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CAPITAL SPENDING AND ECONOMIC GROWTH CORRELATION IN GEORGIA

Government measures during the economic policy implementation should be based on the impact on economic growth and economic development. Moreover, as it is inevitable to have government expenditures, it is crucial to analyze what kind of relationship exists between economic growth and government expenditure. According to Keynes, government expenditure is the measure of the fiscal policy, On the other hand, according to Wagner, public spending is endogenous factor of economic development. There is no common attitude towards Wagner theory. Moreover, Wagner theory is considered to be valid for the long run period and results could be more valid in terms of economic as well as statistical interpretation, when longer time-series is taken. While exploting the dependence between economic growth and government spending, we should analyze the Armey-Rahn curve as well, which explains that up to some point, when government spending is increasing, economic activity is increasing as well, but then is starts to decline. The paper examines such dependence based on Wagner's law and Keynes's theory for Georgia, but using only capital spending as it is perceived as one of the main sources for economic growth. All the available data is used, during 1995-2022, for capital spending growth and economic growth indicators.

The results show that Wagner's law is not fulfilled meaning that economic growth is depended variable and capital spending growth is explanatory. The impact on economic growth is observed after 3 years, which makes sense if we consider the nature of capital spending. However, we can say that due to the lack of data and only two variables included in the analysis, the results might not be relevant.

Keywords: *Armey-Rahn curve, economic growth, Wagner law, government expenditure, fiscal policy.*

JEL classification: *C22, E61, E62, O11*

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კაპიტალურ ხარჯებსა და ეკონომიკურ ზრდას შორის კავშირი საქართველოში

მთავრობის მიერ განხორციელებული ღონისძიებები ეკონომიკური პოლიტიკის გატარებისას დამოკიდებული უნდა იყოს იმ შედეგზე, რაც ეკონომიკურ ზრდასა და ეკონომიკურ განვითარებაზე აისახება. ამასთან, ვინაიდან სახელმწიფო ხარჯების გაწევა გარდაუვალია, მნიშვნელოვანია იმის გაანალიზება, რა მიზეზ-შედეგობრივი კავშირი არსებობს ეკონომიკურ ზრდასა და სახელმწიფო ხარჯებს შორის. კეინზის მიხედვით, სახელმწიფო ხარჯები ფისკალური პოლიტიკის ინსტრუმენტს წარმოადგენს, ხოლო ვაგნერის მიხედვით, სახელმწიფო ხარჯები ეკონომიკური განვითარების ენდოგენურ ფაქტორს წარმოადგენს. აღნიშნული მიდგომების შესახებ არაერთგვარი დამოკიდებულება არსებობს. ამასთან მიჩნეულია, რომ ვაგნერის თეორია დროის გრძელვადიან პერიოდზეა გათვალისწინებული და დროის რაც უფრო დიდი მწკრივი იქნება აღებული ანალიზისას, მით უფრო სანდო შეიძლება იყოს შედეგებიც როგორც ეკონომიკური, ასევე - სტატისტიკური თვალსაზრისით. ეკონომიკურ ზრდასა და სახელმწიფო ხარჯებს შორის დამოკიდებულების კვლევისას გასათვალისწინებელია არმი-რანის მრუდის ანალიზიც, რაც ხსნის, რომ სახელმწიფო შესყიდვების გარკვეულ დონემდე ზრდასთან ერთად იზრდება ეკონომიკური აქტივობა, შემდეგ კი იწყებს შემცირებას. წინამდებარე სტატია იკვლევს აღნიშნულ კავშირს საქართველოსთვის 1995-2022 წლებისთვის, რისთვისაც მხოლოდ კაპიტალურ ხარჯებს იყენებს, ვინაიდან ეს აღიქმება ეკონომიკური ზრდის მთავარ წყაროდ.

