

# The Impact of Remittances on the Trade Balance: Empirical Evidence from North Macedonia

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## Abstract

The impact of remittances on various economic indicators has been analyzed for many developing countries, however, there is little evidence about their impact on the trade balance. For North Macedonia, remittances play an important role because they completely compensate the trade deficit, but on the other hand these remittances are expected to affect the trade deficit, because a large part of these remittances is oriented for further consumption. This paper aims to examine the impact of remittances on North Macedonia's trade balance using quarterly data for the period Q12003 - Q32019. Like many developing countries, North Macedonia's economy relies heavily on remittance flows making it an interesting laboratory for the research question at hand. We differentiate between formal remittances, as measured by workers' compensations and informal remittances, as measured by private current transfers. We find that private current transfers have a significant impact and improve the trade balance, whereas workers' compensation significantly worsens the trade balance. In addition, our results show that inflation worsens the trade balance and past trade rates themselves affect current trade rates. These results point to the need for a more accurate measure of remittance flows in official statistics to be able to capture the full extent of their impact in various economic indicators of a country.

## Keywords

Trade Balance, Remittances, North Macedonia, Current Transfers, Informal Flows

## 1. Introduction

The free movement of goods and people and its impact on sending and receiving

countries has been constantly discussed in the context of European Union developments and beyond.

The economy of Northern Macedonia, as a small open economy where about 80% of trade services are realized with EU countries, over the years faced a negative trade balance. According to the State Statistical Office for the period 2014-2019, the trade balance is almost 1.5 billion euros (or 17% of GDP) over the last five years, with exports of goods and services between 5 billion euros and imports of 6.5 - 7 billion euros.

Against a negative trade balance of 1.5 billion euros (17% of GDP), the current account balance over the last five years marks a deficit of close to 200 million euros (or 2% - 3% of GDP). Inflows from secondary income that on average over the last five years were close to 1.7 billion euros (or 20% of GDP) neutralize the negative effect of trade balance in the current account balance. Secondary income is mainly formed by current transfers that represent remittances from outside without providing any compensation. Secondary income account shows current transfers between residents and nonresidents, which transfers are made in cash or other forms (IMF, 2009).

From this sequence of event, we can see that private transfers, respectively remittances, apart from reducing poverty, improving living standards, financing education and health services they also offset all the negative impact of the trade balance in the current account in particular and the balance of payments in general.

According to the World Bank's Migration and Development Reports for 2019 worldwide, about 200 million migrant workers have sent about \$715 billion to their homes (World Bank, 2019). Considering the high levels of informal transfers of remittances this figure appears to be much higher. Estimates of the importance of informal flows vary widely, ranging from 35 to 75 percent of the flows registered in developing countries (Freund & Spatafora, 2005). At the same time, various market observers suspect that informal flows could range from about 50 percent to 250 percent of recorded flows (Celent, 2002). For these reasons and not only, the role of remittances from migrants in developing countries continues to be an important issue for researchers and policymakers. Remittances represent an essential influx of financial resources, mainly from developed countries to developing countries. With the continued and strong support of these flows, private remittances are important to their home countries, especially in terms of their potential for development (Freund & Spatafora, 2005).

Remittances help the population in receiving countries to cope with poverty alleviation, improving inefficient local labor markets and improving the social security system (Ari & Cergibozan, 2017). It is emphasized that remittances support families to survive by providing them with the means to buy food and other resources, to invest in their children's education, and to improve the housing situation. In a macroeconomic context, it is argued that remittances

drive consumption and economic growth, help finance the trade deficit and contribute to exchange rate stability (Dietz, 2010). Furthermore, remittances are supposed to strengthen the banking system and increase competition in local banks by simplifying bank transfers (Kireyev, 2006).

It should be noted that remittances are also associated with a number of potentially influential effects on government policy, monetary indicators, investment and labor supply. Because remittances create a safety net for host families, they can ease pressure on their governments to engage in economic and social welfare reform. Also, a high inflow of remittances is likely to fuel inflationary pressure and widen the trade deficit. Furthermore, remittances can increase household consumption but cannot be used to invest in productive assets (Taylor, 1992).

Although the impact of remittances has been extensively analyzed, their impact on various economic and social indicators remains unclear. This is mainly due to the fact that accurately collecting data is extremely difficult. A large part of these remittances are not channeled through the formal payment system and consequently do not appear in official statistics. To better understand the inaccuracy of official flows recorded in the current account of the balance of payments we can use the results of a study which was conducted in Macedonia in 2007, where the survey included 1046 households that receive remittances from abroad (Roberts, Markiewitz, Nikolov, & Stojkov, 2008). According to this study, only 38.6% of remittances were sent home by official money transfers (for example through Western Union) or bank transfers.

The purpose of this paper is to find out the extent of the impact of remittances on the trade balance. As mentioned above, they play an important role because they completely compensate the trade deficit, but on the other hand these remittances are expected to deepen the trade deficit, because a large part of these remittances is oriented for further consumption. To evaluate the impact of remittances on the trade balance we define remittances in the narrow sense (when taking into account only formal remittances of workers from abroad) and in the broad sense (taking into account private current transfers, which includes informal remittances).

