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SCIENCES
SCHOOL OF ECONOMY AND PUBLIC ADMINISTRATION
DEPARTMENT OF ECONOMIC AND REGIONAL
DEVELOPMENT



Master program in Applied Economics and Regional Development
Direction: Applied Economics and Management

Dissertation

«Trade and growth: An empirical investigation for the
BRICS-Emerging and High Developed countries »

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Athens, April 2020

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*I would like to dedicate my dissertation to my parents Spyridon and Dimitra
and to my brother Giannis*

Acknowledgments

I am grateful to my supervisor Gregorios Siourounis for the knowledge, guidance and useful advice he provided me during my postgraduate studies and the preparation of my thesis.

Περίληψη

Το διεθνές εμπόριο συνεχίζεται εδώ και χιλιάδες χρόνια και έχει πολυδιάστατη επιρροή στην οικονομία κάθε κράτους, καθώς τα αποτελέσματα του μπορούν να επιφέρουν μεταβολές στην παραγωγή και διανομή των προϊόντων, μεταβολές στο πλαίσιο της αγοράς εργασίας και έχει αντίκτυπο στο βιοτικό επίπεδο κάθε έθνους. Σήμερα, η παγκοσμιοποίηση της οικονομίας φυσικά δεν άφησε ανεπηρέαστο το εμπόριο και φαίνεται ότι αλλάζει σημαντικά τον όγκο και το χαρακτήρα της διεθνούς ροής πόρων με κύριο σύμμαχο το ηλεκτρονικό εμπόριο.

Η άποψη που επικρατεί περισσότερο είναι ότι το εμπόριο είναι η κινητήριος δύναμη της οικονομικής ανάπτυξης και ήδη έχουν γίνει πολλές έρευνες για την σχέση αιτιότητας μεταξύ οικονομικής ανάπτυξης και εμπορίου. Στην παρούσα εργασία όμως ερευνήσαμε κάτι διαφορετικό. Ο σκοπός του άρθρου είναι να προσδιορίσει τον αντίκτυπο του διεθνούς εμπορίου στην οικονομική ανάπτυξη. Συγκεκριμένα, παρουσιάστηκαν οι διαφορές και προσδιορίστηκε την ένταση που έχει η επίδραση του εμπορίου στην ανάπτυξη σε δύο τύπους οικονομιών, τις πιο ανεπτυγμένες και τις BRICS-αναδυόμενες χώρες. Διερευνήσαμε την επίδραση του εμπορίου στην ανάπτυξη, χρησιμοποιώντας δεδομένα από διαστρωματικές χρονοσειρές για την περίοδο 1990-2018 σε σύνολο 25 χωρών. Επίσης, παρουσιάζονται τα περιγραφικά στατιστικά των μεταβλητών που χρησιμοποιήθηκαν και παραθέτετε η ερμηνεία τους. Στη συνέχεια αναλύονται τα αποτελέσματα από το μοντέλο FE και το μοντέλο IV για να καθοριστεί η παραπάνω σχέση. Ως εξαρτημένη μεταβλητή χρησιμοποιήθηκε το πραγματικό κατά κεφαλήν εισόδημα.

Τα αποτελέσματα της έρευνας έδειξαν ότι υπάρχει για τις ανεπτυγμένες χώρες μια ισχυρή σχέση μεταξύ εμπορίου και πραγματικού κατά κεφαλήν εισοδήματος. Από την άλλη πλευρά για τις αναδυόμενες οικονομίες παρατηρήθηκε ότι κινητήριος μοχλός για την οικονομία τους δεν είναι το εμπόριο, αλλά οι άμεσες ξένες επενδύσεις. Συμπεραίνεται για αυτό το λόγο ότι οι ανεπτυγμένες χώρες έχουν ήδη οικοδομήσει μια ισχυρή και καλά οργανωμένη οικονομία, βασισμένη σε καλές δομές και αυτό τους δίνει το πλεονέκτημα της επέκτασης του διεθνούς εμπορίου.

Λέξεις κλειδιά: Οικονομική μεγέθυνση, Διεθνές εμπόριο, Ξένες άμεσες επενδύσεις, Ποιότητα θεσμών, Διαφθορά

Abstract

International trade has been going on for thousands of years and has had a multifaceted impact on the economy of every state, as its effects can bring about changes in the production and distribution of products, changes in the labor market and has an impact on the living standards of every nation. Today, the globalization of the economy, of course, has not left trade unaffected and it seems that the volume and character of the international flow of resources is significantly changing with e-commerce as its main ally.

