TWIN DEFICIT THEORY AND ITS VERIFICATION

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Abstract

At a time of low interest rates and thus a limited (conventional) monetary policy effect, attention turned to fiscal policy and its ability to support economic growth. However, support for the economy by fiscal policy has its limits in the form of a (intertemporal) budget constraint. Thus, the interest is primarily focused on the amount and structure of public revenue and expenditure. The paper summarizes theories of public expenditures justifying their growth by effects of various factors. The study then makes an empirical verification of the impact of selected factors on external economic equilibrium, i.e., it analyses the fundamental logic of the twin deficit theory. The study is made using panel regression on an example of countries of the world (173 out of 195 countries) for the period 1995–2016. The study confirms that basic theoretical approaches can explain the growth in public expenditure. It proves that population age structure, degree of urbanization and population education have significant impacts.

Key words: twin deficit theory, public expenditures, panel regression.

JEL Code: H11, H50, H62.

Introduction

After the global financial crisis (2007–2009), many advanced economies entered a state where the interest rate was near zero or even negative. Economies were entering a so-called liquidity trap situation. In such situations, the effectiveness of conventional monetary policy decreases, at least according to the standard IS-LM model. By applying unconventional monetary policy tools, monetary policy may admittedly boost the economy, but the ability to influence long-term stable economic growth is very limited due to the generally accepted money neutrality at least in the long run.

In such a situation, the economy might benefit from fiscal policy. It may influence agents in two ways: with its revenues and expenditures. In times of low interest rates and decreasing economic performance, it offers itself to boost economic activity by decreasing

taxes on the revenue side and increasing expenditures. Increasing expenditures seems very efficient intuitively, but only in the short run, since in the long run these steps will lead to increasing sectoral indebtedness. At present, most attention is paid to expenditures of the general government sector. There are several theories that attempt to explain the development of these expenditures; each one emphasises one or more factors that cause them to grow. Less room is given to impacts of (increasing) public expenditures on external economic equilibrium (net export), i.e., the twin deficit theory (Abbas et al., 2011).

The paper therefore aims to focus on the main theories of public expenditures, make an empirical verification of selected theories for countries of the world (173 out of 195 countries) for the period 1995–2016 and how they affect external equilibrium. The paper contents is as follows. The first chapter introduces theories of public expenditures,[1] the second section deals with the chosen theoretical framework and methodology. The third chapter offers a verification of the selected theories. A brief summary follows.

1 Public expenditures[2,3]

Public expenditures are resources spent by the general government sector for various purposes (acquisition of public goods); a detailed breakdown is shown below. Analogously to public finance, public expenditures perform several functions: (a) allocation (provision of public goods for population), (b) redistribution (reduction to population income and property inequality), and (c) stabilisation (influencing of aggregate demand).

1.1 Classification and theories of public expenditures

For the purposes of development of statistics and subsequent easier analysis, public expenditures can be classified from several points of view (IMF, GFSM, 2014):

- The economic classification of expenditure, distinguishing between current and capital expenditures.[4] Current expenditures are typically mandatory (i.e., resulting from law or contractual commitments, e.g., expenditures on debt service, social transfers) or

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[1] Theoretically oriented texts use the general term *public expenditures* or, less frequently, *government spending*. The exact term according to the ESA 2010 is *general government expenditure*.

[2] Although the national accounts perspective ESA 2010 (Eurostat, 2013) would require us to speak with precision about revenues (expenditures) of the general government sector and refer to the government (public) sector as the general government sector, we take these terms as synonyms denoting the same facts.

[3] For a summary overview, see, e.g., Brown and Jackson (1995), IMF GFSM (2014).

[4] Theoretical publications dealing with public finance explaining changes in expenditures in this sector frequently does not explicitly distinguish between public expenditures on final consumption and public investment.

quasi-mandatory (obligation not laid down by law or other legal regulation or contractual commitment, but the government factually cannot waive their performance, e.g., wages for employees of budgetary and state-funded institutions, expenditures on defence, etc.). Capital expenditures include, e.g., investment purchases, investment transfers to businesses, etc.

- Sectoral (functional) classification of expenditure, distinguishing expenditures based on what sector they finance (e.g., healthcare, social affairs, education, defence, etc.). This is the foundation for the frequently used COFOG (Classification of the Functions of Government).