The paper is organized as follows: Section Two briefly reviews the existing literature on the impact of remittances on the trade balance; Section Three elaborates the underlying methodology; Section Four presents the results and offers a discussion; and Section Five concludes.

## 2. Literature Review

A number of studies have argued that the inflow of remittances in various forms—from bank transfers to in-kind gifts—plays an important role in reducing poverty and contributing to economic growth (Chami, Hakura, & Montiel, 2009; Buch & Kuckulenz, 2004; World Bank, 2006).

The micro- and macro-economic impact of remittances has been widely do-

cumented. At the macro-level, remittances stabilize the balance of payments, hence contributing to closing the large and persistent trade gaps in many countries and preserve macro-economic stability (World Bank, 2006). At the micro-level, the development effects of remittances, with a certain degree of variety, have been documented for poverty alleviation, improving education and health outcomes, improving income distribution, steering entrepreneurial spirit, etc (Adams & Page, 2005).

Studies about the impact of remittances on the trade balance are limited. In fact, most of these studies focus on developing countries where remittance flows are an important phenomenon. Based on these studies, the resulting economic impact of remittances is sometimes found to be positive and sometimes negative. Furthermore, some studies take a bilateral perspective while others focus on the aggregate trade balance (Bahmani-Oskooee & Ratha, 2004).

A study measuring the impact of remittance inflows on the trade balance has been done for the developing countries of the Asia-Pacific region for the period 1980-2015. Results through OLS, 2-SLS and PGMM show that remittance inflows worsen the trade balance. GDP growth also affects the deterioration of the trade balance, while the devaluation of the currency has a positive impact on the trade balance (Tung, 2018).

Another similar study assesses the impact of remittances on the trade balance of Malaysia for the period 1990-2015. Regression results show that an increase in remittance flows improves the trade balance. In addition to remittances, currency devaluation affects the improvement of the trade balance, while an inflow of capital from abroad worsens the trade balance (Nguyen, 2017).

A study for North Macedonia was conducted to analyze an empirical link between the current account deficit and a range of macroeconomic variables for the period 1998Q1 - 2013Q4. There is a strong link between developments in the current account balance on the one hand and fiscal balance, financial development, market conditions and trade openness on the other. Also the current developments of the current account balance are influenced by the past dynamics of the current account. Delayed current account balance, monetary aggregate M2 and market conditions affect the improvement of the current account balance. On the other hand, trade opening, budget deficits affect the deterioration of the trade balance. While GDP growth and the effective real exchange rate (REER) are not statistically significant (Sadiku, Fetahi-Vehapi, Sadiku, & Berisha, 2015).

Another study was done for Poland, where through the VAR model the results show that national income and money supply has played a crucial role as a determining factor of the trade balance for the period 1997-2008. A weak relationship is found between the trade balance and the effective real exchange rate (Misztal, 2010).

Also, studies find that private transfers are factors of economic development in Macedonia, where they have a positive impact on GDP according to a study

for the period 2005-2015 (Ferati, Sallai, & Deari, 2018).

For the Turkish economy, a study was conducted using the Johansen procedure and the VEC model for a long-term and short-term relationship between the trade balance and other variables. Their results show that the real effective exchange rate, real national and foreign income are the main determinants that explain the variation of Turkey's trade balance. Thus, currency devaluation improves the trade balance in the long run, rising national income improves the trade balance and rising foreign income worsens the trade balance (Ari & Cerigibozan, 2017).

A comprehensive study attempting to measure the real rate of remittances and its structure for Macedonia was made in 2008. Results show that 63.8% of remittances go for consumption, 15.8% for capital investments and 20% for savings (Roberts, Markiewitz, Nikolov, & Stojkov, 2008). This structure of remittance expenditures also creates the logic that a large part of consumption goes to foreign goods, implying that remittances on the one hand are offsetting the negative contribution of the trade deficit on the current account deficit but on the other hand they are also contributing in increasing this trade deficit. There are also concerns that the large increase in remittances is causing an increase in the trade deficit through the phenomenon of "Dutch disease". The increase in remittances may affect an appreciation of the exchange rate, which causes the price of exports to increase and the price of imports to decrease, which may lead to an increase in the trade deficit (Hien, 2017). The findings in the fixed exchange rate regimes also stand in the same line where positive and significant coefficient on this interacted variable suggests that a fixed exchange rate regime allows for an even more pronounced spending effect of remittances and thus higher real appreciation (Lartey & Mandelman, 2008).

Also a more comprehensive study for the new EU member states is done to assess the determinants of the current account balance. According to the results, if remittances are equal to or exceed 5% of GDP then they improve the current account balance by 0.02% (Rahman, 2008).

### 3. Data and Methodology

Previous empirical and theoretical work suggests that the trade balance is influenced by a number of important factors (see **Table 1** below). In the following, we advance a number of hypotheses regarding the relationship between the trade balance and the potential factors affecting the trade balance, which we will continue to evaluate in the following empirical work.

