THE INTERDEPENDENT RELATIONSHIP BETWEEN THE TYPES OF INVESTMENTS AND INCOME IN REPUBLIC OF MACEDONIA

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Abstract

In this paper, we study the interdependent relationship between three types of investments: foreign direct investments, central government investments, and all other investments, and their role in the gross domestic product dynamics in the Republic of Macedonia, by employing the consistent methodology of vector error correction modeling (VECM). Our results reveal that, in the long run, there is only one relationship in which all other investments are dependent variables. In it, the foreign direct investments have a negative effect, thus suggesting the existence of the crowding out phenomena. Additionally, we find that shocks in both foreign direct investments and all other investments have positive, while central government investments have no impact on the gross domestic product. As such, our conclusions can serve policy makers for developing strategies that lead to long run growth.

Keywords: investments, economic growth, crowding out, VECM

JEL Classification codes: C32, E22, F43, H50

Introduction

Ever since the pioneering work of Adam Smith, economists have argued that the economic growth of a nation is, in general, proportional to its rate of investments. Even modern macroeconomic theories suggest that countries with higher level of capital stock have higher productivity, ceteris paribus. On the one hand, based on the evaluation of the dynamics of an economic system, this reasoning implies that increments in the wealth are (partially) a result of successful investment policies. On the other hand, the converse may be also true. In fact, there are many papers that suggest this relationship is endogenous, Romer (1990).

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An even more intriguing puzzle is the study of the implications created by the potential interdependent relationship among different types of physical investments. This is of particular interest to developing countries, since they seek to develop adequate investment policies as a means to achieve sustainable economic growth. Such a study, for example, would reveal the impact of the considerable increase of foreign capital inflow, in the form of foreign direct investment (FDI), in developing countries during the last few decades. While FDI inflow provides a direct boost to the capital account in the balance of payments, and indirect boost to economic growth through possible technological transfer, it may also happen for FDI to crowd out domestic investments, and hence, hamper economic growth (Ullah, 2014). Similarly, by examining the role of the public investments in the other investment types, one may find out whether they really improve the infrastructure (and thereby reduce the cost of doing business), or just inflate the gross domestic product.

Our paper aims to provide an intuition on these relationships in the Republic of Macedonia by implementing the consistent technique of vector error correction modeling (VECM), Johansen (1988). We focus on Macedonia, as the country greatly changed its investment policy over the last decade, but an actual quantitative assessment of the consequences is yet to be produced. Specifically, Macedonia followed the path of many other developing countries and focused its investment policies on FDI. This inflow became one, if not the most important source of external financing, considering the deteriorated position of the balance of payment. Nevertheless, the recorded inflow was still lower than that of neighboring countries, and thus its general impact was left unknown.

The paper has the following structure. In the next section, we provide a more detailed literature review on this topic and associate the authors' conclusions to our contribution. In the Methodology section, we describe the data and the econometric model. The Results section displays our findings, and in the last section we conclude.

Literature Review

The topic of the effect of different types of investment, whether public or private or domestic or foreign, on GDP has been present in the literature since the 1980s. However, a common ground among researchers is yet to be found, due to the use of different data and model specifications in their study. Additionally, each country has its own implications that furthermore enhance the role of a certain type of investments.

One of the first papers that covers this topic is that of Blejer and Khan (1984). The authors utilize a sample consisting of 24 developing countries and covering the period of 1971-1979. Their research provides evidence that investments in infrastructure go in line with private investment, while other types of public spending lead to crowding out the investments coming from the private sector.

In this spirit, Aschauer (1989) infers that - in a situation where the rate of return is given

- an increase in public investments decreases one-to-one private capital. However, the marginal productivity of private capital increases simultaneously, which crowds in private capital. Hence, the net effect of public investment (nonmilitary spending) is positive. Nevertheless, his model is difficult to generalize as it the author, unlike Blejer and Khan, uses data only for the United States.

A separate model from the ones previously described was developed by Khan and Reinhart (1990). In particular, the authors define an empirical growth model based on a larger sample of developing countries. They conclude that private investments have enormous and direct effect on growth. In a similar later research, Khan and Kumar (1997) analyzed the degree to which private and public investments could be complementary or substitutes. Additionally, they developed a theoretical framework that analyses the roles that both types of investments have on the growth process. They emphasize that complementarities could appear when public investments are made in infrastructure. It is inferred that they increase the marginal product of private capital as well. However, public investments in infrastructure do not automatically have positive impact on private investment and growth. According to Button (1998), the diversity of regional economies in most countries where some are much more open by nature, while others are transit areas, means that it is unlikely that they will all have the same initial endowment of infrastructure. It is difficult to see why one would automatically anticipate that an expansion of the public capital base would lead to improved economic performance.

