

5-2014

# THE EFFECT OF INTERNATIONAL TRADE ON INCOME

Huseyin Erpek

Clemson University, [herpek@clemson.edu](mailto:herpek@clemson.edu)

Follow this and additional works at: [https://tigerprints.clemson.edu/all\\_theses](https://tigerprints.clemson.edu/all_theses)

 Part of the [Economics Commons](#)

---

## Recommended Citation

Erpek, Huseyin, "THE EFFECT OF INTERNATIONAL TRADE ON INCOME" (2014). *All Theses*. 1939.  
[https://tigerprints.clemson.edu/all\\_theses/1939](https://tigerprints.clemson.edu/all_theses/1939)

This Thesis is brought to you for free and open access by the Theses at TigerPrints. It has been accepted for inclusion in All Theses by an authorized administrator of TigerPrints. For more information, please contact [kokeefe@clemson.edu](mailto:kokeefe@clemson.edu).

THE EFFECT OF INTERNATIONAL TRADE ON INCOME

---

A Thesis  
Presented to  
the Graduate School of  
Clemson University

---

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts  
Economics

---

by  
Huseyin Emrah Erpek  
May 2014

---

Accepted by:  
Dr. Michal Jerzmanowski, Committee Chair  
Dr. Curtis Simon  
Dr. Jacqueline Oliveira

## **ABSTRACT**

In a modern economy, trade among people, firms, and countries is indispensable. There is also a close connection between the levels of trade and income and how they affect our standards of living. Many economists and policymakers believe in a virtuous circle: the more trade, the more income or vice versa. In order to see the relationship between trade and income, we investigated whether international trade affects the level of income. We analyzed international trades and incomes of eighteen countries in Western Asia Region in a period of 1950 to 2010. We used panel data with 687 observations. Our analysis showed that there is a positive relationship between international trade and income. A 1% increase in international trade between countries causes to increase in income by 1.57% on average. This increase is statistically significant at 1% significance level.

## **ACKNOWLEDGEMENTS**

I would like to thank my committee chair, Dr. Michal Jerzmanowski, for his guidance. I would like to thank my committee members, Dr. Curtis Simon and Dr. Jacqueline Oliveira, for their help about my research and my academic program. I would like to thank Dr. William Haller for his opinions. I would also like thank my family and friends, Tugce Kader, Songul Kaskun, Senad Sinanovic, Dongqi He, Jin Han, and all, for their all the support and encouragement.

## TABLE OF CONTENTS

<b>TITLE PAGE</b> .....	<b>i</b>
<b>ABSTRACT</b> .....	<b>ii</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>iii</b>
<b>LIST OF TABLES</b> .....	<b>v</b>
<b>CHAPTER</b>	
<b>I. INTRODUCTION</b> .....	<b>6</b>
<b>II. RESEARCH DESIGN AND METHODS</b> .....	<b>9</b>
<b>III. RESULTS</b> .....	<b>11</b>
Case of non-OPEC Countries .....	<b>13</b>
Case of OPEC Countries .....	<b>14</b>
<b>IV. CONCLUSION AND DISCUSSION</b> .....	<b>15</b>
<b>APPENDIX</b> .....	<b>21</b>
<b>REFERENCES</b> .....	<b>22</b>

## LIST OF TABLES

<b>TABLE 1: OLS and FE Regression Model Results for Eighteen Western Asia Countries .....</b>	<b>18</b>
<b>TABLE 2: OLS and FE Regression Model Results for Twelve-non-OPEC Western Asia Countries .....</b>	<b>19</b>
<b>TABLE 3: OLS and FE Regression Model Results for Six-OPEC Western Asia Countries.....</b>	<b>20</b>

## I. INTRODUCTION

Trade has been placed in our lives for centuries. If people get on well with each other or if people do not attack each other, they just produce things and sell them to each other. That causes absolute changes on our incomes. These changes start from zero, the trade between just two people in a place and at a time, and spread to the whole world, the trade between international companies. Therefore, this paper tries to investigate the effect of international trade on income.

The importance of international trade is at the highest level around the world today. Trade agreements between countries allow more open international trades. With these agreements, trade barriers or tariff rates are decreased, whereas volume of international trade increases because the countries are emerged each other. This leads to appear more globalized markets. In a global world, people can almost carry everything from one country to another. Those can be raw materials, commodities, or labor forces. As we see, there are some factors that international trade is affected directly or indirectly. The previous several studies such as Michaely (1977), Helpman (1988), Rodrik (1995), and Harrison (1996) show that there are exact relationships between trade and other variables.

