DOES OPTIMAL SIZE OF GOVERNMENT SPENDING EXIST?

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1. Introduction

Growth theory is an important part of modern macroeconomics. The analysis of growth has long been based on the Solow (1956) ”growth accounting” approach, also termed as neo-classical growth theory, which has two important predictions about growth in the long run. These predictions are that economic growth occurs as a result of exogenous technological change, and that income per capita of countries will converge. Since it is presumed that all determinants of growth are exogenous, it is obvious that government policy cannot affect growth rates, except temporarily during the transition of economies to their steady state. Consequently, the role of government in growth process was usually not investigated in standard neo-classical growth models.

The advent of the class of growth models developed by Romer (1986), Lucas (1988), Barro (1990) and Rebelo (1991), which in essence constitute a new, endogenous growth theory, has caused that the view on the role of government in growth process changed. According to this theory, both transition and steady state growth rates are endogenous, implying that also long-run economic growth rates are endogenous. There are several factors that should be important for determining long run growth, although in all endogenous growth models, government can influence growth, either directly or indirectly (see Brons, de Groot and Nijkamp, 1999). As a result, long-term growth rates can differ across nations, and there is no necessity that convergence in income per capita should occur. More significantly, as Dar and AmirKhalkhali (2002) report, a major implication of endogenous growth models is that government policy can have wide-ranging implications for a country's long-run growth performance. Namely, the three main fiscal instruments, being taxation, expenditure, and the aggregate budgetary balance, affect long-term growth through their effects on the efficiency of resource use, the rate of factor accumulation and the pace of technological progress.

2. Government spending and economic growth

Empirical work on the determinants of economic growth seems to present strong evidence that a large government sector negatively affects economic growth. This result has been confirmed in numerous studies (e.g., Barro (1991), Engen and Skinner (1992), Hansson and Henrekson (1994), Gwartney, Holcombe and Lawson (1998), Fölster and Henrekson (2001)). More specifically, in recent studies, the negative impact of government size on factor productivity and capital formation has been stressed, resulting also in lower economic growth. For instance, Dar and AmirKhalkhali (2002) argue that this adverse impact appears to reflect the lower productivity of the capital input in countries with a large government size. Accordingly, the advantage of a small government sector is that, in general, should reflect the

greater efficiencies resulting from fewer policy induced distortions and lower tax burden, more efficient resource use due to the existing market forces, and the absence of crowding-out effects that impair the incentives for capital creation.[1]

In order to investigate the relationship between government spending and economic growth, data for 12 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Sweden and the United Kingdom) were obtained for 1951-1995 time period.[2] According to the panel data regression analysis using five-year arithmetic averages, there is clearly observable negative relationship between the size of government and economic growth.

Table 1: *Relations between government spending and GDP growth, restricted fixed effect approach*[3]

Explanatory variables	**Dependent variable**		
	Real growth of GDP (*RGR*)		**Change in real growth of GDP (*D(RGR)*)**
Regression constant (*CONST*)	7.9391 (0.000)	8.6378 (0.000)	0.1789 (0.179)
Government expenditures in GDP (*EXP*)	-0.1076 (0.000)	-0.1155 (0.000)	/
Change in government expenditures (*D(EXP)*)	/	-0.0678 (0.024)	-0.1428 (0.000)
N	96	84	84
$R^2_{adj.}$	0.5096	0.5531	0.2636
s_e	1.02	0.95	1.23
d-stat.	2.34	2.08	2.00
F-stat.	50.36	35.23	15.86

P-values are in parentheses.

Source: Own calculations.

The slope coefficient of variable *EXP* in the first column indicates that a country with a 10 percentage point larger general government expenditures as a share of GDP has, on average, approximately 1.1 percentage point lower economic growth rate. It seems that government spending alone would explain more than 50 percent of the differences in economic growth rates among 12 European countries during the sample period. Moreover, economic growth also seems to be negatively correlated with the change of government expenditures in last period, reinforcing the negative effect of government expansion on economic growth. The above evidence indicates that big government imposes a heavy penalty in the form of a lower rate of economic growth. Moreover, it can be concluded that the growth rate reductions are

[1] Heitger (2001) also investigated this phenomenon and discovered that growth in government size has negative impact on physical capital formation through the "investment channel", implying that government also crowds out private investment in physical capital.