There is considerable evidence of the link between foreign direct investments (FDI) and economic growth in developing countries. According to Zhang (2001), the impact of FDI on the host economy is country-specific, but FDI tends to be more likely to promote economic growth, when host countries adopt liberalized trade regime, improve education and thereby human capital conditions, encourage export-oriented FDI, and maintain macroeconomic stability. However, Backer and Sleuwaegen (2003) infer that foreign direct investment discourage entry and stimulate exit of domestic entrepreneurs in the short term, but the empirical results suggest that the importance of positive long-term structural effects – learning, demonstration, networking and linkage effects – between foreign and domestic firms can moderate or even reverse crowding out effects.

Our contribution mostly resembles that of Aschauer (1989), as it is directed towards a single economy. It also resembles the other papers, as it offers a description of the role of different types of investments in the economic growth. However, our model is significantly different from any other, as it is built for the purpose of a quantitative assessment of the interdependent relationship between the types of investments and income in Republic of Macedonia, and thus it provides a consistent estimate of it.

Methodology

In this section, we adopt an empirical specification that captures the relationship between a set of three types of investments: foreign direct investments (for_inv),

central government investments (gov_inv), and all other investments (oth_inv) and the gross domestic product (gdp) and describe the data. Data of the foreign direct investments is used from the database of National Bank of Macedonia. For the central government investments we used the quarterly data set of the central budget and we get the data for the other investments by reducing the total investments in the country (data available at the State Statistical Office) with FDI and state investments.

Formally, foreign direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy. Central government investments are those expenditures that arise from the central budget. Finally, all other investments represent the investments made by the domestic private sector, household investments and changes in inventories and net acquisition of valuables.

Additionally, we add the quarterly gross domestic product (gdp) in the model. The GDP has two roles in our analysis: it allows for a direct estimate of the effect of each type of investment on growth, and helps us check for potentially omitted variables that evolve steadily over time.

Methods

As previously mentioned, to analyze the potential endogenous relationship between the four variables we use the consistent technique of vector error correction modeling (VECM) developed by Johansen (1988). In detail, a set of variables that have the property of non-stationarity at levels and integration of the same order and share a cointegration relationship(s), form a VECM under which the short- and long-run relationships are modelled together. The advantage of VECM over other statistical methods is its consistent and robust estimates. By definition, two or more variables are cointegrated if there is a linear combination of them that has a stationary random error. The stationarity of the error term means that the estimates are consistent, in fact "any omitted non-stationary variable that is part of the cointegrated system enters the random error thereby producing nonstationary residuals and leading to a failure to detect cointegration and producing spurious results", Herzer and Volmer (2012), Brooks (2014). Additionally, if cointegration exists, then it also exists in the extended variable space, thus making VECM estimators robust to omitted variable bias, Johansen (2000).

Formally, a Vector Error Correction Model is described with the following equation:

$$\Delta Y_t = \Pi Y_{t-k} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \cdots$$
$$+ \Gamma_{(k-1)} \Delta Y_{(t-(k-1))} + u_t , \tag{1}$$

where = [oth_inv$_t$, for_inv$_t$, gov_inv$_t$, gdp$_t$] is a vector of dependent variables, is a notation for first difference, and respectively denote time and lag; and is the error term. In Eq. (1), is a matrix in which each row forms the implicit form of a cointegration relationship among the variables, and represents the vector autoregression coefficient matrix for the -th lag.

Data

In order to conduct our analysis, we utilize quarterly time series data, ranging from 2008 until 2015 (as of the third quarter), and gathered from various sources. In particular, we use data from the National Bank of Macedonia for foreign direct investments, data from the capital expenditures in the Budget of R. Macedonia for the central government investments, and gross domestic product data taken from the State Statistical Office and calculated under the expenditure method. Additionally, we individually calculate all the other investment variables as a crude approximation of the difference between the gross investments (taken from the State Statistical Office) and the sum of foreign direct investments and central government investments.

