EXPLAINING ECONOMIC GROWTH IN ROMANIA USING THE FRAMEWORK DEVELOPED BY ROBERT SOLOW

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Abstract: Based on Solow model, I tried to analyze the different roles played by labor, capital and especially by what is called "residual" in the Romanian economy during the last 15 years. This last factor indicates a strong correlation between innovation and productivity and, eventually economic growth.

1. Introduction

Looking at the innovation from the end results, such as economic growth is a tempting one (Romer, 1989). The economic growth in Romania, as in many other countries, was associated mainly with the process of industrialization, which has represented the bedrock of innovative process.

The attraction to industry has been very high and not for a reason: in 1938 an occupied person in the Romanian industry produced a gross value 29.2 bigger than in agriculture. As a result of this orientation and efforts, during 1922 and 1938 the national income increased with an annual average rate of 4.3%, bringing the share of industry at 39 % and of agriculture at 61% of total production. But than the war struck, and the national income in Romania in 1947 barely reached 35-40% of the level registered in 1938.

In order to analyze the contribution of the innovation in Romania from the point of view of its contribution to the economic growth after 1989. A short historical development will throw light over the present situation.

The result was that, after the efforts made during the first half of the last century Romania was still sharing the last places in the hierarchies of economic development on our continent.

During 1950 and 1989, Romania has continued the process of industrialization with a focus towards investments, education and scientific and technical progress; the industrial production increased during this period 48 times (the labor productivity in industry increased 12 times), contributing to a growth in national income of about 20 times (Postolache, 1991).

The accumulation rate increased also gradually from an average rate of 17% in the 50' to a maximum of 35% during the five-year plan 1976-1980. As outlined by Dobrescu (1979) during the five-year plan 1971-1975 the accumulating rate was 33.7 corresponding to an annual average growth of national income of 11.3 %. Than the growth rate has diminished to an annually average rate of 7.2% during 1976-1980 and to 4.4% during 1980-1985, while the accumulation rate diminished also to 27.9%.

To put it in prospective the real output per capita in Japan during 1950-2000 increased by 11.4 times, while in USA only by 2.6 times. These rates of growth were strongly correlated

with the rate of technical progress, implying that technology could be a good way towards convergences.

Nowadays, countries like China, Hong Kong, Singapore, Taiwan, Malaysia, Thailand, Indonesia, and South Korea are fast growers. So, which are the secrets of growth, if there are some?

(a) 2. Long-term growth and short-run business fluctuations

In the period 1991-2002 the real GDP in Romania has fluctuated around a slightly upward trend.In the long run the real GDP, in most economies, fluctuates around a rising trend. Long-term economic growth is reflected in the increasing trend of real GDP, irrespective to the business cycles, which are fluctuations of real GDP around its long-term trend.
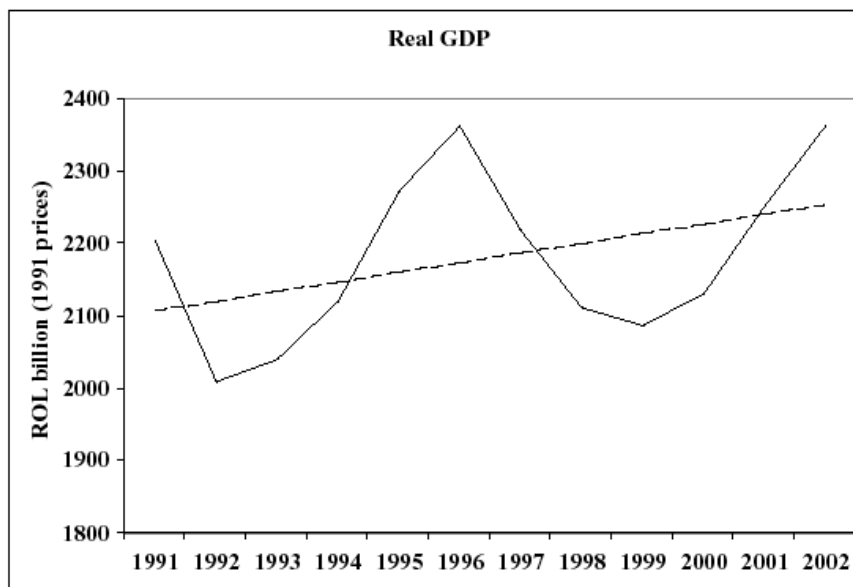
Since it is more difficult to calculate the potential GDP, we will consider the trend value of real GDP as an approximation for potential GDP. The chart above is based on a linear approximation of potential GDP.

