Abstract
The objectives of the paper are to study foreign direct investment dimensions of China and to study causal relationship between exports, FDI and GDP. Vector autoregression model (VAR) is adopted to estimate the long run causal relationship among exports, foreign direct investment and GDP. The cointegration test result shows that there exist a long run equilibrium relationship among exports, FDI and GDP. In the estimated error correction model, FDI is a significant variable and the result indicates that 1% change of increase in FDI will lead to 0.04% change of increase in exports with one year time gap. Granger Causality test indicates that there is a unilateral relationship between exports and FDI and the direction is from FDI to exports which mean that FDI causes exports.
JEL classifications: F14, F21, F23
Key words: FDI, Exports, China, Error Correction Model, Cointegration, Granger Causality

1. Introduction
China is an emerging global player among USA, Japan, and India and European countries. China’s GDP was US $ 4.9 trillion against United States’ US$ 14.3 trillion, Japan’s US $ 5.1 trillion and India’s 1.2 trillion in 2009\(^1\). China was second in the share of world GDP (12.5%) behind United States (20.5%) in 2009\(^2\). China has achieved a high average annual GDP growth rate of 9.2% when United States and Japan have only a marginal growth rate of 2.6% and 1.7% respectively during 1995-07\(^3\). India has also achieved a reasonable growth rate of 7.7% during the same period. Average annual growth rate of per capita GDP of China was the highest of 9.3% among developed countries like United States (6.6%), Japan (1.6%), United Kingdom (2.1) and Australia (2.1%) during 1995-07\(^4\). China had followed a centralized planning model and adopted a nationalistic and socialistic approach with full state control of the economy in the post 1949 under the leadership of Mao Zedong. China had made every effort to take advantage of their core competency by adopting nationalistic thoughts. In 1958, China had initiated a series of economic programs called “Great Leap Forward” to stimulate efficiency and competitiveness. However the programmes failed to achieve positive results and Mao quietly shifted his strategies towards stabilizing the economy by reversing the “Great Leap Forward” Programme, breaking communes into

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\(^1\) World Economic Forum, report of Global competitiveness, 2010-11
\(^2\) ibid
\(^3\) UNCTAD, Hand Book of Statistics, 2009
\(^4\) ibid
smaller units, reorganizing economic reporting, bringing back technical experts and forcing peasants to return to farming. Mao later introduced “Cultural Revolution” to rekindle the spirit of the “Long March” to take the economy to a new height which had again resulted to deterioration of the economy. The control and restriction in China breed rampant corruption in all sectors of the economy. As a result, China had failed to achieve any significant development in the economy. China had realized the flaws of its policies and practices which compelled them to take corrective measures. In 1978, China had initiated the reform process in agriculture, trade and investment, state-owned enterprises and its government institutions. It had carried forward the reform process aggressively in 1980’s and 1990’s. China became a member of WTO in 2001. China integrated the economy with world economy and offered liberal environment for trade and foreign direct investment. China reduced tariffs, eliminated dual pricing practices, repeal price control which was used to protect domestic industries. It had attracted huge foreign direct investment to the tune of US $ 473 billion by 2009 and increased foreign trade in goods and services to US $ 2.4 trillion in 2008. By 2006, the general tariff level on imports in China was 9.9%, which had resulted in thriving imports. Annual GDP growth rate of China was 9% and that of India 6.1% in 2008 whereas Japan (-0.7%) and US (0.4%) had only marginal growth\(^5\). Per capita GDP of China was US$ 3267 and that of India US$1017, whereas Japan enjoyed a per-capita GDP of US$ 38,455 and United States $46,350 in 2008\(^6\). China’s annual average per capita GDP growth rate was 8.3% and that of India 5.8 whereas Japan (-0.5%) and US (0.1%) have insignificant growth in 2008\(^7\). The significant growth achieved by China was because of the government policy towards private enterprises and foreign direct investment. The government of China has adopted entrepreneur friendly policies which helped private entrepreneurs to invest heavily in China to take advantage of the opportunity available in the economy. China’s exports growth has fallen from 28.4% in 2005 to 17.3% in 2008 and but imports growth rate has increased from 8.7% to 12% during the same period\(^8\). The fall of exports growth of China was mainly because of world recession. China considered exports as engine of growth for the economy. China’s share of exports in world’s exports was 6.5% in 2005\(^9\). The share of exports of China in its GDP was 36.6% compared to India’s 22.7% in 2008\(^10\). One of the driving forces behind China’s trade expansion has been foreign direct investment (Henley, 2004).

