IMPACT OF CONVENTIONAL & UNCONVENTIONAL INPUTS ON ECONOMIC GROWTH OF CHINA (AN EMPIRICAL ANALYSIS OF CHINESE ECONOMY)

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ABSTRACT: *This paper empirically examines the long run impact of conventional and unconventional inputs on economic growth of China. The study spans over a period from 1980-2012. The long run relationship among variables has been investigated by applying ARDL approach to cointegration which is considerd to be one of appropriate estimation technique for small sample data. In this study we have introduced a dummy variable to capture the effect of economic liberalization on Chinese economy. Moreover we have also introduced two unconventional inputs i.e. export and FDI inflows. The results show that the impact of inward FDI and Economic liberalization captured through dummy is insignificant while export contributed significantly and positively to Chinese economy during the study period. However, all other traditional inputs which are capital and labor have positive and significant impact on Chinese economy.*

JEL Classification: F14, F43, F15, F21, O11, O53
Keywords: ARDL, Co integration, Unit root, Economic Growth, FDI, Export

1. INTRODUCTION:

Among developing countries, China has become the most important destination of cross boarder direct investment. In recent decades, China's economy has experienced a phenomenal level of economic growth characterized by significant increases in inward foreign direct investment (FDI) and growth in commodity exports. Chinese government has taken active promotion through various policy measures which cause FDI to grow actively. However, little empirical research exists that conducted on measuring such economic success. Moreover, in theory and empirical research there exist controversy among economists regarding the impact of FDI whether it positively or negatively influence economic growth. Some authors argue for an insignificant or even negative effect of FDI, others advocate a strong positive relationship. The relationship between trade, growth and FDI is understudied such as whether FDI and trade are substitutes or complementary or is there any causal relationship between them. Its understanding will be helpful in policy making. As China has been the world largest FDI recipient among developing countries. Trade and FDI inflows have been widely recognized as very important factor in the economic growth process. Further the accumulation of human capital along with sound physical capital is best combination to promote economic growth. In 2001 China's accession to WTO also provoked the researcher to explore its impact on the Chinese economy. China seems to overtake United States economy sooner which is the largest one at present. The main objective of this study is to estimate the long run impact of conventional inputs such as labor force and Capital stock and unconventional inputs such as FDI and exports on economic growth of China.The organization of study is as follow: Section 2 contains review of selected theoretical and empirical literature on the subject. Section 3 consists of the theoretical frame work. This chapter also explains the description of data and its sources. Section 4 explains models specification and research methodology, used to analyze the interrelationship of conventional and unconventional inputs to growth with reference to Chinese Economy. Section 5 gives the empirical results of the different equations made. Chapter 6 offers the conclusion and policy recommendations of the literature. Whereas literature cited is reported at last.

2. LITERATURE REVIEW:

Researchers [1] studied the role of capital accumulation on economic growth of China from 1952-1994 and found that the role capital accumulation remained very important during the study period as it brought a sustained increase in total factor productivity which in return resulted unprecedented growth of economy. Further open door policy also contributed the economy positively through increase in FDI inflows & international trade. Researcher [2] investigated the main determinant of China's economic success. The study is based over a period from 1980-1990s.The results showed that fixed capital investment and merchandise exports were the main determinants of success during the period. Fixed capital investment unidirectional caused industrial output; similarly export unidirectional impacted industrial output. However there is no causal relationship between imports and output. So it's the outward looking strategy which benefited the Chinese economy. Researchers [3] statistically investigated the impact of private enterprise, education and openness on economic growth of China from 1978-1989. They collected data of 29 provinces, autonomous regions and municipalities for this empirical analysis. The findings of study was that higher education, openness measured in term of trade and private and semi-private enterprises increased the economic growth of China, while higher fertility, high inflation and state owned enterprises reduced the volume of growth in these regions. Researcher [4] studied the channels through which inward FDI put impact on transitional Chinese economy. The study used a growth model and cross section and then panel study from 1984-1998. The results showed that FDI promoted growth and put a positive impact on coastal regions than inland regions, at the same time it helped China's