შედეგები აჩვენებს, რომ ვაგნერის კანონი არ სრულდება საქართველოსთვის, რაც ნიშნავს, რომ ეკონომიკური ზრდა დამოკიდებული ცვლადია, ხოლო კაპიტალური ხარჯებია ამხსნელი. ეკონომიკურ ზრდაზე გავლენა 3 წელიწადში ფიქსირდება, რაც ლოგიკურია კაპიტალური ხარჯების ბუნებიდან გამომდინარე. თუმცა, შეგვიძლია ვთქვათ რომ მონაცემთა ნაკლებობისა და იმის გამო, რომ ანალიზში მხოლოდ ორი ცვლადი იყო გამოყენებული, შედეგები შესაძლოა ბოლომდე საიმედო არ იყოს.

საკვანძო სიტყვები: *არმი-რანის მრუდი, ეკონომიკური ზრდა, ვაგნერის კანონი, სახელმწიფო ახარჯები, ფისკალური პოლიტიკა.*

JEL კლასიფიკაცია: *C22, E61, E62, O11*

Introduction and review of literature

Government decisions during economic policy implementation should be based on the impact on economic development, which can be measured as economic growth and economic development. Moreover, as it is inevitable to have government expenditures such as capital spending, it is crucial to

analyze what kind of relationship exists between economic growth and government expenditure. The answer comes from either Keynes's or Wagner's theories. This report explores such relationship between capital spending and economic growth for Georgia during 1995-2022.

According to Keynes, government expenditure is the measure of fiscal policy, through which it is possible to increase revenues (Demez, 2021). On the other hand, according to Wagner, economic growth is accompanied by faster growth in government expenditure (Балацкий, 2010) and therefore, public spending is an endogenous factor of economic development. Wagner's theory shows that as revenue is increasing, it is more necessary to regulate externalities and the demand for public goods is also increasing which causes public spending to growth (Sideris, 2007). In this case, public spending is a behavioral variable as private consumption is (Singh & Sahni, 1984).

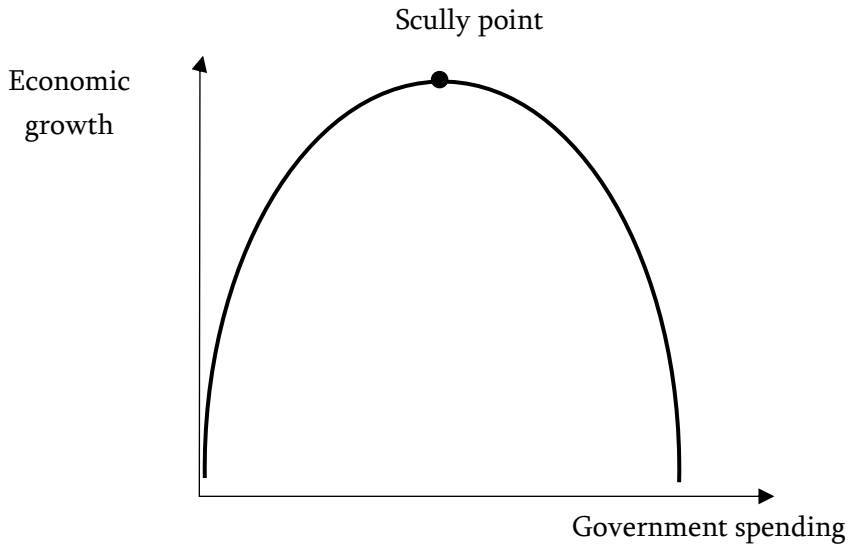
There is no common attitude towards Wagner's theory. As there are different authors who are developing research for different countries, according to some authors, Keynes's theory has been proved, while for others – Wagner's theory. Furthermore, it is also possible for both theories to be in place and bilateral relationship between government expenditure and economic growth to be proved (Abbasov & Aliyev, 2018; Loizides & Vamvoukas, 2005). Moreover, Wagner's theory is considered to be valid in the long run period and results could be more valid in terms of economic as well as statistical interpretation, when longer time series is taken (Sideris, 2007). Wagner's law is more empirical and not economical which shows that only the fact that Wagner's theory is in place does not mean that there is economic development (Балацкий, 2010).

