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China Integrates Asia with the World: An Empirical Study

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Abstract

Purpose- The paper focuses on China's economic integration with Asia region and the world. It also attempts to find the long run relation with short run dynamics of China's trade in Asia and the world.

Design/Methodology/Approach- The augmented Dicky-Fuller (ADF) and Phillips-Perron (PP) methods are applied to test the time-series properties of the variables. Co-integration technique is used to detect the economic integration of China's export to the US and its import from Asian nations using monthly aggregate data from December 2005 to July 2010.

Findings- This study observed that empirically China's export to the US depends on exchange rate and China's import from Asia depends on China's export to the US. China has double role in international trade – (i) China acts as an attractor of all inputs from Asia and (ii) China exports the final products in international market. This study also reveals that the speed of China's import from Asia is faster than that of China's export to the US.

Practical implications – The results imply that China's trade should be treated as an engine of growth in the Asian developing countries and the trade promotion policies should be encouraged. The emerging China will create other opportunities through trade integration with Asia and the world.

Originality/value – China is economically integrated with region and the world. The paper contributes to measure the speed of China's export and import within Asia and the world. These empirical findings will help policy makers to formulate their policy and design the mechanism for application as per their targets.

Key Words: Economic Integration, production network, Co-integration, Asia, China, the US, ECM, Engine of Growth, Export, Import, Long run, Short run dynamics.

1. Introduction

China's foreign trade increases since 1980s. Now, none can deny China in the global arena. With huge trade surplus, China is *making a room* in the world economy (Rodrik 2010). What is the role of China in Asia and global trade? This paper focuses on China's economic integration with Asia region and the world. Feenstra and Wei (2009) nicely introduce China's growing role in the world trade with connecting regional levels. China has already started to dominate the world business with huge trade surplus. This paper focuses on empirical relation of China with Asia and the world. This study also attempts to find the long run relation with short run dynamics of China's trade in Asia region and the world.

Recently most of Asian emerging economies recover slowly from the global economic crisis which started in 2008. China plays a crucial role in the post crisis era in the international as well as in the regional level. China shares the production and production processes with its neighbours and reorganise the industrial production in Asia (especially in the East and South East Asia). China acts as a global player in the supply driven economy which is based on production network in Asia. Industrial production in Asia propelled China at top of the world exporters (Kumar 2011, Zhou et al 2013). China is the most important strategic and decisive player in the '*factory Asia*' and in the international market. Now question arises 'How does China integrate Asia region with the global market?'

There is evidence on the level of integration between China and its Asian neighbours (Robertson and Xu 2010). China's main imports from ASEAN-4 (Indonesia, Malaysia, Thailand, Philippines) is low-tech manufacturing goods whereas durable goods is the main import category from the developed Asian region (Japan and Newly Industrialized Economies i.e., NIEs). In 2010, share of Chinese exports of more sophisticated manufacture has risen substantially with exports in Machinery and Transport Equipments (nearly 20% and 18% of Chinese exports to Asia and the US, respectively). In economic activity and trade,

China is highly integrated within the East and South East Asia region. Truly, China is the regional engine of economic development, which is observed its deep involvements in the *international production networks* (IPN), especially for automotive industry. This supply creates huge input demand that China imports from the East and South East Asia region.

The changes in the industrialization strategies of developing Asian countries and their subsequent adoption of deeper liberalisation of FDI and trade policies¹ have initiated and developed production networks within East Asian region (Qiang 2013, Kumar 2011). China becomes the central attractor in the region and pulls up Asian nations. Asia exports to China to fulfil its input demand. With low production cost (the cheap inputs: labour and raw materials) China pushes the comparatively low price products in the international market. China plays a double role – (a) it acts as an attractor for Asian inputs and (b) it supplies all the products in the international market. Thus, China is integrated with the world market. In this paper, the US represents the international market.

China pushes the products into the world market at relatively cheaper prices pulling poor Asian economies (Wei 2012). China is the main engine of driving growth in the South East Asia. This Chinese growth engine pulls the demand for produced goods from South East Asia while it pushes these products competitive way to the rest of the world especially to the most developed countries like the US and EU. China acts as double engine² of growth. During the crisis, China adopted some stimulus package to boost up its internal domestic demand which helped to raise the regional trade sharply.

¹ Incentives in the form of liberalization policies ensure that costs of relocation for MNC are less than the benefits. Therefore these countries have relied on incentives to attract foreign MNCs to establish production locally and gradually integrated with the regional production network.

² One engine pulls Asian nations and promotes regional growth while other engine pushes the products to the rest of the world.

The global economic crisis³ in 2008 originated in the most developed economies and automatically they have traded the crisis with the rest of the world. The economic crisis spread and widely affects the world causing significant decline in trade, employment and production. Obviously export markets disintegrate quickly and export –led growth economies search alternative way out of it. One of their efforts was to generate internal demand and took several stimulus packages to boost up their economies. Within short period (around middle of 2010) most of Asian economies return to their pre-crisis level of trade (monthly) and financial flows look more stable than in the months before the crisis. From the Asia’s perspective, it looks as exports were again used as an engine to pull their economies out of crisis. In this context, China plays a vital role in creation of internal demand and increase import from Asian countries. China maintains its high growth rate in 2010 (ADB 2013).

