Impact of Labour on Economic Growth in Bulgaria (1991 - 2013)

Stela Raleva*

Summary:

The paper studies empirically the impact of labour on the economic growth in Bulgaria by applying the growth accounting approach. It examines the relationship between labour growth and real GDP growth measured through their rates on a constant and on a chain basis. The labour elasticity coefficient in the production function is calculated by substantiating four alternative approaches. Based on the different elasticity coefficient variants and the data on employment dynamics, the range of impact of labour on the realised rates of economic growth is weighed. On the basis of the outcomes of the investigation a conclusion is reached that real GDP growth in the period 1994-1995 and 2002-2008 was under the positive and changeable over time impact of employment which, except for 1995, was weaker than the impact from developments in capital and total factor productivity. The effect from labour developments is most pronounced in episodes of negative or low positive rates of real GDP growth as was the case in 1992-1993, 1997 and the post-2009 interval, and is strongly negative. A similar negative effect is also observed in the period 1998-2000, however weaker compared to the consequences from developments in the rest of the supply-driven growth factors. The negative impact of employment on real GDP growth typical of the post-2009 period is symptomatic that growth acceleration is possible through an active policy promoting employment.

Key words: labour, employment, economic growth, production function, growth accounting

JEL classification: J21, E20, E25, C10, O47

1. Introduction

Labour, along with capital and the technological level, is considered a major factor in the neoclassical models of economic growth. These models are based on applying the Cobb-Douglass production function, which underlies the concept of economic growth accounting developed by R. Solow and M. Abramovich, and subsequently further developed by E. Denison and A. Meddison, among others. The growth accounting is intended to measure the concrete impact of the fundamental growth factors by differentiation of the production function. As a result of this differentiation the growth rate of aggregate output is presented as the sum total of the growth rates of labour and capital, weighed by their relative shares in income, and the change in total factor productivity. The formulated relationship takes into account the assumption of constant returns to scale of output, of decreasing marginal labour and capital productivity, and of competitive

* Associate Professor, PhD, University of National and World Economy, Department of Economics, e-mail: stela.raleva@gmail.com

economic environment. As unrealistic as some of these assumptions might be, economic growth accounting is used as a methodological tool kit to study the relation of economic growth in real life to changes in its major supply sources.

The paper analyses the impact of labour on real GDP growth rates in Bulgaria using the above specified set of tools. It begins by examining the relationship between long- and short-term dynamics of the two variables over the whole post-1990 period. Next, four alternative assessments are made of labour's relative share in income which, under the assumption of production factor pricing based on the marginal productivity of these factors, is considered as a labour elasticity coefficient in the two-factor production function. In the last stage, based on the outcomes for the elasticity coefficient and labour growth data, the contribution of this factor to the realised rates of economic growth is assessed and characterised.

The paper measures labour input through employment which is a standard practice in most contemporary empirical studies with a focus on the behaviour of actual rather than potential GDP. Employment itself is measured in two ways: by means of Labour Force Survey (LFS) data for the whole post-1990 period relating to the number of employed, and by drawing from the national accounts (NA) data for the period after 1995 related to the number of man hours worked.

2. Relationship between changes in labour and changes in real GDP

In order to pinpoint the correlations between changes in employment and changes in real GDP over the *longer-term horizon* a comparison is made between *real GDP* and *employment indices* using LFS