The prevailing view is that trade is the driving force behind economic growth and much research has already been done on the causal relationship between economic growth and trade. In this paper, however, we investigated something different. The purpose of the article is to identify the impact of international trade on economic growth. In particular, the differences were presented and the intensity of trade's impact on growth in two types of economies, the most developed and the BRICS-emerging countries, was determined. We investigated the impact of trade on growth, using data from stratified time series for the period 1990-2018 in a total of 25 countries. Also, the descriptive statistics of the variables used are presented and their interpretation is given. The results are then analyzed by the FE model and the IV model to determine the above relationship. GDP per capita in constant (2010 \$) was used as a dependent variable.

The results of the survey showed that there is a strong link between developed trade and per capita income for developed countries. On the other hand, for emerging economies, it has been observed that the driving force behind their economy is not trade, but foreign direct investment. It is for this reason that developed countries have already built a strong and well-organized economy, based on good structures, and this gives them the advantage of expanding international trade.

Keywords: Economic growth, International trade, FDI, Institutional quality, Corruption

JEL Classification: F10, F14, O40, O43, D73

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1 Introduction

Trade has already been observed since the Neolithic era, when the Sumerians and later Babylonians and Assyrians, were trading without being a profitable target. Trade had become more intense during the Bronze Age and continued to grow, but nowadays international trade has become increasingly important with a larger share of GDP devoted to exports and imports. International trade between different countries affects on not only in growth but also in development because it increases the employment rates and enabling consumers to enjoy a greater variety of goods. Also trade increases the market competition and increase the consumer surplus.

The purpose of this thesis is to examine the relationship between growth and trade. Also the purpose of this dissertation is the review of literature about trade and growth and the empirical investigation for very high developed and BRICS-emerging economies using panel data. For the BRICS-emerging we have chosen ten countries according to Oxford's survey¹. This dissertation inquires whether there is a relationship between trade and growth and what are the differences between these two types of economies.

The contribution of thesis can be seen in the comparative analysis between the two economies on the impact of trade on growth. Additionally the contribution is based on the econometric specification for empirical investigation . We first use a panel fixed effects model and then a fixed effects IV model. From IV model we examine a precise relationship between trade and growth. In addition, the results of the survey provide information for policy makers to consider the consequences of increasing the growth of the economy. The results can also be used to evaluate investments by foreign and domestic investors.

The main results of the research demonstrate that trade has a positive effect on growth and in particular the impact is greater in very high developed coun-

¹<https://www.businessinsider.com/oxford-economics-ranking-of-emerging-market-economies-2019-2#10-south-africa-1>

tries. Furthermore, we note that foreign direct investment has a positive effect on growth, especially in BRICS-emerging countries. In addition, the corruption rate and the HCI are two key factors for institutional quality. We indicate that the lower level of corruption create a framework for economic growth. Final we see the positive affect of human capital in growth.

The remainder of this thesis is organized as follows. Section 2 presents the literature review. Section 3 describes the economic model and methodology. Section 4 examines and analyze the data. Section 5 presents the empirical results. Section 6 concludes.

2 Literature Review

The potential benefit of trade openness for economic growth has been the subject of many empirical investigations. [Emery \(1967\)](#), considered that there is a causal relationship between the gross national income and exports. He found that there is not a simple causal relationship between variables but that there is an interaction between export and national income. Using cross section data from 50 countries during 1953-63, he estimated the above relationship with OLS method and found that the most significant correlation was between exports and G. N. P. and that for every 2,5 per cent increase in exports, per capita real G. N. P. showed a rise of 1 per cent.

[Fajana \(1979\)](#); [Feder \(1983\)](#) and [Balassa \(1985\)](#), estimated the effect of trade share on the GDP growth with OLS estimators . They also used a lot of control variables to create a more specialized template such as the labor force, the capital, the investments and the FDI. Therefore, they got a better view of additional determinants between this relationship.

[Dollar & Kraay \(2004\)](#), investigated the effect of globalisation on inequality and poverty. The results showed that the view that globalisation leads to faster growth and poverty reduction in poor countries. [Lee et al. \(2004\)](#), applied the identification through heteroskedasticity methodology to estimate the effect of openness on growth while properly controlling for the effect of growth on openness. The results suggest that openness would have a low positive effect on growth. [Awokuse \(2008\)](#) focused in the relationship between trade and economic growth in Argentina, Colombia and Peru. Using Granger causality tests and impulse response functions, he proved that the engine of growth on exports might be misleading.

[Ikpesu et al. \(2019\)](#), studied the role of trade and investment in the growth process in the SSA from 35 countries including SSA using trade openness (% GDP), export (% of GDP) and import (% of GDP) as a measure of trade by

deploying panel corrected standard error (PCSE). They found that trade domestic investment and import have positive effect on growth.

