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Twin Deficits: The Case of North Macedonia

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Abstract: ***The empirical and the theoretical literature have not yet reached a consensus on the causal link between the budget deficit and the current account deficit. Neo-Keynesian theory and the New Cambridge School in particular (but also monetarist theories) postulate the existence of a causal relationship between fiscal and current account deficits. The neoclassical or the rational expectations approach postulates the existence of an opposite relationship: as the government increases its budget deficit, the private sector saves more, which leads to a reduction in the current account deficit. We test the validity of the twin deficit hypothesis for the Republic of North Macedonia using quarterly data for the budget and trade deficit during the period Q1 2006- Q4 2021. Using the Granger causality and a vector autoregressive (VAR) model results partially confirm the twin deficit hypothesis. The weak relation we find between the budget and the trade deficit is not surprising for a small open economy such as North Macedonia, with a fixed exchange rate regime and with foreign direct investments which are mainly driven by the overall business conditions of the country rather than the prevailing interest rates. We find the fiscal policy to be of limited importance for the external position of the country, and call for policies that utilize the comparative advantage of the country, that promote and enhance the quality of goods and services in order to improve the competitive standing of the country in the regional and the global economy.***

Keywords: twin deficit, North Macedonia, Granger causality, VAR model

1. Introduction

The link between the government balance and the current account balance has been long debated in the economic literature. While the correlation between the two variables is widely recognized, the causal effect of the fiscal policy on the current account is still debated among economists. Not only in the theoretical literature, but also in empirical studies there is no consensus on the causal link between the budget deficit and the current account deficit. Most of the empirical literature refers to developed economies and especially the United States because of the persistent budgets over the years with deficits and the current account deficit in the 1980s and 90s.

Neo-Keynesian theory and the New Cambridge School in particular (but also monetarist theories) postulate the existence of a causal relationship between fiscal and current account deficits. The neoclassical or the rational expectations approach postulates the existence of an opposite relationship: as the government increases its budget deficit, the private sector saves more, which leads to a reduction in the current account deficit. These considerations imply that the relationship between the fiscal and current account deficits needs to be established empirically because established theories do not provide a clear guidance. In analytical terms, this relationship should be considered from both long run equilibrium and short-run adjustment perspectives.

Starting from the financial crisis of 2008 and then to the European debt crisis of 2010 and finally to the economic shocks from the Covid-19 pandemic, there is a strain of national budgets, and in this case of North Macedonia where through various fiscal actions the trends were in stabilizing situations and moving as quickly as possible towards an economic recovery. Thus, it has been our primary motivation to give a deeper understanding of the potential implication of the changes in the budget balance on the external position of the Macedonian economy.

In this context, the purpose of this paper is to test empirically the validity of the twin deficit hypothesis in the Republic of North Macedonia using actual quarterly data on Macedonia's budget and trade deficit in the period from the first quarter of 2006 until the fourth quarter of 2021. To achieve this goal, we employed the following econometric methods: Granger causality and a vector autoregressive (VAR).

The paper is organized as follows. After the introduction, we explore the theoretical background and review the empirical literature on the twin deficit hypothesis. In the methodology section, we describe our research methodology and data. In the third section, we perform econometric testing of the validity of twin deficit hypothesis, we presents the results of econometric tests of different hypotheses using Granger causality and vector auto regression techniques. Section 5 summarizes the main findings.

2. Literature Review

A study to analyze the twin deficits was conducted for the period 1993-2013 to empirically investigate the connection between the government budget balance and the balance of the current account in North Macedonia, represented in research by the balance of trade with goods and services, by using the standard VAR model. They ponder whether there is a positive relationship between the two variables, meaning if a budget balance contraction improves the current account balance, indicating that the fiscal policy is influencing the balance of goods and services, and accordingly the current account (Stojcevska & Miteski, 2016).

