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Long-Term Impact of the European Funds on Bulgaria's Economy

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Summary

The objective of this paper is to estimate the long-term effects of the funds of the European Union (EU) on the economy of Bulgaria. The influence of EU funding on capital stock, total factor productivity (TFP) and potential output has been assessed through a methodology based on a two-factor Cobb-Douglas production function. The impact of EU funds on the rates of long-term unemployment and natural unemployment has been also estimated by an OLS regression of time series data. The research results imply that the absorbed EU financing has a positive influence on potential output and TFP and a negative influence on potential employment and long-term unemployment rate.

Key words: Bulgaria, European funds, long-term effects

JEL: F02, F15, F36

Introduction

The EU Structural and Cohesion Funds are crucial to a small open economy with a small amount of domestic savings, such as the Bulgarian one, which relies heavily on external financing to finance its investments, generate economic growth and overcome its lagging behind developed European economies. The aim of the present research is to evaluate the long-term effects of European funding on the Bulgarian economy. It has been achieved by performing the following tasks:

- Study of the management and absorption of the European Union funds in Bulgaria during the period 2007-2015 (Section one);
- Empirical assessment of the impact of the absorption of EU funds on the natural rate of unemployment and the rate of long-term unemployment in Bulgaria (Section two);
- Empirical assessment of the impact of the absorbed EU funds on the potential GDP of Bulgaria (Section three);
- Formulation of recommendations on maximizing the benefits of EU funds to the economy of Bulgaria (Conclusions section).

The long-term effects of EU funds on the Bulgarian economy have been estimated by a methodology based on a two-factor production function of Cobb Douglas.

1. Management and absorption of the European Union funds in Bulgaria in 2007-2015

During the 2007-13 programming period, seven operational programs under the EU Structural and Cohesion Funds (SCF) to the amount of EUR 6.7 billion financed the country's socio-economic development priorities, contributing to narrowing the gap with other EU countries and overcoming the negative effects of the global financial and economic crisis. Bulgaria also received money from the European Agricultural Fund for Rural Development (EAFRD), the European Agricultural Guarantee Fund (EAGF) and the

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European Fisheries Fund (EFF). By the end of 2015 the progress in the absorption of EU funds in Bulgaria was stable with a contracting ratio of over 100%, a payment ratio of 95% and a European Commission (EC) certification ratio of 81%. While making significant efforts to successfully start the absorption of funds in the new 2014-2020 programming period, the Bulgarian authorities focused on the effective completion of the 2007-2013 period.

The reference period (2015) was characterized by an increasing rate of absorption of EU funds, project budget updates, enhanced monitoring of activities (especially where the risk of delays was high) and a comprehensive review of the causes of delays and adequate extension of the deadlines for completion of the projects by the end of 2015. The main challenges were as follows:

- Completion of all projects, including payments until the end of the eligibility period;
- Providing funding for projects that could not be completed by the end of 2015;
- Tackling a huge amount of management verification and suspension of funding under some of the operational programs;
- Preparations for the closure of the 2007-2013 programming period.

Bulgaria's progress in the absorption of EU funds for the period 2007-2015 is summarized in Table 1 and the contracting ratio for the separate EU funds is shown in Table 2.

Table 1: *Progress of Bulgaria in the EU funds (ERDF, CF and ESF) absorption for the period 2007-2015*

Available budget	6.7 billion EUR
Contracted grants	7.0 billion EUR
Contracting ratio	105%
Paid grants	6.4 billion EUR
Payment ratio	95%
EC certification	5.4 billion EUR
EC certification ratio	81%

Source: Eurostat

Table 2. *Contracting ratios of Bulgaria for the separate EU funds (ERDF, CF and ESF) for the period 2007-2015*

EU fund	Contracting ratio
European Regional Development Fund (ERDF)	106%
Cohesion Fund (CF)	107%
European Social Fund (ESF)	104%

Source: KPMJ (2016). EU Funds in Central and Eastern Europe. Progress Report 2007-2015, p. 23

The implementation of the new programming period 2014-2020 started in 2015 with differences in the level of progress across the different operational programs. By the end of 2015, the contracting ratio was 7.9% and the payment ratio was 0.7%. Bulgaria's progress in the absorption of EU funds for the period 2014-2020 is summarized in Table 3.