The structure of output in China has moved in favour of industry from 39.8% of GDP to 48.3% during 1990-2008\(^11\). The industry sector of China has grown 9.4% in 2000 to 14.7% in 2007 where as service sector has grown from 9.7% to 13.4% during the same period\(^12\). One of the reasons for China to move forward very fast was strengthening of its manufacturing sector. China has introduced sweeping labour reforms in 1978.

\(^5\) World Bank, World Development Indicators, 2009
\(^6\) ibid
\(^7\) ibid
\(^8\) ibid
\(^9\) ibid
\(^10\) ibid
\(^11\) UNCTAD, Handbook of Statistics, 2009
\(^12\) World Bank, World Development Indicators, 2009
Under new labour laws, State owned Enterprises (SOEs) were given power to establish their own wage system. Labour contracts were introduced, SOEs were given freedom to evaluate their employees and take corrective actions including dismissal of employees, transfer of surplus employees from one unit to another unit. Clause 27 of the Labour Law (NPC 1994), effective since January 1, 1995 states “Employing units on the average of bankruptcy and undergoing rectification according to the Law, as well as those facing severe business difficulties, can dismiss workers if really necessary” (Lau, 1997). Limited liability or joint-stock companies were given much greater discretion to dismiss redundant workers. During 1998-2002, about 25 million employees of collective and state-owned enterprises have been laid off and herded into reemployment centres where they could stay until they found a job or for three years whichever is less. China has invested 12.6% of its GDP in infrastructure (Gupta et al, 2008).

The objectives of the paper are (i) to study foreign direct investment dimensions of China and (ii) to study the causal relationship between exports, FDI and GDP for China.

The paper is organized as follows. Section 2 is devoted to survey of literature. Section 3 analyses foreign direct investment of China, section 4 discusses causal relationship between exports, FDI and income for China and section 5 concludes the discussions.