With a cross-country regression model, that is easy to see the positive relationship between the ratio of trade components and income. That is because

these kind of variables such as export, import, or gross domestic product seem endogenous. There are also some trade policies that may affect the income directly or indirectly. The policies that international or domestic free-market applications, fiscal or monetary policies applications, or this type policies or applications on economies may be related with some factors that are not included into regression models on income. Therefore, these models cannot always give exact effects of trades on income (Sala-i Martin, 1991). In other words, while international trade is affected by some factors, international trade also affects income. Moreover, there may be a possibility that income affects international trade too.

In order to get rid of this dilemma, an idea of a paper, by Frankel and Romer (1999), indicates that in *ceteris paribus* condition, incomes or government policies of countries do not affect geographical characteristics of countries. This means that the countries are differed by their geographical characteristics. Therefore, geographical characteristics of countries may have an effect on their income levels in terms of trade. If we compare the effects of international trade on income among countries, adding some endowments into the model should give us more logical reasons. That is because the trade volumes of a country in the center of Europe such as Germany and a country far away to neighbors of Germany such as New Guinea are absolutely different because of their geographic locations and conditions. To be more realistic, this differences among countries are not the one fact that countries differ each other. There are many

reasons such as sizes of countries, levels of technology, natural resources, raw-materials, climate etc.

The countries which follow free trade agreements have opportunities to be adapted the technology by the whole country and to trigger reliable investment conditions (Grossman and Hillman, 1991). Also, the countries which do not have strong macroeconomic policies cannot be successful to attract traders (Rodrik, 1998). Not only trade is a reason, but also specialization on producing techniques, producing with scale economies, and transferring of knowledge with some interactions among countries are the other reasons on income to affect (Frankel and Romer, 1999). Therefore, it is possible that there are so many options to investigate the effects of different variables on income.

This study covers eighteen countries<sup>1</sup> in Western Asia Region. The reason why we choose these countries is that there can be a causality effect between similar geographic characteristics, similar cultures, common religion for most of the countries, close neighborhoods, and oil producing. The time period starts from 1950 and comes to 2010.

---

<sup>1</sup> Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, and Yemen. See Appendix for more detail.

## II. RESEARCH DESIGN AND METHODS

We should be careful while constructing a model to choose relevant variables. If we choose irrelevant variables, our model does already not reflect meaningful results. We should also choose variables that are not only relevant variables, but also are uncorrelated each other. If the variables are highly correlated each other, their effects on income will be greater than the results we hope to find. Of course, there can be some surprising results that we do not expect to find or do not recognize their real effects before constructing the model; however, we should know that some cases may show up themselves that they are already affect each other before even placing in the model. To illustrate these explanations related with our research, if transportation networks or communication networks are at high level of technology, the countries that have already kept these advantages in their hands have more powerful trade networks exactly than the others that have not. Additionally, being able to measure of the effect of trade on growth is not easy because Rodriguez and Rodrik (1999) mention that the countries having high income levels trade more even though their incomes have not been gained by international trade.

The model we plan to study on include only international trade on income. However, there may be other effects placed in error term that are related with income. Because our aim is being able to see the effect of international trade on income, we do not add another independent variables. Therefore,

$$\ln(Y_i) = \alpha + \beta \ln(T_i) + \varepsilon_i,$$

$$\ln(Y_{it}) = \alpha + \beta \ln(T_{it}) + \varepsilon_{it},$$

where  $Y_i$  is total income,  $T_i$  is international trade, and  $\varepsilon_i$  is the other influences on income. The first equation is for Ordinary Least Squares (OLS) and the second one is for Fixed Effects (FE) regressions models. All variables are in natural logarithm form. In the equation, the variables are obtained by some four operations.

$Y_{it}$ : Total gross domestic product ( $GDP_{it}$ )

$T_{it}$ : The ratio of sum of exports (X) and imports (M) to gross domestic product (GDP). In order to reach total international trade volume of countries, summation of total exports plus total imports is divided by gross domestic product for each year,  $\{(X_{it}+M_{it})/GDP_{it}\}$ . This ratio is also called trade openness ratio or index. With this index, we can see the share of international trade on countries.

The resource of data is Penn World Table 7.1.

