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BULGARIAN GDP STRUCTURES - CONVERGENCE WITH THE EU

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Abstract
The paper studies the convergence of the GDP expenditure and production structures of Bulgaria and the Czech Republic with the EU. It is structured as follows: first, we analyse convergence of the dynamics of the respective GDP components in the two structural cross-sections. To this end, the behaviour of respective components is characterized and an econometric evaluation of the existing convergence between them is conducted. After that, the convergence of any of the two structures of GDP is examined and trends in its changes over time are interpreted. Convergence in the dynamics of components is measured by using the β-convergence approach and panel modelling. Regarding GDP structural convergence, it is calculated through the divergence index. All data used are on a quarterly basis and refer to the period starting from the first quarter (for structural convergence – from the second quarter) of 1997 till the first quarter of 2005 inclusive.

JEL Classification: C23, E2, F15
Keywords: Convergence, divergence, GDP expenditure structure, GDP production structure

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1. Introduction

The analysis of the convergence of the GDP structure and its components dynamics has been widening in recent years. They are interpreted from the point of view of their influence on the business cycle synchronization. This is very significant for the way national economies respond to the common monetary policy and other economic shocks. Darvas and Szapary (2004) conducted an empirical survey of the behavior of GDP expenditure and production structure components in Hungary, Poland and Slovenia. A high correlation to the Eurozone in industrial production and exports is observed and a lack of such correlation in personal consumption and services. Measuring the correlation between the national business cycles some authors suggest the use of other indicators such as inventory changes (Buiter and Grafe, 2002) and industrial production behavior (Fidrmuc, 2001; Artis at al., 2004), instead of GDP fluctuations.

Convergence analyses of the GDP structures are quite numerous. According to the MPC task force of the ECB (2004), the changes and composition of the GDP by economic sectors are relevant to the monetary policy. This is due to their influence on the transmission mechanisms and to their direct and indirect inflationary effects. Angeloni *et al*. (2005) assume that the output composition is an important indicator for structural convergence and a "benchmark" for assessing the stage of economic development. Following Krugman's methodology (1993), the above authors construct the distance index of output composition towards the Eurozone and estimate it for the New Member States. For the same purposes Von Hagen and Traistaru (2005) calculate the dissimilarity index and analyze its dynamics. Applying similar methodology Van de Coevering (2003) composes the output divergence index for the EU countries, the CEE countries (except Bulgaria), and for USA and Japan for reference.

Neither of the existing empirical studies of the GDP components dynamics and GDP structural convergence with the EU focuses on Bulgaria. An empirical study of this kind of convergence for the Bulgarian economy is given below. The paper is structured as follows: first, it analyzes the convergence of the dynamics of the respective GDP components in the two structural cross-sections. The behaviour of respective components is characterized and an econometric evaluation of the existing convergence between them is conducted. The convergence of any of the two GDP structures is examined and trends in its changes over time are interpreted.

2. Data and Methodology

Studying this type of convergence, the GDP is broken down into its constituent components according to the final expenditure and production approaches. The empirical information about Bulgaria is adapted in advance and the data about the Eurozone and the Czech Republic are obtained from Eurostat. The Czech Republic is included in the analysis for the purpose of establishing a basis for comparison with the new

EU member states. It is assumed that the transformations ensure sufficient comparable data on GDP by final expenditure approach – personal consumption, investment, government purchases and net export, and for the structure of gross value added by economic sectors – agriculture and forestry, industry and services.

Convergence in the dynamics of components is measured by using the β-convergence approach and panel modeling. The β-convergence approach assumes that the variables in poorer countries move faster than those in richer countries and catch them up. In this paper the β-convergence is estimated through the following panel model, including Bulgaria and the Czech Republic:

$$\Delta x_{nt} = \beta_{cn} + \beta x_{nt-1} + \sum_{m=1}^{M} \gamma_m \Delta x_{nt-m} + \varepsilon_{nt} \qquad (1)$$

where, $\Delta x_{nt} = (x_n - x_{EU})_t$, is the difference between the variable in a specific country and that in the European Union; βx_{nt-1} is the error correction term, and β_{cn} is the fixed effect of the constant for every country. The sign expected for β in the case of presence of convergence is negative, i.e. $\beta<0$.