2. A Survey of Literature

There is near consensus that FDI inflows depend on the motives of foreign investors. Motives of foreign investors can be broadly classified as (i) market seeking (ii) resource or asset seeking and (iii) efficiency seeking. Market seeking FDI is to serve local and regional markets. Tariff-jumping or export-substituting FDI is a variant type of this FDI. Market size and market growth of the host country are the main drivers. In the case of resources or asset seeking FDI, investors are looking for resources such as natural resources, raw materials or low-cost labour. This vertical-export oriented FDI involves relocating parts of the production chain to the host country. Resources like oil and natural gas, iron ore, cheap labour attracted FDI in these sectors. Efficiency seeking FDI occurs when the firm can gain from the common governance of geographically dispersed activities in the presence of scale and scope. One important variable explaining the geographical distribution of FDI is agglomeration economics. Investors simply copy investment decision taken by others. The common sources of these positive externalities are knowledge spill overs, specialized labour and intermediate inputs. A seminal work by Wheeler and Mody (1992) makes a strong case for agglomeration (and market size) in US investors’ location decisions. The theory of agglomeration economics argue that once countries attract the first mass of investors, the process will be self-reinforcing without needing a change in policies (Wheeler and Mody 1992) whereas factor endowments theory argues that FDI is drawn to those countries where lower wages and more abundant natural resources prevail. Dunning’s eclectic paradigm developed a comprehensive and holistic approach to explain the level and the pattern of international production (Dunning 1988, 1993). Dunnings analyzed FDI inflows based on three sets of factors viz., ownership specific advantage (O), locational advantage (L) and presence of superior commercial benefits in exploiting both O-type and L-type advantage internally (I) and directly rather than in exchanging them on market through licensing or cooperation agreements with an
independent foreign firm. Ownership advantages are those that are specific to a particular firm and that enable it to take advantage of investment opportunities abroad. Locational advantages are those advantages specific to a country which dictate the choice of production site. Internalization advantages determine whether foreign production will be organized through markets (licensing) or hierarchies (FDI). The location of FDI has been traditionally been explained through the classical sources of comparative advantage (Ricardo, 1817). Firms locate production operation abroad to generate locational advantages that arise from direct access to growing markets, lower labour costs, reduced transportation and communication costs, avoidance of tariffs and non-tariffs barriers and direct access to raw materials and intermediate products that are indispensable for the production of certain goods. Locational factors that ensure cost minimization are determined by relative factor prices, market size and growth (Kravis and Lipsey 1982, Veugelers 1991) as well as transportation cost (Aliber 1970). The ownership advantage of firms is ownership rights over patents, trademarks, commercial secrets and production process thereby effectively denying access to both foreign and domestic competitors. FDI is often used to overcome barriers to entry into a foreign market, including tariff and non-tariffs barriers (Motta 1992). Markuseu and Venables (1995) argued that multinational enterprises (MNEs) reduced the agglomeration forces that arise when international factor mobility is allowed. Wheeler and Mody (1992) had identified three sources of agglomeration economics viz., infrastructural quality, the degree of industrialization and the existing level of FDI. The location preference of foreign investors attempts to link the host country choice with basic motivation for undertaking the investment (Dunning 1988). Resource seeking investors locate production plants where necessary resources are available while efficiency seeking foreign investors is attracted to those countries well-endowed with factors of production such as low-cost labour. Market seeking firms choose countries that offer the best opportunities for entering and expanding within the domestic or regional market while strategically motivated FDI may link one of the above motivations with strategic consideration. Strategic FDI is quite similar to resource seeking FDI (Dunning 1988). According to Mundell (1957) FDI flows into those countries that are importing goods from abroad. Vernon (1966) argues that adequate infrastructure is required to migrate production abroad. Within the basic framework of OLI, Dunning (1981, 2001) had developed a theory of Investment Development Path (IDP) which evolved five stages of development viz. pre-industrialization with no FDI, inflow of FDI, outflow of FDI, but net inward FDI stock, net outward FDI and finally high stocks of both inward and outward FDI. The final stage represented international integration of industrialization. There would be variation of IDP theory across the countries based on their economic structure (Dunning and Narula, 1996). Bajo-Rubio and Simon Sosvilla-Rivero (2002) in their empirical analysis of FDI inflows in Spain during the period 1964-84, found that FDI was explained by GDP (proxy for the size of Spanish market), inflation rate (proxy for macroeconomic instability), unit labour cost, unit capital cost, a measure of trade barriers, real effective exchange rate of the Peseta against the industrialized countries, a dummy variable for the year after the Spanish integration into EC and the lagged value of the foreign capital stock. Bhatt (2000) in his study of foreign direct investment for ASEAN economies found that there was a positive influence of the size of the economy (GNP) on FDI inflows in Indonesia and Singapore; investment-GNP ratio was a significant
factor for FDI inflows in Malaysia; openness of the economy was significant factor in attracting FDI for Malaysia, the Philippines and Thailand. Ferris et al (1994) found that variables such as imports, exports, GDP, number of commercial vehicles used (proxy for a measure of infrastructure development) and political risks explained FDI inflows in Latin American countries. Yang et al (2000) addressed the issue of determinants of FDI inflow into Australia and found that FDI inflow was explained by short-term interest rate, real GDP, the trade-weighted index of the exchange rate, international trade as a fraction of GDP, a measure of labour disputes, wage costs and inflation rate. Erdal and Tatoglu (2002) found the existence of a linear relationship between FDI and the size of domestic market, openness of the economy to foreign trade, infrastructure of the host country, attractiveness of the domestic market, external and internal economic stability. Janicki and Wunnava (2004) estimated the determinants of FDI inflows in nine central and east European countries (CEEC) from 14 European Union countries for the year 1997. They found that international trade, GDP, difference in labour cost explained FDI inflows in European Union countries. Billington (1999) analyzed the factors that determined the choice of location for FDI. He estimated a multi-country model with seven industrialized countries and eleven regions of UK. At country level, he found that market size (income and growth), unemployment, level of host country imports and policy such as corporate tax and interest rates were significant determinants for location of FDI inflows. Campos and Kinoshita (2003) studied the determinants of FDI inflows for 25 transition countries of Central Europe and in the former Soviet Union for the period 1990-1998 and found that the main determinants of FDI inflows to those countries were agglomeration which were proxied by lagged FDI, labour cost, abundance of natural resources, economic reforms, good institutions and quality of bureaucracy. Resmini (2000) investigated the determinants of European Union FDI in the Central and East European Countries (CEECs) at sectoral level during the period 1991-95. GDP per capita, population, the operation risk index and wage differentials were significant factors of FDI inflows. Erdal and Tatoglu (2002) provided an empirical analysis of location-related determinants of FDI inflows for Turkey for the period 1980-1998 and their empirical results showed that the size of the domestic market, physical infrastructure, openness of the economy and market attractiveness proxied by growth rate of real GDP were significant factors responsible for FDI inflows. A causal relationship among macroeconomic variables such as exports, FDI and income are intrinsically related to a country’s economic structure. There exists an extensive survey of literature on the relationship between exports, FDI and income such as Harrison (1996), Dollar (1992), Krueger (1985) and Thornton (1996). Exports and FDI are fundamentally substitutes to each other (Dunning, 1977). Bhagavati (1973) points out that volume and efficiency of FDI are more pronounced in export oriented host countries. Helleiner (1973) explained the role of MNCs in manufacturing exports of LDCs. FDI is essentially a driving force behind China’s rapid expansion (Xing, 2006). FDI in China facilitated it’s exports to the FDI source countries (Liu, Wang and Wei, 2001). FDI has substantially enhanced Vietnam’s exports to its source countries (Xuan and Xing, 2008). Sun (2001) found that FDI has positive and strongest impact on in the coastal region of China. Zhang and Song (2000) found that higher level of FDI led to higher level of provincial exports in China. Barry and Bradley (1997) concluded that there has been a significant direct contribution of
foreign producers to increasing Irish exports. Girma et al (2007) found that FDI affects productivity of the acquired firms by the foreign country. Other studies which have shown a significant positive econometric relationship between inward FDI and the host country's exports are Lin (1995), Leichenko and Erickson (1997), Pain and Wakelin (1998), Hejazi and Zafarian (2001), Liu and Shu (2003), Melwally (2004). On the other hand, Ekanayake, Vogel and Veeramacheneni (2003) found a one-way causality from exports to inward FDI ("exports cause FDI").