We will regress the model with two options. The first one is Ordinary Least Squares (OLS) and the second one is Fixed Effects (FE). With OLS, we will see the effect of international trade on income through years and countries. However, here should be a criticism that OLS regresses our model as a one year or as a one country. In other words, OLS just cares the changes or differences through

data. However, with FE, we can see the effects of international trade on income with group effects and time effects. With this comparison, we will also see the difference between OLS and FE. These two options will be applied on three different country groups. These are the whole sample, OPEC countries sample, and non-OPEC countries sample. In other words, we plan to have six different<sup>2</sup> results to see the relationship. Finally, we will measure the robustness of the models.

### III. RESULTS

There are exact differences between OLS and FE results. Honestly, we have already expected that FE results are more reliable because we want to see the differences based on groups about the effect of international trade on income. Table 1<sup>3</sup> shows both OLS<sub>18</sub> and FE<sub>18</sub> regression analysis results. First column explains our variables. According to second column, OLS<sub>18</sub>, international trade is statistically significant at 10% significance level. Third column, FE<sub>18</sub>, indicates that international trade is statistically significant at 1% significance level

---

<sup>2</sup> Model 1a: OLS<sub>18</sub>: OLS with eighteen countries sample

Model 2a: OLS<sub>12</sub>: OLS with twelve-non-OPEC-countries sample

Model 3a: OLS<sub>6</sub>: OLS with six-OPEC-countries sample

Model 1b: FE<sub>18</sub>: FE with eighteen countries sample

Model 2b: FE<sub>12</sub>: FE with twelve-non-OPEC-countries sample

Model 3b: FE<sub>6</sub>: FE with six-OPEC-countries sample

<sup>3</sup> See tables.

with fixed effects. The values in parenthesis represent standard errors of coefficients. The difference between these two comparisons is that the results with fixed effects are more acceptable. A one percent increase in international trade decreases expected income by 0.17 percent in OLS<sub>18</sub>, whereas a one percent increase in international trade increases income by 1.57 percent in FE<sub>18</sub>. According to OLS, the relation between international trade and income is in a negative way, whereas according to FE, the relation is in a positive way.

Because the reason we already investigate both the group effects and the time effects of countries, the option of using fixed effects is more logical. The indicator of goodness of fit, R-squared, also says that the model with fixed effects more understandable. The fraction of the sample variation in income that can be explained by international trade by 0.46 percent without fixed effects, whereas the fraction of the sample variation in income that can be explained by international trade by 26 percent with fixed effects. These results are predicted for our sample that includes eighteen countries in Western Asia Region by 687 observations. These volumes are pretty high, but we have some missing values on databank of the countries from 1950 to 2010.

Fourth and fifth columns of Table 1 is about robustness of the variables to control for heteroskedasticity problem. In the fifth column, FE<sub>18R</sub><sup>4</sup>, the values in

---

<sup>4</sup> The letter R indicates robustness.

brackets that are called heteroskedasticity-robust standard errors<sup>5</sup> increases dramatically, compared to the standard errors of third column, FE<sub>18</sub>. According to the values of the column four, OLS<sub>18R</sub>, our model still shows stronger relationship on international trade at 5% significance level. However, the values of column five, FE<sub>18R</sub>, we can see that international trade is statistically significant at 1% significance level.

### **Case of non-OPEC Countries**

In our study, six of the eighteen countries in our sample are the members of Organization of Petroleum Exporting Countries (OPEC). Therefore, there may be an effect of these six countries on the rest because of oil exporters' excessive incomes. To test this we excluded those countries from our sample which are Iran, Iraq, Kuwait, Saudi Arabia, Qatar, and United Arab Emirates. After that, we ran the regression with the same method that we already applied for the eighteen countries. The results are the following:

Table 2<sup>6</sup> shows both OLS<sub>12</sub> and FE<sub>12</sub> regression analysis results. First column explains our variables. According to second column, OLS<sub>12</sub>, international trade is statistically significant at 1% significance level. Third column, FE<sub>12</sub>,

---

<sup>5</sup> Heteroskedasticity-robust standard errors are generally larger than usual standard errors. We should use heteroskedasticity-robust standard errors in our model because usual t-test and F-test cannot reflect t distribution and F distribution under usual standard errors.

