

## Models of the Economic Growth and their Relevance

**Nicolae MOROIANU**

Bucharest Academy of Economic Studies  
moroianunicolae@yahoo.com

**Daniela MOROIANU**

Bucharest Academy of Economic Studies  
daniela\_moroianu@yahoo.com

**Abstract.** *Until few years ago, the economic growth was something perfect normal, part of an era marked by the transformation speed. Normality itself has been transformed and we currently are influenced by other rules, unknown yet, which should answer the question: "How do we return to the economic growth?" The economic growth and the models aiming to solve this problem concern the economic history even since its beginnings. In this paper we would like to find out what is the relevance that the well-known macroeconomic models still have and which might be their applicability level in a framework created by a black swan event type.*

**Keywords:** economic growth; Solow-Swan model; economic crisis.

**JEL Codes:** E10, E13, E22, F43.

**REL Codes:** 8E, 8L.

## 1. Introduction

The economic growth is a notion which grinds both the governments and the normal people at the moment of speech. Why? Because we are still kept inside the waves of a big storm which is far from being stopped; in fact we are facing the threatening of a second wave, perhaps more dangerous than the first one. What does this *economic growth* mean? According to mainstream and to most of the economics textbooks, this has been defined as an increase of the capacity of one economy to produce goods and services, using a comparison between two defined periods. The economic growth might be measured in nominal terms, which include inflation or, in real terms, adjusted with inflation. Often, the economic growth is associated with the innovation part and with the technological changes. One good example in this direction is represented by the emergence of the Internet and the changes underlying the production process which have been brought by this new technology. We shouldn't understand through the economic growth just the increase capacity of production of one economy, but also an improvement of the life quality of those people which are part of that economy<sup>(1)</sup>. The economic growth can be measured through the percentage changes of various indicators GDP, GNP and GDP per capita.

Professor Raul Romer (2007), from Stanford University, in one of his writings in *The Concise Encyclopaedia of Economics*, explains the vision of one banker preoccupied by the growth part, compared with what means the part of economic growth for a government. If we have a chessboard (in total 64 squares) and put a cent on the first square, two cents on the second square, four cents on the third one, eight – on the fourth square, we will end up to have on the last square about 92 million dollars. If we use in this multiplying process just the white squares, we'll have about 21.5 million dollars. Of course, the banker will decide to use all the squares, being preoccupied just by the profit, irrespective if we talk about dollars, pounds or lei. When talking about a government, the situation changes, because the State should take into consideration the growth rate (highlighted by the two above different situations – either using all the squares, or using half of them). Thus, the concern for choosing the optimal variant, between doubling the income from one generation to the other, or doubling the income every two generation – decrease all other concerns regarding the economic policies.

In reality, the things are not quite like this. If between 1950 and 1975, for instance, India had a yearly GDP growth rate of 1.8%, we could see how long it will take to this country to double the GDP, using the rule of 72 (in finance, the rule of 72 is a method used to estimate the period of time the value of an investment doubles). By dividing 72 to 1.9 we find out that India could double its GDP in about 40 years. The same rule might be applied for China: to a

yearly GDP growth rate of 10%, China could double the income, by maintaining the same growth rate, in about seven years (Romer, 2007).

The economic growth models were interesting for the economists ever since the classical period (Adam Smith, David Ricardo). Keynesian models, as well as their direct descendants, the Neo-Keynesian models, claim that in order to have a stable economy it is necessary to use macroeconomic politics and the direct intervention of State for reaching the equilibrium and stimulating the economic growth. On the other side there are the models of the Neo-Classics, who are saying that the economy is self-stable and the equilibrium comes naturally.

All above-mentioned growths must be comprised in models, because the systematic structuring of reality into models represents a passion – sometime too burning passion – of the modern scientific phenomenon. In this paper we will focus on the validity and viability of these models during crisis times and we will try to define which their grade of applicability is, taking into consideration the mentioned conditions. Also, taking into consideration the fact that the research is in an incipient stage, the main model used here will be the neoclassical model of growth (Solow-Swan).

## 2. The Solow-Swan economic growth model

One of the most known models of economic growth is the neoclassical model or the Solow-Swan model of growth, as it is known in the specialised macroeconomic literature. This model is an extension of the growth model Harrod-Domar (1946); and the extension is represented by including in the model a new term: increase of productivity. In this new model, the new capital is more valuable than the old capital, because it appears as a result of the improvement of technology during the time.

Further, we will briefly present few of the main characteristics of this model, as well as the function on which this is built, but also changes of the models due to the variable compounds.