A study from different methodological approaches is provided by an empirical assessment for a group of

industrialized and developing countries (Abbas et.al. 2011), and the presented findings of different research. According to the empirical studies listed by (Abass et.al. 2011), there is a broad consensus that fiscal expansion causes worsening of the current account, estimating a current account impact from 0.2 to 0.7 p.p of GDP due to increase in the government deficit of 1 p.p. of GDP. This study confirms the positive relationship between the two variables, indicating that an improvement of the fiscal balance by 1 p.p. of GDP results in current account improvement of 0.3 to 0.4 p.p. of GDP, with stronger effects in emerging and low-income countries under flexible exchange rate regime, higher trade openness, above the potential output and public debt levels above 90% of GDP.

An empirical study using different methodological approaches (VAR, VECM, Granger causality) was conducted to test the twin deficits for North Macedonia for the period 2005-2017. Based on the Granger causality test, they found that there is a causal link between the budget deficit and the current account deficit-an increase in the budget deficit would lead to an increase in the current account deficit. The VAR model did not provide evidence in support of twin deficit hypothesis in the short run. However, based on the results of the vector error correction model (VECM) this hypothesis holds in the long run (Bucevska, 2020).

Using various econometric methods (Ganchev, 2010) tested the validity of the twin deficit hypothesis in Bulgaria. The results of the Granger causality test confirmed the existence of dual causality between the budget and current account deficit. On the other hand, conclusions based on the vector autoregressive (VAR) and the vector error correction model (VECM) both rejected the twin deficit hypothesis in the short run, but the long-term results showed evidence in support of this hypothesis.

The twin deficit hypothesis test was performed using VARs and the analysis of variance for ASEAN economies where major findings are: (1) Long run relationships are detected between budget and current account deficits. (2) The Keynesian view fits well for Thailand since the causality runs from budget deficit to current account deficit. For Indonesia, the causality runs in an opposite direction while the empirical results indicate that a bidirectional pattern of causality exists for Malaysia and the Philippines. (3) They also found support for an indirect causal relationship that runs from budget deficit to higher interest rates, and higher interest rates leading to the appreciation of the exchange rate, which in turn leads with the widening of the current account deficit (Baharumshah & Khalid, 2006)

To sum up, the body of literature does not yield a consensus on the causal link between the two deficits. Likewise, evidence on the impact of the deficits on interest rates, exchange rates and others are mixed. In another paper, was tested the hypothesis with the aid of the (Toda & Yamamoto, 1995) Granger-causality test. It is worth noting that the literature does not provide a single model to test the twin deficits hypothesis. Most studies rely on a simple bivariate model (Piersanti, 2000) (Kouassi, Mougoue, & Kymn, 2004). Several studies (McCosky & Kao, 1999)(Abell, 1990)(Anoruo & Ramchander, 1998) have extended the model to include more variables (e.g. dependency ratio, money supply, interest rate, exchange rate, inflation and income) making it a more realistic dynamic setting. This is interpreted as the current account being determined by factors other than government deficits.

Current Account and Fiscal Balance in National Accounts

A wide range of models has emerged in the literature but in most cases the analytical results that suggest a fiscal deficit are likely to lead to a worsening of the current account. The national account identity provides the basis of the relationship between the two deficits. The model starts with the national income identity for an open economy that can be represented as:

$$Y = C + I + G + X - M \quad (1)$$

where Y = gross domestic product (GDP), C = consumption, I = investment, G = government expenditure, X = exports and M = imports. Defining current account(CA) as the difference between export (X) and import (M), and by simply re-arranging the variables in equation (1), we obtain

$$CA = Y - (C + I + G) = S - I \quad (2)$$

where $(C + I + G)$ is the domestic absorption. This relationship means that the external account has to equal the difference of national savings and investment. It implies that the current account is closely related to savings and investment decisions in an economy. In an open economy, total savings (S) equal domestic investment (I) plus current account (CA), that is

