EC1B5 | Macroeconomics

Chapter 6

Aggregate Incomes

Additional Practice Questions:

Book Question 2

The following table lists 2014 PPP GDP per capita for four countries in $. It also lists the price of a Levi's 501 jeans in local currency in each country in 2014. The price of the Levi's 501 in the United states was $40.58 in 2014.

Country (Local Currency)	2014 PPP GDP per Capita	2014 Levi's 501 Price (in Local Currency)
Switzerland (Swiss franc)	$66,038.70	120.54
Argentina (Argentine peso)	$23,550.31	766.52
Australia (Australian dollar)	$47,671.10	102.23
Malaysia (Malaysian ringgit)	$23,910.80	229.36
Sources for Levi's prices: https://www.nationmaster.com/country-info/stats/Cost-of-living/Clothing-and-shoe-prices/Jeans/1-pair-of-Levi-501s-or-equivalent Source for currency conversion (USD to local currencies) using the average exchange rates: https://www.x-rates.com/average/?from=USD&to=EUR&amount=1&year=2021 Source for PPP GDP per capita: https://tradingeconomics.com/		

Using the Levi's 501 jeans as a representative commodity common to the countries, calculate the PPP-adjustment factor for each country, and then the GDP per capita for each country in the local currency.

Answer:

Following the procedure given in the text, we first calculate the ratio of the price of the U.S. Levi's 501 and the Levi's 501 in the country in question. For example, for Argentina, the calculation would be $40.58/766.52 Argentine pesos = 0.05294. This is the PPP adjustment factor, which we use to divide by the PPP GDP per capita to get the GDP per capita stated in the local currency. For Argentina, the calculation is 23,550.31/0.05294 = 444,849.07 Argentine Pesos.

Here is the table showing the results for all the countries:

Country (currency)	PPP GDP/Capita in $	2014 Levi's 501 Price (Local Currency)	PPP Adjustment Factor	2012 GDP per Capita (Local Currency)

Switzerland (Swiss Franc)	66,038.7	120.54	0.336651734	196,163.26
Argentina (Argentine Peso)	23,550.31	766.52	0.052940563	444,844.35
Australia (Australian Dollar)	47,671.1	102.23	0.396948058	120,094.05
Malaysia (Malaysian Ringgit)	23,910.8	229.36	0.176927101	135,144.93

Book Question 7

In this question, we will use what you learned in the second part of the chapter to compare the performance of an economy in two different time periods, as its physical capital stock and efficiency units of labor change.

a. Suppose that from period 1 to period 2, the unemployment rate in the economy decreases. Everything else remains unchanged. What happens to the total efficiency units of labor? Express your results formally as an inequality, using the formula for total efficiency units of labor presented in the chapter (in particular, recall that total efficiency units of labor in two periods can be written as $H_1 = L_1 \times h1$ and $H_2 = L_2 \times h_2$; where L is the total number of employed workers).

b. What are the consequences of this decrease in unemployment for GDP? Express your results formally as an inequality, using the aggregate production function presented in the chapter.

c. What are the consequences for GDP per capita and GDP per worker?

d. Suppose that there is a technological advance from period 1 to period 2 and, at the same time, an increase in physical capital stock? Can you say whether GDP will increase or decrease? Why or why not?

Answer:

a. The total efficiency units of labor is the product of the average efficiency units of workers and the total number of workers in the economy. A decrease in unemployment implies an increase in the number of workers. Everything else remaining unchanged, an increase in the number of workers increases the total efficiency units of workers. This can be expressed formally as follows: $L_1 < L_2$ implies $H_1 = L_1 \times h_1 < H_2 = L_2 \times h_2$
b. The aggregate production function is expressed as $Y = A \times F(K, H)$, where Y stands for GDP, K is capital stock, H is efficiency units of labor, and A is a technology index. With a decrease in unemployment in period 2, the efficiency units of labor will rise. This means that GDP will also rise as there is a direct relationship between capital, labor, and aggregate output. Formally, this can be expressed as follows: $H_2 > H_1$ implies $F(K, H_2) > F(K, H_1)$, which implies $A \times F(K, H_2) > A \times F(K, H_1)$, which implies $Y_2 > Y_1$.
c. Other things remaining the same, the rise in GDP will increase GDP per capita. The effect on GDP per worker is harder to determine because both GDP and the number of workers are increasing, so the change in the GDP per worker depends on the magnitude of these changes.
d. Technological progress means that the economy can generate more output from the same set of inputs. An increase in physical capital will also affect GDP positively. Therefore, we can say for sure that due to the increase in capital stock and the technological advance, GDP will increase.

Book Question 8

Assume that the country Lusitania has two industries, clothing production and computer chip production. At first, both industries have identical aggregate production functions: the following table shows how the output of each industry is affected by a change in efficiency units of labor.

Y (in Millions of Dollars)	Stock of Physical Capital (Units)	Efficiency Units of labor
100	15,000	16,000
150	15,000	20,000
180	15,000	24,000
200	15,000	28,000
210	15,000	32,000

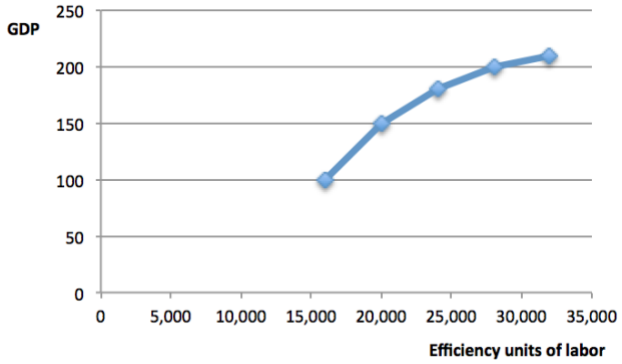
a. Using the data in the table, draw a graph showing how output (on the y-axis) changes with efficiency units of labor (on the x-axis). What explains the shape of the graph? Why is it valid in this case to plot output against the efficiency units of labor and leave the stock of physical capital in the background?

b. A Lusitanian inventor has produced a new technology that doubles the output of computer chips for any combination of capital and labor. Explain, using an equation, how this invention affects the production of computer chips. Create a new table for computer chip production and compare it to the (unchanged) table for clothing production.

c. If you were a central planner, would you make any changes to the allocation of labor, holding capital fixed? If so, what factors might prevent you from implementing your policy?

Answer:

a. The graph should look approximately like the figure below:



GDP increases with an increase in the efficiency units of labor. However, the rate of increase in GDP gradually decreases as the efficiency units of labor increase. The student should explain that this shape is due to the decreasing marginal product: holding the stock of physical capital constant, the relationship between aggregate product and efficiency units of labor becomes less and less steep as the total efficiency units of labor increases.

b. Here, in effect, we're multiplying column A by 2. So now, any combination of labor and capital produces double the output it did before. We show this in the table below:

Y (in Millions of Dollars)	Stock of Physical Capital (Units)	Efficiency Units of labor
200	15,000	16,000
300	15,000	20,000
360	15,000	24,000
400	15,000	28,000
420	15,000	32,000

c. A central planner would re-allocate workers to computer chips—because now marginal product of labor has increased at each level. We'll be able to get more bang for our buck with workers in computer chip industry. However, it may be that higher training is required for workers to produce computer chip, so it might not be possible to simply re-allocate employees.