Lecture 1 - Introduction to Macroeconomics

UCLA - Econ 102 - Fall 2018

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Contents

GDP: The Product Side

Let us start with what is perhaps the most important accounting identity in macro:

$$Y = C + I + G + X - M.$$

Note that very often we denote net exports NX as $NX = X - M$ so that GDP is simply:

$$Y = C + I + G + NX.$$

In some textbooks, imports are also denoted by IM instead of M.

Thus, GDP is the sum of: - Consumption (C)
- Investment (I)
- Government Purchases (G)
- Exports (X)
- Imports (M)

Personal Consumption Expenditures - Consumption (C)

Figure 1 plots GDP from the BEA, as well as PCE, in millions of dollars. US GDP being in the vicinity of USD 20 trillion dollars (or USD 20,000 billions, or USD 20,000,000 millions), this looks about right. On this figure, data for GDP is taken from the Bureau of Economic Analysis's National Income and Product Accounts (NIPA) here and data for Personal Consumption Expenditures is taken from there.

To get a better of sense of how big consumption is as a fraction to GDP (although you may eyeball it on this picture), we might plot consumption as a function of GDP, which is what I do below. You can see that Personal Consumption Expenditures are approximately **60 to 70 % of GDP**. You can also see that it's been rising since the end of the sixties. We will discuss that.

Personal Consumption Expenditures are divided up into:
- Durable Goods (more than 3 years of durability): e.g. cars.
- Non-durable Goods (less than 3 years of durability).
- Services.

Services have become more important than Goods in total consumption since the 1970s.

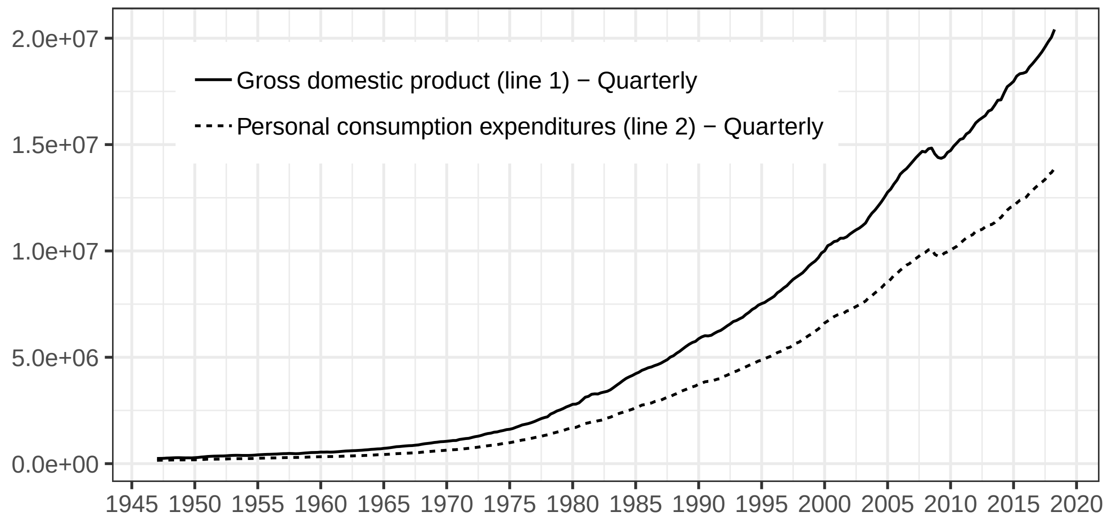

Figure 1: US GDP from NIPA (BEA)

