BULGARIA'S ECONOMIC GROWTH: SUPPLY-SIDE DIMENSIONS

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Abstract

The objective of this paper is to identify the contributions of capital stock, labor input and technological progress to Bulgaria's economic growth under a Currency Board Arrangement. In order to accomplish the goal of the article, a growth accounting approach based on a two-factor Cobb-Douglas production function is employed. The results obtained imply that the total factor productivity and capital stock have been the main supply-side determinants of economic growth in Bulgaria under a CBA while the influence of changes in employment on the dynamics of real GDP has been weaker than the influence of the other two factors. The dynamics of the total factor productivity under a CBA has been rather chaotic, which is a result of the inconsistent development of the transition to a market-oriented economy in Bulgaria. The growth problems of Bulgarian economy are complex and difficult to solve. Their successful resolution requires a combination of short-term measures to stimulate aggregate demand and long-term actions to affect aggregate supply.

Keywords: Bulgaria, currency board arrangement, growth accounting

JEL Classification: O47

Acknowledgement:

The paper is elaborated under the project No SRP-C1/15 "Increasing the Attractiveness of Scientific Careers for Young People", funded under the Regulation №9/08.08.2003 of the Minister of Education and Science of the Republic of Bulgaria.

The extended version of these papers will be published in Scientific Annals of the "Alexandru Ioan Cuza" University of Iasi, Economic Sciences Section (SAAIC) in March 2016.

1. Introduction

After a heavy financial and economic crisis, in July 1997 Bulgaria introduced a CBA, in order to restore the confidence in the national currency and bank system, to impose financial

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discipline and stabilize the economy. Bulgarian Currency Board proved to be a great success. It is a type of a hard currency peg that relies on automatic mechanisms to restore macroeconomic equilibrium, limiting severely the discretion of policymakers (Stoilova, 2010, p. 269). The state intervention in the economy was restricted, which may be considered "a fundamental precondition for the development of free market economy" (Patonov, 2013, p. 315).

The CBA adoption marked the beginning of a new stage in the economic history of Bulgaria. This stage is characterized by a gradual recovery of Bulgarian economy from the collapse in 1990-s and by unstable and uneven growth. After a period of a relatively high growth of 6-7% per annum before the global crisis, Bulgarian economy contracted by 5.01 % in 2009 and grew by less than 2% in the next years. The weak growth was accompanied by deflation trends in 2013 and 2014, which is a dangerous combination and requires a rapid and adequate response by Bulgarian macroeconomic policy-makers.

The objective of this research is to identify the contributions of capital stock, labor input and technological progress to Bulgaria's economic growth in the period of the Currency Board Arrangement. The goal of the study has been achieved by the fulfilment of the following tasks:

1) Select and apply techniques for calculating the indicators whose values cannot be readily obtained from the National Accounts Statistics (Section 2);
2) Present and interpret research results (Section 3).
3) Formulate advisable macroeconomic policies for resolving the growth problems of the Bulgarian economy (Concluding section).

2. Assumptions and methodology of calculations

In this paper the impact of the changes in labor, physical capital and total factor productivity on the changes in real GDP has been investigated by means of the basic growth accounting equation

$$\Delta Y/Y = \Delta A/A + \alpha\, \Delta K/K + \beta\, \Delta L/L \qquad (1).$$

According to this equation, the growth rate of real GDP $\mathbf{\Delta Y/Y}$ is a sum of the growth rate of capital stock $\mathbf{\Delta K/K}$ weighted by the share of capital in the gross income $\boldsymbol{\alpha}$, the growth rate of employment $\mathbf{\Delta L/L}$ weighted by the share of labor in the gross income $\boldsymbol{\beta}$ and the growth rate of total labor productivity $\mathbf{\Delta A/A}$. The way of defining the total factor productivity's contribution to economic growth (as a residual obtained by extracting from the output's growth rate the

contributions of the two basic growth factors), gives the term "total factor productivity" a specific broader meaning. The dynamics of the total factor productivity reflects the influence of all sources of real GDP growth which are not changes in employment and in physical capital accumulation, such as research and development and the formation of human capital.