When government expenditure is high (government size), it might damage effectiveness and economic growth because it might be an additional cost for the economy (Ram, 1986). The author highlights that government effectiveness is important during economic development through productive investment, which explains the impact of the government on economic development. However, government size should be neither so low nor high that it will create an obstacle to effectiveness. This idea is represented by the Armey-Rahn[1] cure and explains, that up to some point when government spending is increasing, economic activity is increasing as well, but then it starts to decline partly due to the crowding-out of private sector investments.

Armey-Rahn curve can be represented graphically as follows:

[1] The model is also known as the Armey curve, also as the BARS (Barro, Armey, Rahn, Scully) curve, according to the surnames of the authors.

Graph 1: Armey-Rahn curve: dependence between government spending and economic growth



Source: constructed by Author, according to Armey (1995)

The relationship between government expenditure and economic growth depends on the developing step the country is. It should be noted that Wagner's theory considers the relationship between government expenditure and economic growth for the countries under the industrialization process. During that time, using government spending as a policy instrument might not be quite effective and monetary policy instruments might even have a more important role (Demez, 2021). The relationship between Wagner's law, at one point, and increasing up to some point and then decreasing Armey-Rahn cure, on the other hand, might be justified by the fact that Wagner is usually proved in developing time and when the country is more developed, there is a more negative impact from government expenditure to the economic growth (declining part of the Armey-Rahn curve). We can say that a high level of government expenditure might damage effectiveness and economic growth. However, Wagner's law is not valid in countries with "classic" capitalism like US or UK, nor in countries with a social model like Sweden nor in countries with transit economies like Russia (Балацкий, 2011). Results differ according to the estimation of short and long time, and methodology and estimation time is important for the results.

The report aims to analyse the literature on the abovementioned topics and also to examine Wagner's law and Armey-Rahn's method for Georgia, using all available data during 1995-2022[2]. For government spending, we only use capital spending as it is perceived as one of the main sources of economic growth.

Literature Review

Empirical studies related to the verification of Wagner's law can be divided into two groups, according to the using methodology: regression estimated by the Ordinary Least Squares (OLS), assuming that data series is stationary; using the Cointegration test between government spending and national income, though the Granger Causality test (Sideris, 2007).

In order to estimate Wagner's law, different authors have used panel data (time horizon for different countries) as well as time series which is the observation of different time horizons for a specific country.

[2] Even though 2022 data is an estimation, as all the forecasts are updated in December 2022, we assume that actual data will not be so different from these estimations.

Therefore, in some panel data, Georgia is also analyzed, when the author was examining post-Soviet Union countries (Abbasov & Aliyev, 2018). As a result, in the case of Georgia, the conditions of Wagner's law were fulfilled.

There should also be considered that different authors have some kind of different econometric methods used during the analyzing process because different methodologies or observations of different time horizons might give different results. For example, according to the analyzes conducted by (Loizides & Vamvoukas, 2005)[3], economic growth causes an increase in government spending (Wagner's law) for Greece during 1960-1995, while government spending causes an increase in economic growth (Keynes theory) during the short-run. These results are different from the results of (Sideris, 2007), according to whom only Wagner's law is fulfilled for Greece. For some researches, the relationship between government expenditure and economic growth is not clear and they vary from positive to negative and to no impact at all, for the countries at developing as well as at developed stages (Nyasha & Odhiambo, 2019).

Wagner's law was verified for Greece during 1833-1938 which results that the growth of government spending being explained by the improvement of economic activity (Sideris, 2007). Cointegration analysis shows that there is a positive relationship between these indicators, while the Granger Causality test indicates that national income causes government spending and therefore, Wagner's law is fulfilled. The advantage of the analyses is the following: the data used for the study contains more than one century, especially when this time is the early development stage of Greece economy.

Panel data analysis is used for 11 EU member countries (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia) to estimate Wagner's law for 1995-2009 (Demez, 2021). According to the results, economic growth causes government spending. The Granger Causality test, which takes into account the country and time specifications, shows a causality relationship (Dumitrescu & Hurlin, 2012). The results observe Wagner's law for the estimated time horizon for countries included in the analyses.