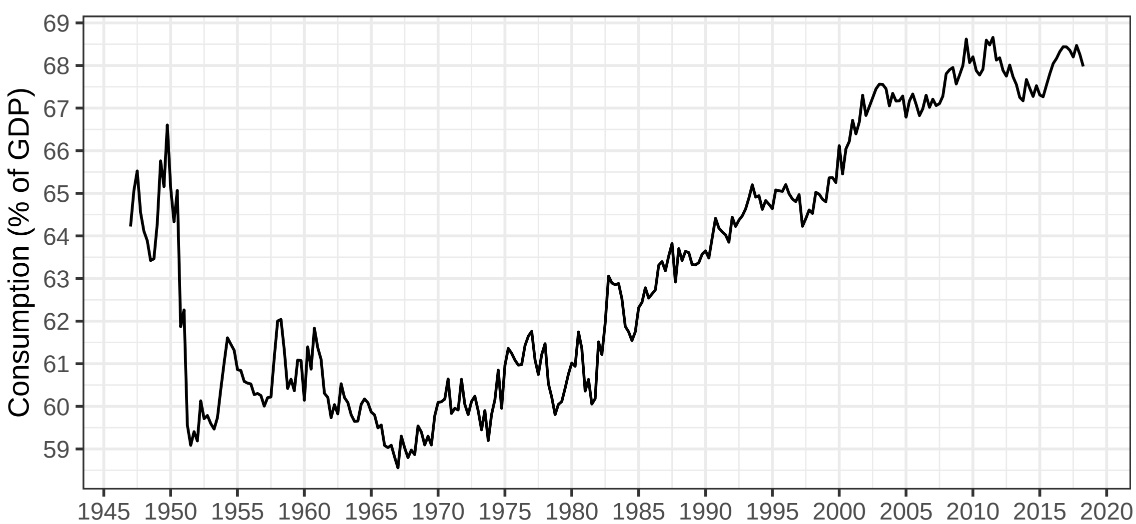

Figure 2: Consumption as a share of GDP from NIPA (BEA)

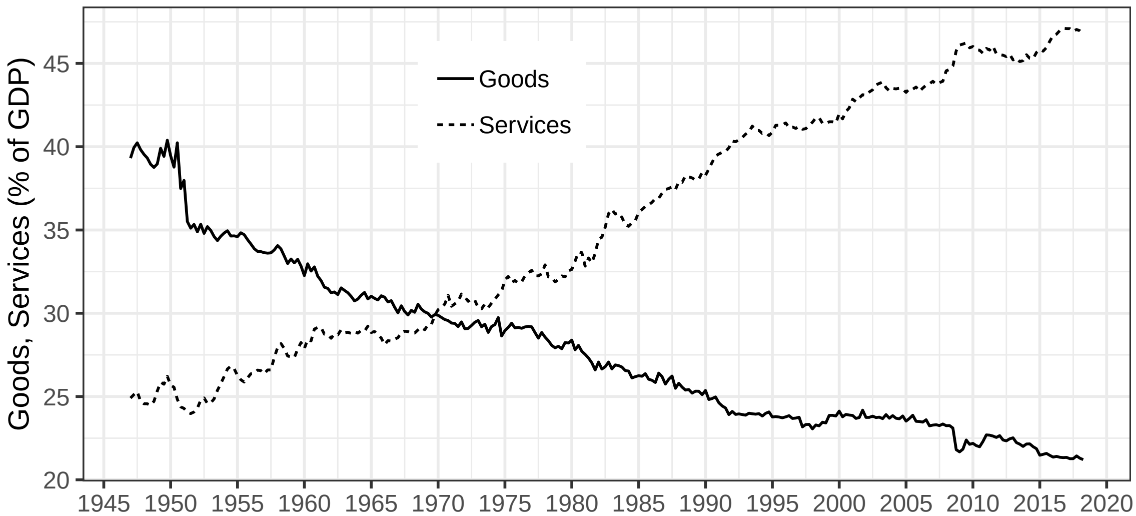

Figure 3: Goods and Services Consumption as a share of GDP from NIPA (BEA)

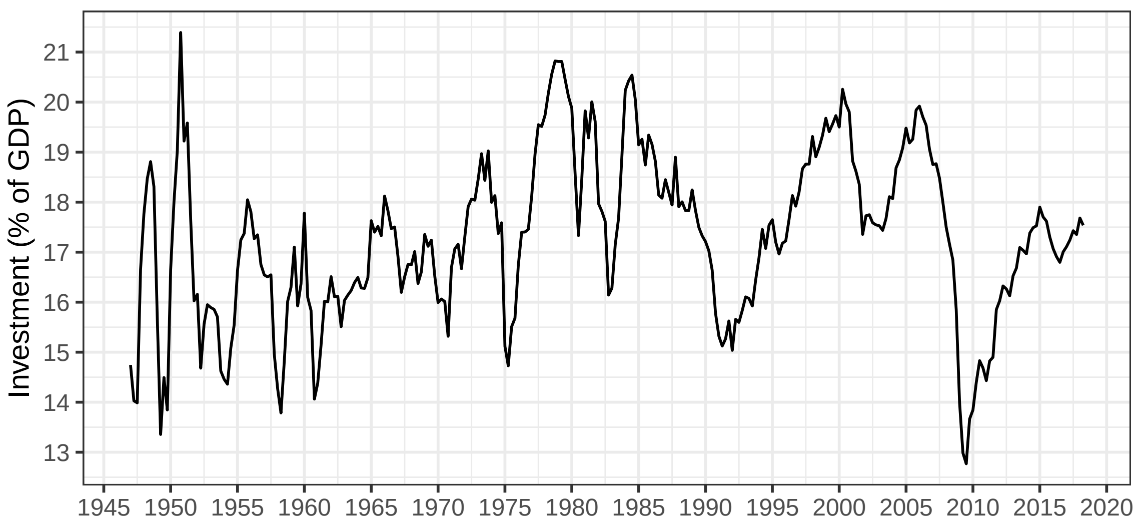

Figure 4: Investment as a share of GDP from NIPA (BEA)

Gross private domestic investment - Investment (I)

Investment has two components: - non residential investment is the purchase of new capital goods by firms: structures, new plants.
- residential investment is the purchase of new houses.