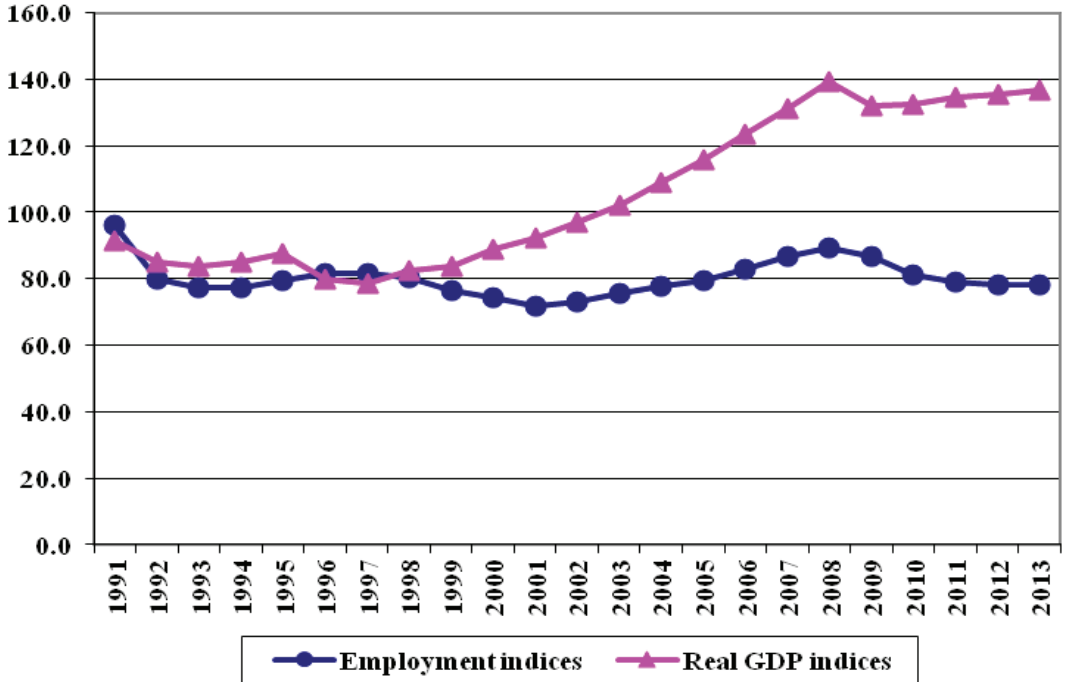

Fig. 1. Employment indices (according to LFS) and real GDP indices, (with 1990 as a base = 100%)

Source: Author's calculations based on: http://www.nsi.bg and other NSI data

data *and 1990 as a reference year*, as well as of their dynamics.[1] As can be seen in Figure 1, unlike real GDP whose behaviour over time follows an ascending trajectory, employment during the whole period oscillates around 80% compared to its level at the start of the transformation process. Besides, except for 1992, the fluctuations are within a relatively narrow band – from a lowest of 71.8% in 2001 to a highest of 89.5% in 2008.

Until 1995, real GDP and the number of employed moved in parallel with labour market indicator after 1991 showing lower values relative to the reference period. Typical of the crisis years 1996 and 1997 is that the lowest real GDP levels couple with employment levels which are higher than the average for the entire interval and exceed the 1994 and 1995 positive GDP growth levels. In terms of employment levels in the period following 1998, three stages can be identified. *The first stage* covers the period until 2005 and is characterised by employment levels lower than 80% relative to the reference 1990 year, either falling behind or following closely those registered in 1993-1994. During the *second stage,* which continues until 2010*,* the number of employed exceeded 80% of their number in 1990. *The third stage* covers the last three years when employment once again fell below the specified limit differing from the first stage in that its index is higher and relatively stable.

From 2002 to 2008 employment peaked by 16.6 percentage points which also concurred with a steady increase in real GDP. The unidirectional course of these movements shows that albeit real GDP increased at higher rates, its growth reflected the increase in employment. The widening gap between the dynamics of the two indicators however is a symptom of the gradual weakening of the impact, which can be accounted for by the growing influence of other factors and changes in productivity. As to the differences in the direction of change in real GDP and the number of employed, typical of the interval after 2009, this is evidence that economic recovery is not a function of the labour market processes.

A comparison between *the chain rates of employment growth, measured through the labour force survey,* and *the real GDP* for the period 1991-2013 shows that they are not explicitly linked (see Figure 2). For the period 1993-1995 this dependence is positive and relates both to the trends and the specific rates of growth of the variables. Subsequently, similarities in the two indicators are observed from 2002 to 2008 when they increased simultaneously at an outpacing growth of the real GDP. Besides, in 2006 and 2007 employment picked up at relatively steady rates, corresponding with the relatively even rates of growth of real aggregate output. In 2009, employment fell in line with the GDP change observed in previous years, but less in terms of quantity.