Table 3. *Progress of Bulgaria in the EU funds (ERDF, CF and ESF) absorption for the period 2014-2020*

Available budget	7.3 billion EUR
Contracted grants	0.58 billion EUR
Contracting ratio	7.92%
Paid grants	0.054 billion EUR
Payment ratio	0.70%
EC certification	0.003 billion EUR
EC certification ratio	0.04%

Source: https://eumis2020.government.bg/

In Bulgaria there was a trend of accelerated absorption of the European funds and of precise planning of the projects. The analyzed period 2007-2015 was characterized by:

- Contracting more funds than the available budget under some operational programs in order to manage the financial risk at the end of the programming period;
- Activities that could not be finalized by the end of 2015 remained at the expense of the beneficiary;
- Increased attention to the quality of control at central and regional level.

Bulgaria put a lot of efforts into the successful completion of its first programming

period under the EU SCF. The structuring and implementation of financial engineering tools was considered a good practice in Bulgaria. Some of the major infrastructure projects were successfully completed, such as the Sofia Metro, which is among the 30 most extensive metro systems in Europe. The extension of Metro Line 1 to Sofia Airport was officially opened in 2015. The other extensions were launched and prepared for further investment. The development of the Unified Management Information System for the EU Structural Instruments in Bulgaria continued in order to improve its functionality and to facilitate the management and control of the EU funds in the previous and the new programming period.

The main problems of the management of the European funds in Bulgaria are:

- Irregularities in public procurements which led to suspension of funding and financial corrections under some operational programs;
- Lack of working capital, which directly affects the pace of progress and the quality of implementation;
- Insufficient exchange of knowledge and experience between managing authorities, beneficiaries and control bodies.

The following lessons can be drawn from the management and absorption of EU funds in Bulgaria for the period 2007-2013:

- It is advisable that the implementation of projects for the new programming period 2014-2020 start as soon as possible;
- Adopt a new approach in the OP Regions for Growth 2014-2020 in order to avoid concentrating funds in major cities, which was typical for the 2007-2013 period;
- Digitalization of the project application process for the new programming period;
- Codification of the legislation on European funds, which led to the adoption of the European Structural and Investment Funds Management Act at the end of 2015.

2. Empirical assessment of the impact of the absorption of EU funds on the natural rate of unemployment and the rate of long-term unemployment

2.1. Assumptions and methodology

It is assumed that in the long run all markets in the economy (labor, goods and money) are in a balanced state, with real GDP being equal to the potential, and the actual unemployment rate equal to the natural rate of unemployment. The natural rate of unemployment is a sum of the rates of structural and frictional unemployment (Todorov, 2017):

$$\mathbf{(1)\ NRU = SUR + FUR}$$

where **NRU** is the natural rate of unemployment, **SUR** – the rate of structural unemployment, **FUR** – the rate of frictional unemployment.

As an approximation for the structural unemployment rate **SUR**, the long-term unemployment rate **LTUR** can be used:

$$\mathbf{(2)\ SUR = LTUR}$$

The long-term unemployment rate **LTUR** is the percentage share of the long-term unemployed (those who have been unemployed for at least one year) **LTU** in the labor force **LF**:

$$\mathbf{(3)\ LTUR = (LTU / LF) * 100\%}$$

The rate of frictional unemployment **FUR** results from labor migration and is assumed to be negligibly small in size in the long run. Hence, in the long term the natural rate of unemployment **NRU** can be considered approximately equal to the long-term unemployment rate **LTUR** (Gladnishki, 2005; Todorov, 2017):

$$\mathbf{(4)\ NRU = LTUR}$$

The impact of the rate of absorption of EU funds on the rate of long-term unemployment (the natural rate of unemployment) was estimated by the equation

$$(5)\ LTUR_t = d_0 + d_1*EUFAR_t + d_2*GDPGR_t + u_t$$

where: $LTUR_t$ – the long-term unemployment rate in Bulgaria in quarter **t**; $EUFAR_t$ - rate of absorption of the ERDF, CF and ESF in Bulgaria in quarter **t**; $GDPGR_t$ - growth rate of Bulgaria's real GDP in quarter **t** compared to the previous quarter **t-1**; d_0 – constant (intercept); d_1, d_2 – regression coefficients; u_t – error term.