The convergence of each GDP component relative share to those in Eurozone, is estimated through the traced over time divergence index, based on the following equation:

$$Div_n = -\sum \frac{(E_{nx} - E_{EZx})^2}{E_{EZx}} \qquad (2)$$

where x, is the variable for which the divergence is estimated; *n* is the country; E_{nx} and E_{EUx} are the relative shares of each component in national and Eurozone GDP**.** If *Div = 0,* then the GDP component share of the country develops as those in the EU, and when it is negative it diverges from those in the Eurozone; The more the value of the coefficient increases (although decreasing in absolute terms), the more is the structural convergence to the Eurozone.

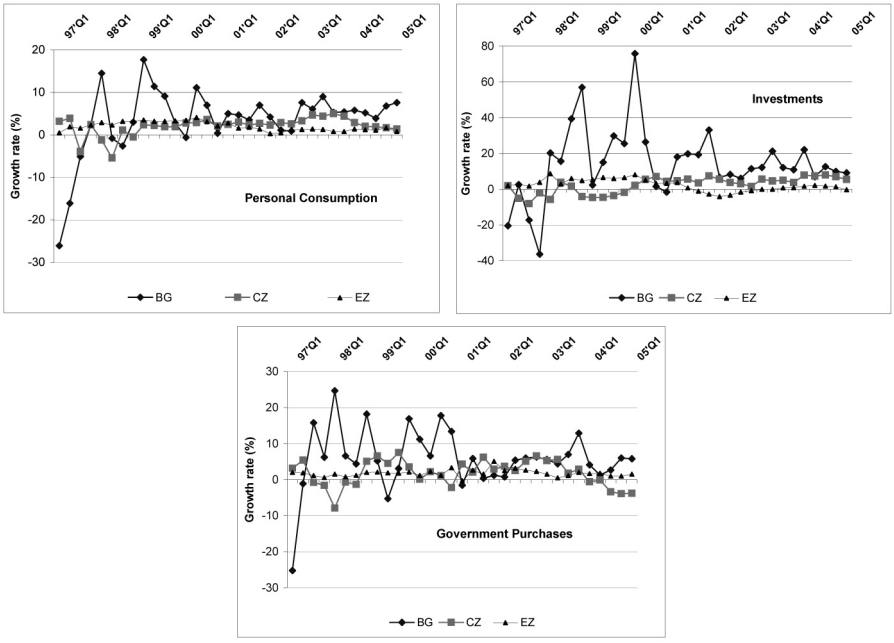
All data used are on a quarterly basis and refer to the period starting from the first quarter (for structural convergence – from the second quarter) of 1997 till the first quarter of 2005 inclusive.

3. The convergence of the real GDP components dynamics

The graphical presentation of the dynamics of real values of GDP elements calculated at constant prices on the corresponding quarter of the previous year gives an idea of the presence or absence of correspondence with the respective indicators in the Eurozone (see Figures 1 – 3).

In terms of the elements of GDP expenditure structure the following peculiarities emerge:

Figure 1. Dynamics of Real Personal Consumption, Investments and Government Purchases



Source: NSI, Eurostat and own calculations.