There are several trade performance indicators to assess the relative position of China and sub-regions in global economy with an objective of offering some ideas on the role of trade in Asia’s recovery from the crisis. All these trade performance indicators are readily available in several reports, for example APTIR 2010. There are numerous academic and policy papers, seminar and conference materials, dedicated to find the linkage of country’s trade performance with the global or regional level. There is only few studies address China’s economic integration⁴ with the world economy in their discussion but none use any econometrics technique, especially time series analysis.

³ This is different from the Asia crisis 1997. It originated in Asia and exported it way out of crisis to the developed economies and they absorbed it. So, developed world were part of solution for the Asian crisis 1997.

⁴ In everyday usage the word ‘integration’ denotes the bringing together of parts into a whole. In the economic literature the term ‘economic integration’ does not have a clear-cut meaning. We propose to define economic integration as a process (that encompasses measures designed to abolish discrimination between economic units belonging to different nations) and as a state of affairs (that represented by the absence of various forms of discrimination between national economies). Economic integration can take several forms with varying degree of integration such as free trade area, custom union, common market etc. (Balassa 1961, Andrei 2012). Adam Smith and David Ricardo developed the concept of economic integration in terms of trade theory. Now, international economic integration is effective and promising stage of development of world economy, a new challenging phase of the internationalization of economic relations but provides platform of interaction and a joint solution of economic problems.

Objective of this paper is to examine China's trade relation with Asia and the world over time. Sophisticated time series econometrics technique is used to judge China's trade integration with Asia region and the world. Integration is measured as the close relationship or association between two or more defined variables. This paper measures economic integration using the degree of association among economic variables under certain conditions. Finally statistical co-integration test measures the co-movement or move together jointly over time.

This study mainly focuses on China's economic integration or association with other countries especially East and South East Asia and the world. In the post economic crisis China becomes a central focus of the world economy. Gradually the developed world is losing the economic power and China is gaining power. It is clear that world economic command and control has shifted from the developed nations to emerging economies. China is in the leading position and plays a pivotal role in the world economy with a strong economic integration with other nations. In this context this paper mainly investigates how China integrates economically with the East and South East Asia and the world. More specifically, this paper focuses on the direction of China's trade flows. This study observed that China's export to the US depends on exchange rate and China's import from South East Asia region depends on China's export to the US.

This paper is organised as follows. Section 2 reviews the literature. Section 3 describes data and methodology used in this study. Section 4 presents empirical results and discuss on it. Finally, Section 5 draws some concluding observations.

2. Literature Review

Economic integration has both a *deepening* and a *widening* dimension (Gomez and Gunderson, 2001). The deepening dimension refers to the expansion of the different aspects

or functional areas and market dimensions that are involved in expanding exchange to stimulate economic integration. Generally economic integration is an agreement among countries in a geographic region that reduce trade barriers to the free flow of goods and services, and factors of production among each others. It reduces trade costs and increases economic activities or GDP and welfare among members of integrated nations. Regional integration arrangements have been the subject of considerable economic analysis, it starts with custom union issue (Viner 1950 and Meade 1955). Lipsey (1957, 1960), Meade (1955), Johnson (1965), Tinbergen (1965) and others authors developed Viner's theory and added their own interpretation. Balassa (1961) presents a scheme of development of integration processes. The academic literature on regionalism covers the contributions of economics, international relations and international political economy. There are five forms of integration such as (i) Free Trade Zone, (ii) Custom Union, (iii) Common Market, (iv) Economic Union, and (v) Full Economic Integration. Recently, both theoretical work and quantitative work on regional integration arrangements have been newly inspired by the current resurgence of regionalism and the issues it poses for both advanced countries and less developed countries. International community is concerned for continued progress in international development and the global trading system.

The *Custom Union* may raise the potentiality of *trade creation* that involves the substitution in both home country production and consumption through exports- imports. Truly the custom union results in net trade creation for the partner country in respect to its imports. Following this concept several regional trading blocs (including the WTO) have formed, and every country gains from the regional and global trade. China avails these also.

China plans and examines to move from state control to free market through economic integration and creating trade zones. China starts to integrate with Asia and world through formation of Free Trade Zone since 1980s. China sets up Special Economic Zones (SEZ) in

1980s and later *export processing area* (EPA) introduces to tap the opportunity that generates employment within country and develops business in the region using Trade Agreements which creates Free Trade Zone. China encourages foreign investment and provides supportive policy to their entry and establishment with good infrastructure in SEZ (Nataraj and Tandon 2011). As a result of demonstrative effects of foreign firm, the domestic firms transform their production activities in favour of sophisticated production and increases exports recently. The rising sophisticated China's exports have been facilitated through upgraded human capital and government policies (Wang and Wei 2008). During 1993-2004 Chinese trade structure evolves due to China's integration into the international production processes through production sharing with Asian countries and specialization in assembly operations (Lemoine and Unal-Kesenci 2004). Some developing countries are unable to change patterns of trade through regional trade agreements (RTA). This is because limited trade within regions of developing nations are usually inter-industry trade rather than intra-industry trade (De Melo and Panagariya 1993).

Economic integration is possible where political conditions conducive to facilitate costly redistributive schemes and compensatory mechanisms. The objective of the creation of an Economic Union is the power of national states to decide economic policy. European integration is the *economic union* in a *common market* using single currency and form *full economic integration* in the supranational framework. There are benefits arising from economies of scale in public good provision and the internalization of cross-border externalities, while costs arises from a loss of sovereignty or a change in the political equilibrium (Casella and Feinstein 2002, and Alesina, Angeloni and Etro 2005). A more recent approach, found in Alesina, Spolaore and Wacziarg (2000 and 2005), focuses on the relationship between political integration, the size of the economic market and economic growth. Under globalization, countries and regions are linked with each other and

cooperation is becoming closer and closer, sharing and utilizing global economic resources. Extensive factor flows and global industrial chain integration are main features of globalization. China has taken advantage of the globalization.