Yucel (2009) investigated the relations between financial development, trade openness and economic growth for Turkish economy. For the empirical analysis he used the Augmented Dickey-Fuller (ADF) for unit root. Moreover, Roshan (2007) examined the export-led growth for Iran used annual time series data for the period 1970-2001. He showed that real export growth principle net-real GDP growth and the decomposition of export needed further research. As well as, Cetin & Ackrill (2018) studied the trade-growth nexus in Slovakia from 1997 to 2014. They examined relationships between exports, imports and growth were using Toda & Yamamoto (1995) technique. Important evidence found in export-led-growth and import-led-growth relations. In contrast, with the previous, Felipe & Lanzafame (2020) inspected the export-led-growth relationship in China, for the period 1981-2016. For empirical results they estimated the growth rate of exports to the income elasticity of imports with the Kalman filter. The Bayesian Model Averaging technique helped them to analyze the importance of China's balance-of-payments equilibrium (BOPE) growth rate and the income elasticity of imports. They showed the composition of total demand was main force for direct effects on the income elasticity of imports, and for the indirect effects on export growth across capital accumulation, in particular fixed asset investment.

Against, Borensztein et al. (1998) studied the impact of foreign direct investment (FDI) on economic growth in a cross-country regression framework. They used FDI flows from 69 were developing countries from 1970 to 1989. The main results revealed that FDI is a mean of transfer of technology and more conduced to growth than the domestic investment. Furthermore, a higher productivity of FDI maintained when the host country had a specific fund of human capital. Complementary, Jude & Levieuge (2017) showed the effect of FDI on economic growth. But, they used an another way, the condition reported to the institutional quality of host countries and they tried to explain the institutional heterogeneity

were using several theories and by using a panel regression model, with samples of developing countries, they showed a positive effect between FDI and growth. [Khamphengvong et al. \(2017\)](#) showed the relationship between FDI, trade openness and economic growth in Lao PDR. The results presented a positive effect on FDI and trade openness in economic growth in a long-term using a VECM (Vector Error Correction Model) from 1990 to 2015. The results of VECM model also showed the one-side direction between foreign direct investment, labor force, capital investment and economic growth in a short-term. Besides, [Hsiao & Shen \(2003\)](#) studied foreign direct investment and economic growth more extensively. First, they analyzed the relation between the real gross domestic product (GDP) and the real FDI for China and 23 developing countries were using time series data from 1982-1998. They showed a positive effect between GDP and FDI. Secondly, they made an analysis for the factors which determining FDI, were making use of panel data of 23 developing countries for the period 1976-1997, were showing that appears to confirm that economic growth, predictable behavior, trust worthiness and commitment from government institutions, infrastructural development of cities, and lower tax rates were significant for FDI. In the end, they analysed the disparity between the coastal and western region using China's provincial and municipal data for the period 1996-1998, they showed the significance of human-capital accumulation and the development of cities in attracting FDI. [Sabir et al. \(2019\)](#) used panel data from countries with various scale of income, for the period 1996 to 2016 with the GMM (Generalized Method of Moments) to examine the effect of institutional quality on FDI flows. They showed that the institutional quality had positive effect on FDI and they concluded that GDP per capita, agriculture value-added as a percentage of GDP, and inflation had negative effect on FDI in developed countries, in contrast with GDP per capita, trade openness, agriculture value-added as a percentage of GDP, and infrastructure, which had positive effect on FDI in developed countries.

Nevertheless, in recent years, there is emphasis on the role of institutions and

governance on economic growth. [Bakkar & Ögçem \(2019\)](#) investigated how the rules of law and elections effect on economic development and increase the economic growth in an as well sample of 167 Islamic and non-Islamic countries for the period 2010-2012. The findings showed that for non-Islamic countries, elections had a first-order effect on economic development and similarly rule of law affected them but hadn't the same impact to the economic development. Except from the law issues, [Jakšić & Jakšić \(2018\)](#) supported that in recent years there's been a shift in the focus of macroeconomics, from the narrow market fundamentalism perspective, to the emphasis on the role of institutions and values.

[Wagner et al. \(2009\)](#) found that high-quality institutions like the rule of law, well-functioning regulation, low corruption, and other institutions that improve resource allocation have a positive effect on average satisfaction with democracy. [Papaioannou & Siourounis \(2008\)](#) investigated the impact of Democratisation on growth. They argue that on average democratisation's are associated with a 1% increase in annual per capita growth, emphasizing that in the medium and long term the impact is even greater.