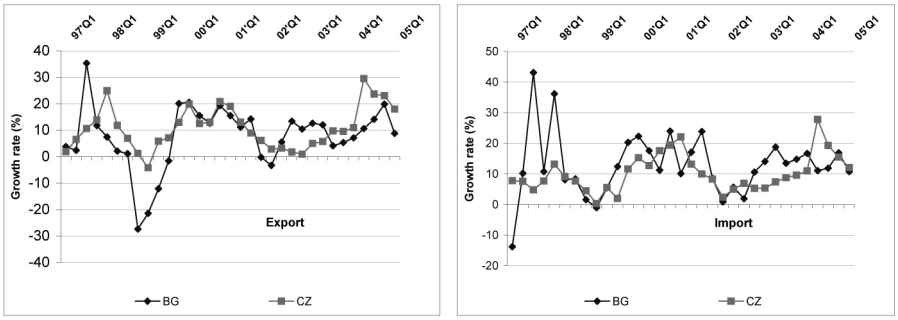
Variations in *personal consumption* of households in Bulgaria surpass considerably those in the Eurozone. This is typical almost of the entire analysed period although deviations vary within a broad range. The largest deviations occur at the beginning of the period and after 2000 they vary less significantly. After 2001 divergence is entirely in favour of the higher real consumption growth due mainly to the relatively low initial levels, optimistic expectations for the future, growth in real incomes and in the last three quarters – pro-active lending by commercial banks. From the comparison between the respective indicators for the Czech Republic and the Eurozone, it becomes clear, that they also differ insignificantly for most of the period, but in the remaining time they are almost identical.

Divergences in *gross investment* growth rates are even higher than those reported for personal consumption. They are typical especially of the period till the second quarter of 2000 and thereafter they diverge in narrower ranges. Similar narrowing of the range of deviations in the second half of the period is typical of the Czech Republic, although the deviations are much less significant than in Bulgaria. As a whole, higher real investment growth than that in the Eurozone is mainly ascribable to the

lower initial base, positive business expectations about future environment (incl. under the impact of anticipated EU membership), growth in real aggregate output and lower interest rates. However, in the last quarters of the review period the possibilities for those factors and conditions to ensure several-fold higher investment growth than that achieved in the first half of the period are reduced, combined with lower or negative investment growth in the Eurozone, although there is no close relationship between them.

Government purchases also tend to exhibit lower growth rates since 2001, consistent with the predominantly conservative fiscal policy. Although smaller, variations in government purchase growth do not show particular convergence compared with corresponding data on the Eurozone, being even divergent sometimes. Unlike Bulgaria, the real government purchases of the Czech Republic fluctuate much more evenly around those in the Eurozone during the review period.

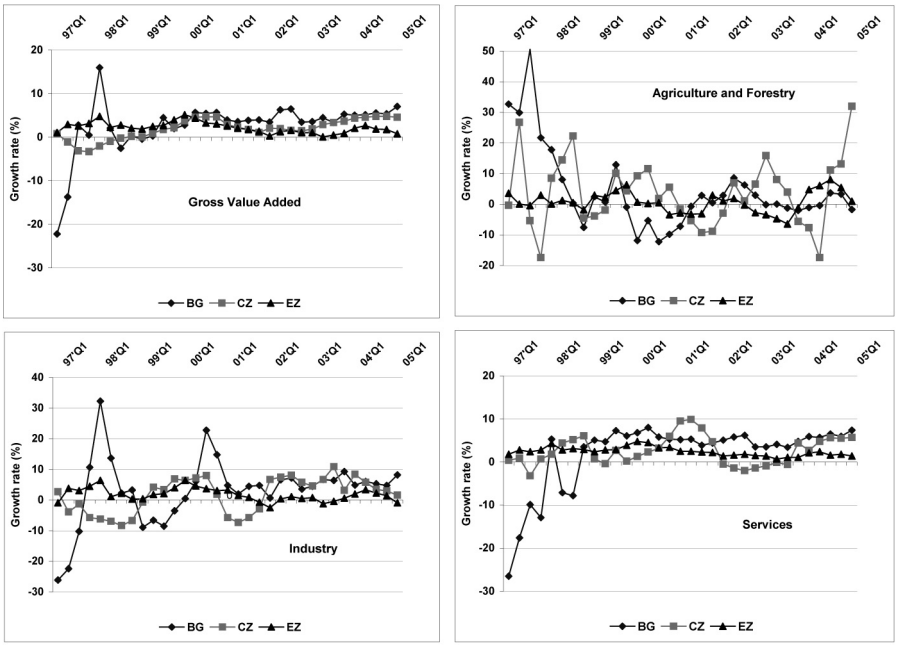
Figure 2. Dynamics of Real Export and Import Values