There are three methodological problems related to the practical application of the growth accounting technique:

1) How to estimate the elasticity coefficients in the basic production function.
2) How to measure labor input.
3) How to measure the growth rate of capital stock.

2.1. Estimating the elasticity coefficients

A basic assumption of the economic equilibrium theory is that each production factor is awarded its marginal productivity. The shares of capital **α** and labor **β** in gross income (GDP) can be determined as **α = rK/Y** and **β = wL/Y**, where **r** is the real interest rate and **w** is the real wage. Hence, **β** is the share of labor income in GDP and **α** is the share of capital income in GDP.

In the original version of the growth accounting technique **β** was set equal to **(1-α)** in accordance with the assumption of constant returns to scale. However, in many recent empirical studies (Krueger, 1999; Senhadji, 2000; Ganev, 2005; Tsalinski, 2007) **β** was determined as the share of compensation of employees in GDP, and **α** was obtained as **α = (1-β)**. The rationale of the new approach is that **α** ought to show the share of capital income in GDP, which can be calculated by dividing the sum of the net operating surplus and the net mixed income by GDP. However, defining **α** as a residual actually means that its value is increased by the share of the consumption of fixed capital in GDP and the difference between the shares of the net taxes on production and the financial intermediation services indirectly measured in GDP. Another reason for overvaluing **α** is the fact that a part of the net mixed income is in reality a labor income and should be added to the compensation of employees.

The original approach to calculating **α** and **β** and its contemporary modifications have their merits and demerits. This paper employs two approaches to estimating elasticities in an attempt to combine their strengths and increase the reliability of research results.

2.1.1. First approach to estimating the elasticity coefficients

The first approach was used by Raleva (2013). According to this approach, the coefficient **β** is calculated as the share of the sum of the compensation of employees and the net mixed income in GDP:

$$\beta = [CE + 1/3\ (NOS + NMI)] / GDP \qquad (2),$$

where CE is the compensation of employees, NOS is the net operating surplus and NMI is the net mixed income.

Assuming constant returns to scale, **α** is treated as a residual and equals **(1-β)**.

When the first approach is applied, both **α** and **β** are overvalued. **β** is overvalued because in the labor income is included the whole income of the non-corporate enterprises and **α** is overvalued because the other elements of the income structure of GDP are added to the capital income. The values of **α** and **β** derived in accordance with the first approach can be seen in Table 1. The average values of **α** and **β** for the period 1997-2013 calculated by the first approach are respectively 0.44 and 0.56.

2.1.2. Second approach to estimating the elasticity coefficients

The second approach was used by Raleva (2013) and returns to the original model construction of the growth accounting concept. According to this approach, **α** is calculated first as

$$\alpha = (NOS + NMI) / GDP \qquad (3),$$

where NOS is the net operating surplus and NMI is the net mixed income.

β is treated as a residual and equals **(1-α)**. The capital income is obtained as a sum of the net operating surplus and the net mixed income, which leads to overvaluation of **α** because the net mixed income contains some labor income. **β** is overvalued too because of its residual character. Both approaches restrict the distortion of the proportions between **α** and **β** caused by the different interpretation of the net mixed income. The values of **α** and **β** derived in accordance with the second approach are shown in Table 2. The average values of **α** and **β** for the period 1997-2013 calculated by the first approach are respectively 0.45 and 0.55.

2.2. Measuring labor input

Two indicators can be used to measure labor input **L** in the production function - the number of employed persons or the number of hours worked in an economy. In this paper the

first indicator is employed. The growth rates of the number of employed persons compared to the previous year are shown in Tables 1 and 2.

2.3. Measuring the growth rate of capital stock

The most complex methodological problem related to the practical application of the growth accounting approach is how to measure the growth rate of capital stock. Two different approaches can be used to solve this problem – the perpetual inventory method (Ganev, 2005) and the constant capital-output ratio approach (Minassian, 2008; Raleva, 2013).