transition. Researchers [5] investigated the relationship between exports, inward FDI and regional economic growth of Chinese economy. For this study they used data on Chinese provinces and found that the structure of economy, state policies and degree of openness played a positive and significant role through export on economic growth of China. Researchers [6] made a panel data study from 1986-1997 on Chinese economy at provincial level. The result supported the belief that increased inward FDI in China affected positively its manufacturing export performance at provincial level. So it established a positive strong FDI export linkage at provincial level since China adopted an open door policy in late 1970's. Researchers [7] examined the causal relationship between foreign direct investment (FDI) and trade openness in China. This is an empirical investigation based on a panel of bilateral data for China and 19 home regions over the period 1984–1998. Econometric technique for panel data was applied to test unit roots and causality. The results indicate a virtuous procedure of development for China: the growth of China's imports causes the growth in inward FDI from a home region, which, in turn, causes the growth of exports from China to the home region. The growth of exports causes the growth of imports. Researchers [8] investigated the long run relationship between exports, imports, FDI & economic growth using quarterly data and found a long run relationship exist among these variables in case of Chinese economy. After identifying the cointegration they checked the causal relationship between FDI, trade and growth and found that bi-directional causality exists between growth, exports and FDI. Researchers [9] investigated the impact of accession of Chinese economy to WTO. In this study a social accounting matrix was constructed as benchmark. The results showed that although Chinese economy's accession to WTO brought significant gains to the economy but these gains were not evenly distributed at sectoral level. The agriculture sector which was given higher protection and capital intensive industries remained looser while labor intensive sectors such as textile and clothing remained the beneficiary sectors. Researchers [10] developed a measure for human capital stock for China over a period of 1952-1999. They found that accumulation of human capital in China increased rapidly during reform period and it put significant and positive impact on economic growth via TFP growth. During reform period incorporating human capital impacted TFP positively which ultimately affected economic growth in healthy fashion, but during pre-reform period it behaved inversely. The study suggests that human capital accumulation must be given higher priority if China desires to have a sustainable growth in coming decades. Researcher [11] studied the impact of FDI and exports on economic growth of China using a large Panel data study spanned over a period 1978-2000. For estimation they applied Arellano and Bond's dynamic panel data technique and found that foreign direct investment and export both have a positive and strong impact on the economic growth of China. According to them these successes is attributed due to two factors, Firstly adoption of world technology and secondly focus of Chinese economy on export promotion strategy. Researchers [12] investigated the FDI contribution in the export performance of the recipient countries using the case of China. They used Panel data technique on disaggregated manufacturing sectors from 1995 to 2005 and concluded that FDI flows contributed significantly and positively on exports. The study is first of its nature by doing sectoral analysis among others which uses national or provincial aggregates Researchers [13] studied the impact of FDI, physical human capital and infrastructure capital on regional growth of China. In this cross provincial study they tested direct and indirect impact of human capital and found that human capital positively affected TFP growth. The infrastructure investment gives high returns in developed regions as compare to interior while investment in human capital gives slightly higher returns in interior regions. The study found that before 1994 FDI has a strong impact on TFP growth than later periods. Researchers [14] examined the China's economic policy regarding FDI. They checked the impact of FDI inflow on China's economic development. Future trends of FDI inflow in China were also projected. The study concluded that China's economic reforms are the expansion of China's trade with the rest of the world. It has significant impact on China's GDP but that study lacked empirical findings; it only explained the theoretical trends.

CONTRIBUTION OF THE STUDY:

This paper makes three contributions to existing literature;

Firstly, first time any study investigated the impact of conventional and unconventional inputs together in case of Chinese economy.

Secondly, most of the past studies have checked the impact of various variables on regional growth of country; through this study we tried to make a comprehensive analysis of Chinese economy as a whole covering a period of 1980-2012.

Thirdly by introducing a dummy variable we have tried to check either the economic integration of economy to WTO in 2001 put a significant impact or not.

3. THEORETICAL FRAMEWORK AND DATA DESCRIPTION:

Both FDI and exports are having growth promoting role. From review of the theory it can be analyzed that both can be modelled in an aggregate production function (APF) framework. In many econometric studies, the standard APF model has been extensively used to estimate the impacts of FDI inflows and exports on growth with reference to many developing countries. It is the assumption of APF that, along with "conventional inputs" of labor and capital used in the neoclassical production function; "unconventional inputs" like FDI and export performance may be included in the model to capture their contribution to economic growth. The APF model has been used by many researchers in the past.

The general APF model to be estimated is derived as:

$$Y_t = A_t L_t^{\alpha} K_t^{\beta} \quad (1)$$

where Y_t denotes the aggregate prodution of the economy (real GDP per capita) at time *t* and , A_t , K_t, L_t are the total factor productivity (TFP), the capital stock, and the stock of labour, respectively.

