Economics of Migration

Mario Lavezzi[1]

[1]University of Palermo
mario.lavezzi@unipa.it

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Basic Concepts of Economics

Labor Markets

- A labor market is where the demand for labor meets the supply for labor. In this case, what is traded in the market are labor services.
- A perfectly competitive labor market has three characteristics: i) there exists a high number of workers and of firms; ii) all workers are identical to firms; iii) there are no entry or exit barriers.
- The labor demand and supply represent relationships between the wage and the employment level.

Basic Concepts of Economics

Labor Markets

- The demand for labor is expressed by the firms, who utilize, for example, labor (L) as a factor of production, together with capital (K), to produce an output (Y).
- The demand is downward sloping: at the level of the firm, the demand for labor depends on labor's marginal product (MPL), which is decreasing.
- For a given wage w, determined in the labor market, the firm chooses the optimal amount of labor to utilize, the one that makes MPL $= w$.

Basic Concepts of Economics

Labor Markets

- The market demand for labor is simply given by the sum of individual labor demands by the firms. It is a downward-sloping function of wages:

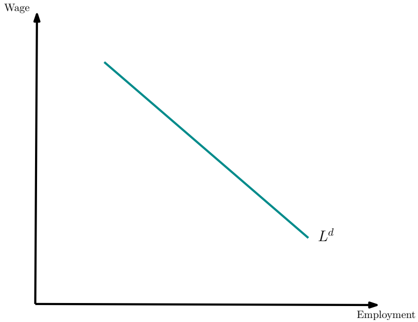


Figure 1: Labor demand

Basic Concepts of Economics

Labor Markets

- The market demand for labor can move to the right for example because the number of firms in the market increases, or to the left if, e.g., the number of firms in the market decreases.
- The supply of labor is expressed by individuals (workers), who offer their labor services to the firms.
- The supply is upward sloping: the higher the wage, the higher the number of workers wishing to work at that wage.
- Why? Individuals trade off the time at work for their leisure time. The higher the wage, the more the workers will be willing to give up leisure time and spend time at work.

Basic Concepts of Economics

Labor Markets

- The market supply for labor is simply given by the sum of individual labor supply functions . It is an upward-sloping function of wages:

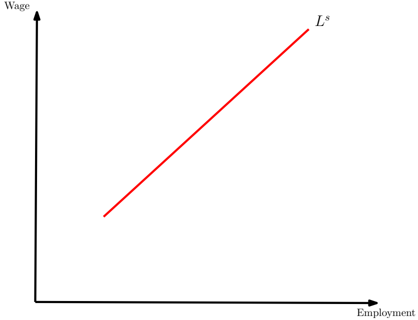


Figure 2: Labor supply

Basic Concepts of Economics

Labor Markets

- The market supply for labor can move to the right: among the reasons we find an increase in the number of workers in the market, or to the left (if the number of workers in the market decreases).

Basic Concepts of Economics

Labor Markets

- In this market, a downward sloping demand curve meets an upward sloping supply curve. The equilibrium of the market is where the demand intersects the supply. This identifies the equilibrium wage and employment levels.

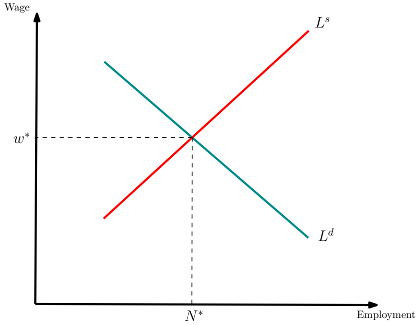


Figure 3: Labor market equilibrium

Basic Concepts of Economics

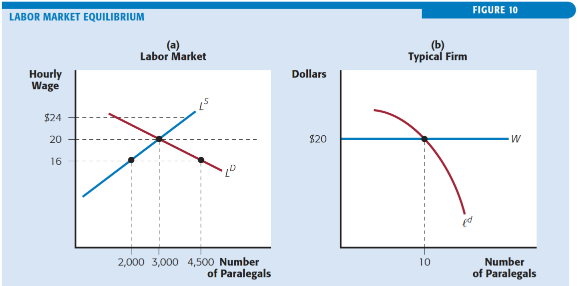
Labor Markets

- If the wage level is above its equilibrium value, there exists an excess supply of labor: in this case the wage tends to decrease until a new equilibrium is reached.
- If the wage level is below its equilibrium value, there exists an excess demand of labor: in this case the wage tends to increase until its new equilibrium is reached.

Basic Concepts of Economics

Labor Markets

- A complete representation of the labor market equilibrium is the following (from Lieberman and Hall, 2003, p. 331):



In panel (a), the market demand and supply curves for paralegals in Chicago intersect to determine a wage of $20 per hour. At that wage, 3,000 paralegals are hired. The individual law firm of panel (b) takes the market wage as given and employs paralegals up to the point where their *MRP* equals that wage rate. The firm shown will hire 10 paralegals at a wage of $20 per hour.