<sup>6</sup> See tables.

indicates that international trade is statistically significant at 1% significance level with fixed effects too. The values in parenthesis represent standard errors of coefficients. The difference between these two comparisons is that the results with fixed effects are more acceptable. A one percent increase in international trade decreases expected income by 0.35 percent in  $OLS_{12}$ , whereas a one percent increase in international trade increases income by 1.89 percent in  $FE_{12}$ . The relation between international trade and income is in a negative way with OLS, whereas the relationship is in a positive way with FE.

Fourth and fifth columns of Table 2 is about robustness of the variables to control for heteroskedasticity problem. In the fifth column,  $FE_{12R}$ , the values in brackets that are called heteroskedasticity-robust standard errors increases dramatically, compared to the standard errors of third column,  $FE_{12}$ . According to the values of the column four and five,  $OLS_{12R}$  and  $FE_{12R}$ , our models still show stronger relations for international trade at 1% significance level.

### **Case of OPEC Countries**

The same comparison we applied for non-OPEC countries can be applied to OPEC countries in our sample too. The results are the following:

Table 3<sup>7</sup> shows both OLS<sub>6</sub> and FE<sub>6</sub> regression analysis results. First column explains our variables. According to the other columns, the results show that international trade is not statistically significant at any significance level. A one percent increase in international trade decreases expected income by 0.24 percent in OLS<sub>6</sub>, whereas a one percent increase in international trade increases income by 0.35 percent in FE<sub>6</sub>.

Fourth and fifth columns of Table 3 are about robustness of the variables to control for heteroskedasticity problem. In the fifth column, FE<sub>6R</sub>, the values in brackets that are called heteroskedasticity-robust standard errors increases dramatically, compared to the standard errors of third column, FE<sub>6</sub>. According to the values of the columns, OLS<sub>6R</sub>, our models are not statistically significant at any significance level.

#### **IV. CONCLUSION AND DISCUSSION**

In this research, we investigate the effect of international trade on income. Our model consists of gross domestic product as dependent variable; international trade as independent variables. The model runs for eighteen different countries in Western Asia region between 1950 and 2010.

---

<sup>7</sup> See tables.

We used Ordinary Least Squares (OLS) and Fixed Effects (FE) regression models. We saw that OLS results are not reliable for our model because we try to understand the effect of international trade on income during the time. However, OLS could not show up the differences between countries and time. Therefore, with a panel data, FE results are more compatible with our study that is based on country effects and time effects.

We regressed international trade on income in our model with FE. The results we obtained from regression models are close what we expect to see. First, there is a positive relationship between international trade and income. Second, we saw that a one percent increase in international trade would cause to increase expected income by 1.57 percent. This is statistically and economically significant at 1% significance level.

However, we were suspicious about the effect of countries in our sample that are members of Organization of Petroleum Exporting Countries (OPEC). Then, we found that a one percent increase in international trade would cause to increase expected income by 1.89 percent, excluding six OPEC members. This is also statistically and economically significant at 1% significance level. After that, within OPEC members in our sample shows that a one percent increase in international trade would cause to increase expected income by 0.35 percent. However, this is not statistically and economically significant at any significance level.

In order to test those results, we applied robustness option to all models. We saw that international trade for eighteen countries and twelve non-OPEC countries is statistically significant at 1% significance level. However, international trade is not statistically significant at any level of significance level for six OPEC countries.

Our reference study, by Frankel and Romer (1991), shows that trade raises income. According to their results, a one percentage point increase in trade share increases income per person by at least one-half percent.

Also, Baier and Bergstrand (2001) indicates that world trade has grown up several reasons such as income growth by 67%, decreasing tariff-rates by 25%, and going down transport-costs by 8%. They found that the amount of growth is 148 percentage points in terms of mean logarithmic form.

As a result, separating countries such as non-OPEC and OPEC countries does not work for our sample. That means international trades of eighteen countries have some impacts on their incomes to each other. When we divide the countries, we lose the effect of international trade on income, but when we put them together, the model works at 1% significance level. We may just say that those Western Asia countries keep trading each other at a balance of international trade. The more export, the more import.