According to [Acemoglu & Robinson \(2010\)](#), inclusive rather than institutions drive growth, as they secure political stability and a successful macroeconomic policy, and enhance initiatives. Inclusive institutions were characterized by the protection of property rights, restriction of social elites and equal chances for all individuals. In contrast, extractive institutions negatively affect entrepreneurship and economic development. From the above we can easily derive the conclusion that along with independence and accountability, inclusion is an essential principle for the emergence and performance of all institutions. However, [Epaphra & Kombe \(2017\)](#) used a GMM (Generalized Method of Moments, fixed and random effect model for 48 countries of Africa for the period 1996-2016, they tried to show the impact of institutions on economic growth. The results showed that institutions were very important for economic growth and the political stability explained better the real GDP per capita. Important factors that affect economic

growth were liberalization of trade, fixed capital formation, labour force and foreign direct investment. They concluded that a better quality of institutions, lower trade restrictions, an increase on domestic and foreign investment and improving the quality of labour force could lead to an increase on economic growth in Africa. Another one theory was that of [Barra et al. \(2020\)](#) based on Wagner's assumption, emphasized on economic performance using indicators on the level of country control of corruption, government effectiveness, political stability, rule of law, regulatory quality and voice and accountability, were taking data from an international database from 1996-2012. They showed that in a short-term, public spending had positive effect on national income but in a long-term there was a convergence on public spending and national output and it diminished for non-democratic, low-income and non-OECD countries.

[Bosma et al. \(2018\)](#) used a 3SLS model and they examined the relationship between institutions, entrepreneurship and economic growth. The results showed that entrepreneurship with important predictors such as institutional quality, financial stability, small government, and perceived start-up skills, contributes to economic growth. [Azam & Emirullah \(2014\)](#) examined the corruption of weak governance with variables such as inflation rate, openness to trade and dependency ratio on gross domestic product (GDP) per capita income. They used annual panel data from 9 countries of Asia and Pacific from 1985 to 2012 and were making use of a multiple regression. They showed a negative relation between corruption and inflation rate and GDP per capita. Also, negative effect had the dependency ratio but openness to trade had positive relation with GDP per capita. So, this research showed the principal of good governance.

3 Theoretical Model and Methodology

In the literature review we mentioned theoretical and empirical investigations for the relationship between the trade and economic growth. We have noticed that there are different approaches to choosing a representative variable for both the dependent and the basic independent which is trade.

We use the GDP per capita in constant 2010 U.S. dollar as dependent variable. This variable is selected because we want to see the effect of trade on the deflated GDP per capita. To approach trade, we have chosen the sum of imports and exports to GDP. This variable is most important because we can see the total external sector of any economy.

Foreign direct investment, has become an important factor for both governments and corporations. In the literature we see some mechanisms between FDI and economic growth. Especially, the FDI create as sustainable growth via job creation and technological spillover.

The HCI is grounded on the following three pillars: α) Share of children surviving past the age of 5 in %, β) Quantity of education (Expected years of schooling by age 18) and Quality of education, γ) Adult survival rates (Share of 15-year-olds who survive until age 60 in % and healthy growth among children (Stunting rates of children under 5 in %).

So , our theoretical model is defined as

$$GDPpc = Trade + FDIinflows + HCI + Populationgr + BCI \quad (1)$$

where $GDPpc$ denotes the GDP per capita (constant US dolar 2010), $Trade$ denotes the sum of imports and exports to GDP, $FDIinflows$ denotes the net inflows of FDI to GDP, HCI is a index that determines the level of development of a country, $Populationgr$ denotes the annual change in total population, BCI is a index that denotes the level of corruption .

The empirical model in the general form can be written as:

$$\mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{u} \quad (2)$$

where \mathbf{Y} is a $\mathbf{n} \times 1$ vector of dependent variable, \mathbf{X} is a $\mathbf{n} \times \mathbf{n}$ matrix of independents variables, $\boldsymbol{\beta}$ is a $\boldsymbol{\kappa} \times 1$ vector of parameters and \mathbf{u} is a $\mathbf{n} \times 1$ vector of disturbances.

More analytical can be written as

$$RGDPpc_{it} = \beta_0 + \beta_1 Trade_{it} + \beta_2 FDIinflows_{it} + \beta_3 HCI + \beta_4 Populationgr_{it} + \beta_5 BCI_{it} + \mathbf{u}_{it} \quad (3)$$

where i in panel analysis represents the id and we use the code of country and t denotes the unit of time.

4 Data

The data are being deriving by the quality of government data set (QOG) [Teorell et al. \(2020\)](#). We use panel data for the period 1990- 2018 and we have choose two groups of countries ² as representative for very high human development countries and BRICS-emerging.

GDP per capita (constant 2010 US\$): GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S.dollars.