In this paper the constant capital-output ratio approach has been employed. According to this approach, the growth rate of capital **ΔK/K** depends on gross investment **I**, the rate of depreciation **d** and the value of capital stock **K** in the base period:

$$\Delta K/K = I/K - d \qquad (4)$$

I/K can be written as a proportion between the rate of accumulation **I/Y** and the capital-output ratio **K/Y**:

$$I/K = (I/Y) / (K/Y) \qquad (5)$$

If **I/K** is substituted in Formula (4) with the right-hand side of Equation (5), then growth rate of capital **ΔK/K** can be calculated as

$$\Delta K/K = (I/Y / K/Y) - d \qquad (6)$$

Like in many empirical investigations (Hernandez & Mauleon, 2003; Cororaton, 2002; Felipe, 1997 etc.), the assumed rate of depreciation **d** in this paper is 0.05.

The capital-output ratio **K/Y** is considered constant in economic theory. In empirical studies this ratio varies between 2 and 3. For Bulgaria the used values of the capital-output ratio are 2.5 (Minassian, 2008) and 2.3 (Raleva, 2013). For the purpose of this study the used value of the capital-output ratio is 2.2. It has been calculated as the average gross-capital-formation-to-change-in-real-GDP ratio for the period 1998-2008 (in accordance with the assumption of Harrod and Domar that the average and the marginal productivity of capital are equal).

The growth rates of capital stock are shown in Tables 1 and 2.

3. Results

The calculated results for the contributions of capital, labor and total factor productivity to economic growth in Bulgaria can be seen in Tables 1 and 2. Tables 1 and 2 represent two variants

of the calculated results corresponding to the two approaches to estimating the elasticity coefficients **α** and **β**. The two approaches to calculating the elasticity coefficients provide similar results: the average values of **α** and **β** for the period 1997-2013 are respectively 0.44 and 0.56 by the first approach and 0.45 and 0.55 by the second approach.

As a whole the dynamics of Bulgaria's output under a CBA has been positive (see Tables 1-2). For the entire period 1997-2013 the real GDP of Bulgaria decreased in three years only – in 1997, 1997 and 2009. However, the average growth rate for the whole period is not high – 2.78%. The standard deviation of growth rates of 3.92% implies that Bulgaria's economic growth under a CBA has been unstable and uneven. In 1997 the fall in real output was small (1.09%) but in 1999 and in 2009 it was disastrous (5.65% and 5.01% respectively). The main contributor to the serious drops in real GDP in 1999 and 2009 was the total factor productivity with respective falls of 4.70% and 7.57%.

The period 2000-2008 was characterized by a relatively high and steady economic growth with an average rate of 5.70% and a standard deviation of 1.01%. In the first part of this period (from 2000 till 2004) the total factor productivity was the main driving force of growth with an average contribution of 3.16%. However, in the second part of the period (from 2005 till 2008) the growth of real GDP was determined mostly by changes in capital stock, whose average contribution was 3.65%.

After the collapse in 2009 (a 5% decline in real output) the recovery of Bulgarian economy has been slow and weak. In the years 2010-2013 Bulgaria recorded a faint economic growth of less than 2% per annum and 1.05% on average. This weak growth has been determined mainly by capital stock, which has grown by an average rate of 2.09%.

The total factor productivity (with a standard deviation of 3.11%) has been the most volatile of the three growth determinants. Capital stock (with a standard deviation of 1.23%) has been the most stable contributor to Bulgaria's economic growth under a CBA.

The contribution of labor to economic growth was positive in 2002-2008 but negative in 1997-2001 and 2009-2013. The average contribution of employment to economic growth for the whole period 1997-2013 is negative (-0.18%). The comparison of the dynamics of output and employment demonstrates that positive changes in the labor market occurred after two years of high and steady economic growth. However, the response of labor market to poor output developments has been immediate.

The fluctuations of output and the total factor productivity show similar patterns. This fact is due to the specificity of the calculation of the change in total factor productivity as a residual obtained from the growth rate of output by subtracting the growth rates of capital stock and labor input.