## TABLES

**Table 1**

OLS and FE Regression Model Results for Eighteen Western Asia Countries

I	II	III	IV	V
	OLS <sub>18</sub>	OLS <sub>18R</sub>	FE <sub>18</sub>	FE <sub>18R</sub>
<b>Trade</b>	-0.172*	-0.172**	1.569***	1.569***
	(-0.097)	[0.081]	(0.102)	[0.321]
<b>Constant</b>	10.648***	10.648***	3.290***	3.290**
	(0.415)	[0.361]	(0.432)	[1.358]
<b>Number of countries</b>	18	18	18	18
<b>Number of observations</b>	687	687	687	687
<b>R-squared</b>	0.0046	0.0046	0.2625 (within)	0.2625 (within)
<b>F-value</b>	3.15*	4.48**	237.79***	23.86***

**Table 2**

OLS and FE Regression Model Results for Twelve-non-OPEC Western Asia Countries

<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>
	<b>OLS<sub>12</sub></b>	<b>OLS<sub>12R</sub></b>	<b>FE<sub>12</sub></b>	<b>FE<sub>12R</sub></b>
<b>Trade</b>	-0.352*** (0.102)	-0.352*** [0.080]	1.892*** (0.110)	1.892*** [0.305]
<b>Constant</b>	10.890*** (0.433)	10.890*** [0.361]	1.541*** (0.459)	1.541 [1.273]
<b>Number of countries</b>	12	12	12	12
<b>Number of observations</b>	490	490	490	490
<b>R-squared</b>	0.0237	0.0237	0.3845	0.3845
<b>F-value</b>	11.82***	19.28***	297.97***	38.36***

**Table 3**

OLS and FE Regression Model Results for Six-OPEC Western Asia Countries

<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>
	<b>OLS<sub>6</sub></b>	<b>OLS<sub>6R</sub></b>	<b>FE<sub>6</sub></b>	<b>FE<sub>6R</sub></b>
<b>Trade</b>	-0.243 (0.167)	-0.243 [0.148]	0.350 (0.224)	0.350 [0.213]
<b>Constant</b>	12.223*** (0.737)	12.223*** (0.688)	9.627*** (0.982)	9.627*** [0.934]
<b>Number of countries</b>	6	6	6	6
<b>Number of observations</b>	197	197	197	197
<b>R-squared</b>	0.0108	0.0108	0.0127	0.0127
<b>F-value</b>	2.13	2.71	2.44	2.69

## APPENDIX

### INCOME GROUPS

#### Lower Middle Income

Armenia

Georgia

Syria

Yemen

#### Upper Middle Income

Azerbaijan

Iran

Iraq

Jordan

Lebanon

Turkey

#### High Income

Bahrain

Cyprus

Israel

Kuwait

Oman

Qatar

Saudi Arabia

United Arab Emirates

## REFERENCES

1. **Frankel, Jeffery A. and Romer, David.** "Does Trade Cause Growth?"  
The American Economic Review, Vol. 89, No. 3, June 1999, pp. 379-399.
2. **Grossman and Hillman.** "African Development Bank Economic Research  
Working Paper, No. 76, 1991.
3. **Harrison, Ann.** "Openness and Growth: A time-Series, Cross-Country  
Analysis for Developing Countries." Journal of Development Economics,  
March 1996, 48(2), pp. 419-447.
4. **Helpman, Elhanan.** "Growth, Technological Progress, and Trade."  
National Bureau of Economic Research (Cambridge, MA) Reprint No.  
1145, 1988.
5. **Michaely, Michael.** "Exports and Growth: An Empirical Investigation."  
Journal of Development Economics, March 1977, 4(1), pp. 49-53.
6. **Rodriguez and Rodrik.** "Exports and Economic Growth: Some Empirical  
Evidence from Arab Gulf Countries." Applied Economics, (29), 1999, pp.  
693-697.
7. **Rodrik, Dani.** "Getting Interventions Right: How South Korea and Taiwan  
Grew Rich." Economic Policy, April 1995, (20), pp. 53-97.
8. **Rodrik, Dani.** "Trade Policy and Economic Performance in Sub-Saharan  
Africa." NBER Working Paper, No. 6562, 1998, National Bureau of  
Economic Research, Cambridge, MA.

9. **Sala-i-Martin, Xavier.** “Comment,” in Oliver Jean Blanchard and Stanley Fischer, eds., NBER Macroeconomics Annual 1991, Cambridge, MA: MIT Press, 1991, pp. 368-378.
10. **Baier, Scott L.** and Bergstad, Jeffrey H. “The Growth of World Trade: Tariffs, Transport Costs, and Income Similarity.” *Journal of International Economics*, (53), 2001, pp. 1-27.