The basic trade balance equation can be specified as:

$$\begin{aligned} \text{TDGDP}_t = & \alpha + \alpha_1 \text{CPI}_t + \alpha_2 \text{RemittGDP}_t + \alpha_3 \text{CurrTransGDP}_t + \alpha_4 \text{BBGDP}_t \\ & + \alpha_5 \text{FDIGDP}_t + \alpha_6 \text{TD4GDP}_{t-4} + \alpha_7 \text{GDPchan}_t + \alpha_8 \text{REER}_t + \varepsilon_t \end{aligned} \quad (1)$$

where  $t$  represents the time period  $t = \text{Q12003} - \text{Q32019}$ . TDGDP as a dependent variable represents the difference between exports and imports of goods and

**Table 1.** Variables, definitions and sources.

Variable	Definition	Source
GDPchan <sub>t</sub>	Gross domestic product according to the expenditure approach, by quarters, current prices (million denars), volume indices (compared to the same period last year %)	stat.gov.mk
TDGDP <sub>t</sub>	Trade balance of goods and services (trade deficit), for the quarter, in relation to the GDP of the respective quarter	nbrm.gov.mk author calculation
CPI <sub>t</sub>	Prices, Consumer Price Index, All items, Percentage change, Corresponding period previous year, Percent	FSI (IMF)
REER	2015 = 100 The indices are calculated with weights based on total foreign trade. * An upward change in the REER indicates appreciation.	nbrm.gov.mk
RemittGDP <sub>t</sub>	BoP data, remittances from workers, includes formal remittances from workers staying one or more years abroad, set in relation to GDP	nbrm.gov.mk
CurrTransGDP <sub>t</sub>	BoP data, Current transfers, except government (Financial enterprises, non-financial enterprises, households and non-profit institutions serving households) set in relation to GDP	nbrm.gov.mk
BBGDP <sub>t</sub>	General government deficit is defined as the balance of income and expenditure of government. This indicator is measured as a percentage of GDP	nbrm.gov.mk
TD4GDP <sub>t</sub>	The trade balance of goods and services with four time delays in relation to GDP	nbrm.gov.mk author calculation
FDIGDP <sub>t</sub>	Foreign direct investment refers to direct investment equity flows in the reporting economy. This indicator is measured as a percentage of GDP	IMF, Balance of Payments database nbrm.gov.mk

services in relation to nominal GDP. While no trade surplus periods were recorded for Macedonia, this dependent variable was termed trade deficit relative to GDP, so a positive coefficient of any independent variable indicates an increase in the trade deficit and a negative sign indicates a decrease in the trade deficit. The independent variable CPI, represents the consumer price index, changes in percentage compared to the same period last year, an indicator which measures the impact of inflation on the dependent variable. The flow of money from emigrants is measured by two variables: RemittGDP and CurrTransGDP. Re-

mittGDP represents money transfers through formal channels through persons—residents and immigrants who have non-resident status due to residence abroad for one or more years. This variable represents a narrow perspective of the real impact of transfers which is put in relation to GDP. The CurrTransGDP variable, on the other hand, includes private current transfers, a broader component of transfers, which is believed to include informal transfers because it includes: employee remittances, rents, pensions, invalidity coming from abroad and activities of the purchase of foreign net effect in the foreign exchange market. This represents the purchase of foreign cash from exchange offices by banks. It is believed that a significant part of the net effective is drawn from private immigration transfers (Нацевска, Крстевска, Петровска, & Уневска, 2006). BBGDP represents the budget balance in relation to GDP. When revenues exceed budget expenditures it represents a surplus and vice versa budget deficit. FDIGDP represents inflows in the form of foreign direct investment relative to GDP. The variable TD4GDP represents the time delay of the dependent variable (four-quarter lags), because it is believed that previous commercial rates affect actual trading rates. GDPchan presents the percentage changes of the most important economic indicator, gross domestic product, measured as a percentage change for the quarter compared to the same period last year, according to the expenditure method. The REER variable represents the real effective exchange rate which is presented in the form of indices where the base year is 2015 = 100. An increase in the index means an appreciation of the national currency and a decrease in competitiveness, and vice versa when we have a decrease in this index, which represents currency devaluation and an increase in international competitiveness. The purpose of effective exchange rates is to provide substantial and comparable measures of price and cost competition between countries.  $\varepsilon$  represents the common error term.

The created linear regression (using least square method) is made in the form of finding the best model. This method lets us choose the best model from amongst all the models which can handle a number of variables varying from “Min variables” to “Max variables”. Furthermore, we choose several “criteria” to determine the best model: Adjusted  $R^2$ , Mean Square of Errors (MSE), Mallows Cp, Akaike’s AIC, Schwarz’s SBC, Amemiya’s PC (see **Table A1** in Appendix).

Using this approach then the best model is with six variables excluding from the model GDPchan and REER. Also out of curiosity, these two variables if included in the model are also statistically insignificant. The linearity assumption we can see by scatterplots between residuals and predicted values and also by observed dependent variable and predicted values. As we can see by scatter plots we conclude that we have positive linear relations between dependent and independents variables (see **Figure A1** in Appendix). The normality of the residuals we have checked by running a Shapiro-Wilk test on the residuals, so the  $H_0$  was accepted (the residuals follow a normal distribution, see **Table A2** in appendix). Testing for homoscedasticity based on the Breusch-Pagan and Abridged-White

test, we can see that the significance  $F > 0.1$  which means that  $H_0$  will be accepted where there is homoscedasticity of term errors and  $H_a$  is rejected in the presence of heteroskedasticity (see **Table A3** in Appendix). This means that the error terms are correctly specified. Variance inflation factor (VIF) measure is used to see if we have problems with multicollinearity, and according to the results we see that the VIF indicator is below 2, which shows that we have no problems with the multicollinearity of the variables (see **Table A4** in Appendix). Testing for auto-correlation of residuals we use Durbin-Watson test which a rule of thumb is that test statistics values in range of 1.5 - 2.5 are relatively normal, so in our dataset Durbin-Watson test is 2.2 (see **Table A5** in Appendix) which means that we don't have problems with auto-correlation.

