

Openness and Economic Growth in Developing Countries Based on Experimental and Mathematical Statistics Analysis

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Abstract—The relationship between economic growth and the opening up of the country has always been a topic that has attracted a lot of attention. In this paper, the author uses a cross country dataset to analyze the correlation between countries' openness and economic growth. This dataset includes 43 upper middle-income countries among developing countries. After eliminating the outlier, the author develops a simple OLS regression model and choose 5 indicators to represent openness respectively, and he also uses the growth rate of real GDP per capita to represent economic growth and controls real GDP per capita to make the model more accurate. In the end, this research finds out that the data and the results support the positive correlation between openness and economic growth.

Keywords-Openness; Economic growth; Tariff; Developing Countries

1 INTRODUCTION

Economists have been interested in whether openness is correlated with economic growth and how significant this correlation is. Although many papers tried to explain this problem, this correlation is still one of the most difficult puzzles in history. With countries in East Asia having accomplished such huge success, it seems plausible to attribute this success to openness to some extent.

Many scholars used cross country data, time series data or panel data to analyze the correlation between openness and economic growth. Most of these researches show positive results and claims that openness does stimulate countries' economy. Dollar [1] and Edwards [2] both focused on developing countries. Dollar claims that countries that liberalize their international trade and become more open will tend to grow faster. Moreover, some scholars claim that under specific circumstance can openness promote economic growth. Papageorgiou [3] analyzed the date from 96 countries and finds out that openness is especially determinant for middle income countries. After all these researches have shown the effect that openness has on economic growth of developing growth, the author tries to examine the validity of this effect by using updated data of developing countries. Since data in Dollar [1] only concerned 30 countries and some countries have become developed countries now, the author believes that it is necessary to use new data to illustrate the correlation between openness and economic growth again.

The purpose of this paper is to demonstrate the positive correlation between openness and

economic growth with a new set of data. At the same time, the indicators of openness are different and less complex than the indicators in Dollar [1].

In Section 2, the author introduces some researches that can explain the inner theory of openness and economic growth, including how openness does to the industry to stimulate economic growth. In Section 3, the author describes the data as well as the indicators he uses, and give explanation about whether these data and indicators are plausible enough for this paper. Apart from that, Section 3 also shows the overall process of the regression and the result as well. In Section 4, the author analyzes the result and states the conclusion of the paper, including some defects in this paper and a discussion on directions for future researches.

2 THE INNER CONNECTION BETWEEN OPENNESS AND ECONOMIC GROWTH

To explain the correlation between openness and economic growth, QunBao[4] analyzes the Output Effect and Technology Spillover Effect. Output Effect demonstrates that countries that participate in international trade are able to import more intermediate products and make use of them. Comparing to producing every intermediate product needed by themselves, importing is a much more efficient way for countries. There are two main statements for this effect. On the one hand, a country's openness decides its tariff level and with higher openness and lower import tariff, the import of the intermediate products will be more low-cost. On the other hand, there exist different market environments as well as natural endowment, openness can let countries make full use of different natural endowment and raise the efficiency of production.

Technology Spillover Effect means that by importing and being invested, companies and research departments will improve their own efficiency by learning and imitating advanced technology, even management skills. The model established in QunBao's[4] research shows that in the open economy, the yield of the research department not only depends on domestic knowledge stock, but also depends on imitation of the technology from overseas-funded enterprises. There are two main reasons that can explain this Technology Spillover Effect. The first reason claims that by being more open to the world, domestic enterprises have more chances to imitate advanced technology. The other one claims that being open also pushes domestic enterprises to update their technology in order to handle the international competition.

3 OPENNESS AND ECONOMIC GROWTH: ANALYTICAL FRAMEWORK AND RESULT DISPLAY

3.1 In the first part of this section, the author shows the variables he uses to run the OLS regression.

3.1.1 Growth

To simplify the model and make the indicator plausible at the same time, the author defines economic growth as the rate of growth of real GDP per capita. To eliminate the effect that American Subprime Mortgage Crisis (2008) and COVID-19(2020) Crisis have to the economic growth, the data used are the average GDP growth rate form 2012-2018. This time series perfectly

avoid those two crises mentioned above and tolerate a recovery period from American Subprime Mortgage Crisis for 3 years. The data were taken from the database of The World Bank[5], from which 43 developing countries were chosen. All of the countries chosen are upper middle-income countries according to the category of The World Bank. The author believes that in the last decade, openness has the greatest influence to the developing countries[3].