The methodology used was an **OLS** regression of time series.

2.2. Data

Quarterly data of the National Statistical Institute (NSI) on the long-term unemployment rate **LTUR** (in the 15-64 age group) and on the real GDP growth rate **GDPGR** as well as monthly data from the website https://www.eufunds.bg/ on the rate of absorption of EU funds **EUFAR** for the period 2010-2015 were employed. The monthly data for the rate of absorption of EU funds were averaged over quarters and transformed into quarterly.

Quarterly absorption of EU funds in Bulgaria ranged from -0.82% to 9.52%, with an average of 3.22%. The long-term unemployment rate in Bulgaria had a minimum of 4.21% and a maximum of 7.89% and its average value was 6.33%. In the period 2010-2015, economic growth in Bulgaria varied from -1.10% to 6.00% and was 2.03% on average (see Table 4).

Table 4 *Descriptive statistics of the variables in Equation (5)*

	LTUR, %	EUFAR, %	GDPGR, %
Mean	6.33	3.22	2.03
Maximum	7.89	9.52	6.00
Minimum	4.21	-0.82	-1.10
Standard deviation	1.03	2.34	2.01
Number of observations	24	24	24

Source: Prepared by the author

The analysis of time series data proceeded with group stationarity tests (see Table 5). The results of the stationarity tests indicated that there is a reason to accept the alternative hypothesis of the absence of a unit root and of the stationarity of the variables.

Table 5 *Group unit root tests for the variables in Equation (5)*

Type of test	Probability
Levin, Lin & Chu t	0.04
Im, Pesaran and Shin W-stat	0.00
ADF - Fisher Chi-square	0.00
PP - Fisher Chi-square	0.00

Source: Prepared by the author

2.3. Results

The results from the OLS estimation of Equation (5) are shown in Table 6. At a significance level of 1%, all explanatory variables are significant. The value of 0.18 of the regression coefficient before **EUFAR** suggests that one percentage point of **EUFAR** change, with other variables held constant, will lead to a 0.18 percentage point change in the long-term unemployment rate **LTUR** (and the natural rate of unemployment **NRU**) in the same direction. The positive sign of the regression coefficient before **EUFAR** contradicts theoretical expectations and could be explained by an increase in structural unemployment in Bulgaria as a result of innovations funded by European funds. The value of the regression coefficient before **GDPGR** (-0.35) means that one percentage point change in the rate of quarterly real **GDP** growth, with other variables held constant, will cause a change of 0.35 percentage point in the rate of long-term unemployment and the natural rate of unemployment in the opposite direction. The negative sign of the coefficient before **GDPGR** is in line with the theoretical expectations of a negative link between economic growth and the unemployment rate.

Table 6 *Estimates of the parameters of Equation (5) for the period 2010-2015*

Parameter	Estimate	Standard error	t-statistic	Probability
Intercept	6.45	0.27	23.66	0.00
EUFAR	0.18	0.06	3.08	0.00
GDPGR	-0.35	0.07	-5.03	0.00

Source: Prepared by the author

The value of the coefficient of determination (0.63) shows that 63% of the changes in the long-term unemployment rate in Bulgaria can be explained by changes in the rate of absorption of the EU funds and in real GDP growth rate. The probability of the F-statistic (0.00) indicates that the alternative hypothesis of the adequacy of the regression model is accepted. The acceptance of the alternative hypothesis does not mean that the model specification is the best possible but only that the regression model adequately reflects the relationship between dependent variable and independent variables.

The serial correlation LM test (Chi-square probability of 0.1879) confirmed the zero hypothesis of the absence of a serial correlation of residuals.