#### 4. Estimation Results

**Table 2** contains descriptive statistics (also **Table A6** in Appendix). Across all years, the trade deficit as a percentage of GDP is 18.29%, with a variation 7.64% - 30.04% of GDP over time. In addition to these indicators in **Table 2** you can find other statistical data for all variables included in the model. The period analyzed on the basis of the quarter Q12003 - Q32019 creates a dataset with 67 data and it is important to highlight that there is no missing data in this time period included in the model.

To measure the relationship and the direction of the relationship between the two variables we use Pearson correlation. As can be seen from **Table 3** (also **Table A7** in Appendix) where the matrix of correlations between the dependent variable and the independent variables is presented, as well as the relation between the independent variables, we can also read the relation but also the

**Table 2.** Descriptive statistics.

Variable	Observations	Obs. with missing data	Obs. without missing data	Min	Max	Mean	Std. deviation
TDGDP	67	0	67	7.642	30.038	18.289	4.890
GDPchan	67	0	67	-3.700	10.700	3.219	3.350
CPI	67	0	67	-2.051	9.754	1.690	2.376
REER	67	0	67	94.931	106.97	99.734	2.481
RemittGDP	67	0	67	1.479	2.893	2.285	0.364
CurrtransfGDP	67	0	67	8.144	22.979	16.202	3.454
BBGDP	67	0	67	-12.029	6.381	-1.863	3.172
FDIGDP	67	0	67	-2.634	21.437	3.714	3.722
TD4GDP	67	0	67	7.642	30.038	18.675	4.689

Source: Author's calculations.



**Table 3.** Correlation matrix.

Variables	TDGDP	GDPchan	CPI	REER	Remitt GDP	Currtransf GDP	BBGDP	FDIGDP	TD4GDP
TDGDP	<b>1</b>	0.049	<b>0.402</b>	-0.20	<b>0.367</b>	<b>-0.316</b>	-0.178	<b>0.272</b>	<b>0.566</b>
GDPchan	0.049	<b>1</b>	0.159	-0.09	0.080	-0.167	0.208	<b>0.304</b>	-0.219
CPI	<b>0.402</b>	0.159	<b>1</b>	<b>-0.34</b>	0.135	0.049	0.079	<b>0.243</b>	-0.038
REER	-0.208	-0.091	<b>-0.34</b>	<b>1</b>	<b>-0.269</b>	<b>-0.475</b>	-0.039	-0.136	-0.132
RemittGDP	<b>0.367</b>	0.080	0.135	<b>-0.26</b>	<b>1</b>	0.169	<b>0.373</b>	0.016	<b>0.337</b>
CurrtransfGDP	<b>-0.316</b>	-0.167	0.049	<b>-0.47</b>	0.169	<b>1</b>	0.133	<b>-0.298</b>	-0.175
BBGDP	-0.178	0.208	0.079	-0.03	<b>0.373</b>	0.133	<b>1</b>	0.066	<b>-0.322</b>
FDIGDP	<b>0.272</b>	<b>0.304</b>	<b>0.243</b>	-0.13	0.016	<b>-0.298</b>	0.066	<b>1</b>	-0.064
TD4GDP	<b>0.566</b>	-0.219	-0.03	-0.13	<b>0.337</b>	-0.175	<b>-0.322</b>	-0.064	<b>1</b>

Values in bold are different from 0 with a significance level  $\alpha = 0.05$ .

direction of this relation. Values in bold are different from 0 with a significance level  $\alpha = 0.05$ .

As can be seen strong positive relationship between the two variables we have between the dependent variable (TDGDP) and TD4GDP, which is expected and logical. We have a positive average correlation between the dependent variable and CPI as well as RemittGDP. We also have a negative average correlation with the dependent variable and CurrTransfGDP. We have a low positive correlation between the dependent variable and the FDIGDP variable. We have no correlation between the dependent variable and GDPchan, REER and BBGDP. Also for the reader can be seen the relations and directions of these relations even between the explanatory variables among themselves. Also through graphs (see **Figure A1** in Appendix) you can see the relationship between the dependent variable and the explanatory variables.

From **Table 4** below (also **Table A8** in the Appendix) we can see the parameters of the model, respectively the significance of the independent variables and their impact on the dependent variable (TDGDP). As can be seen, two models are presented, the one with six variables which is also the best model as a result of the consultation of several "criteria" to determine the best model: Adjusted  $R^2$ , Mean Square of Errors (MSE), Mallows Cp, Akaike's AIC, Schwarz's SBC, Amemiya's PC (see **Table A9** in Appendix).