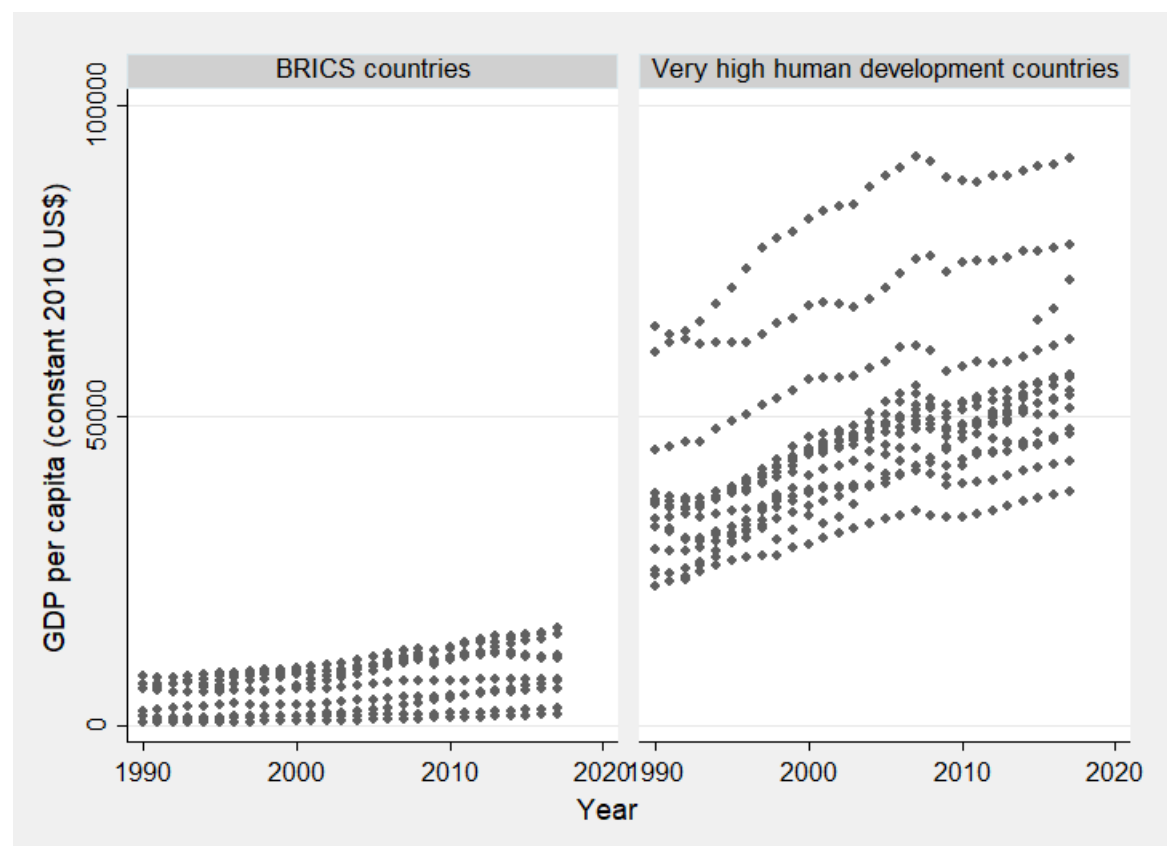


Figure 1: GDP per capita (constant 2010 US\$)

²see Appendix A

Trade (% of GDP) :Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product. The trade-to-GDP ratio is an indicator of the relative importance of international trade in the economy of a country. It is calculated by dividing the aggregate value of imports and exports over a period by the gross domestic product for the same period. It is used as a measure of the openness of a country to international trade, and so may also be called the trade openness ratio.

