

# The Cyclical Behaviour of Government Spending for Social Protection:

## Is the OECD Methodology Robust?

Aleksandr Arsenev, Philipp Heimberger and Bernhard Schütz





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ALEKSANDR ARSENEV  
PHILIPP HEIMBERGER  
BERNHARD SCHÜTZ

Aleksandr Arsenev and Philipp Heimberger are Economists at The Vienna Institute for International Economic Studies (wiiw). Bernhard Schütz is Economist at wiiw and Research Associate at the University of Duisburg-Essen.

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# Abstract

Spending elasticities measure the reaction of different government spending components to the business cycle. They are important inputs for fiscal forecasts, and they are particularly relevant in the context of European Union (EU) fiscal rules, as elasticity estimates enter the estimation of fiscal space. This paper analyses the sensitivity of the estimation method used by the Organisation for Economic Co-operation and Development (OECD) and the European Commission to obtain government spending elasticities by focusing on 11 EU countries in the 1995-2020 period. Our results suggest that spending elasticities are sensitive to small variations in data and model specification. For most EU countries, we reject the assumption that only unemployment spending responds to cyclical variations. While unemployment spending is indeed a major driver of counter-cyclical social spending, other categories of social spending also show signs of responding to the business cycle.

**Keywords:** Government debt; fiscal deficit; fiscal rules; budget elasticity; government spending; social spending

**JEL classification:** E62, H62, E32



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# 1. Introduction

Budget elasticities, which measure the reaction of (components of) the fiscal balance to cyclical conditions, are important inputs in fiscal forecasts. Furthermore, they are key technical inputs in estimating fiscal space in the context of European Union (EU) fiscal rules, which determine how much governments are allowed to borrow. The choice of method for how to adjust the headline fiscal balance for the impact of the business cycle determines the fiscal space that countries have.<sup>1</sup> Estimating the cyclical component of the fiscal balance requires an estimation of the output gap as well as the budget semi-elasticity. While the output gap is the difference between actual output and a model-based estimate of potential output, the budget semi-elasticity measures the reaction of the fiscal balance to changes in the output gap. While concerns about how potential output (and, hence, the output gap) is being estimated are well documented,<sup>2</sup> the estimation of budget elasticities has so far received little attention. A particular point of critique is that the approach used by the European Commission for estimating budget semi-elasticity, which relies on technical work done by the Organisation for Economic Co-operation and Development (OECD)(Price et al. 2014), focuses almost entirely on revenue components (taxes and social contributions), with the assumption on the expenditure side being that only unemployment spending reacts to cyclical conditions (Mourre et al. 2019). However, other parts of the government budget, such as various components of social spending as well as health expenditure, may also be affected by cyclical conditions (e.g. Darby and Melitz 2008; Afonso and Jalles 2013).

Darby and Melitz (2008) refer to two sets of arguments for a connection between health and social spending and the business cycle.<sup>3</sup> On the one hand, people may be less afraid to report being sick in good economic times, when unemployment is low. Moreover, people with permanent health problems may find it easier to keep their job if replacements are harder to find. Finally, higher capacity utilisation would also mean more workplace accidents and thus higher health expenditures. On the other hand, they present the counter-argument that ‘when layoffs rise during recessions, the people with a choice between declaring illness, incapacity or unemployment will base their decision on the rate and the duration of replacement of wages through social benefits’ (Darby and Melitz 2008: 720). Hence, health and social spending may rise in economic downturns, thereby behaving counter-cyclically. We want to add another set of arguments in favour of counter-cyclicality, namely, that becoming unemployed frequently goes along with psychological stress and social deprivation for those directly and indirectly (partners, children) affected (e.g. Paul and Moser 2009; McClelland 2000) and, hence, could lead to rising social and health expenditure. Moreover, the greater fear of becoming unemployed may also be related to health issues (e.g. Sverke et al. 2002) and workplace accidents, as it may induce less adherence to safety standards (Probst and Brubaker 2001).

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<sup>1</sup> For a critical discussion of the drawbacks of conducting cyclical adjustment, see Blanchard (1993) and Mohr and Morris (2007).

<sup>2</sup> See, for example, Truger (2015), Heimberger et al. (2017), Coibion et al. (2018), Fatas (2019) and Schuster et al. (2022).

<sup>3</sup> For a more detailed discussion and a review of the literature, see Darby and Melitz (2008).

This paper tests the approach used by the OECD and the European Commission (henceforth: the OECD-COM approach) by taking a disaggregated look at how different components of government spending react to the business cycle in individual EU countries. We subsequently expand the OECD-COM baseline model to assess the impact of (small) variations in data and model specification as well as to take into account problems of endogeneity and possible third factors driving changes in government spending and cyclical conditions (e.g. Heimberger 2023a). This includes putting forward an instrumental variable approach to tackle endogeneity issues between government spending and economic activity in addition to looking at different estimation periods and testing different measures of the business cycle. Applying these various strategies provides results on the cyclical behaviour of government spending for a range of components of social protection and health for a set of compared EU countries. We conclude by discussing the implications of these results for the use of budget elasticities in fiscal forecasts and EU fiscal rules.

## 2. Related literature

Dozens of papers have studied the cyclical behaviour of overall fiscal policy,<sup>4</sup> and a large part of the literature deals with the cyclicity of total government spending and government consumption.<sup>5</sup> The literature on the cyclicity of health and social spending is smaller in comparison, but there are related papers.

Darby and Melitz (2008) estimate expenditure elasticities for OECD countries using data from the 1982-2003 period. They find that it is not only unemployment spending that reacts to the business cycle, but also that a host of other social and health expenditure categories (health, retirement, incapacity and sick pay) react in a counter-cyclical manner. They conduct panel regressions as well as country-by-country regressions. For the panel regression, they use three-stage least squares (3SLS) regressions with time- and country-fixed effects. As instruments, they use contemporaneous oil price inflation, lags of the expenditure/revenue variable, OECD GDP, the lagged change of the population not working, and the contemporaneous change in exports as a percentage of GDP. For the single country estimates, they use simple ordinary least squares (OLS) regressions. Their regression equation looks as follows:

$$\Delta \left( \frac{B_t}{Y_t} \right) = c + \gamma \cdot t + \alpha \Delta \left( \frac{Y_t}{Y_t^*} \right) + \mu \Delta \pi + \eta r_L + \zeta \Delta \left( \frac{Y_{t-1}}{Y_{t-1}^*} \right) + \lambda \left( \frac{B_{t-1}}{Y_{t-1}} \right) + \varphi \Delta \left( \frac{B_{t-1}}{Y_{t-1}} \right) + u_t \quad (1)$$

In this case,  $B$  denotes the variable of interest (i.e. the various fiscal spending categories), while  $t$ ,  $Y$ ,  $Y^*$ ,  $\pi$  and  $r_L$  respectively refer to a time trend, GDP, potential GDP, inflation and the long-term interest rate. Note that all variables are stated in nominal terms.

Afonso and Jalles (2013) use a panel of developed and emerging economies for the 1970-2008 period. They find that while some spending categories behave acyclically, total spending and spending on social security and welfare behave counter-cyclically. To tackle endogeneity issues, they use a generalised method of moments estimator (system GMM) with lags of the regressors serving as instruments. Furceri (2010) reports that old-age, health and unemployment spending contributed most to smoothing output shocks in OECD countries in the 1980-2005 period. Abbott and Jones (2012) find that total social expenditures in OECD countries in the 1980-2005 period did not respond to cyclical conditions, as counter-cyclicity was constrained by public borrowing limits and political polarisation. D'Addio (2015) presents panel regressions for 20 OECD countries in the 1982-2011 period, with the main finding being that social spending is more counter-cyclical during recessions than during expansions. Ayala-Canon et al. (2022), who analysed the cyclicity of social spending in 35 OECD countries in the 1980-2013 period, argue that social spending was most counter-cyclical during the global financial crisis. Arze del Granado et al. (2013) present evidence that government expenditures on health are procyclical in developing countries but acyclical in advanced economies. Galeano et al. (2021), who use panel data

<sup>4</sup> See, for example, Gavin and Perotti (1997), Weichenrieder and Zimmer (2014), Mawejje and Odhiambo (2022), Gootjes and de Haan (2022), and Heimberger 2023b.

<sup>5</sup> See, for example, Alesina et al. (2008), Ilzetzki and Vegh (2008), Fatas and Mihov (2012), Xing and Fuest (2018), and Jalles (2021).

for 131 countries in the 1980-2019 period, find that unemployment insurance and social security spending are important determinants of the cyclical behaviour of overall government spending.

This overview suggests that the literature does not fully agree on the cyclical behaviour of social expenditures. While several studies have reported average effects based on panel regressions, an important finding of this study is that the cyclical behaviour of public spending may vary across countries. In contrast to studies surveyed in this section, we include more recent data (up to the year 2020, although we also exclude 2020 – the first year of the COVID-19 pandemic – as a robustness check) in addition to applying the estimation set-up used in the OECD-COM approach, which is policy-relevant when it comes to estimating spending reactions to cyclical conditions and builds on country-by-country regressions that allow for different cyclical behaviour across countries. To test the assumption that only unemployment spending is cyclically sensitive, we separate different categories of social spending (old-age, sickness and disability, housing, unemployment, etc.), thereby going beyond the existing literature, which has mostly assessed the cyclical behaviour of overall social spending.

### 3. The OECD-COM approach to estimating budget elasticities

As noted above, when it comes to budget elasticities, the European Commission relies on the estimation method developed by the OECD (Mourre et al. 2019; Price et al. 2014; Girouard and André 2005). On the revenue side, income taxes on wages, self-employed income, capital income and corporate income are considered together with social security contributions and indirect taxes. On the expenditure side, however, the OECD-COM approach only takes unemployment spending into account, and all other government spending is assumed to be cyclically non-sensitive. The estimation of the reaction of a particular component of the government budget follows two steps, with the first step measuring the sensitivity of the budget component to the respective fiscal base (e.g. aggregate gross operating surplus in the case of corporate taxes). In the case of unemployment spending, this elasticity is simply assumed to be equal to 1.<sup>6</sup> In the second step, the OECD-COM method estimates the sensitivity of the fiscal base with respect to the output gap. Once both elasticities are obtained, they can be combined so as to yield the elasticity of a budget component with respect to the output gap (on this, see Mourre et al. 2014; Price et al. 2014; Mourre et al. 2019).

For the second step (sensitivity of the fiscal base with respect to the output gap), the preferred method is to estimate the following model specification, which includes an error correction term and controls for first order autocorrelation in the residuals by using conditional least squares (CLS):<sup>7</sup>

$$\Delta \ln \left( \frac{B_t}{y_t^*} \right) = c + \alpha \Delta \ln \left( \frac{y_t}{y_t^*} \right) + \lambda \ln \left( \frac{B_{t-1}}{y_{t-1}^*} \right) - \beta \ln \left( \frac{y_{t-1}}{y_{t-1}^*} \right) + u_t \quad (2)$$

Here,  $B$  denotes the variable of interest (in this case, the nominal measure of a particular fiscal base),  $y^*$  is real potential output, and  $y$  is real GDP. Note that throughout this paper capital letters refer to nominal values and lower-case letters to real values. In the case of unemployment spending, which is the only expenditure component considered by the OECD-COM approach, the unemployment rate ( $u$ ) is used as the fiscal base.<sup>8</sup> Here, the non-accelerating wage rate of unemployment ( $NAWRU$ ) is used for normalisation purposes:

$$\Delta \ln \left( \frac{u_t}{NAWRU_t} \right) = c + \alpha \Delta \ln \left( \frac{y_t}{y_t^*} \right) + \lambda \ln \left( \frac{u_{t-1}}{NAWRU_{t-1}} \right) - \beta \ln \left( \frac{y_{t-1}}{y_{t-1}^*} \right) + u_t \quad (3)$$

What sticks out when comparing equation (2) with the Darby and Melitz (2008) approach in equation (1) is that the OECD uses potential instead of actual output to normalise the variable of interest, and that it uses the real instead of the nominal value. Using real potential output seems an odd choice given that the variable of interest ( $B$ ) is actually in nominal terms. We will return to this issue below.

<sup>6</sup> The same assumption is used for indirect taxes.

<sup>7</sup> The OECD mentions two other possible specifications consisting of a generalized least squares (GLS) estimation, which controls for autocorrelation in the residuals, and an error correction model. The specification that is almost always preferred is a combination of these two approaches (see Price et al. 2014: 40).

<sup>8</sup> Since they assume in the second step that the elasticity of unemployment spending to the fiscal base measure (i.e. the unemployment rate) is equal to 1, the resulting estimate is also the one that enters the final semi-elasticity.

## 4. Public expenditures and the business cycle

In what follows, we estimate government spending elasticities following the OECD-COM methodology. Detailed information about the data used can be obtained from Table A1 in Appendix A. Our approach is to start from the OECD-COM specification and to then introduce small changes in data and specification details to check how sensitive the elasticity estimates are. This robustness analysis is important, as budget elasticity estimates are used for fiscal forecasting and enter calculations of fiscal space in EU fiscal rules.

### 4.1. BASELINE STRATEGY

However, in contrast to the OECD-COM approach, we use a longer and more recent time period (1995-2020),<sup>9</sup> as Price et al. (2014) only rely on observations in the 1990-2013 period.<sup>10</sup> While we are able to reproduce the output gap elasticities for the compensation of employees (WAGE), gross operating surplus of corporations (GOSC), and the unemployment rate (U\_Rt), data for capital income and self-employed income are not publicly available. Hence, we run conditional least squares regressions with an error correction term while controlling for first order autocorrelation in the residuals. To make our results traceable, we restrict our analysis to a set of 11 EU countries. These include the two largest EU economies (Germany, France) as well as countries from Southern Europe (Italy, Spain, Greece), Northern Europe (Sweden, Denmark), Central Europe (Austria, Czechia) and Eastern Europe (Poland, Romania). This selection offers a wide variety of regional differences, welfare regime models and political heritage to explore, which is useful if our goal is to test the sensitivity of a unified framework. For the sake of brevity, we omit the results for the rest of the EU sample, which has many of the same features as the countries presented.<sup>11</sup>

In what follows, we estimate the elasticities of health spending and various social spending categories with respect to the output gap. We do so to test the OECD-COM assumption that only unemployment spending reacts to the business cycle. Since the fiscal base of these spending categories cannot be reduced to a single item, we estimate their responsiveness to the output gap directly (using the spending category as the independent variable). This means that we run the following conditional least squares regression, which includes an error correction term and controls for first order autocorrelation in the residuals:

$$\Delta \ln \left( \frac{B_t}{y_t^*} \right) = c + \alpha \Delta \ln \left( \frac{y_t}{y_t^*} \right) + \lambda \ln \left( \frac{B_{t-1}}{y_{t-1}^*} \right) - \beta \ln \left( \frac{y_{t-1}}{y_{t-1}^*} \right) + u_t \quad (4)$$

In this case,  $B$  denotes the variable of interest (i.e. the respective spending category).

<sup>9</sup> For Czechia, data are only available from 1997 onwards.

<sup>10</sup> For Germany, the sample is further reduced to the 1991-2013 period, as potential output estimates are not available prior to 1991 (see Price et al. 2014).

<sup>11</sup> Additional results for the rest of the EU sample are available from the authors upon request.



The results are shown in Table 1, where the significance of the coefficients is indicated by asterisks (\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ). In this case, among the countries in our sample, health expenditure (HEAL) only seems to respond significantly to cyclical variations in Czechia and France, where health expenditure seems to rise during downturns.<sup>12</sup> In contrast, social expenditure (SOC) seems to behave counter-cyclically in most countries in the sample (e.g. in Austria, a decline of the business cycle by 1 percentage point indicates a 0.5 percentage point increase in the ratio of nominal social expenditure to real potential output). Overall, the counter-cyclicality of social spending is largely driven by unemployment spending (U\_Sp), and when we use total social expenditure excluding unemployment benefits (SOC\*), only the coefficients for Czechia, Denmark and Italy remain significant. However, we also find a significant counter-cyclical coefficient for family and children expenditure (FAM) in Austria, Germany, Denmark and Spain; for housing expenditure (HOU) in France; for sickness and disability spending (SICK) in Italy; and for spending on survivors' benefits (SURV) in Czechia and Italy.

**Table 1 / Regression coefficients output gap (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.09 (0.17)	-0.5*** (0.13)	-0.19 (0.11)	-1.07** (0.33)	-0.56 (0.88)	-0.13 (0.1)	-0.02 (0.36)	-0.05 (0.08)	-4.79*** (0.59)	-4.31*** (0.79)	0.61*** (0.07)	0.67* (0.3)
CZ	-1.03*** (0.31)	-0.71** (0.26)	-0.57* (0.27)	1.16 (0.76)	-4.88 (3.8)	-0.12 (0.19)	-0.73 (0.46)	-1.29*** (0.39)	-6.33*** (1.17)	-1.38* (0.69)	0.8*** (0.16)	1.18*** (0.31)
DE	-0.47 (0.27)	-0.75*** (0.16)	-0.19 (0.12)	-1.68*** (0.31)	0.14 (2.02)	-0.06 (0.11)	0.3 (0.22)	0.06 (0.14)	-4.26*** (0.55)	-3.21*** (0.4)	0.59*** (0.08)	1.19*** (0.28)
DK	-0.35 (0.21)	-0.59*** (0.11)	-0.34* (0.17)	-0.49* (0.22)	-0.2 (0.16)	0.01 (0.23)	-0.39 (0.2)	0.15 (1.36)	-2.4*** (0.4)	-4.32*** (0.95)	0.53*** (0.09)	1.68*** (0.41)
ES	-0.46 (0.24)	-0.62*** (0.1)	0.06 (0.06)	1.16* (0.46)	-1.01 (1.64)	-0.09 (0.08)	-0.19 (0.19)	-0.07 (0.13)	-5.69*** (0.39)	-2.39*** (0.6)	0.88*** (0.11)	1.37*** (0.29)
FR	-0.27* (0.13)	-0.49*** (0.09)	-0.04 (0.1)	0.05 (0.18)	-0.7** (0.25)	0.02 (0.1)	-0.46 (0.39)	0.01 (0.16)	-4.91*** (0.34)	-0.95* (0.41)	0.57*** (0.07)	1.94*** (0.28)
EL	-0.28 (0.32)	0.43* (0.19)	0.44 (0.23)	0.53 (0.97)	-3.62 (6.76)	0.05 (0.32)	0.1 (0.47)	0.34 (0.5)	-3.34*** (0.71)	-1.61*** (0.43)	0.75*** (0.21)	1.64*** (0.29)
IT	-0.13 (0.21)	-0.59*** (0.11)	-0.22** (0.07)	-0.4 (0.33)	-0.9 (1.08)	-0.02 (0.06)	-0.48* (0.21)	-0.31*** (0.06)	-6.48*** (0.48)	-0.57 (0.35)	0.9*** (0.11)	1.34*** (0.2)
PL	0.18 (0.49)	-0.12 (0.36)	-0.2 (0.31)	-0.35 (2.28)	-2.65 (1.43)	-0.2 (0.46)	-1.13 (0.91)	0.14 (0.6)	-4.85* (2.2)	-3.34** (1.07)	0.77** (0.27)	0.93 (0.7)
RO	0.19 (0.65)	-0.49 (0.39)	0.45 (0.36)	0.33 (0.9)	2.35 (2.72)	0.7 (0.68)	0.99 (0.53)	0.74 (0.72)	0.51 (1.27)	-0.25 (0.4)	0.96* (0.48)	1.53* (0.62)
SE	-0.03 (0.19)	-0.54* (0.21)	-0.31 (0.17)	0.18 (0.16)	-1.18 (0.8)	-0.53** (0.17)	-0.05 (0.25)	-0.62 (0.42)	-5.13*** (1.25)	-3.42*** (0.71)	0.68*** (0.17)	1.6*** (0.34)

Notes: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

For the sake of comparison, we also look at the responses of the unemployment rate, the compensation of employees, and the gross operating profits of corporations to the business cycle. In the OECD-COM

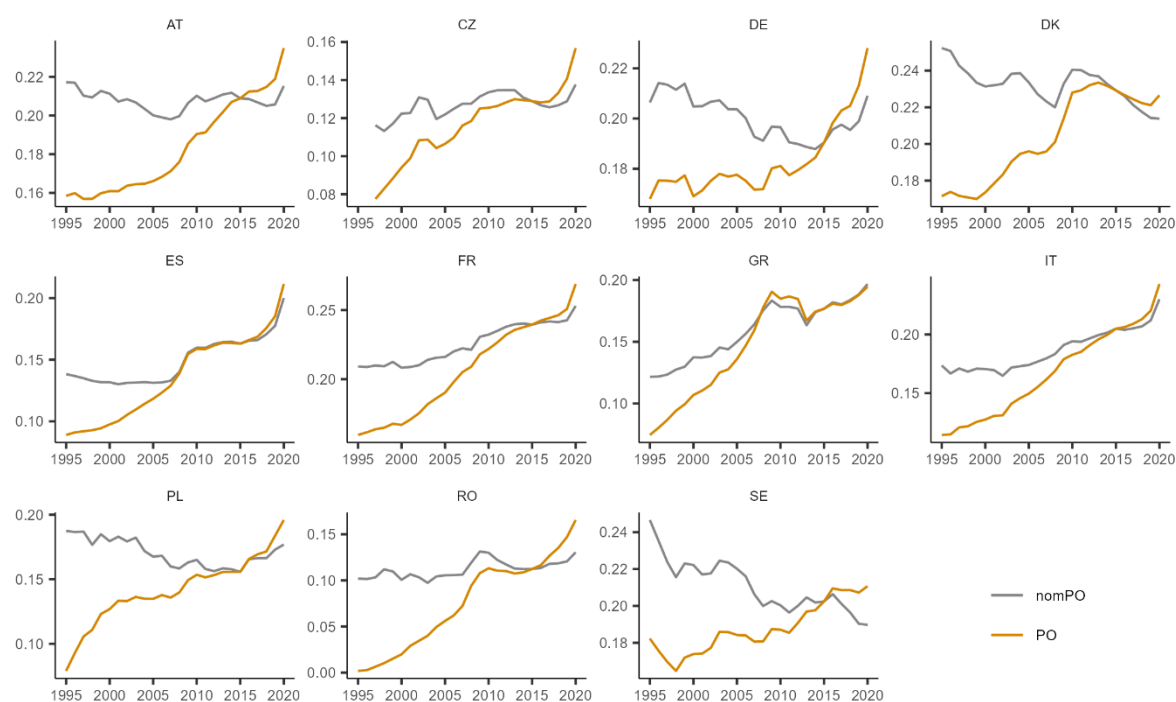
<sup>12</sup> Results using an OLS estimator can be found in Appendix D.

approach, the unemployment rate is used to assess the responsiveness of unemployment spending, while compensation of employees and gross operating profits of corporations are used in an attempt to estimate the responsiveness of the revenue side (see previous section). The results (see the last three columns of Table 1) indicate significant pro-cyclical behaviour of compensation of employees (WAGE) and gross operating surpluses of corporations (GOSC) for almost every country in the sample. Furthermore, an improvement in the business cycle – indicated by an increase in the output gap – is, on average, significantly related to a decline in unemployment spending for almost all countries.