$$S = I + CA \quad (3)$$

Equation (3) states that an open economy can source domestically and internationally for the necessary funds for investments to enhance its income. In other words, external borrowings allow for investments at levels beyond those that could be financed through domestic savings. From a policy perspective, this relationship implies that policies supporting investments have a negative impact on the current account, while policies that reduce consumption (private or public) have a positive impact on current account because they increase national savings. National savings can be decomposed further into private (Sp) and government savings (Sg). Using $Sp = Y - T - C$ and $Sg = T - G$, where T is the government revenue, and substituting them into equation (3) yields

$$Sp = I + CA + (G - T) \quad (4)$$

or

$$CA = Sp - I - (G - T) \quad (5)$$

Assuming savings-investment balance for simplicity, equation (5) states that a rise in the budget deficit (G – T) will increase the current account deficit if private savings is equal to investment. Thus, it is clear from equation (5) that external account and fiscal balance are interrelated, or twinned. That is, for a given private savings and investment, government budget and the current account should move in the same direction and by the same amount.

According to the twin deficit theory we would expect that a deterioration of the budget balance would cause side effects in increasing the current account deficit, always if private savings and investment do not change much. But equation (5) is an identity and is not based on any theory of economic behavior, so the results of economic policies cannot be proposed without any economic model (Obstfeld, Krugman, & Melitz). Sometimes empirical evidence confirms twin deficits and sometimes even refutes. One explanation is based on the economic theory known as the "Ricardian equivalence" of taxes and budget deficits, which states that when the state reduces taxes and increases the budget deficit, consumers anticipate that they will later face higher taxes, to pay off the created state debt (Barro, 1989). In their expectations they increase their (private) savings to compensate for the decline in state savings (Hashemzadeh, 2006). Conversely, the state that reduces its deficit through higher taxes (thus increasing state savings) will encourage the private sector to reduce private savings (Khalid, 1999).

This study is also important for the fact that Macedonia has a monetary strategy based on the fixed exchange rate against the euro. According to the literature and various empirical assessments there is also the channel of influence made in the foreign exchange market (Ibrahim & Kumah, 1996). When budget deficits are high and persistent, this also means an impact on the credit market, affecting the increase of interest rates (Bradley, 1986) (Kaufmann, Scharler, & Winckler, 2002). As a result of rising interest rates we have capital inflows causing pressure to appreciate the currency and this leads to potential impacts on imports and exports.

Data

To test the twin deficit hypothesis, we use quarterly data of the trade deficit and the budget deficit variables for the time period 2006-2021 expressed as a percentage of GDP. Data are taken from the International Financial Statistics database. Table 1 shows summary statistics and the correlation matrix, whereas Figure 1 shows the evolution over time of the budget deficit and the trade deficit variables. There are 64 observations in the dataset. The average trade deficit over the period under analysis is 17.8% of GDP with a standard deviation of 5.1%.

Table 1: Descriptive statistics and Correlation Matrix

Variable	Obs	Mean	Std. Dev.	Min	Max
Budget deficit	64	2.206	3.016	-6.381	12.029
Trade deficit	64	17.780	5.106	7.642	30.038
	Budget deficit	Trade deficit			
Budget deficit	1				
Trade deficit	0.197	1			

The lowest trade deficit is achieved in the third quarter of 2018 and amounts to 7.6% whereas the highest value is reached in the first quarter of 2009 and amounts to 30.03%. With regards to the budget deficit, the average is 2.2% of GDP with a standard deviation of 3.02%. The lowest and highest budget deficits are -6.4% of GDP i.e. a budget surplus (reached in the third quarter of 2007) and 12.03% (reached in the fourth quarter of 2008), respectively. The correlation between the two variables – a positive 0.197 – gives some initial indication that the two deficits move in the same direction.