[2] Data are based on GGDC (2003) (GDP growth) and Cusack (1991/98) (government expenditure ratio).

[3] Regression estimates include White's heteroscedasticity-consistent covariance matrix estimators and first-order autoregressive adjustment. The results of restricted F test indicate that the restricted fixed effect regression model should not be invalid.

substantially greater for the countries with the largest expansion in the size of government.[4] Namely, the regression results add some precision to these findings – there is a strong negative relationship between the change in government expenditures and change in GDP growth. For example, the results indicate that a one-percentage point change (increase) in government spending is associated with an approximately 0.15 percentage point change (reduction) in real economic growth rate. This provides additional support for the hypothesis that also growth of government sector reduces economic growth rates.

3. Non-linear relationship between government spending and economic output (the concept of optimally sized government)

Although it may seem plausible that negative relationship between government size and economic growth exists, mainstream theory, such as in Barro (1990) or Dar and AmirKhalkhali (2002), predicts that the negative effect should be expected in countries where the size of government sector exceeds a certain threshold. The fact that a complex and non-linear relationship between government spending and growth exists has been first empirically verified in endogenous growth models. For instance, Barro (1990) pointed out that different sizes of government have two effects on growth rate. Namely, an increase in taxes reduces growth rate through disincentive effects, but an increase in government spending raises marginal productivity of capital, which raises growth rate. He argues that the second force dominates when the government is small, and the first force dominates when the government is large. Consequently, the effect of increased government spending on economic growth should be non-monotonic and some optimal size of government should exist. He showed that the government services are ”optimally” provided when their marginal product equals unity (so-called Barro rule). Interestingly, based on empirical findings Barro plotted an inverted U-shaped curve showing the relationship between growth rate and government expenditure ratio.

The notion of the existence of systematic non-linear relationship between government spending and economic growth has been later reformulated and popularised in several studies. For instance, Heitger (2001) views increases in government size arising from increased consumption as constraints on growth, while increases in size that arise from government investment should be positive in their effect on growth. His central hypothesis is that government expenditures on core public goods (such as on the rule of law, internal and external security, etc.) have a positive impact on economic growth[5], but this positive impact of government tends to decline or even reverse if government further increases expenditures in a way that it also provides private goods. He stresses that two important reasons for a negative impact of excessive government spending on economic growth are the fact that the necessary taxes reduce the incentives to work, to invest and to innovate, and the fact that government crowds out more efficient private suppliers.

Similarly, Yavas (1998) has shown that an increase in government size will increase the steady-state level of output if the economy is at low steady-state (i.e., underdeveloped), and will decrease the steady-state level of output if the economy is at a high steady-state (i.e.,

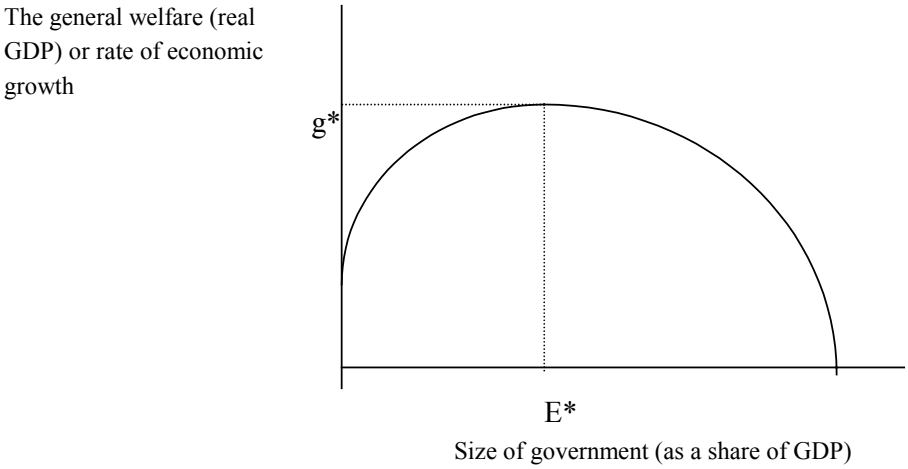
[4] Because the sample is based on countries with relatively similar political structures, incomes, and levels of development, the potential impact of differences in such things as culture, natural resources, and motivation of the people is minimised.