The residual heteroscedasticity test (Chi-square probability of 0.2457) confirmed the null hypothesis of the absence of heteroscedasticity in Equation (5).

The requirement of normal residual distribution is observed in Equation (5). The probability of the Jarque-Bera statistic is 0.44, which gives reason to accept the zero hypothesis of a normal residual distribution.

The Ramsey's RESET Test confirmed the zero hypothesis of the lack of errors in the specification of Equation (5) at the 5% significance level (probability of 0.0634).

3. Empirical estimation of the impact of the absorbed EU funds on the potential GDP of Bulgaria

3.1. Assumptions and methodology

The methodology of Todorov (2017) with the following modifications was used to assess the impact of the absorbed EU funds on the potential GDP of Bulgaria:

- The capacity utilization in industry was removed from the formula for calculating the potential output;
- The effect of EU funds on capital stocks was accounted for - the absorbed EU funds were transformed from nominal to real terms by deflation with a price index (deflator) and were added to the amount of capital stock;
- The impact of the absorbed EU funds on the long-term unemployment rate was accounted for - the change in the rate of absorption of the EU funds by 1% leads to 0.18% change in the long-term unemployment rate in the same direction (see Section 3);
- The effect of the absorbed EU funds on total factor productivity (TFP) was accounted for. TFP was calculated as a residual after taking into account the effects of the absorbed EU funds on employment and on capital stocks.

Similar to Gladnishki (2005) and Todorov (2017), in the present study the potential GDP of Bulgaria was estimated through an approach based on a two-factor production function of Cobb Douglas:

$$(6)\ YPOT = A * K\alpha * LPOT\beta$$

where $YPOT$ is Bulgaria's potential output, A is total factor productivity, K is capital stock, α is the elasticity of output with respect to capital, $LPOT$ is the potential (optimal) employment of labor resources and β is the elasticity of output with respect to labor.

3.1.1. Estimating the elasticity coefficients in the production function

The elasticity coefficients were estimated via an equilibrium approach, which is based on the income structure of Bulgaria's GDP and was used by Raleva (2013) and Todorov (2015). According to this approach, the whole mixed income is treated as a labor income. The labor income is calculated by adding to the compensation of employees **CE** one third of the sum of the net mixed income **NMI** and the net operating surplus **NOS**. The capital income equals two thirds of the sum of the net mixed income **NMI** and the net operating surplus **NOS**. The coefficients **α** and **β** are calculated as

$$(7)\ \alpha = \frac{2}{3}(NOS+NMI)/(CE+NOS+NMI)$$

$$(8)\ \beta = \frac{[CE + 1/3\ (NOS + NMI)]}{(CE + NOS + NMI)}$$

The sum of **α** and **β** is **1**. The average values of **α** and **β** for the period 1997-2015 are respectively **0.35** and **0.65** and were used in estimating Bulgaria's potential output.

3.1.2. Estimating capital stock and the impact of EU funds on capital stock

Given that the Bulgarian national statistics does not provide data on capital stock, one of the methodological problems, related to potential output estimation, is how to calculate the size of capital stock. Two 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; Todorov and Durova, 2016). In this paper the constant capital-output ratio approach is employed.

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), 2.3 (Raleva, 2013) and 2.2 (Todorov, 2016). For the purpose of this study, the used value of the capital-output ratio is 2.2. It is 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). Hence, the actual real size of capital stock **K** can be determined by multiplying the real GDP **Y** by the capital/output ratio **K/Y,** whose value is 2.2:

$$(9)\ K = Y * K/Y = Y * 2.2$$

The absorbed EU funds have the character of investments, so in the present analysis it is assumed that they directly increase the amount of capital stock in the Bulgarian economy. Since the absorbed EU funds are in nominal terms, they should be deflated and transformed in real terms before being added to capital stock. The increase in capital stock **ΔKt** in year t as a result of the absorption of EU funds EUFt in the same year **t** can be calculated using the formula

$$(10)\ \Delta K_t = EUF_t / PI_t$$

where: ΔK_t – increase in capital stock in year **t**; EUF_t – absorbed EU funds in year **t**; PI_t – price index (deflator).