As a result of estimating 9 Post-Soviet Union countries (Azerbaijan, Estonia, Latvia, Lithuania, Moldova, Georgia, Uzbekistan, Ukraine, and Kyrgyz Republic), for some countries including Georgia Wagner's theory is fulfilled, for Uzbekistan there was causality from both direction and Wagner's, as well as Keynes theories, were observed (Abbasov & Aliyev, 2018). In addition, there are different results during the short-term and long-run analyses. For example, both theories were observed during the short-term and as economic growth causes government spending, also higher revenues were caused by the spending (except Lithuania and the Kyrgyz Republic). As for the long term, a specific theory is more observed (Wagner's law for Latvia, Lithuania, Georgia, and Ukraine. Keynes theory for Estonia, Azerbaijan, and Moldova). Considering the fact that the estimation of the Wagner theory needs a long time horizon to have a big amount of observations, for Post-Soviet Union countries the number of data is not sufficient to test the theory thoroughly (Paparas & Stoian, 2016).

One more analysis was conducted for two Post-Soviet Union countries, the Kyrgyz Republic and Tajikistan (Abdieva et al., 2017). Using the quarterly data of 2000-2013 it is tested that Keynes theory is observed for the Kyrgyz Republic, while there was no causality between these variables in Tajikistan. According to Keynes, economic activity is improved through fiscal policy, which can be reflected in the stimulation of the economy through education, healthcare or infrastructure (Vasilev, 2019). After some level, public spending will negatively affect economic growth which can be illustrated in the Armey-Rahn curve.

Testing of Wagner's law happened in Romania for 1995-2015 by Paparas and Stoian (2016). The method relies on the Vector Autoregression (VAR) model where in regressions there is more than one

[3] Authors also consider unemployment and inflation, as explanatory variables, during the analyses.

depended variable and each of them is depended on the lags of different variables. As there might be cointegration not in the long run but in the short-term period, the relationship between government spending and national income can be tested through the Granger Causality test. The test did not show short-run dependence between these variables, while cointegration indicates long-run dependence. Authors point out that one of the reasons why economic growth does not cause government spending might be explained by the importance of non-economic factors. Wagner's law is also fulfilled for the long-run period for Romania for 1991-2014 (Lingxiao & Peculea, 2016). In this case, the authors have used Autoregressive Distributed Lag (ARDL) during the estimation, which is also used for Turkeye for 1981-2008 for the estimation of the Armey-Rahn curve (Yüksel, 2019).

Wagner's law and Keynes's theory are estimated for 2000-2008 using the quarterly data for Poland (Gurgul et al., 2012). As a result, Keynes's theory is fulfilled and hence, spending on national defence and public safety causes economic growth. As for the Capital spending, though not all the studies show that it has growth-enhancing impact, recent literature has more evidence about this result, compared to the older literature (Romp, W. E. & Haan, J., 2005). Moreover, according to the estimation of the short and long-run dynamics about public spending and economic growth in Nigeria for 1970-2019, when ARDL model with structural breaks was used, capital spending impacted economic growth, which demonstrates Keynes's theory in Nigeria (Aluthge et al, 2021).

It should be noted that the research about the above-mentioned Armey-Rahn is proved, when Keynes's theory is in place and when there is a non-linear relationship between government spending and economic growth. For example, for Bulgaria during 2010-2018 (Vasilev, 2019) and Turkeye during 1981-2018 (Yüksel, 2019). Moreover, if Wagner's theory means the impact of Gross Domestic Product (GDP) on government spending, there exists the other way too, and government spending also affects the economy. Armey-Rahn considers that dependence and assumes that the dependence is positive up to the specific point (Scully[4] point), while after that point increasing spending causes a reduction in economic activity (e.g Sweden and Russia during 1990-2007). It is considered that Scully point is around 23 percent, however, it varies across countries, e.g for Sweden it is 39 percent, for Russia it is 28 percent (Балацкий, 2010), for Turkey it is 16 percent (Yüksel, 2019), while for the United States, it is 12 percent (Coayla, 2021). Therefore, the consolidation of Wagner's law and the Armey-Rahn curve might be represented as follows (see diagram 1): according to Wagner, economic growth facilitates government spending, while according to Armey-Rahn theory, government spending increases the economy up to Scully point, after which the relationship becomes negative and economic activity is declining. Scully's point of Armey-Rahn is estimated for Georgia for 2002-2014 and it resulted that the optimal size of the government is 21 percent (Tabaghua, 2017). Georgia was on the upward part of the curve, while the actual point is above the optimal after 2006.

