Exercise Class 1

BIG - INTRODUCTION TO MACROECONOMICS - 30326

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Short Theory Resume

How to measure GDP. GDP measures the state of a given economy, but it could be defined in different ways.

1. GDP is the value of **final goods and services** produced in the economy during a given period.

   This measure of GDP is given by final goods and services, therefore those produced by firms and consumed by consumers. For **final** its meant the value of sales revenues. Intermediate goods, i.e. those produced by firms for other firms, are not included.

2. GDP is the **sum of value added** in the economy during a given period.

   This GDP measure is given by the value of production minus the value of intermediate goods used for the production. Here there is no distinction between intermediate or final producers, all the firms are included in the calculation.

3. GDP is the **sum of incomes** in the economy during a given period.

   This GDP measure is built upon the sum of capital (profits) and labour (wages) incomes. All the firms are included in the calculation. No final values of production taken into account.

Exercise 1 (Question 2)

Consider an economy where there are only three firms. An agricultural firm grows **70 worth** of wheat paying **50 in wages** to peasants; the rest is profit. The agricultural firm sells its whole production to a baker. The baker's workers transform wheat in **200 worth of bread**: they are paid **100 in wages**. The baker sells 180 of bread to households for final consumption and 20 to a "restaurant". The cost of wheat and worker's wages are the only costs for the baker: the rest is profit. The "restaurant" serves the bread purchased by the baker with waiters paid **wages for 30**. The clients of the restaurant pay **bills for 60** allowing the restaurant a **profit of 10**. Show than the GDP of this economy can be calculated in three ways with the same result: sum of the values of final goods produced, sum of the value added of the three firms and sum of the incomes (wages and profits) earned by workers and firms'

	Agricultural		Bakery		Restaurant	
	Revenues	Expenses	Revenues	Expenses	Revenues	Expenses
	70	50	200	170	60	50
Interm. Cost				70		20
Wages		50		100		30
Profits	20		30		10	

Table 1: Production Side Table - Ex.1

	Final Consumers	
	Revenues	Expenses
	240	240
Purchases (Bak.+Rest.)		180+60
Wages (Agr.+Bak.+Rest.)	50+100+30	
Profits (Agr.+Bak.+Rest.)	20+30+10	

Table 2: Consumption Side Table - Ex.1

owners.

Solution

- Value of final goods and services: $180 + 60 = 240$;

- Sum of value added: $70 + 130 + 40 = 240$

- Sum of incomes (capital+labour): $(20 + 30 + 10) + (50 + 100 + 30) = 60 + 180 = 240$

Exercise 2 (Question 3)

Modify the economy of the previous question in two ways. Suppose the agricultural firm, with the same amount of work, produces **10 more of wheat**: besides selling 70 to the baker,

it **exports abroad the additional 10 produced**, thus increasing **profits** which reach the value of **30**. And suppose the restaurant's served meals do not consist of the purchased bread alone but also include **other imported food, worth 60**. The value of imported food is added to its **clients' bills** that will thus amount to **120**. Profits and wages of the restaurant do not change. Calculate (in the way you prefer) the value of GDP and show that in this economy, as investment is 0, **savings are equal to exports minus imports**.

Solution

- Value of final goods and services: $180 + 120 + (10 - 60) = 250$;

- Sum of value added: $80 + 130 + 40 = 250$

- Sum of incomes (capital+labour): $(30 + 30 + 10) + (50 + 100 + 30) = 70 + 180 = 250$

Savings calculation:

$$Y = C + I + G + (EX - IM)$$
$$Y - T = C + I + G + (EX - IM) - T$$
$$Y - T - C = I + (G - T) + (EX - IM)$$
$$\underbrace{(Y - T - C)}_{\text{Private Savings}} + \underbrace{(T - G)}_{\text{Public Savings}} = I + \underbrace{(EX - IM)}_{\text{Trade Balance}}$$
$$S_{\text{TOT}} = I + (EX - IM) = 0 + (-50) = -50$$

Note that total savings in this case coincide with private ones, since $G = T = 0$, hence they could have been also computed as $S = Y - T - C = 250 - 0 - 300 = -50$

Exercise 3 (Question 16)

Explain with simple algebra what is the effect of an increase in taxes, ceteris paribus, of the equilibrium level of Y. Then, express with algebra the impact of an increase in public expenditure G on equilibrium Y. Put together the two results and derive the impact on equilibrium Y of an increase in G financed with an equal increase in taxes.