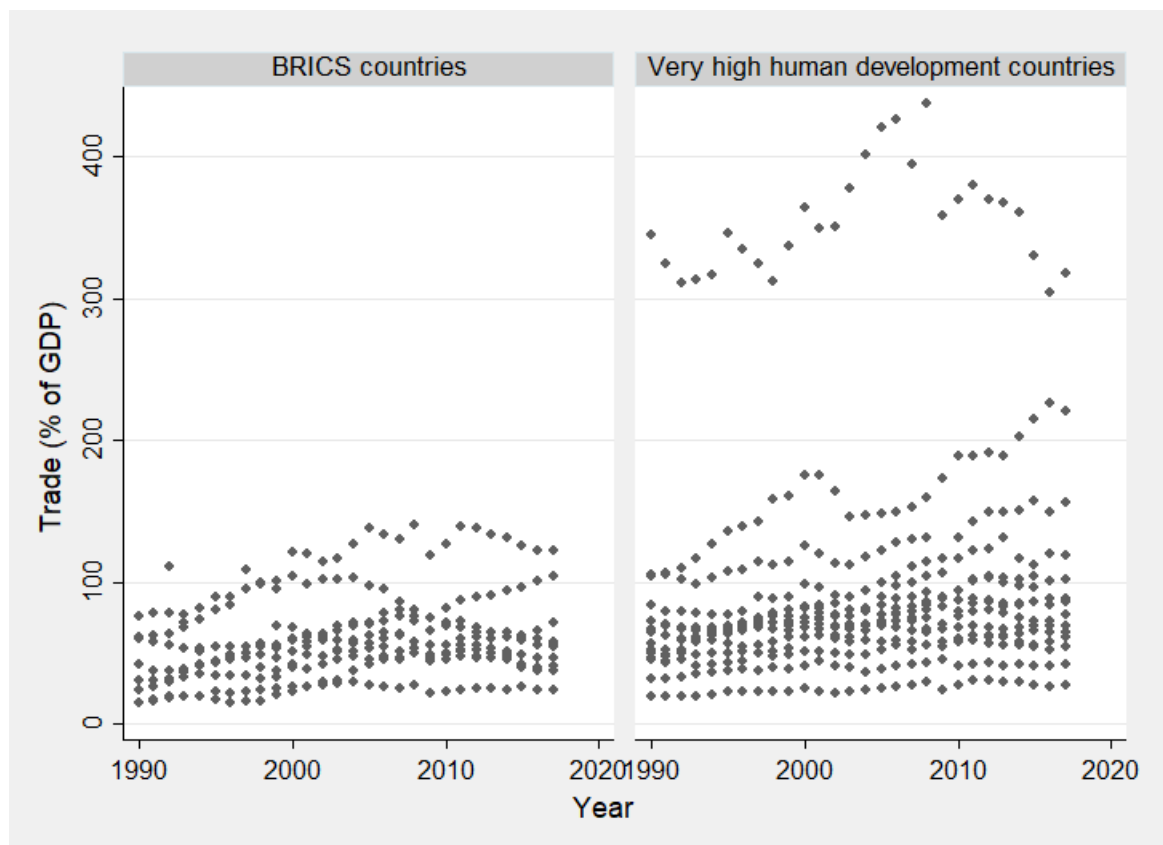


Figure 2: Trade (% of GDP)

Foreign direct investment, net inflows (% of GDP): Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.

Human capital index: The index measures the amount of human capital that a child born today can expect to attain by age 18, given the risks of poor health and poor education that prevail in the country where they live. It is designed to highlight how improvements in current health and education outcomes shape the productivity of the next generation of workers, assuming that children born today experience over the next 18 years the educational opportunities and health risks that children in this age range currently face. The knowledge and skills that employees have developed through training and education programs have a very large impact on productivity.

Population growth (annual %): Annual population growth rate for year t is the exponential rate of growth of midyear population from year $t - 1$ to t , expressed as a percentage. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The relationship between population growth and GDP per capital is controversial. Many economists argue that higher population growth could generate higher per capital income because it promotes technological progress, while other economists rely on the Solow's model according to which the GDP per capital affected negatively by population growth.

The Bayesian Corruption Indicator : The Bayesian Corruption Index is a composite index of the perceived overall level of corruption: with corruption referred to as the abuse of public power for private gain. Perceived corruption: Given the hidden nature of corruption, direct measures are hard to come by, or

inherently awed (e.g. the number of corruption convictions). Instead, we amalgamate the opinion on the level of corruption from inhabitants of the country, companies operating there, NGOs, and officials working both in governmental and supra-governmental organizations. Composite: it combines the information of 20 different surveys and more than 80 different survey questions that cover the perceived level of corruption.

The BCI index values lie between 0 and 100, with an increase in the index corresponding to a raise in the level of corruption. This is a first difference with CPI and WGI where an increase means that the level of corruption has decreased. The absolute scale of the BCI index was obtained by rescaling all the individual survey data such that zero corresponds to the lowest possible level of corruption and 1 to the highest one. We subsequently rescaled the BCI index such that when all underlying indicators are zero (one), the expected value of the BCI index is zero (hundred).

In the table 1 we see the descriptive statistics. First notation is the number of observation. The BRICS and developing countries has smaller number of observations than very high human development countries. The reason is that the group of BRICS has smaller number of countries. Also the GDP per capita of the high developed countries is on average (47127,29\$), while for BRICS it is much smaller (6557,473\$). Similar results we see in the trade because the set of the very high human developed countries has an extreme external sector. Furthermore the BRICS has lower net FDI inflows. The human capital index can be used as a proxy for institutional quality. We see that the HCI on average is (3.29) in developed and (2.43) in BRICS. Corruption is also explained by other variables such as the small number of judges, control over the media and more. Last but not least we see that the population growth and is lower in developed countries.

