Causality between International Financial Integration and Trade Openness in High Income OECD Countries: Panel Data Analysis

Abhijit Bhattacharya
Assistant Professor of Economics, Department of Economics
Pingla Thana Mahavidyalaya, Paschim Medinipur, West Bengal

Archita Ghosh
Professor of Economics, Department of Economics
University of Kalyani, Kalyani, West Bengal

Abstract

Theoretically trade openness and international financial integration should go hand in hand. However, both these variables depend on a number of economic and non-economic factors; as a result, theoretical findings are not always confirmed in reality. In the present paper we try to judge the theoretical perception on the relationship between trade openness and international financial integration with empirical evidences for a panel of 28 High Income OECD countries over the period 1995-2011. Panel unit root test shows that both the series on financial integration and trade openness are integrated of order one. We have applied Pedroni and Kao cointegration tests to find that these two series are cointegrated. Then we have performed vector error correction. Our result confirms the absence of long run causality either from trade openness to international financial integration or from international financial integration to trade openness. We have also tested for short run causality and have found that unidirectional causality exists from international financial integration to trade openness.

Keywords*: International financial integration, Trade openness, Panel causality analysis*
JEL Classification: F36, C33

1. Introduction

Financial integration can be defined as 'the process through which financial market of an economy becomes closely integrated with those in other economies or with those in the rest of the world' (Ho, 2009). Contrary to financial integration is economic integration, which is an arrangement among nations that normally aims at reduction or elimination of trade barriers and coordination of monetary and fiscal policies of the countries. It is believed that economic integration and financial integration have a close interrelationship affecting one another. Theoretically trade openness, an outcome of economic integration, and international financial integration seem to move hand in hand. Most of the papers dealing with the determinants of international financial integration find that trade openness is one of the most important determinants of international financial integration that affects the latter positively. However, there are studies that find a negative relation too. In our attempt (Bhattacharya, 2017) to find out determinants of international

financial integration considering sample countries from all the income categories of the countries worldwide it was revealed that this relation does not hold always. Even in some cases there seems to exist a negative relation between trade openness and international financial integration. This led us to a detailed study on the relationship between these two variables. For that we have considered 28 high income OECD countries.

The rest of the paper is follows: In section 2 we briefly discuss the theoretical relationship between the two. A review of the existing literature is given in section 3. Section 4 consists of description of the data and the methodology used in our study. In section 5 we present our empirical findings and section 6 concludes.

2. International Financial Integration, Trade Openness and the Theoretical Relations between the Two

International financial integration is measured by the sum of foreign assets and foreign liabilities as a percentage of GDP. Although the process of financial integration can take place in various other forms like sharing of information and technologies by the firms and financial institutions located at different countries, sharing of best practices by different financial institutions or transactions of newly engineered financial products among the economies etc., we shall consider only cross-border capital flows, i.e., foreign assets and liabilities, to define international financial integration. Assets and liabilities are taken in several ways - sometimes as aggregate assets and liabilities, sometimes by foreign direct investment and foreign portfolio investment equities only and sometimes by adding debt investment to it. Here we have taken international financial integration as the sum of total assets consisting of FDI asset, FPI equity asset, debt asset, financial derivative asset and foreign exchange reserves excluding gold and total liability consisting of FDI liability, FPI equity liability, debt liability and financial derivative liability as a percentage of GDP. Trade openness is measured by the summation of exports and imports as a percentage of GDP.

Goods trade and asset trade are theoretically related in several ways:

a) If a country does not participate in goods trade it may give a negative signal to a foreign investor for investing in that country. More trade openness gives a confidence to an investor to invest more in the country concerned, reducing financial home bias. According to Lane and Milesi- Ferretti (2003) this is called a ‘familiarity effect’.
b) In a country with more liberalized foreign trade, it is easy for an investor/ producer to import machinery or raw materials for increasing production and also to export his/her product in the world market. Barriers to export and import may discourage an investor to invest in the country.

Again in case of Foreign Direct Investment, intra-firm intermediate trade being important, trade openness and international financial integration becomes jointly determined.

c) Lane and Milesi- Ferretti (2003) show that trade in goods directly results in

the corresponding financial transactions such as trade credit, transportation costs and export insurance, thus leading to increased international financial integration.

d) According to Obstfeld and Rogoff (2000), trade costs create an international wedge between marginal rates of substitution and thus limit the gains of asset trade. Thus increased trade cost due to barriers on export and import puts a barrier on international financial integration of a country.

