Regional Variations in Per Capita Incomes among a Group of Developing Asian Economies: Role of FDI, Infrastructures and Human Capital

Abstract: *The study examines what explains the variances of regional per capita incomes of a group of eleven Asian economies and in that the major stress is given on FDI inflows whether those flows have any role in causing variances in the per capita income of these countries along with incorporating other key economic indicators such as human capital formation, and transport, information and communication related infrastructures. We found that differences in interest rates and educational achievements negatively explain the variances of per capita incomes, which may imply that these factors contribute less to the variances of per capita incomes. However, the variances of FDI and infrastructure index (a composite of physical and information related technological indices), have positively and significantly contributed to explaining the variances in per capita incomes for a group of middle and poor Asian economies in the Asian region. This finding seems to be quite be conclusive and robust to employing alternative appropriate time series estimation techniques.*

Key words: Regional economy, FDI, Human capital formation, Transport & ICT infrastructures.

JEL Classifications: E22, E24 & E50

Introduction

The individual developing economies of the Asian region have grown at different rates in the era of globalization and financial market integration from their respective initial low levels of incomes. Some countries, for instance, South Korea, have successfully and exceptionally transited to the league of developed nations with their remarkable high speed of economic growth by building on their growth foundations through the establishment of progressive manufacturing and industrial sectors and other reforms aimed at achieving higher economic growth. Some countries have not been able to achieve the desired rate of growth and are growing at a very smaller pace due to the structural policy rigidities in the public sectors and resultant attitude of the private sectors in the economy, as a result they have not been able to level up their per capita incomes. This latter has in turn translated into low levels of living standards. The success and failures of these individual Asian economies are quite specific to the type of their domestic economic reforms carried out with respect to agricultural, infrastructural, industrial and labour laws and the reforms undertaken in respect of external sectors. Different countries have adopted various growth strategies for achieving higher economic growth. Some countries have given emphasis on external sector reforms for intensifying their trade and attracting foreign investment inflows and some countries have given importance on domestic reforms. Following the export-led growth hypothesis, numerous studies in the literature have explored the pattern and composition of exports and investigated whether the growth processes of these economies are primarily driven by their export growth strategies and performance. There are also studies which have examined whether FDI inflows and its patterns matter for the economic development of these developing Asian economies including other developing economies in the world for achieving higher economic growth. The Asian economies have got different economic potentials to attract FDIs into their region. Given that there exists differing economic potentials among themselves to attract foreign investments into their economies, which broadly depend on their outward looking policies such as labour reforms, trade and investment policies and financial development and financial liberalization policies, at the same time they also share some broad characteristics which are common to all, and that differentiated them from the other developed

economies. There exist significant regional differences within the region in terms of their per capita incomes as can clearly be noticed from Figure 1, which reflects on their standard of livings of these economies. The human capital development and infrastructural improvements can significantly matter for their overall development of these individual economies. The study more importantly, attempts to understand the variation in the FDI inflows into developing Asian region (as reflected from Figure 2) among other factors such as physical and information and communication infrastructures. More specifically, it tries to examine whether variations in FDI significantly matter in influencing the regional variations in the pattern of per capita incomes across a group of countries. Given this motivation, the study has set the following key important objective, which necessitates for designing the broad macroeconomic policy reforms of these economies that would help them to achieve better economic growth performance.

Objective of the study

The broad objective of the study is to understand whether variations in aggregate FDI inflows across a group of eleven individual developing countries in the Asian region have caused regional variations in their standard of livings. The variation in the standard of livings among these developing Asian economies is examined by considering their variations w.r.t. the per capita incomes across these Asian countries and also over time. Further, these variations are measured from computation of standard deviations of per capital incomes across the Asian countries through different time points along with the standard deviations of other key economic factors. The relationship between variations in FDI and variations in per capita income is examined with an application of time series analysis, by controlling the variations in financial development Index, variations in Human Development Index (HDI), variations in infrastructures including IT infrastructures, and variations in other policy factors such as corporate taxes.

This is thought to help us to answer whether the variations in FDI inflows across these developing economies have any correspondence with their variations in per capita incomes of these developing Asian countries by controlling the variations in other important factors as already spelled out in the above. The study has largely relied on time series methods to investigate the above issue. It largely draws on the data from the WDI of the World Bank encompassing the period of pre-liberalization and post-liberalization phases from 1980 to 2014 and we also put period dummies for major economic changes or events like Asian economic crisis of 1997-98 which may likely to cause major economic changes for these economies as whole and these should get reflected from the trends of broad set of macro performance variables.

Using the principal component analysis, a composite index such as infrastructural development index of countries, which is thought to be very crucial for promoting the per capita income growth rates of countries and therefore regional variations in per capita income levels was constructed and incorporated. Similar consideration has also gone into the construction of the HDI for these countries, along with incorporating the characteristics of financial markets of these countries which is represented in real interest rate movements of commercial banks.

In keeping with the regional policy perspective in mind, this study makes an initial attempt as this issue is not investigated so far in literature. Studies have only devoted to focus on for

individual countries, i.e. the FDI inflows into these countries and whether those have resulted in regional disparities across different regions or provinces within the individual countries. Or at best, the studies have tried to link up the foreign direct investment inflows into individual countries or groups of countries with their GDPs/per capita GDPs/growth rates[1]. Therefore, by attempting to verify the above issue, the study makes an initial effort of its first kind in the literature. Finally, the study presents econometric results crucially for concluding some key policy recommendations for the Asian economies under consideration.

