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Problem Set on Measurement

1.   Y = C+I+G+NX. How will each of the following be counted towards U.S. GDP and the components of GDP? Explain your answers.

a.   You pay tuition to Amherst College.

Consumption (C). Because I consume the educational good at cost of money to earn higher education, so that I can reap benefits of the degree in terms of salary, job security and prestige in future

b.   You buy a car that was manufactured in Japan.

As this is an international exchange we can say that this counts as net exports (NX).

c.   The town of Amherst buys a new snow-plough.

As this is money spent by government (G), we can say that this can be counted as government spending.

d.   Starbucks buys a new cash register.

This can be considered investment (I) as this is a capital expenditure.

e.   Starbucks buys chocolate chips and dough from Ghirardelli chocolate Co. (in San Francisco), intending to use them to make cookies for sale to customers. (assume enough dough and chocolate chips to make 1 cookie costs them 30 cents)

Consumption (C). Because Starbucks is buying the raw material (good) from Ghirardelli chocolate Co.

f.   Starbucks buys coffee beans that were grown in Brazil, for sale to customers. (suppose it pays 25 cents for enough coffee to make one cup of coffee)

As this is an international exchange, we can say that this counts as net exports (NX).

g.   You buy, from Starbucks, a cup of coffee made using coffee that was grown in Brazil ($1.50), and a chocolate-chip cookie ($1).

As we buy coffee cup from Starbucks, it essentially counts as consumer good and thus as Consumption (c).

2. Amazon.com agreed to pay its workers $20 per hour in 1999 and $22 per hour in 2001. The CPI was 166 in 1999 and 180 in 2001.

(a) Calculate the real wage rate in each year.

1999: $(20/166) \times 100 = 2000/166 = \boxed{1000/83}$

2001: $(22/180) \times 100 = 2200/180 = 550/45 = \boxed{110/9}$

(b) Did these workers get a real wage increase between 1999 and 2001?

We can see that $\boxed{(\text{real wage})_{2001} > (\text{real wage})_{1999}}$

$\boxed{\text{Yes}}$.

3. In 1999 in Canada, the nominal interest rate was 6 percent per year and the inflation rate was 2 percent per year.

(a) Calculate the real interest rate.

real interest rate = nominal interest rate − inflation rate

$= 6 - 2 = \boxed{4}$ Ans

(b) If the real interest rate did not change and the rate of inflation rose to 4 percent per year, how would the nominal interest rate change?

nominal interest rate = real interest rate + inflation rate

$= 4 + 4 = \boxed{8}$ Ans

4. Mexico's real GDP was 1,448 billion pesos in 1998 and 1,501 billion pesos in 1999. Mexico's population growth rate in 1998-1999 was 1.8 percent.

(a) Calculate the rate of increase in Mexico's real GDP.

$$\text{rate of change of Mexico's real GDP} = \left(\frac{1501 - 1448}{1448} \times 100\right) = \frac{5300}{1448} \approx \boxed{3.66\%} \text{ Ans}$$

(b) Calculate the rate of increase in Mexico's per capita real GDP.

let's say population in 1998 is $\widehat{P}$, then population in 1999 is $1.018P$

$$\text{rate of change of Mexico's real GDP per capita} = \left(\frac{\left(\frac{1501}{1.018P}\right)}{\left(\frac{1448}{P}\right)} - 1\right) \times 100 = \frac{1501 - 1448(1.018)}{1448(1.018)} \times 100 \approx \boxed{1.827\%}$$

Ans

(c) If the reported rates of increase of real GDP and population are maintained, approximately how many years will it take to double Mexico's per capita real GDP?

$$2\left(\text{GDP}\right)_{\text{initial}} = \left(1 + \frac{R}{100}\right)^{n} \left(\text{GDP}\right)_{\text{initial}} \Rightarrow n \approx \frac{\log 2}{\log(1.01827)}$$

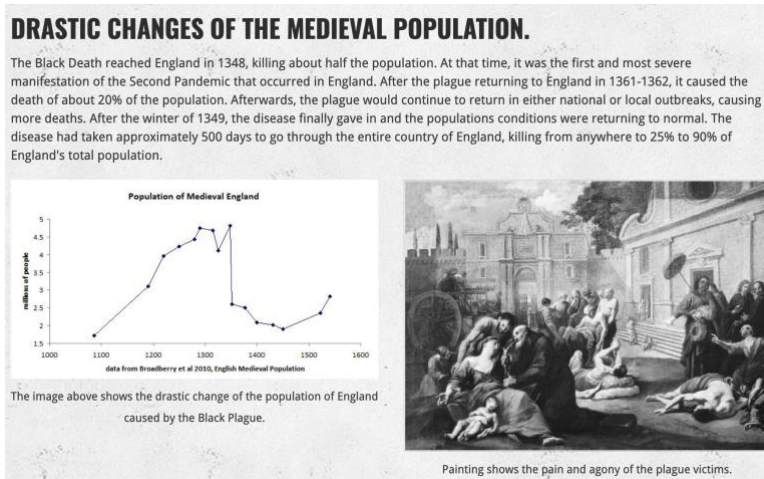$$\Rightarrow \boxed{n \approx 38.28 \text{ years}} \text{ Ans}$$

(d) If the rate of increase of real GDP remained the same but the rate of population growth fell from 1.8 percent to 1 percent, approximately how many years would it take to double Mexico's per capita real GDP?

rate of change of mexico's GDP per capita now will be $= \left(\frac{1501}{(1.01)(1448)} - 1\right) \times 100 \approx \boxed{2.634\%}$

$\Rightarrow 2(\text{GDP})_{\text{initial}} = \left(1 + \frac{R}{100}\right)^{n}(\text{GDP})_{\text{initial}} \Rightarrow n \approx \frac{\log 2}{\log(1.02634)} \approx \boxed{26.66 \text{ years}}$

Ans

5. Let's examine the Malthusian model and the Black Death

DRASTIC CHANGES OF THE MEDIEVAL POPULATION.