3.1.2 Openness

In fact, the most controversial aspect of this topic is how to measure the openness of countries. That is because many countries have a variety of methods to protect their own industry, such as tariff and many non-tariff methods. It is really hard to transfer non-tariff methods to a specific variable that can be used in an empirical analysis. However, using tariff only is not plausible enough to represent a country's openness. To demonstrate the openness level as comprehensive as possible, the author takes 5 indicators to run the regression respectively, which are Overall Openness Index(denoted as OPI)[6], Financial Market Openness Index(denoted as FMP)[6], Trade share[5], Trade Weighted Average Tariff for All products[7] and Ratio of Foreign Direct Investment Net Inflows[5] to Real GDP. All of the indicator above are the simple average values from 2012-2018, same period as economic growth indicator is.

Since tariff do not change drastically, the author also needs to explain that the average value of tariff is the simple average of tariff in 3 years: 2012, 2015, 2018, not all of the 7 years.

As for non-tariff indicators, OPI and FMP are indicators of financial openness, both of the two indicators are taken from the database of the International Monetary Fund, category aggregate openness index. The author believes that financial openness should also be an important aspect of openness, which is why OPI and FMP are selected as openness indicators in the regression.

Also, Ratio of Foreign Direct Investment Net Inflows to Real GDP is another indicator to represent openness, as many countries control capital inflows to protect their financial market security, especially in developing countries. Financial markets in developing countries are commonly vulnerable to strike, so most governments choose to control strictly to foreign capital inflows. And it can be easily concluded that countries that control foreign capital inflows not that strictly are more open to the world. And to eliminate the influence of the scales of countries, the author uses the ratio of foreign direct investment net inflows to real GDP as the indicator.

At last, trade share is another indicator chosen to represent openness, trade raises income[8], shows that countries that trade more reach higher level of income. And this is because of openness so that trade share is adequate to be an indicator of openness. Trade share is the ratio of the sum value of import and export to real GDP, which can be seen as the proportion of trade value in GDP.

3.1.3 Real GDP Per Capita

The author includes real GDP per capita as another explaining indicator that needs to be controlled. As many researches have been done to analyze the existence of middle-income trap, it is necessary to consider the effect of real GDP per capita. And this indicator also uses the simple average value from 2012-2018.

Basically, according to formula(1), the OLS regression equation is shown below:

$$\text{growth}_{\text{gdp}} = \beta_1 * \text{openness} + \beta_2 * \text{gdp}_{\text{per}} + \beta_0 + \varepsilon \quad (1)$$

There are 5 indicators of openness, and there are 5 similar regression equation accordingly. All of the variable in the equation is fully explained above. β_1 shows the correlation of openness and growth rate of GDP per capita, β_2 shows the correlation of GDP per capita and growth rate of GDP per capita, β_0 shows the intercept of the regression model, ε is error term.

The author expects that openness level should have positive correlation with growth rate of GDP per capita, and GDP per capita should have negative correlation with growth rate of GDP per capita.

3.2 Regression process and Result

In the process of regression, the author finds that Equatorial Guinea is an outlier with really low growth rate of GDP per capita. It is shown in the left graph, after deleting this outlier, the author gets the graph on the right. And the other equations faced the same problem as well. And the outlier should be deleted from the dataset in every regression.