## 4.2. NORMALISING WITH NOMINAL POTENTIAL OUTPUT

The OECD-COM approach uses a real value (potential output  $y^*$ ) to normalise nominal values in equation (1). Figure 1 plots the social expenditure series normalised with real vs. nominal potential output for our selection of EU countries.<sup>13</sup> It can be seen that, as expected, using real potential output to normalise nominal spending creates a clear upward trend in the variable due to the presence of inflation (a problem that would be even worse if the high inflation rates prevalent at the time of writing were part of the sample), while the other variable looks much more stable on the whole.

**Figure 1 / Normalising with real vs. nominal potential output: social expenditure**



Notes: nomPO: social expenditure/nominal potential output. PO: social expenditure/real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

<sup>13</sup> For a depiction of health spending, see Figure A1 in Appendix B. Furthermore, Figures A2 and A3 provide a representation in logarithmic (“log”) differences.

Hence, we slightly adapt the OECD-COM framework by using nominal potential output to normalise the spending categories and the tax-base variables:<sup>14</sup>

$$\Delta \ln \left( \frac{B_t}{Y_t^*} \right) = c + \alpha \Delta \ln \left( \frac{y_t}{y_t^*} \right) + \lambda \ln \left( \frac{B_{t-1}}{Y_{t-1}^*} \right) - \beta \ln \left( \frac{y_{t-1}}{y_{t-1}^*} \right) + u_t \quad (5)$$

**Table 2 / Regression coefficients output gap; normalising with nominal potential output (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.05 (0.17)	-0.5*** (0.12)	-0.19 (0.11)	-0.69 (0.4)	-0.11 (0.9)	-0.13 (0.13)	0.19 (0.33)	0.05 (0.08)	-4.65*** (0.53)	-4.31*** (0.79)	0.6*** (0.07)	0.91*** (0.26)
CZ	-0.94*** (0.25)	-0.67** (0.23)	-0.57* (0.24)	1.37 (0.74)	-4.41 (3.76)	-0.18 (0.21)	-0.44 (0.49)	-0.71 (0.48)	-6.22*** (1.28)	-1.38* (0.69)	0.94*** (0.15)	1.46*** (0.23)
DE	-0.45 (0.3)	-0.68*** (0.16)	-0.22 (0.12)	-1.67*** (0.33)	-0.01 (2.11)	-0.12 (0.1)	0.29 (0.22)	-0.03 (0.12)	-4.15*** (0.62)	-3.21*** (0.4)	0.58*** (0.1)	1.36*** (0.25)
DK	-0.28 (0.22)	-0.65*** (0.13)	-0.34* (0.13)	-0.27 (0.25)	-0.04 (0.23)	-0.24 (0.24)	-0.48*** (0.14)	0.34 (1.5)	-2.53*** (0.41)	-4.32*** (0.95)	0.26* (0.1)	1.9*** (0.33)
ES	-0.69*** (0.2)	-0.76*** (0.13)	-0.09 (0.09)	0.65 (0.42)	-1.1 (1.64)	-0.19 (0.12)	-0.32* (0.16)	-0.24 (0.14)	-5.9*** (0.36)	-2.39*** (0.6)	0.79*** (0.09)	1.11*** (0.24)
FR	-0.26* (0.13)	-0.46*** (0.09)	-0.01 (0.11)	0.19 (0.16)	-0.25 (0.35)	0.08 (0.12)	-0.69 (0.38)	0.12 (0.11)	-4.85*** (0.34)	-0.95* (0.41)	0.67*** (0.07)	1.94*** (0.19)
EL	-0.39 (0.28)	0.39* (0.18)	0.35 (0.19)	0.37 (0.9)	-3.06 (6.74)	-0.07 (0.3)	-0.4 (0.28)	0.21 (0.45)	-2.94*** (0.53)	-1.61*** (0.43)	0.66* (0.3)	1.62*** (0.31)
IT	-0.1 (0.2)	-0.56*** (0.12)	-0.18** (0.07)	-0.49 (0.32)	-0.82 (1.06)	0.02 (0.08)	-0.53** (0.2)	-0.27*** (0.06)	-6.47*** (0.51)	-0.57 (0.35)	0.81*** (0.13)	1.39*** (0.19)
PO	0.32 (0.45)	-0.32 (0.32)	-0.39 (0.45)	-0.65 (2.52)	-2.67 (1.5)	-0.35 (0.5)	-0.57 (0.77)	0.4 (0.6)	-5.02* (2.02)	-3.34** (1.07)	0.56** (0.21)	0.56 (0.67)
RO	0.64 (0.69)	-0.13 (0.32)	0.25 (0.41)	-0.53 (0.58)	3.96 (2.64)	-0.25 (0.71)	-0.68 (0.38)	-0.04 (0.65)	-1.06 (1.08)	-0.25 (0.4)	1.06* (0.42)	1.39 (0.85)
SE	-0.02 (0.17)	-0.43 (0.26)	-0.27 (0.21)	0.28* (0.13)	-1.13 (0.75)	-0.42* (0.16)	-0.14 (0.25)	-0.71 (0.41)	-5.3*** (1.17)	-3.42*** (0.71)	0.48*** (0.14)	1.85*** (0.25)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

When testing for autocorrelation in the residuals (see Table A27 in Appendix G for Table 2, and Table A28 for Table 3), we do not observe any clearly problematic cases given the number of models run, even though some of the specifications (notably, Spain in both nominal and real frameworks) do encounter the issue. We conclude that, overall, the problem of autocorrelation is not pronounced, although one should be careful to note that some of the models occasionally do have it, with the nominal specification doing marginally better on balance. The presence of autocorrelation in the residuals suggests that some of the models are underspecified. Further research might consider implementing a more fine-tuned autoregressive integrated moving average (ARIMA) design or introducing additional variables to account for individual cases.

<sup>14</sup> Note that, if we wanted to have  $Y^*$  instead of  $y^*$  in all denominators, we could easily replace  $y/y^*$  with  $Y/Y^*$  in equation (4). The result would be the same since  $Y/Y^* = (y \cdot P)/(y^* \cdot P) = y/y^*$ .

In terms of results, while the unemployment rate ( $U_{Rt}$ ), worker compensation (WAGE) and gross operating surplus (GOSC) again show the expected signs, this set-up also points to significant counter-cyclical of health spending (HEAL) in Czechia, Spain and France (see Table 2). Social expenditure is again significantly counter-cyclical in almost all countries. However, when we remove unemployment spending from overall social spending ( $SOC^*$ ), we only find counter-cyclical coefficients for Czechia, Denmark and Italy. In general, the sizes of the significant coefficients tend to be of the same order of magnitude as the previous results. Notable results in terms of statistical significance are significant counter-cyclical behaviour of spending on family and children (FAM) in Germany; for sickness and disability spending (SICK) in Denmark, Spain and Italy; and for spending on survivors' benefits (SURV) in Italy. We conclude that the choice of whether to use a real or nominal value for potential output when normalising other fiscal variables can have an impact on the cyclical coefficients obtained.

### 4.3. ALTERNATIVE MEASURE OF THE OUTPUT GAP

Potential output estimates of the European Commission and other organisations have been shown to suffer from a pro-cyclical bias; in other words, they are revised in the same direction as the change in economic activity (e.g. Heimberger and Kapeller 2017; Fatas 2019; Coibion et al. 2018).<sup>15</sup> The OECD-COM approach uses potential output to normalise all variables involved in the regression. In order to react to that critique, we use an alternative measure: the share of the employed (E) and self-employed (SE) in the total working-age population ( $P_{15-64}$ ). Figure 2 compares the change in this measure of labour market inclusion and the OECD output gap measure for the countries in our sample.<sup>16</sup> The advantage of replacing potential output (as measured by the OECD-COM approach) with the working-age population is that the latter is arguably less endogenous.<sup>17</sup> We choose this measure, as Mason et al. (2021) have shown that labour force participation, especially for less privileged groups, is strongly influenced by economic conditions. For example, when labour markets are tight, more people are drawn into the labour force as the prospects for less-privileged groups improve.

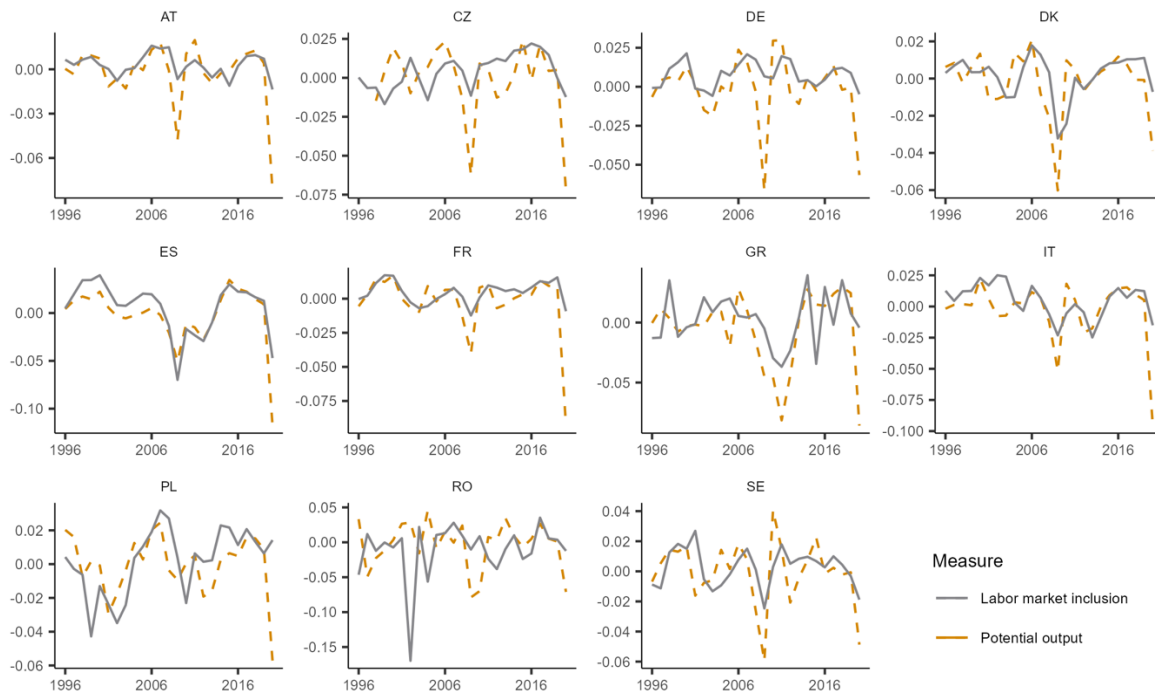
Figure 3 provides an illustration of the regression setting. In this case, we want to measure the impact of our business cycle measure on the variable of interest normalised by our measure of full capacity (the emphasised arrow). This setting includes two potential caveats, with the first being related to demographical change, which represents a third variable that may potentially drive both other variables (see graphic on left). In order to eliminate this influence, we include controls for the shares of the population older than 64 and younger than 15 (see graphic on right). The second caveat also applies to the original OECD-COM method, which is the reverse causality resulting from our variable of interest having an influence on the business cycle through the income/consumption demand channel (graphic on left). While we will stick with the original method for now (which means not controlling for this channel), we will also deal with this channel in the next section, when we introduce exports normalised by our measure of full capacity as an instrument (graphic on right).

<sup>15</sup> A major reason behind this is that estimates of structural unemployment, which are a major component of the potential output calculation, largely follow the observed movement of actual unemployment (Heimberger et al. 2017).

<sup>16</sup> A comparison in levels can be found in Figure A4 in Appendix B.

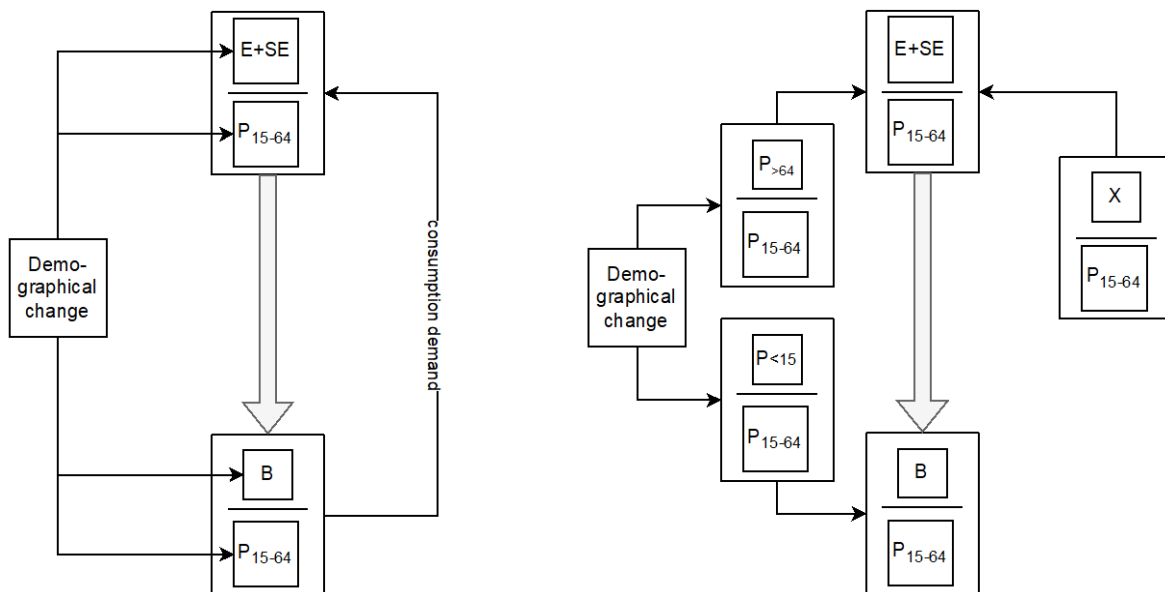
<sup>17</sup> The working-age population does not respond to changes in current unemployment in the short run. However, it could respond in the medium term, as labor market conditions may influence migration patterns.

**Figure 2 / Change in employed and self-employed as a ratio of the working-age population**



Sources: AMECO, own calculations.

**Figure 3 / Regression using the employed and self-employed as a fraction of the working-age population without instrument and controls (left) and including instruments and controls (right)**



Notes: E...employed, SE...self-employed, P15-64...population between 15 and 64, P>64...population over 64, P<15...population under 15, B...variable of interest in nominal terms, X...nom. Exports.

The tax bases (WAGE, GOSC) and the unemployment rate (U\_Rt) show the expected signs and are mostly significant (see Table 3).<sup>18</sup> In contrast to previous results, we observe significant pro-cyclical coefficients, including for: health expenditure (HEAL) in Denmark, Poland and Sweden; spending on families and children (FAM) in Spain and Greece; housing expenditure (HOU) in Czechia; and old-age spending (OLD) in Italy. Social spending (SOC) is only significant in four countries: Germany, Denmark, Spain and France. Once we deduct unemployment spending (SOC\*), only Germany and Spain remain significant. Furthermore, we observe significant counter-cyclical results for housing expenditure (HOU) in Poland, old-age spending (OLD) in Germany, sickness and disability spending (SICK) in France, and spending on survivors' pensions (SURV) in Sweden. We conclude that the spending elasticities obtained are sensitive to the specific choice of using the output gap as a measure of cyclical conditions.

