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Abstract

The aim of this paper is to apply recently developed panel cointegration techniques proposed by Pedroni (1999, 2004) to evaluate the effectiveness of various regional trade agreements by examine the goods market integration between trading partners using purchasing power parity (PPP). The results obtained from panel cointegration tests strongly support the validity of long-run PPP in almost all cases. Evidence of price convergence suggested that the panel countries of free trade areas (FTAs) are integrated, hence FTAs has fostererd the price convergence.

Key words: purchasing power parity, economic integration, free trade area, panel cointegration test.

JEL Classification: E31, F15, F31

1. Introduction

To date, there are many regional trade agreements emerged. These agreements aim to remove tariffs and other non tariff barriers between nations. Tariffs and quotas drive wedges between prices. As these barriers fall, prices converge, ceteris paribus. Besides, Hummels and Skiba (2004) describes lowering these barriers may reduce natural barriers such as distance. Obviously trade agreements not going to change the physical distance but trade agreements that increase the volume of trade can result in

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falling of transportation costs because the average cost of transportation falls as the volume of trade increases. Therefore, trade agreements could contribute to price convergence and foster economic integration.

Since many regional trade agreements appeared to facilitate trade and spur economic growth, this paper aims to examine whether or not the purchasing power parity (PPP) hypothesis for regional agreements has been satisfied. Besides assessing the validity of PPP, the current study intends to verify if the integration process among countries of a free trade area (FTA) has brought a convergence among the exchange rate and inflation.

The organization of this paper is as follows. Section II discusses the Law of One Price and Purchasing Power Parity in terms of testing for market integration. Section III describes the method and data employed in this study. Section IV presents the empirical results and Section V concludes.

2. PPP and Good market Integration

This regional power makes an interesting area to test PPP. According to PPP, in the absence of transportation costs, tariffs and other barriers to trade, and with free trade, the exchange rate between two countries should reflect the relative purchasing power of the two countries. The concept of PPP is based on arbitrage of goods prices across countries. Markets enforce the law of one price, because the pursuit of profit tends to equalize prices of identical goods in different countries. Even though short run deviations from PPP may occur, the PPP relationship is expected to hold in the long run. If there is price differential between countries, arbitragers will take the opportunity to make profit by buy low and sell high. Excess demand of foreign currency will cause the foreign exchange rate to move until it equalizes prices between countries. If trade liberalization between trading partners is successful, it implied that there will be free trade of goods among trading partners. In another words, PPP will hold between trading partners.

From the literatures purchasing power parity can be used to gauge the integration of goods markets between countries. Moosa and Bhatti (1997) assessed the degree of integration between the goods market of Japan and six Asian countries by testing PPP using cointegration test. The paper concludes that Asian goods markets have reached a high level of integration. Chinn (1997) used the PPP to survey the goods market integration in Asia-Pacific and conclude that there is a substantial degree of goods market integration in the markets. Laureti (2001) intends to verify if the integration process among Europe and the Mediterranean countries has brought a convergence among the exchange rate and inflation. By using PPP, the results confirm that the higher the degree of economic integration, the higher the correlation between changes in the exchange rates and inflation. Laurenceson (2003) investigates the degree of economic integration between China and ASEAN by testing the international parity conditions. The results indicate that China is already highly integrated with ASEAN with respect to trade in goods and services. Cheung *et al.* (2003, 2006) investigated the real integration of China, Hong Kong, and Taiwan using relative PPP. Result shows that China and Hong Kong appear to have experienced significant increases in integration during the sample period. Koedijk *et al.* (2004) study the impact of the introduction of the euro in 1999 on the behavior of real exchange rates and conclude that the process of economic integration in Europe has accelerated convergence toward PPP within the euro area. Aggarwal and Simmons (2006) examine if PPP holds for the Caribbean currencies and if there is any evidence of a currency bloc. This paper documents that PPP seems to hold among the Caribbean exchange rates and there seems to be some evidence of cointegration among the Caribbean currencies especially after the 1990 move towards economic integration in the region. Moodley *et al*. (2000) has tested whether the Canada-US trade agreement has fostered the price integration between US and Canada markets using cointegration and Kalman-filter techniques. And they found evidence of price convergence.

3. Methodology and Data

The PPP theory is usually expressed by a long-run relationship between the nominal exchange rate and the relative price levels. There are two types of

PPP, strong form and weak form of PPP. In this paper we employed Pedroni (1999, 2004) panel cointegration tests to test the long-run PPP hypothesis in the FTA perspective. We use four within-group tests and three between-group tests to check whether the nominal exchanges and consumer price index (CPI) are cointegrated[1]. PPP holds if the nominal exchange rate and the relative price levels are cointegrated.

The data are monthly nominal exchange rates (domestic currency against USD) and CPI spanning from 1976M1 to 2007M12 for 63 countries obtained from the International Monetary Fund's International Financial Statistics. We aggregate the countries according to FTA. The selected countries are listed in Appendix. The period of analysis is dictated by data availability, and more importantly, by the realities of the liberalization process. The sample period for each FTA will start from the inforcement date of FTA if data is available[2].