[5] For instance, Brumm (1997) argues that military spending positively and statistically significantly impacts economic growth rate by increasing the security of property rights. This calls into some question the notion that defence spending is unproductive and Kennedy’s (1987) suggestion that increased military spending, which results in ”imperial overreach”, drains resources out of nations and causes their decline.

developed). He argues that in the underdeveloped countries a significant portion of the government expenditures is directed to the building of the infrastructure of the economy and this type of government expenditure will have a stimulating effect on private sector production. In contrast, the developed countries already have most of their infrastructures built and a major part of their government spending is on welfare programmes and various social services. Accordingly, the positive effect on spending on these programmes on private output will not be as great as that of expenditures on infrastructure.

The notion of optimal size of government has been popularised by Armey (1995), who developed so-called Armey Curve. He argues that non-existence of government causes a state of anarchy and low levels of output per capita, because there is no rule of law, and no protection of property rights. Consequently, there is little incentive to save and invest, because the threat of expropriation exists. Similarly, where all input and output decisions are made by government, output per capita is also low.[6] However, where there is a mix of private and government decisions on the allocation of resources, output should be larger. Accordingly, the output-enhancing features of government should dominate when government is very small, and expansions in governmental size should be associated with expansions in output. Nevertheless, at some point growth-enhancing features of government should diminish and further expansion of government should no longer lead to output expansion. Namely, as spending rises, additional projects financed by government become increasingly less productive and the taxes and borrowing levied to finance government impose increasing burdens.[7] At some point, the marginal benefits from increased government spending become zero (point E* in Figure 1).

Figure 1: *Government spending and the economy (the Armey Curve)*



Source: Armey, 1995.

According to Chao and Grubel (1998), several forces shape afore mentioned inverted U curve. Namely, they stress that the law of diminishing returns to additional government spending exists and the additional withdrawal of resources from the private sector more and more

[6] As Vedder and Gallaway (1998) stress, the monopolisation of the allocation of resources and other economic decisions by government usually does not lead to sustained economic prosperity, as too much government stifles the spirit of enterprise and consequently lowers economic growth. In this context, the revealing should be the experience of former socialist and communist countries in Europe.

[7] For instance, while the construction of main roads as a part of infrastructure initially assists output expansion, the construction of secondary roads has less added positive impact.

occurs at the cost of projects with ever-higher returns. Besides, in order to raise revenue to finance government spending, taxes have to be imposed, which reduce the private sector's incentives to work, save, invest, and take risks. Nevertheless, some of the spending programmes can also disincentive effects if they lower the risk of economic life.[8] These effects change economic behaviour of individuals, which decrease the effective supply of labour and entrepreneurship. As Chao and Grubel point out, all these forces reduce economic growth.

There have been several attempts to determine the level of government spending at which growth rate is optimised. For example, Vedder and Gallaway (1998) estimated that the optimal size of federal government spending based on the Armey Curve in the United States in the period 1947-1997 was 17.45 percent of gross domestic, meaning that federal spending of about 22 percent at the beginning of 1990s was roughly 20 percent too large from the standpoint of growth optimisation. Considering general government spending, Peden (1991) estimated that the optimal size of U.S. government is at 20 percent of GDP. Similar conclusion were obtained by Scully (1994) who estimated that optimal growth-maximising average rate for federal, state and local taxes combined was between 21.5 percent and 22.9 percent of gross national product in the United States in the period 1929-1989. In addition, Chao and Gruber (1998) estimated that in the period 1929-1996 optimal size of government spending in Canada was about 27 percent, which is about 20 percentage points less that the actual government spending in 1996. In somewhat different context, by examining socio-economic indicators, Tanzi and Schuknecht (1998) and Afonso, Schuknecht and Tanzi (2003) suggest that general government spending in excess of 30 percent of national output reduces economic growth and produces practically no additional improvement in social measures of well being.

