1. EU'S CAM AND POTENTIAL GDP ESTIMATES. SOME INCONSISTENT RESULTS IN THE CASE OF ROMANIA

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Abstract

The paper quantifies the differences in the estimated potential GDP due to corrections to the used data series. The corrections are necessary, since the capital series used by the DG ECFIN, in the absence of a coherent series, was constructed based on an approximation of the initial stock, using the perpetual inventory method. Recently, the INS has finished recreating the capital series, and the differences in values are quite significant. Secondly, the CAM uses a value of 0.65 for the elasticity of labor, selected based on the average share of wages in the EU15 in the 1960 period. The average value for Romania computed for the 1995-2018 period from the statistical series is 0.45, significantly lower than the above-mentioned value. We used the CAM for computing an alternative potential GDP essentially the GAP interface provided, in order to make sure that the differences were not induced by differences in the estimation process (Kalman filter, Hodrick Prescott filter), but by the differences in the data. The estimated potential GDP using the new data proved to be remarkable similar to the DG ECFIN, but the output gap captured some differences. The authors' computed gap is smaller in absolute value than that of the EU's. Although the sign of the gap is mostly similar, the DG ECFIN gap is positive, while the authors' gap is negative (although small) at the end of the interval (2017-2019). Since the sign of the GAP is most important in assessing the fiscal stance and performances of the EU countries, determining the European Commission recommendations on the economic policies that a country should adopt, according also to the matrix of fiscal requirements, the results raise some questions regarding the accuracy of the DG ECFIN estimations of the potential GDP.

Keywords: potential GDP, output gap, EU fiscal surveillance framework, cyclical position

JEL Classification: E1, E6.

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1. Introduction

Potential GDP has recently become a widely used tool by all the developed countries, because it describes the level of gross domestic product that can be reached by an economy when it arrives at its full potential in terms of efficient use of its inputs, when labor and capital are used at optimum capacity, without inflationary pressures in the economy. Potential GDP is a measure of the production capacity of an economy, but not of the maximum capacity, so the economy may function below potential, when the factors of production (all or only one) are underused, or above potential (for short durations), when the reverse is true. Operating above capacity introduces strong pressures into the economy, inflationary, but not only. Knowing the economic potential of a country allows the decision makers to design policies to rise the potential of an economy by increasing the factors of production, such as investment policies in physical capital (infrastructure), and / or human capital, as well as policies which make the economy more attractive to foreign direct investment.

The importance of potential GDP has become even greater since March 2012, when the Treaty on Stability, Coordination and Governance (TSCG) within the Economic and Monetary Union (with the most important component - the Fiscal Compact) was signed, which was implemented starting with 1.01.2013. The main objective of the treaty is to maintain a sound and sustainable nature of public finances and to avoid excessive levels of budget deficits (European Union, 2012).

The specific regulatory framework for economic and fiscal surveillance of the Member States was structured by two levels, connected and in temporal succession. The preventive arm consists in setting medium-term budgetary objectives, based on output gap and structural balance. The case of non-compliance with the recommendations made by the European Commission for a return to a prudent fiscal policy may lead to the activation of the Significant Deviation Procedure (SDP). The corrective arm, which usually succeeds the PDS and, if the budget deficit exceeds the 3% threshold and / or the public debt increases at an unsatisfactory rate, if it is above the 60% threshold, involves the launch of the multi-stage Excessive Deficit Procedure (EDP), leading to severe financial sanctions for the Member States that do not comply with the budget corrections recommended by the European Commission (fines of up to 0.5% of GDP, limitation of the EIB lending opportunities and / or temporary suspension of access to financing from the European Structural and Investment Funds).