A Brief Review of literature

The theory argues two contrasting income effects of FDI inflows that can lead to exacerbation of income inequality within countries, and even between the countries that those who receive more and receive least FDI inflows. On the one hand FDI can exacerbate income differentials by raising wages in recipient sectors of the host economy. This is in line with the dependency theory of FDI which views foreign control as an instrument for impoverishing the host countries, creating employment opportunities for those economic elite agents, which in turn would pose a high opportunity cost for the economy as a whole, increasing capital intensity (even by extracting and exploiting the capital and natural resources of the host countries), raising unemployment in the traditional sectors and consequently, exacerbating income differentials (Bornschier and Chase Dunn 1985).[2] This gives rise to the proposition that the country which would receive more FDI inflows would experience an economic decline comparing the country which would not receive FDI inflows. Thereby, it would create income inequality among the high FDI receiving countries and other countries whether they receive less or no FDI.

By contrast, FDI can be conceived as to stimulate growth and employment in the host countries that serve to narrow the income gaps with developed countries but will experience higher economic growth comparing similar developing economies which will not receive or receive less of FDI inflows. This conforms to the modernist theory of FDI which highlights the importance of diffusion of knowledge and technology associated with FDI and that in the long-run, it can lead to a higher income (Figinia and Gorg 2011) of the host countries.[3] FDI is considered as a conduit for transferring new technologies and skills and upgrading local capacity. This is typically the FDI inflows into developed host countries.

Another alternative view bases on the argument that since FDI activity are oriented towards more skill intensive than the local domestic activity, it would thereby generate increased

[1] In connection with such relationships already investigated in the literature, as a prelude we have also investigated the relationship between the FDI inflows into these 11 Asian economies and GDP in levels/GDP growth rates/per capita GDP at levels, carrying out a panel system GMM estimation analysis, we also observed that there is a strong influence of FDI inflows on the latter variables. The results are not reproduced for sake of brevity. However, it can be presented on request.

[2] Rich states transferring and extracting resources from poorer and more nascent economies, making wealthy countries wealthier and poor countries poorer.

[3] The presence of a foreign firm in a country creates an arena where knowledge and technology can be exchanged. The trade of skills and methods enable the host country to take a leap forward towards a more rapid path of economic growth and development. This transfer of knowledge and technology also contributes to the improvement and expansion of human capital in the host country, by encouraging education and "learning by doing" in advanced and innovative surroundings. FDI boosts up the productivity of labour force in a country, by implementing techniques and machineries proven to function well in the production processes in the investors' domestic firms. In addition to these firms being more capital intensive, they are in control newer technology and high-skilled workers. Thus, FDI supports the economic growth and development which is necessary for reducing the inequality and poverty reduction.

income inequality by increasing the demand for skilled labor (Taylor and Driffield 2005). Once it opens up the demands for the skilled labor, it would change the host country by inducing to produce more skilled educated human capital which would contribute towards the productivity and wage differences in the host country comparing the country which does not receive greater amount of FDI inflows. The endowment-driven theoretical North-South models of Feenstra and Hanson (1997) also predicted greater income inequality in the host countries as FDI raises the skill premium.
For developing countries, Figinia and Gorg (2011) developed a two stage non-linear model where FDI initially accentuates inequality between skilled and unskilled workers through the introduction of advanced technology. In the second stage, domestic capacity begins to imitate the production technologies introduced by FDI and then the gap between those workers gets closer. Thus FDI has a Williamson type inverted-U effect on equality in developing countries. But this would add to the regional inequality as the country which receives larger flows of FDI progresses rapidly.

The studies relating to particular contexts such as India, Brazil and Indonesia, have highlighted the fact that high levels of spatial concentration in the flows of FDI has led to a direct relationship between inward FDI and regional disparities (Sjoholm 1999, Daumal 2010). China has been the focus of many empirical studies relating to the FDI and regional inequality (Zhang and Zhang 2003, Fu 2004). The studies show that Chinese economic growth over the last two decades was fueled by FDI and accompanied by widening regional gaps. However, when it relates to the issue of whether FDI inherently causes these disparities or they are a result of the uneven distribution of FDI, is unclear (Wei et al 2009). This may be on account of quality of the data, the studies fail to establish the direct relationship between the FDI inflows received in different geographies within a country and with their per capita incomes within the same country.

The empirical evidence with respect to the effect of FDI on domestic income inequality takes an inconclusive position as is revealed in various theoretical and empirical models. For individual countries, FDI intensity is shown to be negatively related to income equality. This is true for both developed countries (Taylor and Driffield 2004) and developing countries (Feenstra and Hanson 1997). However, these existing studies are different from the present study as the present study compares the effect of variation in FDI inflows whether that has contributed to the variation in per capita incomes among the groups of developing countries in the Asian region.

Röller and Waverman (2001) assessed the impact of telecommunications on economic development. Hoffmann (2003) considers single indicators – international telephone circuits, the total length of roads and the number of aircraft departures – to investigate the relationship between public infrastructure and international capital flows. PCA provided a natural way of assigning weights to different indicators within an aggregate index. Kumar (2006) and Francois and Manchin (2013) used PCA in a panel context. However, employing PCA in a panel context tended to unduly restrict the set of countries and the data series that could be included in the analysis. Any gap in the data series would have the effect that the constructed indices were no longer comparable over time. Kumar (2006) employs PCA to assess the effects of infrastructure on FDI. His PCA is based on just six specific indicators of road transport indicators, telecommunication, information, and energy. Francois and Manchin (2013) rely exclusively on

road and air transport and some indicators of telecommunication in their analysis of the effects of infrastructure and institutions on trade patterns.