All data are in current million Macedonian denars and are seasonally adjusted, using the Census X-12 method. As a means of control for any potential bias due to the use of the current prices, we add a trend in each statistical test and equation estimation.
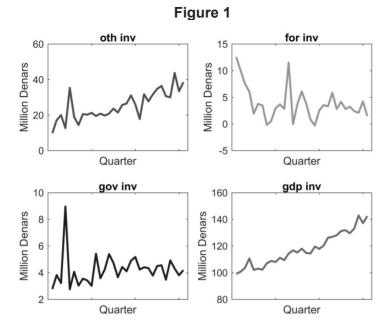
In Table 1., we provide the summary statistics for the variables. We observe that, during our research period, most investments on average belong to the other investments, followed by the government investments, whereas foreign investments have the smallest share. However, other investments also have the highest standard deviations.

Table 1. Summary Statistics

Statistic	oth_inv	gov_inv	for_inv	gdp
Mean	25.217	4.217	3.853	117.614
Median	23.658	4.191	3.3	115.161
Max	43.732	8.957	12.562	142.866
Min	9.77	2.753	-0.278	99.071
Std. dev.	8.097	1.136	3.111	12.484

Source: Own computation

In order to provide a better evaluation of the data in Figure 1., we make time series plots. By inspecting the dynamics of the oth_inv, for_inv, gov_inv, and gdp, we can infer that the domestic investments and gross domestic product exhibit steady growth, the central government investments grow at a very small rate, and the foreign direct investments display a decrease during the examination period. Altogether, it appears that all four variables are non-stationary, thus suggesting that they have the potential to form a cointegrating system and a vector error correction model.

Figure 1

Results

The first step towards estimating a cointegration, respectively a vector error correction model (VECM), is formally testing the stationarity properties of the variables. In particular, each variable should include a unit root at their level and be integrated of the same order. We test the stationarity of foreign investments, central government investments, all other investments, and the gross domestic product by employing the Augmented Dickey Fuller test, Brooks (2014). For each variable, we fix the lag length to 1. Additionally, in each level specification we include an intercept and a trend, whereas we include only a trend in the differences.

Table 2 presents the results for the stationarity tests. They suggest that, at a 1% significance level, all variables are non-stationary at their levels and integrated of order 1. This allows us to continue to the next step – testing the cointegration relationship between the variables.

Table 2. Stationarity Tests

Variable	Level	First Difference
for_inv	-3.855	-5.76*
oth_inv	-4.203	-7.805*
gov_inv	-4.244	-6.058*
gdp	-2.389	-5.623*

Notes: T- statistics for Augmented Dickey Fuller tests for each variable. In the levels, intercept and trend were included for each variable, and only intercepts for the difference. Lags length was fixed to 1. * p<0.01.

The existence of a cointegrating vector between foreign investments, central government investments, all other investments, and gross domestic product implies that the variables share an equilibrium relationship that is in the long run independent from the short-term shocks. We test for presence of cointegration by applying three tests: i) the Maximum Eigenvalue; ii) Trace test, both described in Johansen, (1988); and iii) the Engle-Granger test, Engle and Granger (1987). The first two tests belong to the Johansen methodology, under which only the number of cointegrating vectors in the error correction model is tested, whereas the Engle-Granger tests whether the proposed cointegrating vector is valid.

The statistics for all tests are shown in Table 3. At the 1% significance level, both the Maximum Eigenvalue and Trace tests indicate that there is only one cointegrating vector between the variables. In order to discover it, we apply the Engle-Granger test separately 4 times, where we vary the dependent variable. We infer that - at 1% - only the relationship in which all other investments are the dependent variable is a cointegrating vector. This conclusion is in line with several other previous findings. For instance, an analysis from Desai, Foley and Hines (2005) about American multinational firms, suggests that foreign investments have impact on domestic private investments. A study implemented by Bosco and Emerence (2016) of the effects of GDP, interest rate and inflation on private investments in Rwanda shows that the gross domestic product affects private investments both in the short and in the long run. Erden and Holcombe (2005) indicate that a 10 percent increase in public investment would increase private investment by about 2 percent.

Table 3. Cointegration Tests

Johansen Tests	Cointegration Vectors			
	0	≤1	≤2	≤3
Maximum Eigenvalue	43.906*	20.657	11.165	5.492
Trace	81.221*	37.314	16.657	5.492
Engle-Granger Test	Dependent Variable			
	for_inv	oth_inv	gov_inv	gdp
Z-statistic	-17.672	-31.489*	-15.155	-11.534

Notes: Lag length was fixed between 1 and 2.* p<0.01.

Since the variables are non-stationary at their levels, integrated of the same order and cointegrated, we proceed to estimation of the vector error correction model. We study two characteristics of the VECM: i) the cointegrating, long-term dynamics of the model, and ii) the short-term impulse responses of the variables when there is a shock in another variable.