The disparities in the behaviour of the goods market and the labour market were most pronounced at the beginning and at the end of the transformational recession (1991-1997), over the subsequent five years, as well as immediately after the crisis of 2009. In 1991, a negative rate of employment growth was registered with an absolute value of more than half the rate of decrease of real GDP in absolute terms. The quantitative ratio between the two

[1] The real GDP indices for the pre-1995 and post-1995 periods, with 1990 taken as a base, are calculated using the chain rates of growth under the previous and current NSI methodology. The reason to apply this combined approach is the absence of consistent data for the whole period and is considered acceptable as it does not change the trends and relations outlined through them.

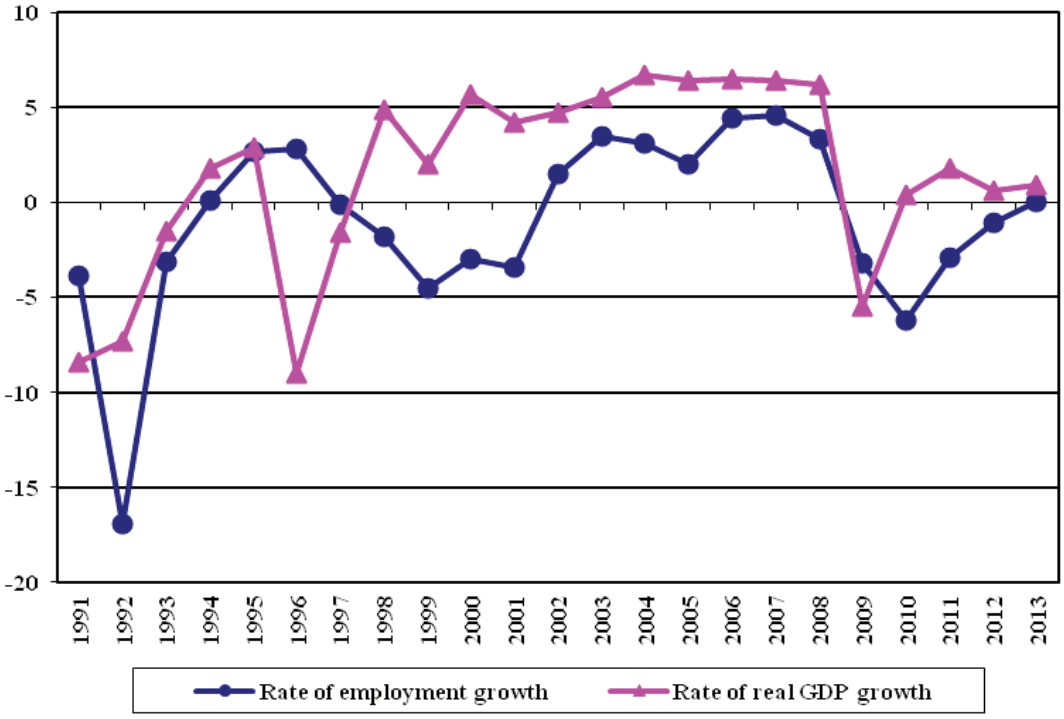

Fig. 2. Chain rates of employment growth (based on LFS) and real GDP growth, 1991-2013 (%)
Source: Author's calculations based on: http://www.nsi.bg and other NSI data

negative rates of growth changed in 1992 when employment shrank by 16.9% while real GDP fell by a declining rate year-on-year. The abrupt decline in the number of employed can be accounted for by the high inefficient employment during the period of administrative command economy as well as by the initial shock to the labour market from the transformational recession. The divergence of goods market and labour market behaviours was most prominent in 1996 when the maximum GDP decline of 9% coupled with a 2.8% employment growth. Over the periods 1997-2001 and 2010-2012, the number of employed decreased albeit at a slow rate while, except for 1997, real GDP increased, their growth rates moving almost in synchrony during the last three years of the first interval and in 2011. Typical of 2012 is that the slowing down employment decline relative to previous years was in parallel with a decreasing positive rate of economic growth. Symptoms of some positive dependence were observed in 2013 when the moderate pick up of growth by 0.3 percentage points was coupled with a reversal of the decline in employment observed since 2009.