Vijl and Wagner (2012) employ PCA in a purely cross -section analysis on aid, infrastructure and trade. Calderón and Servén (2014) circumvent this PCA-related problem by using 5 year averages of all the data in their study of the impact of infrastructure on economic growth and income distribution. While a balanced dataset may be created in this way, the downside is a loss of information concerning the variation over time. From this it can be summarized that both theory and empirics do not give clear cut insights about the effects of FDI on regional inequality among the developing host countries. However, it can be argued that FDI can both exacerbate income differentials and close income gaps depending on the levels and nature of inflows of FDI across countries. This requires empirical investigation for the Asian region which has been under much discussion for the inflows of FDI. Regional inequalities can be conceived as a result of FDI locational choices, and FDI spatial behavior can be interpreted as a result of regional disparities. This study does not analyse the nature of FDIs which requires a specific separate study. Rather it analyses the role of FDI in regional variations in per capita incomes at a broader regional level.

Binder and Pesaran (1999) argue that in the long run, the evolution of per-capita output is majorly determined by technological factors. The endogenous growth models also predict that per-capita output follows a stochastic trend where certain policy changes (i.e. productive public-investment decisions) may have long-run consequences for the level of output (Jones, 1995 & Kocherlakota and Yi, 1996). Reviewing the broad set of theoretical and empirical literatures, we specify the growth model below by relating to the per capita income and FDI inflows along with other key variables for bringing out an understanding on the relationship in the context of a group of developing Asian economies.

An Empirical Model of Regional Per Capita Income Differences

The model considered for purpose of establishing the relationship between regional per capita income differences and FDI in our study, can be represented as follows:

$$Percapincome\,\mathrm{var}_t = b_0 \inf raindex\,\mathrm{var}_t + b_1 FDI \inf lows\,\mathrm{var}_t + b_2 eduachiev\,\mathrm{var}_t + b_3 \mathrm{int}\, rest\, rate\,\mathrm{var}_t + u_t \quad (1)$$

Where, the variance of percapita income (percapincome var) in the above model is defined as a function of variance of infrastructure index (infraindex var), variance of FDI inflows (FDI inflows var), variance of educational achievements (edu achieve) and variance of interest rate (interestrate var) on commercial bank lending rates. However, these variables are relabeled with only minor modification later while discussing the empirical result for sake of convenience in identifying them along with using them in their logarithmic values.

The per capita income is likely to be directly related to all the variables in the model (1) except the interest rate on commercial bank lending rate. The rate of interest rate is likely to determine the private investment which in turn is a key factor to influence the per cap income of countries

as well as this is a monetary policy or financial channel variable which is likely to be linked up with most of the key macro variables in every economy.

Data and Variable Descriptions

We have considered middle and low income countries' variations in the per capita incomes as to understand whether variations in foreign direct investment (FDI) or ICT and other infrastructures along with educational attainments are the factors which could explain the variations in economic performances of eleven Asian economies such as Bangladesh, India, Indonesia, China, Thailand, Malaysia, Philippines, Sri Lanka, Nepal, Pakistan, Vietnam. Since there are different types of infrastructures such as ICT (like internet, mobile and landline) and physical infrastructures (including transport infrastructures like rail lines, airplane carriers) and including all of those infrastructures individually would involve consuming significant degrees of freedom in the empirical estimation, therefore, we have constituted a combined index of infrastructure through principal component analysis. The infrastructure index constructed is by a composite of fixed telephone subscriptions (per 100 people), mobile cellular subscriptions (per 100 people), internet users (per 100 people), electric power consumption (kWh per million population), air transport registered carrier departures worldwide (per million). The interest rates on Commercial bank deposits, foreign direct investments are taken in real terms by deflating with respect to GDP implicit deflators.[4] The educational attainment index is further worked out from the composite of gross enrollment ratio at the primary level for both sexes (%) and gross enrollment ratio at the tertiary level for both sexes (%) on the basis of principal component analysis. We have also checked the individual importance of these educational variables in causing variations in economic performance of these Asian economies.

Application of Econometric Methodology

The study models the regional variations in economic growth from the variance of per capita incomes across a set of Asian countries and across same time period but over different time points and attempts to explore whether variances in FDI inflows at different time points along with the variances in infrastructural development and educational achievements and interest rates are the factors which could explain such variances in per capita incomes for a set of developing countries within Asian region. We examined the time series properties of the variables and tried to apply relevant econometrics methodology. Since the unit root test results suggests the mixed order of variables present in the considered model, therefore, the study applies ARDL to cointegration approach as an appropriate basic estimational technique. Then the robustness of results are judged by conducting Hansen's cointegration technique along with estimating the parameters of the per capita variation equation through the application of Fully Modified Ordinary Least Square(FMOLS) procedure along with using Dynamic Ordinary Least Square (DOLS) estimation as appropriate estimation techniques after observing presence of cointegrating vectors from single equation methods. Since all of the variables are in variances, therefore, we also examined the ARCH and GARCH effects present in the model. After finding existence of cointegration in the model, we estimate the ARCH and GARCH effects along with

[4] Corporate tax revenue to GDP along with easy of doing business in countries could not be incorporated due to lack of availability of data in some periods corresponding to our period of analysis. We had also incorporated the variations of credit to GDP ratio and broad money supply to GDP ratio as to capture the differences in financial market development of these countries.

carrying out the variance decomposition and impulse response analysis of the VAR model. This is done in order to arrive at some concrete inference on the relationship between per capita income and foreign direct investment in the Asian region.

Econometric Result Discussion

As already stated in the above section, before estimating our regional per capita income difference model, we carried out to check the usual stationary properties of all the series to be used in the estimating equation. The test results suggest that most of the variables are non-stationary in their levels but found to be stationary after their first differences. Therefore, it could be concluded that they are all first order differenced stationary variables i.e. I(1) variables. After finding out all the variables included in our growth model are I(1), next stage is to estimate the per capita income difference model through the use of some appropriate time series techniques.