In addition, public expenditures can be classified based on: (a) rate of return, (b) sources of financing public expenditures, (c) subsectors of the general government sector that make the expenditures, (d) whether planned or not.

From the theoretical point of view, the approaches can be categorised by their causality and by the micro- and macroeconomic perspective:

- The causal approach to changes in expenditures of this sector may be either exogenous or endogenous depending on the economic growth. The exogenous approach postulates that growth of public expenditures will affect economic growth. The endogenous approach emphasises that growth of public expenditures is caused by economic development.

- The theories can also be viewed from a microeconomic or a macroeconomic perspective. Microeconomic theories concentrate on public goods demand and supply factors. Macroeconomic theories explain how public expenditures behave over longer periods, i.e., they analyse the temporal distribution of public expenditures, which is important for our empirical section.

The following are among the most frequently mentioned public expenditure growth theories:[5]

- Wagner's law declares that growing per capita income means a growing share of expenditures of the public sector. He justifies growing share of expenditures by income elasticity of demand for certain public goods being higher than one.

- Threshold effect – for some reason, government has to increase expenditures temporarily (e.g., to finance a military conflict or impacts of an economic crisis), so it

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[5] Due to the limited space available for this paper, we refer to, for example, Jackson and Brown (1995), who often refer to the original contributions of the theories and offer further discussion.

temporarily increases the tax ratio that society can tolerate, and the government sector justifies the taxation increase by the exceptional situation. As soon as the reason for higher taxation ceases (e.g., the reason for increased expenditures is over), the expenditures usually do not decrease, only their structure changes.[6]

- Rostow and Musgrave tried to explain investment of the general government sector in the context of economic convergence. If an economy is at the start of its evolution, it is typical for the government sector to make higher investment expenditures, e.g., on infrastructure. With the economy's gradual convergence towards advanced countries, the government investment activity decreases, which usually does not apply to public non-investment expenditures (e.g., on healthcare, education, etc.).

- Welfare theory – this approach advocates the thesis of the need to provide a living standard for all citizens, i.e., is grounded in the redistribution function of public finance. The government sector provides its citizens with social security, such as public healthcare, old age pensions, etc.

- Gradual growth theory – growth in public expenditures is affected by technological changes, which bring higher costs of application and implementation of these changes, or these changes cause provision of public goods on a larger scale (greater extent, more beneficiaries, etc.).

- Baumol's law – labour productivity growth in a private sector (processing industry) causes a "wage contagion" in the service sector, including non-market services, where productivity increases are more difficult due to the nature of the outputs provided (difficult substitution of capital for the labour). In cases of low public goods demand elasticity, the costs per unit output in the public sector grow.

2   Theoretical framework, methodology and data description

In the next subchapter we will focus on the theoretical concept, followed by a text devoted to methodology and data descriptions.

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[6] A typical example is the response of some governments after the oil shocks in the 1970s, which used the context of increased oil prices to increase their expenditures to boost the economy burdened by high fuel prices (Alesina and Perotti, 1994). As soon as the fuel prices decreased, the public expenditures in some economies did not decrease adequately. In our empirical section, we might consider impacts of the global financial crisis of the 2000s on growth in public expenditures, but the insufficient number of "post-crisis" years in our empirical analysis would make the verification insufficiently credible.

2.1   Theoretical framework

The theoretical framework chosen is the so-called twin deficit theory, i.e., simultaneous existence of deficits in the general government sector balance and the net export of balance of payments. There are two basic perspectives of the twin deficit theory. The first approach is referred to as Keynesian, the other as Ricardian, also known as the Barro-Ricardo hypothesis.

The Keynesian approach is grounded in the fundamental relationships of macroeconomic analysis, i.e., it essentially follows the expenditure method of product calculation and makes gradual modifications to reach the relationship between the general government sector balance and the external economic equilibrium. The identity holds in an open economy according to economic theory (Mach, 2001):

$$Y \equiv C + G + I + EX - IM, \qquad (1)$$

where Y is production (income), C is private consumption, G is public expenditures, I is private investment, EX is exports of goods and services, IM is imports of goods and services. The net exports (NX) equals the difference between exports and imports, i.e., $NX = EX - IM$. The disposable income Y_D can be expressed simply as:

$$Y_D \equiv Y + TR - TA . \qquad (2)$$

where TR is transfers and TA is taxes. The disposable income is divided into consumption and saving. The difference between taxes and transfers is net taxes (T). In addition, it holds that:

$$C + S + T \equiv C + G + I + EX - IM, \qquad (3)$$

$$S + T + IM \equiv I + G + EX, \qquad (4)$$

where S is private saving. Equation (4) can be rewritten and expressed as:[7]

$$NX \equiv (S - I) + (T - G). \qquad (5)$$

The first parentheses describe private sector saving and investment, the other is the balance of the general government sector. If the first parentheses are negative and the second balanced, the net export are negative (deficit) due to the private sector and its generation of saving and investment. If the government achieves a deficit (i.e., revenues from taxes is lower than public expenditures), the net export also enters a deficit in the case of equal private

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[7] This basic approach identifies *NX* with the current account of the balance of payments and explicitly excludes less important items of the current account of the balance of primary and secondary incomes.

saving and investment. This effect, i.e., simultaneous existence of a public finance and net export deficit, is known as the twin deficit.

Advocates of the alternative Barro-Ricardo approach (Barro, 1974) do not believe that changes in government deficit have an impact on real-world macroeconomic quantities; thus, they deny the Keynesian approach. If the tax burden decreases with public expenditures constant, the state budget deficit becomes worse while the households' disposable income increases. However, the growth of disposable income is not manifested as increased consumption but growing saving. The initial decrease in public saving is compensated for by growing private saving; thus, the national saving do not change and neither does the interest rate, which would have an effect on investment activity. Thus, the net export balance will not change either.

2.2 Methodology and data description

Our analysis examines how public expenditures affect net export, i.e.,

$$NX = f_1(G), \qquad (6)$$

where the public expenditures can be classified according to the categories (theories) above. Each of these categories of public expenditures (e.g., healthcare, education, etc.) is then influenced by various factors, e.g.,

$$G = f_2(demographic\ factors, geographic\ factors\ ...). \qquad (7)$$

Then we can write:

$$NX = f_3(demographic\ factors, geographic\ factors\ ...). \qquad (8)$$

The econometric technique used for the verification is panel regression (fixed effects model), which can be written as (Wooldridge, 2010):

$$y_{it} = \alpha_i + \beta_1 x_{it} + \beta_2 x_{it} + \cdots + u_{it} \qquad (9)$$

where $i = 1, 2... N$; $t = 1, 2... T$; α_i is the constant representing the effect of variables characteristic of the i-th observation, $\beta_{1,2...K}$ is the constant vector with the dimension $1 \times K$, where K is the number of independent variables, u_{it} is the error component, for which $u_{it} \sim IDD(0; \sigma_u^2)$. Using the Hausman test, we verified the suitability of the fixed effects model (for N, i.e., countries of the world), stationarity of time series was verified using the

usual tests (Levin, Lin and Chu; Im, Pesaran and Shin; 5% significance level). Unavailability of some data means this is an unbalanced panel.

The analysis included countries of the world (173 out of 195 countries) for the period 1995–2016 with an annual data frequency. All the data come from the publicly accessible UNCTADstat and World Bank databases. Econometric software used: Eviews 9.

3   Hypotheses and empirical verification

It can be assumed that the percentages of the pre-productive (aged 0–14, *YOUN*) and post-productive (aged 65 or more, *OLD*) generations in relation to the productive generation (aged 15–64) will affect the net export negatively, which is based on the life cycle theory known from theories of consumption. It explains the rates of consumption and saving (thus also investment) in the context of the population age structure (see Modigliani, 2005, for an overview).[8] When applying this theory to the general government sector, we can also say that the younger (pre-productive) and older (post-productive) parts of the population draw public services more than the overall average for the population (ÚNRR. 2019). This involves, for example, expenditures on primary education in the case of juveniles and expenditures on old age pensions for the post-productive generation.