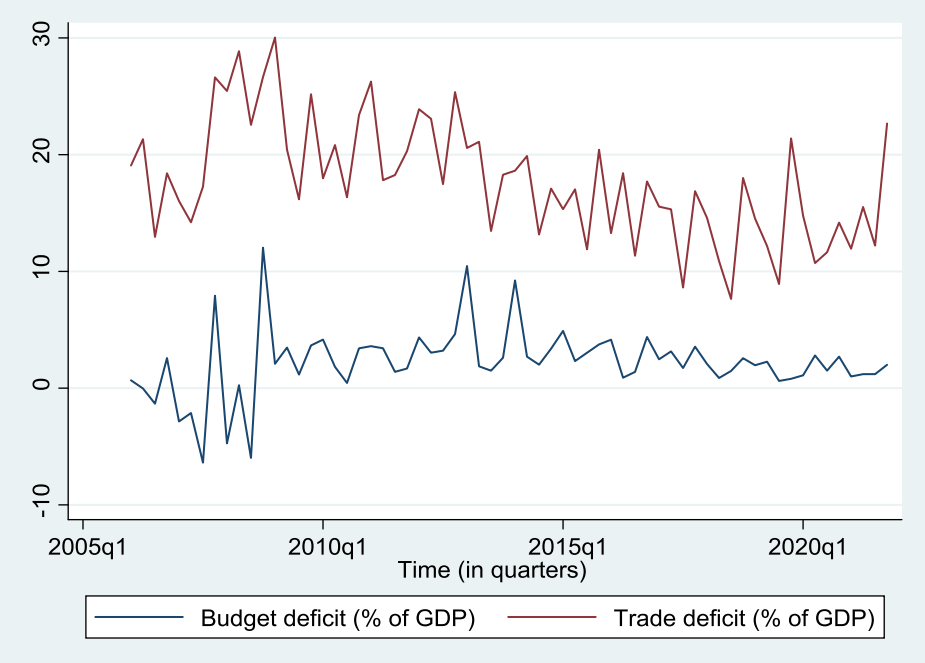

Figure 1: Time series plot

A visual inspection of the time series plot (Figure 1) shows that there does not seem to be a trend in the time series. As a preliminary analysis we regress the two variables and check how their R square compares to the Durbin-Watson test (results are shown in the appendix, Table A1). As a rule of thumb, if the R square is greater than the Durbin-Watson test the time series are non-stationary. We find an R-square of 0.038 and a Durbin-Watson test of 1.127. As the R-square is smaller than the Durbin-Watson test it suggests that the time series are stationary. We also present the Autocorrelation Functions for both time series in Figure 2.Results show that as the number of lags increases the autocorrelations are generally not significant, i.e. are inside the grey area representing the Bartlett's 95% confidence bands. This lands further support in favor of stationarity. In addition to the visual inspection of the data, we conduct a more formal stationarity test in the following section, to make sure that our time series variables are stationary and nonspurious relations can be estimated.