Since all the variables are measured in their variances, therefore, we attempted to estimate the model through ARCH and GARCH modeling procedures, besides using some appropriate time series procedures. This means that the ARCH and GARCH methodology is recoursed here as a secondary exercise as it is believed that since it involves the use of annual data series which may not show much frequency in the pattern of their fluctuations. Therefore, we have tried to use more appropriate time series techniques. When we investigated the time series properties of the individual variables by conducting the unit root tests, it points out that there is a mixed order of integrated variables present in the per capital income variation model. Therefore, it suggest that ARDL model to cointegration approach may be an appropriate estimational strategy and then after we carry out a number of relevant models viz FMOLS and DOLS models which are familiar advanced time series models used in the econometric literature as to check the robustness of the results obtained based on our primary estimational econometric results.

The following Table 1 which produces the traditional based unit root test results(such as Dickey-Fuller and Augmented Dickey-Fuller and Phillips-Perron tests), it suggests that almost all of the variables except the real interest rate are non-stationary at their levels. However, the variables found to be non-stationary in their levels are observed to be first difference stationary. This implies that the estimated model contains a mixture of I(0) and I(1) variables.

Table 1: Unit root test results

	In Levels			In Differences		
Variables	DF	ADF	PP	DF	ADF	PP
lnRGDP Percap Var	-.33	-.23 (2)	-.27(2)	-5.30*	-5.30*(3)	-5.36*(2)
LnRFDI Variance	-2.50	-2.50(2)	-2.43(2)	-4.59*	-4.59*(2)	-4.95(2)*
lninfrastructure Var	-.58	-0.58(2)	-.57(3)	-5.09*	-5.09**(1)	-5.08*(3)
Lneducational attainment Var	-1.92	-2.64(3)	-2.68(3)	-5.72*	-5.72(3)***	-5.75(3)*
Lnrealinterest Rate Var	-3.99*	-4.06(3)*	-4.05(3)*			
Lnprimaryeducation Var	-1.10	-1.65(3)	-1.16(3)	-5.85*	-1.93(2)	-5.84(2)*
Lntertiary education Var	-.63	-1.20(3)	-0.42(3)	-4.38(2)*	-2.57(2)***	-4.35(2)*

Note: Ln initial to the variable name stands for natural logarithmic values of variables. RGDP per cap var – real per capita variance, RFDI Var – real FDI variance, infrastructure Var – infrastructure variance, educational attainment Var – educational attainment variance, realinterest rate var– real interest rate variance, primaryeducation Var – primary education variance, tertiary education Var – tertiary education Variance. Here var stands for variance of a variable computed for 11 countries with reference to different points of time and this is alternatively interpreted as variations while discussing the results.

At first we implemented single equation based cointegration procedure of Pesaran and Shin (2001) and then we go for the parameter instability test of Hansen. When we checked the presence of cointegration through the ARDL based bounds test, we found from the corresponding F-statistics of the model that the null of cointegration can be rejected at 5% level confirming that there is presence of cointegration. Then we report the long run parameters and short run parameters with the use of ARDL based cointegration test. Further in order to check the robustness of cointegration results, we conducted Hansen's parameter instability test and the test statistics based on it (as reflected from its Lc statistic reported in Table 2) suggests that the null of parameter instability is rejected in favour of the alternative that there is presence of cointegration considering the per capita income variance as the dependent variable in our model. After confirming to Hansen's test results, we estimate the parameter of the model through FMOLS and DOLS which can supplement to our basic results derived with ARDL to cointegration results.

The long run results derived from the ARDL to cointegration suggests that all of the variables incorporated are quite significant in explaining the variance of regional per capita income within the Asian region. Although the variation in educational achievement has the maximum dominant explanatory power, but the sign of its coefficient is surprisingly negative along with the interest rate parameter. Among the other two variables, it is the variation in infrastructure index, which is positively and dominantly contributes to explaining the variation in per capita incomes and then the FDI inflows which explain the variation in per capita incomes.

The results reflect that although the variances of the ICT infrastructures positively explains the variances of the per capita GDP of the Asian countries, apart that the variance of Foreign Direct Investment (FDI) inflows have emerged as a critical and positive determinant of variances of per capita income for the Asian countries. Further, although educational attainment seems to greatly matters in explaining the regional variations in per capita incomes but its sign needs to be interpreted most carefully as this may indicate that when there are greater variances in the educational attainment of population among these Asian countries, the variances of per capita income is lesser. This could alternatively imply that the presence of variances in the educational achievements might not be an important or significant contributing factor leading to the variances of the growth process of these economies. This could be due to the mass migration of skilled workers from these countries and thereby leaving these economies with unskilled and semi skilled workers, which causes little or insignificant variations in the growth of per capita incomes of these countries. This is a key and startling result for the policy for the Asian region. The negative sign of interest rate has almost similar implication which means that given that interest rate differences are very narrow, with increase in their differences at the margin may not have much implication for the per capita variation in the Asian region.

The results from FMOLS and DOLS almost present similar results for FDI and infrastructure variances along with the coefficients of variances of educational attainment and interest rates influencing the per capita income except some minor differences. Thus, It shows that the variances of FDI, and infrastructures cause significant positive variations in the variance of per capita incomes across the Asian countries. Variance in the educational attainment contributes to negative variation in the variances of per capita incomes among Asian countries.[5] This confirms that variation in infrastructure and FDI inflows matter for the differences in the per capita incomes among the Asian countries.