Source: NSI, Eurostat and own calculations

Lack of comparable quarterly data about the dynamics of *real export and real import* in the Eurozone does not allow making a parallel with the corresponding information on Bulgaria and the Czech Republic. The comparison between the two countries here is intended to show whether changes in the two indicators are similar to those of a new member state. With the exception of the reported decline in Bulgaria's real exports in the fourth quarter of 1998 – third quarter of 1999 period, in the remaining time real exports varied almost identically. With the exception of particular quarters in 1997 and 1998, the same applies to fluctuations in real import values. Thus in contrast to the dynamics of the other GDP components in Bulgaria, which for most of the time or at least over half of the period exceed considerably those in the Czech Republic, their range of fluctuation decreasing gradually over time, changes in real exports and real imports do not follow this pattern and are not so specific.

Figure 3. Dynamics of Real Gross Value Added



Source: NSI, Eurostat and own calculations

As for the components of *gross value added* by economic sectors the following major characteristics could be outlined:

Fluctuations in gross value added at constant prices for the economy as a whole are the lowest among all compared indicators so far. If we disregard the initial quarters, in which significant fluctuations occurred in Bulgaria, in the next quarters growth rates are consistently identical to and changing in line with those in the Eurozone. The Czech Republic's gross value added displays similar behaviour but the duration of matchings is much longer than that of the parallel movement.

In contrast to real gross value added in the economy as a whole, the real gross value added in agriculture and forestry exhibits a strongly pronounced volatility. It is particularly pronounced for Bulgaria and the Czech Republic where its margins are very significant. At the same time, volatility of real gross value added in this sector proves to be a typical feature of the Eurozone, whose fluctuations are divergent and vary within an atypically wide range. Significant variations in the reviewed element in Bulgaria, the Czech Republic and the Eurozone make it impossible to draw specific conclusions on whether there is convergence or divergence between them over time, based only on the graphical presentation.

Huge deviations occur in the growth of real gross value added in *industry* in the first half of the time frame, also displayed in most elements of GDP by expenditure structure. Subsequently growth rates declined dramatically, but given their lower values, the gap with the Eurozone as a whole does not change significantly. For the Czech Republic, initially faster growth alternates with slower growth than the Eurozone and thereafter their path is similar to that in Bulgaria with the exception of the last quarter.

The behaviour of real gross value added in *services* is similar to that of the gross value added in industry. After the analysed indicator came within the range of Eurozone fluctuations, it grew faster but moved in parallel with those in the Eurozone. At the same time, its values in the Czech Republic vary above or below those of the Eurozone but this is not related to sustainable convergence with them.

In order to obtain a more reliable evaluation of the convergence in the dynamics of the elements in the two GDP structures a panel model is constructed, including Bulgaria, the Czech Republic and the Eurozone. Using panel modeling, a β-convergence between the real GDP components dynamics is measured.[22]

The econometric results of the unconditional β-convergence test are presented in Table 1a and Table 1b. As a whole, they show existence of β-convergence in the dynamics of consumption and gross value added in agriculture and forestry. As for the other GDP components of the two analysed structures, no evidence of their convergence is produced and in terms of the technical characteristics of the model this conclusion is most categorical in respect of the dynamics of government purchases.

Signs in front of the coefficients obtained (plus or minus) and the coefficients themselves by country (fixed effects) outline a completely different picture for Bulgaria and the Czech Republic. For the Czech Republic there is convergence in real values of all GDP components towards the Eurozone but it runs at different speed. The degree of convergence is the highest for the growth in gross value added in agriculture and forestry and the lowest in the growth of real investment. For all the other variables the reported speed could be assessed as average.

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2. In order to avoid peak changes in the studied indicators in the first quarter of 1997 consistent with extreme inflation rates, data in the econometric analysis cover the period starting from the second quarter of the year. Given the limited information on the dynamics of real exports and real imports, as was already mentioned, they are excluded from the breakdown of GDP into its constituent elements in the expenditure structure.