Gross private domestic investment is approximately **15 to 20 % of GDP**, as you can see on Figure 4. It is also very volatile over the cycle.

Government Purchases (G)

Government purchases are composed of purchases of goods by the government plus the compensation of government employees. Overall, they comprise about approximately 20% of GDP, as can be seen on Figure 5. Note however that they do not include transfers from the government of interest payments on government debt.

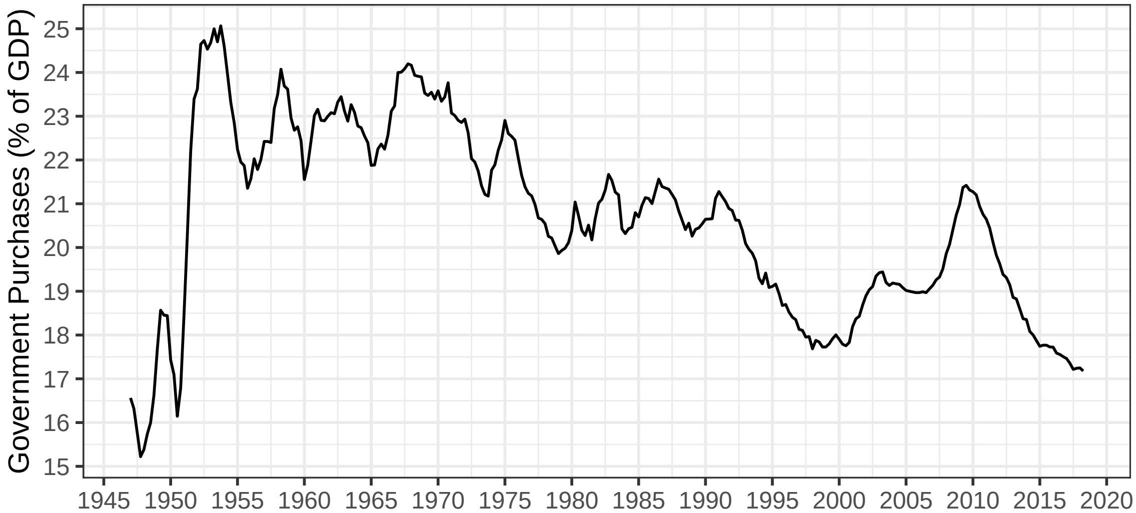

Figure 5: Government Purchases as a share of GDP from NIPA (BEA)

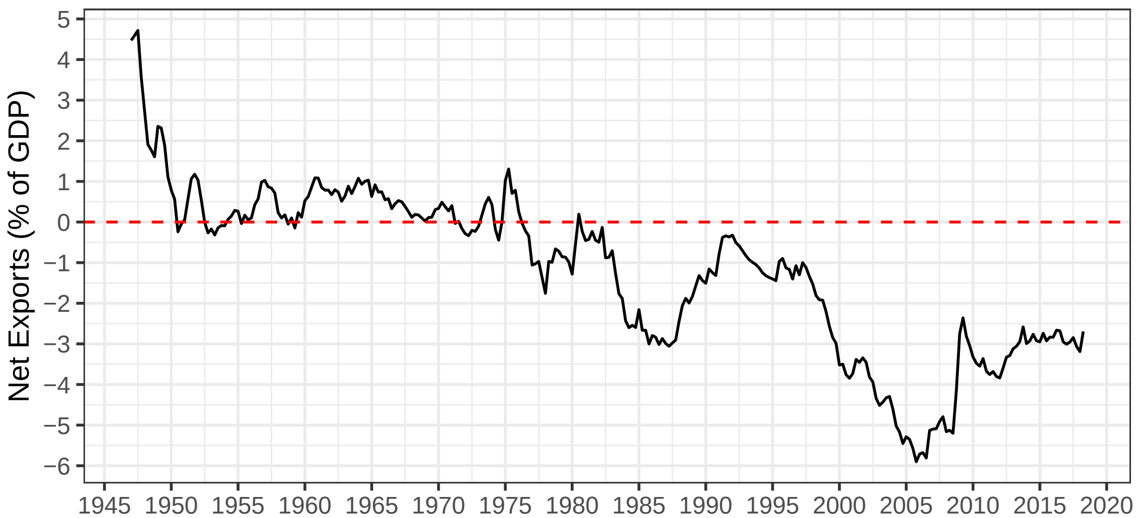

Figure 6: Net Exports as a share of GDP from NIPA (BEA)

Net Exports (NX)

Net exports of goods and services are approximately **-2 to -6 % of GDP**, at least in the modern period (and in the United States), as you can see on Figure 6.