Potential GDP measures what the economy could produce if all resources (land, labor and capital) were employed at their normal levels of utilization.

(b) 3. Factors of economic growth

The trend movement of real GDP is predominantly driven by the supply side of the economy. We will limit to three the main reasons why potential GDP grows: capital, labor input and productivity.

We will take into consideration the labor force defined as the number of persons who are either employed or unemployed, and the unemployment rate as the percentage of the labor force that is unemployed.

We will consider the volume of physical capital in any given year as it is determined by investment in previous years, and the investment as a flow of new capital during the year, that contributes to the changes in the stock of capital.

However, total factor productivity incorporates the productivity of both labor and capital, and the process of technological change tends to positively impact upon factor productivity.

Robert Solow of M.I.T., who received the Nobel Prize in 1987, developed a framework that can be used to determine the contributions of labor, capital, as well as total factor productivity to economic growth of a country (Solow, 1970).

His formula was used, among others, by Edward Denison of the Brookings Institution to study the contributions of each factor to long-term growth in the United States (Denison, 1974).

Assuming that GDP rate r^y equals productivity rate r^A plus the weighted rates of employment r^L and capital r^K:

than, $r^y = r^A + a \cdot r^L + (1-a)r^K$

where the weight denoted "**a**" represents the share of labor cost in value added.

This growth formula can be used to infer the rate of total factor productivity as a residual:

$r^A = r^y - a \cdot r^L - (1-a)r^K$

(c) 3.1. Explaining Romanian economic growth

During the past decade, overall growth performance of the Romanian economy was disappointing.

Real GDP was highly volatile and its potential level grew at an extremely slow pace.

According to IMF estimations, potential GDP grew at an annual rate of 1.2 percent in the period 1992-2001.

The explanation of the low growth rate requires a closer look at employment, capital developments and total factor productivity

Employment persistently declined throughout 1992-2001 at an annual rate of - 2.0 percent.

Capital stock data is not available for Romania for that period, but IMF estimates suggest that it slightly increased by about 1 percent annually over the 1992–2001 period.

(i) *Source of GDP growth in the period 1992-2001*

			Annual percentage change
GDP			1.2
	Rate	Share Contribution	

Employment	-2.0	0.5	-1.0
Capital	1.0	0.5	0.5
Total factor productivity			1.7

(d) 4. Total factor productivity and growth policies in Romania

Based on the statistical evidence we assume a labor share of 0.5; this implies a modest contribution of capital (0.5 percentage points) to GDP growth.

At the same time the employment contribution was negative, estimated at 1 percentage point.

It comes out that total factor productivity, as measured by the Solow residual, provided the major contribution to GDP growth, which means 1.7%

So one can see that the positive rate of annual percentage change of GDP of 1.2% has resulted from a negative contribution of employment by –1%, by a positive contribution of capital by 0.5%, cumulated with a positive contribution of total factor productivity of 1.7%

The practice shows that the government can influence all three of the determinants of growth: labor input, capital formation and total factor productivity.

The idea of stimulating productivity has been attractive to policy makers, but there have been few proposals for concrete action.

Perhaps the most important role that the government can play in improving productivity growth is in the area of education and research and development.

A highly skilled labor force is obviously a key ingredient to successful productivity growth. In this respect Romania is facing a strange paradox: while the creative capacity is over average, the mechanism of using it is weak (Nastase, 1994).

On the other hand, increased growth in the capital stock requires consistently high levels of investment spending. Starting next year tax cuts and investment tax credits may be utilized for stimulating investments. However, the experience of other economies in transition shows that the effects of the investment tax credits tend to be rather disappointing.

Tax cuts may also be used to improve work incentives. However, one should keep in mind that labor supply is rather inelastic, so that even a large tax cut has only a small effect on employment.

It is trough that lower taxes may provide incentives to work (the substitution effect), but the higher level of after-tax income, generally depresses work (the income effect).

The government also plays a role in sponsoring research in science and engineering, and during the last 3-4 years a consistent policy in this field has been pursued in Romania (Chirovici, 2004).

(e)   4.1 The role of institutional factors

Economic growth also depends on factors that facilitate the production, the distribution and the sale of goods and services, which economists refer to as the economic infrastructure.