Table 1a. β-convergence Test for the Dynamics of the GDP Structures

	Expenditure structure			Production structure		
	Consumption	Investments	Government Purchases	Agriculture and Forestry	Industry	Services
const	0.49	0.54	0.12	-1.63	0.65	0.64
	(-1.160)	(-0.663)	(-0.201)	(-1.073)	(-0.923)	(-1.531)
β	-0.69	0.31	0.95	-0.56	0.37	-0.58
	(-1.017)	(-0.693)	(-2.054)	(-1.012)	(-0.935)	(-0.932)
β Bg	0.52	0.04	0.42	0.28	0.34	0.41
β Cz	-0.52	-0.04	-0.42	-0.88	-0.34	-0.41
Lag	-0.18	-0.27	-0.26	-0.33	0.12	-0.19
	-1.37	-2.06	-2.20	-2.13	0.95	-1.55
R^2	0.06	0.10	0.20	0.11	0.02	0.06
Prob.	0.29	0.09	0.00	0.21	0.70	0.33

Table 1b. β-convergence Degree of GDP Components

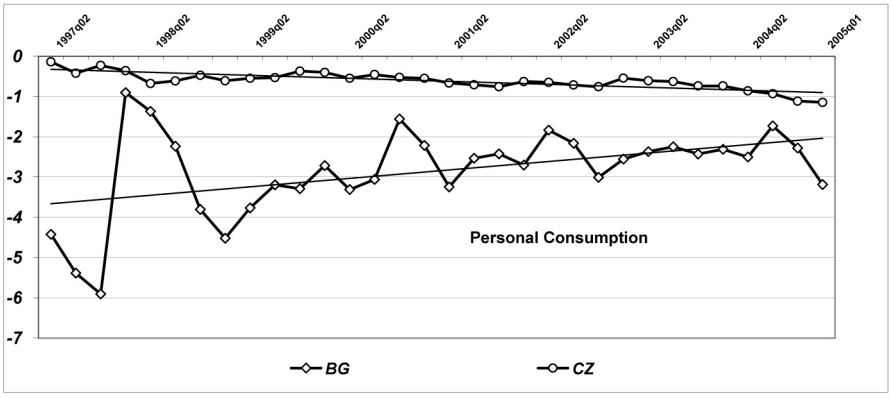
	Expenditure structure			Production structure		
	Consumption	Investments	Government Purchases	Agriculture and Forestry	Industry	Services
β	average to high	none	none	average	none	none
β Bg	none	none	none	none	none	none
β Cz	average	low	average	high	average	average

Unlike the Czech Republic, Bulgaria does not converge towards the Eurozone in any of the dynamics of the structural components of the product (the sign in front of the β-coefficient for each of them is positive).

4. Structural convergence

The study of the level and dynamics of structural convergence of the Bulgarian economy is carried out again by comparison with the Czech Republic and the Eurozone as a base. The expenditure and production structures of GDP are examined consistently for the period from the second quarter of 1997 till the first quarter of 2005 inclusive. To assess structural convergence the divergence coefficient is used and the closer it is to zero (using the Eurozone as a base), the higher the structural convergence or alignment with the Eurozone countries (see Figures 4 – 10).

Figure 4. Convergence of Personal Consumption Relative Share



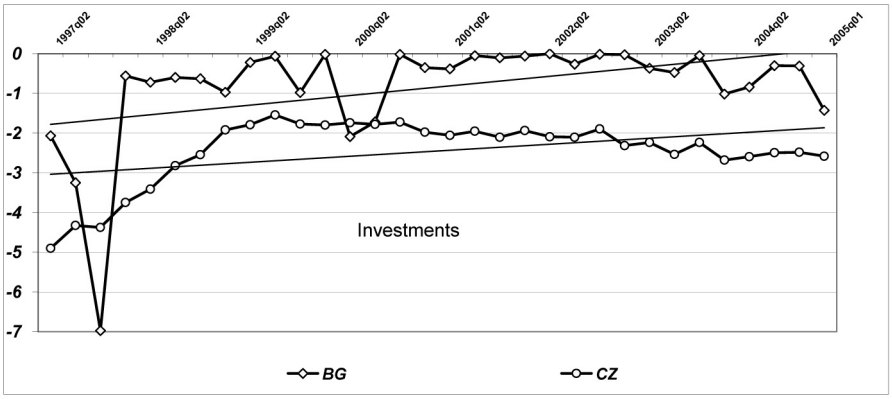
Source: NSI, Eurostat and own calculations