In March 2020, in order to mitigate the economic and social impact of the COVID-19 pandemic and the lockdown effect, as part of its response strategy, the European Commission activated, for the first time, the general escape clause of the TSCG, which temporarily suspends the rules of the European budgetary framework, so that the Member States can take measures to support the economy, companies and the population in order to meet the challenges of the crisis. Given that the activation of the derogation clause is temporary, provided that the medium-term fiscal sustainability is not threatened and that the EDP procedures are not suspended during that period, it is expected that once the crisis is over, the clause will cease effect and the fiscal rules will be restored at the EU level. It is estimated that the Romanian's budget deficit in 2020 might be as high as 9% of the GDP, making the computation of the potential GDP more important than ever.

The Commission employs a unitary methodology for all the countries, a methodology that is in continuous process of refining, but we identified problems related to the data employed in

the case of Romania. Our aim is to analyze how the results are affected if the correct data is used.

The paper is structured as follows. The next section presents a literature review, following by a short presentation of the European Commission methodology for computing the output gap. Next, we present the problems that we identified, mainly in the data and the avenues we have taken to correct them. The next section presents the results, followed by conclusions.

2. Literature Review

There are several types of methods used in the literature to calculate potential GDP. Arnold, Dennis and Peterson (2004) classify the methods for estimating potential output into statistical methods, the production function method, simultaneous equations, and multivariate models (VAR, SVAR). In addition to the above-presented methods, another used method is that of cyclical indicators, used by the Office for Budget Responsibility in the UK (Office for Budget Responsability, 2011) and (Murray, 2014).

Statistical methods estimate the potential GDP as the trend of real GDP. The assumption underlying this method is that GDP can be broken down into two components, a trend one and a cyclical one. For the breakdown into the two components, various GDP filtering methods are used. The simplest, and very used in the literature due to its ease of application is the Hodrick-Prescott filter. The main problem with this methodology is that there is no motivation to conclude that the two components obtained from filtering are indeed the potential and the GDP gap. An infinity of trend and cycle pairs can be obtained, pairs computed with different smoothing coefficients. The literature provides optimal smoothing coefficients depending on the periodicity of the data. Ignoring the previous problems, the HP filter also suffers from estimation problems at the end of the interval, where the data is fewer. As the potential GDP is a tool that is important for forecasting, its performance at the right end of the range is essential.

However, multivariate filters are methods used quite often in estimating potential GDP, as is the case with the methodology used in the US described in the works (Alichi, New Methodology for Estimating the Output Gap in the United States, 2015) and (Alichi, et al., 2017) or the methodology used by the Central Bank of Canada see (Butler, 1996) and (Pichette, St-Amant, Tomlin, & Anoma, 2015) (Saman & Pauna, 2013).

The production function method is by far the most commonly used method for estimating the potential GDP. The EU methodology described in Havik *et al*. (2014), the OECD methodology presented in the paper by Giorno, Richardson and Roseveare (1995) and its subsequent revision (Turner *et al*., 2016), the IMF methodology (De Masi, 1997), the methodology of the Central Bank of Iceland (Central Bank of Iceland, 2005), the methodology of the Central Bank of Japan (Kawamoto *et al*., 2017), are just a few examples. The main advantage of the production method is that it starts from the GDP definition. However, the calculation of the potential value of factors contains a degree of subjectivism.

The method of simultaneous equations involves building a system of equations to define the potential GDP, the equilibrium unemployment rate (NAIRU, NAWRU, etc.), the inflation rate, etc., equations that include among the explanatory variables also variables modeled in other equations. This system of equations is estimated simultaneously, using different methods, including multi-varied filters. This method is used in the IMF methodology for estimating potential GDP (De Masi, 1997).

3. European Commission's Methodology for Computing Potential GDP – CAM (Common Agreed Methodology)

The methodology that the EU uses to estimate the potential GDP is presented in Havik *et al*. (2014).

The EU methodology is built on the production function method. It computes the potential GDP starting from the supply potential of the economy. It has the advantage that it has a direct link with economic theory and the disadvantage that assumptions must be made about the functional form of the production function, technology, returns to scale, the dynamics of technical progress (TFP) and the use of factors of production.