3. Relationship between Trade Openness and International Financial Integration: A Brief Review of Literature

The trends of International Financial Integration for a sample of 18 OECD countries and its determinants have been analysed by Lane and Milesi- Ferretti (2003) over the period 1978-2001. This paper revealed that impact of trade openness on international financial integration is positive. Vo and Daly (2007) have considered a number of measures of International Financial Integration and analysed the drivers of International Financial Integration for a set of 79 countries, both developed and developing, for the time period 1980- 2003. They have used panel ordinary least squares (OLS), two stage least squares (2SLS) and generalized method of moments (GMM) – both difference and system methods. In their analysis trade openness is a determinant, having a positive effect, of international financial integration. Arfaoui and Abaoub (2010) have found that for a set of 7 developed as well as 8 emerging economies over the period 1988 to 2008, trade openness in most of the measures of international financial integration negatively affect international financial integration although trade openness is not significant in a number of cases in the study. Interestingly contrary to positive relation as explained by the theory, trade openness has a negative significant impact on aggregate FDI flows as a share of GDP. Arora and Ratnasiri (2014) have worked on regional financial integration of South Asian countries. In their analysis they have dealt with financial cooperation as well as financial integration. Using principal component analysis the paper has found that the trade openness is one of the significant determinants of regional financial integration of South Asia. Garali and Othmani (2015) have dealt with the determinants of International Financial Integration in eight Middle East and North African Countries for the period 2006-2012. They conclude that trade openness attracts the attention of international investors and they invest more in the countries having more trade openness. Determinants of international financial integration of South Asian countries during 2004-2011 have been analyzed by Bhattacharya and Ghosh (2016a). In their study also they have found that trade openness is one of the significant positive determinants of international financial integration. In another study, Bhattacharya and Ghosh (2016b) have found the determinants of international financial integration of 32 middle income countries during 2002-2011 and the study revealed that international financial integration is negatively and significantly related with trade openness.

From the literature survey it is found that although in most of the cases trade openness is positively related to international financial integration, in some cases the relationship is opposite. It also appears that the relationship between these two is context-specific. So it becomes necessary to find out the exact relationship between these two variables in

greater detail. It is also to be mentioned that all the studies have looked at trade openness as one of the determinants of international financial integration; the reverse has not been considered in any of the studies we have reviewed.

Therefore our objective of this paper is to

a) see whether there exists any long or short run relationship between international financial integration (IFIVB henceforth) and trade openness (OPENNESS henceforth) for our chosen set of countries; and
b) look into the nature of the relationship, if exists, i.e., whether relationship is unidirectional or bidirectional.

4. Data and Methodology

4.1. Data

We have taken 28 high income OECD (HIOECD) countries. The reason behind selection of high income countries lies in the fact that these countries were liberalised long ago and impact of other institutional and non-economic factors on the values of the variables concerned are likely to get eliminated during our chosen period. This elimination of non-economic and institutional factors is necessary for proper reflection of the actual relation between the variables. We have selected the HIOECD countries on the basis of World Bank classification. There are 32 HIOECD countries as per the latest (2015) classification of the World Bank. Since we have taken asset and liability data from 1995, we have taken 28 countries which were classified as HIOECD by 1996. Countries we have considered are Austria, Australia, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea Republic, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom, and the United States of America.

We have taken asset and liability data for international financial integration from the upgraded and extended version of the External Wealth of Nations Mark II database by Lane and Milesi-Ferretti (Lane and Milesi-Ferretti, 2007). They provide data for the period 1970-2011 for 188 countries plus the Euro area as a whole. Lane and Milesi-Ferretti's database seems to be advancement over the data provided by International Financial Statistics published by the IMF since for a large number of countries (especially developing and low income countries) the IMF data of asset or liability are available only for a few years. Lane and Milesi-Ferretti have extended this dataset up to the extent possible. Export and Import data are taken from the World Bank database.

4.2. Methodology

We have chosen a time period of 16 years. Following the practice we have treated this panel as long term panel and applied long run panel econometric techniques. These follow a few tests performed step by step. Before going for the test of panel causality we have to apply panel co-integration test, on which the form of the equations for the causality test depends.

To study co-integration between international financial integration and trade openness, as a pre-requisite we have first performed panel unit root test to see whether the variables -

international financial integration and trade openness - are stationary or not. A number of methods exist to test for the presence of panel unit root. These are Levin, Lin and Chu test, Im, Pesaran and Shin test, Fisher ADF, Fisher PP and Hadri test to check the presence of unit root.