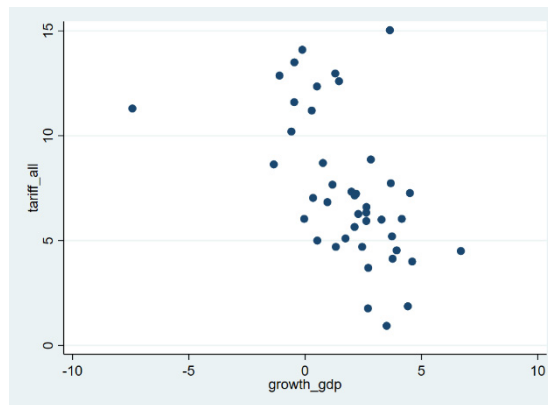


Figure1: Overall Graph with Outlier

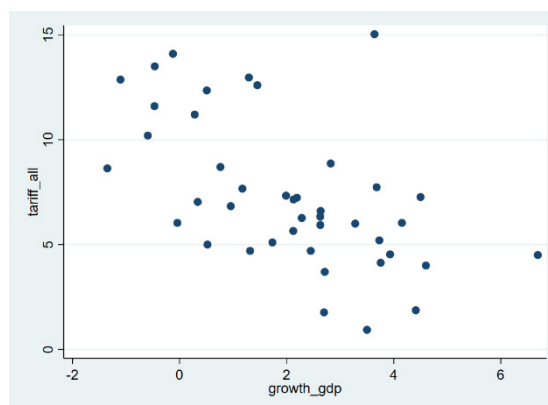


Figure2: Overall Graph without Outlier

After finishing all the regression equation, the result is shown in the Figure3 below:

	(1)	(2)	(3)	(4)	(5)
	growth_gdp	growth_gdp	growth_gdp	growth_gdp	growth_gdp
gdp_per_adj	-0.0283 (-0.31)	-0.0473 (-0.42)	-0.0326 (-0.28)	-0.0711 (-0.66)	-0.0436 (-0.39)
tariff_all	-0.282*** (-4.12)				
opi		0.0513 (0.05)			
fmp			0.602 (0.66)		
capital_ra-o				2.405 (0.26)	
tradeshare					0.00611 (0.62)
_cons	4.324*** (5.25)	2.403* (2.37)	2.062 (1.97)	2.451* (2.54)	1.883 (1.48)
N	42	37	36	41	40
t statistics in parentheses					
* p<0.05, ** p<0.01, *** p<0.001					
.					

Figure3: Result of Regression

Note: The value in the bracket is t-value, and *** denotes significance at the 1% level. Due to some data missing problems, dataset of different equations is slightly different. The full dataset includes 43 countries with the outlier counted in it.

From the regression result above, several explanations are given:

(a) Among all the 5 indicators, trade weighted tariff of all products shows significance at the 1% level, which means there is a clear negative correlation of tariff and economic growth. Therefore, it shows that economic growth has a positive correlation with openness.

(b) OPI and FMP are both indicators of financial openness, however, FMP shows more significance than OPI. But these two indicators both show positive absolute values.

(c) Capital inflows ratio shows little significance and positive absolute value in this regression, the author believes that there exist some omitted variables that need to be controlled when trying to use capital inflows ratio to represent openness.

(d) Trade share shows positive absolute value and significance to some extent. Since it is the most direct indicator of how much trade weight in a country, the main reason for its low significance probably is a small dataset.

(e) All of the 5 equations show that the correlation between real GDP per capita and growth rate of real GDP per capita does have a negative absolute value. Although these results are not significant to a large extent, they still show the rationality to include real GDP per capita into the equation.

(f) All of the positive intercepts also show that there are numbers of variable concerned missing, and their high significance also demonstrates this conclusion as well.

4 CONCLUSION

After solving several problems existing in former researches such as small dataset and updating the data to the period of 2012-2018, the author successfully examines the conclusion that openness has positive correlation with economic growth. It is safe to consider openness as one of the stimulations of economic growth from the results shown in the regression.

But still, how to represent countries' openness is contradictory and the dataset this paper uses is limited. Therefore, further researches can try to use a more comprehensive dataset and develop better indicators of openness to demonstrate the correlation between openness and economic growth.

Appendix:

Countries included:

Countries, Albania, Argentina, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Botswana, Brazil, China, Colombia, Costa Rica, Cuba, Dominic, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Georgia, Guatemala, Guyana, Jamaica, Jordan, Kazakhstan, Malaysia, Maldives, Mauritius, Mexico, Moldova, Montenegro, Namibia, Panama, Paraguay, Peru, Russian federation, Saint Lucia, Saint Vincent and the Grenadines, Serbia, South Africa, Suriname, Thailand, Tonga, Turkey.

Categories from The World Bank

OPI: Overall Openness Index is the unweighted average of the openness of twelve types of asset categories: equity, bond, money market, collective investment, derivatives and other instruments, commercial credit, financial credit, direct investment, direct investment liquidation, guarantees, real estate and personal capital transaction. Range between 0 to 1 (1 indicates fully liberalized).

FMP: Financial Market Openness Index is the unweighted average of the openness of twelve types of asset categories: equity, bond, money market, collective investment, derivatives and other instruments. Range between 0 to 1 (1 indicates fully liberalized).

Source: Wang-Jahan Index

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