Table 2: Long run Estimates from ARDL based Cointegration Test

Dependent / Independent variables	LRGDP per capita Dispersion ARDL(1, 1, 1, 1, 1)	LRGDP per capita Dispersion (FMOLS)	LRGDP per capita Dispersion (DOLS)
Lnrfdi Dispersion	0.068***	0.0525*	0.020*
Lnreal Interest Rate Dispersion	-0.082*	-0.0139	-0.048*
Linfrastructure Dispersion	0.729*	0.775*	0.892*
Lneducational Attainment Dispersion	-0.836*	-0.643*	-1.091*
C	11.5685*	12.01*	13.46*
Adjusted R-squared	.73	.98	.994
F test	3.68**		
LC statistic (Hansen's Parameter Instability)		2.49*	

Note: The tabulated F-test statistics on the lagged coefficient of the explanatory variables in the above ECM equation exceeds the critical values at 5% level. The value ranges from 2.56 to 3.49.

The ECM coefficient from the following Table 2 supplements the above long run relationship in the model as ECM has a relevant correct negative sign. The ECM term shows that 56 percent of the deviations from the long run equilibrium is adjusted in the short-run. That means it takes almost 2 years for the full adjustment if there is any short run deviations from the long run equilibrium position. In the short run, the variations in infrastructure and FDI inflows positively influence the variation in per capita incomes. The variation of interest rate reduces the variations in per capita incomes.

Table 2: Short run Estimates based on ARDL to Cointegration Approach

Dependent / Independent variables	LRGDP per capita Dispersion
Lnrfdi Dispersion	0.057**
Lnreal Interest Rate Dispersion	-0.029*

[5] In place of using this composite educational achievement when we used separate educational variables (representing primary and tertiary educational achievements), it does not change our basic results. We also tried to augment the given model with incorporation of domestic private investment as a proportion to GDP as well as financial sector development indicator (like broad money supply and alternatively bank credit to GDP ratio), but these indicators turn out to be insignificant. Therefore, we do not report the results incorporating these variables in the model.

Linfrastructure Dispersion	0.752*
Lneducational Attainment Dispersion	0.098
C	7.42*
ECM(-1)	-.562*

Results from GARCH model

Since the model is about establishing the relationships between the variations of the dependent variable and explanatory variable and the econometrics literature suggest the application of ARCH-GARCH modeling as the relevant modeling strategy, therefore if we find ARCH and GARCH effects, we interpret the coefficients of our basic model in order to examine whether it supports the results obtained from the previous long run estimates. Since the model under consideration is a cointegratiing model, therefore, the regression results based on level variables are likely to provide consistent parameters. At first the variance equation of the model confirms that there is a presence of ARCH-GARCH effect. This is also shown in Graph 1 in the appendix. Now we can analyze the estimated parameters from the mean equation presented in the upper portion of the Table 3. It almost yields similar results on the key variables of our focus that the variation of infrastructure index is positively and dominantly explaining the variations in per capita incomes along with the FDI inflows. The variation in interest rate is found to be insignificant with the change of estimation technique, although our basic results remain consistent. The educational achievement variable is negatively related with the variance of per capita incomes of the Asian region. This proves that our key results remain consistent whatever the estimational strategy that we adopt.

Table 3: Results from M-GARCH models

Dependent / Independent variables	LRGDP per capita Dispersion
Lnrfdi Dispersion	0.055*
Lnreal Interest Rate Dispersion	-0.016
Linfrastructure Dispersion	0.762*
Lneducational Attainment Dispersion	-0.462*
C	11.88*
Variance Equation(GARCH = C(1) + C(2)*RESID(-1)^2 + C(3)*GARCH(-1))	
C	0.001***
RESID(-1)^2	-0.231*
GARCH(-1)	0.872*

Furthermore, in keeping with the policy perspective in mind and in order to reinforce the above results, we have also carried out the variance decomposition and impulse responses analysis of VAR on the same model. In the following, we analyse not only the response of variance of the real GDP to any shocks on FDI inflows and other variables but also one examine whether there is also effect in the opposite directions. The variance decomposition analysis of VAR shows that

the variation in the variance of infrastructure index and interest rate and to some extent the per capita income of the countries matter in explaining the variation in the variance of the real foreign direct investment(RFDI). When it comes to decomposition of the variance in the variation of the per capita GDP, it is the variance of all the variables such as variation in the real foreign direct investment (RFDI) inflows, infrastructure index, and educational attainment explain the maximum variations.