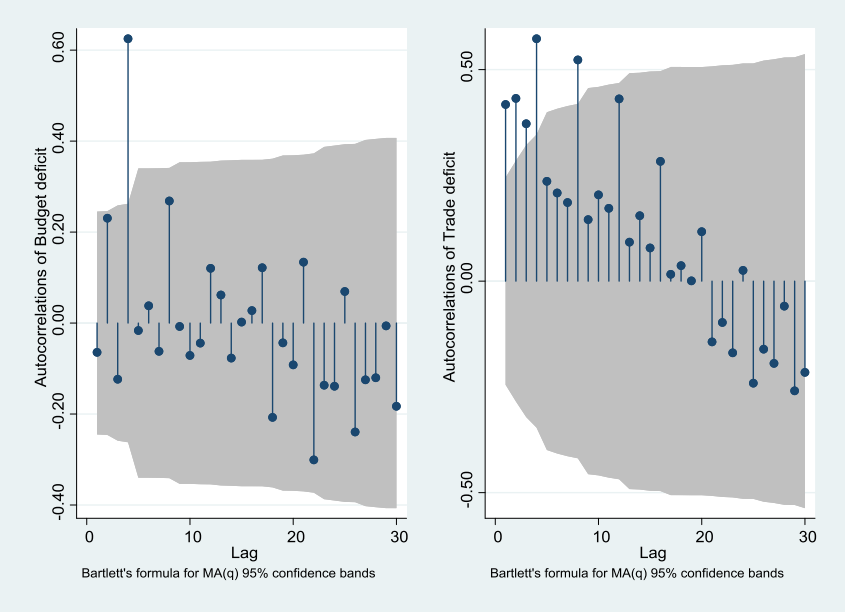

Figure 2: Autocorrelation Functions

3. Methodology

We start the empirical analysis by performing stationarity tests of our time series using the Dickey-Fuller test. Results are shown in Table 2. The hypotheses tested through this test are as follows:
H_0: There is unit root (the series is non-stationary)
H_a: There is no unit root (the series is stationary)

A rejection of the null, means evidence in favor of stationarity. As can be seen from Table 2, for both, the budget deficit, and the trade deficit variable we find that the absolute value of the test statistic is higher than all the interpolated Dickey-Fuller 1%, 5% and 10% critical values, rejecting the null hypothesis of non-stationarity. Likewise, the MacKinnon approximate p-values are close to zero for both variables, thereby rejecting the null hypothesis at the usual 1%, 5% and 10% significance levels. As a robustness check we also use the Phillips-Perron test and reject the null hypothesis that the variable contains a unit root for both the budget deficit and the trade deficit variable.

Table 2: Dickey-Fuller tests

Dickey-Fuller test for unit root			Number of obs =	63
Budget deficit				
	---------- Interpolated Dickey-Fuller ---------			
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-8.347	-3.562	-2.920	-2.595
MacKinnon approximate p-value for Z(t) = 0.0000				
Dickey-Fuller test for unit root			Number of obs =	63
Trade deficit				
	---------- Interpolated Dickey-Fuller ---------			
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-4.927	-3.562	-2.920	-2.595
MacKinnon approximate p-value for Z(t) = 0.0000				

Because our variables are stationary at levels (i.e. integrated of order zero, I(0)) we estimate a Vector Autoregression model in levels, i.e. we only look at the long-run relation between the variables. Because we find the time series variables to be stationary there is no need to estimate a vector error correction model (VECM) as any shocks to the system in the short run quickly adjust to the long run. The bivariate vector autoregression (VAR) we estimate takes the following form:

$$BD_t = \alpha_0 + \alpha_1 BD_{t-1} + \cdots + \alpha_k BD_{t-k} + \beta_1 TD_{t-1} + \beta_k TD_{t-k} + \varepsilon_t$$

$$TD_t = \alpha_0 + \alpha_1 TD_{t-1} + \cdots + \alpha_k TD_{t-k} + \beta_1 BD_{t-1} + \beta_k BD_{t-k} + u_t$$

where, *BD* and *TD* are abbreviations for the Budget deficit and the Trade deficit variables, respectively. α_k , β_k are parameters to be estimated, and ε_t, u_t are the error terms.

Before proceeding with estimating the equation we need to choose the optimal lag length of the model. Among the Akaike'sinformation criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC) the information criterion with the lowest value is selected. Results are presented in the appendix (Table A2). The lowest value belongs to the Akaike's information criterion (9.02) at the fourth lag length. We therefore chose lag four as the optimal length of the VAR model.

In order to check for the direction of causality, we perform Granger causality tests. It is important to note here that Granger causality measures precedence but does not by itself indicate causality. The calculated F-statistics from this test are Wald statistics for the joint null hypothesis:

$$\beta_1 = \beta_2 = \cdots = \beta_k = 0$$

for each of the equations in the VAR model. In terms of our variables the null hypotheses state:

H_0: Trade deficit does not Granger-cause budget deficit (for the first regression)

H_0: Budget deficit does not Granger-cause trade deficit (for the second regression)

A rejection of the null would provide evidence that budget deficit Granger-causes trade deficit, in the first regression, and trade deficit Granger-causes budget deficit in the second regression, respectively.