3. Foreign Direct Investment inflows in China

Foreign Direct Investment (FDI) is not only a source of capital funds and foreign exchange, but also a dynamic and efficient vehicle to secure the much needed industrial technology, managerial expertise and marketing knowledge and networks to improve growth, employment, productivity and export performance. High FDI inflows would contribute to high level of investment and employment generation, raising productivity and skill development and sharply improve competitiveness (Bhatt 2008a). FDI inflows for China were US$ 95 billion compared to US$ 22.6 billion for Australia and US$ 35 billion for India in 2009 (Table 8). China had attracted significant FDI inflows whose inward FDI stock accumulated to US$ 473 billion by 2009 (Table 9). FDI inflows as a percentage of Gross Fixed capital formation was 4 per cent for China against 8.4 per cent for India and 8 per cent for Australia in 2009 (Table 10). Stock of FDI inflows as a percentage of Gross Domestic Product was 10.1 per cent for China where as it was 33.5 per cent for Australia and 13 per cent for India in 2009 (Table 11). The main vehicle of FDI inflows in China was through mergers and acquisitions (M&As). It has provided opportunities for foreign multinational companies to undertake direct investment in the country through M & As involving host country firms. The number of companies sold to foreign MNCs in China was 142 worth of US$ 10.9 billion in 2009 whereas for Australia 283 companies were sold for at US $ 22 billion (Table 5). The number of companies purchased abroad by China based was 69 for US$ 40 billion and Australia purchased 153 companies for US$ 18.5 billion in 2008 (Table 6).

<table>
<thead>
<tr>
<th>Year</th>
<th>Australia</th>
<th>China</th>
<th>India</th>
<th>Japan</th>
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<th>New Zealand</th>
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<td>2009</td>
<td>22.6</td>
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<td>34.6</td>
<td>11.9</td>
<td>4.9</td>
<td>4.7</td>
</tr>
</tbody>
</table>

Source: UNCTAD. World Investment Report 2009
Table 2: Stock of FDI Inflows (in billions of US$)