Healthcare expenditures of the general government sector also play a crucial role in the context of demographic structure of the population. The concept of "healthy ageing" is debated widely at present in the context of healthcare expenditures (Hlaváček and Lakotová, 2019). The life expectancy increases practically worldwide. The question remains whether this extension to the life expectancy[9] is connected with "healthy ageing", i.e., whether life is extended in good health. If so, we can expect a positive impact on the development of the general government sector balance (e.g., thanks to participation of older generations on the labour markets). Conversely, if the life expectancy increases but if individuals spend these "additional" years of life not in good health but with complications (health restrictions and chronic illness) having a significant impact on their participation on the labour market and independence, it may a negative effect on the balance of general government sector

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[8] A certain analogy of the public expenditure approach of Musgrave and Rostow discussed above offers itself. Instead of an individual's life, we use the "life" (development) of a selected economy and its convergence, since the structure of public expenditures differs in various stages of economic convergence. A more precise worldwide verification of Musgrave and Rostow's approach collided with a lack of data.

[9] Extension of life expectancy is associated with higher costs of (not only) medical services, which experience substantial technological advances, which may indeed fulfil the concept of "healthy ageing" but with increased public expenditures (see gradual growth theory).

Some studies (Rodrik, 2015) prove higher growth and demand for goods of the non-tradable sector in more or faster urbanised economies. Ceteris paribus, the development of the non-tradable sector has an impact on worsening external economic equilibrium. If a country has a higher share of urban population in the total population (*CITY*, in per cent), then these more urbanised economies will also tend towards higher public expenditures (on urban infrastructure, etc.). We can also expect the higher income elasticity of demand for some services more typical of urbanised areas and their close vicinity (professional secondary and university education, research and development, greater need for expenditures on public order and security, etc.) to cause growth in the share of public expenditures in the product.

The number of years of school attendance beyond compulsory education (*EDU*) is used as a proxy variable to describe expenditures connected with education higher than primary. Public sector expenditures on higher education levels should affect the sector balance negatively at first,[10] but the more educated population in future should cause an increase in the human capital "stock" with higher productivity, which should reflect positively in the general government sector balance, thus also in net export (Grossman and Helpman, 1990).

The table below summarises the panel regression outputs. The share of net export in GDP (*NX*) was chosen as the independent variable.

Tab. 1: Determinants of public expenditures affecting net export

Dependent variable	Independent variable	Parameter	Standard error	t-statistics	p-value
NX	*CONS*	37.440	4.980	7.518	0.000
	YOUN	-0.229	0.037	-6.269	0.000
	OLD	-0.357	0.105	-3.396	0.001
	CITY	-0.120	0.064	-1.879	0.060
	EDU	-0.280	0.153	-1.826	0.068

Source: World Bank, UNCTADstat.
Note: number of observations: 2,866, adjusted R^2 = 0.758, F-stat = 51.931 (0.000), panel regression with fixed effects for countries. *CONS* = constant

The results of our estimate confirm the hypotheses formulated above. A negative effect on net export was registered for all the independent variables. Population ageing has the greatest impact on the general government sector balance. Conversely, the least impact was registered for degree of urbanisation.

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[10] It may also cause delayed entry of these young people on the labour market.

Experimentally, the model also included the share of gross value added in selected service sectors[11] in GDP, which reflects, in large part, the development of employee compensations, which should be connected with a negative impact on net export. The non-tradable nature of most of the services – particularly non-market ones – and Baumol's law (Baumol, 1967) are reflected here. The question remains whether the prior concept of "non-productive" services formulated when Baumol's paper was published may still apply today. Maybe it is no longer the case, since the service sector, primarily in services connected with modern technologies, achieve productivity similar to manufacturing (Young, 2014).

Conclusion

The present paper points out the importance of fiscal policy particularly after the global financial crisis. However, fiscal policy is also limited in the context of stimulating the economy, in terms of both its tax policy and expenditures. The general government expenditures have – not only in periods of decreasing economic activity – a tendency to grow constantly, as pointed out in numerous studies. According to the twin deficit theorem, growth in public expenditures leads to worsening external economic equilibrium, ceteris paribus.

Therefore, this study made an empirical verification of selected public expenditure theories on a panel of countries of the world (173 out of 195 countries) for the period 1995–2016 and how they affect net export. We proved that factors of fundamental significance are population age structure, degree of urbanisation due to higher demand for public goods in cities and (temporarily) expenditures associated with education levels higher than primary.

Acknowledgment

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[11] These are services included in section J–P according to the International Standard Industrial Classification of All Economic Activities. These include non-market services. A precise selection of non-market services only was not possible due to data unavailability in the databases used. Other variables used in Baumol's model were also available with difficulty for all the world's economies.

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