	Agricultural		Bakery		Restaurant	
	Revenues	Expenses	Revenues	Expenses	Revenues	Expenses
	80	50	200	170	120	50
Interm. Cost				70		20
Wages		50		100		30
Exports	10					
Imports						60
Profits	30		30		10	

Table 3: Production Side Table - Ex.2

	Final Consumers	
	Revenues	Expenses
	250	300
Purchases (Bak.+Rest.)		180+120
Wages (Agr.+Bak.+Rest.)	50+100+30	
Profits (Agr.+Bak.+Rest.)	30+30+10	
	Trade Balance	
Exports	10	
Imports		60

Table 4: Consumption Side Table - Ex.2

Solution Consider the following system of equations, which includes the GDP and consumption equations.

$$\begin{cases} Y & = C + I + G + (EX - IM) \\ C & = c_0 + c_1(Y - T) \end{cases}$$

$$Y = c_0 + c_1(Y - T) + I + G + (EX - IM)$$
$$(1 - c_1)Y = c_0 - c_1 T + I + G + (EX - IM)$$
$$Y = \frac{1}{1 - c_1}[c_0 - c_1 T + I + G + (EX - IM)]$$

Now consider a positive effect of taxes and public expenditure on the equilibrium level of output; $(\Delta G > 0, \Delta T > 0)$.

$$\Delta Y = \frac{1}{1 - c_1} \Delta G > 0$$
$$\Delta Y = \frac{-c_1}{1 - c_1} \Delta T < 0$$

Now suppose $\Delta G = \Delta T > 0$, the compound effect is given by $(\Delta G + \Delta T)$:

$$\Delta Y = \frac{1 - c_1}{1 - c_1} \Delta G$$

The economic explanation follows: higher public expenditure increases aggregate demand by a magnitude equal to the multiplier $\frac{1}{1-c_1}$. The same increase in taxes reduces aggregate demand by that amount multiplied by the propensity to consume (c_1), which is smaller than 1.

In other words: part of the taxes is paid with savings instead of reduced consumption. Therefore, an increase in public expenditure financed by taxes overall has a positive impact on aggregate demand.

This is sometimes called the *Haavelmo* theorem. Obviously, when the increase in G is financed with debt or money the impact is larger.

1   Exercise 4 (Question 17)

In an economy **private investment is 50**, the **government deficit is 100** and the **current account** of the balance of payments has a surplus of **10**. How much is **private saving**?

How would you describe, in words, the way private savings are "used"? What channels are available for households to use their savings in this way (in other words: how does this channeling happens, how does the saved income reaches the uses towards which it is directed?)

Solution

$$Y = C + I + G + (EX - IM)$$

$$Y - T = C + I + G + (EX - IM) - T$$

$$Y - T - C = I + (G - T) + (EX - IM)$$

$$\underbrace{(Y - T - C)}_{\text{Private Savings}} = \underbrace{I}_{\text{Private Investment}} + \underbrace{(G - T)}_{\text{Public Spending}} + \underbrace{(EX - IM)}_{\text{Trade Balance}}$$

$$S_{\text{Pr}} = 50 + 100 + 10 = 160$$

The economic explanation follows: private saving gets invested in real assets for an amount of 50. The rest is lent to the government (100) or to the rest of the world (10). The rest of the world spends more on domestic goods than the domestic economy spends abroad $(EX > IM)$: the difference (10) is an increase in the domestic economy's claims on the rest of the world.