For the purpose of explanation, we add to the model the other two variables (GDPchan; REER) that are excluded from the first model where we can see that the two variables excluded from the first model are not statistically significant and the significance of the other variables remains the same as in the base model with six variables.

R-squared is 0.63 (see **Table A1** and **Table A5** in the Appendix) which means that the dependent variable (TDGDP) is explained up to 63% of the independent variables presented in the model. Following the results from **Table 4**, we can see

**Table 4.** Model parameters (dependent variable: TDGDP).

Source	Models with six variables R <sup>2</sup> = 0.63		Models with eight variables R <sup>2</sup> = 0.63	
	Value	Pr >  t	Value	Pr >  t
Intercept	5.147	0.082	28.739	0.293
GDPchan	0.000		-0.016	0.906
CPI	0.763	<b>0.000***</b>	0.709	<b>0.002***</b>
REER	0.000		-0.212	0.393
RemittGDP	3.796	<b>0.013***</b>	3.724	<b>0.016***</b>
CurrtransfGDP	-0.353	<b>0.009***</b>	-0.443	<b>0.004***</b>
BBGDP	-0.248	0.060	-0.242	0.084
FDIGDP	0.183	0.144	0.149	0.271
TD4GDP	0.415	<b>0.000***</b>	0.387	<b>0.001***</b>

Notes: the dependent variable is the trade deficits as a percentage of GDP. \*\*\*, \*\* and \* denote significance at the 1 percent, 5 percent and 10 percent level.

that the independent variables: CPI, RemittGDP, CurrtransfGDP, TD4GDP are variables that statistically affect and explain the dependent variable (TDGDP) and all variables are significant at 1 percent level.

With the increase of inflation by 1 percent, the trade deficit increases by 0.76% in relation to GDP, ceteris paribus. The presence of inflation causes the prices of domestic products to rise faster than the prices of products of trading partners, thus making domestic products less competitive and consequently reducing the demand for those products and increasing the demand for imported goods. Also, the inflation rate increases the cost of borrowing due to a higher interest rate. This in turn discourages potential investors from undertaking exports activities (Aye Mengistu & Lee, 2014). The results of other authors are also in line, underlining the fact that inflation is harmful to the economic growth and this has effects on the trade balance (Ademe, 2016).

To measure the impact of cash flows from emigrants as we have said two variables have been introduced. Initially, the dilemma arises whether these two variables explain the same thing and we can have the presence of multicollinearity, but as can be seen from Table 3, the correlation coefficient is 0.169, which means that these two indicators are explaining distinct phenomena from each other. Also from Table 2 you can see the average of the RemittGDP variable which is 2.28% of GDP and the average of the CurrTransfGDP variable which is 16.2% of GDP. As we presented earlier the first variable explains in a narrow concept remittances taking only formal flows from workers who work one or more years abroad. While the second variable represents a broader concept which includes the category of net effective operations that are believed to be from informal channels of remittances. Both of these variables have emerged

statistically significant at 1 percent level and in the opposite direction, respectively with the increase of the RemittGDP variable by 1% in relation to GDP increases the trade deficit of 3.79% in relation to GDP and with the increase of the CurrTransfGDP variable for 1% of GDP reduces the trade deficit of 0.35% of GDP, in ceteris paribus. The most accessible and realistic indicator is definitely the second variable and therefore we think it is more relevant in the real explanation of these cash flows coming from abroad. Also studies of other authors that have been done for different countries and for different periods of time show that the results are not in line, respectively in some authors it is seen that remittances worsen the trade balance (Tung, 2018) and some results show that remittances improve the trade balance (Nguyen, 2017; Rahman, 2008).

It is believed that opening trade routes, finding trading partners affect trade rates. Therefore positive trading rates that have been realized in finding new trading partners or routes in the past definitely affect today's trading positions. We have therefore introduced the lagged dependent variable into a regression model, implying the fact that past trading rates definitely affect current trading rates. The result finds this variable as statistically significant at 1 percent level and an increase in the trade deficit relative to GDP before the four quarters affects the increase of 0.415% of the current trade deficit relative to GDP.

The budget balance does not affect the trade balance. The theory of "twin deficits" is not proven in our model, although as can be seen it has a statistical relevance (*p*-value) very close to the level of acceptability. The expressed causality is very logical, because with the improvement of the budget balance of 1% in relation to GDP, the trade deficit decreases by 0.25% in relation to GDP. In fact, there is room for a possible new work on the budget balance and the effects on the trade deficit, but we cannot dwell only on the traditional view of linking the impact of the budget balance on the trade balance. There is evidence of a budget-to-trade deficit causality but there is also strong evidence of trade-to-budget deficit causality. Also the evidence that there are periods when there is no relationship between these variables. Foreign direct investment is not proven to be statistically significant and has a positive coefficient.

A standardized beta coefficient (see Table A9 and Figure A2 in Appendix) compares the strength of the effect of each individual independent variable to the dependent variable. The higher the absolute value of the beta coefficient, the stronger the effect.

## 5. Conclusion

The purpose of this paper is to find out the extent of the impact of remittances on the trade balance. Remittances play an important role because they completely compensate the trade deficit, but on the other hand these remittances are expected to deepen the trade deficit, because a large part of these remittances is oriented for further consumption. To evaluate the impact of remittances on the trade balance we define remittances in the narrow sense (when taking into ac-

count only formal remittances of workers from abroad) and in the broad sense (taking into account private current transfers, which includes informal remittances). In addition to remittances, the model examines other variables that may have an impact on the trade balance.