For the review period, with the exception of the fluctuation during the 1997 crisis, a clearly pronounced and stabilizing trend towards convergence of the relative share of personal consumption towards that of the Czech Republic and the countries from the Eurozone is observed. Per se, the above dynamics could be interpreted as a positive evaluation of personal consumption in Bulgaria but the low initial base should be taken into consideration, i.e. the comparatively high relative share of personal consumption in GDP vis-à-vis the European standard. Although the Czech Republic diverges as a trend in personal consumption from the Eurozone, it converges towards it much more than Bulgaria.

There are concerns that the positive trend of convergence of the relative share of personal consumption in Bulgaria towards that in the Eurozone could halt or even reverse. A major factor in this could be external and internal price shocks as a result of rises in energy commodity prices and the general anticipated price shock from the consecutive accession to the European Union and the Eurozone in particular.

Investments or gross capital formation is the only component of the expenditure structure in respect of which Bulgaria converges better than the Czech Republic towards the Eurozone both in absolute terms and as a trend. This is a good strategic indicator for the Bulgarian economy because if this trend sustains or develops further and the absolute volume of gross capital formation increases, this will lead to better adaptation of the other components of our economic structures towards equilibrium.

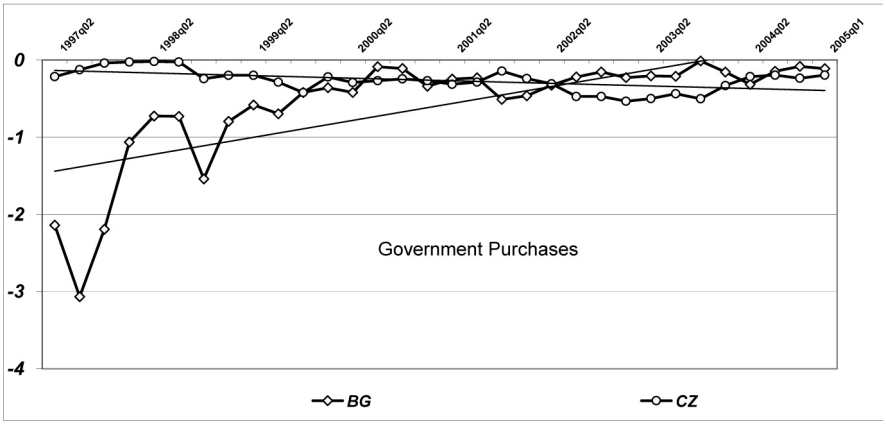
Figure 5. Convergence of Investments Relative Share



Source: NSI, Eurostat and own calculations.

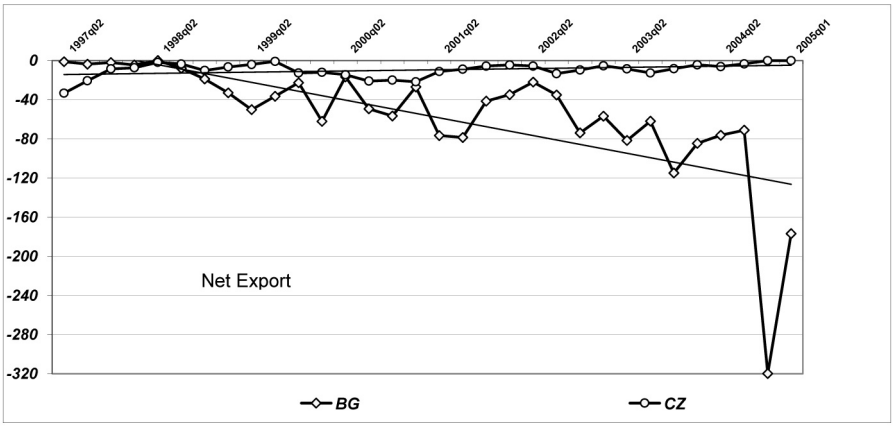
Government spending interpreted through the component *government purchases* is yet another component of GDP where the trend in Bulgaria's structural convergence is better than that of the Czech Republic in terms of direction and strength. In absolute terms, the divergence coefficient for Bulgaria since the beginning of 2000 is better than that of the Czech Republic and tends strongly to zero. This is still another expression of the financial and fiscal stability, reflecting adherence to the currency board principles and conformity with IMF agreements.