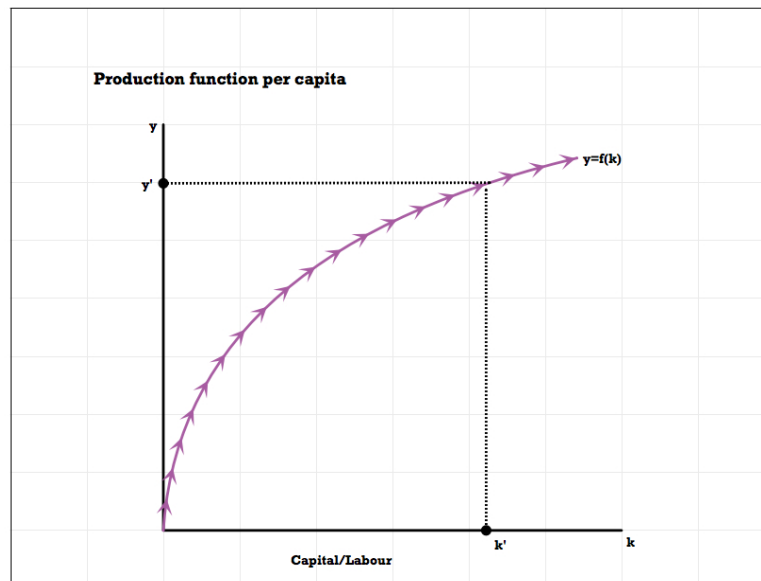
This model actually shows how the rate of economic growth, the population growth and the technological progress influence the economic growth during a certain period of time. The premises used in this model are:

- The economy is perfectly competitive;
- There are two production factors which are perfectly substitutable (work L and capital K – in the initial analysis does not appear the technical progress);
- The perfect mobility of the production factors;
- Complete employment in using the resources (Socol, 2009).

In this model, the production function is one of the type Cobb-Douglas, in the following format:

$$Y = A \times K^{\alpha} \times L^{\alpha-1}$$

The production function represented by the correlation between the output per inhabitant and the coefficient capital-work may be graphically represented as follows (Dornbusch et al., 2007):

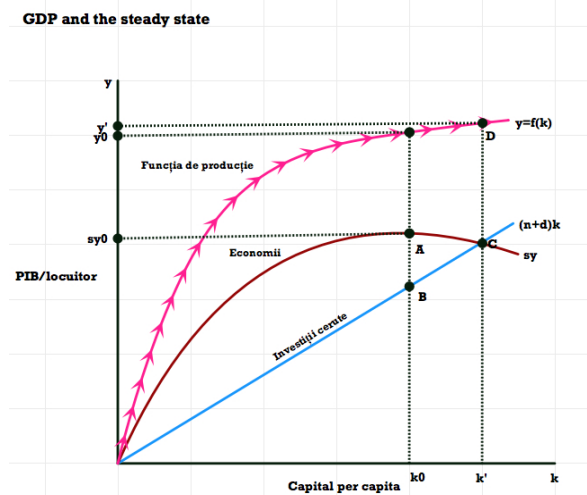


**Source:** redrawn graphic after the same name graphic from Macroeconomics – R. Dornbusch, Stanley Fischer și Richard Startz.

**Figure 1.** *Production function per capita*

The model takes into consideration a closed economy, with a single sector in which the homogeneous production has as destination either the consume or the investments, in order to create new capital units and the savings are equal to the investments. The capital will have a constant and positive depreciation rate (Socol, 2009).

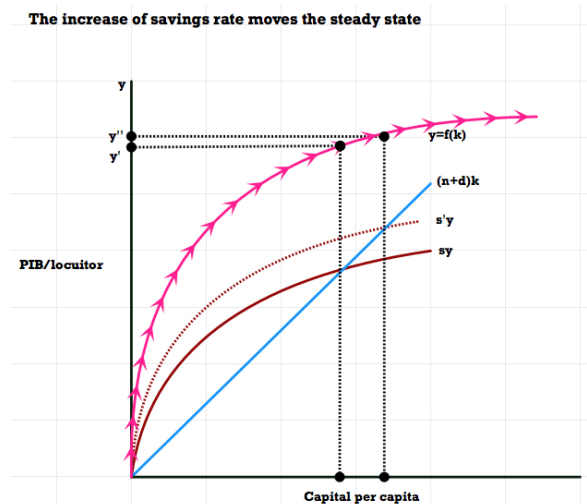
In the above graph we may notice that once the capital increases, the output increases, too. However, as we go on the capital axe, one may notice that this will produce lower results compared with the previous period, due to the decreasing product of the capital. This might be an explanation for the fact that an economy reaches a steady state, instead of continuing its growth for an unlimited period of time. What does it mean a steady state? An economy will naturally go towards a steady state, according to the neo-classical model. The investment necessary to maintain a constant level of the working capital will depend on the population growth rate, but also on the depreciation speed of the capital. Therefore, we have below the graphical representation of the steady state:



**Source:** redrawn graphic after the same name graphic from Macroeconomics – R. Dornbusch, Stanley Fischer și Richard Startz.