The GDP is modeled with the help of a Cobb-Douglas production function with constant returns to scale:

$$Y = (U_L\, L\, E_L)^{\alpha}(U_K\, K\, E_K)^{1-\alpha} = TFP\, L^{\alpha}K^{1-\alpha}$$

where: *L* is the labor input, *K* is the capital input, *α* is the elasticity of labor, and since constant returns to scale (1 – α) is the elasticity of capital, *TFP* is the total factor productivity.

$$TFP = (E_L^{\alpha}E_K^{1-\alpha})(U_L^{\alpha}U_K^{1-\alpha})$$

where: E_L and E_K are the efficiency of labor and capital, and U_L and U_K are the degree of utilization of labor and capital.

The value for labor elasticity is computed under the hypothesis of perfect competition, when labor elasticity can be estimated from the share of labor income in the GVA. The average share of wages for the EU15 over the 1960-2003 period is 0.63, and based on these figures, it was decided that the value of labor elasticity accepted for all the EU countries was 0.65, and 0.35 for capital, respectively.

The potential GDP is computed when the factor inputs are at their potential levels. Potential capital is easy to compute, because the potential capital is when the existing capital is used at its maximum; therefore, potential capital is equal to the actual capital stock[3].

Labor is defined in terms of the number of hours worked, according to its definition:

$$L = POPW \cdot PART \cdot (1 - UN) \cdot HOURS$$

where: $POPW$ is the working age population, $PART$ is the participation rate, UN is the unemployment rate, and $HOURS$ is the yearly average number of hours per worker.

Similarly, the potential labor force is defined as:

$$LP = POPW \cdot PARTS \cdot (1 - NAWRU) \cdot HOURST$$

where: $PARTS$ is the smoothed participation, $NAWRU$ is the structural unemployment, and $HOURST$ is the smoothed *HOURS*.

In the computation of the potential labor force both the yearly average number of hours per worker and the participation rate are smoothed using the Hodrick-Prescot filter. The $NAWRU$ is the unemployment rate which is consistent with a stable wage inflation.

[3] The capital series is stable over time and does not need smoothing.

When computing the potential GDP, separately from potential labor and capital one needs to smooth total factor productivity as well. For both NAWRU and the TFP, the European Commission methodology makes use of a Kalman filter. The European Commission uses an interface built by the Joint Research Centre. The details regarding the program can be found in Planas and Rossi (European Comission – CIRCABC, 2016) and Planas and Rossi (Program GAP. Technical Description and User-manual, 2018).

3.1. Computation of the NAWRU

The unemployment rate, u_t, is decomposed into two components: a trend ($NAWRU$), which is denoted by n_t, and a cycle, g_t

$$u_t = n_t + g_t$$

$$\Delta n_t = \eta_{t-1} + a_{nt}$$

$$\eta_t = \eta_{t-1} + a_{\eta t}$$

$$g_t = \phi_{g1}\, g_{t-1} + \phi_{g2}\, g_{t-2} + a_{gt}$$

The $NAWRU$ is a random walk process in the first or the second difference, and the cycle is autoregressive of second order. The cycle is linked with the labor cost through a Phillips curve type of equation:

$$w_t = \mu_w + \phi_{w1} w_{t-1} + \beta_0\, g_t + \beta_1\, g_{t-1} + \gamma_w\, z_t + a_{wt}$$

The z_t is a vector of exogenous variables such as labor productivity, terms of trade, etc. In the case of the Romanian equation, no exogenous variables were included in the Phillips curve equation.

3.2. Computation of the TFP

Similarly, the natural logarithm of the *TFP* is decomposed into a trend (p_t) and a cycle (c_t):

$$tfp_t = p_t + c_t$$

$$\Delta\, p_t = \eta_{t-1} + a_{pt}$$

$$\eta_t = \mu_p(1-\rho) + \rho\, \eta_{t-1} + a_{\eta t}$$

$$c_t = \phi_{c1} c_{t-1} + \phi_{c2} c_{t-2} + a_{ct}$$

The potential GDP is integrated of order 1, and follows a dampened trend where the growth rate is μ_p. The cycle of the *tfp* is an AR(2) process. The cycle is connected to the capacity utilization through the following equation:

$$cu_t = \mu_{cu} + \beta_{cu} c_t + e_t$$

$$e_t = \phi_{cu} e_{t-1} + a_{cut}$$

For the computation of the TFP, the Commission employs a Bayesian methodology. The advantage of this approach is that it incorporates information regarding the parameters of the model, information which is available either from the macroeconomic theory or the empirical studies. The a priori assumptions about the distribution of the coefficients are detailed in Planas & Rossi (Program GAP. Technical Description and User-manual, 2018).