Table 4: Variance Decomposition results from VAR

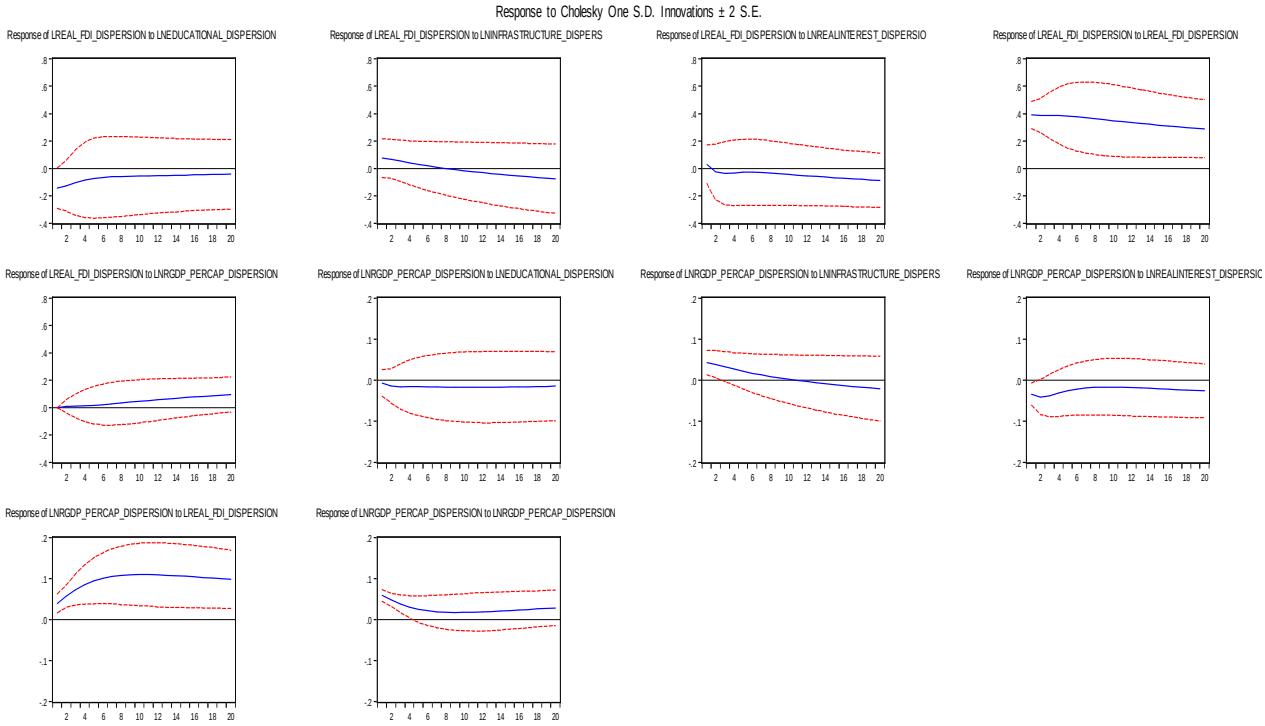
Variance Decomposition of LNRFDI DISPERSION:					
Period	Lneducational Attainment Dsipersion	Linfrastru cture dispersion	Lnreal Interest Rate Dispersion	Lnrfdi Dispersion	Lnrgdp Percapita Dispersion
1	11.72048	3.080836	0.474027	84.72466	0.000000
2	10.73900	2.887345	0.451644	85.90694	0.015066
3	9.435854	2.533230	0.571816	87.43125	0.027848
4	8.303112	2.173473	0.603347	88.87757	0.042502
5	7.419431	1.860792	0.597403	90.05742	0.064953
6	6.748975	1.605679	0.591449	90.95367	0.100231
8	5.842386	1.250555	0.630668	92.05412	0.222269
12	4.868003	1.006476	0.963848	92.46899	0.692687
15	4.429422	1.126262	1.394800	91.82770	1.221811
20	3.909747	1.739445	2.337179	89.66373	2.349900
Variance Decomposition of LNRGDP PERCAPITA DISPERSION:					
Period	Lneducationa l Attainment Dispersion	Linfrastruct ure Dispersion	Lnreal Interest Rate Dispersion	Lnrfdi Dispersion	Lnrgdp Percapita Dispersion
1	0.607464	22.56526	14.65343	18.95527	43.21857
2	1.551392	19.38494	17.13162	28.10852	33.82353
3	1.960872	16.45625	16.49206	37.99448	27.09634
4	2.103591	13.85944	14.70662	47.23416	22.09618
5	2.145082	11.65331	12.77836	55.08413	18.33913
6	2.158148	9.841512	11.08650	61.40257	15.51127
8	2.182699	7.217412	8.631269	70.21818	11.75044
12	2.239317	4.505965	6.235901	78.80894	8.209875
15	2.246324	3.662261	5.556173	81.38429	7.150957
20	2.193214	3.377396	5.392731	82.32183	6.714833
Cholesky Ordering: Lneducational Attainment Dispersion, Linfrastructure Dispersion, Lnreal Interest Rate Dispersion, Lnrfdi Dispersion, Lnrgdp Percapita Dispersion					

Analyzing the impulse response results from Figure 1, it shows that the shocks in the variance of educational attainment negatively and marginally explains the variance in foreign direct investment (FDI) as we had observed similar relationships from the previous results already noted. This may be because of the fact that there is exodus of educated and skilled labour forces from the Asian region along with mass exodus of unskilled workers also, as a result, the variances of educational attainment is not quite important or less significant for the variances of the real FDI in the region. The shocks in the variance of the infrastructure although positively

influence the variations in FDI inflows but it is of less significance. The variance of real interest rate of commercial bank deposits negatively affects the variance of FDI. There exists narrow differences in interest rates in the Asian region but any variation in interest rates at the margin across the Asian region, it would scare the foreign investors to invest even in the most favored destination as it could indicate some elements of risks in investments and therefore the variance of real foreign direct investment is reduced among the Asian countries with interest rate disparity. The shock in the variance of Real FDI has positive influence on RFDI itself. The shock in the variance of the per capita income has positive influence on RFDI.

When it comes to factors explaining the variances of per capita GDP in the given model, it is seen that the shocks in educational attainment have negative influence on per capita GDP. The shocks in the variance in infrastructure index have a positive influence on per capita GDP while the shocks in real interest rate have negative influence on the real per capita GDP. The shocks in RFDI have a positive and dominant impact on real per capita GDP, including its own shock which also yields a positive response on real per capita GDP.

Figure 1: Impulse Response Result Analysis



From the above results discussed, it shows that two factors are critical for the regional differences in per capita incomes among the developing countries under discussion. Those two factors are variations in infrastructure and the FDI inflows. When it comes to explaining the variations in FDI inflows, it is the per capital income variation which is quite crucial or significant.