<table>
<thead>
<tr>
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<td>101.1</td>
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<td>25.7</td>
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<td>193.3</td>
<td>16.3</td>
<td>50.3</td>
<td>38.1</td>
<td>24.9</td>
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<td>2005</td>
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<td>272.1</td>
<td>43.2</td>
<td>100.9</td>
<td>104.9</td>
<td>51.5</td>
</tr>
<tr>
<td>2009</td>
<td>328.1</td>
<td>473.1</td>
<td>164.0</td>
<td>200.1</td>
<td>110.8</td>
<td>66.6</td>
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</table>

Source: UNCTAD. World Investment Report 2009

Table 3: FDI inflows as a Percentage of Gross Fixed Capital Formation

<table>
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<th>Year</th>
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</tr>
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<td>8.4</td>
<td>1.1</td>
<td>2.4</td>
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</table>

Source: UNCTAD. World Investment Report 2009

Table 4: FDI inflows as a Percentage of Gross Domestic Product

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<td>48.2</td>
</tr>
<tr>
<td>2009</td>
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<td>10.1</td>
<td>12.9</td>
<td>3.9</td>
<td>13.3</td>
<td>57.7</td>
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</table>

Source: UNCTAD. World Investment Report 2009

Table 5: Value of cross-border M&A sales (in billions of US$)

<table>
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<th>Australia</th>
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<th>India</th>
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<tr>
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<td>2008</td>
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<td>9.3</td>
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<td>.4</td>
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Note: … indicates negligible. Source: UNCTAD. World Investment Report 2009

193
Table 6: Value of cross-border M&A purchases (in billions of $US)

<table>
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<th>Year</th>
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<td>2008</td>
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<td>13.5</td>
<td>56.4</td>
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<td>4.1</td>
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</tbody>
</table>

Note: … indicates negligible. Source: UNCTAD. World Investment Report 2009

4. Model of Exports, FDI and Income for China

The exports model considered in this study is given by:

\[ \text{Exports} = f(\text{FDI, GDP}) \]

Where FDI = Foreign Direct Investment
GDP = Gross Domestic Product

The two other variables such as capital stock and exchange rates have been dropped from the model as they are not significant in the estimated model. Moreover these two variables are correlated with FDI and GDP creating multicollinearity problem.

The data used in this analysis are annual covering the period 1978-2009 and are obtained from International Monetary Fund and UNCTAD. The analysis was made over 1978-2009 as China had opened its economy since 1978.

Vector Autoregression model (VAR) is adopted to estimate the long run causal relationship among exports, foreign direct investment and GDP.

Unit Root Test.

Before testing the cointegration of two or more variable, it is required to check whether the variables have unit root. The existence of unit root can be tested by augmented Dickey-Fuller test (ADF) and/or Phillip- Perron test (PP).

The general form of augmented Dickey-Fuller test is given by

\[ \Delta Y_t = \alpha + \beta t + \lambda Y_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta Y_{t-i} + u_t \]

The null and alternative hypothesis for the existence of unit root in \( Y_t \) is:

\[ H_0: \lambda = 0 \quad H_1: \lambda < 0 \]

The null hypothesis is that there is a unit root.

The Phillip- Perron equation is given by

\[ \Delta Y_t = \alpha + \lambda Y_{t-1} + u_t \]

Johansen Cointegration Test (Hjalmarsson and Osterholm, 2007)

Johansen (1991, 1995) developed cointegration test based on Vector Autoregression Model (VAR) of order \( p \) which is given by

\[ y_t = \mu + A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + \varepsilon_t \]
Where \( y_t \) is an \( n \times 1 \) vector of non-stationary I(1) variables and \( \epsilon_t \) is an \( n \times 1 \) vector of innovations.

This can be re-written as

\[
\Delta y_t = \mu + \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \epsilon_t
\]

Where \( \prod = \sum_{i=1}^{p} A_i - I \) and \( \Gamma_i = -\sum_{j=i+1}^{p} A_j \).

Granger’s representation theorem asserts that if the coefficient matrix \( \prod \) has reduced rank \( r < n \), then there exist \( n \times r \) matrices \( \alpha \) and \( \beta \) each with rank \( r \) such that \( \prod = \alpha \beta' \) and \( \beta' y_t \) is I(0). \( r \) is the number of cointegrating relations and each column of \( \beta \) is the cointegrating vector. The elements of \( \alpha \) are known as the adjustment parameters in the Vector Error Correction (VEC) model. Johansen’s method is to estimate the \( \prod \) matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of \( \prod \).