4. Results

Table 3 presents results from estimating the VAR model. Looking at the individual coefficients from the first regression with budget deficit as the dependent variable, we find that only the fourth lag of the trade deficit variable has a positive and significant effect on the budget deficit variable at the 10% significance level. For the regression with trade deficit as the dependent variable the second and the third lag of the budget deficit variable have a negative and significant effect on the trade deficit variable at 1% significance level. The fourth lag of the budget deficit variable is positive but statistically not significant.

Table 3: Vector Autoregressive results

Sample: 2007q1 - 2021q4		Number of obs			=	60
Log likelihood =	-286.131	AIC			=	10.13768
FPE =	87.0507	HQIC			=	10.38345
Det(Sigma_ml) =	47.557	SBIC			=	10.76599
Equation	Parms	RMSE	R-sq	chi2	P>chi2	
Budget deficit	9	2.33073	0.4983	59.58882	0	
Trade deficit	9	3.48148	0.6148	95.77289	0	
	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Budget deficit						
Budget deficit						
L1.	-0.034	0.100	-0.34	0.73	-0.230	0.161
L2.	0.048	0.099	0.49	0.625	-0.146	0.243
L3.	-0.044	0.108	-0.4	0.687	-0.255	0.168
L4.	0.616	0.113	5.43	0.000	0.394	0.838
Trade deficit						
L1.	0.049	0.079	0.62	0.534	-0.106	0.204
L2.	0.053	0.074	0.72	0.472	-0.091	0.197
L3.	-0.024	0.072	-0.33	0.74	-0.164	0.117
L4.	0.123	0.071	1.72	0.086	-0.017	0.263
Constant	-2.587	1.387	-1.87	0.062	-5.305	0.131
Trade deficit						
Budget deficit						
L1.	-0.020	0.149	-0.14	0.893	-0.312	0.272
L2.	-0.633	0.148	-4.27	0.000	-0.923	-0.343
L3.	-0.524	0.161	-3.25	0.001	-0.840	-0.208
L4.	0.131	0.169	0.78	0.438	-0.200	0.463
Trade deficit						
L1.	0.031	0.118	0.26	0.793	-0.200	0.262
L2.	0.313	0.110	2.85	0.004	0.098	0.528
L3.	0.123	0.107	1.15	0.251	-0.087	0.333
L4.	0.404	0.107	3.78	0.000	0.195	0.613
Constant	4.633	2.071	2.24	0.025	0.573	8.693

We next perform some diagnostic tests to make sure the model is stable and well specified. Results are presented in the appendix, Table A3. The eigenvalues from the stability test are within a unit circle meaning that the VAR model satisfies the stability condition. Also, we cannot reject the null hypothesis of no autocorrelation and the null hypothesis of normality in the distribution of the error term increasing our confidence on the specification of the VAR model.

After estimating the VAR model, we perform a Granger causality test, with results presented in Table 4.For the first equation the Wald test is that the coefficients on the four lags of the Trade deficit that appear in the equation for Budget Deficit are jointly zero. Therefore, in the first set of equations the null hypothesis is that Trade deficit does not granger cause Budget deficit. We reject this hypothesis at 10%significance level and conclude that Trade deficit does Granger-cause Budget deficit. In the second set of equations the null hypothesis is that Budget deficit does not Granger-cause Trade deficit. We reject this hypothesis at1% significance level and conclude that Budget deficit Granger-causes Trade deficit.