We want to investigate the impacts of FDI inflows (*FDI*) and exports as "unconventional inputs" on economic growth. Thus the model will take the form

$$Y_t = C_t L_t^{\alpha} K_t^{\beta} FDI_t^{\varphi} X_t^{\delta} \quad (2)$$

We include a dummy variable *D* representing economic liberalization to take account of the trade regime in China (*D*

= 1 from 1980-2000 and *D* = 0 from 2001-2012). Equation (2) becomes:

$Y_t = C_t L_t^{\alpha} K_t^{\beta} FDI_t^{\varphi} X_t^{\delta} D_t^{\psi}$ (3)

where α,β, φ, δ and ψ are constant elasticity coefficients of output with respect to the Lt, K_t, FDI_t, X_t, and Dt.

From equation (3), an explicit estimable function is specified, after taking the natural logs of both sides, as follows:

$\ln Y_t = C_t + \alpha \ln L_t + \beta \ln K_t + \varphi \ln FDI_t + \delta \ln X_t + \psi D_t + e_t$ (4)

Where all coefficients and variables are as defined, C is a constant parameter, and e_t is the white noise error term. The sign of the constant elasticity coefficient α,β, φ, δ and ψ are all expected to be positive. Equation (4) represents only the long-run equilibrium relationship and may form a cointegration set provided all the variables are integrated of order 1.

3.1 DATA DESCRIPTIONS AND SOURCE:

lnY in the model is defined as natural log real GDP per capita; ln FDI is the natural log of foreign direct investment flows; ln X is the natural log of export performance variable; ln the model, L is measured as the natural log of volume of the total labour force; ln K is proxied by the natural log of real value of gross fixed capital formation (GFCF). This proxy for capital stock has been used in many previous studies as literature suggests such as Kohpaiboon (2004), Mansouri (2005) etc. D is dummy variable for economic liberalisation in China. The annual time series data used is gathered from the World Development Indicators (2004) published by the World Bank and covers the period from 1980 to 2012.

4. ECONOMETRIC METHODOLOGY:

Firstly, we have checked the time series properties of the variables of the model, in the time series analysis it is essential to evaluate the stationarity of the data, whether the series is stationary or not, if stationary then of which degree. Non-stationary data series usually provide spurious results[1] and it must be detrended before any analysis is undertaken. Unit root test is used to examine the stationarity of the data. In this regard the (ADF) Augmented Dickey Fuller (1979)[2] test and the (PP) Phillips Perron (1988)[3], tests are used at 1%, 5% and 10% levels of significance.

Stationarity test:

A stationary time series have the following three properties.

$E(Y_t) = \mu$ (5

$Var(Y_t) = E(Y_t - \mu)^2 = \sigma_2$ (6

$\Delta k = E(Yt - \mu)^2 (Yt + K - \mu)$ (7

Which states mean and variance of the series is independent of time and the covariance between the two time periods depends on the lag between the two periods and not on the actual time period at which the covariance is calculated. In other words, stationary series exhibit mean reversion, shocks to a stationary series are temporary and overtime will dissolve. While Non-stationary series do not possess a mean to which the series reverse, shocks have permanent effects and the variance is time dependent. In the presence of unit root in series, the OLS estimations may lead to spurious and misleading results. There are two most popular tests for checking the unit roots in a time series. (i) Augmented Dickey Fuller (ADF) test and (ii) Phillips Perron (PP) test. Moreover there exists graphical approach also to check the stationarity. The time plot of a time series is examined, if the graph has an upward or downward trend, the series suggest that the mean and variance of the series are changing overtime, which are the indications of non stationary series. In the study, we will use ADF test to examine the stationarity problem.

Stationarity Test: The Unit Root (Augmented Dickey Fuller) Test:

The ADF test is the modified version of the Dickey Fuller (DF) test, which is presented by the Dickey and Fuller in (1979)[4]. The Dicky Fuller test for unit root may be conducted in the following two steps: First of all, runs OLS regression of following type:

$\Delta Yt = \delta Yt\text{-}1 + \varepsilon t$ …. (8)

and save the t_{δ} ratio as mentioned in equation 5. Secondly, the existence of unit roots in the time series data Y_t according to the following hypothesis.

Ho: $\delta = 0$, for non stationarity if $t_{\delta} > \tau$

H_1: $\delta < 0$, for stationarity, if $t_{\delta} < \tau$

Where τ is the critical value as given by researcher[20].

For a time series to be stationary the t_{δ} value must be much negative. Otherwise, the time series is non-stationary. Dickey and Fuller have tabulated τ critical values when regression equation contains constant also i.e. when equation (8) becomes:

$\Delta Yt = \alpha + \delta Y_{t-1} + \varepsilon t$…. (9)

Where α is the intercept, t is the Linear Time Trend and δ is the parameter to be tested.