China's exports rise rapidly after China's entry into the WTO in 2001. The value of Chinese trade has nearly double every four years during 1980-2010 (Feenstra and Wei 2009). This rapid growth has transformed China from a negligible player in the world trade to the top largest exporter, as well as a substantial importer of raw materials, intermediate inputs and other goods. China's share rise in the international trade is remarkable in the last three decades. International trade share of China jumps from less than 2% in 1985 to 7% in 2005 (Gaulier et al. 2007). Applying constant market share analysis Husted and Nishioka (2012) provides evidence that China's trade gain is at the cost of lost of market share of developed countries for the period of 1995-2005.

During 1993 - 2003, China became an assembly country for firms in Asia. Truly, China transformed as a global manufacturing base for multinational firms who expanded their cross border production in East Asia and integrated China in their global networks. The segmentation of production processes is the main force driving regional trade (Borrus et al 2000, Gaulier et al 2007). Asia's final goods exports largely depend on market outside region⁵. China boosts up intra-regional trade and integrates Asia with the world. There is a clear change in trade pattern in Asia in the 1990s. It shows that emerging China is fostering the regionalization as well as globalization processes.

Now, it is noted that the nominal value of exports and imports attributed to ordinary and *processing* trade, which is important in China and its share is very high in China's trade⁶. *Processing trade* includes imports that enter the country duty-free and will be incorporated into exported goods, and exports that rely on these processing imports. Most of China's

⁵ Now, in this context, question arises regarding speciality of China's export trade (Rodrik 2006).

⁶ Samuelson (2002) rightly pointed out that China's tremendous growth could be a positive threat to its trading partners.

exports are processing exports, intermediate materials of which including raw materials, accessories and components are mostly imported. Trade liberalization facilitates smooth movement of goods, and services and resources among these countries. China import inputs for their productions and exports to the world market. Truly, China's exports have a high dependency ratio on imports. Foreign trade dependency ratio of China, which is the ratio of total volume of foreign trade to GDP, has increased from 38.7% in 1995 to 69.1% in 2006 (Cuihong and Jiansuo 2007). China depends heavily on external neighbouring economies for importing the production processes (Song and Yuan 2012) that actively promotes the regional economic integration of East Asia, and exports to the world market. Truly, China is at the centre of gravity in the East and South East Asia and acts as a pivotal role in the formation of production network. Few literatures focused on the role of trade policy or liberalization in creating the international production network⁷.

The integration of China into the global economy in general and East Asia in particular has further deepened international production fragmentation to unprecedented levels (Haddad, 2007; Athukorala, 2007, Anas 2007). At the turn of the decade, China's processing exports (that are produced from processing and/or assembly of imported inputs) accounted for nearly half of its total exports. In 2006, 51.5% of China's intra East Asian trade was in machinery products, of which more than half was trade in parts and components. The rate of annual

⁷The concept of production network is based on the global value chain system. It underlines the notion of sequential and interconnected structure of economic activities, with each link in a value chain and adding value in the process (Henderson et al. 2002). Value chain may include a wide-range of related and dependent activities within or between chains. More specifically, Porter divides all of the activities in a value chain into two big groups: primary and support. Primary activities include research-and-development, manufacturing, marketing, and logistics services; while support activities include finance, human resource management, and technology development and procurement. It is common for a producer of an intermediary input to be involved in several value chains, which can span within- and across- geographic boundaries. This implies that the activities are not only done within the boundary of a single firm – as in the traditional Porter's conception of value chain – but also are done by more than one firms located in more than one countries or region. This large interconnected system of value chain has become known as Global Value Chain (GVC) (Kuroiwa and Toh 2008). Kuroiwa and Toh (2008) viewed IPN as a complement to GVC. It reflects the accelerated fragmentation in knowledge-intensive activities of some value chains, which had become the modularisation, allows the activities to be separated from the value chains and to be performed at different location (Ernst and Luthje 2003). Production network is not only integrating firms and parts of the firms but also national economies. Kimura and Ando (2005), define IPN to consist of vertical production chains that are extended across countries within a region as well as distribution network across the world.

growth was 22.7% in parts and components with its East Asian partners between 1993 and 2006 (Kimura and Obashi, 2008).

Given the extent to which the East Asian countries have managed to liberalize their capital account transactions in recent years, one might expect that financial markets of these economies may have become more closely linked with one another than in the past. The investment policy response was essentially many policy packages with an objective to attract foreign direct investment (FDI). Targeted countries' FDI policy was so aggressive, reflecting the rather tight competition among the countries for the alternative manufacturing relocations and other countries' businesses⁸. In response to the fear of losing FDI, ASEAN countries even took a radical approach of 'accepting everybody', instead of making selection (Kimura 2006). For trade policy, many Asian countries particularly the East and South East Asian countries cut unilaterally their tariffs rate, which is often viewed as '*race to the bottom*' (Baldwin 2006, 2007).⁹ Moreover, according to Baldwin, some of this tariff cut came in the form of duty-drawback and duty-free treatment for the establishments in economic processing zone; but, not only that, over the time countries realised the large benefit of giving lower trade cost by switching from special treatments to lowering applied MFN tariff rates, and as the result, many of these countries continuously cut their tariff, unilaterally, in the past two decades.

