries. Use data from PWT 9.0 to answer the following questions (remember to document what you are doing!)

[2] *Hint*: Penn World Tables 9.0 is a useful database for this exercise.

(a) *Randomly* select 25 rich- and 25 poor- countries and make one scatter plot, similar to Figure 2, with the natural logarithm of real GDP per capita in 1980 on the x-axis and the average annual growth rate of real GDP per capita between 1980 and 2010 on the y-axis for all 50 countries. Insert a linear trend line and comment on the result. Do you detect any sign of absolute convergence?

[Figure 2 about here.]

(b) Redo exercise (a), but now separate between rich and poor countries−that is, make one scatter plot for each group and insert the correspondent trend line. What can you say about absolute- and conditional-convergence based on the new graphs and, also, on the graph you created in (a)?

(c) The conditional convergence hypothesis can be empirically tested using regression equation (2):

$$\frac{\ln RGDPL_{i,t+p} - \ln RGDPL_{i,t}}{\Delta t} = \beta_0 + \beta_1 \ln RGDPL_{i,t} + \beta_2 X_i + \varepsilon_i \quad (2)$$

where $RGDPL$ denotes real GDP per capita and X is a vector of controls in which we need to condition the analysis on. Subindexes i and t denote country and time, respectively[3]. Finally, ε is the error term in the regression.

(i) What sign does the conditional convergence hypothesis predict for β_1 in the regression equation?

(ii) Use data from PWT 9.0 to estimate equation (2) for your sample of 50 countries by OLS. Let the vector of controls X have to components: the average annual population growth rate between 1980 and 2010, and the arithmetic mean for the variable *hc* (human capital) over the period $1980 - 2010$. Show descriptive statistics for all variables included in the regression, i.e. a table containing *obs.*, *max*, *min*, *mean* and *std. deviation* for all variables. Also present the estimated coefficients with the associated t-statistics and comment on the results. Are the estimated coefficients significant at the 10-, 5- or 1-percent significance level? Does your result reject or support the conditional convergence hypothesis?

[3]Please note that p is an scalar which identifies the number of years added to t and in this case, $p = 30$

3 The Income League and GDP Growth

Small changes in growth rates can have dramatic effects in real GDP per capita when looking at sufficiently long time periods. The "income league" ranks countries according to their PPP-adjusted GDP per capita. The richest country gets rank 1, the second richest rank 2, and so on. A lower rank hence means a less wealthy population.

(a) Collect PPP-adjusted GDP per capita for a random sample of 20 countries and create an "income league" table for the years 1980 and 2014. Table 1 gives an example of how such a table should look like. The table shall be sorted according to richness in year 1980.

[Table 1 about here.]

According to the table above, Switzerland had the highest PPP adjusted GDP per capita in 1980 and the third highest in 2010.

(b) What position would the richest country in 1980 have in the league in 2014 if their PPP-adjusted GDP per capita would have growth on average one percentage point slower per year than it actually did between 1980 and 2014? What position would the poorest country in 1980 have if its PPP-adjusted GDP per capita would have grown on average one percentage point faster per year than it actually did between 1980 and 2014?

4 The Income Distribution

This exercise asks you to look at the evolution of the income distribution across rich countries during the last 60 years using the Lorentz curve.

(a) Explain what the Lorentz curve and the Gini coefficient are and how they can be used to measure inequality.

(b) Collect the following data from PWT 9.0: real GDP per capita and total population for the years 1950, 1970, 1990 and 2010 for a random sample of 30 rich countries. Exclude countries that don?t have data for all four years prior to the sampling so you will end up with a balanced panel of data comprising 30 countries. Next draw one Lorentz curve per year for your sample and comment on how the income distribution has evolved since 1950.

5 Your choice!

Make a short macroeconomic analysis of whatever topic you are interested in!

Figures

Figure 1: Growth accounting

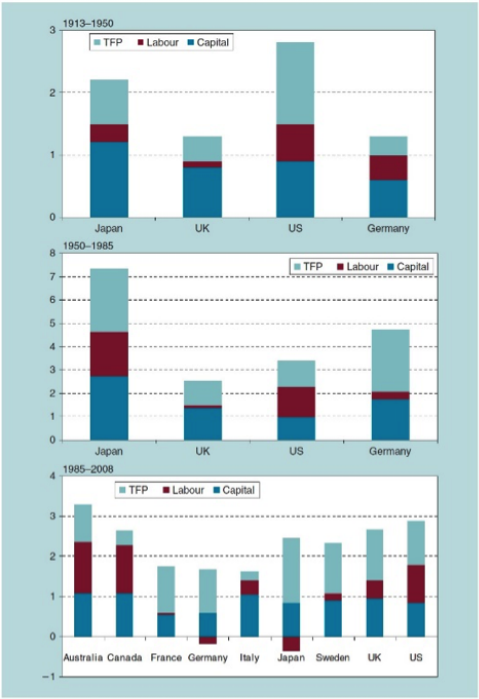

FIGURE 5.17 ● **Growth accounting for developed economies.** TFP and capital growth have accounted for the largest parts of growth in developed economies. *Sources:* Crafts, Globalization and Growth in the Twentieth Century, IMF Working Paper 11/44 (2002), OECD and authors' calculations.

Figure 2: Convergence

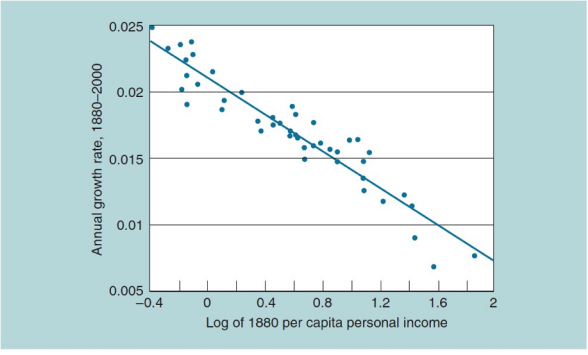

FIGURE 6.8 ● **Convergence – the US states.** Output converges within the United States. *Source:* Barro and Sala-i-Martin, *Economic Growth* (New York: McGraw-Hill, 2003).

Tables

Table 1: Ranking of richest countries in the world

Country	1980	2010
Switzerland	1	3
Luxembourg	2	4
Norway	3	2
U.S.A.	4	1
⋮	⋮	⋮
Mexico	30	29

Notes: Ranks presented in the table are fictional and do not represent the true values.