The behaviour of employment indicates that the labour market in Bulgaria responds with a *lag* to the positive developments in real GDP witnessed from 1998, with employment starting to pick up only since 2002. A lagged effect on employment was also observed after 2009, given that employment growth takes time to recover and is influenced by realised positive rates of growth in real GDP and their relative sustainability over time. On the grounds of the lagging labour market vis-à-vis the processes in the goods market, it could be inferred that the existing similarity in the dynamics of employment

and real GDP by years over the period 2002-2009 is an indication of a positive impact in the direction from changes in employment to the dynamics of real aggregate output. At the same time, a note should be made here that although the two dynamics – in 1992 and from 2010 to 2012 – were largely divergent, employment declines had significant downward pressure on growth.[2]

3. Relative shares of labour in income

Assessing the inputs of labour to real GDP growth rates involves calculating initially the relevant *coefficient of elasticity* in the two-factor production function. Assuming that production factor prices depend on their marginal productivity, the coefficient is measured by the relative share of labour in income whereas under the assumption of constant returns to scale its sum with the capital coefficient gives 1.

The paper employs *two modifications of income*. According to *one* of them income is not identified with GDP but with the sum of compensations of employees, net operating surplus and net mixed income. The concrete calculation of labour's relative share in income then is done following two approaches (see Table 1). According to the *first approach* it is equal to the weight of compensations of

Table 1. Alternative assessments of labour's relative share in income and rate of employment growth, 1991 – 2013, (%)*

Year	Labour's relative share (elasticity coefficient)				Rate of employment rowth
	First approach	Second approach	Third approach	Fourth approach	
1991	52,7	68,5	53,7	62,9	n.a.
1992	67,6	78,4	61,4	74,6	-16,9
1993	67,4	78,3	60,6	74,8	-3,1
1994	58,9	72,6	56,0	68,3	0,1
1995	54,1	69,4	55,5	63,2	2,7
1996	52,4	68,3	54,2	62,2	2,6
1997	42,3	61,5	51,3	51,9	-3,1
1998	52,4	68,3	52,3	63,9	-4,3
1999	50,4	66,9	51,0	62,2	-3,2
2000	48,0	65,3	49,4	60,7	-4,1
2001	48,0	65,4	49,5	60,7	-0,1
2002	46,7	64,5	48,7	59,7	0,2
2003	48,7	65,8	47,8	62,7	2,3
2004	48,9	65,9	46,8	63,7	4,0
2005	49,1	66,1	46,3	64,3	2,4
2006	47,9	65,3	45,7	63,6	3,1
2007	48,0	65,3	46,2	63,2	3,2
2008	48,8	65,9	47,5	63,1	4,8
2009	51,8	67,9	49,5	64,9	-4,5
2010	53,2	68,8	49,7	66,2	-4
2011	51,6	67,7	49,7	64,5	-2,3
2012	52,4	68,2	50,4	64,9	-2,5
2013	n.a	n.a	n.a	n.a	-0,4

** The data on labour's relative share through 1995 are following the previous NSI methodology, and after 1995 – following NSI's current methodology.*

Source: Author's calculations based on: NSI, Key Macroeconomic Indicators, 1999, pp. 3, 6 and http://www.nsi.bg.

[2] Analogical linkage with real GDP dynamics can also be observed when employment is measured by the number of employed and the number of hours worked based on national accounts data. For greater details about these dependencies see Raleva S., Employment and Economic Growth, Compendium of papers from the scientific conference: "Economics and Society: Global and Regional Challenges to Bulgaria", UNWE's Publishing Complex, 2014.

employees in the above defined approach. Represented in the above described way, the income elasticity coefficient has the meaning of actual weight in income which, together with the relevant capital elasticity coefficient, normally adds up to 1. The shortcoming of this approach however is that the relative share of labour is unrealistically underestimated since the whole net mixed income is wrongly taken for capital income.