Table 4 provides the results for the cointegration relationship. We find that, in the long run, an increase of 1 million denars in foreign investments decreases all the other investments by 3.893 million denars. This implies that the other investment types do

not share a healthy relationship with foreign companies. Several dynamics may drive this relationship. In particular, it may happen that FDIs displace the private sector - the increments in foreign ownership may decrease the local investors' incentives to develop new ventures. For the time being, however, we can not provide a full argument on this conclusion, as all other investments also include household investments and changes in inventories and net acquisition of valuables. Hence, the negative relationship may also be due to the displacement of the household investments or to the foreign direct investments having a negative impact on the changes in inventories and the net acquisition of valuables.

An increase of 1 million denars in central government investments increases the domestic private investments by 9.741 million denars, thus implying that the greater government spending over the years acted as a support for all other investments types. However, the interpretation should be taken with caution, as most (if not all) central government investments were in the construction sector, whereas other sectors received negligent aid from the country. A sector-based analysis would definitely provide a better intuition on the role of the government in the long-term dynamics of other investments. Additionally, the methodology of obtaining the amount of other investments can interfere with the final results. Finally, an increase of the gross domestic product in the same amount increases the other investments by 1.930 million denars. This is expected since, by the property of the marginal propensity to save, absolute increases of the wealth imply a greater magnitude left to be invested.

Table 4. Cointegration

Dependent Variable: oth_inv		
for_inv	-3.893*	(0.586)
gov_inv	9.741*	(1.733)
gdp	1.930*	(0.525)

Notes: A linear trend was included in the equation. Standard errors in brackets.* $p<0.01$.

Figure 2 shows the accumulated impulse responses of each variable after a shock in another variable, for the next 8 periods. We infer that shocks in other investments have positive impact on themselves and on the gdp, negative effect on foreign investments, and a negligible effect on central government investments. Shocks in foreign investments have negative impact on other investments and positive impact on each other variable, whereas shocks in central government investments have negligible impact on every variable. Lastly, shocks in the gross domestic product positively affect both foreign investments and themselves and have a minor effect on other and central government investments. While these results are to a certain extent in line with the cointegration results, they create additional implications. Specifically, they show the effect of all types of investments on gdp. It is clear that our results suggest that central government investments have no impact on the gross domestic product, whereas other investments and foreign direct investments support the income. This is an interesting phenomenon, which has to be analyzed even further in the future because of the negative cointegrating relationship.
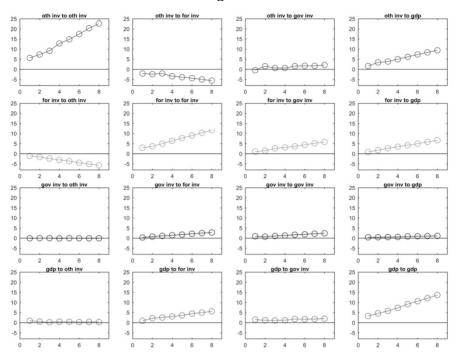
Figure 2.

Conclusion

We addressed the issue of the unknown relationship among the types of investments and their role in the economic growth in the Republic of Macedonia. We did so by constructing a vector error correction model, especially suited for evaluating both the long- and short-term dynamics of an econometric system.

Based on the results of the analyses, we found out that - in the long run - only other investments (all investments except central government and foreign direct ones) depend on the investment types and GDP. In this research, the really important fact that the relationship of the foreign direct investments has a negative effect suggests that the investment policies should probably be changed in order to promote innovative activities by domestic firms or households. One main reason why foreign investments have negative effects can be the different fiscal and non-fiscal subsidies that these investments receive from the government, and these subsidies are covered by the taxpayers, consisted mostly of domestic private companies, and the fact that, on the other side, there has been no sufficient collaboration between the new foreign investments and the domestic private companies. New foreign direct investments use most of the production materials from subcontractors outside of Macedonia. Benefits of the new foreign investments in Macedonia are new employments within the companies and the expenses of the foreign company for utilities. According to

the econometric analyzes by Titarenko (2006), FDIs displace domestic investment in Latvia, i.e. one additional lat of FDI inflow in the Latvian economy leads to less than a one-lat increase in the total investments. In addition, we discovered that shocks in both foreign direct investments and other investments have positive impact on growth, while central government investments have a negligible effect. Because of the enormous central government spending over the past decade, this conclusion furthermore supports the thesis of necessity of revisions in the investment policy in Macedonia.

Definitely, our quantitative analysis can serve only as a suggestion for policy makers. However, when coupled with an extensive qualitative analysis, it can act as a powerful policy recommendation tool.

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