4. Data

Although the data series used to estimate the potential GDP originates from national sources, there are two exceptions to that. The first is the series of the capital stock. Due to a lack of a coherent series, the Commission opted to construct one using the recurrent formula:

$$K_t = K_{t-1}(1 - dep) + Inv_t$$

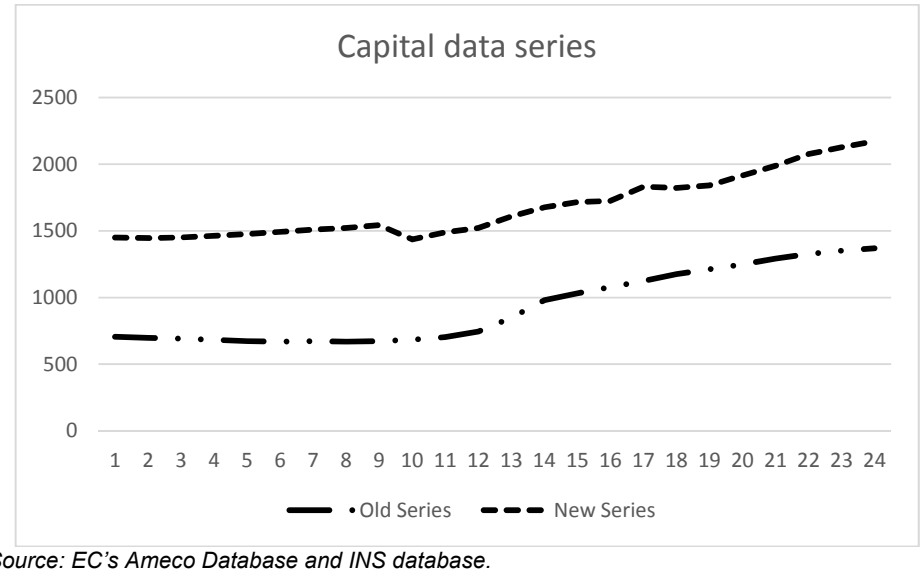
where: K_t is the capital stock at *t* and K_{t-1} is the capital stock at *t-1*, *dep* is the depreciation rate, and Inv_t is the investment flow at *t*.

In order to compute a capital series, one needs the investment data, a rate of depreciation and a value for the original capital stock. The Commission solved the lack of information on capital by linking the value of the stock of capital to the value of the GDP, namely the capital stock in 1995 is double the real GDP.

In the meantime, the National Statistical Office has finished computing a capital series which covers the period 2000-2017. We have extrapolated the data backwards to 1995 to cover the same period as the rest of the European Commission series.

Figure 1

The Capital Series Used by the EC and the INS Capital Series



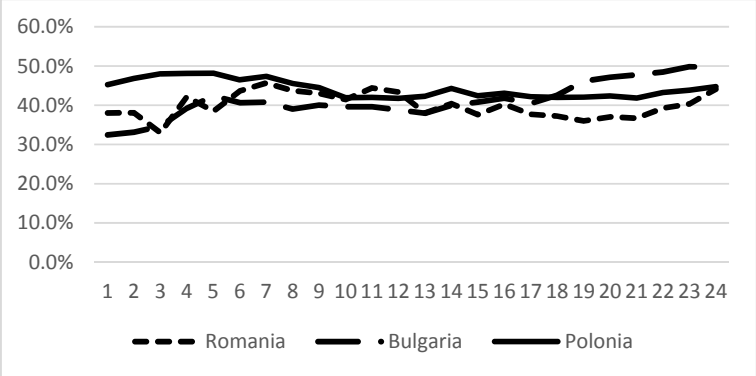
Source: EC's Ameco Database and INS database.