The created linear regression (using least square method) is made in the form of finding the best model. This method lets us choose the best model from amongst all the models which can handle a number of variables varying from “Min variables” to “Max variables”. Furthermore, we choose several “criteria” to determine the best model: Adjusted  $R^2$ , Mean Square of Errors (MSE), Mallows Cp, Akaike’s AIC, Schwarz’s SBC, Amemiya’s PC where the best model is with six variables excluding from the model GDPchan and REER.

R-squared is 0.63 which means that the dependent variable (TDGDP) is explained up to 63% by the independent variables included in the model. Following the results from the table we can see that the independent variables: CPI, RemittGDP, CurrtransfGDP, TD4GDP are variables that statistically affect and explain the dependent variable (TDGDP) and all variables are significant at 1 percent level. Emigrant remittances measured through the private current transfers’ indicator are presented as statistically significant and the increase of this indicator improves the trade balance. On the other hand, the other variable, workers’ compensation is statistically significant and its increase worsens the trade balance. Looking at the qualitative aspect, we believe that the variable current transfers better represent the real flows of emigrants, because the variable workers’ compensation only narrowly and formally records these flows. On the other hand, rising inflation worsens the trade balance, and also past trade rates positively and significantly affect current trade rates.

## Conflicts of Interest

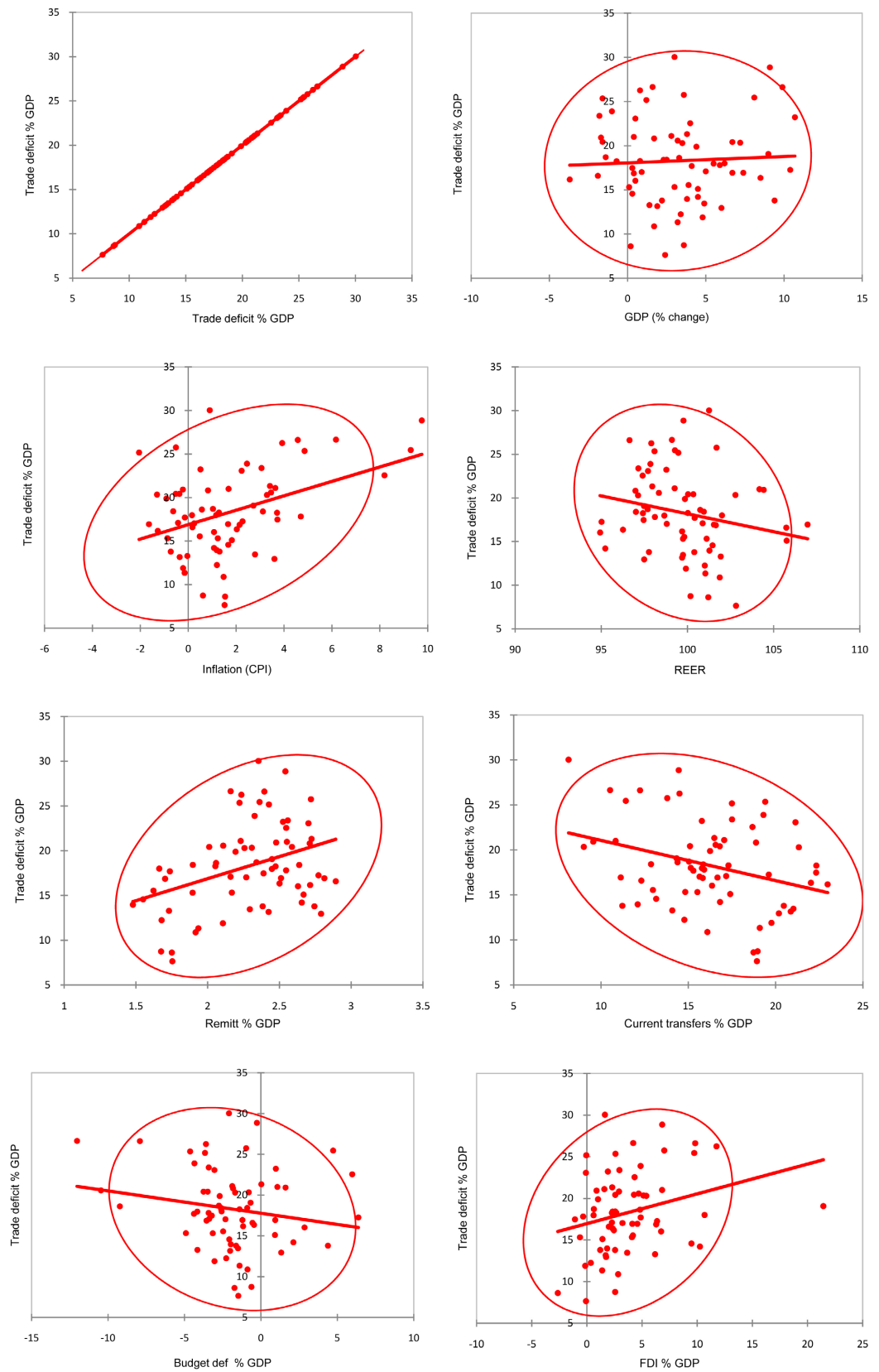
The authors declare no conflicts of interest regarding the publication of this paper.