Further, when the regression equation contains a constant and linear trend, equation (8) can be written as

$\Delta Yt = \alpha + \beta t + \delta Yt\text{-}1 + \varepsilon t$ …. (10)

The null hypothesis of non stationary or the unit root is rejected if the observed t statistics is sufficiently negative as compared to the negative values of the Dickey Fuller (1979). While conducting the DF test it is explicitly assumed the error term in the DF regression models are uncorrelated. But there are some cases in reality where the error terms are correlated. Thus to account for the possible autocorrelation, Dickey and Fuller modified their earlier test by adding the lagged term of the dependent variables to the explanatory variables in the model. Thus the equations become:

$$\Delta Yt = \delta Yt\text{-}1 + \sum_{j=2}^{q} \delta_j \Delta_{t-j+1} + \epsilon_t \ldots (11)$$

[1] Damodar N. Gujrati

[2] Dickey, D.A., and Fuller, W.A. (1979) "Distribution of the Estimators for Autoregressive Time- Series with a Unit Root" *Journal of the American Statistical Association*, 74: 427-431.

[3] Phillips,P.C.B. and Perron,P. 1988. Testing for a unit root in time series regression. *Biomètrika* 75(2): 336-346.

[4] Researchers[20] Distribution of the Estimators for Autoregressive Time-Series with a Unit Root, *Journal of the American Statistical Association* 74: 427-431.

$$\Delta Yt = \alpha + \delta_j\, Yt\text{-}1 + \sum_{j=2}^{q} \delta_j \Delta_{t\text{-}j+1} + \epsilon_t \ldots. (12)$$

$$\Delta Yt = \alpha + \beta t + \delta Yt\text{-}1 + \sum_{j=2}^{q} \delta_j \Delta_{t\text{-}j+1} + \epsilon_t \ldots. (13)$$

Since, Dickey Fuller test as given by equations 8, 9 and 10 has been augmented with the lagged difference term to produce equations 11, 12 and 13 the usual D.F. test applied to the later equations (11, 12 and 13) took the name Augmented Dickey Fuller test. In fact, the critical values for DF, τ statistics still holds for the ADF test and the testing of hypothesis is still that is presented earlier. In equations 11, 12, 13 the number of additional lagged differenced terms will depend on the minimum value of AIC and SIC (Akaike, 1973 and Schwartz, (1989)[5].

Auto Regressive Distributive Lagged Model (ARDL):

The ARDL approach has certain econometric advantages in comparison to other single co-integration procedures (Researchers [16]; Researchers [17]; Researchers [18][6(a, b, c)]. Firstly, problem of endogenity and inability to test hypotheses on the estimated coefficients are avoided. Secondly, the long and short-run parameters of the model in question are estimated simultaneously. Thirdly, the econometric methodology is relieved of the burden of establishing the order of integration amongst the variables and of pre-testing for unit roots means ARDL approach can be applied irrespective of whether the regressors are I(1) and I(0) or mutually cointegrated as Johansen's method requires that variables must be integrated with variables of the same order for the cointegration test. ARDL approach permits the inclusion of Dummy variable in the cointegration test process, which in not permitted in other time series approaches.

An ARDL model is a General Dynamic Specification, which uses the lags of the dependent variable and the lagged and simultaneous values of the independent variables, through which the short-run effects can be directly estimated, and the long-run equilibrium relationship can be indirectly estimated. The ARDL regression yields a test statistic, which can be compared to two asymptotic critical values (upper and lower critical values). If the test statistic is above an upper critical value, the null hypothesis of no long-run relationship can be rejected irrespective of the orders of integration for the time series. Similarly, if the test statistic is below the lower critical value, the null hypothesis of no long-run relationship is accepted. If the test statistics lie between the upper and lower values, the result is inconclusive. The ARDL approach involves two steps for estimating the long-run relationship. The first step is to examine the existence of a long-run relationship among all variables in the equation under examination. If the co integration is confirmed; in the second stage the long-run coefficients and the short-run coefficients are estimated. The ARDL model selected by SBC performs better alternatives then AIC, because SBC is a consistent model selection criterion, but AIC is not, Researchers [19]. Also, according to the Monte Carlo evidence, the standard information criteria like SBC and AIC select the correct lag order reliably in the ARDL model.