**Table 3 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.06 (0.43)	-0.6 (0.36)	0.03 (0.26)	-1.41 (1.05)	0.16 (2.14)	0.34 (0.24)	1.08 (1.09)	0.27 (0.15)	-8.05*** (1.96)	-11.91*** (1.65)	1.75*** (0.18)	1.62 (0.87)
CZ	-0.63 (0.56)	0.41 (0.66)	0.78 (0.67)	1.45 (2.75)	22.35** (8.11)	0.13 (0.37)	1.84 (1.25)	-0.87 (0.97)	-12.97*** (3.05)	-5.03*** (1.47)	2.33*** (0.39)	2.18* (0.94)
DE	-0.13 (0.46)	-1.48*** (0.3)	-0.68** (0.22)	-3.17* (1.45)	12.39 (7.08)	-0.44** (0.15)	-0.21 (0.6)	-0.14 (0.28)	-10.09*** (1.99)	-7.35*** (1.43)	1.22*** (0.18)	1.29 (1.52)
DK	0.68* (0.33)	-1.04*** (0.16)	-0.31 (0.16)	-0.32 (0.3)	-0.32 (0.35)	0.42 (0.28)	-0.02 (0.29)	3.51 (2.7)	-5.61*** (0.57)	-9*** (1.32)	1.24*** (0.06)	0.25 (1.1)
ES	-0.07 (0.33)	-0.68*** (0.13)	0.19** (0.07)	1.24* (0.61)	-5.8*** (1.71)	0.1 (0.07)	0.39 (0.23)	-0.02 (0.16)	-5.86*** (0.79)	-4.14*** (0.61)	1.42*** (0.14)	1.87*** (0.37)
FR	-0.5* (0.21)	-0.94** (0.31)	-0.19 (0.21)	0.59 (0.45)	-1.44* (0.6)	-0.3 (0.25)	-2.19** (0.73)	-0.52 (0.27)	-9.59*** (2.57)	-6.26*** (1.47)	1.44*** (0.21)	3.5** (1.23)
EL	0.01 (0.56)	0.52 (0.54)	0.04 (0.75)	8.54*** (1.24)	6.37 (15.87)	-0.04 (1.1)	-1.06 (0.81)	-0.19 (1.64)	-2.04 (2.2)	-0.96 (0.84)	0.47 (0.33)	-0.94 (0.73)
IT	0.07 (0.42)	-0.44 (0.27)	0.05 (0.25)	-0.43 (0.84)	-2.31 (3.01)	0.42* (0.17)	0.55 (1.05)	-0.27 (0.17)	-4.05 (3.57)	-2.52* (1)	1.29*** (0.29)	2.21*** (0.47)
PO	1.69*** (0.38)	0.2 (0.22)	0.04 (0.19)	2.68 (3.28)	-2.83*** (0.85)	-0.21 (0.26)	-0.48 (0.79)	0.08 (0.74)	2.1 (2.02)	-5.69*** (1.14)	1.7*** (0.16)	2.21 (1.13)
RO	1.2 (0.67)	0.81 (0.42)	0.31 (0.43)	-0.12 (0.99)	-4.51 (4.22)	0.3 (0.51)	1 (0.87)	-0.02 (0.76)	-3.08** (1.15)	-1.1*** (0.27)	0.56 (0.42)	-0.97 (0.66)
SE	1.03*** (0.17)	-0.35 (0.47)	0.04 (0.26)	0.81* (0.31)	-2.16 (2.35)	0.26 (0.34)	-0.04 (0.43)	-2.51** (0.88)	-14.46*** (2.16)	-8.12*** (0.68)	1.37*** (0.25)	0.27 (1.01)

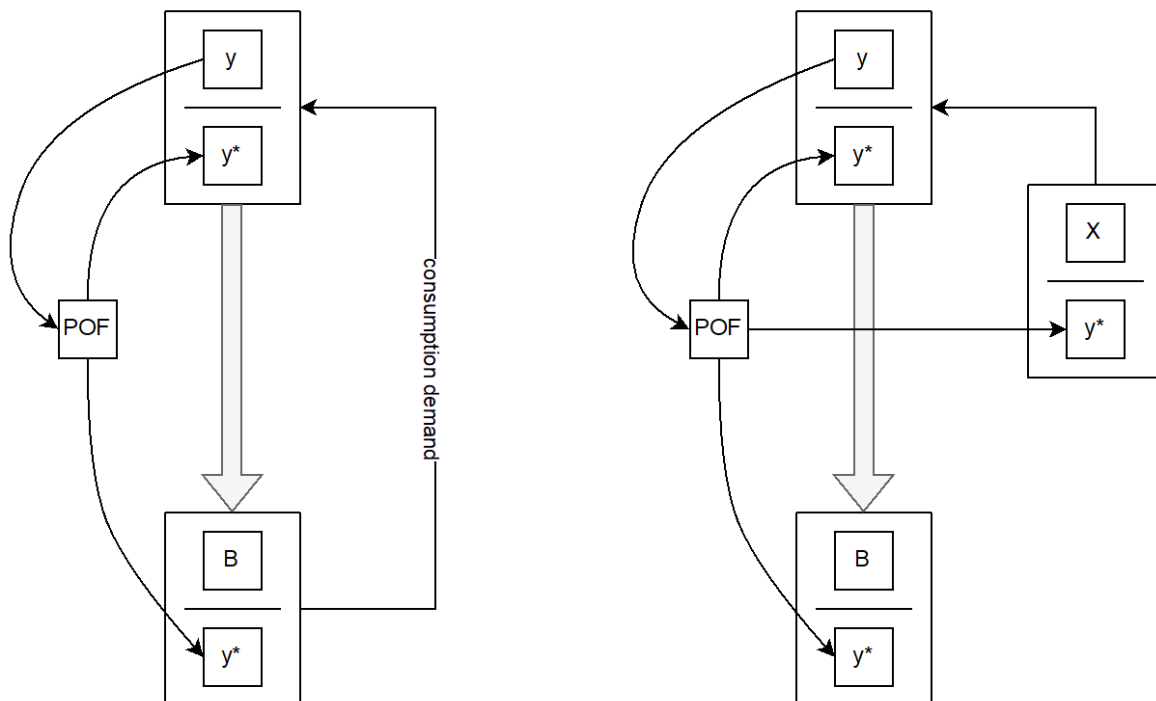
Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.  
Sources: Eurostat (COFOG), AMECO, own calculations.

<sup>18</sup> Note that since all variables are now normalised by the size of the working-age population instead of potential output, the sizes of the coefficients cannot be directly compared to the ones obtained before.

#### 4.4. INSTRUMENTAL VARIABLE APPROACH

The OECD-COM approach does not address endogeneity issues. The problem of endogeneity is related to tax-base and spending variables, as illustrated in Figure 4. In this case, we want to measure the impact of our business cycle measure (the ratio of output to potential output) on our variable of interest normalised by potential output (the emphasised arrow). However, at the same time, a change in the variable of interest (e.g. social spending or wage income) will have an impact on the business cycle measure through the income/consumption demand channel, as illustrated in the graphic on the left.<sup>19</sup> In order to close that back channel, we introduce nominal exports normalised by real potential output as an instrument for our business cycle measure (see graphic on the right). The left-hand graphic in Figure 4 also illustrates the second problem encountered with the standard OECD-COM method, namely, that due to problems related to the calculation method (here referred to as 'potential output framework', or POF, in Figure 4) potential output suffers from a procyclical bias (for a discussion, see Heimberger et al. 2017; see also Footnote 15. Hence, the business cycle influences the outcome through an additional channel, which leads to a bias in the results. Unfortunately, we are unable to deal with this back channel in this set-up (hence, it is also present in the right-hand graphic), but it illustrates the motivation behind using an alternative measure of potential output in the previous section (compare Figure 3).

**Figure 4 / Regression framework without instrument (left) and with instrument (right)**



Notes:  $y$ ...real GDP,  $y^*$ ...real potential output,  $B$ ...variable of interest in nominal terms, POF...potential output framework.

<sup>19</sup> For the impact of social spending on GDP, see e.g. Furceri and Zdzienicka (2012).

**Table 4 / Regression coefficients output gap (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.02 (0.31)	-0.64* (0.26)	-0.29 (0.23)	-0.96 (0.61)	-1.02 (1.62)	-0.19 (0.21)	-1.39 (0.88)	-0.07 (0.17)	-5.74*** (1.14)	-6.08** (1.66)	0.5*** (0.11)	1.91* (0.77)
CZ	-1.23 (1.03)	-2.14 (1.25)	-1.98 (1.33)	-0.55 (2.13)	-26.95 (14.79)	-0.39 (0.72)	-0.03 (1.06)	-1.28 (0.92)	-7.08** (2.34)	-0.85 (1.12)	1.21* (0.45)	2.09* (0.81)
DE	-0.34 (0.35)	-1.04*** (0.25)	-0.27 (0.18)	-1.68** (0.45)	-0.65 (2.78)	-0.07 (0.14)	0.22 (0.34)	0.11 (0.18)	-3.73*** (0.76)	-2.02** (0.57)	0.46*** (0.12)	1.13* (0.42)
DK	-0.34 (0.32)	-0.62* (0.22)	-0.2 (0.23)	-0.4 (0.37)	-0.19 (0.25)	0.21 (0.35)	0.03 (0.29)	-0.79 (2.12)	-2.82** (0.86)	-7.61*** (1.95)	0.57*** (0.13)	3.69*** (0.83)
ES	-1.48 (0.88)	-1.15** (0.37)	-0.23 (0.2)	-1.12 (1.71)	0.93 (3.22)	-0.2 (0.17)	-0.58 (0.59)	0.2 (0.38)	-7.21*** (1.24)	-3.78* (1.45)	1*** (0.24)	0.77 (0.63)
FR	-0.31 (0.18)	-0.53*** (0.12)	-0.1 (0.14)	0.19 (0.27)	-1.07* (0.39)	0.15 (0.16)	-1.2 (0.63)	0.02 (0.23)	-5.05*** (0.56)	-1.89** (0.65)	0.61*** (0.11)	2.44*** (0.44)
EL	-2.92 (5.49)	-0.72 (2.41)	-1.25 (2.69)	-3.69 (3.63)	-195.07 (1380.87)	-3.11 (7.01)	1.15 (2.36)	3.31 (8.96)	-1.44 (3.09)	-2.07 (1.49)	-0.4 (1.19)	4.59 (4.49)
IT	0.15 (0.32)	-0.5* (0.2)	-0.33* (0.14)	-1.47* (0.65)	-0.51 (1.91)	0 (0.13)	-0.73 (0.42)	-0.43** (0.12)	-5.81*** (0.8)	-0.58 (0.55)	0.67** (0.18)	1.61*** (0.33)
PO	-7.79 (12.94)	-1.59 (2.54)	2.65 (6.13)	-13.46 (34.62)	7.63 (16.16)	5.43 (14.5)	-18.57 (86.73)	-1.55 (5.65)	-66.79 (259.59)	-6.72 (3.38)	0.91 (1.57)	2.18 (2.66)
RO	7.5 (21.13)	-16.16 (115.98)	2.83 (5.31)	-10.08 (23.83)	3.55 (11)	8.72 (25.09)	-5.82 (38.25)	-80.71 (2984.14)	3.01 (4.15)	0.7 (2.75)	-4.83 (8.4)	16.99 (54.72)
SE	-0.31 (0.28)	-0.88** (0.31)	-0.51 (0.24)	0.18 (0.23)	-1.01 (1.13)	-0.66* (0.25)	-0.19 (0.36)	-0.71 (0.57)	-5.11* (2.1)	-3.07** (0.91)	0.7** (0.24)	1.92** (0.5)

Notes: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

Hence, in what follows, we tackle endogeneity issues by instrumenting the output gap with nominal exports as a share of real potential output ( $X/y^*$ ) and reporting results from a two-stage least squares (2SLS) regression (see Table 4). Nominal exports should be a good instrument, as they are a major determinant driving business cycle fluctuations (and, hence, the output gap), but at the same time, they should (at least in the short term) not be driven by domestic demand effects resulting from changes in private-sector income.<sup>20</sup> Weak instrument tests reject the null hypothesis of the instrument being weak in most cases except for Czechia, Greece, Poland and Romania.<sup>21</sup> Compensation of employees (WAGE) and gross operating surplus of corporations (GOSC) still show a significant pro-cyclical leaning for most countries, while the unemployment rate behaves counter-cyclically. When it comes to expenditure, however, only unemployment spending (U\_Sp) is found to be significantly counter-cyclical. While social spending (SOC) is significant for most countries, it becomes insignificant once unemployment spending has been removed (SOC\*). The only notable counter-cyclical behaviour can be found in the case of expenditure for family and children (FAM) in Germany and Italy, for housing (HOU) in France, and for

<sup>20</sup> In the medium term, domestic demand effects can have an impact on exports via foreign demand effects resulting from the higher demand for imports that comes along with them. Darby and Melitz (2008) also use nominal exports as one of their instruments.

<sup>21</sup> Weak instrument test statistics can be obtained from the authors upon request.



survivors' benefits (SURV) in Italy. Results for normalising with nominal potential output can be found in Appendix C (Table A4), but they also support our conclusion that while the OECD-COM approach does not tackle endogeneity issues, using an instrumental variable approach may change the results obtained on government spending elasticities.

In terms of the size of the coefficients, the social expenditure coefficients that remain significant tend to be larger in size. For example, in the case of Germany, a decline in the business cycle by 1 percentage point is associated with a 1.04 percentage point increase in the social expenditure to real potential output ratio (before: 0.75 percentage points). Regarding the other coefficients, the majority of those that remain significant tend to be larger in size (e.g. in Austria, unemployment spending from -4.79 to -5.74 and the unemployment rate from -4.31 to -6.38), though the results do not present a uniform picture in this case (e.g. unemployment in Germany from -4.26 to -3.73).

#### 4.5. VARIATION IN DATA COVERAGE

Is the OECD-COM approach robust to small changes in data coverage? In what follows, we reduce the sample size by one observation, excluding either the year 1995 (effectively reducing the sample to the 1998-2020 period) or 2020 (leading to an effective sample of the 1997-2019 period). The differences in results are minor if we leave out observations for 1995, as Tables A12-A20 in Appendix E show.<sup>22</sup> However, excluding observations for 2020 has a larger influence, which is hardly a surprise considering that 2020 constitutes the first year of the COVID-19 pandemic, which had a huge impact on output and government spending. Note that this period differed from other recessions in the sense that it had its origin in a health crisis and not, for example, in a financial crisis. This is precisely what we see in the regression results. For example, when 2020 is excluded, many of the health-expenditure coefficients lose their significance, which implies that a single crisis observation may change the average regression coefficient. While we focus on the baseline regression set-up (see Table 5), results for the alternative specifications and the alternative output measure are also available in Appendix E.

Health spending used to show significant coefficients for Czechia and France in the baseline estimation (Table 1). However, after eliminating 2020 from the sample, we find only one significant coefficient, in this case for Poland (see Table 5). Furthermore, it was significant for four countries in the CLS estimation with nominal potential output (Table 2), while it is not significant for a single country without 2020 (see Table A18 in Appendix E). Social spending is less affected by the change in sample, as most coefficients that were significant before remain significant (the main exceptions are Austria and Czechia; see also regression results in Appendix E). Results for unemployment spending are not strongly affected in terms of significance and signs of the coefficients. As with respect to the other individual spending variables (SOC\*, FAM, HOU, OLD, SICK, SURV), we observe for the CLS regressions that several coefficients which were significant before turn insignificant, while others turn significant. Hence, the inclusion or exclusion of observations for a single year can have a non-negligible influence on the estimates for government spending elasticity. On the other hand, results are quite stable for the 2SLS estimator (see Appendix E), potentially showing the importance of taking endogeneity into account.

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<sup>22</sup> In the case of Czechia, it does not make a difference because data for 1995 was not available anyway.

**Table 5 / Regression coefficients output gap when excluding the year 2020 (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.16 (0.25)	-0.37 (0.2)	-0.1 (0.17)	-0.49 (0.52)	-2.25 (1.19)	-0.1 (0.16)	-0.12 (0.59)	0.09 (0.11)	-3.97*** (0.8)	-5.79*** (1.03)	0.65*** (0.09)	1.8*** (0.35)
CZ	-0.34 (0.32)	-0.35 (0.31)	-0.17 (0.31)	2.13** (0.77)	-6.81 (5.12)	0.12 (0.23)	0.18 (0.57)	-0.58 (0.51)	-8.06*** (1.48)	-2.16* (1.04)	0.96*** (0.2)	1.54*** (0.39)
DE	0 (0.27)	-0.87*** (0.2)	-0.28 (0.16)	-1.07** (0.34)	-1.7 (2.47)	-0.17 (0.13)	0.23 (0.26)	0.05 (0.16)	-3.39*** (0.6)	-2.82*** (0.46)	0.52*** (0.09)	1.33*** (0.34)
DK	-0.24 (0.22)	-0.6*** (0.13)	-0.34 (0.19)	-0.59* (0.24)	-0.21 (0.18)	-0.12 (0.25)	-0.15 (0.22)	-0.74 (1.5)	-2.08*** (0.43)	-5.17*** (1.07)	0.54*** (0.09)	2.01*** (0.48)
ES	0.5 (0.36)	-0.68** (0.21)	0.03 (0.1)	0.99 (1.07)	-3.99 (3.25)	-0.34*** (0.07)	0.88*** (0.23)	-0.2 (0.17)	-5.97*** (1.04)	-4.91*** (1.06)	1.37*** (0.19)	0.47 (0.59)
FR	-0.03 (0.22)	-0.44** (0.16)	-0.23 (0.18)	0.26 (0.33)	-1.54*** (0.32)	0.07 (0.2)	-0.8 (0.67)	-0.41 (0.28)	-3.09*** (0.66)	-4.35*** (0.87)	0.56*** (0.1)	2.59*** (0.5)
EL	-0.55 (0.45)	0.53** (0.19)	0.48* (0.24)	1.26 (1.21)	6.03 (5.41)	0.09 (0.36)	0.01 (0.59)	0.46 (0.52)	-3.1** (1)	-2.55*** (0.57)	0.96*** (0.16)	1.41*** (0.37)
IT	0.48 (0.29)	-0.43** (0.15)	-0.16 (0.1)	-0.82 (0.51)	-1.73 (1.95)	0.02 (0.09)	-0.79* (0.31)	-0.53*** (0.05)	-5.24*** (0.66)	-2.34*** (0.57)	0.7*** (0.16)	2*** (0.24)
PO	1.43* (0.57)	0.34 (0.46)	-0.1 (0.45)	-0.21 (3.76)	-4.62* (1.81)	-0.34 (0.65)	-0.31 (1.32)	-0.66 (0.86)	-3.02 (2.27)	-4.38** (1.67)	1.19** (0.38)	1.99* (0.87)
RO	0.48 (0.74)	-0.2 (0.41)	0.97* (0.42)	1.12 (1.01)	-0.5 (2.86)	1.46** (0.55)	1.25** (0.47)	1.08 (0.9)	2.09 (1.6)	0 (0.44)	1.28* (0.52)	1.68* (0.68)
SE	-0.03 (0.22)	-0.58* (0.25)	-0.41* (0.2)	0.03 (0.15)	-0.54 (0.93)	-0.73*** (0.17)	-0.01 (0.29)	-0.68 (0.5)	-5.09*** (1.49)	-3.34*** (0.87)	0.7*** (0.2)	1.87*** (0.38)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

## 5. Conclusions

This paper, which focuses on 11 EU countries for the 1995-2020 period, has analysed the sensitivity of the estimation method used by the OECD and the European Commission to obtain government spending elasticities. Our results suggest that the assumption that only unemployment spending responds to cyclical variations is too strong. While unemployment spending is indeed a major driver of counter-cyclical social spending, other categories of social spending also show signs of responding to the business cycle. However, the results for individual countries differ when using different estimation methods and data samples. Using data from the 1995-2020 period, we found that excluding 2020 (i.e. the first year of the COVID-19 pandemic) from the sample does have a strong influence on the results. The latter raises the question of how the OECD-COM method can robustly deal with required data updates, as observations for single years may significantly influence the results obtained. At present, the OECD-COM approach only updates all budget elasticities every nine years (see Mourre et al. 2019: 10). This may lead to the application of outdated estimates of spending elasticities, which has implications for fiscal forecasts and estimations of fiscal space in EU fiscal rules.

The only spending variable that seems to be quite robust to the variations in data and specification is indeed unemployment spending, which turns out to be robustly counter-cyclical for most of the countries across the various estimation scenarios. However, only taking into account unemployment expenditures on the spending side (which is the current method of the European Commission) consequently means that only a minor fraction of the expenditure side is actually included in accounting for the cyclical effect on the deficit. For example, unemployment spending only accounts for between 6% (Spain) and less than 1% (Romania) of total spending for the countries in our sample. In contrast, aggregate social spending, which is quite consistently reported to be significant, accounts for between 43% (Denmark, Germany) and 31% (Czechia) of total spending.

Our results are broadly in line with the results of Darby and Melitz (2008), who find that health and age-related expenditures as well as incapacity and sick pay react to the cycle. Afonso and Jalles (2013) also find that total spending and spending on social security and welfare behave counter-cyclically, while some spending categories do not seem to respond. However, in their study, they use a panel of countries, which is a much better precondition in terms of sample size, while adapting the OECD-COM methodology of finding coefficients of individual countries meant that we had to stick to single-country regressions. In general, larger sample sizes would also be preferable when it comes to dealing with endogeneity. Although the OECD-COM approach does not use instruments in its estimation procedure, we ran every specification both with and without instruments. The small sample size, which also haunts the elasticity estimates currently used in the OECD-COM approach, significantly hampers the reliability of the estimations. This is relevant because the spending elasticity estimates obtained using the OECD-COM approach inform fiscal forecasts and estimations of fiscal space in EU fiscal rules.<sup>23</sup>

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<sup>23</sup> Table A25 in Appendix F shows changes in structural fiscal balances in the context of EU fiscal rules while taking the cyclicalities of social and health spending into account.

In terms of future research, the assumption used in the OECD-COM approach – namely, that budget elasticities are constant over time – needs to be tested in more detail, such as by using estimation strategies that allow for variation over time in the cyclicity of government spending components. It would also be worthwhile to use longer data samples to estimate spending elasticities so as to increase the sample size, such as by using data from national statistical institutes for selected countries to provide public expenditures data that go back to, say, the 1960s or 1970s. Finally, it would be worthwhile to take a more disaggregated look at the cyclical sensitivity of various components of health spending.

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# Supplementary Appendix

## APPENDIX A / VARIABLES AND DATA SOURCES

Table A1 provides an overview of the variables and the data sources used in the estimation process.