China's trade gravity integrates most of the nations in the East and South East Asia through production network. Intuitively everybody accept this production integration especially in automotive industry in this region. Regional free trade agreement and trade liberalisation policies help to integrate the production system and strengthen market integration in the region as well as the world (Ando 2006, 2007, Authokorala 2006, 2007, Koopman et al 2008). This production network system integrates the national capital markets with the world

⁸ China's outgoing FDI has created positive effect on trade development in developing economies (Qiang 2013).

⁹ Kuchiki (2005) mentioned some anecdotal evidence on the 'race-to-the-bottom' unilateral tariff cuts.

capital market. The result is the huge flow of foreign direct investment (FDI) towards these nations. This FDI flow over time gradually brings all nations closer in the production front removing national boundary. The characteristic of this region is that the market is integrated through production network (Ng and Yeats 2003, Anas 2007). So, FDI flow is very important factor that promotes economic integration in the region¹⁰ (Pan 2012). For a measure of regional integration in East Asia, one would need information on intra-regional capital flows in East Asia relative to inter-regional flows between East Asia¹¹ and the rest of the world.

The emergence of China has intensified the international segmentation of production processes within Asia, but still depends on the world (outside Asia) markets for its final goods exports (Gaulier et al 2007). Now it is clear that China's trade strategy is balanced between developed and developing countries, because presently developed countries have the market while developing countries are likely to do so in future. China's trade strategy is in longer-term market plans. In this view, China might be integrated with Asia and the world, and could be dominating power in the world trade. Other emerging economies like India, Brazil, Russia, South Africa, other Asian and Latin American economies are also formulating their trade strategy and integrating their regions with the world (Berry 2011, Kumar and Singh 2009, OECD 2009, Kacowicz 2008). China's trade strategy plays a crucial role in

¹⁰ This balance of payment characteristic together with underdevelopment of financial markets suggests that the level of financial transactions including bank lending and trade in regional securities between different countries in East Asia is likely to have been relatively small, in particular when a large Japanese bank lending to direct investment in other East Asian countries are excluded. Furthermore, since the outbreak of the 1997-98 crisis, Japanese banks lending and FDI to other East Asian countries have fallen dramatically. So Korea's and Taiwan's FDIs moved to other East Asian countries. Singapore's FDI data are rather sketchy, but its FDI to Malaysia and Indonesia declined during the post crisis period from 1997 to 1999. As a result, it would be reasonable to assume that intra-regional financial flows in East Asia have been smaller than inter-regional flows between East Asia on the one hand and North America and Europe on the other. This feature of inter regional capital movements have become more visible with the increase in current account surpluses of Indonesia, Malaysia, Republic of Korea, and Thailand and provides a piece of indirect evidence that East Asian countries have forged tighter financial links with North America and Europe than with their neighbouring economies in the process of financial liberalization. The economic integration can be measured as the degree of association among nations. So, the basic criteria are the correlation coefficient bilaterally and multilaterally under certain conditions. Alternatively the level of integration can be measured in terms of conditional correlation and finally co- integration among nation in trade and FDI flows.

¹¹ East Asia as it is defined to include the ASEAN members, Taiwan, Hong Kong, China, Korea, and Japan has always been a net saver to the rest of the world.

global and regional economic integration. China's trade policy and free trade agreement (FTA) strategy is important and has significant implications for all (Cui 2013). Multilateralism like WTO and regionalism such as FTA are the two crucial paths for international trade (Zhao and Webster 2011). China has strong balancing trade strategy which includes both multilateral and regional approaches.

3. Data and Methodology

In this study the economic integration is measured in terms of trade flows using monthly data on export and import of China during December 2005 to July 2010. Monthly Data (million US dollar units) on China's export to the US and Asia's total export to China are taken from CEIC¹². Here, China's import from eight Asian nations is equivalent to their (eight Asian nations') export to China. Time period is December 2005 to July 2010. It covers the global economic crisis period also. All export and import are expressed in terms of value measured at US dollar¹³. Chinese foreign currency rate remains almost fixed against US dollar. Chinese fixed exchange rate generates huge trade surplus even during global crisis accompanied with high inflation. Since foreign exchange rate is almost fixed in China, it is not considered as a

¹² For this study the main data source is the CEIC.

¹³ China's trade surplus is huge and stable foreign exchange rate. There is an impression that Chinese policy makers are maintaining an undervalued exchange rate so as to achieve a much needed high growth rate. The exchange rate can be an effective tool in reducing the trade surplus, as China is an economy in transition where prices may still play a role in supply and demand decisions. In this context, Garcia-Herrero and Koivu (2008) show empirically that Chinese imports do not react to exchange rate (Renminbi or RMB) appreciation. By estimating bilateral import equations for China and its major trading partners, Garcia-Herrero and Koivu (2008) find that such reaction of imports to exchange rate appreciation is confirmed for South-East Asian countries but not for others. It is due to vertical integration as a large share of Chinese imports from South East Asia is directed to re-exporting. Liao et al (2010) examines how China's exports are affected by exchange rate stocks from countries who supply intermediate inputs to China. Devaluations of other Asian currencies do not necessarily damage China's exports, as imported intermediate goods could become cheaper. Intermediate goods costs depend on its own share in China's export and degree of exchange rate pass-through in the imported intermediate goods prices, and China's total exports could benefit if intermediate goods price are not sticky. Liao et al (2010) suggest that above findings do not depend on the choice of currency invoicing between RMB and the US dollar or choice between fixed exchange and flexible exchange rate regimes. The existing literature (Liao et al. 2010, Garcia-Herrero and Koivu 2008) has no consensus regarding the impact of Renminbi on China's trade. China abolished the dual-track exchange rate system in 1994 and created a unified rate pegged to the US dollar. The renminbi exchange rate remained stable for the next 11 years, granting a competitive edge to China's cheap exports. Till date RMB is nearly fixed that is fuelling foreign criticism of currency manipulation.