Figure 4: Labor market equilibrium. Source: Lieberman and Hall (2003)

Basic Concepts of Economics

Economic Growth

- Economic growth is the process by which aggregate output (and income) of an economy increases.
- The measure utilized to assess economic growth is GDP, which corresponds to the output Y at the aggregate level, or per capita GDP, i.e. the average level of GDP available to a given population.
- Per capita GDP is given by Y/P, where P is the population of the economy. In some models, the relevant magnitude is Y/L, i.e. output/GDP per worker.

Basic Concepts of Economics

Economic Growth

- Models of economic growth usually start from the specification of an aggregate production function such as the Cobb-Douglas production function, with the specification of a time subscript t:

$$Y(t) = A(t)K(t)^{\alpha}L(t)^{(1-\alpha)} \tag{1}$$

- In Eq. (1) time is discrete, i.e. time periods are counted as: $t = 0, 1, 2, 3....$ (Alternatively, time could be continuous, if time flows as a continuous variable).

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Economic Growth

- Eq. (1) is a convenient expression to start thinking about growth. By reading it, we can infer that changes in $Y(t)$ depend on changes in $A(t)$ (i.e. the technological level), $K(t)$, the (aggregate) capital stock, or $L(t)$, the (aggregate) quantity of labor utilized in production.
- With some manipulation, a simple way to express the dependence of the growth of Y (our main interest) on the growth of A, K and L is:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \alpha \frac{\Delta K}{K} + (1 - \alpha)\frac{\Delta L}{L} \tag{2}$$

- where ΔY / Y is the growth rate of Y (in discrete time).

Basic Concepts of Economics

Economic Growth

- In continuous time, the expression above would be:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha\frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{L}}{L} \tag{3}$$

- An expression such as: $\dot{Y}/Y$ indicates the (instantaneous) growth rate of that variable, i.e. the speed at which that variable changes in a given instant.
- Eq. (3) tells us that the growth rate of output is given by the sum of the growth rate of technology (i.e. the technological progress) and on a combination (which is denoted as "weighted average") of the growth rates of capital and labor.

Basic Concepts of Economics

Economic Growth

- Eq. (3) allows to perform a growth accounting exercise (see, e.g. Jones, 2013, pp. 45-6), i.e. to evaluate the contributions of the terms on the right-hand side to the growth of output.
- The shares α and $(1-\alpha)$ are, in many national accounting statistics, approximately equal to $1/3$ and $2/3$ (it means that, approximately, $1/3$ of the output produced by an economy goes to capital and $2/3$ to labor).
- (Given some conditions, output is completely exhausted in the payment to factors, i.e. $Y = rK + wL$ and the factor shares of capital and labor are given by, respectively, $\alpha = rK/Y$ and $(1-\alpha) = wL/Y$. (Jones, 2013, p. 23)).

Basic Concepts of Economics

Economic Growth

- For example, it capital grows at the rate of 0.01, labor grows at 0.02, and technology grows at 0.02, then the growth of output will be $g_Y = 0.02 + 0.33 \times 0.01 + 0.66 \times 0.02 = 0.0365$ or 3.65%.
- At this point, we have learned <u>how to decompose the growth rate of output into the growth rate of technology, of capital and of labor</u>.
- For example, if a country has a higher rate of technological progress, given the growth rates of K and L, it will enjoy a higher economic growth.

Basic Concepts of Economics

Economic Growth

- In addition, from Eq. (3) we can derive the growth rate of output per worker, which is simply given by:

$$\frac{\dot{Y}}{Y} - \frac{\dot{L}}{L} = \frac{\dot{A}}{A} + \alpha \left(\frac{\dot{K}}{K} - \frac{\dot{L}}{L} \right) \tag{4}$$

Basic Concepts of Economics

Economic Growth

- If we denote $Y/L = y$, $K/L = k$, the growth rate of y as g_y, the growth rate of k as g_k, and the growth rate of A as g_A, we can rewrite Eq. (4) as:

$$g_y = g_A + \alpha g_k \tag{5}$$

- Eq. (5) shows that the growth rate of output per worker is given by the sum on the growth rate of technology and of the growth rate of capital per worker (multiplied by α).
- This has an important implication: i) if $g_k = 0$, which is what happens in *steady-state*, the only source of long-run growth (measured by g_y) is given by technological progress.

Basic Concepts of Economics

Economic Growth

- However, at this point we do not have a theory of economic growth, i.e. we do not have explanations of why for example capital per worker should grow and/or why technology should grow over time.

Basic Concepts of Economics

The Solow Model

- The most popular growth model in economics is the Solow model, from the economist (and Nobel Laureate) Robert Solow, who proposed the model in 1956.
- The Solow model is very simple. It is based on two equations (we follow the presentation of the Solow model of Jones, 2013, cap. 2).