Figure 6. Convergence of Government Purchases Relative Share



Source: NSI, Eurostat and own calculations

Figure 7. Convergence of Net Exports Relative Share



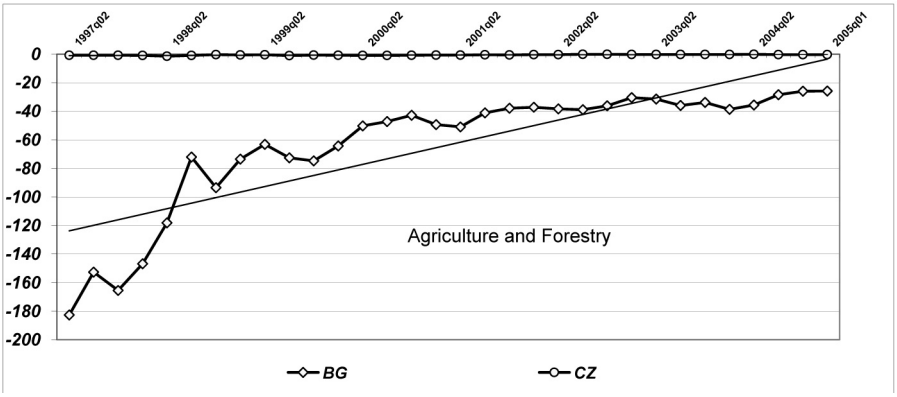
Source: NSI, Eurostat and own calculations

Unlike the other components of the expenditure structure of GDP, the relative share of net export does not converge but diverges from that of the Eurozone. Moreover, the divergence is strong, with a strongly deteriorating (drifting far from zero) divergence coefficient. In a very open economy depending on the import-export structure like that of Bulgaria, better convergence to the Eurozone is needed, which entails constraining the foreign trade deficit within more acceptable limits.

The second structure of GDP used to study convergence is the *production structure* – by major sectors of the national economy: agriculture and forestry, industry and services.

Convergence of the relative share of Bulgarian *agriculture and forestry* towards those of the Czech Republic and the Eurozone shows a very strong positive trend but the initial base is very low. The achieved certain stabilization of the divergence coefficient within values between (-40) and (-20) could be assumed as a negative evaluation, given the observed almost full convergence of the relative shares of this sector between the Czech Republic and the Eurozone. Real processes of "Europeanisation" of Bulgarian agriculture and forestry are yet to take place. A serious policy and government commitment is needed if we are to meet Europe's expectations about accepting us as producers and suppliers of the products of this economic sector (see Figure 8).

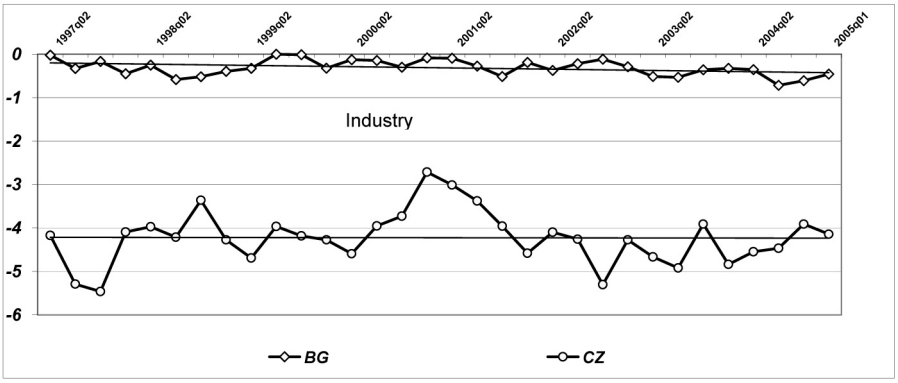
Figure 8. Convergence of the Agriculture and Forestry Relative Share