Figure 1 presents the two series of capital. The two series follow a similar path, but there is a large gap between them, in the sense that the INS capital is substantially larger than the EC, which means that the original assumption of double the GDP did not describe correctly the capital stock. Whether or not the difference in values has any significant impact on the potential GDP has to be discovered, especially since the correlation coefficient between them is very high, higher than 0.9.

The second problem discovered in the data relates to the selected value for the elasticity of labor force. The EC chose a value of 0.65, based on the average share of wages in the GVA for EU15 in the period 1960-2003. For most of the EU new member states, the chosen value is too high. Figure 2 shows the evolution of the value for selected countries. All three countries have values lower than 50% for the entire interval, Romania's value fluctuates around 40%, but due to the fact that it increased at the end of the interval, we selected for our estimation a value of 45%.

Figure 2

The Share of Labor Costs in the GDP for Selected Countries



Source: Authors' computations.

Both problems identified in the data set under-represents the importance of capital in the potential GDP, first because the value of the series is almost half of the real value, and second because the elasticity of the capital is lower by 0.2 than the value suggested by the Romanian statistical data.

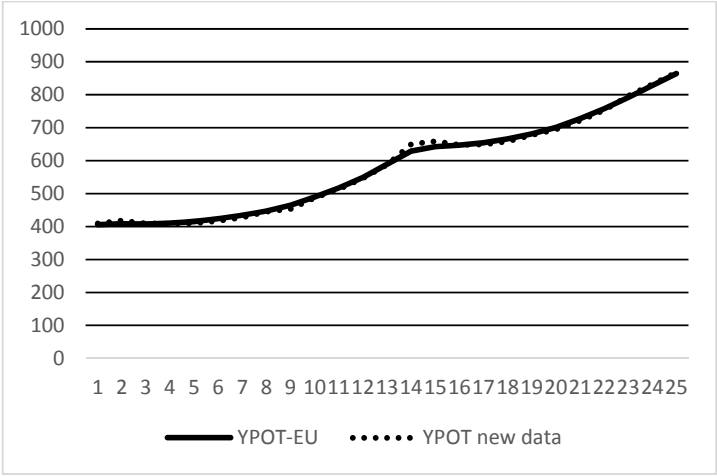
Results

The results of the estimation of the potential GDP are presented in Figure 3.

The two lines are almost identical, the difference in the data between the two GDP series is absorbed in the total factor productivity. The high correlation between the two series of capital is probably responsible for the small differences between the series of the potential GDP.With the potential GDP thus estimated, we computed two series for the GDP gap. They are presented in Figure 4.

Figure 3

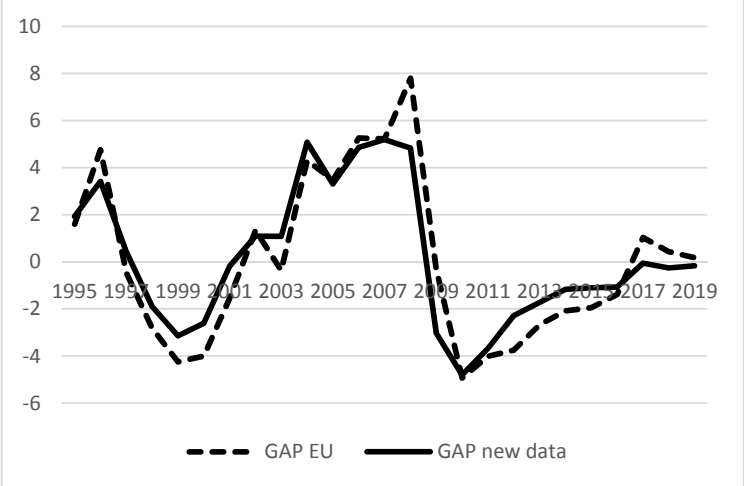
The EU Potential GDP and the Potential GDP Estimated with INS Data



Source: Authors' computations.