Besides, some theoretical studies have advocated the use of an allocative efficiency rule to establish the optimal size and scope of government.[9] As Gupta et.al. (2001) stress, the rule that the size and scope of government are optimal when the social marginal cost of public resources is equal to their social marginal benefit is difficult to operationalise, although it may be intellectually appealing. Consequently, alternative rules need to be used to establish optimal or "appropriate" size of government, as for instance Armey Curve relationship. Nevertheless, it should be mentioned that most economists would probably accept the validity of the inverted-U shape of the Armey curve as a realistic description of the world. However, in order to validate the curve and get the precise curvature of the line, empirical analysis should be performed.

4. Evidence on the existence of Armey Curve phenomenon

Statistical testing has shown that the Armey Curve phenomenon exists in the United States, although it was tested separately for central and local government spending. However, as Vedder and Gallaway (1998) admit, it is possible that their results could be spurious, as they potentially do not fully account for other factors that might affect economic growth[10], so they suggest the replication of the test for other countries as different nations have different

[8] For instance, social security programmes protecting workers from unemployment, illness, and retirement often cause them to change their behaviour and reduce work-effort and savings as they are insured.
[9] On the theoretical background of this rule see Bailey (1999).
[10] For instance, the possibility exists that economic growth is strongly influenced by cycles of innovation and the rise in the relative size of government may coincide with a slowdown in the rate of innovation for reasons unrelated to government, as reported by Schumpeter (1934).

political environments, different spending histories, and different patterns of change in non-observable variables, such as the pace and pattern of innovation.

4.1. Data and methodology

Therefore, the purpose of the article is to empirically verify the existence of Armey Curve in the sample of selected European countries for the 1950-1996 period, using general government expenditure ratio[11]. This was the period without wars and the extensive development of the welfare state in modern times, resulting in the rise of government spending. The data on general government expenditure as a share of GDP and real gross domestic product were, similarly to the analysis in chapter 2, obtained for 12 Western European industrial countries, for which the data after the end of World War II are continuously available: Austria, Belgium, Denmark, France, Finland, Federal Republic of Germany, Republic of Ireland, Italy, Netherlands, Norway, Sweden and the United Kingdom. Compared to most others countries around the world, the institutional arrangements and income levels of 12 European countries are relatively similar. These countries were politically stable democracies throughout the whole period after the World War II and 11 of these countries are now even members of the European Union, so panel data analysis could be applied. Nevertheless, despite their similarities in many areas, including economic and political connections and common institutional framework, the size of government sector as a share of economy has varied substantially among them and across time periods. The data on real gross domestic product were obtained from GGDC (2003) and the data on general government expenditure were obtained from Cusack (1991, 1998).[12]

Since time series and cross section data on general government expenditure and real gross domestic product were obtained, both of which are supposed to be relevant to this particular empirical problem, it is reasonable that the econometric methodology is based on pooling of time series and cross-sectional observations. Since each cross-sectional unit (12 countries) has the same number of the time series observations (47), balanced panels is estimated. Therefore, the Armey Curve can be written as:

$$GDP_{it} = \beta_1 + \beta_2 EXP_{it} + \beta_3 EXP^2_{it} + u_{it}$$

i = AUT, BEL,..., UK
t = 1950, 1951,..., 1996

It is expected that the linear term, *EXP*, would have the positive sign and is designed to show beneficial effects of government spending on output. On the contrary, the squared term, EXP^2, is expected to have negative sign and should measure any adverse effects associated with

[11] It is worth noting that several studies use central government expenditure ratio as a measure of the size of government, probably because this measure is available for more countries. However, as Gwartney, Holcombe and Lawson (1998) report, this ratio can be highly misleading, because it can underestimate the size of government for countries where substantial activities are undertaken at lower levels of government, as for example in Nordic Countries. Consequently, general government expenditure ratio is used in the analysis in order to test the impact of all budgetary government activities on economic output.

[12] The analysis ends in 1996. Namely, the principle is to use data from one source and not to update them with data from other sources. Besides, in the late 1990s public sector reform (including welfare state reform) and reduction of government spending has become an important part of policymaking in European countries. Therefore, the period until mid 1990s, when growth in government spending occurred, is useful in modelling optimal size of government from growth perspective.

increased governmental size. Put differently, this term should indicate the decreasing marginal productivity of government spending.

4.2. Panel data regression analysis of the Armey Curve

Estimation of panel data regression models depends on the assumptions that are made about intercept, the slope coefficients, and the error term. First, the simplest, and possibly naive approach is to disregard the space and time dimension of the pooled data. The results are as follows.