According to Researchers [19], the economic growth Equation of the model can be expressed as follows:

$$\Delta \ln Y = \beta_0 + \sum_{j=1}^{n} \alpha_j \Delta \ln Y_{t-j} + \sum_{j=1}^{n} \beta_j \Delta \ln L_{t-j} + \sum_{j=1}^{n} \delta_j \Delta \ln K_{t-j} + \sum_{j=1}^{n} \mu_j \Delta \ln FDI_{t-j} + \sum_{j=1}^{n} \phi_j \Delta \ln X_{t-j} + \eta_1 \ln Y_{t-1} + \eta_2 \ln L_{t-1} + \eta_3 \ln K_{t-1} + \eta_4 \ln FDI_{t-1} + \eta_5 \ln X_{t-1} + \eta_6 D_t + \mu_t \quad \_\_\_\_\_ 14$$

Where β_0 is a drift component and μ_t is the white noise error. The first step in the ARDL approach is to estimate Equation (2) using ordinary least square (OLS). The second step is to find out the presence of cointegration by restricting all estimated coefficients of lagged level variables equal to zero. So, the null hypothesis of no cointegration is $H_0 : \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = 0$ is tested against the alternative $H_0 : \eta_1 \neq 0, \eta_2 \neq 0, \eta_3 \neq 0, \eta_4 \neq 0, \eta_5 \neq 0$ by the mean of a F-test with an asymptotic non-standard distribution.

Two critical values are given by Pesaran *et al.*[7] (2001) for the cointegration test. The lower critical bound assumes all the variables are I(0), means that there is no cointegration among the variables, while the upper bound assumes that all the variables are I(1). There is cointegration among the variables. These can be denoted as $H_0 : \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = 0$ (there is no cointegration among the variables), against $H_0 : \eta_1 \neq 0, \eta_2 \neq 0, \eta_3 \neq 0, \eta_4 \neq 0, \eta_5 \neq 0$, (there is cointegration among the variables). If the F-computed is above the upper critical value, the null hypothesis of no long-run relationship can be rejected irrespective of the orders of integration for the time series therefore exist a cointegration among the variables. However, if the F-statistics is less than the lower critical value, then the null hypothesis of no long-run relationship cannot be rejected. Therefore, there is no

[5] Researchers [15] "Export and Economic Growth in India: Causal Interpretation". *MPRA Paper* No. 14670.

[6 (a)] Researchers [16] "Cointegration and error correction: representation, estimation, and testing" *Econometrica, 55, 251-276.*

[(b)] Researchers [17] "Statistical Analysis of Cointegration Vectors" *Journal of Economic Dynamics and Control 12:231-254.*

[(c)] Researchers [18] "Maximum Likelihood Estimation and Inference on Cointegration with Applications to Money Demand" *Oxford Bulletin of Economics and Statistics* 52:169-210.

[7] Researchers [19]. "Bounds testing approaches to the analysis of level relationships"*Journal of Applied Econometrics 16, 289–326.*

cointegration among the variables. If the F-statistics lies between the lower and upper bound, then the results are inconclusive.

5. EMPIRICAL RESULTS AND ANALYSIS:

This section contains the findings of the study, its analysis, results, tables of results and discussion. In the first step, we have tested the stationary status of all variables to determine their order of integration, before we proceed with the ARDL Bounds test. The test will ensure the absence of I (2) among variables, so as to avoid spurious results. The stationarity of the data will be investigated by the Augmented Dickey Fuller (ADF) test. The results of Augmented Dickey Fuller (ADF) test are given in table 1.All the variables reject the null hypothesis of non-stationarity till the first difference. Hence the series of variables are integrated of order one, I(1).

Table 1: Unit Root Results

Augmented Dickey-Fuller Test Statistics

Model Specification with Constant					
A: Level					
Variables	**T-Statistics**	**1%**	**5%**	**10%**	**P values**
lY	-0.936	-3.610	-2.976	-2.627	0.761
Llf	-2.480	-3.662	-2.960	-2.619	0.130
Lgfcf	-1.246	-3.662	-2.960	-2.619	0.641
Lfdi	-0.849	-3.654	-2.957	-2.617	0.791
Lex	1.309	-3.654	-2.957	-2.617	0.998
Model Specification with Constant and Linear Trend					
lY	-3.822	-4.310	-3.544	-3.222	0.010
Llf	-1.110	-4.285	-3.563	-3.215	0.926
Lgfcf	-4.312	-4.285	-3.563	-3.215	0.013
Lfdi	-1.452	-4.273	-3.558	-3.212	0.825
Lex	-2.628	-4.310	-3.574	-3.222	0.271
B: First Differences					
Model Specification with Constant					
lY	-2.513	-3.70	-2.964	-2.621	0.123
Llf	0.780	-3.662	-2.960	-2.619	0.811
Lgfcf	-3.759	-3.680	-2.968	-2.623	0.008
Lfdi	-4.138	-3.662	-2.960	-2.619	0.003
Lex	-3.923	-3.662	-2.960	-2.619	0.005
Model Specification with Constant and Linear Trend/none					
lY	-2.537	-4.297	-3.568	-3.218	0.310
Llf	-2.308	-4.285	-3.563	-3.215	0.418
Llf	-2.033	-2.642	-1.952	-1.610	0.042
Lgfcf	-3.683	-4.310	-3.574	-3.222	0.041
Lfdi	-4.125	-4.285	-3.563	-3.215	0.014
Lex	-4.320	-4.285	-3.563	-3.215	0.009