Table 4: Granger causality test

Equation	Excluded	chi2	df	Prob > chi2
Budget deficit	Trade deficit	9.3397	4	0.053
Budget deficit	ALL	9.3397	4	0.053
Trade deficit	Budget deficit	29.68	4	0
Trade deficit	ALL	29.68	4	0

In order to analyze the sign of the causalities detected above and their dynamic impact over time we estimate Impulse Response Functions for a period of 10 quarters. Results are presented in Figure 3.The graph in the top right panel shows the response of the Trade deficit as a result of a one standard deviation increase in the Budget deficit variable. We can see from the graph that there is no consistent relation between the two deficits. Trade deficit initially (during the first two quarters after the shock) decreases in response to a one standard deviation increase in the budget deficit, increases during the third and the fourth period, before decreasing again during the fifth and the sixth quarter. The graph in the bottom left panel shows the response of the Budget deficit variable for a one standard deviation increase in the Trade deficit variable. As we can see, this relation is rather weak as the impulse response function hovers around zero. These results are consistent with the VAR results shown in Table 3 where the effect of the trade deficit on the budget deficit variable was significant only at 10% significance level, whereas the effect was stronger (at 1% significance level) for the impact of budget deficit on the trade deficit variable.

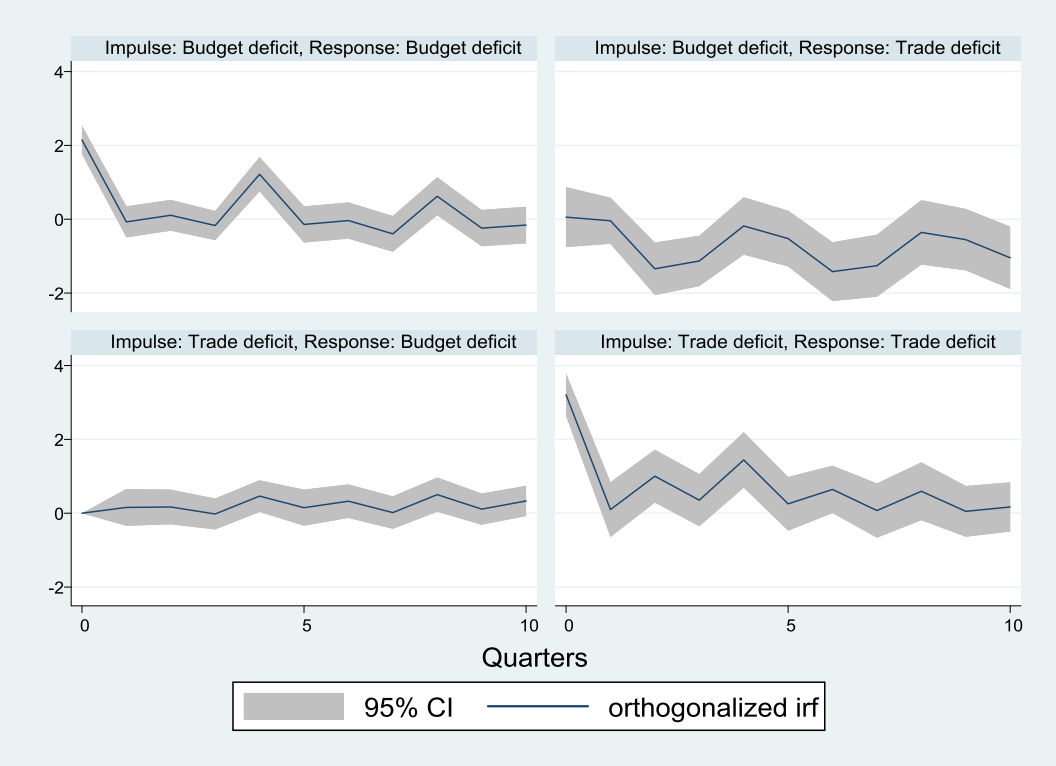

Figure 3: Impulse Response Functions

As a final robustness check we include two exogenous dummy variables in the VAR model, namely, a dummy variable indicating the 2008/2009 financial crisis and a dummy variable from the second quarter of 2020 onwards indicating the period after the start of the COVID-19 pandemic. We do not find significant coefficients for these two dummy variables in the VAR model, and our main results do not materially change (results available upon request).