Under the *second approach,* total net mixed income is counted to income from labour. Then, the elasticity coefficient is calculated as a relative share in the income of the sum total of compensation of employees and net mixed income. Net mixed income itself is obtained as 1/3 of the amount of the net operating surplus and net mixed income.[3] Under this approach, the share of labour incomes is somewhat overvalued since net mixed income is not limited to real labour incomes. The two ways of measuring labour's relative share in income produce two estimates for labour contribution, which by way of their formation are undervalued and overvalued. Therefore, they should not be absolutized, but should rather be approached as setting a certain range of factoral influence.

The above two approaches have a significant weakness entailed from the fact that the coefficients calculated by them are actually not GDP elasticities. As the basis taken for their calculation is the sum of production factor incomes, their calculation in relation to GDP, while also calculating their elasticity to capital, leads to violating the condition of constant returns to scale. These deficiencies are the reason to use yet *another* modification of income whereby it coincides with GDP in this paper.

When taking into account this wider perception of income, elasticity coefficients are calculated by applying a third and a fourth approaches (See Table 1). The *third approach* consists in calculating the labour elasticity coefficient as a relative weight in GDP of the sum of compensations of employees and net mixed income (presented as 1/3 of the sum of net operating surplus and net mixed income). A distinctive feature of this approach is that the relative significance of labour income is overestimated since total income of non-corporate enterprises is counted to it, which is also coupled with overestimation of the relative share of capital income as it is obtained as a residual value comprising all other components of the GDP income structure. The *fourth approach* implies a return to the fundamental model construction of the growth accounting concept by initially differentiating the relative share of capital income and presenting the weight of labour income as a residual value. Under this approach, labour income is identified with the sum of all other components of the GDP income structure outside the sum of net operating surplus and net mixed income. This way, the outcome is once again overestimating the relative weights of labour and capital incomes, respectively, due to the residual character of the income elasticity coefficient, as well as disregarding the fact that net mixed income includes incomes from labour. Thus, by means of the last two approaches the distortion in the measurement of the relative share of labour, conditioned by the different interpretations of net mixed income, is effectively dealt with.

The next basic methodological issue of empirical analysis relates to the manner of measuring the growth of the labour

[2] Such an approach was applied in Bulgaria by K Ganev, however on a GDP basis due to insufficient data of net operating surplus and net mixed income separately over the whole reference period. See Ganev, K., Measuring total factor productivity: Economic growth accounting in Bulgaria, BNB Discussion Papers, 2005, 48.

factor. For this purpose, two indicators of employment are used referring to the periods through 1995 and thereafter. For the first period this is the number of employed obtained according to LFS, and for the second – the number of hours worked according to NA (see Table 1). The contribution of employment is calculated by multiplying its growth rates in the current year by the weights of labour in the income from the preceding year. A parallel analysis of the contribution based on current weights for most of the years gives roughly the same or very close quantitative results due to the relevant stability of these weights over time.

4. Contribution of labour to economic growth rates

The *estimates of labour contribution* in real GDP growth rates are given in Table 2. As could be seen from the Table, under the *first two approaches for measuring the elasticity coefficients* the analysed impact is most distinct at the beginning and end of the period amid largely negative or low positive real GDP rates of growth. Especially illustrative of this is 1992 when the fall in employment accounted for between 8.9 and 11.5 percentage points of the realised decline of aggregate output by 7.3%. Similar correlations were also observed in 1993 and 1997 when the GDP reduction by 1.5% and 1.6% was triggered by decrease in employment of between 2.1 and 2.4 percentage points and 1.6 to 2.1 percentage points, respectively. This principle however is not valid for all crisis years, the role of labour being even positive during the most recessional 1996. The next more palpable decline in real GDP by 5.5% in 2009 was largely influenced by change in employment with a contribution within the range of -1.3 to -1.8 percentage points, albeit this impact was not quantitatively determining.