The rejection of null hypothesis i.e. series is non stationary is based on Mac Kinnon critical values

Table 2: ARDL Bounds Cointegration for equation (A)

F- Statistics	**95% critical values Bounds**		**90% critical values Bounds**	
	Lower Bound I(0)	**Upper Bound I(1)**	**Lower Bound I(0)**	**Upper Bound I(1)**
F_Y (Y| L, K, FDI, X) =5.242	3.069	4.518	2.560	3.788
F_L (L| Y, K, FDI, X) =38.723				
F_K (K| Y, L, FDI, X)=2.093				
F_{FDI}(FDI| Y, K, L, X) =7.196				
F_X (X| Y, L, K, FDI) =2.623				

The table presents the results of the calculated F-statistics when each variable is normalized in the ARDL-OLS regressions. The calculated F-statistics F_Y (Y| L, K, FDI, X) =5.242 is higher than the upper bound critical value 4.518,the null hypothesis of no cointegration is rejected, implying long run relationships among the variables when the equation is normalized on real GDP, labour force and foreign direct investment . It can again be observed when the, 'conventional variable' labour force has been kept as dependent variable, F_L (L| Y, K, FDI, X) =38.723 is also higher than the upper-bound critical value 4.518. Thus, the null hypotheses of no cointegration are rejected, implying long-run cointegration relationships amongst the variables when the regressions are normalized on both Yt and Lt variables. However, based on the growth theory, Y_t is used as the dependent variable in the study.

Autoregressive Distributed Lag Estimates selected based on SBC: To observe the goodness of fit of the ARDL model, relevant diagnostic tests are conducted. The diagnostic tests examine the normality, serial Correlation, functional form and heteroscedasticity associated with the model. Given the fact that the variables in the estimation model have different lag orders, it is not surprising that the model fails heteroscedasticity test. (Samreth, Sovannroeun,2008)

Since we are using 32 annual observations, we choose 1 as the maximum lag length in the ARDL model and the calculated F-statistic is equal to 5.242, given that this value is higher then the upper bound (4.518) critical value reported in Pesaran et al. (2001) at the 95% significance level. So, it is found that cointegration exists among variables.

Estimated Long-run Coefficients using the ARDL Approach:

Once we established that a long-run cointegration relationship exist, equation (14) is estimated using the following ARDL (1, 0, 0, 0, 0,0) specification. The results obtained by normalizing on real GDP per capita (Y t), in the long run are reported in Table 4.

Table 3: Autoregressive Distributed Lag Estimates selected based on SBC

Regressor	Coefficient	S.E	T-Ratios	Probability
lY(-1)	0.456	0.050	9.219	0.000
Llf	1.030	0.160	6.428	0.000
Lgfcf	0.254	0.036	7.160	0.000
Lfdi	-0.009	0.009	-0.970	0.341
Lex	0.086	0.019	4.415	0.000
D	-0.030	0.017	-1.687	0.104
INPT	-3.391	0.792	-4.282	0.000

Table 4: Estimated Long Run Coefficients using the ARDL Approach
ARDL (1,0,0,0,0,0) selected based on Schwarz Bayesian Criterion:

Regressor	Coefficient	S.E	T-Ratios	Probability
Llf	1.897	0.246	7.714	0.000**
Lgfcf	0.468	0.057	8.272	0.000**
Lfdi	-0.016	0.017	-0.958	0.347
Lex	0.157	0.031	5.149	0.000**
D	-0.054	9.031	-1.713	0.099
INPT	-6.239	1.371	-4.552	0.000**

** indicates that variable is significant at 1% level of significance

The labour force variable is positively signed and very significant at the 1 percent level. This is indicative of the growth in productivity of labour in China. The estimated coefficients of the long-run relationship show that capital investment proxied by real gross fixed capital formation has a very high significant impact on GDP per capita (Economic growth). A 1% increase in capital investment leads to approximately 0.46% increase in GDP per capita, all things being equal. Considering the impact of unconventional variable export on economic growth, it has been observed that exports are highly significant at 1% t-probability and has the expected positive impact on economic growth. A 1% increase in exports leads to a 0.15% increase in economic growth. Interestingly, we found that the coefficient of foreign direct investment inflows (FDI) has a negative impact on growth but it has highly insignificant impact. By observing the dummy variable for economic liberalization it has been analyzed that it is not only insignificant in all regressions but also has a negative sign. Interestingly, we found that the coefficient of foreign direct investment inflows (FDI) has a negative impact on growth but it has highly insignificant impact.