For the estimation of capital stock and the impact of the absorbed EU funds on it were used annual data of Eurostat (on Bulgaria's GDP and deflator at prices of 2010) and KPMG (on the amount of the absorbed EU funds in Bulgaria) for the period 2010-2015.

Table 7: *Capital stock and absorbed EU funds, millions of Euros at prices of 2010*

Year	Capital stock with the absorbed EU funds	Absorbed EU funds	Capital stock without the absorbed EU fund
2010	84 107	469	83 638
2011	85 718	568	85 149
2012	85 744	933	84 811
2013	86 484	1 254	85 230
2014	87 633	1 435	86 197
2015	90 803	1 099	89 704
Total		5 760	

Source: Prepared by the author

The effect of the absorbed EU funds on capital stock in the Bulgarian economy is shown in Table 10. For the period 2010-2015, the absorbed EU funds increased capital stock in Bulgaria by nearly 5.8 billion euro at 2010 prices. It can be concluded that the funds of the European Union are an important source of investment financing and of expanding the production capacity of the Bulgarian economy.

3.1.3. Estimating potential (optimal) employment and the impact of EU funds on potential employment

Two indicators can be used to measure labor input in the production function - the number of employees or the number of hours worked in an economy. In the present study, as in Minassian (2008), Ganev (2005) and Todorov (2015, 2016 and 2017), the first indicator was chosen.

Potential (optimal) employment of labor resources is calculated by the formula

$$(11)\ LPOT = LF * (1 - LTUR - OREULC + IREULC)$$

Where: **LPOT** – potential (optimal) employment of labor resources; **LF** – labor force; **LTUR** – rate of long-term unemployment; **OREULC** – outflow rate of employees under labor contract; **IREULC** – inflow rate of employees under labor contract.

Potential employment and the effect of the absorbed EU funds on it are shown in Table 8. It was accounted for that a change in the rate of absorption of EU funds by 1 percentage point leads to 0.18 percentage point change in the rate of long-term unemployment in the same direction. An increase in absorbed EU funds ceteris paribus causes a reduction in potential employment, as a possible reason for this is an increase in structural unemployment due to financing of innovations with European funds.

Table 8 *Impact of EU funds on potential employment*

Year	Potential employment in the presence of EU funds, thousands of persons	EU funds absorption rate, percentage	Potential employment in the lack of EU funds, thousands of persons
2010	3 247	7	3 290
2011	3 164	9	3 218
2012	3 143	15	3 234
2013	3 165	20	3 287
2014	3 189	23	3 329
2015	3 203	18	3 312

Source: Prepared by the author

3.1.4. Estimating total factor productivity and the impact of EU funds

For each year of the 2010-2015 period, total factor productivity was calculated using the formula

$$(12)\ A_t = Y_t / (K_t^{0.35} * L_t^{0.65})$$

Where: A_t – total factor productivity in year t; Y_t – GDP in year t at 2010 prices in millions of euro; K_t – capital stock in year t at 2010 prices in millions of euro; L_t – number of employed persons in year t (in thousands).

The values of total factor productivity in the presence and in the absence of EU funds are shown in Table 9. It was accounted for that capital stock and employment are different in the presence and in the absence of EU funds of EU funds. Total factor productivity is higher in the presence of EU funds than in their absence. Possible explanations for the positive effect of the absorbed EU funds on total factor productivity are improvements in the technology and the infrastructure of the Bulgarian economy as a result of the realization of EU funded projects. As an increase in the absorption rate of EU funds leads to an increase in the long-term unemployment rate (see Section 3), it is unlikely that the increase in total factor productivity is due to a rise in the quantity and quality of human capital. If the quantity and quality of human capital rose, the increase in the absorption of EU funds would cause a decline in the rate of long-term unemployment.