4. Results and Discussions

To save space, the results of unit root test for nominal exchanges and CPI are not reported here. Given that the nominal exchanges and CPI have unit root, we perform the panel cointegration tests for nominal exchanges and CPI.

Table 1 reports the results of all the seven statistics proposed by Pedroni to test the null hypothesis of no cointegration - four within-dimension panel statistics and three between-dimension group statistics. The columns labeled within-dimension present the computed value of the statistics where the alternative hypothesis is common autoregressive coefficient across different countries. The columns labeled between-dimension report the computed value of the statistics under the alternative hypothesis that individual autoregressive coefficient for each country. The results revealed that null hypothesis of no cointegration are rejected for all of the cases under between-dimension group statistics except for one case in AFTA. For the

[1] See Pedroni (1999, 2004) for further details.
[2] The sample period for EEA ended at 1998M12 where the exchange rates for some EEA countries are not available after the formation of EU.

within-dimension panel statistics, the results seems to support there is a cointegration relationship between exchange rate and relative prices for ECOWAS, ALADI, SAFTA and to certain extent for GAFTA and CISFTA, but there is less evident for AFTA and EEA. Nevertheless, we are more concerned with the between-dimension group statistics due to its rather realisitc alternative hypothesis of heterogeneity. Thus, the results suggest that there is a common stochastic trend between exchange rate and relative prices, hence, weak PPP hold between countries within a FTA.

5. Conclusions

This study aims to evaluate the effectiveness of various regional trade agreements by examine the goods market integration between trading partners using PPP. Using the panel cointegration developed by Pedroni (1999, 2004), This paper has examined PPP among countries with FTA over the period 1976M1 to 2007M12. The results presented in panel cointegration based on between-dimension group statistics are more supportive than the statistics based on within-dimension panel statistics. Cointegration results show that the variables are cointegrated especially under heterogeneous alternatives. Hence, PPP seems to hold among countries with FTA. Evidence of price convergence suggested that the panel countries of FTAs are integrated, therefore, FTAs has fostererd the price convergence and hence, the aims of FTAs are generally acheived.

Table 1: Results of Panel Cointegration Tests

				Within-dimension panel statistics				Between-dimension group statistics		
Region	Sample period	T	N	v-stat	rho-stat	PP-stat	ADF-stat	rho-stat	PP-stat	ADF-stat
AFTA	1992M2-2007M12	1146	6	1.14	0.28	-1.20	9.87[a]	1.71[c]	0.33	15.30[a]
CISFTA	1996M3-2005M1	963	9	-1.94[c]	1.94[c]	-0.80	0.54	3.94[a]	2.83[a]	14.22[a]
EEA	1976M1-1998M12	3588	13	-0.43	1.53	1.41	4.97[a]	2.72[a]	2.47[b]	7.65[a]
ECOWAS	1993M8-2005M1	1656	12	-0.31	-5.32[a]	-7.16[a]	-7.40[a]	-1.70[c]	-2.01[c]	5.97[a]
GAFTA	1998M1-2005M3	583	9	-3861.95[a]	1.40	1.94	3.42[a]	1.30[c]	1.68[c]	5.39[a]
ALADI	1981M4-2005M6	2619	9	2.42[b]	-2.82[a]	-6.16[a]	-0.93	-2.41[b]	-4.79[a]	9.49[a]
SAFTA	1996M8-2004M12	505	5	-1.72[c]	1.95[c]	2.43[b]	4.37[a]	2.51[b]	2.87[c]	6.75[a]

Note: Results are with deterministic trend. a, b and c indicate rejection of the null hypothesis of non cointegration at 1%, 5% and 10% significant level, based on respectively critical values.

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Appendix

Table A1: Selected Free Trade Area

	Agreement	Countries	Date (in force)
1	ASEAN Free Trade Area (AFTA)	Brunei, Indonesia, Malaysia, Philippines, Singapore and Thailand.	28/1/1992
2	Commonwealth of Independent States Free Trade Agreement (CISFTA)	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia and Ukraine.	12/30/1994
3	European Economic Area (EEA)	Norway, Austria, Finland, Sweden, Belgium, The Kingdom of Denmark, Cyprus, Luxembourg, Hungary Malta, Netherlands, Portuguese Republic and United Kingdom.	01/01/1958
4	Economic Community of West African States (ECOWAS)	Benin, Burkina Faso, Cote d'lvoire, Gambia, Ghana, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.	07/24/1993
5	Greater Arab Free Trade Area (GAFTA)	Algeria, Egypt, Jordan, Kuwait, Morocco, Oman, Saudi Arabia, Syria and Tunisia.	01/01/1998
6	Latin American Integration Association (ALADI)	Bolivia, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela.	03/18/1981
7	South Asia Free Trade Agreement (SAFTA)	India, Pakistan, Bangladesh, Nepal and Maldives.	12/07/1995

Note: The countries selected to include in each FTA are based on data availability.