Figure 4

The GDP Gap Estimated by the EU and the Gap Estimated with INS Data



Source: Authors' computations.

Despite the small differences in the two series of the potential GDP, the examination of GDP deviation (Output Gap) in the two cases (GAP EU for the Commission's estimates, and GAP INS for our estimates, respectively) leads to some conclusions with relevant implications on

the EU Council and the European Commission's assessments of fiscal performance and the cyclical position of Romania's economy in relation to the EU fiscal surveillance framework.

The data presented in Figure 3a and Figure 4 is presented in Table 1

From the data presented in Table 1, it follows that the GAP INS series, regardless of the sign (modulus), is usually characterized by lower values than those of the GAP EU series, which means smaller deviations of real GDP and, therefore, a more accurate estimate of its trend based on the INS data.

The two series have the same sign during the 1995-2019 period, with the exception of 1997 and 2003, when GAP EU was negative and GAP INS positive, with a difference of about one percentage point, as well as of the last three years of the analysis (2017, 2018, 2019), when OG EU was positive, while OG INS was negative, the differences being below one percentage point and closing the gap.

Table 1

Output Gap Estimates of DG ECFIN and Authors' Estimates Using INS Data

Year	CAM DG EGFIN data		Real GDP (bn. LEI)	CAM INS data	
	YPOT-EU (bn.LEI)	GAP EU (%)		YPOT-INS (bn.LEI)	GAP INS (%)
1995	405.5	1.5	411.6	404.2	1.8
1996	408.5	4.7	427.6	413.9	3.3
1997	408.9	-0.5	406.9	405.3	0.4
1998	410.6	-2.9	398.6	406.7	-2.0
1999	414.6	-4.2	397.1	409.9	-3.1
2000	424.0	-4.0	406.9	417.9	-2.6
2001	434.7	-1.5	428.1	428.8	-0.2
2002	447.0	1.2	452.6	448.1	1.0
2003	464.7	-0.3	463.2	458.1	1.1
2004	489.9	4.4	511.5	486.3	5.2
2005	517.0	3.5	535.3	517.9	3.4
2006	549.1	5.3	578.3	551.2	4.9
2007	589.2	5.3	620.1	589.4	5.2
2008	628.9	7.8	677.9	646.7	4.8
2009	642.1	-0.2	640.5	660.0	-3.0
2010	646.9	-4.9	615.5	646.0	-4.7
2011	654.2	-4.0	627.8	652.0	-3.7
2012	666.0	-3.8	640.9	656.0	-2.3
2013	681.2	-2.6	663.4	674.7	-1.7
2014	700.6	-2.1	686.0	694.1	-1.2
2015	727.1	-2.0	712.6	721.0	-1.2
2016	757.5	-1.4	746.8	755.1	-1.1
2017	791.8	1.0	799.9	800.5	-0.1
2018	828.4	0.4	831.5	834.2	-0.3
2019	864.5	0.1	865.5	867.5	-0.2

Source: DG ECFIN computations and authors' computations.

During the 2017-2019 interval, in all the EU and national documents, statistics and forecasts Romania's output gap was positive and, therefore, the recommended economic policies conformed to this situation, namely an economy with expansionist tendency due to an excess demand. The obvious policy, which is the increase in the monetary policy interest rate was applied in the first half of 2018.

It should be noted that in the situation of a positive GAP, especially if it is relatively small and more sensitive to revisions, the measures to counter inflationary pressures and fiscal consolidation may lead to downward revisions of the estimated level of potential GDP, which, due to a negative feedback loop and/or hysteresis effects, it maintains the GAP on positive territory. On the other hand, the higher the positive GAP, the more justified are the fiscal and monetary measures to correct the excess demand and prevent pro-cyclical discretionary budgetary policies, as the matrix of fiscal adjustment requirements of SGP is designed.