variable for this study. It should be noted that Hong Kong is the gate way of China's trade with Asia and the World. In this context, this study has taken foreign exchange rate of Hong Kong (HK\$/US\$). It is acts as a proxy variable for exchange rate for China. HK dollar/US dollar is considered as foreign exchange rate (Fx) and is taken from IMF (monthly average data). Other variables affect Chinese trade and incorporated in data generating process in time series data (Enders 2004). Using the monthly trade data (from CEIC) on export and import, and foreign exchange rate (Fx); this paper examines the co- integrating relationship between China's export to the US and its import from major eight Asian economies (hereby, Asia8). Asia8 is consisting with South Korea, Hong Kong, Singapore, Malaysia, Thailand, Indonesia, Philippines and Taiwan (Dinda 2011). Exports of Asia8 to China are added in terms of the US dollar and that is the import of China from Asia8. Aggregate values of China's exports to the US and imports from Asia8 are used in this study to capture economic integration applying ECM. A more disaggregated analysis of the data is definitely useful in pattern of trade composition study which reported in several studies (see, Song and Yuan 2012, Lin 2011, Robertson and Xu 2010, Husted et al. 2012, Kimura and Obashi, 2008) and present data set also shows similar pattern of Chinese trade¹⁴, but main focus of this paper is on aggregate level, not disaggregate level. However, this data set also displays China's sector specific trade decomposition. In 2006, China imports from ASEAN-4 (21%), Japan (4%) and NIE (5.5%). The share of hi-tech products is nearly 32.8% in China's total exports and 41.3% in China's total imports. Imports of hi-tech products are sourced mainly from NIE, Japan, and ASEAN-4; and exported to the developed world (NIE, EU and the US). In 2009, the major composition of Chinese exports to the US are Machinery and Transport Equipment (around 49.7%), miscellaneous manufactured articles (26.94%), manufactured goods (materials) 11.46%, Chemical related products (4.6%) etc; and the most important component of

¹⁴China's trade composition is changing rapidly and has strong impact on the economy. At end of 2006, China's trade surplus is around 8% of GDP that reflects a sharp rise in the manufacturing trade surplus and electronics, machinery, Iron and Steel, organic chemicals are the main contributors.

Chinese imports is the sophisticated technological products. These findings also support Lin (2011).

Basic statistical measure of integration or association is correlation among the variables. In this context this study measures the correlation between China and Asia8 in aggregate level as well as individual countries. The economic integration should be measured as the degree of association among the same variable within the region for the defined period.

The paper examines the characteristics of data by unit root test and co- integration test. The unit root tests are used to judge nature of variables whether they are stationary or non-stationary. Following unit root tests the co- integration test is necessary for the variables having integration of order one, i.e., I(1). Now the long run equilibrium relationship between China's export to the US (*ChnXUS*) and Asia8's export to China (*Asia8XChn*) is

$$ChnXUS_t = \alpha + \beta Asia8XChn_t + \lambda Fx_t + e_t \quad (1)$$

Where F_x is exchange rate and e is the disturbance term. Foreign exchange rate is an important variable and it is consider here as a control variable. The short run dynamics is observed in the error correction model (ECM), it is derived from eq(1)

$$\Delta ChnXUS_t = \beta \Delta Asia8XChn_t + \lambda \Delta Fx_t + \eta e_{t-1} + \varepsilon_t \quad (2)$$

Where error in last period is

$e_{t-1} = ChnXUS_{t-1} - \alpha - \beta Asia8XChn_{t-1} - \lambda Fx_{t-1}$, η is the error adjustment coefficient or speed of error correction, and ε_t is the white noise. Granger causality is applicable for short run, while long run equilibrium is captured in the error correction term. Optimum lags are required to attain ε_t which follows zero mean and constant variance, i.e., $\varepsilon_t \sim (0, \sigma^2)$. For Granger causality, the ECM equ. (2) can be rewritten as

$$\Delta ChnXUS_t = \sum_{i=1}^p \beta_{1i} \Delta Asia8XChn_{t-i} + \sum_{j=1}^q \beta_{2j} \Delta ChnXUS_{t-j} + \sum_{l=1}^k \beta_{3l} \Delta Fx_{t-l} + \eta_1 e_{t-1} + \varepsilon_{1t} \quad (2a)$$

$$\Delta Asia8XChn_t = \sum_{i=1}^r \beta_{4i} \Delta Asia8XChn_{t-i} + \sum_{j=1}^s \beta_{5j} \Delta ChnXUS_{t-j} + \sum_{l=1}^k \beta_{6l} \Delta Fx_{t-l} + \eta_2 e_{t-1} + \varepsilon_{2t} \quad (2b)$$

Considering $\beta_{3l} = \beta_{6l} = 0$ (without Fx), the unidirectional Granger causality is running from Asia8's export to China to the direction of China's export to the US provided at least one $\beta_{4i} \neq 0$, while the unidirectional Granger causality is running from China's export to the US to the direction of Asia8's export to China if at least one $\beta_{5j} \neq 0$. There is a bidirectional causality provided both have at least one non-zero coefficients in both the equations ($\beta_{4i} \neq 0, \beta_{5j} \neq 0$). Similar logic is applicable for exchange variable ($\beta_{3i} \neq 0$, or, $\beta_{6j} \neq 0$, or both non-zero).