Johansen (1988) and Johansen and Juselius (1990) suggested two test statistic to determine the number of cointegration vectors. The first one is the trace test (\( \lambda \) trace). It tests the null hypothesis that the number of distinct cointegrating vector is less than or equal to \( q \) against a general unrestricted alternatives \( q = r \). The test is calculated as:

\[
\lambda_{\text{trace}}(r) = -T \ln \left( 1 - \frac{1}{r} \right) \sum_{i=r+1}^{p} \lambda_i
\]

Where \( T \) is the number of usable observations and \( \lambda_i \)'s are the estimated eigenvalue from the matrix. The trace test tests the null hypothesis of \( r \) cointegrating vectors against the alternative hypothesis of \( n \) cointegrating vectors.

The second test statistic is the maximum eigenvalue test (\( \lambda \) max) that is calculated as:

\[
\lambda_{\text{max}}(r, r+1) = -T \ln \left( 1 - \frac{1}{r+1} \right)
\]

Where \( T \) is the number of usable observations and and \( \lambda_i \)'s are the estimated eigenvalue from the matrix.

The maximum eigenvalue test tests the null hypothesis of \( r \) cointegrating vectors against the alternative \( r+1 \) cointegrating vector.

The results of unit root test of all the three variables are given in Table 7 which indicates that exports and GDP have unit root at level at 5% level of significance. Since variables have unit root, it can be tested whether there exist atleast one cointegration equation among the variables by Johansen cointegration test. The test result reveals that there exists atleast one cointegration equation at 5% level (Table 8). The existence of the cointegrating equations confirms the long run equilibrium linear relation among the variables. The cointegrating equation is given by:

\[
\log(\text{export}) = 1.318320 \log(\text{GDP}) - 0.031400 \log(\text{FDI})
\]

\[ t\text{-ratio} = 14.882818 \quad (-2.4920653) \]

A Vector Autoregression Model (VAR) with an Error Correction Mechanism

As seen above, since there exists cointegration relation among the variables, a VAR model with an Error Correction can be estimated.

The Vector Error Correction Model takes the following form:

\[
\Delta \log(\text{exports}_t) = \text{lagged}(\Delta \log(\text{exports}_t)) + \Delta (\log(\text{GDP}_t)) + \Delta (\log((\text{FDI}_t))) + \beta u_{t-1} + v_t
\]

Where \( \Delta \) is the first difference of the variables, \( u_{t-1} \) are the estimated residuals from the cointegrated regression (long-run relationship) and represent the deviation from
the equilibrium in time period $t$. $-1 < \beta < 0$, short-run parameter and $\nu_i$ white disturbance term.

The estimated Error Correction Model is given in Table 9. The model is significant with adjusted $R^2 = 0.424990$. The error correction term is statistically significant and has a negative sign indicating that there exists a long run equilibrium relationship among exports, GDP and FDI. FDI is a significant variable in the model which indicates that a change of 1% increase in FDI will lead to 0.04% change in increase in exports with one year time gap.

Granger Causality Test indicates that there is a unilateral relationship between exports and FDI and the direction is from FDI to exports. Hence it is confirmed from the Granger causality test that FDI causes Exports. There is also unilateral relationship between exports and GDP and the direction is from exports to GDP. But there is bilateral relationship between GDP and FDI (Table 10).

### Table 7: Unit Root Test for Stationarity

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF Test Statistic</th>
<th>PP Test Statistic</th>
<th>Critical value at 5% level</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(Export)</td>
<td>-1.0047</td>
<td>-0.6651</td>
<td>-2.9571</td>
</tr>
<tr>
<td>Δ(log(Export))</td>
<td>-3.2311</td>
<td>-3.1899</td>
<td>-2.9571</td>
</tr>
<tr>
<td>log(GDP)</td>
<td>1.9764</td>
<td>3.2896</td>
<td>-2.9571</td>
</tr>
<tr>
<td>Δ(log(GDP))</td>
<td>-5.8459</td>
<td>-5.8446</td>
<td>-2.9571</td>
</tr>
<tr>
<td>log(FDI)</td>
<td>-4.8323</td>
<td>-11.5541</td>
<td>-2.9571</td>
</tr>
<tr>
<td>Δ(log(FDI))</td>
<td>-3.1911</td>
<td>-3.1787</td>
<td>-2.9571</td>
</tr>
</tbody>
</table>