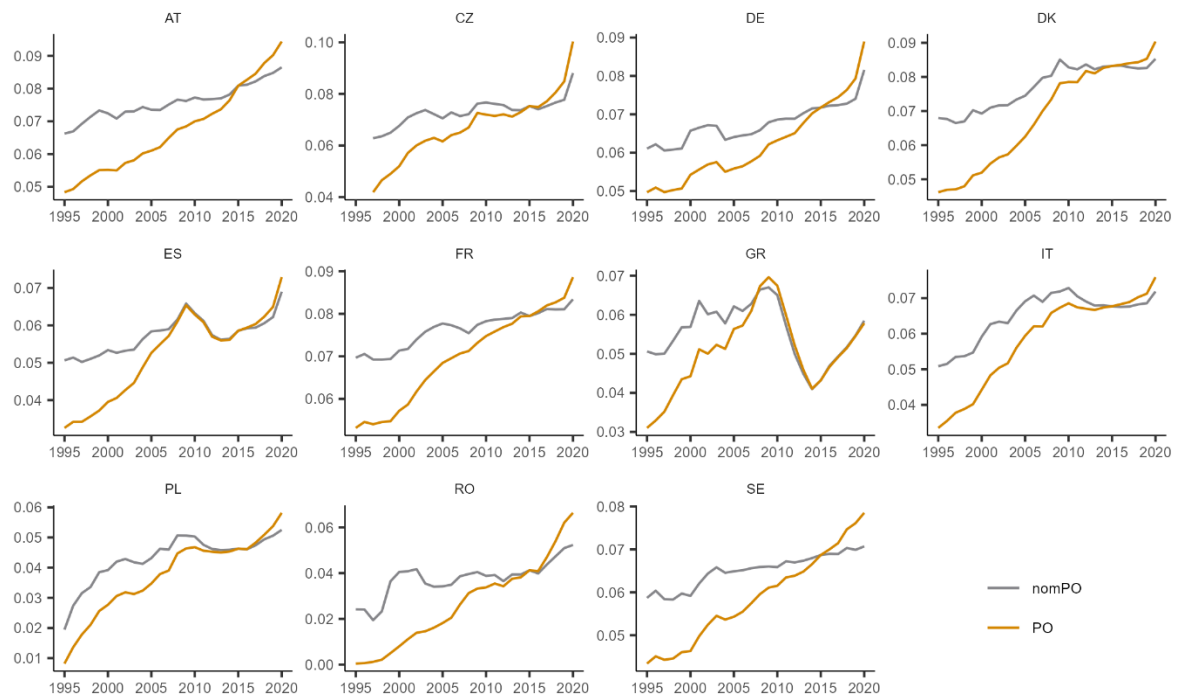
**Table A1 / Variables and data sources**

Variable	Description	Source
Y	GDP, nominal	Eurostat - COFOG
y*	Potential GDP, real	AMECO, Spring 2022
p	GDP, price deflator	AMECO
u	Unemployment rate	AMECO
NAWRU	Non-accelerating wage rate of unemployment	AMECO
y	GDP, real (Y/p)	Own calculations
B	Variable of interest, nominal	
	Compensation of employees, total economy	AMECO
	Corporations, gross operating surplus	AMECO
	Unemployment expenditure	Eurostat - COFOG
	Social expenditure	Eurostat - COFOG
	Housing expenditure	Eurostat - COFOG
	Old-age expenditure	Eurostat - COFOG
	Expenditure on survivors' pensions	Eurostat - COFOG
X	Health expenditure	Eurostat - COFOG
	Exports of goods, nominal	AMECO
P <sub>15-64</sub>	Population 15 to 64 years	AMECO
P <sub>&gt;64</sub>	Population 65 years and older	AMECO
P <sub>&lt;15</sub>	Population 0 to 14 years	AMECO

## APPENDIX B / ADDITIONAL FIGURES AND TABLES

Figure A1 plots health expenditure normalised with real vs. nominal potential output, while Figures A2 and A3 plot the social- and health-expenditure series normalised with real vs. nominal potential output for our selection of EU countries in logarithmic (“log”) differences. Table A2 shows the share of spending categories in total government expenditure.

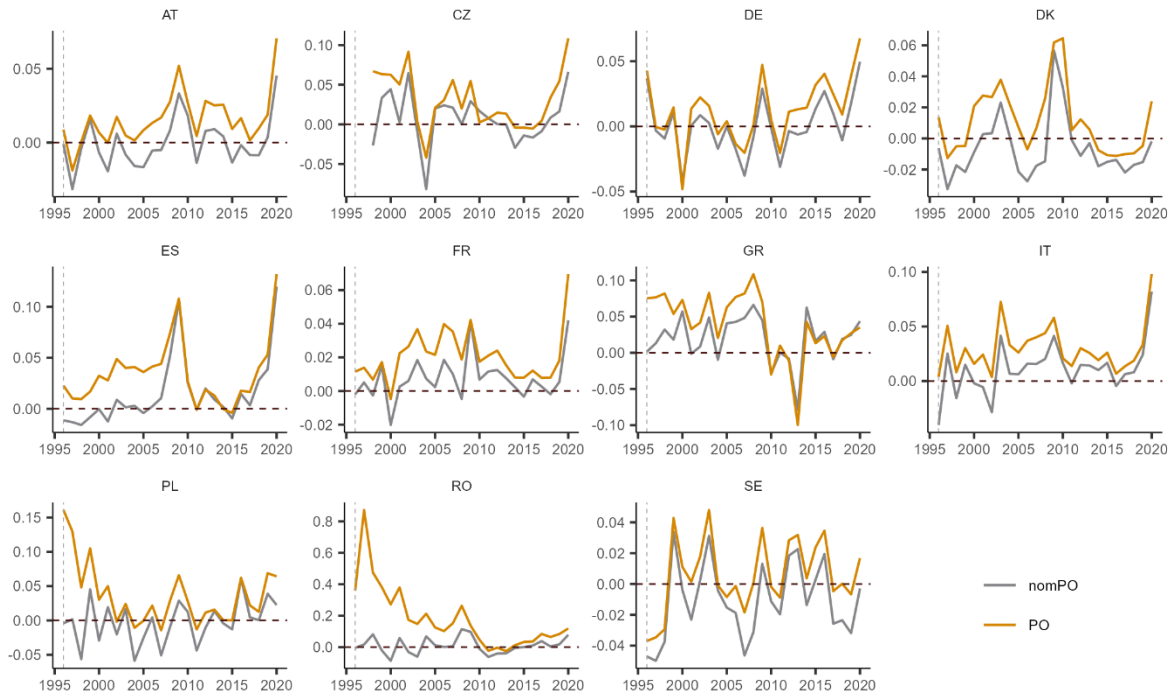
**Figure A1 / Normalising with real vs. nominal potential output: health expenditure**



Sources: Eurostat (COFOG), AMECO, own calculations.

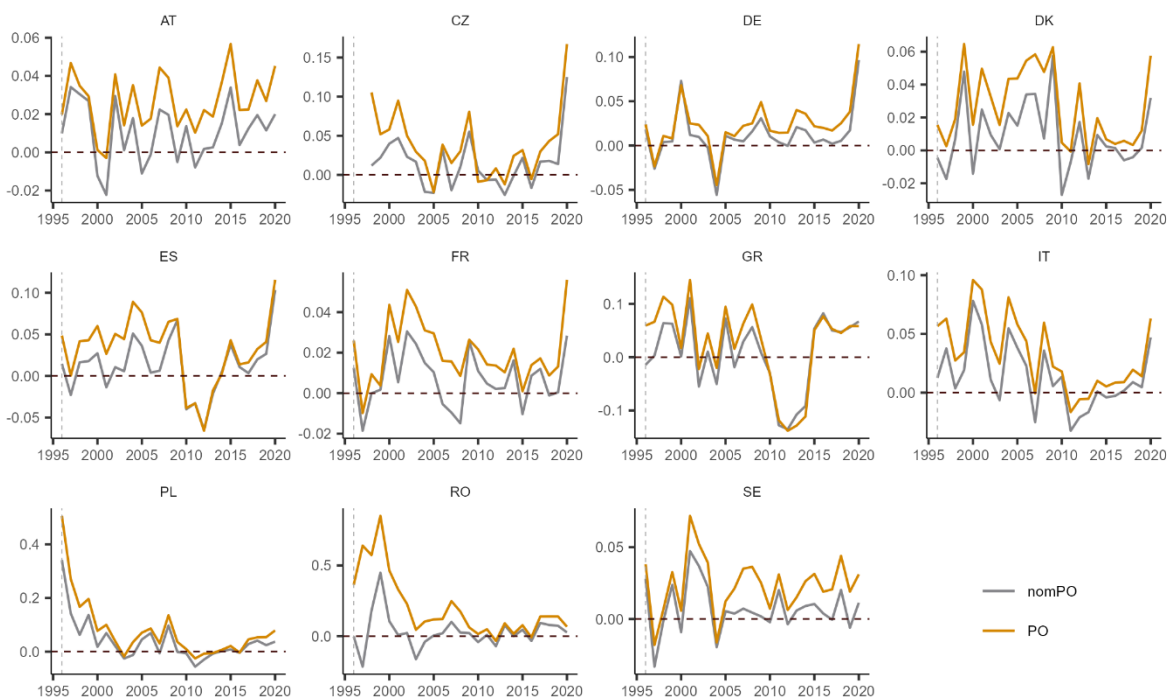


**Figure A2 / Normalising with real vs. nominal potential output (in log differences): social expenditure**

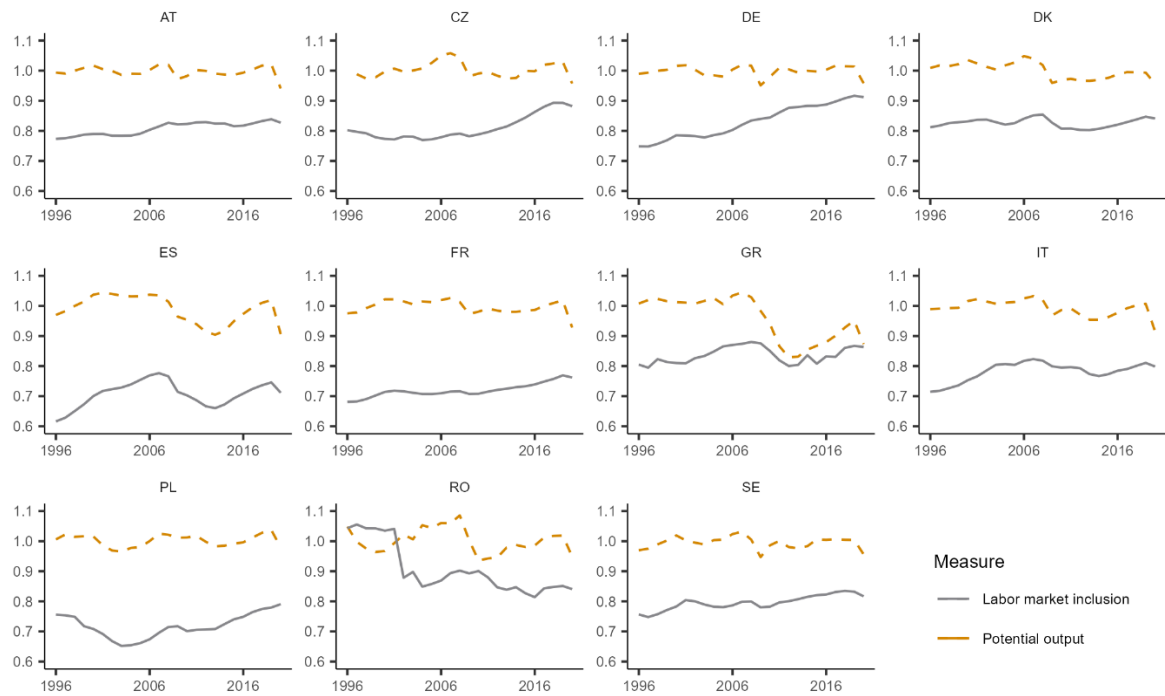


Sources: Eurostat (COFOG), AMECO, own calculations.

**Figure A3 / Normalising with real vs. nominal potential output (in log differences): health expenditure**



Sources: Eurostat (COFOG), AMECO, own calculations.

**Figure A4 / Employed and self-employed as a ratio of working-age population**

Sources: AMECO, own calculations.

**Table A2 / Share of spending categories in total government spending (percent)**

Country	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp
AT	15.4	40.8	38.2	4.7	0.2	24.5	3.8	2.9	2.6
CZ	17.8	31.1	30.6	4.0	0.4	17.6	5.4	1.5	0.6
DE	15.5	42.7	38.5	3.6	0.9	20.6	6.6	4.2	4.2
DK	15.5	43.4	37.9	8.9	1.2	14.5	9.1	0.0	5.5
ES	14.0	37.5	31.7	1.7	0.1	18.5	5.3	4.9	5.8
FR	14.1	42.3	39.0	4.3	1.6	23.3	4.9	2.7	3.3
EL	11.1	36.7	35.3	1.4	0.2	26.9	3.1	3.1	1.4
IT	14.2	40.6	38.6	1.9	0.1	26.8	3.5	5.3	2.0
PO	11.0	37.2	35.9	3.4	0.1	21.5	5.7	4.0	1.4
RO	11.0	32.7	32.2	3.0	0.0	24.5	2.7	0.2	0.5
SE	13.5	40.4	37.8	4.9	0.6	20.8	8.5	0.7	2.7

Sources: Eurostat (COFOG), own calculations.

## APPENDIX C / INSTRUMENTAL VARIABLE ESTIMATIONS

This section displays the two-stage least squares results for the regressions that use nominal potential output for normalisation (Table A3) and the alternative output gap measure (Table A4). For the former, the weak instrument test rejects the null hypothesis of the instrument being weak in most cases except for Greece, Poland and Romania. With the instrument, the base variables (U\_Rt, WAGE, GOSC) are mostly significant and show the expected signs. Furthermore, we see significant coefficients for health expenditure in Czechia, Denmark, Spain and France. Social expenditure is mostly significant, but becomes insignificant (with Denmark being the only exception) once unemployment spending (SOC\*) is excluded. Furthermore, we find significant counter-cyclical results for spending on family and children (FAM) in Germany and Italy, for old-age spending (OLD) in Spain, for sickness and disability spending (SICK) in Denmark and France, and for spending on survivors' pensions (SURV) in Italy.

**Table A3 / Regression coefficients output gap normalising with nominal potential output (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.06 (0.33)	-0.52* (0.22)	-0.19 (0.2)	-0.22 (0.75)	0.48 (1.84)	-0.24 (0.24)	-0.81 (0.7)	0.06 (0.16)	-5.23*** (0.96)	-6.17** (1.65)	0.51*** (0.12)	1.96* (0.69)
CZ	-1.29* (0.57)	-1.39* (0.59)	-1.33 (0.63)	0.15 (2.2)	-22.33 (12.15)	-0.9 (0.65)	-1.82 (1.49)	-0.39 (1.09)	-7.07* (2.78)	-0.37 (1.05)	0.77 (0.39)	1.55** (0.4)
DE	-0.29 (0.39)	-0.75** (0.21)	-0.18 (0.17)	-1.66** (0.48)	-0.22 (2.9)	-0.05 (0.15)	0.23 (0.33)	0.04 (0.17)	-3.64*** (0.8)	-1.99** (0.59)	0.55*** (0.14)	1.22** (0.41)
DK	-0.65* (0.31)	-1.01*** (0.24)	-0.57** (0.18)	-0.65 (0.41)	-0.35 (0.35)	-0.31 (0.33)	-0.44** (0.15)	-0.6 (2.01)	-3.59*** (0.79)	-6.86*** (1.66)	0.18 (0.14)	3*** (0.57)
ES	-1.64* (0.73)	-1.37** (0.46)	-0.45 (0.25)	-1.48 (1.75)	1.15 (3.79)	-0.51* (0.23)	-0.89 (0.62)	-0.09 (0.33)	-6.13*** (0.64)	-3.57* (1.5)	0.89*** (0.17)	0.45 (0.56)
FR	-0.45* (0.18)	-0.62*** (0.14)	-0.21 (0.17)	0.19 (0.22)	-0.58 (0.54)	-0.01 (0.18)	-1.41* (0.56)	0.07 (0.15)	-5.07*** (0.54)	-1.77** (0.62)	0.47** (0.14)	2.07*** (0.25)
EL	-1.97 (3.07)	-1 (2.73)	-1.94 (3.54)	-3.57 (3.19)	2039.45 (152972.29)	-5.21 (14.05)	1.61 (2.2)	2.89 (9.56)	-0.32 (3.72)	-2.48 (2.01)	-0.41 (1.01)	4.36 (4.51)
IT	0.21 (0.32)	-0.44 (0.22)	-0.26 (0.13)	-1.38* (0.58)	-0.48 (1.85)	0.07 (0.15)	-0.77 (0.37)	-0.34** (0.1)	-5.8*** (0.79)	-0.59 (0.56)	0.61** (0.21)	1.61*** (0.3)
PO	-13.97 (50.72)	0.2 (1.96)	3.95 (6.84)	0.71 (24.4)	13.02 (23.44)	5.52 (8.71)	-5.79 (34.13)	0.96 (3.8)	-63.07 (159.95)	-7.56* (3.46)	1.09 (0.91)	0.17 (3.37)
RO	0.75 (5.63)	0.08 (1.09)	-1.07 (2.59)	-10.42 (19.04)	1049.77 (66691.17)	-0.62 (8.18)	-4.83 (10.18)	0.12 (8.69)	-5.31 (29.17)	4.59 (9.21)	-6.26 (11.2)	5.81 (5.21)
SE	-0.32 (0.25)	-0.95* (0.41)	-0.6 (0.32)	0.35 (0.2)	-1.11 (1.08)	-0.52* (0.23)	-0.31 (0.36)	-0.78 (0.55)	-4.93* (2.02)	-3.03** (0.9)	0.57* (0.22)	2*** (0.37)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

The procyclicality that we observe when we use our alternative measure of the business cycle may be a sign of reverse causality. Hence, we once again use our export variable as an instrument (Table A5). Using an instrument in these regressions is difficult, as the weak instrument tests do not reject the null hypothesis of the instrument being weak in the cases of Czechia, Germany, Spain, Greece, Poland and Romania.

With the instrument, the tax bases WAGE and GOSC as well as the unemployment rate (U\_Rt) show the expected signs and are mostly significant. The procyclical results that we observed before disappear, with only housing expenditure (HOU) in Greece displaying a significant positive coefficient. Health expenditure becomes insignificant again. Total social expenditure (SOC) is only significant for Germany, Spain, and France but insignificant once unemployment spending (SOC\*) is excluded. Spending for housing (HOU) is significant in France and for survivors' pensions (SURV) in Italy. Unemployment spending (U\_Sp) turns out to be significant and with the expected sign in Germany, Denmark, Spain, France and Sweden. The remaining spending categories are all reported to be insignificant.

**Table A4 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.26 (0.88)	-1.75 (1.02)	-0.79 (0.76)	-2.37 (2.67)	-2.74 (5.85)	-0.25 (0.53)	0.8 (4.1)	-0.05 (0.42)	-14.55 (7.83)	-17.34* (6.77)	1.83*** (0.34)	6.26* (2.4)
CZ	-29.3 (87.1)	-29.18 (125.29)	-21.95 (85.49)	-63.45 (333.6)	376.71 (1415.71)	2.35 (16.87)	-42.94 (145.61)	-18.26 (53.66)	-56.45 (57.23)	-5.01 (8.7)	11.28 (13.1)	13.96 (12.11)
DE	-1.21 (1.47)	-5.08* (2.36)	-5.73 (11.95)	-9.12 (9.49)	11.05 (22.91)	-1.6 (2.71)	-0.76 (2.21)	-3.71 (5.49)	-23.17* (8.19)	-14.56* (6.52)	2.35* (0.82)	10.44 (5.52)
DK	0.1 (0.88)	-0.54 (0.39)	0 (0.48)	-0.4 (0.96)	-0.05 (0.78)	0.72 (0.66)	0.98 (0.9)	-0.72 (7.15)	-4.91*** (0.86)	-14.48*** (2.19)	1.42*** (0.16)	9.47* (4.05)
ES	-1.58 (1.21)	-1.06** (0.33)	-0.09 (0.23)	-0.67 (2.13)	-0.29 (5.31)	0.09 (0.16)	-0.42 (0.86)	0.35 (0.5)	-7.11** (2.05)	-5.44* (2.14)	1.4*** (0.3)	1.2 (0.79)
FR	-0.32 (0.45)	-1.84** (0.63)	-0.66 (0.48)	0.65 (0.82)	-3.47* (1.5)	0.3 (0.53)	-3.91 (1.94)	0.15 (0.69)	-11.67** (3.49)	-9.51* (3.76)	2.12** (0.68)	7.4*** (1.85)
EL	1.02 (2.21)	1.2 (1.79)	2.03 (1.88)	11.4* (4.86)	66.92 (101.61)	2.08 (2.55)	-4.97 (4.18)	-2.17 (5.7)	1.12 (8.74)	4.18 (4.57)	0.73 (1.21)	-5.27 (5.58)
IT	0.55 (0.92)	-1.71 (0.98)	-1.18 (0.99)	-4.35 (2.24)	-2.53 (7.04)	0.09 (0.53)	-4.91 (4.36)	-1* (0.45)	-20.87 (10.31)	-3.05 (2.27)	2.04* (0.77)	4.11** (1.15)
PO	13 (33.67)	-0.07 (10.03)	-0.52 (0.84)	1.95 (3.78)	-3.15 (3.3)	-0.35 (0.79)	2.91 (6.17)	1.21 (3.64)	7.05 (4.67)	-9.15 (7.9)	1.83 (0.92)	3.57 (6.44)
RO	3.13 (3.53)	-7.96 (15.48)	1.44 (1.48)	-1.48 (2.98)	-0.29 (11.16)	1.65 (1.59)	1.29 (2.12)	0.92 (2.17)	-5.61 (3.9)	-2.84 (7.99)	4.29 (7.28)	-31.25 (138.64)
SE	0.03 (0.81)	-4.24 (6.19)	-1.58 (1.01)	1.24 (0.97)	-1.25 (4.7)	-1.26 (1.06)	-0.67 (1.25)	-4.11 (2.06)	-15.13* (5.23)	-8.19*** (1.68)	3.21 (1.86)	13.13 (11.53)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.