Concluding Remarks

The present paper tried to explain whether variance of per capita income or regional inequality could be explained due to variances in FDI inflows along with variance of other key factors such as interest rates to capture financial development, infrastructure index which comprised of a composite index of physical and ICT infrastructures and also educational achievements. We found that the variance of interest rates and educational achievements mostly negatively explain the variances in per capita incomes which indirectly may imply that they contribute less to the variance of per capita incomes or they do matter only at the margin in explaining the variation of per capita incomes. However, the variance of FDI and infrastructure index (basically a composite of physical and information related technologies), both have contributed positively and significantly in explaining the variances in per capita incomes across a group of middle and poor Asian economies considered in the study.

Thus the present study reinforces the conclusion that foreign direct investment (FDI) and infrastructures are critical to the growth and development of the Asian economies and so also contribute to the regional variations in the Asian economies. Since some of these countries are growing at a faster rate even though they are growing from a low per capita income base, therefore, the countries should make massive investment expenditures on critical infrastructures so as to attract foreign investment and achieve higher economic growth rates.

The study also suggests that human capital development is not so a significant factor in their per capita income of these Asian countries, which is contrary to many other studies carried out for the advanced countries. This suggests that skilled human capital might be moving out of these regions due to lack of ample opportunities for the skilled labour forces and absence of conducive work environment. Ultimately these economies are left with massive unskilled labour forces which contribute to lower productivity and lower per capita incomes. The countries have to work towards retaining the skilled labour forces, which would raise their productivity and level of income and hence share of each individual in the total income. This also points out massive infrastructural investment requirement in these economies. Given the fact that most of these economies are facing scarce fiscal resources on account of low revenue productivity (as reflected in Figure 3) comparing with the OECD countries' average, it requires the cooperation of both the government and non-government entities including the support of the private sector to massively fund in areas of the critical infrastructures necessary for economic development and upliftment of economies from low per capita income traps of a vast segment of their total population. This incredible result is verified and confirmed by employing different time series methodologies and therefore, the result seems to be conclusive or it remains invariable to any change of estimational techniques.

Nevertheless, this study also gives some directions for future research which will be useful for policy perspective. The model employed in the paper can be replicated for studying the regional variations in the pattern of economic development within the African region, why most of these countries in the region are not able to attract inflows of FDI despite so much of money is poured into this region by international organizations, which would give an understanding on what contributes to the regional differences in per capita incomes of this region. On the basis of estimated results if policy would be taken in that direction, the problem can be addressed most

effectively which would contribute to a balanced growth of the region. This analysis can also be carried out by employing panel data with time series dimensions. As far as individual countries are concerned, one can also attempt studying whether levels of FDI inflows received by individual countries cause variations or fluctuations in per capita incomes across those countries in a panel for the Asian region.

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Figure 1: GDP Per Capita of a Group of 11 Asian Economies (at constant prices of 2010 in US $)

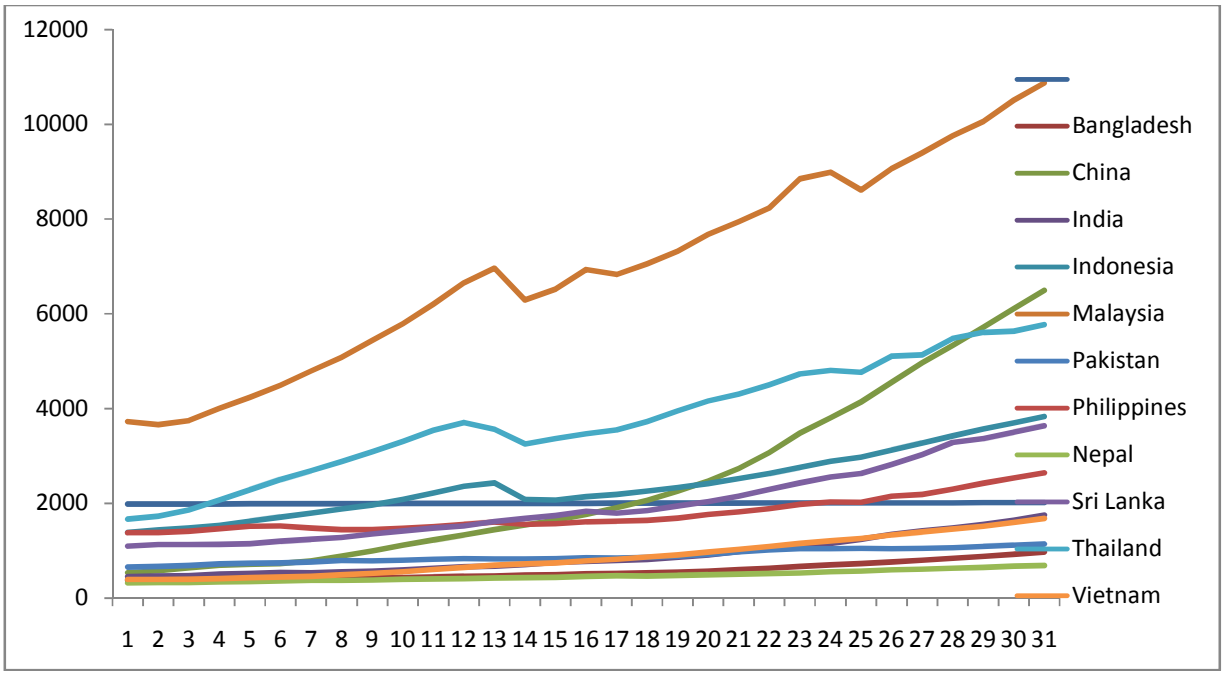

Figure 2: FDI (net inflows) to GDP among a Group of 11 Asian Economies (in percent)