### Table 8: Johansen Cointegration Test. Unrestricted Cointegration Rank Test (Trace)

<table>
<thead>
<tr>
<th>Hypothesized no. of CEs</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.644806</td>
<td>43.81331</td>
<td>29.79707</td>
<td>0.0007</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.264043</td>
<td>10.69040</td>
<td>15.49471</td>
<td>0.2313</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.027117</td>
<td>0.879740</td>
<td>3.841466</td>
<td>0.3483</td>
</tr>
</tbody>
</table>

Notes: Trace test indicates 1 cointegrating equation at the 0.05 level; *denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michalis (1999) p-values

### Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

<table>
<thead>
<tr>
<th>Hypothesized no. of CEs</th>
<th>Eigenvalue</th>
<th>Max-Eigen Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.644806</td>
<td>33.12291</td>
<td>21.13162</td>
<td>0.0007</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.264043</td>
<td>9.810662</td>
<td>14.26460</td>
<td>0.2247</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.027117</td>
<td>0.879740</td>
<td>3.841466</td>
<td>0.3483</td>
</tr>
</tbody>
</table>

Notes: Max-Eigenvalue test indicates 1 cointegrating equation at the 0.05 level; *denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michalis (1999) p-values
Table 9: Vector Error Correction Model

\[ \Delta (\text{log Export})_t = -0.221549 \Delta \text{EC}_{t-1} + 0.217731 \Delta (\text{log Export})_{t-1} - 0.291326 \Delta (\text{log Export})_{t-2} \]
\[ + 0.565985 \Delta (\text{log GDP})_{t-1} - 0.413952 \Delta (\text{log GDP})_{t-2} \]
\[ (2.03501) \quad (2.05182) \]
\[ + 0.036145 \Delta (\text{log FDI})_{t-1} + 0.018769 \Delta (\text{log FDI})_{t-2} - 0.013207 \]
\[ (2.87139) \quad (1.47878) \]
\[ \Delta \text{log GDP} \]
\[ \Delta \text{log FDI} \]

\[ R^2 = 0.554831 \quad \text{Adj } R^2 = 0.424990 \quad N = 32 \]

*indicate significant at 1% level; \( \Delta \) indicates first difference; \( \text{EC}_{t-1} \) is the error correction term.

Table 10: Pairwise Granger Causality Tests

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Obs</th>
<th>F-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOG(GDP) does not Granger Cause LOG(EXPORT)</td>
<td>32</td>
<td>0.28456</td>
<td>0.5978</td>
</tr>
<tr>
<td>LOG(EXPORT) does not Granger Cause LOG(GDP)</td>
<td></td>
<td>12.1838</td>
<td>0.0016</td>
</tr>
<tr>
<td>LOG(FDI) does not Granger Cause LOG(EXPORT)</td>
<td>32</td>
<td>4.92818</td>
<td>0.0344</td>
</tr>
<tr>
<td>LOG(EXPORT) does not Granger Cause LOG(FDI)</td>
<td></td>
<td>0.60822</td>
<td>0.4418</td>
</tr>
<tr>
<td>LOG(FDI) does not Granger Cause LOG(GDP)</td>
<td>32</td>
<td>0.63820</td>
<td>0.4309</td>
</tr>
<tr>
<td>LOG(GDP) does not Granger Cause LOG(FDI)</td>
<td></td>
<td>0.23453</td>
<td>0.6318</td>
</tr>
</tbody>
</table>

5. Summary and Conclusion

China is emerging as a global player among USA, Japan and India and European Countries. China was second in the share of world GDP (12.5%) behind USA (20.5%) in 2009. It attracted FDI to the tune of US $ 95 billion in 2009 compared to US$ 130 billion for USA. China’s policy of openness provided opportunities for foreign multinational companies to undertake direct investment in the country through M & As involving host country firms. A vector autoregression model (VAR) is adopted to estimate the long run causal relationship among exports, foreign direct investment and GDP. The cointegration test result shows that there exist a long run equilibrium relationship among FDI, GDP and Exports. In the estimated Error Correction Model, FDI is a significant variable and the result indicates that 1% change of increase in FDI will lead to 0.04% change of increase in exports with one year time gap. Granger Causality test indicates that there is a unilateral relationship between exports and FDI and the direction is from FDI to exports which means that FDI causes exports.
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