Sources: Eurostat (COFOG), AMECO, own calculations.

**APPENDIX D / RESULTS OLS ESTIMATION**

Tables A5 to A7 provide the results obtained from ordinary least squares (OLS) estimation.

**Table A5 / Regression coefficients output gap (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.09 (0.19)	-0.45** (0.15)	-0.13 (0.13)	-1.05* (0.37)	-0.56 (1.01)	-0.06 (0.12)	-0.1 (0.42)	0.01 (0.1)	-5*** (0.72)	-4.32*** (0.94)	0.54*** (0.08)	0.55 (0.37)
CZ	-0.98* (0.39)	-0.68* (0.32)	-0.52 (0.33)	0.98 (0.93)	-4.46 (4.28)	0 (0.23)	-0.32 (0.57)	-1.23* (0.47)	-6.25*** (1.14)	-0.57 (0.48)	0.78*** (0.16)	1.17** (0.36)
DE	-0.44 (0.3)	-0.75** (0.2)	-0.13 (0.15)	-1.71*** (0.39)	-0.03 (2.5)	-0.04 (0.13)	0.57 (0.28)	0.19 (0.17)	-4.19*** (0.66)	-2.64*** (0.45)	0.57*** (0.1)	1.22** (0.36)
DK	-0.39 (0.25)	-0.7*** (0.17)	-0.34 (0.17)	-0.42 (0.28)	-0.28 (0.18)	0 (0.25)	-0.29 (0.21)	0.16 (1.64)	-2.58** (0.71)	-4.37*** (1.03)	0.54*** (0.1)	2.24*** (0.52)
ES	-0.26 (0.27)	-0.6*** (0.12)	0.06 (0.06)	1.32* (0.5)	-0.95 (1.79)	-0.08 (0.09)	-0.08 (0.22)	-0.05 (0.16)	-5.68*** (0.5)	-2.27** (0.68)	0.85*** (0.12)	1.3*** (0.32)
FR	-0.28 (0.14)	-0.48*** (0.09)	-0.03 (0.11)	0.05 (0.2)	-0.72* (0.29)	0.06 (0.12)	-0.47 (0.45)	0 (0.18)	-4.79*** (0.45)	-0.95 (0.48)	0.59*** (0.08)	1.97*** (0.31)
EL	0.21 (0.46)	0.35 (0.24)	0.38 (0.33)	-0.33 (1.71)	-1.68 (7.5)	-0.02 (0.43)	-0.1 (0.61)	0.16 (0.66)	-3.67** (0.92)	-1.47** (0.47)	0.65** (0.19)	1.73*** (0.35)
IT	-0.14 (0.23)	-0.62*** (0.14)	-0.25* (0.1)	-0.55 (0.38)	-0.91 (1.31)	-0.04 (0.09)	-0.48 (0.27)	-0.32** (0.08)	-6.19*** (0.55)	-0.34 (0.39)	0.89*** (0.12)	1.33*** (0.23)
PO	0.4 (0.52)	-0.07 (0.4)	-0.25 (0.4)	-0.42 (2.79)	-2.8 (1.96)	-0.2 (0.56)	-1.19 (1.07)	0.13 (0.74)	-6.79 (3.46)	-3.18*** (0.77)	0.94** (0.32)	1.03 (0.84)
RO	0.16 (0.72)	-0.59 (0.49)	0.64 (0.44)	0.58 (0.88)	2.41 (3.23)	0.91 (0.63)	0.69 (0.64)	0.91 (0.85)	0.32 (1.49)	-0.16 (0.49)	0.98 (0.56)	1.22 (0.8)
SE	-0.04 (0.22)	-0.5* (0.24)	-0.29 (0.2)	0.18 (0.2)	-1.16 (0.96)	-0.53* (0.21)	-0.05 (0.3)	-0.57 (0.5)	-5.14** (1.55)	-3.5*** (0.73)	0.69** (0.19)	1.76*** (0.41)

Notes: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A6 / Regression coefficients output gap normalising with nominal potential output (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.05 (0.2)	-0.45** (0.15)	-0.13 (0.13)	-0.67 (0.44)	-0.12 (1.17)	-0.07 (0.15)	0.08 (0.37)	0.07 (0.1)	-4.67*** (0.62)	-4.32*** (0.94)	0.57*** (0.09)	0.74* (0.35)
CZ	-0.91** (0.29)	-0.66* (0.26)	-0.56 (0.28)	1.32 (0.96)	-3.76 (4.2)	-0.25 (0.29)	-0.24 (0.67)	-0.64 (0.56)	-5.94*** (1.42)	-0.57 (0.48)	0.92*** (0.17)	1.41*** (0.26)
DE	-0.43 (0.33)	-0.63** (0.18)	-0.14 (0.15)	-1.69** (0.42)	-0.21 (2.57)	-0.07 (0.14)	0.53 (0.27)	0.04 (0.16)	-4.25*** (0.69)	-2.64*** (0.45)	0.57*** (0.12)	1.19** (0.33)
DK	-0.41 (0.24)	-0.74*** (0.18)	-0.43** (0.14)	-0.28 (0.31)	-0.06 (0.27)	-0.23 (0.26)	-0.42** (0.12)	0.25 (1.63)	-3.19*** (0.67)	-4.37*** (1.03)	0.27* (0.11)	2.25*** (0.41)
ES	-0.56* (0.27)	-0.68*** (0.15)	-0.09 (0.09)	1.06 (0.54)	-0.99 (1.81)	-0.22 (0.13)	-0.23 (0.23)	-0.23 (0.16)	-6.01*** (0.38)	-2.27** (0.68)	0.75*** (0.09)	0.88** (0.29)
FR	-0.27 (0.14)	-0.47*** (0.1)	-0.01 (0.13)	0.18 (0.18)	-0.25 (0.41)	0.08 (0.14)	-0.69 (0.43)	0.11 (0.13)	-4.69*** (0.44)	-0.95 (0.48)	0.65*** (0.1)	1.91*** (0.2)
EL	-0.31 (0.36)	0.3 (0.24)	0.29 (0.3)	-1.61 (1.6)	-1.17 (7.38)	-0.15 (0.39)	-0.39 (0.39)	0.05 (0.61)	-3.43*** (0.79)	-1.47** (0.47)	0.5* (0.19)	1.67*** (0.31)
IT	-0.11 (0.23)	-0.59** (0.16)	-0.2 (0.09)	-0.56 (0.36)	-0.85 (1.29)	0.01 (0.11)	-0.53 (0.25)	-0.27** (0.07)	-6.15*** (0.56)	-0.34 (0.39)	0.81*** (0.15)	1.39*** (0.22)
PO	0.31 (0.48)	-0.33 (0.4)	-0.41 (0.53)	-0.64 (2.95)	-2.67 (2.02)	-0.35 (0.61)	-1.03 (0.76)	0.38 (0.72)	-6.86 (3.17)	-3.18*** (0.77)	0.9* (0.34)	0.71 (0.75)
RO	0.45 (0.8)	-0.08 (0.41)	0.25 (0.5)	-0.27 (0.87)	3.5 (3.26)	-0.23 (0.83)	-0.27 (0.61)	0.05 (0.94)	-1.03 (1.58)	-0.16 (0.49)	1.3* (0.51)	1.27 (0.84)
SE	-0.03 (0.2)	-0.43 (0.3)	-0.28 (0.25)	0.29 (0.17)	-1.1 (0.92)	-0.4 (0.2)	-0.19 (0.31)	-0.67 (0.49)	-5.27** (1.49)	-3.5*** (0.73)	0.59** (0.18)	1.78*** (0.3)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A7 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.11 (0.52)	-0.6 (0.44)	0.03 (0.32)	-1.21 (1.21)	0.39 (2.72)	0.34 (0.3)	0.8 (1.15)	0.28 (0.18)	-7.27* (2.69)	-11.57*** (2.62)	1.7*** (0.22)	1.87 (1.08)
CZ	-0.94 (0.81)	0.23 (0.68)	0.45 (0.66)	1.25 (4.06)	19.66* (9.12)	-0.06 (0.44)	2.07 (1.8)	-0.91 (1.26)	-13.15** (3.56)	-1.91 (1.09)	2.29*** (0.48)	2.37 (1.25)
DE	-0.39 (0.65)	-1.85*** (0.44)	-0.77 (0.38)	-1.49 (1.44)	11.5 (10.06)	-0.63 (0.33)	0.29 (0.72)	-0.2 (0.44)	-13.41** (3.44)	-5.73* (2.22)	1.26*** (0.22)	1.15 (1.72)
DK	0.37 (0.46)	-0.94*** (0.22)	-0.33 (0.23)	-0.5 (0.46)	-0.39 (0.38)	0.56 (0.36)	0.11 (0.36)	3.49 (3.16)	-5*** (0.58)	-12.01*** (1.86)	1.37*** (0.11)	1.79 (1.58)
ES	0.06 (0.31)	-0.57*** (0.13)	0.19* (0.08)	1.81** (0.62)	-5.48* (2.48)	0.1 (0.09)	0.39 (0.27)	0.01 (0.21)	-5.78*** (1.03)	-4.12*** (0.96)	1.26*** (0.16)	1.68*** (0.37)
FR	-0.57 (0.34)	-0.9* (0.35)	-0.2 (0.27)	0.61 (0.52)	-2* (0.79)	-0.28 (0.29)	-2.2 (1.09)	-0.51 (0.41)	-7.14** (2.45)	-4.49* (2.02)	1.09** (0.33)	4.66** (1.18)
EL	0.02 (0.69)	0.6 (0.62)	0.11 (0.9)	7.73** (1.81)	19.92 (24.2)	0.34 (1.31)	-1.56 (1.14)	-0.73 (2.04)	-0.3 (3.5)	0.76 (1.19)	0.44 (0.37)	-1.19 (0.93)
IT	-0.01 (0.48)	-0.69 (0.4)	0.04 (0.42)	-1.25 (1.18)	-2.76 (3.63)	0.4 (0.28)	0.55 (1.4)	-0.45 (0.24)	-7.43 (4.97)	-1.11 (1.09)	1.38** (0.35)	2.44*** (0.5)
PO	1.57** (0.49)	0.03 (0.29)	-0.37 (0.31)	3.89 (2.49)	-2.98 (1.46)	-0.38 (0.44)	-0.54 (1.59)	1.25 (1.34)	2.92 (3.01)	-3.36** (0.95)	1.83*** (0.32)	0.97 (0.9)
RO	1.12 (0.74)	0.75 (0.53)	-0.09 (0.65)	-0.14 (1.28)	-4.97 (5)	0.05 (0.79)	0.81 (0.9)	-0.23 (1.11)	-2.52 (1.37)	-1.15** (0.31)	0.53 (0.5)	-0.93 (0.82)
SE	0.94** (0.27)	-0.06 (0.4)	-0.39 (0.35)	0.94 (0.47)	-2.08 (2.96)	-0.11 (0.44)	0.24 (0.62)	-2.8 (1.31)	-13.18** (3.03)	-7.57*** (0.76)	1.38*** (0.34)	0.56 (1.29)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.

Sources: Eurostat (COFOG), AMECO, own calculations.

## APPENDIX E / SENSITIVITY ANALYSIS: SAMPLE SIZE

Tables A8 to A16 show the results that one obtains when omitting the year 1995 from the sample.

Tables A17 to A24 contain the remaining results for eliminating the year 2020 from the sample.

**Table A8 / Regression coefficients output gap when excluding the year 1995 (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.04 (0.16)	-0.55*** (0.11)	-0.22* (0.1)	-1.1*** (0.22)	-0.65 (0.91)	-0.15 (0.1)	-0.07 (0.34)	-0.05 (0.07)	-5.01*** (0.52)	-4.21*** (0.84)	0.6*** (0.07)	0.69* (0.29)
CZ	-1.03*** (0.31)	-0.71** (0.26)	-0.57* (0.27)	1.16 (0.76)	-4.88 (3.8)	-0.12 (0.19)	-0.73 (0.46)	-1.29*** (0.39)	-6.33*** (1.17)	-1.38* (0.69)	0.8*** (0.16)	1.18*** (0.31)
DE	-0.52 (0.27)	-0.76*** (0.17)	-0.19 (0.12)	-1.68*** (0.31)	0.14 (2.02)	-0.06 (0.11)	0.3 (0.22)	0.06 (0.14)	-4.26*** (0.55)	-3.2*** (0.38)	0.58*** (0.08)	1.19*** (0.3)
DK	-0.37* (0.19)	-0.59*** (0.1)	-0.35** (0.12)	-0.51* (0.22)	-0.2 (0.17)	0.02 (0.22)	-0.39 (0.21)	-0.11 (1.43)	-2.39*** (0.43)	-4.3*** (1)	0.57*** (0.08)	1.66*** (0.34)
ES	-0.55* (0.26)	-0.61*** (0.1)	0.06 (0.06)	1.03 (0.6)	-0.76 (1.56)	-0.09 (0.08)	-0.22 (0.21)	-0.09 (0.14)	-5.71*** (0.4)	-2.44*** (0.63)	0.91*** (0.11)	1.2*** (0.23)
FR	-0.39*** (0.12)	-0.5*** (0.1)	-0.05 (0.11)	-0.03 (0.18)	-0.62* (0.27)	0.03 (0.1)	-0.53 (0.42)	-0.09 (0.16)	-4.94*** (0.34)	-0.95* (0.43)	0.55*** (0.06)	2.04*** (0.31)
EL	-0.29 (0.33)	0.48* (0.2)	0.44 (0.23)	0.53 (0.97)	-3.62 (6.76)	0.05 (0.32)	0.1 (0.47)	0.34 (0.5)	-3.34*** (0.71)	-1.72*** (0.4)	0.8*** (0.22)	1.65*** (0.29)
IT	-0.21 (0.21)	-0.58*** (0.12)	-0.22** (0.07)	-0.4 (0.33)	-0.9 (1.08)	-0.02 (0.06)	-0.48* (0.21)	-0.31*** (0.06)	-6.48*** (0.48)	-0.59 (0.36)	0.84*** (0.08)	1.28*** (0.2)
PO	0.21 (0.55)	-0.21 (0.32)	-0.2 (0.31)	-0.35 (2.28)	-2.65 (1.43)	-0.2 (0.46)	-1.13 (0.91)	0.14 (0.6)	-4.85* (2.2)	-3.38** (1.14)	1.07*** (0.31)	0.77 (0.77)
RO	0.08 (0.75)	0.17 (0.48)	0.45 (0.36)	0.33 (0.9)	2.35 (2.72)	0.7 (0.68)	0.99 (0.53)	0.74 (0.72)	0.51 (1.27)	-1.01 (0.55)	1.1* (0.49)	1.67** (0.64)
SE	-0.13 (0.19)	-0.5** (0.17)	-0.31 (0.17)	0.18 (0.16)	-1.18 (0.8)	-0.53** (0.17)	-0.05 (0.25)	-0.62 (0.42)	-5.13*** (1.25)	-3.41*** (0.72)	0.67*** (0.14)	1.64*** (0.32)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.