We have applied Levin, Lin, and Chu (LLC) t test for testing the presence of a common unit root process and Im, Pesaran and Shin W statistic, ADF- Fisher chi square and Phillips-Perron (PP)-Fisher chi-square test to test the presence of individual unit roots.

Levin et al. (2002) considers the following basic ADF specification:

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + X'_{it}\delta + \epsilon_{it}$$

y_{it} represents endogenous and X_{it} represents exogenous variables. Here we assume a common $\alpha = \rho - 1$ (ρ is the autoregressive coefficient), but the lag orders (p_i) may vary across cross sections. We test the null hypothesis of the presence of a unit root against the alternative of no unit root.

Im et al. (2003) consider separate ADF regressions for each cross section. The null hypothesis is that all the α's are zero against the alternative of some of the α's being negative.

Phillips and Perron (1988) use a nonparametric method of controlling for serial correlation while testing for a unit root. They apply the non-augmented Dickey Fuller test. The Phillips-Perron (PP) test is based on the statistic:

$$\bar{t}_\alpha = t_\alpha \left(\frac{\gamma_0}{f_0}\right)^{1/2} - \frac{T(f_0 - \gamma_0)(\text{se}(\hat{\alpha}))}{2{f_0}^{1/2}s}$$

where $\hat{\alpha}$ is the estimate, and t_α is the t-ratio of α, se(α) is standard error of α, and s is the standard error of the test regression. γ_0 is a consistent estimate of the error variance [= (T-k)s^2/T, k is the number of regressors]. f_0 is an estimator of the residual spectrum at frequency zero.

We have employed Summary test to see the summary results. We have tested for the presence of unit root in the variables in levels first and in first differenced form, if found to have a unit root in level. We have performed unit root test assuming individual intercept, individual intercept and trend and none. Our summary result says that majority of the test shows that both the variables - international financial integration and trade openness - have unit root in levels. We have then checked whether the series have unit root in first differenced form or not. We have found that almost for all the tests both the series are stationary in first differenced form.

Having found that the two series are non-stationary we have applied Panel Co-integration test to check whether the variables are co integrated or not, that is whether they have any long term association or not. We take three models assuming no deterministic trend,

deterministic trend and intercept and no deterministic trend and intercept. We have done both within dimension and between dimension tests. We have done Pedroni Engel Granger based test and Kao method to test for cointegration. Here our null hypothesis is that there is no co-integration.

Pedroni (1999, 2004) proposes several tests for cointegration that allow for heterogeneous intercepts and trend coefficients across cross-sections. The equation is

$$y_{it} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \cdots + \beta_{Mi} x_{Mi,t} + \varepsilon_{i,t}$$

For t = 1,…….., T; i = 1, ……, N; m = 1, ...M. y and x are assumed to be I(1).

The Kao (1999) test follows the same basic approach as the Pedroni tests, but specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors.

If the variables are cointegrated, for testing causality between them we have to apply vector error correction model (VECM). As we want to check whether the relationship between international financial integration and trade openness are bidirectional or unidirectional, we shall use system method of estimation. Here our equations are

$$\Delta y_{i,t} = \alpha_{10,i} + \alpha_{11,i} \Delta y_{i,t-1} + \ldots + \alpha_{1M,i} \Delta y_{i,t-M} + \beta_{11,i} \Delta x_{i,t-1} + \ldots + \beta_{1N,i} \Delta x_{i,t-N} + \lambda_y ECT + \varepsilon_{1i,t}$$

$$\Delta x_{i,t} = \alpha_{20,i} + \alpha_{21,i} \Delta x_{i,t-1} + \ldots + \alpha_{2M,i} \Delta x_{i,t-M} + \beta_{21,i} \Delta y_{i,t-1} + \ldots + \beta_{2N,i} \Delta y_{i,t-N} + \lambda_x ECT + \varepsilon_{2i,t}$$

Δ denotes the first difference, t means time period and i is for cross sectional variations. ECT is the error correction term. $\lambda_{i,}$ the coefficient of the error correction term, measures the speed of adjustment. Long-run causality depends on the value of $\lambda_{i,.}$ If λ_i is negative and significant, we conclude that a long run causality runs from the independent to dependent variable of the concerned equation. Short-run causality depends on the significance of $\beta_{1j,i}$ and $\beta_{2j,i.}$ The null hypotheses in each case are $\beta_{1j,i} = 0$; and $\beta_{2j,i} = 0$ for all i, j against the alternative that all $\beta_{1j,i}$ and $\beta_{2j,i}$ are not zero. The joint significance of $\beta_{p1,i}=\beta_{p2,i} = \ldots = \beta_{pN,i} = 0$, where p = 1,2, is tested by the Wald test.