The Black Death reached England in 1348, killing about half the population. At that time, it was the first and most severe manifestation of the Second Pandemic that occurred in England. After the plague returning to England in 1361-1362, it caused the death of about 20% of the population. Afterwards, the plague would continue to return in either national or local outbreaks, causing more deaths. After the winter of 1349, the disease finally gave in and the populations conditions were returning to normal. The disease had taken approximately 500 days to go through the entire country of England, killing from anywhere to 25% to 90% of England's total population.

Population of Medieval England

data from Broadberry et al 2010, English Medieval Population

The image above shows the drastic change of the population of England caused by the Black Plague.

Painting shows the pain and agony of the plague victims.

a. Using the information above, use the Malthusian model to demonstrate what is happening in Medieval England and your prediction about per capita medium income.

b. After the plague was over, what would you predict would happen to median per capita incomes in England? Explain.

Now let's think about population centers in the ancient world. Watch the video at:

http://metrocosm.com/history-of-cities/

c. Use the Malthusian model to help explain why population centers arise at about the same latitude all over the planet.

d. Written languages are thought to have been invented independently in the Near East, China and Mesoamerica (in that order). Use the Malthusian model to explain this. What impact did this innovation likely have on population sizes? Per capita median incomes? Explain.

Sol Q5

(a)
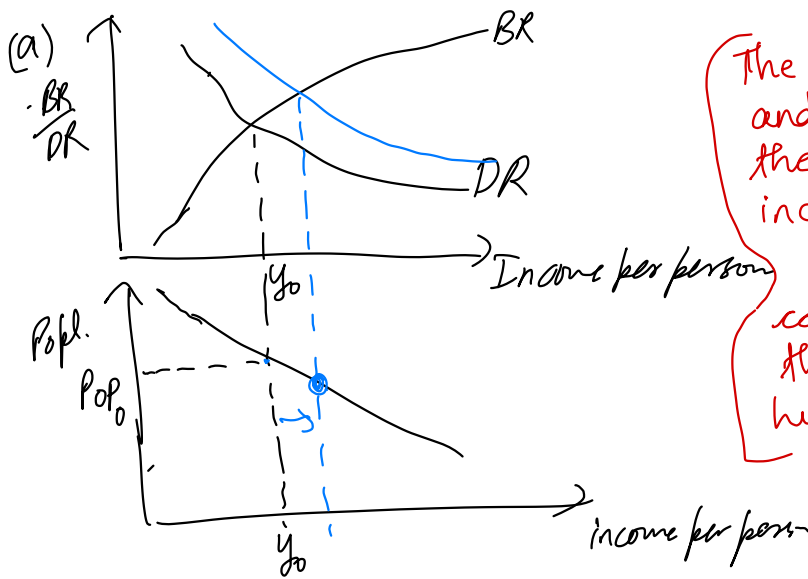
The death rates would rise and this will decrease the population, while increasing the income per person because capital is constant as there is just loss of human life [no loss of capital]

(b) After the plague is over, the death rate would be back to normal and everything will work out fine, but people would be more willing to produce more kids. This rise in birth rate would make the population higher but the income per person would fall. Alternatively people might start focusing more on technologies and this might shift the popl. $\underline{vs}$ income per person curve out, leading to higher population but about the same income per person eventually.

(c) Because the fertility of land is one of the most determining factors of productivity and hence people would prefer to live in an area where there is fertile land. As the distribution of resources over the earth is often geographically characterised by the latitudes and logitudes, it happened that a certain latitude had much more sustainable resources along it compared to other latitudes, so people increased in population there and these became population centers.

(d) $\frac{BR}{DR}$
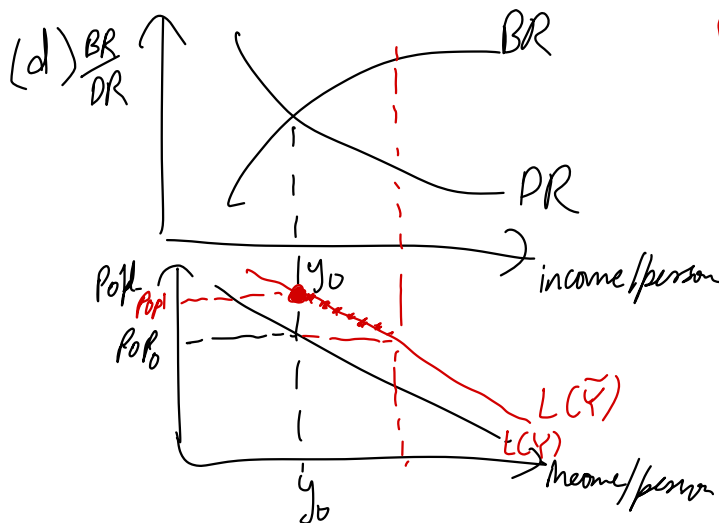
The development of languages in these countries as per malthusian model lead to a huge increase in population while the per capita median income remained the same.