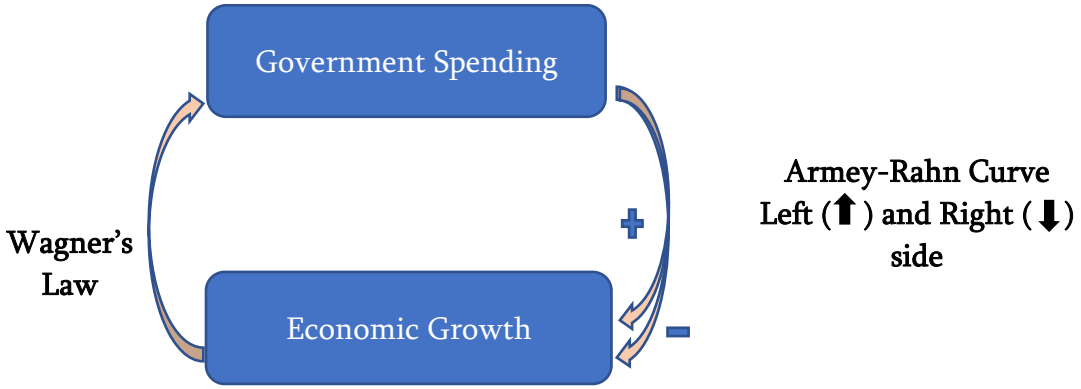
Data and Methodology

In order to test Wagner's law for Georgia, we have used some approaches of different authors during our analysis (Sideris, 2007; Abdieva et al., 2017; Abbasov & Aliyev, 2018; Demez, 2021). For the analysis, we used the growth of capital spending (acquisition of non-financial assets) and real GDP growth. For the econometrical study, there are several steps used: first, there is stationarity to be determined for tested the degree of integration, for which unit root test is used through the Augmented Dickey-Fuller (ADF) test. The next step is the assessment of the cointegration between the selected variables, which will check the correlation of the time series during the estimated period. Cointegration analysis is tested using the Johansen methodology through maximum likelihood. Lastly, causality is

[4] The name point is coming from the surname of the author (Scully), which was also participating in the process of Armey-Rahn development and who tested the maximal point of the curve.

estimated using the Granger Causality test, for which one series of the stationary data is regressed to another series, in order to test whether Wagner's causality is fulfilled for Georgia or not.

Diagram 1: Wagner's Law and Armey-Rahn Curve



Source: constructed by Author

We used the unit root test to estimate the growth of real capital spending and real GDP growth. As data was already in terms of the percentage change, it showed that the time series was stationary (stationary means that variables do not have a trend or seasonality for that time series). As the series is stationary, we can test cointegration.

Table 1: Results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root test, for Capital Spending and Gross Domestic Product (GDP) growth

Variable	Augmented Dickey-Fuller (ADF)		Phillips-Perron (PP)	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
Growth in G (% change)	0.037**	0.129	0.035**	0.125
Growth in Y (% change)	0.002***	0.024**	0.003***	0.015**

*** and ** demonstrates statistical significance level at 1 and 5 percent, respectively.

The null hypothesis about the non-stationarity of the above-mentioned variables is rejected. According to the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, for capital spending, the variable of capital spending growth is not tested about non-stationary by a 5 percent significance level, when only intercept is used. As for the growth rate of GDP, non-stationarity is not fulfilled by a 1 percent significance level when only intercept is used and by a 5 percent significance level when intercept and trend are used. Hence, both variables are stationary, as they are already used in terms of the percent change.

