

The Relationship between Trade and Foreign Direct Investment in G7 Countries a Panel Data Approach

Mihaela Simionescu¹

Abstract

In the context of globalization process, the relationship between trade and foreign direct investment has been studied for G7 countries. The Granger causality tests for panel data reflected in period from 2002 to 2013 that there is only short run causality between FDI and exports and FDI and imports. There is unidirectional causal relationship on long run between FDI and trade. Moreover, short run causality in both senses was observed for FDI and trade in G7 countries on the considered horizon.

Keywords: panel data, Granger causality, unit root tests, FDI, trade

JEL Classification: F14, C23, C33

1. Introduction

The trade and foreign direct investment are two variables that have an important impact on globalization process, the relationship among them being different from a country to another. The causality between these two variables definitively influences the decision-making process. Two major directions have been identified in literature: the FDI determines the international trade or the other way round and FDI is a substitute or a complement of international trade.

The objective of this research is to analyze the long run and short run causality between FDI, import, export and trade in G7 countries over the period 2002-2013 using panel causality based on an error correction model.

¹ PhD Senior Researcher, Institute for Economic Forecasting of the Romanian Academy, 050711, Bucharest - Romania, Casa Academiei, 13, Calea 13 Septembrie, district 5.
Email: mihaela_mb1@yahoo.com

After a brief introduction, the paper focuses on a short literature review followed by the empirical application and conclusions.

2. Literature Review

The relationship between trade and FDI have been examined till now in numerous studies. Fukasaku et al. (2000) used bivariate vector error correction models to prove that in economies based on trade there is a positive impact of FDI on trade. This direct relationship was also observed by Dunning et al. (2001) for FDI and growth trade in Taiwan and Korea. Many authors, like Swenson (2004), Rose and Spiegel (2004), Do and Levchenko (2004) and Lane and Milesi-Ferretti (2008), proved that a greater inflow of FDI generates a higher trade (as volume) and an increase in productivity rate. Blonigen et al. (2004) obtained that the tariff-jumping FDI has an important negative impact on the domestic firms' exports from USA.

Wörz (2005) studied the relationship between industrial allocation of FDI and economic growth. The author made a comparison of CEECs with countries from East Asia and OECD members.

Hsiao F. S., & Hsiao M. C. W. (2006) studied the Granger causality between FDI, GDP and exports in 8 rapidly developing countries from East and Southeast Asia. FDI has a direct impact on GDP. Driffield and Love (2007) concluded that FDI determined an increase in exports' productivity. Beugelsdijk et al. (2008) proved that there is an inverse relationship between trade and horizontal FDI. Anwar and Nguyen (2010) used a gravity model to show that there is a complementary relation between FDI and imports, but also between FDI and exports in Vietnam. Jayachandran and Seilan (2010) showed that there is a causal relationship in India between FDI, economic growth and trade on the horizon 1970-2007. Tekin (2012) showed that there is a direct, unidirectional causality from exports to GDP in some countries (in Haiti, Rwanda and Sierra Leone), and from GDP to exports in other countries (Angola, Chad and Zambia).

Liu, Wang, and Wei (2001) have analyzed the causal relation between FDI and trade (exports and imports) in China. The authors used a panel of bilateral data for China and 19 home countries or regions on the horizon 1984–1998.

The panel data methods were used to test unit roots and causality. The results showed a potential development for China: the increase in imports determines the increase in FDI from regions to China and increase in exports from China to regions or home country. An increase in exports determines the increase in imports.

Dritsaki, M., Dritsaki, C., & Adamopoulos, A. (2004) analyzed the relationship between Trade, FDI and economic growth in Greece in the period 1960-2002. There is a long-run equilibrium relation. There is a causal relationship between FDI, economic growth, trade in Greece.

Pramadhan, Bissoondeal, & Driffield, N. L. (2007) tested the relationship between trade, growth and FDI in Indonesia in the period from 1990 to 2004. There is a checked relation between trade and FDI, but both variables are sensitive to growth effects.

3. Panel Causality Relation between FDI and Trade

This research is based on annual data for the G7 countries during 2002 till 2013. The data are provided by Eurostat, World Bank and OECD. The variables utilized in this study are: exports of goods and services (EX), imports of goods and services (IM) at constant prices (2000=100), foreign direct investment, net inflows (2000=100) and gross domestic product (GDP) at constant prices (2000=100), trade as percent of GDP (TR). In this analysis logarithm of the variables has been used.

In order to test the causality between trade and foreign direct investment several stages are followed. First of all, the integration order has been verified using Levin et al. (2002) test, which is a panel unit root test. For this order of integration the long run relation between variables was determined using Kao's (1999) panel co-integration. Finally, a panel vector error correction model was built to determine the dynamic adjustment of trade and FDI. The Granger causality test used the next models:

$$\Delta FDI_{it} = c_{1i} + \sum_q \theta_{11\ iq} \Delta FDI_{it-q} + \sum_p \theta_{12\ ip} \Delta GDP_{it-p} + \sum_p \theta_{13\ ip} \Delta EX_{it-p} + \delta_{1i} ECT_{it-1} + \varepsilon_{1t} \quad (1)$$

$$\Delta EX_{it} = c_{2i} + \sum_q \theta_{21\ iq} \Delta EX_{it-q} + \sum_p \theta_{22\ ip} \Delta GDP_{it-p} + \sum_p \theta_{23\ ip} \Delta FDI_{it-p} + \delta_{2i} ECT_{it-1} + \varepsilon_{2t} \quad (2)$$