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### Appendix



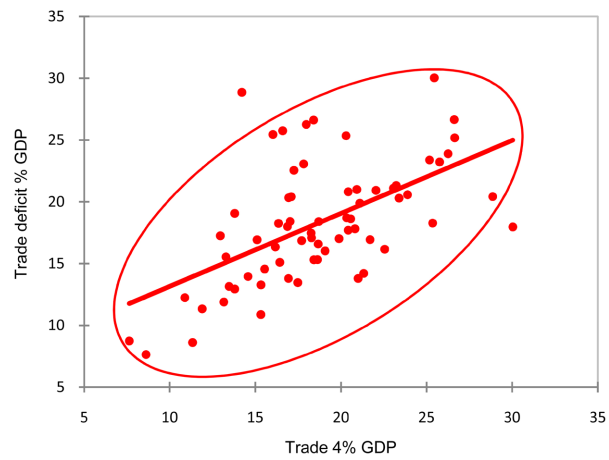


Figure A1. Scatter plots.

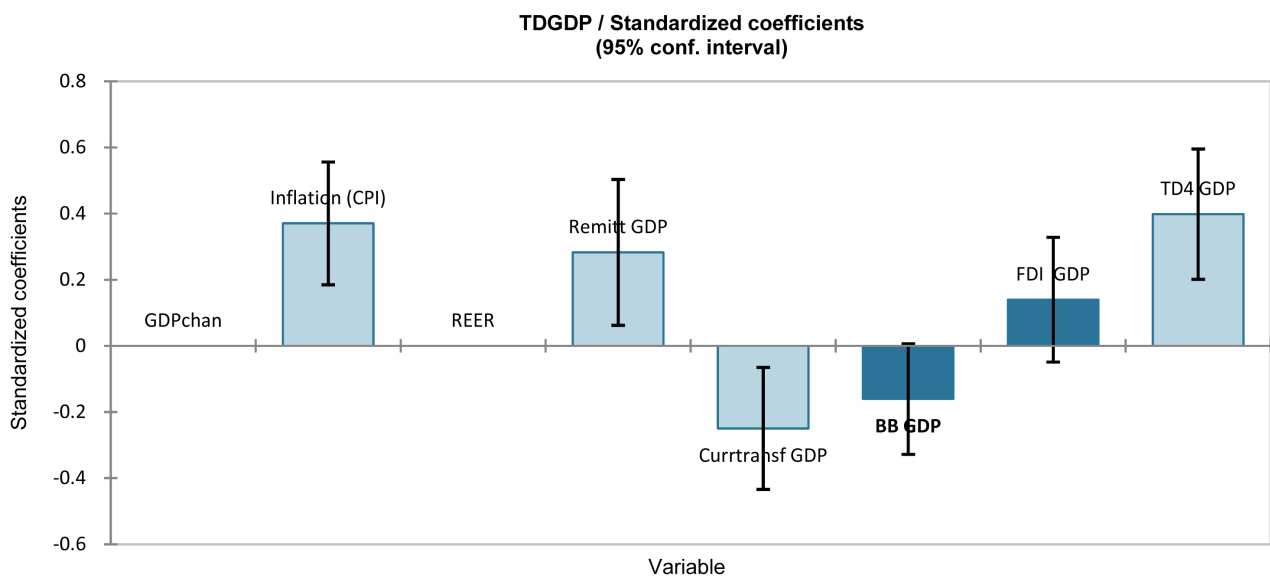


Figure A2. TDGDP/Standardized coefficients.

Table A1. Summary of the variables selection TDGDP.

Nbr. of variables	Variables	MSE	R <sup>2</sup>	Adjusted R <sup>2</sup>	Mallows' Cp	Akaike's AIC	Schwarz's SBC	Amemiya's PC
2	CPI/TD4GDP	12.318	0.500	0.485	17.340	171.171	177.785	0.530
3	CPI/CurrTransfGDP/TD4GDP	11.082	0.558	0.536	10.379	165.032	173.851	0.483
4	CPI/RemittGDP/CurrTransfGDP/TD4GDP	10.386	0.592	0.566	6.988	161.613	172.636	0.459
5	CPI/RemittGDP/CurrTransfGDP/BBGDP/TD4GDP	10.148	0.608	0.576	6.513	160.971	174.199	0.455
6	CPI/RemittGDP/CurrTransfGDP/BBGDP/FDIGDP/TD4GDP	9.894	0.624	0.586	5.990	160.164	175.597	0.449
7	CPI/REER/RemittGDP/CurrTransfGDP/BBGDP/FDIGDP/TD4GDP	9.895	0.630	0.586	7.014	161.047	178.684	0.455

The best model for the selected selection criterion is displayed in blue.

**Table A2.** Test on the normality of the residuals (Shapiro-Wilk) (TDGDP).

W	0.981
p-value (Two-tailed)	0.399
Alpha	0.050

H0: The residuals follow a Normal distribution. Ha: The residuals do not follow a Normal distribution. As the computed p-value is greater than the significance level  $\alpha = 0.05$ , one cannot reject the null hypothesis H0.