According to our calculations based on INS data, in the case of Romania the negative sign of GAP under the circumstances of a relatively small deviation of GDP (between 0.1 and 0.3 percentage points) in the period 2017-2019 would have required a much more careful calibration of economic and monetary policy measures to avoid the deterioration of macroeconomic and fiscal parameters in 2018 and 2019, in particular as a result of wage rises in the budgetary sector, as well as rise in the public pensions.

Given the small differences between the levels of potential GDP estimated by DG ECFIN and those resulting from our calculations based on INS data, the figures on the contribution of labor, capital and total factor productivity are close for both estimates (Table 2).

Table 2

Contribution to Potential GDP Growth in 2018 and 2019

- % -

Indicators	2018		2019	
	DG-ECFIN data	INS data	DG-ECFIN data	INS data
Y-POT growth rate	4,62	4,20	4,35	4,00
Contributions:				
Labor	0,25	0,15	0,09	0,06
Capital	1,14	1,14	1,32	1,32
TFP	3,24	2,91	2,94	2,62

Source: Country Report Romania. Commission Staff Working Document, European Commission, Brussels, 26.02.2020; authors' computations.

However, the data presented in Table 2 for 2018 and 2019 shows that, under circumstances of slightly different rates of potential GDP growth in both variants, while the contribution of capital accumulation is identical, the contribution of labor and total factor productivity is by 0.1-0.3 percentage points lower in the case of estimates based on INS data than in those of DG ECFIN, which may suggest a more appropriate estimate of these contributions according to our computations.

Regarding the potential GDP, it is affected on the side of human capital by unfavorable demographic trends that have led to a significant shortage of labor and skilled personnel, given that the education system does not provide training adequate to the demand and developments in the labor market. Thus, the contribution of labor, although modest but

positive, is expected to decrease and even to slip into negative territory, a trend which is highlighted by the results of our calculations based on INS data.

The main contribution to potential GDP growth is given by the total factor productivity which is expected to remain in the short and medium term its most important factor, but shifting to a slowdown, which can be partially offset by the increase in the contribution of capital accumulation, rising investment (Marinescu, Spanulescu, & Craiu, 2019), especially in sustainable transport, energy and environmental infrastructure.

Conclusions

The paper quantifies the difference in the estimated potential GDP due to corrections to the used data series. The corrections are necessary, since the capital series the DG ECFIN used, in the absence of a coherent series, was constructed on the basis of an approximation of the initial stock, using the perpetual inventory method. Recently, the INS has finished recreating the capital series, and the differences in values are quite significant. Secondly, the CAM uses a value of 0.65 for the elasticity of labor selected on the basis of the average share of wages for the EU15 over the period 1960-2003, which was 0.63. The average value for Romania computed for the 1995-2018 period from the statistical series is 0.45, significantly lower than the used value.

We used the CAM for computing an alternative potential GDP essentially the GDP interface provided, in order to make sure that the differences were not induced by differences in the estimation process (Kalman filter, Hodrick Prescott filter), but by the differences in the data.

The results, despite small differences in the two series of the potential GDP, the analysis of Output Gap showed some inconsistencies, with implications on the fiscal performance assessments of Romania's economy in relation to the EU fiscal surveillance framework. The fiscal consolidation and performances should be regarded also as insuring the right balance between public debt sustainability and economic output growth (Albu & Albu, 2021). According to our calculations based on INS data, the negative sign of Output Gap in the period 2017-2019 compared to the positive one estimated by DG-ECFIN would have required a much more careful calibration of economic and monetary policy measures to avoid the deterioration of macroeconomic and fiscal parameters in 2018 and 2019. Also, smaller deviations from actual GDP, as resulted based on INS data, suggest a more accurate estimate of potential growth trend.

As regards the contribution to potential GDP growth, our computations have clearly showed that labor contribution is expected to decrease and enter into negative territory, the main contribution, even shifting to a slowdown, remaining to be given by the total factor productivity, and a foreseeable increase in the contribution of capital accumulation, helped by European funds in the short and medium term.

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