ECM representation of the selected ARDL model:

The adjustment speed of the variables or how quickly or slowly variables in the dynamic model returns to equilibrium can be observed with the help of error correction coefficient. The results of the short-run dynamic coefficients associated with the long-run relationships based on the ECM version of ARDL model are given in Table 5. The signs of the short-run dynamic impacts are maintained to the long-run. However, this time the labour force variable is only significant at 1% t-probability. Dummy variable is also nearly significant at only 10%. Capital investment and exports are both significant at the 1% level and have relatively lower impacts on growth in the short-run and long-run compared to the other variables.

Table 5: Error Correction Representation for the Selected ARDL Model
ARDL (1,0,0,0,0,0) selected based on Schwarz Bayesian Criterion

Regressor	Coefficient	S.E	T-Ratios	Probability
Dllf	1.031	0.160	6.428	0.000
Dlgfcf	0.254	0.355	7.160	0.000
Dlfdi	-0.009	0.009	-0.970	0.341
Dlex	0.086	0.019	4.415	0.000
dD	-0.029	0.017	-1.687	0.104
Ecm(-1)	-0.544	0.050	-10.978	0.000

ecm = LY -1.8968*LLF -.46776*LGFCF + .016301*LFDI -.15747*LEX + .053777*D + 6.2391*INPT

The equilibrium correction coefficient, estimated -0.54 (0.050) is highly significant, has the correct sign, and imply a fairly high speed of adjustment to equilibrium after a shock.

Approximately 54% of disequilibrium from the previous year's shock converges back to the long-run equilibrium in the current year.

The cumulative sum (CUSUM) and cumulative sum of squares(CUSUMQ) plots (fig.1) from a recursive estimation of the model also indicate stability in the coefficients over the sample.

CUSUM AND CUSUMSQ PLOT:

To test the parametric stability among the variables for the entire period of study under consideration Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUMSQ) proposed by Brown et al.,(1975) have been used. The test confirm stability in the model, as the plots of CUSUM and CUSUMSQ tests in the study are not crossing the critical value line of 5 percent level of significance.

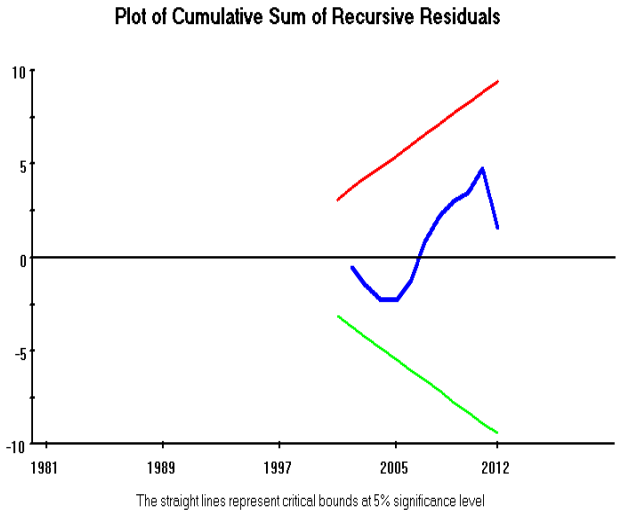

Fig.1: Plot of CUSUM and CUSUMSQ for Coefficients Stability:

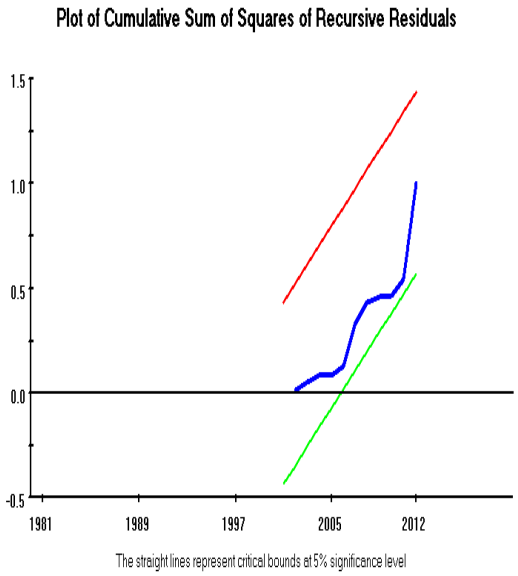

Fig.2: Plot of CUSUM and CUSUMSQ for Coefficients Stability (Graph of cumulative sum of squares of recursive residuals):