5. Conclusion

In this paper we have tested the twin deficit hypothesis for the economy of North Macedonia during the period 2006-2021. Overall, results from our empirical analysis partially confirm the twin deficit hypothesis. We find a positive relation between the two deficits only at certain time lags, most likely when effects from the budget deficit materialize and impact the external position of the country. For other time lags we find a negative relation between the two deficits contrary to the predictions of the twin deficit hypothesis. As more data become available to researchers an important area for future research is a thorough investigation of the channels through which the two deficits communicate (i.e. interest rates, exchange rates, etc.). The weak relation we find between the budget and the trade deficit is not surprising for a small open economy such as North Macedonia, with a fixed exchange rate regime and with foreign direct investments which are mainly driven by the overall business conditions of the country rather than the prevailing interest rates. We find the fiscal policy to be of limited importance for the external position of the country, and call for policies that utilize the comparative advantage of the country, that promote and enhance the quality of goods and services in order to improve the competitive standing of the country in the regional and the global economy.

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Appendices

Table A1: Comparing R-square with the Durbin-Watson test statistics

Source	SS	df	MS	Number of obs	=	64
				F(1, 62)	=	2.50
Model	63.7362125	1	63.7362125	Prob > F	=	0.1188
Residual	1579.05701	62	25.4686614	R-squared	=	0.0388
				Adj R-squared	=	0.0233
Total	1642.79322	63	26.0760829	Root MSE	=	5.0466
Trade deficit	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Budget deficit	.3335287	.2108352	1.58	0.119	-.0879249	.7549824
Constant	17.0445	.7837121	21.75	0.000	15.47788	18.61112
Durbin-Watson d-statistic (2, 64) = 1.127565						

Table A2: Choosing the optimal lag length

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-257.607				74.3775	9.9849	10.0137	10.0599
1	-251.131	12.954	4	0.012	67.636	9.88964	9.97595	10.1148
2	-244.764	12.734	4	0.013	61.8082	9.7986	9.94246	10.1738
3	-241.086	7.3549	4	0.118	62.711	9.811	10.0124	10.3363
4	-216.437	49.299	4	0	28.4481*	9.0168*	9.27574*	9.69223*
5	-214.908	3.058	4	0.548	31.4705	9.11183	9.42832	9.93736
6	-212.818	4.1786	4	0.382	34.1656	9.18532	9.55935	10.1609
7	-207.979	9.6797	4	0.046	33.4807	9.15302	9.58459	10.2787
8	-201.084	13.789	4	0.008	30.4399	9.04168	9.5308	10.3175
9	-197.267	7.6327	4	0.106	31.3057	9.04875	9.59541	10.4747
10	-195.109	4.3163	4	0.365	34.515	9.11959	9.72379	10.6956
11	-189.711	10.796	4	0.029	33.8257	9.06582	9.72757	10.7919
12	-184.651	10.12*	4	0.038	33.8574	9.02505	9.74434	10.9012

Table A3: Diagnostic tests

Stability test			
Eigenvalue	Modulus		
-0.9395513	0.939551		
.9232683 + .1443852i	0.93449		
.9232683 - .1443852i	0.93449		
.03848159 + .9041993i	0.905018		
.03848159 - .9041993i	0.905018		
-0.7997245	0.799725		
-.09386027 + .6512376i	0.657967		
-.09386027 - .6512376i	0.657967		
Autocorrelation test			
lag	chi2	df	Prob > chi2
1	1.8707	4	0.75953
2	2.0648	4	0.72385
Jarque-Bera normality test			
Equation	chi2	df	Prob > chi2
Budget deficit	3.526	2	0.17154
Trade deficit	1.725	2	0.42221
ALL	5.25	4	0.26256