**Table A9 / Regression coefficients output gap normalising with nominal potential output when excluding the year 1995 (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.02 (0.17)	-0.51*** (0.11)	-0.19 (0.11)	-0.72* (0.36)	-0.18 (1.03)	-0.15 (0.12)	0.13 (0.29)	0.04 (0.08)	-4.83*** (0.49)	-4.21*** (0.84)	0.59*** (0.07)	0.93*** (0.26)
CZ	-0.94*** (0.25)	-0.67** (0.23)	-0.57* (0.24)	1.37 (0.74)	-4.41 (3.76)	-0.18 (0.21)	-0.44 (0.49)	-0.71 (0.48)	-6.22*** (1.28)	-1.38* (0.69)	0.94*** (0.15)	1.46*** (0.23)
DE	-0.5 (0.3)	-0.67*** (0.17)	-0.22 (0.12)	-1.67*** (0.33)	-0.01 (2.11)	-0.12 (0.1)	0.29 (0.22)	-0.03 (0.12)	-4.15*** (0.62)	-3.2*** (0.38)	0.58*** (0.1)	1.35*** (0.26)
DK	-0.28 (0.19)	-0.64*** (0.12)	-0.35** (0.13)	-0.31 (0.25)	0.1 (0.25)	-0.2 (0.25)	-0.47** (0.14)	0.31 (1.37)	-2.56*** (0.43)	-4.3*** (1)	0.27** (0.1)	1.99*** (0.28)
ES	-0.69*** (0.2)	-0.76*** (0.13)	-0.08 (0.09)	0.7 (0.43)	-0.75 (1.56)	-0.19 (0.11)	-0.31 (0.18)	-0.22 (0.14)	-5.88*** (0.37)	-2.44*** (0.63)	0.76*** (0.08)	1.17*** (0.24)
FR	-0.36*** (0.11)	-0.5*** (0.09)	-0.04 (0.12)	0.19 (0.16)	-0.15 (0.33)	0.06 (0.12)	-0.72 (0.39)	0.12 (0.12)	-4.9*** (0.34)	-0.95* (0.43)	0.71*** (0.06)	1.91*** (0.19)
EL	-0.42 (0.27)	0.39* (0.19)	0.35 (0.19)	0.37 (0.9)	-3.06 (6.74)	-0.07 (0.3)	-0.4 (0.28)	0.21 (0.45)	-2.94*** (0.53)	-1.72*** (0.4)	0.39** (0.12)	1.64*** (0.38)
IT	-0.15 (0.19)	-0.57*** (0.13)	-0.18** (0.07)	-0.49 (0.32)	-0.82 (1.06)	0.02 (0.08)	-0.53** (0.2)	-0.27*** (0.06)	-6.47*** (0.51)	-0.59 (0.36)	0.85*** (0.08)	1.3*** (0.2)
PO	0.3 (0.48)	-0.35 (0.33)	-0.39 (0.45)	-0.65 (2.52)	-2.67 (1.5)	-0.35 (0.5)	-0.57 (0.77)	0.4 (0.6)	-5.02* (2.02)	-3.38** (1.14)	0.93** (0.3)	0.71 (0.72)
RO	-0.34 (0.59)	0.05 (0.38)	0.25 (0.41)	-0.53 (0.58)	3.96 (2.64)	-0.25 (0.71)	-0.68 (0.38)	-0.04 (0.65)	-1.06 (1.08)	-1.01 (0.55)	1.08** (0.36)	1.28 (0.85)
SE	-0.14 (0.15)	-0.64** (0.22)	-0.27 (0.21)	0.28* (0.13)	-1.13 (0.75)	-0.42* (0.16)	-0.14 (0.25)	-0.71 (0.41)	-5.3*** (1.17)	-3.41*** (0.72)	0.53*** (0.1)	1.88*** (0.25)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A10 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population when excluding the year 1995 (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.22 (0.45)	-0.57 (0.34)	0.06 (0.22)	-1.35 (0.79)	0.12 (2.21)	0.32 (0.25)	0.72 (1.01)	0.27 (0.16)	-8.71*** (2.17)	-11.52*** (1.67)	1.72*** (0.16)	1.81 (0.94)
CZ	-0.82 (0.57)	0.35 (0.69)	0.73 (0.71)	4.21** (1.44)	22.22** (8.31)	0.12 (0.38)	1.35 (0.84)	-0.9 (1.01)	-13.13*** (2.99)	-5.57*** (1.41)	2.35*** (0.36)	2.18* (0.93)
DE	-0.32 (0.56)	-1.62*** (0.37)	-0.68** (0.22)	-3.17* (1.45)	12.39 (7.08)	-0.44** (0.15)	-0.21 (0.6)	-0.14 (0.28)	-10.09*** (1.99)	-5.08** (1.61)	1.11*** (0.19)	1.91 (1.67)
DK	0.7* (0.3)	-1.04*** (0.16)	-0.31 (0.17)	-0.31 (0.31)	-0.33 (0.36)	0.41 (0.28)	-0.02 (0.3)	3.58 (2.77)	-5.7*** (0.53)	-9.22*** (1.37)	1.23*** (0.07)	0.43 (1.01)
ES	-0.3 (0.32)	-0.71*** (0.12)	0.18* (0.08)	1.38* (0.68)	-2.93 (1.72)	0.1 (0.08)	0.26 (0.25)	-0.14 (0.18)	-6.17*** (0.75)	-3.99*** (0.7)	1.51*** (0.11)	2.03*** (0.44)
FR	-0.71*** (0.21)	-0.9** (0.35)	-0.16 (0.24)	0.74 (0.47)	-1.13 (0.68)	-0.32 (0.28)	-3.09*** (0.74)	-0.66* (0.29)	-10.61*** (2.13)	-6.75*** (1.6)	1.45*** (0.2)	3.4* (1.48)
EL	-0.79 (0.5)	0.18 (0.67)	0.04 (0.75)	8.54*** (1.24)	6.37 (15.87)	-0.04 (1.1)	-1.06 (0.81)	-0.19 (1.64)	-2.04 (2.2)	1.19 (1.04)	0.82* (0.34)	-1.13 (0.85)
IT	-0.22 (0.42)	-0.52 (0.34)	0.05 (0.25)	-0.43 (0.84)	-2.31 (3.01)	0.42* (0.17)	0.55 (1.05)	-0.27 (0.17)	-4.05 (3.57)	-2.46* (1.01)	0.95*** (0.26)	2.05*** (0.41)
PO	2.01*** (0.23)	0.19 (0.19)	0.04 (0.19)	2.68 (3.28)	-2.83*** (0.85)	-0.21 (0.26)	-0.48 (0.79)	0.08 (0.74)	2.1 (2.02)	-5.46** (1.7)	1.71*** (0.18)	2.04 (1.45)
RO	2.23*** (0.62)	0.6 (0.31)	0.31 (0.43)	-0.12 (0.99)	-4.51 (4.22)	0.3 (0.51)	1 (0.87)	-0.02 (0.76)	-3.08** (1.15)	-0.93** (0.28)	0.57 (0.43)	-1.13 (0.61)
SE	1.02*** (0.24)	-1.07*** (0.2)	0.04 (0.26)	0.81* (0.31)	-2.16 (2.35)	0.26 (0.34)	-0.04 (0.43)	-2.51** (0.88)	-14.46*** (2.16)	-9.5*** (0.83)	1.46*** (0.26)	0.2 (1.53)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A11 / Regression coefficients output gap when excluding the year 1995 (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.05 (0.28)	-0.52* (0.2)	-0.21 (0.19)	-0.65 (0.55)	-0.94 (1.6)	-0.15 (0.19)	-1.12 (0.74)	0.04 (0.15)	-5.16*** (0.9)	-6.12** (1.61)	0.51*** (0.11)	1.84* (0.74)
CZ	-1.23 (1.03)	-2.14 (1.25)	-1.98 (1.33)	-0.55 (2.13)	-26.95 (14.79)	-0.39 (0.72)	-0.03 (1.06)	-1.28 (0.92)	-7.08** (2.34)	-0.85 (1.12)	1.21* (0.45)	2.09* (0.81)
DE	-0.32 (0.34)	-1.04*** (0.26)	-0.27 (0.18)	-1.68** (0.45)	-0.65 (2.78)	-0.07 (0.14)	0.22 (0.34)	0.11 (0.18)	-3.73*** (0.76)	-2.17*** (0.5)	0.48*** (0.11)	1.13* (0.43)
DK	-0.34 (0.31)	-0.61** (0.2)	-0.21 (0.21)	-0.41 (0.37)	-0.18 (0.25)	0.22 (0.34)	0.03 (0.3)	-0.82 (2.15)	-2.85** (0.88)	-7.64** (2.03)	0.57*** (0.13)	3.68*** (0.85)
ES	-1.23 (0.67)	-1.15** (0.35)	-0.22 (0.2)	-0.78 (1.34)	-1.72 (2.52)	-0.18 (0.16)	-0.47 (0.5)	0.22 (0.37)	-7.02*** (1.08)	-3.98* (1.51)	0.93*** (0.2)	1.1* (0.47)
FR	-0.3 (0.16)	-0.53*** (0.12)	-0.11 (0.14)	0.19 (0.28)	-1.05* (0.4)	0.13 (0.15)	-1.16 (0.61)	0.03 (0.22)	-4.95*** (0.53)	-1.85** (0.63)	0.63*** (0.1)	2.44*** (0.45)
EL	-2.39 (4.37)	-0.72 (2.3)	-1.25 (2.69)	-3.69 (3.63)	-195.07 (1380.87)	-3.11 (7.01)	1.15 (2.36)	3.31 (8.96)	-1.44 (3.09)	-2.16 (1.62)	-0.43 (1.21)	4.42 (4.14)
IT	0.15 (0.34)	-0.47* (0.2)	-0.33* (0.14)	-1.47* (0.65)	-0.51 (1.91)	0 (0.13)	-0.73 (0.42)	-0.43** (0.12)	-5.81*** (0.8)	-0.6 (0.57)	0.69** (0.2)	1.57*** (0.33)
PO	-7.4 (12.74)	-1.5 (2.18)	2.65 (6.13)	-13.46 (34.62)	7.63 (16.16)	5.43 (14.5)	-18.57 (86.73)	-1.55 (5.65)	-66.79 (259.59)	-7.7 (4.73)	0.4 (1.52)	1.75 (3.22)
RO	3.83 (6.36)	0.37 (2.7)	2.83 (5.31)	-10.08 (23.83)	3.55 (11)	8.72 (25.09)	-5.82 (38.25)	-80.71 (2984.14)	3.01 (4.15)	0.22 (2.43)	-3.28 (4.27)	2.83 (3.6)
SE	-0.23 (0.25)	-0.76* (0.27)	-0.51 (0.24)	0.18 (0.23)	-1.01 (1.13)	-0.66* (0.25)	-0.19 (0.36)	-0.71 (0.57)	-5.11* (2.1)	-3.21** (0.86)	0.66** (0.23)	1.94*** (0.49)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A12 / Regression coefficients output gap normalising with nominal potential output when excluding the year 1995 (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.01 (0.31)	-0.45* (0.2)	-0.14 (0.19)	-0.08 (0.72)	0.46 (1.83)	-0.17 (0.22)	-0.74 (0.66)	0.07 (0.16)	-4.81*** (0.8)	-6.21** (1.59)	0.51*** (0.12)	1.9* (0.67)
CZ	-1.29* (0.57)	-1.39* (0.59)	-1.33 (0.63)	0.15 (2.2)	-22.33 (12.15)	-0.9 (0.65)	-1.82 (1.49)	-0.39 (1.09)	-7.07* (2.78)	-0.37 (1.05)	0.77 (0.39)	1.55** (0.4)
DE	-0.26 (0.38)	-0.75** (0.22)	-0.18 (0.17)	-1.66** (0.48)	-0.22 (2.9)	-0.05 (0.15)	0.23 (0.33)	0.04 (0.17)	-3.64*** (0.8)	-2.17*** (0.52)	0.55*** (0.14)	1.22** (0.42)
DK	-0.63* (0.29)	-1.04*** (0.23)	-0.56** (0.18)	-0.65 (0.42)	-0.34 (0.35)	-0.27 (0.33)	-0.43* (0.15)	-0.59 (2.03)	-3.59*** (0.81)	-6.87*** (1.73)	0.19 (0.14)	3*** (0.58)
ES	-1.31* (0.52)	-1.33** (0.41)	-0.42 (0.24)	-1.04 (1.33)	-1.61 (2.87)	-0.43* (0.2)	-0.77 (0.53)	0 (0.35)	-6.2*** (0.64)	-3.77* (1.57)	0.77*** (0.15)	0.82 (0.45)
FR	-0.42* (0.15)	-0.61*** (0.13)	-0.2 (0.17)	0.17 (0.22)	-0.75 (0.5)	-0.02 (0.18)	-1.3* (0.53)	0.07 (0.15)	-4.92*** (0.51)	-1.73** (0.6)	0.52*** (0.12)	2.05*** (0.25)
EL	-1.68 (2.62)	-1 (2.8)	-1.94 (3.54)	-3.57 (3.19)	2039.45 (152972.29)	-5.21 (14.05)	1.61 (2.2)	2.89 (9.56)	-0.32 (3.72)	-2.5 (2.06)	-0.41 (1.04)	4.49 (4.98)
IT	0.21 (0.33)	-0.44 (0.22)	-0.26 (0.13)	-1.38* (0.58)	-0.48 (1.85)	0.07 (0.15)	-0.77 (0.37)	-0.34** (0.1)	-5.8*** (0.79)	-0.61 (0.58)	0.61* (0.22)	1.59*** (0.31)
PO	-12.83 (46.54)	0.14 (2.16)	3.95 (6.84)	0.71 (24.4)	13.02 (23.44)	5.52 (8.71)	-5.79 (34.13)	0.96 (3.8)	-63.07 (159.95)	-8 (4.14)	0.8 (0.86)	0.08 (3.82)
RO	2.61 (4.94)	0.11 (1.04)	-1.07 (2.59)	-10.42 (19.04)	1049.77 (66691.17)	-0.62 (8.18)	-4.83 (10.18)	0.12 (8.69)	-5.31 (29.17)	-17.1 (88.37)	-5.97 (10.24)	5.69 (5)
SE	-0.25 (0.2)	-0.92* (0.37)	-0.6 (0.32)	0.35 (0.2)	-1.11 (1.08)	-0.52* (0.23)	-0.31 (0.36)	-0.78 (0.55)	-4.93* (2.02)	-3.15** (0.86)	0.58* (0.22)	1.92*** (0.35)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A13 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population when excluding the year 1995 (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.13 (0.91)	-1.46 (0.9)	-0.5 (0.63)	-1.91 (2.42)	-1.41 (5.55)	-0.17 (0.52)	0.43 (4.56)	0.06 (0.39)	-13.24 (7.21)	-17.33* (6.91)	1.9*** (0.32)	6.29* (2.51)
CZ	-21.38 (61.84)	-41.98 (241.47)	-28.69 (133.38)	-3654.9 (4033270.03)	215.77 (482.57)	2.59 (9.53)	-17.45 (44.49)	-21.07 (69.82)	-53.93 (52.98)	-3.81 (10.73)	7.92 (5.53)	14.12 (12.55)
DE	-1.3 (1.51)	-5.18* (2.41)	-5.73 (11.95)	-9.12 (9.49)	11.05 (22.91)	-1.6 (2.71)	-0.76 (2.21)	-3.71 (5.49)	-23.17* (8.19)	-14.6* (6.87)	2.35* (0.84)	10.31 (5.2)
DK	0.07 (0.88)	-0.58 (0.38)	-0.01 (0.49)	-0.37 (0.96)	-0.04 (0.81)	0.73 (0.68)	0.98 (0.93)	-0.6 (7.33)	-4.88*** (0.84)	-14.59*** (2.21)	1.42*** (0.16)	9.41* (4.15)
ES	-1.17 (0.74)	-0.97** (0.26)	-0.07 (0.2)	-0.51 (1.7)	-1.24 (3.61)	0.09 (0.17)	-0.2 (0.61)	0.36 (0.44)	-6.52** (1.7)	-5.32* (1.88)	1.3*** (0.21)	1.33* (0.61)
FR	-0.38 (0.44)	-1.86* (0.66)	-0.66 (0.5)	0.69 (0.84)	-3.48* (1.52)	0.36 (0.57)	-4.07* (1.85)	0.14 (0.72)	-11.55** (3.39)	-9.1* (3.49)	2.12** (0.71)	7.44** (2)
EL	0.97 (2.22)	1.22 (1.67)	2.03 (1.88)	11.4* (4.86)	66.92 (101.61)	2.08 (2.55)	-4.97 (4.18)	-2.17 (5.7)	1.12 (8.74)	4.2 (4.49)	0.46 (0.95)	-5.12 (4.99)
IT	0.55 (0.98)	-1.75 (1.03)	-1.18 (0.99)	-4.35 (2.24)	-2.53 (7.04)	0.09 (0.53)	-4.91 (4.36)	-1* (0.45)	-20.87 (10.31)	-3.2 (2.4)	2.07** (0.61)	4.06** (1.29)
PO	11.2 (26.42)	33.41 (3702.25)	-0.52 (0.84)	1.95 (3.78)	-3.15 (3.3)	-0.35 (0.79)	2.91 (6.17)	1.21 (3.64)	7.05 (4.67)	-11.35 (11.28)	1.67 (0.97)	4.58 (9.81)
RO	5.22 (7.39)	-1.97 (3.48)	1.44 (1.48)	-1.48 (2.98)	-0.29 (11.16)	1.65 (1.59)	1.29 (2.12)	0.92 (2.17)	-5.61 (3.9)	0.48 (5.15)	2.44 (3.35)	-6.4 (8.96)
SE	0.09 (0.71)	-1.72 (1.24)	-1.58 (1.01)	1.24 (0.97)	-1.25 (4.7)	-1.26 (1.06)	-0.67 (1.25)	-4.11 (2.06)	-15.13* (5.23)	-8.13*** (1.56)	2.38** (0.67)	10.92 (7.36)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A14 / Regression coefficients output gap when excluding the year 1995 (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.05 (0.19)	-0.5*** (0.13)	-0.17 (0.12)	-1.08** (0.34)	-0.66 (1.03)	-0.08 (0.12)	-0.18 (0.41)	0 (0.09)	-5.14*** (0.61)	-4.25*** (0.97)	0.54*** (0.08)	0.59 (0.38)
CZ	-0.98* (0.39)	-0.68* (0.32)	-0.52 (0.33)	0.98 (0.93)	-4.46 (4.28)	0 (0.23)	-0.32 (0.57)	-1.23* (0.47)	-6.25*** (1.14)	-0.57 (0.48)	0.78*** (0.16)	1.17** (0.36)
DE	-0.47 (0.29)	-0.74** (0.21)	-0.13 (0.15)	-1.71*** (0.39)	-0.03 (2.5)	-0.04 (0.13)	0.57 (0.28)	0.19 (0.17)	-4.19*** (0.66)	-2.59*** (0.41)	0.57*** (0.1)	1.22** (0.37)
DK	-0.41 (0.24)	-0.69*** (0.16)	-0.33* (0.16)	-0.43 (0.29)	-0.27 (0.19)	0.01 (0.25)	-0.29 (0.22)	0.12 (1.66)	-2.54** (0.72)	-4.35*** (1.06)	0.54*** (0.1)	2.24*** (0.53)
ES	-0.33 (0.27)	-0.59*** (0.12)	0.06 (0.07)	1.3* (0.52)	-1.08 (1.49)	-0.08 (0.09)	-0.13 (0.23)	-0.05 (0.16)	-5.7*** (0.52)	-2.28** (0.7)	0.9*** (0.12)	1.16** (0.3)
FR	-0.38** (0.13)	-0.48*** (0.1)	-0.01 (0.11)	0.06 (0.21)	-0.61 (0.31)	0.09 (0.12)	-0.55 (0.47)	-0.06 (0.18)	-4.91*** (0.45)	-0.96 (0.49)	0.55*** (0.08)	2*** (0.34)
EL	0.13 (0.46)	0.37 (0.25)	0.38 (0.33)	-0.33 (1.71)	-1.68 (7.5)	-0.02 (0.43)	-0.1 (0.61)	0.16 (0.66)	-3.67** (0.92)	-1.5** (0.5)	0.66** (0.19)	1.75*** (0.36)
IT	-0.14 (0.24)	-0.57*** (0.14)	-0.25* (0.1)	-0.55 (0.38)	-0.91 (1.31)	-0.04 (0.09)	-0.48 (0.27)	-0.32** (0.08)	-6.19*** (0.55)	-0.35 (0.4)	0.96*** (0.13)	1.29*** (0.23)
PO	0.4 (0.51)	-0.23 (0.37)	-0.25 (0.4)	-0.42 (2.79)	-2.8 (1.96)	-0.2 (0.56)	-1.19 (1.07)	0.13 (0.74)	-6.79 (3.46)	-3.15** (0.81)	0.96** (0.3)	0.82 (0.87)
RO	0.18 (0.77)	0.2 (0.49)	0.64 (0.44)	0.58 (0.88)	2.41 (3.23)	0.91 (0.63)	0.69 (0.64)	0.91 (0.85)	0.32 (1.49)	-0.8 (0.68)	0.99 (0.58)	1.68* (0.73)
SE	-0.11 (0.21)	-0.53* (0.23)	-0.29 (0.2)	0.18 (0.2)	-1.16 (0.96)	-0.53* (0.21)	-0.05 (0.3)	-0.57 (0.5)	-5.14** (1.55)	-3.34*** (0.74)	0.71** (0.2)	1.75*** (0.42)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A15 / Regression coefficients output gap normalising with nominal potential output when excluding the year 1995 (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0 (0.2)	-0.46** (0.14)	-0.14 (0.13)	-0.78 (0.43)	-0.12 (1.2)	-0.08 (0.14)	0.04 (0.38)	0.06 (0.1)	-4.81*** (0.57)	-4.25*** (0.97)	0.57*** (0.09)	0.76* (0.35)
CZ	-0.91** (0.29)	-0.66* (0.26)	-0.56 (0.28)	1.32 (0.96)	-3.76 (4.2)	-0.25 (0.29)	-0.24 (0.67)	-0.64 (0.56)	-5.94*** (1.42)	-0.57 (0.48)	0.92*** (0.17)	1.41*** (0.26)
DE	-0.47 (0.32)	-0.63** (0.19)	-0.14 (0.15)	-1.69** (0.42)	-0.21 (2.57)	-0.07 (0.14)	0.53 (0.27)	0.04 (0.16)	-4.25*** (0.69)	-2.59*** (0.41)	0.57*** (0.12)	1.19** (0.34)
DK	-0.41 (0.23)	-0.78*** (0.18)	-0.41** (0.14)	-0.29 (0.32)	-0.03 (0.27)	-0.18 (0.26)	-0.41** (0.12)	0.23 (1.64)	-3.17*** (0.69)	-4.35*** (1.06)	0.27* (0.11)	2.26*** (0.43)
ES	-0.63* (0.26)	-0.69*** (0.16)	-0.09 (0.09)	1.02 (0.56)	-0.95 (1.48)	-0.21 (0.12)	-0.25 (0.24)	-0.22 (0.16)	-6.02*** (0.39)	-2.28** (0.7)	0.73*** (0.08)	0.87** (0.27)
FR	-0.35* (0.12)	-0.48*** (0.11)	-0.02 (0.14)	0.21 (0.19)	-0.16 (0.38)	0.1 (0.15)	-0.73 (0.44)	0.12 (0.13)	-4.71*** (0.43)	-0.96 (0.49)	0.65*** (0.09)	1.91*** (0.21)
EL	-0.35 (0.33)	0.29 (0.25)	0.29 (0.3)	-1.61 (1.6)	-1.17 (7.38)	-0.15 (0.39)	-0.39 (0.39)	0.05 (0.61)	-3.43*** (0.79)	-1.5** (0.5)	0.49* (0.19)	1.68*** (0.32)
IT	-0.11 (0.24)	-0.56** (0.16)	-0.2 (0.09)	-0.56 (0.36)	-0.85 (1.29)	0.01 (0.11)	-0.53 (0.25)	-0.27** (0.07)	-6.15*** (0.56)	-0.35 (0.4)	0.81*** (0.15)	1.35*** (0.22)
PO	0.31 (0.49)	-0.45 (0.42)	-0.41 (0.53)	-0.64 (2.95)	-2.67 (2.02)	-0.35 (0.61)	-1.03 (0.76)	0.38 (0.72)	-6.86 (3.17)	-3.15** (0.81)	0.86* (0.32)	0.69 (0.8)
RO	-0.07 (0.59)	-0.26 (0.46)	0.25 (0.5)	-0.27 (0.87)	3.5 (3.26)	-0.23 (0.83)	-0.27 (0.61)	0.05 (0.94)	-1.03 (1.58)	-0.8 (0.68)	1.09* (0.48)	1.33 (0.89)
SE	-0.13 (0.18)	-0.57 (0.29)	-0.28 (0.25)	0.29 (0.17)	-1.1 (0.92)	-0.4 (0.2)	-0.19 (0.31)	-0.67 (0.49)	-5.27** (1.49)	-3.34*** (0.74)	0.58** (0.19)	1.82*** (0.3)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A16 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population when excluding the year 1995 (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	-0.17 (0.53)	-0.58 (0.41)	0.03 (0.29)	-1.41 (1.16)	0.41 (2.75)	0.35 (0.3)	0.53 (1.21)	0.29 (0.18)	-7.31* (2.62)	-11.28*** (2.76)	1.71*** (0.2)	1.85 (1.12)
CZ	-0.93 (0.7)	0.22 (0.7)	0.45 (0.68)	3.64 (2.38)	20.43* (9.17)	-0.12 (0.45)	1.35 (1.15)	-0.94 (1.29)	-13.1** (3.64)	-1.79 (1.12)	2.45*** (0.49)	2.37 (1.24)
DE	-0.58 (0.69)	-1.94*** (0.47)	-0.77 (0.38)	-1.49 (1.44)	11.5 (10.06)	-0.63 (0.33)	0.29 (0.72)	-0.2 (0.44)	-13.41** (3.44)	-4.32 (2.37)	1.19*** (0.24)	1.47 (1.91)
DK	0.33 (0.46)	-0.96*** (0.21)	-0.33 (0.23)	-0.51 (0.48)	-0.39 (0.4)	0.61 (0.38)	0.11 (0.37)	3.69 (3.22)	-5.14*** (0.58)	-12.19*** (1.88)	1.37*** (0.12)	1.78 (1.62)
ES	-0.19 (0.33)	-0.62*** (0.14)	0.19 (0.09)	2** (0.66)	-2.07 (2.26)	0.11 (0.1)	0.27 (0.31)	-0.05 (0.23)	-6.13*** (1.06)	-4.1*** (1.02)	1.4*** (0.13)	1.63** (0.43)
FR	-0.74* (0.33)	-0.87* (0.38)	-0.16 (0.3)	0.82 (0.56)	-1.59 (0.84)	-0.23 (0.33)	-2.89* (1.14)	-0.61 (0.44)	-7.74** (2.65)	-4.72* (2.16)	0.93* (0.35)	4.46** (1.26)
EL	-0.57 (0.68)	0.34 (0.73)	0.11 (0.9)	7.73** (1.81)	19.92 (24.2)	0.34 (1.31)	-1.56 (1.14)	-0.73 (2.04)	-0.3 (3.5)	1 (1.35)	0.66 (0.38)	-1.52 (1.03)
IT	-0.09 (0.52)	-0.61 (0.5)	0.04 (0.42)	-1.25 (1.18)	-2.76 (3.63)	0.4 (0.28)	0.55 (1.4)	-0.45 (0.24)	-7.43 (4.97)	-1.24 (1.16)	1.92*** (0.35)	2.18*** (0.51)
PO	1.67** (0.44)	-0.19 (0.26)	-0.37 (0.31)	3.89 (2.49)	-2.98 (1.46)	-0.38 (0.44)	-0.54 (1.59)	1.25 (1.34)	2.92 (3.01)	-3.5** (0.94)	1.8*** (0.33)	0.98 (1.07)
RO	1.27 (0.79)	0.57 (0.37)	-0.09 (0.65)	-0.14 (1.28)	-4.97 (5)	0.05 (0.79)	0.81 (0.9)	-0.23 (1.11)	-2.52 (1.37)	-1.2** (0.35)	0.56 (0.51)	-1.22 (0.75)
SE	0.88* (0.32)	-0.66 (0.41)	-0.39 (0.35)	0.94 (0.47)	-2.08 (2.96)	-0.11 (0.44)	0.24 (0.62)	-2.8 (1.31)	-13.18** (3.03)	-8.37*** (0.93)	2.05*** (0.36)	0.66 (1.55)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.  
Sources: Eurostat (COFOG), AMECO, own calculations.