Table 2: *Panel data modelling of Armey Curve*[13]

Dependent variable *D(GDP)*, all models include White's HC	**Fixed effect (FEM) model**	**Least-squares dummy variable (LSDV) model**	**Error components (ECM) model**
CONST	-10944.56 (0.3899)	Country-specific intercepts[14]	-5619.91[15] (0.3709)
EXP	1167.84 (0.0543)	539.5015 (0.0341)	686.8285 (0.0175)
EXP^2	-15.9709 (0.0157)	-6.7380 (0.0190)	-8.1528 (0.0155)
AR adjustment (order)	1	1	/
N	540	540	552
$R^2_{adj.}$	0.4626	0.5605	0.5145 (GLS)
s_e	8251.03	7461.59	7789.97
d-stat.	2.08	1.89	1.36
F-stat.	155.66	350.72	/
Curve peak (EXP as a share of GDP)	36.56	40.03	42.12

P-values are in parentheses.

Source: Own calculations.

The results suggest that Armey Curve for 12 European countries peaks where the government spending equals at 36.56 percent of GDP (FEM model), at 40.03 percent of GDP (LSDV model), or at 42.12 percent of GDP (ECM model). If these results are correct, the size of government in countries analysed has been too large from the standpoint of growth or output

[13] FEM model suggests that the intercept and slope values are identical for all countries (see Gujarati, 2002). As already mentioned, each country has its political environment or "spending history", which means that appropriate model should also incorporate the "individuality" of each country. One proposed methodological way to take into account the "individuality" of each country is to let the possibility that intercepts vary for each country but still assume that the slope coefficients are constant across countries (LSDV and ECM model). Due to the existing problem of non-stationarity in level values of variable GDP, first-order differenced values of variable GDP are used as dependent variable.

[14] Country-specific values of regression constant are as follows: UK= 6673.01, IRL= -6954.54, NL= -2669.33, BEL= -4588.66, FRA= 10327.06, GER= 14738.87, AUT= -5462.23, ITA=9840.66, FIN= -6169.01, SWE= -4268.80, DK= -5277.06, NOR= -6162.97.

[15] Random error components for each country are: UK= 5079.00, IRL= -9182.20, NL= -4562.90, BEL= -6850.86, FRA= 8690.07, GER= 13067.52, AUT= -7652.81, ITA=7999.27, FIN= -8607.15, SWE= -6462.65, DK= -7565.78, NOR= -8343.45.

optimisation, since their government amounted, on average, 52.02 percent of GDP in 1996. Therefore, potential scope for reduction of government spending is from approximately 19 percent up to approximately 30 percent, depending on the estimation results of various panel data models employed.

However, given large differences in the size of government across countries included in the sample, some theoretical as well as methodological considerations about panel data estimation should be expressed. For instance, the results of the Seemingly Unrelated Regression (SURE) panel data model show that many differential intercept and the differential slope coefficients are statistically significant, indicating that the Armey Curves of all 12 analysed countries are obviously not identical. This might suggest that the data for the 12 countries are not ”poolable”, in which case Armey Curve phenomenon should be estimated for each country separately. In addition, Gupta et.al. (2001, p. 6) argue, although on more theoretical grounds, that there is no unique optimum level of government spending applicable to all countries. According to them, the social cost of raising revenues, as well as their social benefits, can be expected to vary among countries because of political economy factors, such as differences in voters' preferences and in the effectiveness of budgetary institutions. Consequently, a change in the scope of government would necessarily affect the social marginal benefit of some programmes, and, following, the overall marginal benefit of public spending.

4.3. Time series modelling of Armey Curve

According to the above results, panel data estimation of common Armey Curve for 12 European countries seems to be invalid. Therefore, Armey Curve should be estimated for each country separately. Methodology of time-series estimation is based on Autoregressive Integrated Moving Average (ARIMA) modelling.