4. Results and discussion

Let examine the China's regional and global integration. Here the basic assumption is that the US represents the rest of the world. Now the paper examines China's export to the US and China's import from Asian8 countries (or Asia8's export to China).

4.1 Preliminary Results

The degree of association or correlation between China's export and import is high and the correlation coefficient is 0.80 (See 2nd column last row of Table 1). Table 1 provides the pair wise correlation coefficient matrix. Second column shows the correlation between China's export to the US and Asian countries' export to China (or China's import from eight Asian countries). All these nations have strong association with China's export except Philippines. Rest of the columns (3-9) describe the degree of association or closeness among nations which are exporting to China (i.e., China's import) in the region¹⁵. The estimated correlation coefficient also supports the high degrees of association among china's importing countries from the East and South East Asia. Gaulier et al (2007) supports it. These degrees of association measurement are valid for only China's import related economic integration.

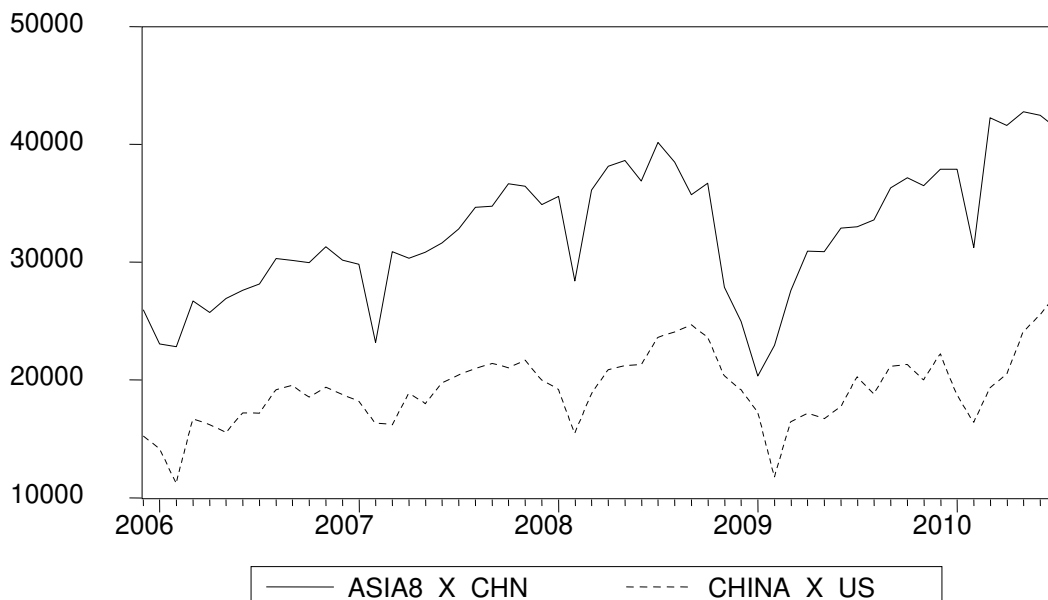
¹⁵ This paper considers only trade values not the trade intensity. Obviously trade intensity varies among nations.

Table 1: Pair wise Correlation Coefficients

	CHINA_X_US	HONGKONG_X_CHN	INDONESIA_X_CHN	KOREA_X_CHN	MALAYSIA_X_CHN	PHILIPPINES_X_CHN	SINGAPORE_X_CHN	THAILAND_X_CHN
CHINA_X_US	1							
HONGKONG_X_CHN	0.85	1						
INDONESIA_X_CHN	0.57	0.63	1					
KOREA_X_CHN	0.70	0.80	0.86	1				
MALAYSIA_X_CHN	0.67	0.75	0.83	0.93	1			
PHILIPPINES_X_CHN	0.31	0.29	0.06	0.21	0.05	1		
SINGAPORE_X_CHN	0.70	0.73	0.67	0.84	0.75	0.49	1	
THAILAND_X_CHN	0.66	0.77	0.88	0.92	0.90	0.14	0.74	1
Asia8	0.80							

China is one of the important growing business hubs in this region¹⁶. It is clear from time series data regarding China's export and import. The US is considered as proxy of the world, since the US is the main trading partner of China in global scale (see, Gaulier et al 2007).

Fig 1: China export to US and import from Asia8 economies



¹⁶ Other most important business hubs are Hong Kong and Singapore in the region.

Fig 1 depicts the China's export to the US and Asia8 export to China during December 2005 – July 2010. It is clear from figure 1 that China's export and import occur simultaneously. The common fall of Chinese export and import are observed in each January-February month which is the Chinese New Year. Chinese trade reaches at minimum in February 2009. Sharp decline in Chinese export and import started from October 2008 and turned up again in March 2009. There is a significant positive trend of Chinese trade (export and import) with a break in February 2009. There is strong association between China's export to the US and import from Asia8 nations. Fig 1 suggests that there is a close coordinated movement between China's export to the US and China's import from Asia8 nations. So, China's export to the US is closely associated with its import from Asian countries and both China's export and import jointly move over time. These are similar to the findings of Gaulier et al (2007).

4.2 Basic Results

The paper also examines the co-movement applying co-integration techniques. Panel A in Table 2 suggest that China's exports to the US and China's imports from Asia8 nations are non-stationary.