The Wald statistic that compares an unrestricted model with a restricted model is given by Andreß et al. (2012)

$$W_{r/u}^2 = \left(C\hat{\beta} - 0\right)' \left(C\hat{V}_{\hat{\beta}} C'\right)^{-1} \left(C\hat{\beta} - 0\right) = \left(C\hat{\beta}\right)' \left(C\hat{V}_{\hat{\beta}} C'\right)^{-1} C\hat{\beta}$$

Where C is constraint matrix, $\hat{\beta}$ shows vector of estimated parameters and $\hat{V}_{\beta}$ includes all estimated variances and covariances of the parameter estimates. Wald statistic follows Chi-square distribution with degrees of freedom is equal to the number of restrictions.

5. Empirical Findings

We have first applied unit root tests on the variables IFIVB and OPENNESS. The model specification includes individual effects, i.e., separate constant terms that capture individual cross section effects. The results are reported in table 1 below.

Table 1. IPS, LLC, ADF and PP Panel Unit Root Test

	At level								At first difference					
	IPS		LLC		ADF		PP		IPS		ADF		PP	
Variable	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value
IFIVB	0.35	0.64	-3.93	0.00	61.60	0.28	61.53	0.28	-16.96	0.00	325.03	0.00	443.90	0.00
OPENNESS	1.02	0.85	-2.14	0.02	47.37	0.79	41.27	0.93	-13.19	0.00	255.56	0.00	354.43	0.00

Source: Authors' Calculation

LLC(assumes common unit root process) reveals the absence of unit root in level form but all the individual unit root tests such as IPS, ADF and PP (all assumes individual unit root process) accept the null hypothesis of the presence of unit root. In case of first differenced form all the tests with individual unit root show the absence of unit root. So from a summary of the results we conclude that both the variables IFIVB and OPENNESS are I(1).

Having identified both the series as non-stationary of the same order our next task is to test whether the variables are cointegrated or not. We have applied Pedroni's panel cointegration test as well as the Kao method for testing cointegration. Our results of cointegration tests are presented in tables 2 to 5.

Table 2. Pedroni's Panel Cointegration Test Results assuming no deterministic trend

Within-Dimension	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	2.954101	0.0016	-1.025445	0.8474
Panel rho-Statistic	-6.681275	0.0000	-1.000363	0.1586
Panel PP-Statistic	-8.740641	0.0000	-3.399345	0.0003
Panel ADF-Statistic	-8.725731	0.0000	-3.722377	0.0001
Between-Dimension	Statistic	Prob.		
Group rho-Statistic	-0.555215	0.2894		
Group PP-Statistic	-5.743258	0.0000		
Group ADF-Statistic	-5.462360	0.0000		

Source: Authors' calculation

Following the practice, the decision regarding rejection/ non-rejection of the null hypothesis is taken on the basis of majority rule. In table 2 we find that in the case of within-dimension, out of eight statistics – with and without weights – null hypothesis of no cointegration is rejected in six cases. In case of between-dimension, null hypothesis is

rejected in two cases out of three. Hence overall the null hypothesis is rejected.

From the results presented in tables 3 and 4 also, where we have selected models with deterministic intercept and trend and without any deterministic intercept or trend, we reach the same conclusion. Even when the Kao method for cointegration is applied we get the same result of IFIVB and OPENNESS having cointegration between them.

Table 3. Pedroni's Panel Cointegration Test Results assuming deterministic intercept and trend

Within-Dimension	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	12.31053	0.0000	8.539124	0.0000
Panel rho-Statistic	-3.140761	0.0008	-1.478241	0.0697
Panel PP-Statistic	-6.806613	0.0000	-5.582228	0.0000
Panel ADF-Statistic	-6.990695	0.0000	-4.718865	0.0000
Between-Dimension	Statistic	Prob.		
Group rho-Statistic	0.639390	0.7387		
Group PP-Statistic	-9.202436	0.0000		
Group ADF-Statistic	-5.813956	0.0000		

Source: Authors' calculation

Table 4. Pedroni's Panel Cointegration Test Results assuming no deterministic intercept or trend