For the cointegration testing, we use the Johanson cointegration test, where the null hypothesis assumes that there is no cointegration in the model. To test the cointegration, there can be used two statistics by the Johansen test.

Table 2: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.559924	25.56612	15.49471	0.0011
At most 1*	0.216864	5.866760	3.841465	0.0154

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.559924	19.69936	14.26460	0.0063
At most 1*	0.216864	5.866760	3.841465	0.0154

* Denotes rejection of the hypothesis at the 0.05 level.

As a result, we can observe that Trace Statistic is higher than the critical value at the none and at most 1 numbers, which means that we can reject the null hypothesis and say that model has two cointegration vectors (equations). The same results are detected from the Max-Eigen Statistic.
We can therefore conclude that there are two cointegration capital spending growth causes economic growth and economic growth causes growth in capital spending.

After that we can use the Granger Causality test to examine the causality. As our variables are stationary, we can use Vector Error Correction Method (VECM) to check for the Granger Causality test. The table below indicated the Granger Causality test where Y is economic growth and G is capital spending growth. The results show that there is no significant correlation between the growth in capital spending and economic growth, while there is more likelihood to reject the hypothesis that capital spending growth does not cause economic growth and we can say that economic growth is a dependent variable while capital spending is the explanatory variable, which means that Wagner is not tested but Armey-Rahn is fulfilled for Georgia during 1996-2022. As for the number of lags, the test considers three

lags including in the causality meaning that for the growth in capital spending, the result of the economic growth is observed after 3 years, which makes sense if we consider the nature of capital spending.

Table 3: Granger Causality test

Sample: 1996 2022

Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
Y does not Granger Cause G	24	0.93663	0.4446
G does not Granger Cause Y		2.85173	0.0681

We should note that the data used for the analysis include 1995-2022 years but as the indicators are presented in growth rate, the time series is from 1996. Hence, due to the lack of data, the results cannot be considered quite relevant. Moreover, only two variables are used and other economic indicators which might influence economic growth or capital growth, are not included in the analysis as explanatory variables. We do not examine Scully's point as it is mainly observed for the Armey-Rahn when all the government spending is considered and not only capital spending.

Results

The paper used capital spending as it is perceived as one of the main sources for economic growth. All the available data is used, during 1995-2022, for capital spending growth and economic growth indicators. The results show that Wagner's law is not fulfilled meaning that economic growth is depended variable and capital spending growth is explanatory. The impact on economic growth is observed after 3 years, which makes sense if we consider the nature of capital spending. However, we can say that due to the lack of data and only two variables included in the analysis, the results might not be relevant.

Conclusions

According to Wagner's theory, economic growth is followed by the fast growth of government spending and such spending is an endogenous factor of economic development. There is no common attitude towards Wagner's theory da different literature indicates that Wagner's law is fulfilled for some countries, while for others – not.

Moreover, it is considered that Wagner's law is valid for the long run period and results could be more valid when the data time series is for a long period. In addition, the relationship between government spending and the national income is depended on the development stage of the country, and Wagner's law is tested to be fulfilled in the developing, industrialization period. The results are different when estimating short-run and long-term periods, used methodology and estimated time can also affect the results.

Economic activity is increasing when government spending increases up to some point, while after that it starts to decline, partly due to the crowding-out effect of the private sector investments. It demonstrates that a high level of spending might impair the effectiveness and economic growth, which is represented as the Armey-Rahn curve. As a result, we can conclude that the negative impact of government spending on economic growth is higher in more developed countries (downward part of the Armey-Rahn curve).

According to the analyzed data of capital spending and economic growth for Georgia, Wagner's law is not fulfilled during 1996-2022 meaning that economic growth is depended variable and capital spending growth is explanatory. However, we can say that due to the lack of data and only two variables included in the analysis, the results might not be relevant.

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