Table 1: Descriptive Statistics

	<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
<i>BRICS Countries</i>	GDP per capita (constant 2010)	273	6557.473	4037.034	575.502	15826.39
	Trade	273	58.27	27.995	15.162	140.437
	FDI, net inflows	273	2.528	2.056	-.066	11.654
	Human capital index	273	2.45	0.474	1.487	3.404
	Population growth	273	1.09	0.723	-1.044	2.543
	BCI	273	49.547	8.144	25.969	64.361
<i>Very high human development Countries</i>	GDP per capita (constant 2010)	418	47127.29	14403.24	22571.9	91617.28
	Trade	418	95.449	78.309	19.786	437.327
	FDI, net inflows	418	5.607	9.418	-28.583	86.611
	Human capital index	418	3.311	0.307	2.047	3.974
	Population growth	418	0.891	0.717	-1.854	5.322
	BCI	418	16.742	5.92	6.45	32.332

5 Empirical Results

In this section we represent the summary results from the assessment of the theoretical model we defined in section 3. We use panel data from 25 countries during 1990-2018. We separate the results in two groups of countries: for emerging BRICS countries and for very high human developed countries.

For the econometric specification we studied other (LS) estimators such as the random effects, the population average, the pooled OLS and the first differences estimator. Furthermore we observed that we have a strongly balanced panel .Moreover, we investigated the LSDV estimator. Also we checked the Generalized Method of Moments(GMM). Furthermore, we performed the Hausman test and the results showed that the FE model is better than the RE model. However ,the estimator with the best econometric specification was the fixed effects estimator.

In Table 2 we see the results from the fixed effects estimation. On one hand, we see the positive effect of trade on growth. Especially we observe that the effect of trade in developed (94,509) is almost seven times larger than in BRICS (14,696). We see that trade has a much greater impact on the GDP per capita of developed countries than on emerging-BRICS . This is in line with the research of oxford economics³, which argues that emerging economies will be rapidly accumulating capital through domestic funding to achieve strong GDP and a strong increase in total factor productivity (TFP) growth. TFP represents the growth in real output which is in excess of growth in inputs such as labor and capital. On the other hand, developed countries have already built a strong and well-organized economy based on good structures and this gives them the advantage of expanding international trade. The coefficients are statistically significant at 1% for both economies. So, our research confirms the current literature on the positive effect of trade on growth.

The growth is positively and statistically significant affected from the net in-

³<https://www.businessinsider.com/oxford-economics-ranking-of-emerging-market-economies-2019-2#10-south-africa-1>

flows FDI. The coefficient of BRICS is higher than developed because there is an explosion of foreign direct investment in recent years, especially in the BRICS countries⁴. In general, foreign investment in emerging countries has now increased to a large extent and is the main lever for the development of the country's economy.

In addition, the HCI has greater effect in developed countries. nevertheless, it is obvious how important the effect of the variable (23364,13) for developed and respectively for the BRICS-emerging (7290,9).It makes sense if one considers that the index measures, how much capital each country loses due to lack of education and health. As far as HCI is concerned. Developed countries have on the average a much higher index than emerging ones, which are at the lowest levels in the ranking.

Furthermore we see the positive affect of population growth. In terms of population growth, in the emerging countries the population is already at a huge level so an increase would create a problem in contrast to the developing countries that have a demographic problem. Specifically, the population of BRICS-emerging countries includes 41.59% of the world's population.

We aimed to see whether institutional factors affect growth. From the Corruption Index, we see that the quality of institutions is a catalyst factor for economic growth. If the corruption index rises by one unit, we immediately see dramatic reductions in the per capita GDP for both high developed (-974,4)and BRICS -emerging (-283,8). It is true that developed countries have a much lower degree of corruption than emerging ones. This indicator also includes quality data such as the quality of the institutions and the public structure. Therefore, this difference in the index is expected. We noted that this indicator has a greater impact on developed countries, perhaps due to the fact that these countries have been established as "non-corrupt" and this is a competitive advantage over emerging-BRICS

⁴Characteristic example is the case of China during seven years (2007-2014) direct foreign investment from 74.8 billion euros reached 119.6 billion euros (KPMG China Outlook, 2015), i.e a little below double.

countries.

We also performed the diagnostic tests for multicollinearity⁵, heteroscedasticity⁶ and auto-correlation⁷.