**Figure 2.** *The GDP and the steady state investment*

What will happen with the economy when the growth of the saving rate ( $sy$ ) in the above graph will start increasing? According to the neo-classical theory, the saving rate will not affect the long-term rate of economic growth, but will long-term influence the level of the output/capita. This problem can be graphically expressed as follows:



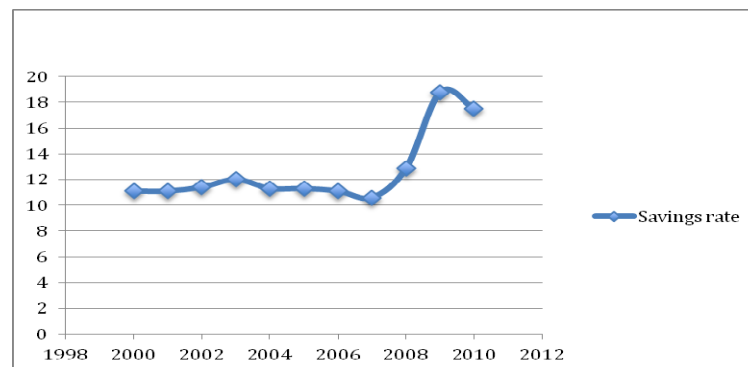
**Source:** redrawn graphic after the same name graphic from Macroeconomics – R. Dornbusch, Stanley Fischer și Richard Startz.

**Figure 3.** *Growth of savings rate moves the steady state*

### 3. Anomalies during crisis time

Further, we will use only this variation of the model Solow-Swan in order to reach the practical side of the matter discussed in this paper. One of the reasons is that, in our opinion, the saving rate represents one of the main indicators of an economy, but it reflects the level of the financial education of one nation (if the saving rate is high, of course the amount of incomes for consume is more reduced). Even if the model of growth discussed above has some limitations (the premises itself on which the model is based), we will try to find equivalents into the real economy, in order to test – however at a low grade of accuracy – the validity of this model during crisis time.

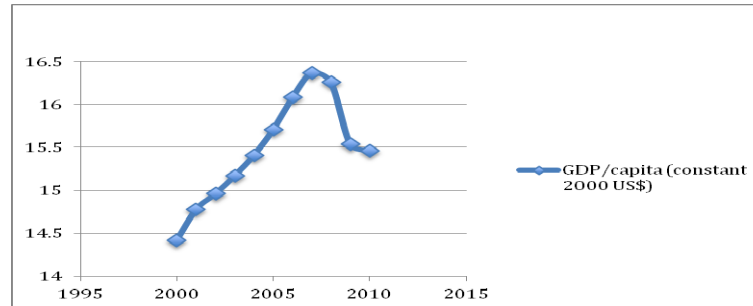
Considering the fact that this crisis began in the period 2007-2008, we cannot focus the analysis on a long period of time, as the neoclassical theory requests, however we will take into consideration the evolution of the Spanish economy during 2000 and 2010. The reason for which we have chosen this country is that at the moment the crisis began this was one of the countries powerfully hit by crisis, but also that the anomaly which appeared here can be better observed than in other countries. In the next two graphs we can notice the evolution of GDP per capita, calculated in USD 2000, and also the evolution of the savings rate.



Source: World Bank Quick Query.

**Figure 4.** Savings rate for Spain

In this graph we can see a relatively linear evolution of the trend between 2000 and 2007, the level of the savings rate being in the range of 10-12 percentages. Once the crisis appeared, it may be seen that the saving rate started to exceed the range into which it fluctuated during the previous years.



Source: World Bank Quick Query.

**Figure 5.** *GDP/capita evolution for Spain*

The GDP per capita had – as it was in most of the countries – an ascending trend, sustained by a prolonged boom period of the world economy.

Comparing the two graphs, once the crisis appeared, it may be noticed that the trend reversed for the two variables, the link between them being reversed. Therefore, not always an increase of the savings rate determines an increase of GDP/capita.

#### 4. Conclusions

We saw in the previous part of this paper how the anomalies appeared in the rationality of the economic growth. The causes we could intuitively detect, in our opinion, may be found by studying behavioural economics. The psychological fundamentals underlying the human behaviour determined the population – who was facing a threat and so was mentally forced – to take precautions measures, in order to avoid being unprepared in the following period. In front of rationality stood this time the preservation instinct.

Another big problem of the models aiming to explain the economic growth and to offer recovering scenarios is represented by the implementation of these models. There are big gaps of the transfer of knowledge between those who develop models (academic world, researchers) and those who are supposed to ensure the smooth running of the economy (both governments and the business community).

In this paper we focussed for the time being on a single moment, but the research will be extended in the next papers, including in our analysis other models of economic growth. Nevertheless, there is one single thing which cannot be challenged, i.e.: the more findings we'll have and the bigger the innovation process (closer to the rhythm of occurrence of these technologies), the more we'll have economic growth.

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## Note

- <sup>(1)</sup> Definition from the Investopedia.com site: <http://www.investopedia.com/terms/e/economicgrowth.asp#axzz1drQ6zThy>.

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