6. CONCLUSION

In this study the impact of conventional Inputs like capital stock and labor force and unconventional inputs that is foreign direct investment and exports on economic growth of China has been studied. Since China joined WTO in 2001 so we have introduced a dummy variable to check either this integration played a significant role or not. The Augmented dickey fuller test is employed to check the stationarity of variables, Afterward the long run and short run relationship among the said variables has been studied by employing ARDL cointegration technique. Our results indicate the presence of cointegration. All the variables in long run exert positive and significantly impact on Chinese economy with an exception to FDI which is insignificant during this study period. The dummy variable is also insignificant indicating that global integration has not significantly affected the economy during our study span. This perhaps is due to the fact that Chinese government is currently engaged in tackling the issue of coordination between liberalization process and domestic economic reforms. To gain fruits from liberalization such issues must be tackled altogether.

REFERENCES:

[1] Hu, Z. F. and M. S. Khan. " Why is China Growing so Fast?"*IMF Staff Papers*, **44(1)**.1997

[2] Yu, Q. "Investment, international trade and economic growth in China: Evidence in the 1980–1990s" *China Economic Review*, **9(1)**, 73–84.1998

[3] Chen, B. and Y. Feng. "Determinants of economic growth in China: Private enterprise, education, and openness", *China Economic Review*, **11(1)**, 1–15.2000

[4] Zhang, K. H. "How does foreign direct investment affect economic growth in China?" *Economics of Transition*, **9(3)**, 679–693(2001)

[5] Suna, H. and A. Parikh. "Exports, Inward Foreign Direct Investment (FDI) and Regional Economic Growth in China", *Regional Studies*, **35 (3)**, 187-196(2001)

[6] Zhanga, K.H. and S. Songb. "Promoting exports: the role of inward FDI in China," *China Economic Review*, **11 (4)**, 385–396(2001)

[7] Xiaming, L., W. Chengang, and W. Yingqi. "Causal links between foreign direct investment and trade in China," *China Economic Review*, **12**, 190–202(2001)

[8] Liu, X., P. Burridge, and P. J. N. Sinclair. 2002. "Relationships between economic growth, foreign direct investment and trade: evidence from China," *Applied Economics*, **34(11)**, 1433-1440(2002)

[9] Zhai, F. and S. Li. 2002. "The implication of Accession to WTO on China's Economy," *Third Annual Conference on Global Economic Analysis Melbourne, Australia*, June 27-30 (2002)

[10]WANG, Y. and Y. YAO. "Sources of China's economic growth 1952–1999: incorporating human capital accumulation," *China Economic Review*, **14 (1)**, 32–52 (2003)

[11]Yao, S. "On economic Growth, FDI and Exports in China," *Applied Economics*, **38(3)**, 339-351 (2006)

[12]Weishi, G., A. O. Titus, and Y. Yan. "The Contribution of Foreign Direct Investment to China's Export Performance: Evidence from Disaggregated Sectors," *American Agricultural Economics Association Annual Meeting, Orlando*, July (2008)

[13] Fleishera, B., H. Lib, and M. Q. Zhao. "Human capital, economic growth, and regional inequality in China," *Journal of Development Economics*, 92(2), 215–231 (2010)

[14] Fung, K.C., H. Iizaka, and S. Tong. "Foreign Direct Investment in China: Policy, Trend and Impact," *International conference Paper on "China's Economy in the 21st Century* (2002)

[15] Pandey and Kumar. "Export and Economic Growth in India: Causal Interpretation,"*MPRA Paper* No. **14670** (2006)3

[16]Engle, R.F. and C.W.J. Granger. "Cointegration and error correction: representation, estimation, and testing," *Econometrica*, **55**, 251-276.(1987*)*

[17] Johansen, S. "Statistical Analysis of Cointegration Vector," *Journal of Economic Dynamics and Control* **12** :231-254.(1988)

[18] Johansen, S., and Juselius, K. "Maximum Likelihood Estimation and Inference on Cointegration with Applications to Money Demand," *Oxford Bulletin of Economics and Statistics* **52**:169-210 (1990)

[19] Pesaran, M.H., Shin, Y., Smith, R. "Bounds testing approaches to the analysis of level relationships," *Journal of Applied Econometrics* 16, 289–326 (2001)

[20] Distribution of the Estimators for Autoregressive Time-Series with a Unit Root, *Journal of the American Statistical Association* **74**: 427-431 (1979)