Table 2: Unit root test and Co-integration

A: Unit Root Test				
Variables	ADF		PP	
	Level	1 st Difference	Level	1 st Difference
LnChinaXusa	0.596	-4.91***	-2.81	-6.73***
LnAsiaXChina	-3.04	-9.157***	-3.05	-9.16***
FX	-3.017	-6.49***	-2.39	-6.46***
B: Co-integration Test				
Unrestricted Cointegration Rank Test (Trace)				
Null Hypothesis	Eigen value	Trace Statistic	Critical Value at 5% level	P-Value
Ho: r = 0, Vs H1: r <=1	0.528813	46.67866***	29.797	0.0003
Ho: r = 1, Vs H1: r <=2	0.092495	7.548664	15.495	0.5148
At most 2	0.046972	2.501769	3.8415	0.1137

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Null Hypothesis	Eigen value	Max-Eigen Statistic	Critical Value at 5% level	Critical Value at 1% level
Ho: r = 0, Vs H1: r <=1	0.528813	39.13000***	21.1316	0.0001
Ho: r = 1, Vs H1: r <=2	0.092495	5.046895	14.2646	0.759
At most 2	0.046972	2.501769	3.841466	0.1137

Note: '***' indicates 1% level of significance.

The augmented Dickey Fuller (ADF) and Philips Perron (PP) tests suggest that all the variables follow integration of order one, i.e., I(1). Next step is co-integration test. Johansen co-integration test indicates that there is statistically significant one co-integrating equation. The estimated long run equilibrium relationship between China's export to the US and China's imports from Asia8 countries is

$$\ln ChnXUS_t - 0.303 \ln ChnMAsia8_t - 1.079 Fx_t + 1.186278 = 0 .$$

This suggests that there is a direct relationship between China's export to the US and China's import from Asia8 and foreign exchange rate. Percentage change of China's export to the US is 0.303 as China's import from Asia8 increases by one percentage (see, Husted and Nishioka (2012)). Irrespective of China's import from Asia8, other variables (like tariff rates, business environment etc) determine the estimated amount¹⁷ of 3.2765 million dollar of China's export to the US per month. It is true that China integrates the East and South East Asia with the rest of the world. China plays a crucial role and connects Asia into the global market. This economic integration was successful only through adaptation of liberalisation policies which actually promoted to develop production network in the region. With this long run equilibrium path there will be a short run dynamics. In short run if any deviation from equilibrium path, then error correction mechanism starts to work.

¹⁷ i.e., $e^{1.186278} = 3.2765$

Table 3: Estimated Results of Vector Error Correction Model

Cointegrating Eq:	CointEq1		
LNCHINAXUSA(-1)	1.000000		
LNASIAXCHINA(-1)	-0.302998*** (-5.0662)		
FX(-1)	-1.079381** (-2.43079)		
C	1.186278		
Error Correction:	D(LNCHINAXUSA)	D(LNASIAXCHINA)	D(FX)
CointEq1	-0.699763*** (-5.75)	-0.788724*** (-2.88)	-0.048546* (-1.67)
D(LNCHINAXUSA(-1))	0.191231 (1.56)	0.231264 (0.84)	-0.005760 (-0.197)
D(LNCHINAXUSA(-2))	0.331563*** (2.85)	0.577424** (2.21)	0.006995 (0.25)
D(LNCHINAXUSA(-3))	0.435067*** (4.105)	0.296852 (1.25)	0.028524 (1.13)
D(LNASIAXCHINA(-1))	0.014879 (0.17)	-0.635108*** (-3.268)	0.001369 (0.067)
D(LNASIAXCHINA(-2))	0.049765 (0.598)	-0.387854** (-2.074)	0.007390 (0.373)
D(LNASIAXCHINA(-3))	0.005395 (0.072)	-0.178541 (-1.066)	-0.014709 (-0.829)
D(FX(-1))	-1.378041** (-2.082)	0.189227 (0.127)	0.135920 (0.86)
D(FX(-2))	-0.061742 (-0.098)	0.158986 (0.112)	-0.401285*** (-2.67)
D(FX(-3))	-0.659224 (-0.936)	0.627790 (0.3966)	-0.198247 (-1.182)
C	0.003272 (0.43)	0.016395 (0.96)	0.000587 (0.325)
R-squared	0.666622	0.306020	0.280447
Adj. R-squared	0.585311	0.136756	0.104947
Sum sq. Resids	0.116635	0.589559	0.006614
S.E. equation	0.053336	0.119915	0.012701
F-statistic	8.198368	1.807947	1.597984
Log likelihood	84.81395	42.68543	159.4289
Akaike AIC	-2.838998	-1.218670	-5.708803
Schwarz SC	-2.426235	-0.805907	-5.296040
Mean dependent	0.009277	0.009286	0.000385
S.D. dependent	0.082825	0.129064	0.013425
Determinant resid covariance (dof adj.)		6.55E-09	
Determinant resid covariance		3.21E-09	
Log likelihood		287.1329	
Akaike information criterion		-9.658957	
Schwarz criterion		-8.308096	

Note: (i) Figures in parenthesis are t- values. (ii) '***' and '**' indicate the level of significance at 1% and 5%, respectively.