The labour impact of -2.1 to -2.7 percentage points registered in 2010, which was stronger relative to the preceding year, was compensated by the stimulating influence of the other factors and the rate of economic growth was slightly positive. This suggests that right after the last crisis, employment developments were a key factor suppressing growth. Such a conclusion can be made also for 2012 when real aggregate output increased by merely 0.6% with an impact of labour dynamics within -1.3 to -1.7 percentage points. In 2011, the negative contribution of employment was relatively smaller in absolute terms vis-à-vis that of 2010 and 2012, which was one of the conditions for the higher real GDP growth. In 2013, employment measured through national accounts had only a negligible negative contribution to growth, which also accelerated compared to the previous year.

The years of positive rates of economic growth of 2% and more were in general characterised by a relatively lower quantitative impact of developments in the number of employed or the number of man hours worked. An exception to this principle was 1995 when the reflection of labour on real GDP growth by 2.9% was from 1.6 to 2 percentage points. The high and relatively stable rates of economic growth over the period 2003-2008 were also positively influenced by employment dynamics, which however accounted for between 22.2% and 30.6% of these rates on average.[4] This contribution was at its highest in 2004 when it accounted for between 28.4% and 38.8% of gross output growth. In 2001 and 2002 the real GDP dynamics was conditioned by factors outside labour developments, as was also the case in 1994. As to the interval

[4] Author's calculations based on: http://www.nsi.bg and other NSI data.

Table 1. Contribution of labour to the rates of real GDP growth under alternative elasticity coefficients, 1992-2013

Year	Rate of real GDP growth (%)	Contribution of labour (percentage points)			
		First approach	Second approach	Third approach	Fourth approach
1992	-7,3	-8,9	-11,5	-9,1	-10,6
1993	-1,5	-2,1	-2,4	-1,9	-2,3
1994	1,8	0,1	0,1	0,1	0,1
1995	2,9	1,6	2,0	1,5	1,8
1996	-9,0	1,4	1,8	1,4	1,6
1997	-1,6	-1,6	-2,1	-1,7	-1,9
1998	4,9	-1,8	-2,6	-2,2	-2,2
1999	2,0	-1,7	-2,2	-1,7	-2,0
2000	5,7	-2,1	-2,7	-2,1	-2,5
2001	4,2	0,0	-0,1	0,0	-0,1
2002	4,7	0,1	0,1	0,1	0,1
2003	5,5	1,1	1,5	1,1	1,4
2004	6,7	1,9	2,6	1,9	2,5
2005	6,4	1,2	1,6	1,1	1,5
2006	6,5	1,5	2,0	1,4	2,0
2007	6,4	1,5	2,1	1,5	2,0
2008	6,2	1,3	1,8	1,2	1,7
2009	-5,5	-1,3	-1,8	-1,3	-1,7
2010	0,4	-2,1	-2,7	-2,0	-2,6
2011	1,8	-1,2	-1,6	-1,1	-1,5
2012	0,6	-1,3	-1,7	-1,2	-1,6
2013	0,9	-0,2	-0,3	-0,2	-0,3

Source: Author's calculations based on: NSI, Key Macroeconomic Indicators, 1999, pp. 3, 6; http://www.nsi.bg and other NSI data.

from 1998 to 2000, the developments in employment had a negative effect on growth. This negative impact was the strongest in 2000 – between -2.1 and -2.7 percentage points – on the back of a real GDP growth of 5.7%. Moreover, the negative contribution of labour over the three years was proportionate to the contribution reported in 1993, 1997 and 2010, but was much lower in relative terms than the combined influence of the changes in capital and total factor productivity.

In measuring labour contribution by the *third and fourth approach* the values obtained for the elasticity coefficients are very close to those from using the first and second approach, respectively (see Table 2). The close estimates obtained from the first and third approach indicate that counting total net mixed income to the incomes from labour is almost entirely compensated by viewing all other GDP components, apart from labour incomes, as capital income. Under the *third approach,* during half of the years to 1995 a relatively smaller contribution of labour is observed than under the first approach. During most of the time after 1995 the contributions of labour according to these two variants of the elasticity coefficients coincide completely. In the period 1997-1998, the decline in employment under the third approach has a stronger negative impact on GRP growth, while in 2005-2006 and

2008 the underestimation of the labour impact vis-à-vis the first approach is negligible.