**Table A17 / Regression coefficients output gap normalising with nominal potential output when excluding the year 2020 (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.27 (0.26)	-0.34 (0.19)	-0.12 (0.18)	-0.21 (0.6)	-2.17 (1.53)	-0.06 (0.2)	-0.1 (0.52)	0.08 (0.13)	-3.01*** (0.77)	-5.79*** (1.03)	0.69*** (0.11)	1.82*** (0.33)
CZ	-0.26 (0.24)	-0.45 (0.31)	-0.27 (0.32)	2.16** (0.82)	-6.69 (5.04)	0.08 (0.28)	0.39 (0.6)	-0.39 (0.64)	-8.41*** (1.75)	-2.16* (1.04)	1.08*** (0.18)	1.53*** (0.32)
DE	0.1 (0.28)	-0.55** (0.19)	-0.16 (0.14)	-0.95** (0.34)	-2.16 (2.44)	-0.07 (0.13)	0.27 (0.26)	0.06 (0.15)	-3.24*** (0.6)	-2.82*** (0.46)	0.59*** (0.12)	1.37*** (0.31)
DK	-0.21 (0.23)	-0.77*** (0.13)	-0.53*** (0.14)	-0.36 (0.28)	-0.26 (0.25)	-0.51* (0.25)	-0.45** (0.16)	-0.8 (1.52)	-2.38*** (0.47)	-5.17*** (1.07)	0.1 (0.1)	2.52*** (0.66)
ES	-0.44 (0.41)	-1.1*** (0.24)	-0.42*** (0.13)	-0.42 (0.83)	-3.53 (2.94)	-0.82*** (0.12)	0.47 (0.31)	-0.51* (0.21)	-6.82*** (0.85)	-4.91*** (1.06)	1.02*** (0.19)	-0.44 (0.42)
FR	-0.25 (0.24)	-0.58*** (0.15)	-0.43* (0.18)	0.03 (0.31)	-1.49** (0.46)	-0.28 (0.21)	-0.98 (0.69)	-0.4* (0.17)	-3.23*** (0.75)	-4.35*** (0.87)	0.32** (0.11)	2.58*** (0.34)
EL	-0.43 (0.41)	0.48** (0.17)	0.4* (0.19)	1.4 (1.11)	6.25 (5.27)	0 (0.32)	-0.61 (0.37)	0.47 (0.54)	-2.62*** (0.68)	-2.55*** (0.57)	0.93*** (0.14)	1.41*** (0.33)
IT	0.49 (0.3)	-0.42* (0.16)	-0.16 (0.1)	-1.71*** (0.37)	-1.74 (1.94)	0.05 (0.11)	-0.79** (0.29)	-0.51*** (0.05)	-5.2*** (0.69)	-2.34*** (0.57)	0.62** (0.2)	2.14*** (0.24)
PO	0.91 (0.48)	-0.2 (0.38)	-0.26 (0.68)	-0.47 (4.51)	-4.99** (1.78)	-0.65 (0.71)	-0.62 (1.27)	-1.11 (0.86)	-3.29 (2.1)	-4.38** (1.67)	0.45 (0.32)	1.47 (1.02)
RO	1.04 (0.77)	0.05 (0.36)	0.77 (0.45)	-0.48 (0.67)	0.04 (2.59)	0.6 (0.82)	-0.5 (0.45)	-0.3 (0.55)	0.11 (1.09)	0 (0.44)	1.25* (0.5)	1.44 (0.97)
SE	0.01 (0.19)	-0.51 (0.28)	-0.38 (0.23)	0.22 (0.15)	-0.74 (0.87)	-0.6** (0.19)	-0.08 (0.29)	-0.72 (0.48)	-5.22*** (1.34)	-3.34*** (0.87)	0.52** (0.19)	2.21*** (0.28)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A18 / Regression coefficients output gap when excluding the year 2020 (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.05 (0.34)	-0.65* (0.29)	-0.3 (0.26)	-0.82 (0.75)	-1.53 (2.03)	-0.2 (0.23)	-1.6 (0.94)	-0.06 (0.21)	-5.73*** (1.39)	-6.77** (1.74)	0.51** (0.14)	2.15*** (0.53)
CZ	-1.17 (0.99)	-2.19 (1.4)	-2 (1.44)	-0.44 (2.74)	-39.86 (24.47)	-0.38 (0.75)	0.51 (1.24)	-0.95 (1.21)	-8.62** (2.7)	-1.28 (1.75)	1.25** (0.42)	2.22* (0.8)
DE	-0.12 (0.34)	-1.17** (0.3)	-0.36 (0.23)	-1.23* (0.52)	-1.95 (3.23)	-0.13 (0.17)	0.11 (0.45)	0.13 (0.21)	-3.32** (0.81)	-1.6* (0.62)	0.39** (0.12)	1.18* (0.49)
DK	-0.29 (0.33)	-0.61* (0.25)	-0.19 (0.26)	-0.43 (0.42)	-0.19 (0.27)	0.18 (0.37)	0.22 (0.29)	-1.51 (2.28)	-2.8** (0.92)	-8.57*** (2.1)	0.58*** (0.15)	4*** (0.79)
ES	-2.36 (2.31)	-1.51* (0.65)	-0.46 (0.39)	-3.2 (3.73)	1.65 (6.2)	-0.39* (0.19)	-0.69 (1.43)	0.27 (0.64)	-9.38* (3.65)	-9.14 (4.73)	1.22** (0.36)	-0.39 (1.29)
FR	-0.22 (0.32)	-0.54* (0.22)	-0.24 (0.24)	0.41 (0.48)	-2.18*** (0.53)	0.22 (0.29)	-1.99 (1.06)	-0.13 (0.4)	-4.37*** (0.96)	-6.06*** (1.46)	0.59** (0.15)	3.17*** (0.67)
EL	20.96 (217.79)	-29.97 (2063.3)	-4.91 (25.03)	-4.08 (5.44)	26.96 (41.63)	14.21 (116.35)	3.5 (12.94)	-42.75 (935.5)	4.26 (19.13)	-4.77 (5.69)	-1.59 (4.74)	-6.13 (25.32)
IT	0.47 (0.4)	-0.41 (0.26)	-0.33 (0.19)	-1.98* (0.69)	-0.52 (2.96)	0.03 (0.17)	-0.82 (0.47)	-0.54*** (0.09)	-5.42*** (0.84)	-1.22 (0.89)	0.52* (0.23)	1.9*** (0.36)
PO	-14.11 (34.36)	-2.99 (8.05)	4.93 (12.75)	-21.75 (58.6)	9.26 (19.61)	4.85 (9.71)	-14.95 (43.43)	-2.06 (6.08)	-35.89 (54.21)	-10.19 (6.14)	0.96 (1.6)	3.16 (3)
RO	14.71 (66.01)	-6 (11.85)	798.06 (278604.69)	39.2 (319.91)	-29.17 (117.34)	-14.82 (65.45)	1.66 (7.84)	-8.84 (37.01)	15.68 (27.9)	0.1 (1.82)	-9.44 (25.86)	-33.17 (221.41)
SE	-0.36 (0.34)	-1.01* (0.38)	-0.67* (0.31)	0.02 (0.23)	-0.52 (1.32)	-0.87** (0.28)	-0.19 (0.43)	-0.79 (0.69)	-5.06 (2.6)	-3.07* (1.15)	0.72* (0.29)	2.26*** (0.55)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.  
Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A19 / Regression coefficients output gap normalising with nominal potential output when excluding the year 2020 (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.1 (0.36)	-0.5 (0.29)	-0.19 (0.26)	-0.13 (0.81)	0.14 (2.48)	-0.26 (0.3)	-1.11 (0.81)	0.06 (0.18)	-4.98** (1.28)	-6.98*** (1.76)	0.51** (0.17)	2.48** (0.67)
CZ	-0.99 (0.68)	-1.61 (0.9)	-1.52 (0.96)	0.36 (3.32)	-35.25 (21.8)	-0.99 (0.85)	-1.86 (1.79)	-0.29 (1.23)	-8.07* (2.86)	-0.53 (1.75)	0.78 (0.44)	1.69* (0.69)
DE	-0.01 (0.37)	-0.71** (0.25)	-0.12 (0.2)	-1.13* (0.52)	-1.68 (3.29)	-0.01 (0.18)	0.19 (0.42)	0.06 (0.19)	-3.25** (0.87)	-1.55* (0.65)	0.54** (0.17)	1.18* (0.5)
DK	-0.65 (0.36)	-1.08*** (0.22)	-0.71*** (0.17)	-0.73 (0.45)	-0.52 (0.37)	-0.44 (0.33)	-0.42* (0.18)	-1.61 (2.16)	-3.61*** (0.86)	-8.02*** (1.89)	0.07 (0.14)	3.33*** (0.52)
ES	-2.54 (1.85)	-1.92* (0.73)	-0.83* (0.35)	-3.77 (3.75)	1.92 (6.65)	-0.88*** (0.22)	-1.13 (1.36)	-0.07 (0.58)	-6.5*** (1.24)	-8.51 (4.96)	1.05** (0.33)	-0.68 (1.09)
FR	-0.68 (0.37)	-0.88** (0.25)	-0.63* (0.26)	0.12 (0.44)	-2.03* (0.89)	-0.28 (0.29)	-2.44* (1.08)	-0.26 (0.26)	-4.57** (1.18)	-5.95*** (1.43)	0.09 (0.18)	2.54*** (0.47)
EL	-33.44 (797.61)	-3.6 (33.24)	-4.81 (19.81)	-2.93 (4.14)	25.18 (36.5)	16.07 (134.68)	3.84 (8.78)	-4.55 (13.9)	7.3 (25.28)	-6.4 (9.74)	-1 (2.84)	-3.46 (13.04)
IT	0.54 (0.4)	-0.34 (0.28)	-0.26 (0.18)	-1.96* (0.65)	-0.55 (2.92)	0.11 (0.2)	-0.87 (0.44)	-0.45*** (0.09)	-5.38*** (0.86)	-1.22 (0.88)	0.48 (0.26)	1.93*** (0.33)
PO	13.39 (35.24)	-13.48 (184.08)	-29.39 (168.02)	-6.93 (112.94)	28.63 (76.4)	15.04 (44.15)	-19.56 (279.51)	-0.73 (10.54)	-94.79 (332.88)	-11.8 (6.77)	1.32 (1.52)	1.37 (6.85)
RO	-16.24 (203.43)	0.69 (1.52)	1.93 (56.55)	23.78 (97.67)	-60.65 (293.64)	-2.39 (8.05)	9.86 (59.87)	2.13 (50.56)	116.24 (21393.82)	9.43 (28.5)	-30.65 (184.12)	8.95 (11.74)
SE	-0.36 (0.3)	-1.04* (0.45)	-0.69 (0.35)	0.31 (0.25)	-0.81 (1.27)	-0.7* (0.28)	-0.29 (0.43)	-0.82 (0.67)	-4.79 (2.43)	-3.01* (1.14)	0.61* (0.26)	2.35*** (0.41)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A20 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population when excluding the year 2020 (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.32 (0.44)	0.01 (0.25)	0.42 (0.24)	-0.14 (0.98)	-0.23 (2.36)	0.71*** (0.15)	0.66 (1.17)	0.5*** (0.13)	-5.68*** (1.42)	-11.96*** (1.7)	1.57*** (0.21)	1.76 (1)
CZ	0.08 (0.61)	0.95 (0.6)	1.25* (0.58)	3.21 (3.03)	24.95** (8.32)	0.17 (0.4)	3.07* (1.34)	1.01 (0.84)	-10.65*** (2.74)	-5.26*** (1.56)	1.96*** (0.4)	1.92 (1.11)
DE	0.39* (0.18)	-1.29*** (0.31)	-0.48** (0.18)	-1.1 (0.79)	10.53 (7.89)	-0.3* (0.15)	-0.26 (0.63)	-0.17 (0.26)	-7.69*** (1.58)	-6.25*** (1.56)	1.15*** (0.16)	0.55 (1.5)
DK	0.74** (0.28)	-1.03*** (0.17)	-0.3 (0.17)	-0.32 (0.31)	-0.25 (0.35)	0.44 (0.29)	0.1 (0.26)	1.86 (2.32)	-5.36*** (0.52)	-9.03*** (1.35)	1.25*** (0.06)	0.39 (1.13)
ES	0.44 (0.32)	-0.44** (0.14)	0.14 (0.09)	0.4 (0.72)	-7.05*** (2.02)	0.03 (0.08)	0.77*** (0.23)	-0.09 (0.2)	-3.98*** (0.3)	-4.74*** (0.71)	1.14*** (0.17)	1.09* (0.47)
FR	-0.41 (0.23)	-0.44* (0.18)	-0.19 (0.23)	0.89 (0.48)	-1.46* (0.65)	-0.43 (0.26)	-2.4** (0.76)	-0.56* (0.28)	-4.03*** (0.96)	-7.7*** (1.52)	0.97*** (0.2)	2.57** (0.87)
EL	0.12 (0.59)	0.56 (0.55)	0.07 (0.75)	8.42*** (1.25)	6.79 (16.69)	0.02 (1.1)	-0.55 (0.7)	-0.05 (1.33)	-2.27 (2.19)	-0.95 (0.88)	0.58* (0.3)	-0.38 (0.74)
IT	0.38 (0.4)	-0.1 (0.14)	0.18 (0.17)	-0.4 (0.88)	-1.84 (3.24)	0.5*** (0.13)	0.16 (0.94)	-0.21 (0.17)	-5.76** (1.77)	-2.82** (0.92)	0.95*** (0.2)	2.23*** (0.49)
PO	1.65*** (0.35)	0.17 (0.18)	0.11 (0.18)	2.67 (3.38)	-2.85** (0.91)	-0.21 (0.26)	-0.46 (0.54)	0.08 (0.76)	1.68 (2.08)	-5.68*** (0.93)	1.73*** (0.17)	1.59 (1.12)
RO	1.19 (0.69)	0.77 (0.4)	0.34 (0.4)	-0.03 (1.04)	-3.32 (2.82)	0.32 (0.5)	1.5* (0.75)	0 (0.76)	-2.58** (0.95)	-1.25*** (0.24)	0.56 (0.43)	-0.97 (0.67)
SE	1.17*** (0.18)	-0.28 (0.49)	0.2 (0.27)	0.29 (0.26)	-1.99 (2)	0.39 (0.36)	0.09 (0.46)	-2.85** (0.94)	-12.71*** (2.47)	-8.05*** (0.73)	1.39*** (0.28)	0.06 (1.13)