Table 3: *Time series modelling of Armey Curve*

D. var. (*GDP*)	**Italy**	**France**	**Finland**	**Sweden**	**Germany**	**Ireland**	**Netherlands**	**Belgium**
CONST	-415560.3 (0.0153)	-163202.8 (0.0878)	-3336.61 (0.1611)	-4131.56 (0.2785)	-211235.0 (0.1449)	-11204.78 (0.0203)	-27559.11 (0.0615)	-14771.23 (0.0073)
EXP	24205.31 (0.0180)	8751.52 (0.0522)	264.91 (0.0315)	317.34 (0.0723)	12603.73 (0.0910)	610.0280 (0.0118)	1541.45 (0.0244)	920.8113 (0.0015)
EXP^2	-326.33 (0.0278)	-102.01 (0.0476)	-3.40 (0.0238)	-3.45 (0.0635)	-163.90 (0.0794)	-7.1804 (0.0137)	-17.1825 (0.0237)	-10.9868 (0.0017)
ARIMA Adj.	(0,1,0)	(0,1,1)	(0,1,3)	(1,1,3)	(0,1,0)	(1,1,0)	(1,1,0)	(0,1,0)
N	46	46	46	45	46	45	45	46
$R^2_{adj.}$	0.1411	0.1516	0.2446	0.3124	0.060	0.4660	0.1703	0.1761
s_e	35009.29	9466.09	1490.15	1705.16	16223.43	757.62	2794.73	2053.72
d-stat.	1.96	1.97	1.58	1.72	1.50	1.96	1.97	2.24
F-stat.	4.70	3.68	5.86	5.00	2.44	13.80	4.01	5.81

P-values are in parenthesis. Only countries with revealed phenomenon are presented in the table.

Source: Own calculations.

The results reported in the above table reveal that Armey Curve can be modelled for eight out of twelve European countries analysed. Those countries are Italy, France, Finland, Sweden, Germany, Ireland, Netherlands, and Belgium.[16] Based on those estimates, the proper extension of government spending reduction from the standpoint of output estimation can be derived for each country. The results presented in the table below indicate that the potentially huge scope exists for spending reduction, approximately 19 percent on average, which is a huge reduction, but still not so colossal to leave the government only the role of ”night-watchman”. These results should prove useful also for other countries, but nothing more or nothing less, as a benchmark value and not as possible highly sophisticated prescription.[17]

Table 4: *Possible scope for government spending reduction*

Country	**Size of government (% of GDP, 1996)**	**Armey Curve optimum (% of GDP)**	**Percentage change in spending as a share of GDP**
Italy	44.90	37.09	-17.39
France	54.73	42.90	-21.62
Finland	58.74	38.98	-33.64
Sweden	65.02	45.96	-29.31
Germany	48.72	38.45	-21.08
Ireland	39.60	42.28	+6.77
Netherlands	51.97	44.86	-13.68
Belgium	52.97	41.91	-20.88
		Average percentage change	**-18.85**

Source: Own calculations.

5. Concluding remarks

A substantial broadening in the scope of government activities occurred in recent decades in the majority of developed countries, primarily due to the development of modern welfare states. However, those welfare states have faced with several problems, especially in the form of efficiency losses from redistribution and disincentives of high taxation, which have obviously caused the decline of long-term GDP growth. Although negative and statistically significant relationship between government size and GDP growth has been established in this and several other studies, mainstream theory predicts that the negative effect should be expected in countries where the size of government sector exceeds a certain threshold. Consequently, optimal size of

[16] Yet, statistically significant estimates are not being obtained for United Kingdom, Austria, Denmark and Norway. Interestingly, results even show that the size of government is obviously “too small” in Ireland. However, this should prove useful, since it indicates that the modelling of Armey Curve is not biased toward smaller government.

[17] For instance, one of the frequently asked questions in connection with public sector reform in Slovenia is, what is the optimal size of our government sector. It is extremely difficult to answer this question, especially if the lack of comparable data prior to 1990s (due to the existence of different social and economic system) prevents the implementation of serious national study of causes of government sector growth.

government sector from GDP growth perspective should exist. The panel data estimates of Armey Curve suggest that optimal size of government in the sample of 12 European countries is approximately between 36 and 42 percent of GDP, indicating that potential scope for reduction of government spending ratio is from approximately 19 to approximately 30 percent. However, given the fact that large differences in the size of government across countries included in the sample exist, some theoretical as well as methodological considerations about panel data estimation occurred. Consequently, separate time series data estimations are implemented, implying, on average, approximately 19 percent reduction in government spending ratio.

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