As to the *fourth approach* for calculating the relative share of labour in income, the assessed contributions come closest to the results from the second approach. The differences between the outcomes under the second and fourth variant of the elasticity coefficient are higher than the differences between the first and third variant showing unidirectional trends and fairly even variations. The fourth approach applied for the period after 1991 shows largely lower labour contribution values vis-à-vis those under the second approach, coinciding only in isolated years. The slightly overestimated role of labour in the second variant of the elasticity coefficient as a result of the inclusion of total net mixed income, gives grounds to consider the fourth variant as the most realistic one. All the more so that the closer similarity of its contributions with the second variant corresponds to the principle that albeit total net mixed income cannot be viewed as income from labour, the larger part of it actually has that meaning.

Despite the existing methodological differences, the third and fourth approach for measuring the contribution of the labour factor lead only to negligible variance from the assessments under the first two approaches and accordingly set analogical ranges of factoral impact. This implies that the above described conclusions from the empirical analysis, based on using the first two approaches, will also be valid in a wider interpretation of income from production factors as coinciding with GDP.

Conclusions

From the empirical analysis based on indices of the studied indicators with 1990 as a base and chain rates of growth, a conclusion is reached that the increase in real GDP in 1994-1995 and 2002-2008 was positively influenced by labour developments of varying over time intensity. In the years of strongest decline in employment, the rates of economic growth had a more conservative behaviour. When applying the growth accounting approach to measure the contribution of labour it becomes evident that the impact was most pronounced in the period 1992-1993, 1997 and after 2009, and was very negative. This impact was also negative in the period 1998-2000, however weaker than the effect from changes in capital and in total factor productivity. As regards the period 2003-2008, characterised by relatively high positive rates of economic growth, the increase in employment, while not dominating, acted as one of the sources of this growth.

The negative labour impact on the economic growth observed since 2009 and presently indicates that a focused policy encouraging employment is needed. The more so as the above impact is realised by both aggregate supply and aggregate demand given that employment decline proves to be one of the most significant sources of subdued domestic consumption.

References

Ganev, K., Izmervane na obshtata faktorna proizvoditelnost: schetovodstvo na ikonomicheskiya rastezh za Balgariya, Diskusionni materiali na BNB, 2005, 48

Minasyan, G., Pregryava li Balgarskata ikonomika?, Ikonomicheska misal, 2008, 3, s. 3-29

Raleva, S., Inflatsia i ikonomicheski rastezh: teoriya, metodologiya, empirika, IK-UNSS, 2013

Raleva, S., Zaetost i ikonomicheski rastezh, Sbornik s dokladi ot nauchna konferentsiya "Ikonomika i obshtestvo: globalni i regionalni predizvikatelstva pred Balgariya", IK na UNSS, 2014

Tsalinski, Ts., Dva podhoda za empirichna otsenka na potentsialnoto proizvodstvo na Balgariya, Diskusionni materiali na BNB, 2006, 57

Abramovitz, M., Resource and Output Trends in the United States since 1870, *American Economic Review*, 1956, 46, pp. 5-23

Denison, E., Why Growth Rates Differ, Washington: The Brookings Institution, 1967

Denison, E., Trends in American Economic Growth, 1929-1982, Washington: The Brookings Institution, 1985

Meddison, A., Phases of Capitalist Development, Oxford: Oxford University Press, 1982

Krueger, A., Measuring Labor's Share, National Bureau of Economic Research Working Paper, 1999, 7006

Senhadji, A., Sources of Economic Growth: An Extensive Growth Accounting Exercise, IMF Working Paper, 1999, 77

Solow, R., A Contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*, 1956, 70(1), pp. 65-94

Solow, R., Technical Change and the Aggregate Production Function, *Review of Economics and Statistics*, 1957, 39, pp. 312-320