Notes: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A21 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population when excluding the year 2020 (two-stage least squares, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.69 (1.04)	-1.3 (1.02)	-0.54 (0.84)	-1.55 (2.91)	-3.67 (7.07)	0.41 (0.43)	0.54 (4.47)	0.14 (0.42)	-13.13 (7.39)	-17.62* (7.22)	1.74*** (0.41)	7.45* (3.06)
CZ	118.38 (1535.19)	-159.7 (3666.76)	-67.31 (782.04)	1705.2 (255384.4)	192.72 (332.12)	2.64 (19.78)	-456.86 (15692.05)	85.38 (1871.42)	-286.93 (2471.06)	-10.12 (32.15)	19.84 (51.62)	17.87 (19.72)
DE	0.41 (0.91)	-7.36 (6.28)	-9.48 (55.54)	-5.77 (10.61)	7.97 (29.28)	2.96 (34.15)	-1.04 (2.52)	-3.39 (4.92)	-28.12 (18.53)	-13.01 (6.83)	2.22* (0.84)	10.87 (6.63)
DK	0.15 (0.8)	-0.54 (0.41)	0.01 (0.5)	-0.37 (1.01)	-0.01 (0.81)	0.73 (0.68)	0.96 (0.78)	-1.69 (6.63)	-4.63*** (0.77)	-14.7*** (2.31)	1.43*** (0.15)	9.64* (4.07)
ES	-2.18 (2.43)	-1.09* (0.51)	-0.36 (0.46)	-3.51 (5.14)	0.31 (7.39)	0.01 (0.24)	-0.47 (1.51)	0.51 (0.87)	-4.73** (1.29)	-6.91* (3.23)	1.18** (0.38)	0.04 (1.4)
FR	0.07 (0.56)	-1.16* (0.51)	-0.87 (0.63)	1.28 (1.03)	-4.33 (2.06)	0.2 (0.66)	-5.96 (2.93)	0.14 (0.84)	-6.09** (1.7)	-18.37* (8.11)	1.49** (0.44)	6.51** (2.07)
EL	1.65 (2.95)	1.57 (1.89)	2.18 (1.95)	9.51 (5.53)	37.12 (62.03)	2.5 (2.79)	-4.02 (4.41)	-3.85 (5.27)	-0.95 (9.22)	3.96 (4.56)	1.67 (1.74)	-5.22 (12.51)
IT	1.32 (1.14)	-0.65 (0.56)	-0.62 (0.64)	-4.73 (2.63)	-2.01 (8.33)	0.44 (0.41)	-4.1 (3.56)	-0.94 (0.48)	-14.01* (5.96)	-4.93 (3.53)	1.45* (0.68)	4.3** (1.45)
PO	13.95 (42.19)	2.22 (8.68)	-0.75 (0.75)	1.73 (3.89)	-3.7 (4.65)	-0.35 (0.8)	-1.06 (2.89)	1.17 (3.59)	6.77 (5.14)	-6.47 (3.78)	1.89 (0.97)	3.23 (5.68)
RO	3.14 (3.63)	-9.31 (19.18)	2.12 (1.76)	-0.56 (2.89)	-7.7 (10.68)	2.12 (1.8)	2.39 (2.29)	1.24 (2.34)	-1.93 (2.59)	-2.44 (6.24)	4.71 (8.84)	-34.48 (172.49)
SE	0.08 (1.34)	-16.5 (96.83)	-1.77 (1.67)	-0.31 (1.54)	-0.03 (4.51)	-1.73 (1.99)	-0.55 (1.35)	-5.43 (2.51)	-12 (7.12)	-8** (2.32)	7.01 (11.58)	32.1 (60.08)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A22 / Regression coefficients output gap when excluding the year 2020 (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.15 (0.28)	-0.3 (0.23)	-0.02 (0.21)	-0.41 (0.54)	-2.06 (1.51)	-0.02 (0.19)	-0.25 (0.65)	0.19 (0.14)	-4.02** (1.07)	-6.22*** (1.36)	0.6*** (0.11)	1.68** (0.44)
CZ	-0.29 (0.37)	-0.3 (0.36)	-0.11 (0.36)	2.29 (1.13)	-5.54 (6.03)	0.21 (0.26)	0.62 (0.67)	-0.6 (0.59)	-8.45*** (1.29)	-0.96 (0.68)	0.94*** (0.2)	1.51** (0.47)
DE	0 (0.3)	-0.87** (0.25)	-0.19 (0.2)	-0.94 (0.45)	-1.95 (2.95)	-0.13 (0.16)	0.59 (0.37)	0.24 (0.19)	-3.62*** (0.73)	-2.18*** (0.49)	0.47*** (0.11)	1.35** (0.42)
DK	-0.26 (0.27)	-0.7** (0.2)	-0.36 (0.2)	-0.48 (0.33)	-0.3 (0.21)	-0.12 (0.27)	-0.01 (0.22)	-0.57 (1.73)	-2.53** (0.76)	-5.27*** (1.13)	0.55*** (0.11)	2.7*** (0.51)
ES	0.52 (0.37)	-0.54* (0.19)	0.05 (0.1)	1.59 (0.79)	-4.28 (3.55)	-0.37** (0.11)	0.86* (0.3)	-0.2 (0.23)	-4.81*** (1.07)	-4.9** (1.53)	1.21*** (0.2)	0.73 (0.44)
FR	-0.03 (0.25)	-0.41* (0.17)	-0.19 (0.19)	0.25 (0.37)	-2.19*** (0.4)	0.03 (0.22)	-0.83 (0.79)	-0.37 (0.31)	-2.8*** (0.66)	-4.18*** (0.95)	0.53*** (0.12)	2.81*** (0.52)
EL	0.68 (0.56)	0.49 (0.27)	0.46 (0.38)	0.58 (2)	6.69 (10.31)	0 (0.51)	-0.41 (0.82)	0.34 (0.75)	-4.02* (1.41)	-2.35** (0.77)	0.83** (0.24)	1.51** (0.47)
IT	0.48 (0.34)	-0.42 (0.22)	-0.19 (0.15)	-1.3* (0.53)	-1.73 (2.3)	0.03 (0.14)	-0.78 (0.39)	-0.6*** (0.07)	-4.96*** (0.68)	-2.13* (0.75)	0.69** (0.18)	2.02*** (0.3)
PO	1.41* (0.63)	0.32 (0.52)	-0.2 (0.64)	-0.44 (4.77)	-6.12* (2.75)	-0.35 (0.79)	-0.42 (1.55)	-0.69 (1.04)	-4.26 (4.35)	-4.44*** (0.96)	1.43** (0.37)	2.42* (0.97)
RO	0.42 (0.83)	-0.27 (0.54)	1.05* (0.42)	1.02 (0.98)	-0.56 (3.45)	1.39 (0.68)	1.02 (0.68)	1.18 (0.93)	1.74 (1.9)	0.08 (0.52)	1.35* (0.64)	1.32 (0.91)
SE	-0.03 (0.26)	-0.53 (0.28)	-0.39 (0.25)	0.02 (0.2)	-0.53 (1.1)	-0.75** (0.23)	0 (0.36)	-0.62 (0.59)	-5.08* (1.88)	-3.66*** (0.88)	0.71** (0.23)	2.22*** (0.45)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by real potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A23 / Regression coefficients output gap normalising with nominal potential output when excluding the year 2020 (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.25 (0.29)	-0.3 (0.22)	-0.07 (0.2)	-0.17 (0.68)	-2.1 (1.73)	0 (0.22)	-0.25 (0.56)	0.09 (0.15)	-2.98** (0.86)	-6.22*** (1.36)	0.64*** (0.13)	1.52** (0.45)
CZ	-0.25 (0.28)	-0.47 (0.35)	-0.29 (0.36)	2.55 (1.23)	-4.94 (5.94)	-0.05 (0.37)	0.65 (0.82)	-0.32 (0.72)	-8.42*** (1.61)	-0.96 (0.68)	1.04*** (0.2)	1.42** (0.36)
DE	0.1 (0.32)	-0.53* (0.21)	-0.05 (0.18)	-0.81 (0.45)	-2.41 (2.91)	-0.02 (0.16)	0.62 (0.34)	0.09 (0.18)	-3.68*** (0.78)	-2.18*** (0.49)	0.57*** (0.15)	1.13* (0.39)
DK	-0.35 (0.27)	-0.85*** (0.17)	-0.61*** (0.14)	-0.38 (0.36)	-0.27 (0.29)	-0.43 (0.27)	-0.38* (0.15)	-0.63 (1.7)	-3.17*** (0.72)	-5.27*** (1.13)	0.11 (0.12)	2.7*** (0.39)
ES	0.09 (0.43)	-0.88** (0.24)	-0.36* (0.13)	1.14 (0.87)	-3.44 (3.25)	-0.81*** (0.16)	0.37 (0.32)	-0.5 (0.28)	-7.19*** (0.91)	-4.9** (1.53)	0.84*** (0.2)	0.25 (0.39)
FR	-0.27 (0.27)	-0.62** (0.18)	-0.44* (0.2)	0.03 (0.35)	-2.35** (0.66)	-0.31 (0.22)	-0.98 (0.78)	-0.4 (0.2)	-2.51** (0.75)	-4.18*** (0.95)	0.24 (0.13)	2.44*** (0.38)
EL	-0.08 (0.49)	0.48 (0.26)	0.42 (0.33)	-0.76 (1.77)	7.01 (10.03)	-0.05 (0.46)	-0.76 (0.49)	0.4 (0.79)	-3.54* (1.16)	-2.35** (0.77)	0.75** (0.23)	1.5** (0.41)
IT	0.48 (0.35)	-0.4 (0.23)	-0.15 (0.15)	-1.33* (0.51)	-1.77 (2.27)	0.09 (0.17)	-0.8* (0.36)	-0.52*** (0.08)	-4.96*** (0.71)	-2.13* (0.75)	0.6* (0.23)	2.15*** (0.28)
PO	0.9 (0.62)	-0.18 (0.54)	-0.3 (0.9)	-0.48 (5.26)	-6.36* (2.75)	-0.69 (0.88)	-1.9 (1.1)	-0.98 (0.9)	-4.36 (4.07)	-4.44*** (0.96)	1.01* (0.45)	1.73 (0.92)
RO	0.89 (0.91)	0.18 (0.44)	0.77 (0.53)	-0.02 (0.99)	-0.01 (2.74)	0.4 (1)	-0.06 (0.66)	-0.6 (1.57)	0.42 (1.5)	0.08 (0.52)	1.57* (0.59)	1.29 (0.96)
SE	-0.01 (0.23)	-0.5 (0.32)	-0.38 (0.27)	0.23 (0.2)	-0.69 (1.07)	-0.6* (0.23)	-0.12 (0.36)	-0.68 (0.57)	-5.16* (1.76)	-3.66*** (0.88)	0.65** (0.21)	2.21*** (0.33)

Notes: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by nominal potential output.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A24 / Regression coefficients alternative output gap measure: ratio of employed and self-employed to the working-age population when excluding the year 2020 (OLS, AR1)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.31 (0.58)	0.01 (0.33)	0.4 (0.28)	-0.06 (1.21)	0.03 (3.07)	0.76** (0.22)	0.4 (1.24)	0.51** (0.15)	-4.9* (2.12)	-11.68*** (2.85)	1.48*** (0.26)	2.1 (1.24)
CZ	-0.24 (0.86)	0.84 (0.7)	1.08 (0.68)	3.16 (4.37)	23.55* (9.86)	-0.04 (0.49)	3.13 (1.91)	0.74 (1.14)	-10.52* (3.75)	-2.08 (1.25)	1.96** (0.5)	2.07 (1.46)
DE	0.28 (0.37)	-1.64** (0.5)	-0.65 (0.36)	0.09 (0.77)	8.95 (11.51)	-0.56 (0.38)	0.2 (0.76)	-0.21 (0.46)	-8.07 (4.63)	-4.09 (1.94)	1.14*** (0.2)	0.55 (1.78)
DK	0.52 (0.41)	-0.93*** (0.23)	-0.31 (0.24)	-0.49 (0.48)	-0.34 (0.39)	0.62 (0.39)	0.17 (0.3)	1.86 (2.95)	-4.9*** (0.52)	-12.17*** (1.95)	1.4*** (0.11)	2.13 (1.62)
ES	0.47 (0.35)	-0.38* (0.14)	0.15 (0.11)	1.41 (0.75)	-7.05* (2.98)	0.04 (0.11)	0.79* (0.3)	-0.07 (0.28)	-3.94*** (0.55)	-4.93*** (1.19)	1.03*** (0.17)	1.27** (0.4)
FR	-0.34 (0.39)	-0.55 (0.27)	-0.21 (0.3)	0.87 (0.56)	-2.12* (0.86)	-0.41 (0.31)	-2.62* (1.21)	-0.61 (0.45)	-3.3** (1.01)	-6.4* (2.32)	0.93*** (0.23)	3.45** (1.15)
EL	0.11 (0.73)	0.62 (0.64)	0.12 (0.94)	7.12** (1.84)	28.01 (25.81)	0.4 (1.38)	-0.97 (1.03)	-0.48 (2.05)	-0.7 (3.56)	0.75 (1.23)	0.57 (0.36)	-0.46 (0.92)
IT	0.35 (0.49)	-0.27 (0.22)	0.14 (0.27)	-1.25 (1.28)	-2.43 (4)	0.51* (0.22)	0.24 (1.46)	-0.39 (0.24)	-5.53 (2.52)	-1.74 (1.3)	0.98** (0.27)	2.28*** (0.55)
PO	1.52** (0.49)	-0.06 (0.27)	-0.33 (0.32)	3.87 (2.62)	-3.07 (1.61)	-0.38 (0.46)	0.15 (1.03)	1.41 (1.57)	2.15 (3.22)	-3.86*** (0.9)	1.89*** (0.33)	1.02 (0.81)
RO	1.11 (0.76)	0.69 (0.52)	0.04 (0.64)	-0.04 (1.3)	-6.38 (4.67)	0.13 (0.82)	0.91 (0.86)	-0.17 (1.16)	-1.97 (1.03)	-1.19*** (0.29)	0.54 (0.52)	-0.93 (0.85)
SE	1.13*** (0.28)	0.04 (0.43)	-0.19 (0.38)	0.55 (0.45)	-2.05 (2.82)	0.06 (0.52)	0.35 (0.65)	-3.11 (1.4)	-11.23** (3.35)	-7.46*** (0.82)	1.4** (0.38)	0.38 (1.48)

Notes: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations. Note that all variables are normalised by the size of the working-age population.  
Sources: Eurostat (COFOG), AMECO, own calculations.



## APPENDIX F / SENSITIVITY ANALYSIS: IMPLICATIONS FOR STRUCTURAL FISCAL BALANCES

In order to show the implications of our results, we report the structural budget balances that would result in the context of cyclical adjustment in EU fiscal rules if health and social spending were taken into account when calculating budget semi-elasticities. By only accounting for unemployment spending, the OECD-COM method actually considers a rather small part of total public spending (between 0.5% and 5.8% for the countries in our sample; see Table A2 in Appendix B). Table A25 shows how including the presented spending elasticities changes the structural balance estimates for 2022. We thereby include social spending in two different ways: First, we include each component of social spending (FAM, HOU, OLD, SICK, SURV, U\_Sp) and health spending separately (see 'disaggregated' columns). Second, we treat them as a single item, including only the coefficient for SOC (see 'aggregated' columns). In both cases, we only include statistically significant coefficients (meaning that an insignificant coefficient is treated as if the elasticity were 0). The official estimate used by the European Commission is reported in the column on the far right. Differences in estimated structural fiscal balances to the official estimate range from -0.12 percentage points (Greece, CLS, aggregated) to +0.29 percentage points (Czechia, 2SLS, nominal, aggregated). Results for excluding the year 2020 can be found in Table A26.

**Table A25 / Structural balances (percent) under semi-elasticities including individual items of social spending (disaggregated) and total social spending (aggregated); only statistically significant coefficients are considered**

Country	disaggregated				aggregated				Official
	CLS	CLS (nom)	2SLS	2SLS (nom)	CLS	CLS (nom)	2SLS	2SLS (nom)	
AT	-3.84	-3.81	-3.82	-3.81	-3.85	-3.85	-3.88	-3.86	-3.81
CZ	-3.11	-3.13	-3.20	-3.10	-3.04	-3.05	-3.22	-2.92	-3.21
DE	-2.27	-2.28	-2.28	-2.28	-2.27	-2.27	-2.35	-2.27	-2.29
DK	3.11	3.11	3.12	3.08	3.10	3.09	3.10	3.05	3.13
ES	-3.97	-3.88	-3.90	-3.75	-4.01	-3.92	-3.89	-3.71	-3.95
FR	-4.74	-4.74	-4.74	-4.75	-4.74	-4.74	-4.74	-4.75	-4.74
EL	-2.24	-2.25	-2.27	-2.27	-2.36	-2.35	-2.27	-2.27	-2.24
IT	-8.67	-8.67	-8.67	-8.67	-8.70	-8.69	-8.69	-8.62	-8.63
PO	-4.96	-4.96	-4.90	-4.99	-4.90	-4.90	-4.90	-4.90	-4.98
RO	-5.84	-5.84	-5.84	-5.84	-5.84	-5.84	-5.84	-5.84	-5.83
SE	0.55	0.56	0.63	0.56	0.56	0.59	0.54	0.53	0.57

Notes: All numbers reported in the table are in percent of potential output. CLS: conditional least squares. (nom): normalisation with nominal potential output. 2SLS: two-stage least squares.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A26 / Structural balances (percent) under semi-elasticities including individual items of social spending (disaggregated) and total social (aggregated) when excluding the year 2020 from the sample; only statistically significant coefficients are considered**

Country	disaggregated				aggregated				Official
	CLS	CLS (nom)	2SLS	2SLS (nom)	CLS	CLS (nom)	2SLS	2SLS (nom)	
AT	-3.68	-3.78	-3.81	-3.78	-3.74	-3.74	-3.86	-3.74	-3.81
CZ	-3.24	-3.24	-3.20	-3.24	-3.22	-3.22	-3.22	-3.22	-3.21
DE	-2.28	-2.28	-2.28	-2.28	-2.26	-2.27	-2.25	-2.27	-2.29
DK	3.11	3.10	3.12	3.10	3.10	3.06	3.10	3.06	3.13
ES	-4.01	-3.81	-3.91	-3.81	-4.00	-3.72	-3.89	-3.72	-3.95
FR	-4.73	-4.73	-4.74	-4.73	-4.74	-4.75	-4.74	-4.75	-4.74
EL	-2.24	-2.25	-2.22	-2.25	-2.38	-2.27	-2.27	-2.27	-2.24
IT	-8.67	-8.68	-8.61	-8.68	-8.68	-8.62	-8.68	-8.62	-8.63
PO	-4.76	-4.91	-4.90	-4.91	-4.77	-4.90	-4.90	-4.90	-4.98
RO	-6.00	-5.84	-5.84	-5.84	-5.84	-5.84	-5.84	-5.84	-5.83
SE	0.55	0.55	0.55	0.55	0.56	0.53	0.55	0.53	0.57

Sources: Eurostat (COFOG), AMECO, own calculations.

## APPENDIX G / AUTOREGRESSION IN RESIDUALS OF CLS

Tables A27 and A28 report the results of testing the residuals for autocorrelation in the residuals for the two conditional least squares specifications while controlling for first order autocorrelation in the residuals and normalising with real and nominal potential output, respectively.

**Table A27 / Ljung-Box test for autocorrelation in the residuals when normalising with real potential output (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.359	0.45	0.416	0.912	0.238	0.668	0.325	0.155	0.009	0.717	0.859	0.421
CZ	0.202	0.604	0.371	0.283	0.4	0.059	0.287	0.2	0.321	0.01	0.044	0.031
DE	0.075	0.979	0.552	0.077	0.306	0.154	0.29	0.216	0.699	0.087	0.586	0.322
DK	0.413	0.627	0.4	0.412	0.969	0.389	0.522	0.784	0.83	0.359	0.412	0.615
ES	0.142	0.234	0.021	0.005	0.023	0.014	0.533	0.176	0.099	0.176	0.465	0.411
FR	0.135	0.894	0.826	0.156	0.5	0.152	0.663	0.342	0.312	0.193	0.481	0.107
EL	0.1	0.286	0.121	0.032	0.013	0.233	0.18	0.42	0.13	0.143	0.865	0.056
IT	0.022	0.063	0.215	0.377	0.824	0.695	0.966	0.369	0.362	0.691	0.333	0.3
PO	0.261	0.467	0.35	0.762	0.077	0.037	0.086	0.487	0.919	0.021	0.091	0.364
RO	0.46	0.26	0.184	0.212	0.272	0.344	0.224	0.45	0.293	0.893	0.689	0.031
SE	0.226	0.017	0.152	0.654	0.911	0.281	0.124	0	0.341	0.374	0.407	0.821

Notes:  $p < 0.05$  suggests the presence of autocorrelation in the residuals; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations.

Sources: Eurostat (COFOG), AMECO, own calculations.

**Table A28 / Ljung-Box test for autocorrelation in the residuals when normalising with nominal potential output (conditional least squares controlling for first order autocorrelation in the residuals)**

Country code	HEAL	SOC	SOC*	FAM	HOU	OLD	SICK	SURV	U_Sp	U_Rt	WAGE	GOSC
AT	0.549	0.177	0.209	0.459	0.292	0.681	0.284	0.139	0.058	0.717	0.61	0.525
CZ	0.517	0.326	0.204	0.367	0.312	0.146	0.125	0.9	0.203	0.01	0.437	0.146
DE	0.153	0.611	0.444	0.066	0.397	0.141	0.119	0.043	0.628	0.087	0.999	0.653
DK	0.161	0.467	0.502	0.374	0.766	0.659	0.262	0.679	0.926	0.359	0.974	0.626
ES	0.013	0.497	0.698	0.043	0.017	0.052	0.206	0.171	0.103	0.176	0.455	0.597
FR	0.465	0.963	0.31	0.283	0.71	0.012	0.719	0.569	0.347	0.193	0.46	0.101
EL	0.29	0.343	0.191	0.067	0.01	0.178	0.27	0.397	0.293	0.143	0.842	0.07
IT	0.003	0.205	0.211	0.501	0.857	0.542	0.92	0.438	0.45	0.691	0.863	0.312
PO	0.431	0.16	0.226	0.873	0.21	0.031	0.217	0.438	0.869	0.021	0.339	0.681
RO	0.495	0.014	0.144	0.062	0.369	0.098	0.043	0.502	0.897	0.893	0.774	0.372
SE	0.132	0.064	0.068	0.949	0.925	0.162	0.039	0	0.357	0.374	0.784	0.864

Notes:  $p < 0.05$  suggests the presence of autocorrelation in the residuals; HEAL...health expenditure, SOC...social expenditure, SOC\*...social expenditure net of unemployment spending, FAM...spending on family and children, HOU...housing spending, OLD...old-age spending, SICK...sickness and disability spending, SURV...spending on survivors' pensions, U\_Sp...unemployment spending, U\_Rt...unemployment rate, WAGE...compensation of employees, GOSC...gross operating surplus of corporations.

Sources: Eurostat (COFOG), AMECO, own calculations.



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Internet Homepage: [www.wiiw.ac.at](http://www.wiiw.ac.at)

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