In this context, infrastructure does not refer to roads, structures, dams or other capital goods, but to institutional factors:

- Forms of government (encouraging private ownership and free enterprise, enforcing contracts and stamping out corruption, protecting physical and intellectual property);

- Monetary policy (ensuring the independence of the central bank committed to achieving price stability);
- Trade policy (supporting free trade);
- Regulatory framework (balancing the costs and the benefits of government intervention in the private sector).

During the first 10 years, after 1989, the stop and go policy in Romania was not conducive towards a harmonious social capability. It was only after 2000 that a consistent strategy has been developed in this respect.

(f)   4.2. Determinants of productivity growth in Romania 1992-2001

The hypothesis of the IMF is that the more efficient utilization of labor and capital was among the major determinants of total factor productivity growth at an annual rate of 1.7 percent throughout 1992-2001.

Privatization and restructuring improved, albeit rather slowly, the utilization and allocation of factor inputs, reducing hidden unemployment. At the same time, the new private sector, institutional reforms, more efficient management structures, as well as human capital accumulation in accordance with the requirements of a market economy gradually strengthened, sustaining the timid productivity gains.

(g)   5. Natural unemployment and the trend of Romanian unemployment rate

The institutional structure of the economy gives rise to a "natural" rate of unemployment toward which the economy gravitates, and which limits the efficient employment as factor of economic growth.

When the economy is at potential GDP, the unemployment is at its natural level and the factors of production are used at their normal intensity. Efforts to lower unemployment below the natural rate can succeed only in the short run and only by inducing upward pressures upon prices. Or in Romania, with relatively high inflation, there's no scope for such development (Dorbrescu, 2000).

However, estimates of the natural rate of unemployment provide a useful benchmark against which to gauge the current performance of the economy, as measured by the actual unemployment rate. Natural unemployment is said to occur when the only existing unemployment is frictional and structural.

The unemployment rate fluctuated around an upward trend suggesting that the rate of natural unemployment has increased in the period 1991-2002.

The increase of natural unemployment is not surprising in periods of intensive restructuring. If job creation is slow in compensating for job destruction, then the trend of unemployment is up.

But the employment shrank by about 1.4 million people throughout 1991-2002.

In the same period, unemployment surged by more than 0.7 million people.

Labor force fell by about 0.7 million, moderating the effects of restructuring on unemployment.

Besides negative demographic trends, overly generous pension regulations played their role in fostering the decline of labor force, and consequently in employment.

There are expectations that the decline in the labor force might cease. Though continued restructuring could result in further layoffs, new industries and the service sector should be able to absorb these workers. Therefore, the unemployment rate is expected to stay around its current level of about 7- 8 percent.

6. Economic growth, 2001-2004

Based on the same methodology we will continue our analysis for the period 2001-2004 (estimates for 2004), when the average growth rate has been around 5%.

(i) Source of GDP growth in the period 2001-2004

			Average annual percentage change
GDP			5
	Rate	Share Contribution	
Employment	0	0.5	0
Capital	2	0.5	2
Total factor productivity			3

Taking into account the developments from the last 3-4 years, when real GDP has increased by about 5% per year, we can notice from the above table that total factor productivity has contributed to the GDP growth by 3percentege points, reflecting a strong component of innovation activity, since the more efficient reallocation of labor and capital registered in the previous period has approaching the normality. And this has come mainly from the demand side due to the " reanimation" of the industrial activity. This is confirmed also by the fact the foreign investments in Romania have been concentrated (64.7% at end of March 2004) in industry, at the same time, taking advantage of and bringing innovation to Romania.

On the other hand, the factor capital has contributed to the GDP growth by 2 percentage points, reflecting the fact that the investment ratio to GDP has increased from around 17% in 1999 to 22.5% in 2003, and the trend is an increasing one.

The correlation between industrial production and innovation developments has been quite strong. Going back, in 1992 the industrial production was smaller than in 1989 by 37.3%; it increased by almost 18% between 1993-1996, only to decreased again by 14% between 1997-1999.

 Starting with 2000 it has increased by more than 7% on average, being the main driving force of the GDP, since than. It is expected that this year the industrial production will reach the 1990 level.

The research and development picture has reflected, in general, but with a certain delay, the fluctuation of industrial activity, showing the strong importance of the demand side, for this type of activity during the transition period. Only relatively recent the economic agents have rediscovered the utility of their own research activity; the fact that they cannot depend on imports in this domain has become clear for them, and they abandoned the idea that everything should come from abroad. The inside research (the factory research) has started to give important results, and new industrial sectors, science-intensive have appeared.