Table 2: Fixed Effects Estimators

<i>VARIABLES</i>	<i>BRICS countries</i>	<i>Very high human development countries</i>
Trade (% of GDP)	14.696*** (4.649)	94.509*** (11.937)
Foreign direct investment, net inflows (% of GDP)	108.277*** (39.055)	68.851*** (23.078)
Human capital index	7,290.991*** (339.317)	23,364.131*** (1,125.881)
Population growth (annual %)	2,011.542*** (252.992)	2,767.778*** (327.452)
The Bayesian Corruption Indicator	-283.899*** (20.405)	-974.448*** (106.783)
Constant	-558.499 (1,490.828)	-25,785.529*** (4,919.759)
Observations	273	418
R-squared	0.786	0.797
Number of ccode	10	15

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Dependent variable GDP per capita (constant 2010 US\$)

In the table 3 we represent the results from IV estimation. The instrumented variable is the Trade, included instruments are the FDI, HCI, population growth, Bayesian corruption index and the excluded variables are the lagged GDP per capita and lagged trade. These variables have no economic interpretation neither are used in the literature as instruments. However, in econometric techniques the dependent variable with time lag can be used because it is not created endogenously.

For the BRICS countries from the IV estimation we see that the coefficient of

⁵VIF values

⁶Modified Wald test for groupwise heteroskedasticity in fixed effects regression model

⁷Wooldridge test for auto-correlation in panel data. H_0 : no first-order auto-correlation

trade is lower. So the relationship is more accurate. In addition, we see that the FDI⁸, corruption and population growth has less intense effect on growth in IV model. However HCI has higher affect on growth.

On developed countries the effect of trade is higher. In general, we see that all appraisers are weaker than the FE model. Furthermore all variables are statistically significant at 1% and 5%.

Table 3: IV Estimators

<i>VARIABLES</i>	<i>BRICS countries</i>	<i>Very high human development countries</i>
Trade (% of GDP)	13.482** (5.654)	118.692*** (13.997)
FDI, net inflows (% of GDP)	93.605** (38.856)	58.197** (23.044)
Human capital index	7,356.320*** (342.849)	23,268.422*** (1,145.607)
Population growth (annual %)	1,985.752*** (251.707)	2,595.875*** (329.002)
The Bayesian Corruption Indicator	-274.678*** (20.008)	-864.891*** (110.553)
Observations	263	402
R-squared	0.787	0.789
Number of ccode	10	15

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Dependent variable GDP per capita (constant 2010 US\$)

⁸Foreign direct investment, net inflows (% of GDP)

Also as shown in table 4 we see that the instruments satisfies the diagnostic tests to identify the relationship between trade and GDP per capita.

Table 4: Diagnostic Tests for instruments variables

<i>Test</i>	<i>BRICS countries</i>	<i>Very high human development countries</i>
Underidentification test (Anderson canon. corr. LM statistic):	193.891***	279.199***
Weak identification test (Cragg-Donald Wald F statistic):	405.107	493.386
Stock-Yogo weak ID test critical values:		
10% maximal IV size	19.93	19.93
15% maximal IV size	11.59	11.59
20% maximal IV size	8.75	8.75
25% maximal IV size	7.25	7.25
Sargan statistic (overidentification test of all instruments):	233.231***	329.954***

6 Conclusions

In recent years, international trade is occupying many researchers who have attempted to analyze the role of trade in the economic growth of countries. This study provides an empirical analysis of the relationships between trade (% GDP) and economic growth. I investigate the impact of trade on economic growth for two groups of countries: Developed countries and emerging-BRICS countries, by using the annual data for period 1990 - 2018. I use Fixed Effects estimation and fixed Effects-IV in panel analysis .Based on results, there was a difference in the intensity of the trade effect on the growth of the two types of economies. In particular, the role of trade in the economy of developed countries is very important. While in emerging-BRICS economies it was found that trade has a smaller share in GDP per capita. It was also concluded that direct foreign investment is the driving force behind the emerging economies of these countries. The variables that include qualitative characteristics have given greater boost to the economy of developed countries. Specifically, in the model we used the Human capital index, the Bayesian Corruption Indicator and Population growth. In the human capital index, the difference in performance in developing in relation to emerging economies is quite high.

A future proposal to expand the work is to analyze a system of equations (Cowles Commission), in which the independent variables will be determined endogenously. This way and by using a (3SLS) estimator, we will have more consistent results.

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Appendix A: Countries

Table 5: List of countries

BRICS countries	Very high human development countries
Brazil	United States
Russian Federation	Norway
India	Switzerland
China	Ireland
South Africa	Germany
Poland	Australia
Chile	Iceland
Thailand	Sweden
Philippines	Singapore
Turkey	Netherlands
	Denmark
	Finland
	Canada
	New Zealand
	United Kingdom