The contribution of changes in capital stock to economic growth was positive in all years of the period 1997-2013 except for the years 1997 and 1998, when it was negative. The average contribution of capital stock to economic growth for the period 1997-2013 is 2.17%, which makes it the main contributor to Bulgaria's economic growth under a CBA. The peak contributions of changes in capital stock to economic growth were in the years 2003-2008 (an average of 3.11%). After the upward movements in 1997-2008, the impact of capital stock on economic growth decreased in 2009-2013 (an average of 2.39%, or a decline of 0.72% compared to the period 2003-2008). It may be inferred that the increase in capital stock in 1997-2008 resulted from an improvement of the business environment in Bulgaria. This improvement of the business environment was caused by the following events:

1) The introduction of the CBA in 1997, which led to financial and macroeconomic stability.
2) The increase in lending in 2003-2008, which was due to the purchase of Bulgarian banks by foreign banks and to the massive inflow of foreign capital to Bulgaria.
3) The accession of Bulgaria to the European Union, which increased the certainty for foreign investors in Bulgaria.

As a result of the global and domestic economic crisis and the slow recovery of Bulgarian economy from this crisis, the influence of changes in capital stock on economic growth fell in 2009-2013, when the uncertain political and economic environment led to a sharp drop in investment.

It can be inferred that capital stock has been the main supply-side determinant of economic growth in Bulgaria under a CBA while the influence of the total factor productivity and changes in employment on the dynamics of real GDP has been weaker. The dynamics of the total factor productivity under a CBA has been rather chaotic, which may be attributed to the inconsistent development of the transition to a market-oriented economy in Bulgaria. The ineffective use of labor resources has insignificantly contributed to lowering the growth rates of real GDP. This small negative impact of employment has been offset by rises in capital stock and total factor productivity. The fall in employment has been accompanied by increased influence of

scientific progress and organizational factors. Economic effectiveness has increased in the process of privatization and restructuring of the Bulgarian economy.

4. Conclusions

The results of this research provide evidence that capital stock and the total factor productivity have been the main supply-side determinants of Bulgaria's economic growth under a CBA, while employment has had an insignificant negative impact on growth. This inference implies that Bulgarian policymakers have to concentrate their efforts on encouraging investment and on raising productivity in order to stimulate economic growth.

Labor productivity per person employed and per hour worked in Bulgaria is 30-40% of EU average, which makes Bulgarian workforce the least productive one in the EU (Todorov, 2014b).

Bulgaria's experience has proved that investment activity is determined mainly by institutional and macroeconomic environment, while tax stimuli and other preferences have relatively weaker impact on investors' decisions. In spite of its low corporate tax rate of 10%, Bulgaria has attracted less investment than other transition economies from Central and Eastern Europe with higher corporate tax rates.

Bulgaria's institutional environment is characterized by high levels of bureaucracy and corruption and by sluggish and ineffective work of state administration. The lack of good legislation and quality institutions, the absence of quality infrastructure and the shortage of well-qualified and highly-productive labor force are the main obstacles to investment (local and foreign). Other factors, which impede investment, are the political instability and the absence of succession and continuity in macroeconomic policies of different governments.

Bulgaria may boost investment and increase productivity by:

1) Improving the quality of its legislation and institutions.
2) Building good public infrastructure.
3) Encouraging and investing in the formation of human capital.
4) Stimulating and investing in research and development activities.

Considering the slow and painful process of institutional transformation in Bulgaria, and the low share of investment in public infrastructure, human capital and research and development in Bulgaria's GDP compared to EU levels, the supply-side prospects of Bulgaria's economic growth cannot be good. Other factor such as the low saving rate, stagnant domestic consumption

and investment, underdeveloped financial markets and the real appreciation of the Bulgarian lev (Todorov, 2014a) may make the growth perspectives of the Bulgarian economy even worse.