Real Salary Earnings and Labour Productivity in Industry
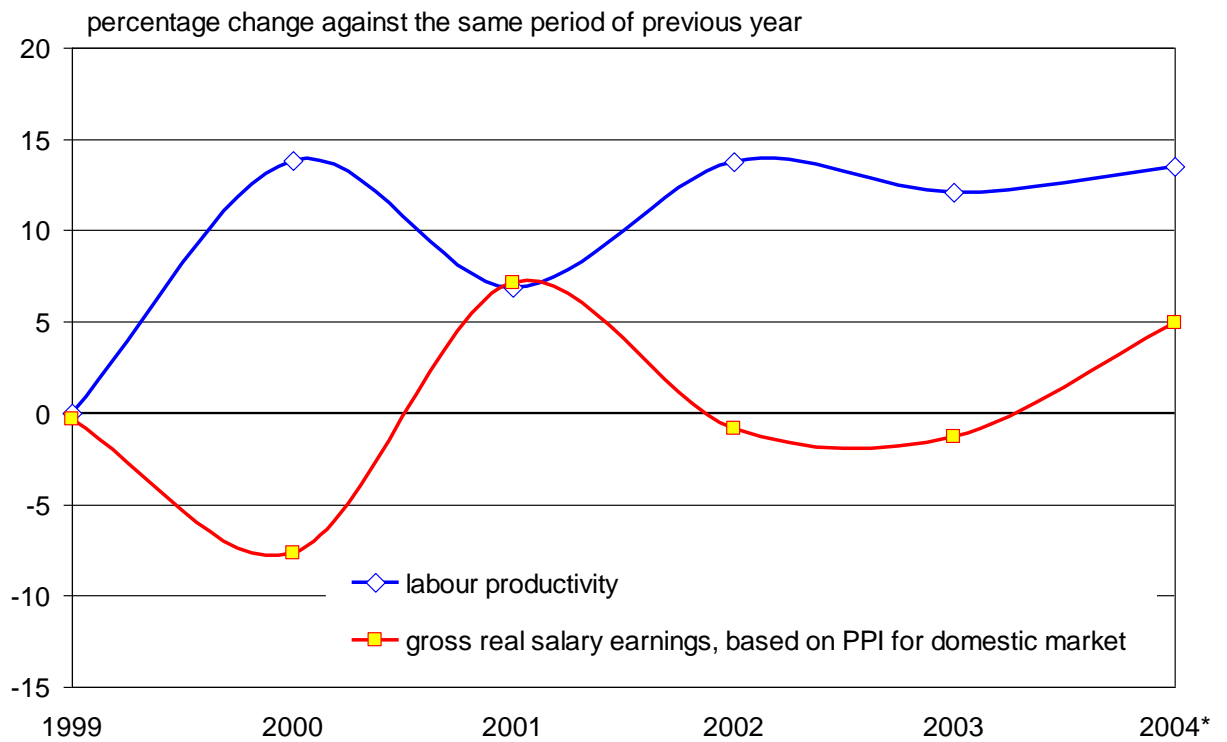
Source: National Institute of Statistics, NBR calculations   *) Jan. - Mar.

Starting with 2000, as one can see from the above graph, the industrial productivity has gained a sustainable trend, based on investments and innovation.

This trend, if continued, resembles the trends registered in France during the '50 and '60, and could by contusive to steadily decrease in the gap between Romania and the developed countries. Already the GDP per capita has increased from 6000 Euros to an estimated 7250 this year.

In spite of all this efforts, only this year Romanian economy will reach the 1990 level, although in certain fields it has made significant progress, which could represent a necessary shortcut for the cutch-up process.

7. Conclusion

The results of this short analysis show that innovation, through the total factor productivity, played a determinant role in the economic growth in Romania during the transition period.

Although during the first 10-11 years of the post socialist transition the annual average rate of growth in Romania was very modest, 1.2%, the total factor productivity contributed with 1.7 percentage points, the majority of which came from a reallocation of labor and capital.

But during the last 4 years, in spite of the fact that the reallocation effect has diminished substantially as privatization has advanced in a predominant way, the total factor productivity has increased its importance to 3 percentage points. This is coherent however with the development of new products and the introduction of new technologies in the economy. The question remains if one can consider this as a sustainable innovation and if European Union funding for innovation will be conducive towards long-term economic growth and competitiveness (Leal Filho, 2004).

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