$$\Delta FDI_{it} = c_{3i} + \sum_q \theta_{31\ iq} \Delta FDI_{it-q} + \sum_p \theta_{32\ ip} \Delta GDP_{it-p} + \sum_p \theta_{33\ ip} \Delta IM_{it-p} + \delta_{3i} ECT_{it-1} + \varepsilon_{3t} \quad (3)$$

$$\Delta IM_{it} = c_{4i} + \sum_q \theta_{41\ iq} \Delta IM_{it-q} + \sum_p \theta_{42\ ip} \Delta GDP_{it-p} + \sum_p \theta_{43\ ip} \Delta FDI_{it-p} + \delta_{4i} ECT_{it-1} + \varepsilon_{4t} \quad (4)$$

$$\Delta FDI_{it} = c_{5i} + \sum_q \theta_{51\ iq} \Delta FDI_{it-q} + \sum_p \theta_{52\ ip} \Delta GDP_{it-p} + \sum_p \theta_{53\ ip} \Delta TR_{it-p} + \delta_{5i} ECT_{it-1} + \varepsilon_{1t} \quad (5)$$

$$\Delta TR_{it} = c_{6i} + \sum_q \theta_{61\ iq} \Delta TR_{it-q} + \sum_p \theta_{62\ ip} \Delta GDP_{it-p} + \sum_p \theta_{63\ ip} \Delta FDI_{it-p} + \delta_{6i} ECT_{it-1} + \varepsilon_{6t} \quad (6)$$

where Δ - first order difference, ε – error, δ – short term adjustment parameter (it shows the speed of the values of a variable towards long term equilibrium) and ECT- lagged residual (it comes from the long term co-integration relation)

F test is used to check if the parameters are different from null value. A significant and negative error correction term implies long term causality.

All the variables are transformed by applying the logarithm. The new variables are denoted with: LFDI, LGDP, LEX, LIMP and LTR. First of all Phillips-Perron individual unit root was applied and then Levin-Lin-Chu unit-root test. The results showed that the variables are co-integrated of order 1.

Table 1: The results of Levin-Lin-Chu unit-root test

LLC test	LFDI	LEXP	LIMP	LGDP	LTR
Level: t-adjusted (probability)	-3.5733* (0.0002)	-1.5214 (0.0641)	-2.114*(0.0174)	-1.1642(0.1222)	-7.657*(0.00)
First difference t-adjusted (probability)	-3.7066*(0.0001)	-2.2996*(0.0107)	-3.4832*(0.0002)	-1.7329*(0.0412)	-13.3558(0.00)

*denotes statistically significant at 0.05 level of confidence, so it means stationary panels

For analyzing the existence of long term equilibrium relation between variables the Kao's (1999) ADF test was used. The null hypothesis in this case refers to lack of co-integration. It resulted that there is a long run relationship between the models' variables.

Table 2: The Results of Kao's Test

Model	t-statistic	Probability
1	-2.456	0.0062
2	-4.657	0.000
3	-2.638	0.0103
4	-3.986	0.000
5	-3.328	0.0005
6	-2.256	0.0104

Source: author's computations

All the probability values are lower than 0.05, fact that implies that all the coefficients are significant at 5% level of significance.

The Hausman test is used to establish which model is better: fixed effects model and random effects model. The null assumption states that the random effect is not correlated with exogenous variables. The logical demarche confirms the results of Hausman test, the fixed effects model being more suitable than the random effects model.

Table 3: The Results of Hausman Test

Model	Chi-square statistic	Probability
1	34.093	0.000
2	124.721	0.000
3	69.142	0.000
4	153.049	0.000
5	194.057	0.000
6	24.729	0.000

Source: author's computations

We estimated the panel VAR model with lagged error correction term. There is long term causality between these variables, because we have significant and negative parameters for lagged error correction term.

Table 4: The Results of Panel Granger Causality Tests

Endogenous	DLFDI	DLFDI	DLFDI	DLEXP	DLIMP	DLTR
Exogenous						
intercept	-0.00465	-0.0364	0.00729*	0.02476	0.0723	0.03376*
DLGDP	1.207*	1.529*	1.037*	0.635*	1.778*	1.445*
DLEXP	-	0.556*	-	-	-	-
DLIMP	0.887*	-	-	-	-	-
DLFDI	-	-	-	0.047*	0.0132*	0.0227*
DLTR	-	-	1.002*	-	-	-
DLEXP(-1)	-	-	-	-0.335*	-	-
DLIMP(-1)	-	-	-	-	-0.0337*	-
DLFDI(-1)	0.634*	0.705*	0.447*	-	-	-
DLTR(-1)	-	-	-	-	-	-0.148*
ECM(-1)	-0.624*	-0.644*	-0.179*	0.492*	0.0038	0.328*
Adjusted R	0.5403	0.4837	0.1945	0.4382	0.6034	0.5567
F-statistics	20.34	22.78	18.89	21.34	29.67	30.05
Durbin-W	1.934	1.972	2.003	1.983	2.026	2.017

*denotes significant coefficients at 5% level of significance

The lagged error correction terms have positive values. These results reflect that we do not have a long term causality relationship between FDI and exports and imports. However, there is short term causality between these variables, because the parameters of FDI differ statistically from 0. From trade to FDI there is long run unidirectional causality and on short term bidirectional causality between the two variables.

4. Conclusions

The relationship between FDI and trade was investigated in G7 countries using panel data approach. The topic has a considerable importance for practitioners, but also for policy-makers and academic environment.

The Granger causality tests for panel data reflected in our empirical example that there is only short run causality between FDI and exports and FDI and imports. Moreover, short run causality in both senses was observed for FDI and trade in G7 countries on the considered horizon.

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