Table 9 *Total factor productivity with and without EU funds*

Year	Total factor productivity with EU funds	Total factor productivity without EU funds
2010	3,90	3,88
2011	4,05	4,01
2012	4,08	4,01
2013	4,10	4,01
2014	4,09	3,99
2015	4,14	4,07

Source: Prepared by the author

3.2. Results

The values of the potential GDP of Bulgaria in the presence and in the absence of EU funds are shown in Table 10. In each year of the analyzed period 2010-2015 the potential GDP in the presence of utilized EU funds was higher than the potential GDP in the absence of EU funds. For the entire period 2010-2015 the absorbed EU funds increased Bulgaria's potential GDP by EUR 311 million at 2010 prices. The positive effects of the EU funds on potential GDP (generated by the increase in capital stock and total factor productivity) are greater than their negative effects on potential output (caused by the decrease in potential employment as a result of the increase in the absorbed EU funds).

Table 10: *Potential GDP with and without EU funds, million Euros at prices of 2010*

Year	Potential GDP with EU funds	Potential GDP without EU funds	Difference
2010	39 603	39 584	19
2011	40 638	40 608	30
2012	40 756	40 703	53
2013	41 287	41 209	78
2014	41 613	41 534	79
2015	42 773	42 721	52
Total		311	

Source: Prepared by the author

CONCLUSIONS

From the empirical estimation of the impact of the absorption of EU funds on the natural rate of unemployment and the rate of long-term unemployment, the following conclusions can be drawn:

- There is a significant positive relationship between the rate of absorption of EU funds and the rate of long-term unemployment (the natural rate of unemployment), which is contrary to theoretical expectations and could be explained by an increase in structural unemployment resulting from the

financing of innovations with EU funds. Such a relationship should be a signal of concern to political and economic strategists at national and European level, as it indicates an adversary impact of the absorbed EU funds on the long-term unemployment rate and the natural rate of unemployment in Bulgaria;

- There is a significant negative relationship between the real GDP growth rate and the long-term unemployment rate (the natural rate of unemployment) that corresponds to theoretical expectations and can be considered a confirmation of the hypothesis of the existence of hysteresis.

The empirical assessment of the impact of the absorbed EU funds on the potential GDP of Bulgaria suggests that while in the short run the absorption of the EU funds does not affect economic growth, employment and unemployment in Bulgaria, in the long term it has a positive effect on potential GDP and total factor productivity, but a negative impact on potential employment and the rate of long-term unemployment. Potential GDP and total factor productivity rise due to improvements in technology and infrastructure, but the quantity and quality of human capital is in decline (the rate of long-term unemployment increases). It is recommended that investment in human capital be raised in order to enhance its quantity and quality and to maximize the beneficial long-term effects of the absorbed EU funds on the Bulgarian economy.

REFERENCES

Ganev, K. (2005). Measuring Total Factor Productivity: Growth Accounting for Bulgaria. Bulgarian National Bank Discussion Paper No. 48/2005.

Gladnishki, A. (2005). Measuring potential output: using the instruments of production functions. Agency for Economic Analysis and Forecasting (AEAF), Ministry of Finance, Republic of Bulgaria.

http://ec.europa.eu/eurostat

http://www.nsi.bg/

https://eumis2020.government.bg/

https://www.eufunds.bg/izpalnenie-na-operativnite-programi

KPMJ (2016). EU Funds in Central and Eastern Europe. Progress Report 2007-2015.

Minassian, G. (2008). Is the Bulgarian Economy Overheating? *Economic Thought Journal*, Volume 2008, Issue 3, pp. 3-29.

Raleva, S. (2013). Inflation and Economic Growth. Sofia: Publishing Complex of the University of National and World Economy.

Todorov, I. (2015). Two Approaches for Evaluating the Aggregated Production Function of Bulgaria. *Economic Studies Journal*, Vol. 2015, Issue 4, pp. 67-81.

Todorov, I. (2016). Supply-Side Factors of Economic Growth in Bulgaria. *Economic Alternatives*, Issue 2, pp. 159-174.

Todorov, I. (2017). The Growth and the Cyclical Recurrence of Bulgaria's Economy under a Currency Board Arrangement. Sofia: Avangard Prima.

Todorov, I., K. Durova (2016). Economic Growth of Bulgaria and Its Determinants. *Economic Studies Journal*, Vol. 2016, Issue 4, pp. 3-35.