Source: NSI, Eurostat and own calculations

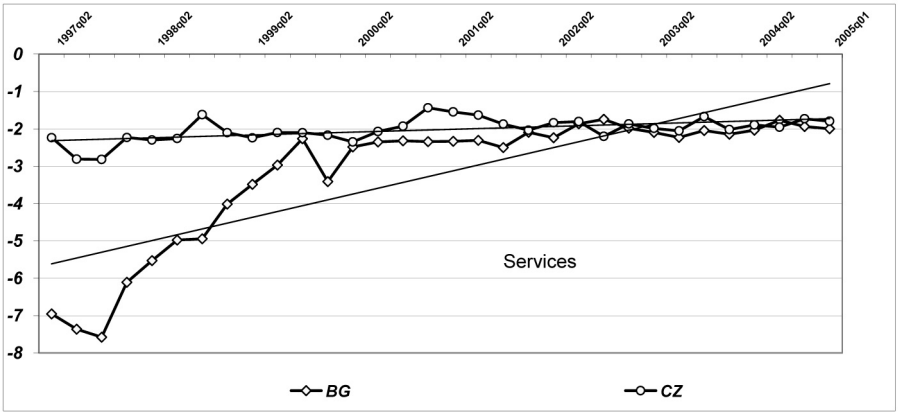
Bulgaria's convergence to the Eurozone in the relative weight of *industrial output* is the strongest of all observed components within the structures of GDP. As Figure 9 shows, the trends for Bulgaria and the Czech Republic are polar and the divergence coefficient for Bulgaria is much better, i.e. much closer to zero. In real terms, however, this convergence is ineffective, showing formal matching and overlapping of industrial economic structures between Bulgaria and the Eurozone in aggregated terms against a very obsolete capital equipment and high capital- and labour-intensive Bulgarian sector as a whole.

Figure 9. Convergence of the Industry Relative Share



Source: NSI, Eurostat and own calculations.

Figure 10. Convergence of the Services Relative Share



Source: NSI, Eurostat and own calculations.

Convergence of the relative share of the third and the biggest component of the production structure of GDP shows a very strong positive trend. Since the end of 2001 the relative shares of *services* in Bulgaria and the Czech Republic are almost equal, but the convergence of the two countries towards the Eurozone is still insufficient (the divergence coefficient is stabilised about -2).

5. Conclusions

Based on the above analysis of the convergence in the structures of GDP it could be concluded that for the time being Bulgaria has not reduced the gap with the Eurozone in respect of fluctuations in real values of consumption, investment and government purchases. The same is true for the dynamics of the gross value added in agriculture and forestry, industry and services. At the same time, there are positive trends of convergence of the levels of the relative weights of the first three elements in the expenditure structure of GDP, as well as of the relative weights of gross value added in the three major sectors: agriculture and forestry, industry and services.

The analysis of the convergence of the Bulgarian economy prompts the following conclusions:

First, the dynamics of the GDP components in the expenditure and production structure as a whole do not converge with those of the Eurozone. This allows us to interpret the result obtained as unfavourable from the point of view of the possibilities of synchronising the cyclical development of the economies. As opposed to Bulgaria, the Czech Republic for example displays convergence with the Eurozone in the growth of the real values of all GDP elements - albeit at a different speed.

Second, in relation to convergence of the relative shares of the GDP components of Bulgaria in the expenditure and production structure some positive tendencies are outlined. They relate not so much to the levels of convergence measured with the divergence index as to the observed almost constant improvement through drawing closer to the relative shares of the respective components in the Eurozone. The only exception is the relative share of net exports, which does not converge but rather deviates from that of the Eurozone and on a rather large scale. The reported similarity of the structure of the gross value added according to economic sectors may be interpreted as a prerequisite for the future diminishing of the lack of synchronisation of the national cycles related to the inadequate reaction of the different sectors of the real economy in relation to the general monetary policy pursued.

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