Within-Dimension	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	8.420566	0.0000	1.247120	0.1062
Panel rho-Statistic	-9.313202	0.0000	-1.304955	0.0960
Panel PP-Statistic	-8.711492	0.0000	-3.047428	0.0012
Panel ADF-Statistic	-9.150798	0.0000	-3.802864	0.0001
Between-Dimension	Statistic	Prob.		
Group rho-Statistic	1.009268	0.8436		
Group PP-Statistic	-3.554493	0.0002		
Group ADF-Statistic	-3.976916	0.0000		

Source: Authors' calculation

Table 5. Kao Method of Panel Cointegration Test assuming no deterministic trend

	t-Statistic	Prob.
ADF	2.821755	0.0024

Source: Authors' calculation

Thus from tables 2 to 5 we find that irrespective of considering weighted statistics or statistics without weights in almost all the cases the null hypothesis of no cointegration is rejected. Applying majority rule we conclude that the series are cointegrated.

As the variables of our concern are cointegrated, for finding causality we apply vector error correction model. We have done vector error correction estimates in two models; one is when our dependent variable is IFIVB and the other one is when the dependent variable is OPENNESS. The relevant equations are obtained as

D(IFIVB) = C(1)*(IFIVB(-1) + 9.56375445678*OPENNESS(-1) - 1888.84370463) +

C(2)*D(IFIVB(-1)) + C(3)*D(IFIVB(-2)) + C(4)*D(OPENNESS(-1)) + C(5)*D(OPENNESS(-2)) + C(6)

D(OPENNESS) = C(7)*(OPENNESS(-1) + 0.104561446503*IFIVB(-1) - 197.500229974) + C(8)*D(OPENNESS(-1)) + C(9)*D(OPENNESS(-2)) + C(10)*D(IFIVB(-1)) + C(11)*D(IFIVB(-2)) + C(12)

The results are reported in table 6.

Table 6. Vector Error Correction Estimates

	Coefficient	Std. Error	t-Statistic	Prob.	Dependent variable
CointEq1	0.071602	0.005544	12.91594	0	IFIVB
CointEq2	0.000633	0.001107	0.571891	0.5676	OPENNESS

Source: Authors' calculation

For long run causality running from independent variable to the dependent variable the requirement is that the error correction term (here coefficient) has to be negative as well as significant. The value of the coefficient multiplied by 100 shows the speed of adjustment towards the long run equilibrium when causality is present. But in our result for both models the coefficients are positive. So there is no long run causality running from independent variable to the dependent variable.

We have performed Wald test to check whether there exists short run causality or not. The null hypothesis assumes no short run causality from independent variable to the dependent variable.

Null Hypothesis for the first equation is: C(4)=C(5)=0

Null Hypothesis for the second equation is: C(10)=C(11)=0

The results are reported in table 7 below.

Table 7: Wald Test

Test Statistic	Value	df	Prob.	Dependent variable
Chi-square	0.495212	2	0.7807	IFIVB
Chi-square	48.04492	2	0.0000	OPENNESS

Source: Authors' calculation

In our estimates when IFIVB is dependent there is no causality running from OPENNESS to IFIVB since p value is much higher than 0.05. When OPENNESS is dependent there is causality running from IFIVB to OPENNESS since p value is less than 0.05. The result is highly significant (significant at 1%).

So, overall our result shows that there is no long run causality running from either OPENNESS to IFIVB or IFIVB to OPENNESS but there exists unidirectional short run causality running from IFIVB to OPENNESS. We have measured financial integration by capital flows comprising of FDI, FPI and debt flows. Such flows can facilitate growth of the real sector of the economy, thus leading to higher imports. Also the country might find larger markets outside, thus leading to higher exports. So more financially integrated

a country is to the rest of the world, higher is its openness.

6. Summary and Conclusion

The present paper has tried to investigate causality between international financial integration and trade openness for 28 high income OECD countries during 1995-2011. In several steps we have done the job. As a prerequisite to cointegration test we have performed unit root test and found that both the series are I(1). Then we have done panel co-integration test and found that international financial integration and trade openness are co-integrated, that is, there exists a long run relationship between international financial integration and trade openness. Then we have applied vector error correction model to check existence and direction of causality. We have found that there is no long run causality in either direction between international financial integration and trade openness. However there exists unidirectional causality running from international financial integration to trade openness. This direction of causality may be due to the fact that more financially integrated a country is, more it imports for production as well as finds markets for its own products, thus leading to increased trade openness.

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