Basic Concepts of Economics

The Solow Model

- The first equation is a Cobb-Douglas production function. For simplicity let's assume first that there is no technological progress. We can write the (aggregate) production function as (leaving out the time subscript t):

$$Y = K^{\alpha} L^{(1-\alpha)} \tag{6}$$

- Let us rewrite Eq. (6) in terms of output and capital per worker.

$$y = k^{\alpha} \tag{7}$$

Basic Concepts of Economics

The Solow Model

- The graphical representation of Eq. (7) is given by:

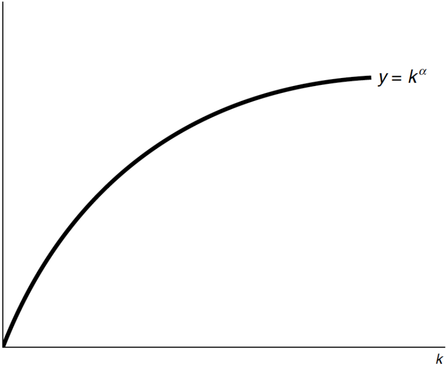

Figure 5: The production function in the Solow model. Source: Jones (2013)

Basic Concepts of Economics

The Solow Model

- The second equation of the Solow model is the *accumulation equation*, i.e. an equation specifying how capital is accumulated. It looks like this:

$$\dot{K} = sY - \delta K \tag{8}$$

- where s is the *saving rate* of the economy, and δ is the *depreciation rate* of capital.
- Now we have to rewrite Eq. (8) in terms of per capita capital, to be consistent with Eq. (7). Remember that $y = Y/L$ and that the growth rate of capital per worker is given by g_k.

Basic Concepts of Economics

The Solow Model

- From Eq. (8) we can write:

$$\frac{\dot{K}}{K} = s\frac{Y}{K} - \delta = s\frac{y}{k} - \delta \tag{9}$$

- Therefore:

$$g_k = \frac{\dot{k}}{k} = \frac{\dot{K}}{K} - \frac{\dot{L}}{L} = s\frac{y}{k} - \delta - n \tag{10}$$

where $n = \dot{L}/L$, i.e. it is the growth rate of the labor force.

Basic Concepts of Economics

The Solow Model

- We are interested to study the case in which the economy reaches a *steady-state*, i.e. an equilibrium in which $g_k = 0$ (which implies, from Eq. (7) that $g_y = 0$).
- The steady state conditions obtain when $\dot{k} = 0$ which, from Eq. (9) implies that:

$$sy = (\delta + n)k \tag{11}$$

- At this point, the two key equations of the Solow model are Eq. (7), and Eq. (11). They can be plotted together, as in the following figure:

Basic Concepts of Economics

The Solow Model

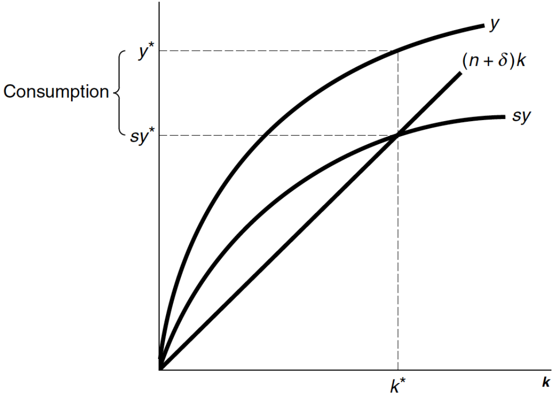

Figure 6: Steady state in the Solow model. Source: Jones (2013)

Basic Concepts of Economics

The Solow Model

- Figure 6 show that the economy *converges* towards a steady-state level of per worker capital k^* and y^*.
- Economic growth, i.e. increases of per worker capital and output, only occurs in the transition, i.e. until the steady-state value of k^* is reached. At that point, there is no more growth, but constant per worker levels of capital and output.
- Other empirical implications of the model are: i) the higher the growth rate of the labor force n, the lower the level of k^* and y^*; ii) the higher the saving rate s, the higher the level of k^* and y^*.
- These effects, however, leave untouched the result that, in the long-run, the growth rate of per worker capital and income are zero.

Basic Concepts of Economics

The Solow Model

- However, if we introduce technological progress in the Solow model, i.e. we start from an equation like this:

$$Y = K^{\alpha} A L^{(1-\alpha)} \tag{12}$$

  it is possible to show that the dynamics depicted in Figure 6 is the same, but the per-worker magnitudes in the long-run grow at the rate of growth of technological progress, g_A (see Eq. 5).
- Note that in Eq. (12), technological progress appears as affecting only labor, in this case it is defined *labor-augmenting* technological progress.

Basic Concepts of Economics

The Solow Model

- In such a model, technological progress is *exogenous*, i.e. it appears as a *public good*.
- Technological progress takes place through the production of *ideas*, when an idea is generated, it is freely available to anyone that wants to use it (and can be replicated at no costs).
- More recent generations of growth models are defined *endogenous growth* models, because they allow technological progress to be obtained by purposeful actions of firms, researchers, etc. (see, e.g., Jones, 2013, Ch. 4, 5, 9)

Bibliography

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Lieberman, M. and R. Hall (2003), *Economics. Principles and Applications*, South Western Pub.