**Table A3.** Analysis of variance (TDGDP).

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	6	984,327	164,055	16,582	<0.0001
Error	60	593,623	9894		
Corrected Total	66	1,577,951			

**Table A4.** Multicollinearity statistics.

	GDPchan	CPI	REER	Remitt GDP	Currtransf GDP	BBGDP	FDIGDP	TD4GDP
Tolerance	0.782	0.825	0.543	0.565	0.510	0.629	0.735	0.530
VIF	1.279	1.212	1.840	1.771	1.962	1.590	1.360	1.887

**Table A5.** Goodness of fit statistics (TDGDP).

Observations	67
Sum of weights	67
DF	60
R <sup>2</sup>	0.624
Adjusted R <sup>2</sup>	0.586
MSE	9.894
RMSE	3.145
MAPE	13.060
DW	2.209
Cp	5.990
AIC	160.164
SBC	175.597
PC	0.464



**Table A6.** Descriptive statistics.

	Observations	Obs. with missing data	Obs. without missing data	Min	Max	Mean	Std. deviation
TDGDP	67	0	67	7.642	30.038	18.289	4.890
GDPchan	67	0	67	-3.700	10.700	3.219	3.350
CPI	67	0	67	-2.051	9.754	1.690	2.376
REER	67	0	67	94.931	106.972	99.734	2.481
RemittGDP	67	0	67	1.479	2.893	2.285	0.364
CurrtransfGDP	67	0	67	8.144	22.979	16.202	3.454
BBGDP	67	0	67	-12.029	6.381	-1.863	3.172
FDIGDP	67	0	67	-2.634	21.437	3.714	3.722
TD4GDP	67	0	67	7.642	30.038	18.675	4.689

**Table A7.** Correlation matrix.

Variables	TDGDP	GDPchan	CPI	REER	Remitt GDP	Currtransf GDP	BBGDP	FDIGDP	TD4GDP
TDGDP	<b>1</b>	0.049	<b>0.402</b>	-0.20	<b>0.367</b>	<b>-0.316</b>	-0.178	<b>0.272</b>	<b>0.566</b>
GDPchan	0.049	<b>1</b>	0.159	-0.09	0.080	-0.167	0.208	<b>0.304</b>	-0.219
CPI	<b>0.402</b>	0.159	<b>1</b>	<b>-0.34</b>	0.135	0.049	0.079	<b>0.243</b>	-0.038
REER	-0.208	-0.091	<b>-0.34</b>	<b>1</b>	<b>-0.269</b>	<b>-0.475</b>	-0.039	-0.136	-0.132
RemittGDP	<b>0.367</b>	0.080	0.135	<b>-0.26</b>	<b>1</b>	0.169	<b>0.373</b>	0.016	<b>0.337</b>
CurrtransfGDP	<b>-0.316</b>	-0.167	0.049	<b>-0.47</b>	0.169	<b>1</b>	0.133	<b>-0.298</b>	-0.175
BBGDP	-0.178	0.208	0.079	-0.03	<b>0.373</b>	0.133	<b>1</b>	0.066	<b>-0.322</b>
FDIGDP	<b>0.272</b>	<b>0.304</b>	<b>0.243</b>	-0.13	0.016	<b>-0.298</b>	0.066	<b>1</b>	-0.064
TD4GDP	<b>0.566</b>	-0.219	-0.03	-0.13	<b>0.337</b>	-0.175	<b>-0.322</b>	-0.064	<b>1</b>

**Table A8.** Model parameters.

Source	Value	Standard error	t	Pr >  t	Lower bound (95%)	Upper bound (95%)
Intercept	5.147	2.911	1.768	0.082	-0.676	10.971
GDPchan	0.000	0.000				
CPI	0.763	0.191	3.991	<b>0.000</b>	0.380	1.145
REER	0.000	0.000				
RemittGDP	3.796	1.480	2.565	<b>0.013</b>	0.836	6.757
CurrtransfGDP	-0.353	0.131	-2.707	<b>0.009</b>	-0.614	-0.092
BBGDP	-0.248	0.129	-1.920	0.060	-0.506	0.010
FDIGDP	0.183	0.124	1.480	0.144	-0.064	0.431
TD4GDP	0.415	0.103	4.040	<b>0.000</b>	0.210	0.621

**Table A9.** Standardized coefficients (TDGDP).

Source	Value	Standard error	t	Pr >  t	Lower bound (95%)	Upper bound (95%)
Intercept	0.000	0.000				
GDPchan	0.370	0.093	3.991	<b>0.000</b>	0.185	0.556
CPI	0.000	0.000				
REER	0.283	0.110	2.565	<b>0.013</b>	0.062	0.503
RemittGDP	-0.250	0.092	-2.707	<b>0.009</b>	-0.434	-0.065
CurrtransfGDP	-0.161	0.084	-1.920	0.060	-0.328	0.007
BBGDP	0.140	0.094	1.480	0.144	-0.049	0.328
FDIGDP	0.398	0.099	4.040	<b>0.000</b>	0.201	0.595
TD4GDP	0.000	0.000				