GDP: The Income Side

Cobb Douglas Production function.

In order to organize our thinking, let's write out a Cobb-Douglas production function, defined as:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha},$$

where α is a number between 0 and 1. Let us think of a firm who chooses the amount of labor it uses L_t as well as the amount of capital it uses K_t in order to maximize its profits:

$$\max_{K_t, L_t} \quad A_t K_t^{\alpha} L_t^{1-\alpha} - rK_t - wL_t.$$

From Econ 101, it should be clear that a way to solve this problem is simply to set the derivatives of the profit function equal to 0 with respect to K_t and L_t which gives:

$$\alpha A_t K_t^{\alpha-1} L_t^{1-\alpha} - r = 0$$

when differentiating with respect to K_t and

$$(1-\alpha) A_t K_t^{\alpha} L_t^{-\alpha} - w = 0$$

when differentiating with respect to L_t.

The total wage bill wL_t is then given by:

$$wL_t = (1-\alpha) A_t K_t^{\alpha} L_t^{-\alpha} * L_t = (1-\alpha) Y_t.$$

The total income going to capital rK_t is given by:

$$rK_t = \alpha A_t K_t^{\alpha-1} L_t^{1-\alpha} * K_t = \alpha Y_t.$$

Thus, the share of capital in value added is:

$$\boxed{\frac{rK_t}{Y_t} = \alpha},$$

while the share of labor in value added is

$$\frac{wL_t}{Y_t} = 1 - \alpha.$$

The Income Side in the Data

So in practice, how much goes to the compensation of employees, and how much goes to the returns to capital? The answer is that it goes approximately for 1/3 to capital and for 2/3 to labor. The calculations for these are less straightforward than for computing the share of consumption, investment, as we did above. The reason is that in practice, the division between labor and capital is not as clear cut in the national accounts as one might hope: for example, someone who owns her/his own business reports most of her/his income in the form of capital income, even when a large part of it is actually labor income, so that compensation of employees is (vastly) understated. Figure 7 shows which results are obtained using this understated measure. It needs to be adjusted upwards by about 10% of GDP, for the reasons mentioned above.

For our purposes, we only need to remember that the share of compensation of employees is approximately 2/3 of value added. Therefore, we will very often work with a Cobb-Douglas production function such that:

$$Y_t = A_t K_t^{1/3} L_t^{2/3}.$$

Lecture 2 will walk you through the Solow growth model, where we shall make heavy use of that Cobb-Douglas production function.

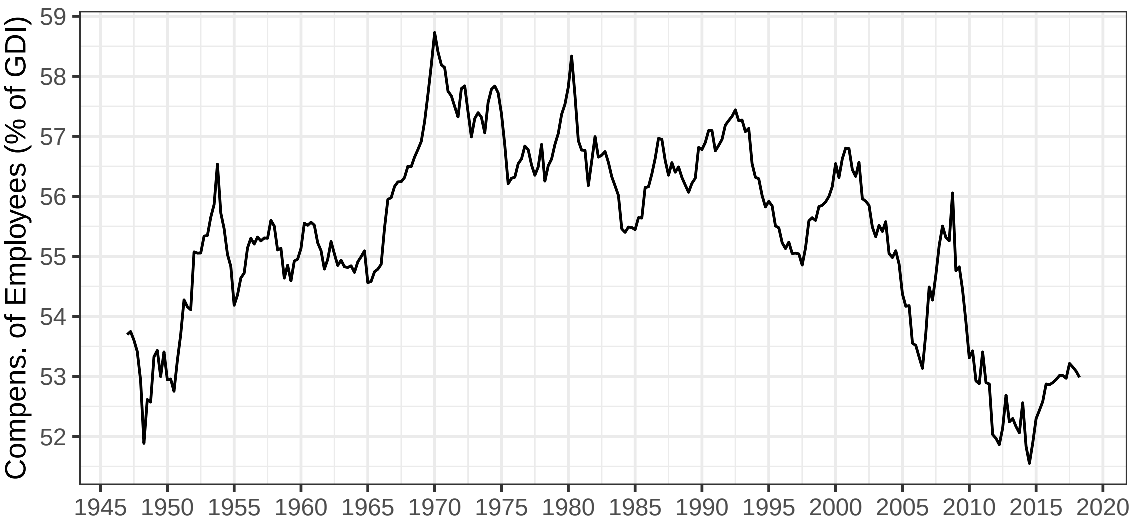

Figure 7: Compensation of Employees as a share of GDP from NIPA (BEA)