4.3 Speed of Adjustment

Using vector error correction model (VECM) we observe that all the error correction coefficients are negative and statistically significant. This suggests that if there is any divergence from equilibrium relationship in short run, it will come back to the long run equilibrium path. The error correction coefficient values are the speed of convergence to the co-integrating relation. The speed of error correction in case of China's export to the US is 69.98% while China's import from Asia8 is 78.87% and the least is 4.85% in foreign exchange rate. So the speed of China's import from Asia8 is faster than that of China's export to the US. The speed of error correction varies due to several reasons - (i) distance in space, and time, (ii) difference in culture, and (iii) formalities in international trade. Asia8 is in nearly same time zone and unique in culture. Asian neighbouring nations are comparatively less formal than developed nations like the US.

Vector error correction model (VECM) also provides the vector autoregressive (VAR) structure. From this estimated VAR structure the paper observes that China's export to the US follows autoregressive (AR) and also depends on exchange rate only, while China's import from Asia8 follows autoregressive of order 2 i.e., AR(2), and also depends on China's export to the US in lag 2 (see, Table 3). Exchange rate is autonomous and follows AR (1). In terms of Granger causality, China's export to the US is the cause of exchange rate at Hong Kong. Here, Granger causality is unidirectional running from exchange rate to China's export to the US. In other words, China's export depends on exchange rate and its own past performance only. China's supply to the world creates the demand for inputs in East and South East Asia region. China's export to the US is the cause of China's import from Asia. Here, the unidirectional causality is running from China's export to the US to China's import from Asia. Briefly, Exchange rates \implies China's export to the US \implies China's import from Asia8. So, exchange rate stimulates China's export to the world market which induces Asia

to supply inputs to China. Truly, China's share in the world trade increases over time but not at the cost of emerging economies trade share that is also confirmed by Husted and Nishioka (2012). This induced demand actually integrates the nations within region and involves in production network through trade liberalisation.

4.4 Discussion

Let r_t , r_t^* and f denote the change of China's export to the US, change of China's import from Asia8 countries and change of foreign exchange rate, respectively. From Table 3, on the basis of statistical significance, the estimated equations of VAR structure are $r_t = 0.33r_{t-2} + 0.435r_{t-3} - 1.38f_{t-1} + \varepsilon_{1t}$, $r_t^* = 0.58r_{t-2} - 0.637r_{t-1}^* - 0.39r_{t-2}^* + \varepsilon_{2t}$ and $f_t = -0.4f_{t-1} + \varepsilon_{3t}$ where ε_{1t} , ε_{2t} and ε_{3t} are white noise terms with zero expectations and constant variances. These equations take specific form depending on the statistical significance of individual parameters of VECM. Thus, the change of China's export to the US follows autoregressive form but statistically significant autoregressive lags are two and three month and exchange rate lag is one. So, China's export to the US is autoregressive (i.e., self dependent) and also depends on foreign exchange rate. It suggests that China's export to the US depend on exchange rate only, not export of Asia8 to China. The change of China's import from Asia8 countries is too autoregressive form and also depends on the change of China's export to the US. If there is any disturbance in China's export to the US that affects the export to the US due to autoregressive structure and also affects China's import from Asia8 due to second equation. These results support validate the report of APTIR 2010. It should be noted that if any shock in China's import from Asia8 it affects import only, not export. So, the direction of causality is running from China's export to the US to China's import from Asia8. Gaulier et

al. (2005) support our results also but in different way¹⁸. In other words, Asia8's export to China will be affected if China's export to the US is disturbed.

5. Conclusion

China is emerging as a giant in Asia as well as in the world economy. China is a major economic hub in the region and plays important role in the international economy. Empirical findings suggest that China's export depends on exchange rate only while China's import from Asia depends on China's export to the US. Co-integration technique provides long run equilibrium relation or economic integration of China's export to the world (the US) and its import from Asia8 (i.e., East and South East Asia). In short run unidirectional causality is running from exchange rate to Chinese export to the world and that to China's import from Asia. The error is corrected in short run. The error adjustments suggest that the speed of China's import from Asia is faster than that of China's export to the US due to distance (in space, time and culture). From the findings it is clear that China has double role in international trade – first it attracts inputs from the East and South East Asia region and secondly pushes the products in international market. This suggests that China is economically integrated with region and the world market as a whole. These empirical findings will help policy makers to formulate their policy and design the mechanism for application as per their targets.

Since China is trade surplus economy, China may influence exchange rate and thereby impact on China's export trade. In short run China can manage foreign exchange rate and support corrective mechanism to bring back the economy in long run path. The results imply that China's export promotion policies can be encouraged in long run and that has certain impact on Chinese economy which also creates opportunities in East and South East Asia through

¹⁸ It is true that the emergence of China has led to the re-organization of production in Asia and trade pattern. Now, firms in Asian countries export intermediate goods to their affiliates in China and they use China as an export base to the US and Europe.

trade integration with them and the world. As China undergoes industrial upgrading to more sophisticated product markets, it will leave the market space for other developing countries to enter the more labour-intensive industries. China is a potential leader and has power to change the pattern of international diffusion of industrial development and also create opportunities for other nations in Asia region. In this context China's trade policy is important and has significant implications for Asia region and the world. China's trade policy should ensure that China could walk on two legs using a strong balancing trade strategy which includes both global and regional approaches. Multilateralism and regionalism are the need of time and will support China to walk on two legs. It will ensure China's sustainable development in long run integrating Asian economies with the world economy.

This study has some limitation in terms of data availability, and choice of methodology. In future we collect more information on trade flow and other variables, then use gravity model. Application of gravity model may provide more interesting unknown results and that is our next research agenda.

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