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Appendices

Table 1. Contributions of capital, labor and total factor productivity to economic growth in Bulgaria (variant 1)

Year	ΔY/Y	α	ΔK/K	α*ΔK/K	β	ΔL/L	β*ΔL/L	ΔA/A
1997	-1.09%	0.46	-0.80%	-0.37%	0.54	-3.07%	-1.66%	0.94%
1998	3.46%	0.44	0.53%	0.23%	0.56	-1.03%	-0.57%	3.80%
1999	-5.65%	0.44	3.48%	1.52%	0.56	-4.32%	-2.43%	-4.74%
2000	6.04%	0.44	3.05%	1.36%	0.56	-2.38%	-1.32%	6.00%
2001	3.80%	0.44	3.67%	1.63%	0.56	-0.75%	-0.42%	2.59%
2002	4.48%	0.46	3.94%	1.80%	0.54	0.23%	0.12%	2.55%
2003	5.36%	0.46	4.23%	1.93%	0.54	2.96%	1.61%	1.82%
2004	6.56%	0.46	4.58%	2.09%	0.54	2.59%	1.41%	3.06%
2005	5.96%	0.46	6.44%	2.93%	0.54	2.70%	1.47%	1.55%
2006	6.47%	0.46	7.55%	3.46%	0.54	3.34%	1.81%	1.20%
2007	6.91%	0.46	8.41%	3.87%	0.54	3.18%	1.72%	1.32%
2008	5.75%	0.44	10.03%	4.39%	0.56	2.36%	1.33%	0.03%
2009	-5.01%	0.43	8.26%	3.58%	0.57	-1.71%	-0.97%	-7.62%
2010	0.66%	0.43	5.61%	2.40%	0.57	-3.88%	-2.22%	0.47%
2011	1.98%	0.44	4.73%	2.07%	0.56	-2.20%	-1.24%	1.15%
2012	0.49%	0.42	4.83%	2.03%	0.58	-2.50%	-1.45%	-0.09%
2013	1.07%	0.40	4.70%	1.87%	0.60	-0.43%	-0.26%	-0.54%
Average	**2.78%**	**0.44**	**4.90%**	**2.17%**	**0.56**	**-0.29%**	**-0.18%**	**0.79%**

Source: Calculated by the author on the basis of data from the website of the National Statistical Institute of Bulgaria, www.nsi.bg.

Table 2. Contributions of capital, labor and total factor productivity to economic growth in Bulgaria (variant 2)

Year	ΔY/Y	α	ΔK/K	α*ΔK/K	β	ΔL/L	β*ΔL/L	ΔA/A
1997	-1.09%	0.57	-0.80%	-0.46%	0.43	-3.07%	-1.31%	0.68%
1998	3.46%	0.47	0.53%	0.25%	0.53	-1.03%	-0.54%	3.75%
1999	-5.65%	0.43	3.48%	1.51%	0.57	-4.32%	-2.45%	-4.70%
2000	6.04%	0.47	3.05%	1.43%	0.53	-2.38%	-1.26%	5.88%
2001	3.80%	0.47	3.67%	1.71%	0.53	-0.75%	-0.40%	2.50%
2002	4.48%	0.47	3.94%	1.84%	0.53	0.23%	0.12%	2.52%
2003	5.36%	0.44	4.23%	1.87%	0.56	2.96%	1.65%	1.84%
2004	6.56%	0.44	4.58%	2.03%	0.56	2.59%	1.45%	3.09%
2005	5.96%	0.43	6.44%	2.77%	0.57	2.70%	1.54%	1.65%
2006	6.47%	0.44	7.55%	3.35%	0.56	3.34%	1.86%	1.26%
2007	6.91%	0.46	8.41%	3.87%	0.54	3.18%	1.72%	1.32%
2008	5.75%	0.46	10.03%	4.61%	0.54	2.36%	1.27%	-0.13%
2009	-5.01%	0.43	8.26%	3.54%	0.57	-1.71%	-0.98%	-7.57%
2010	0.66%	0.40	5.61%	2.27%	0.60	-3.88%	-2.31%	0.70%
2011	1.98%	0.44	4.73%	2.06%	0.56	-2.20%	-1.24%	1.16%

2012	0.49%	0.42	4.83%	2.04%	0.58	-2.50%	-1.44%	-0.11%
2013	1.07%	0.40	4.70%	1.88%	0.60	-0.43%	-0.26%	-0.56%
Average	**2.78%**	**0.45**	**4.90%**	**2.15%**	**0.55**	**-0.29%**	**-0.15%**	**0.78%**

Source: Calculated by the author on the basis of data from the website of the National Statistical Institute of Bulgaria, www.nsi.bg