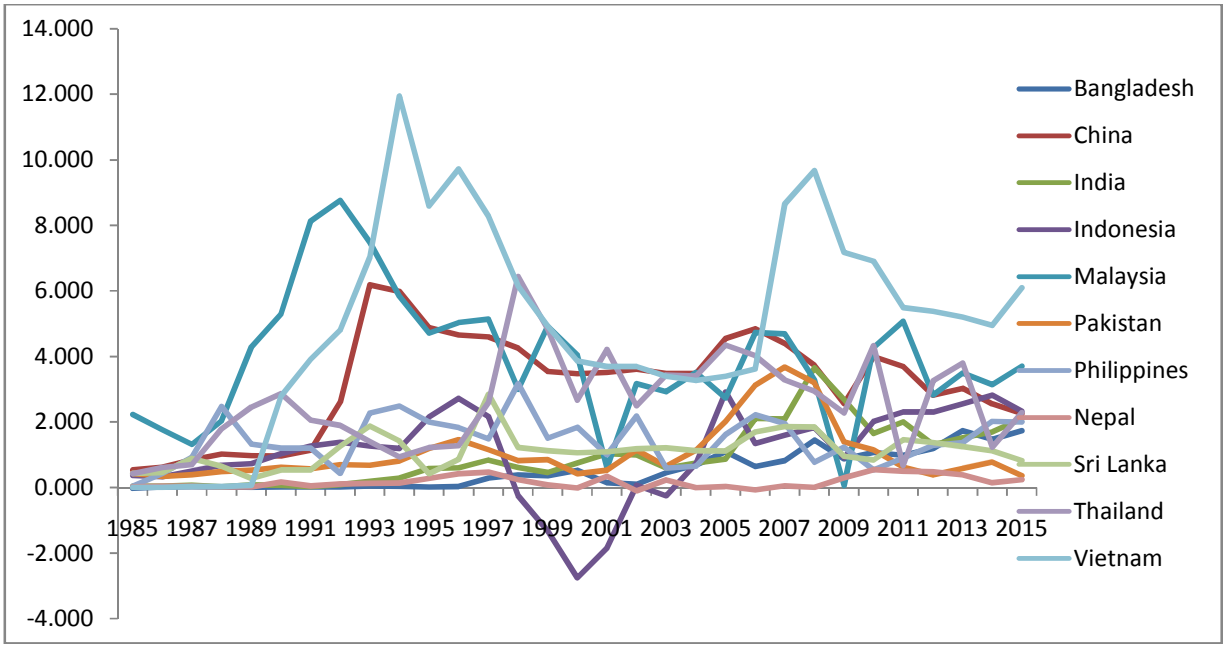

Figure 3: Total Tax Revenue to GDP across a group of 11 Economies in Asia

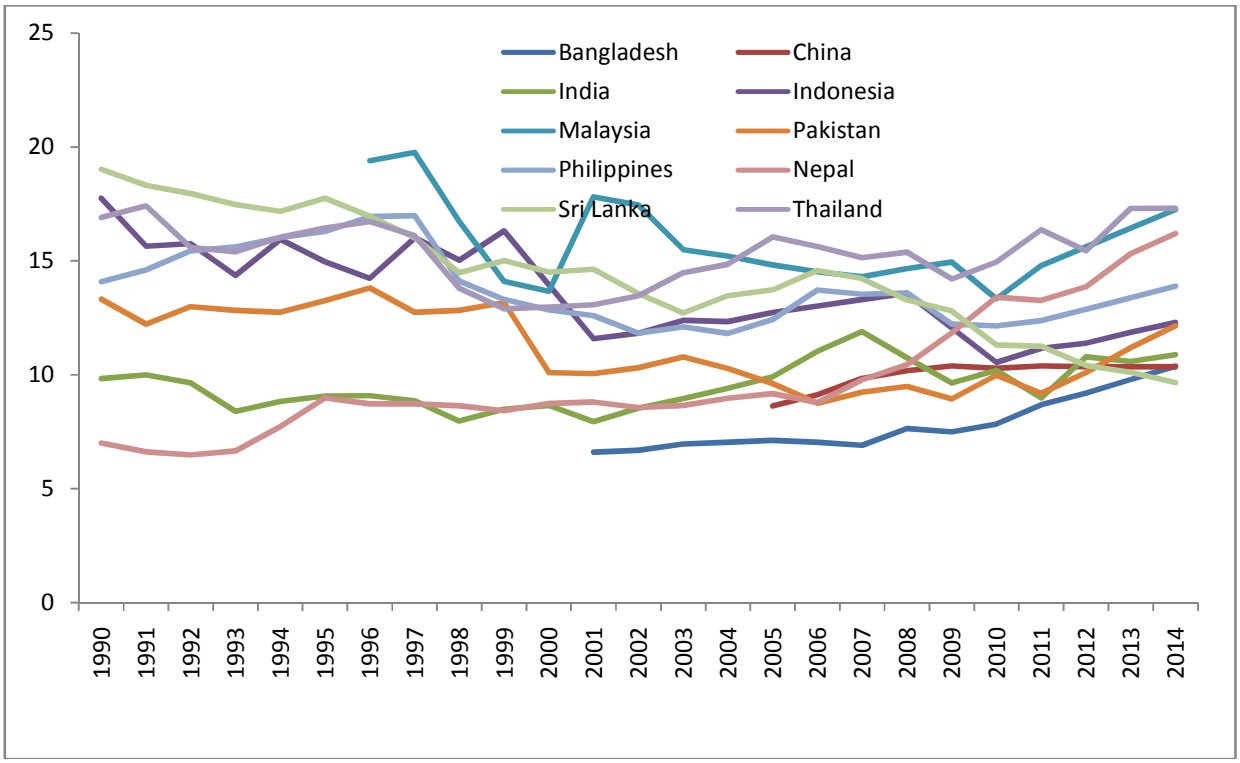

Figure 4: Real Growth Rate of GDP (Constant 2010 USD$)

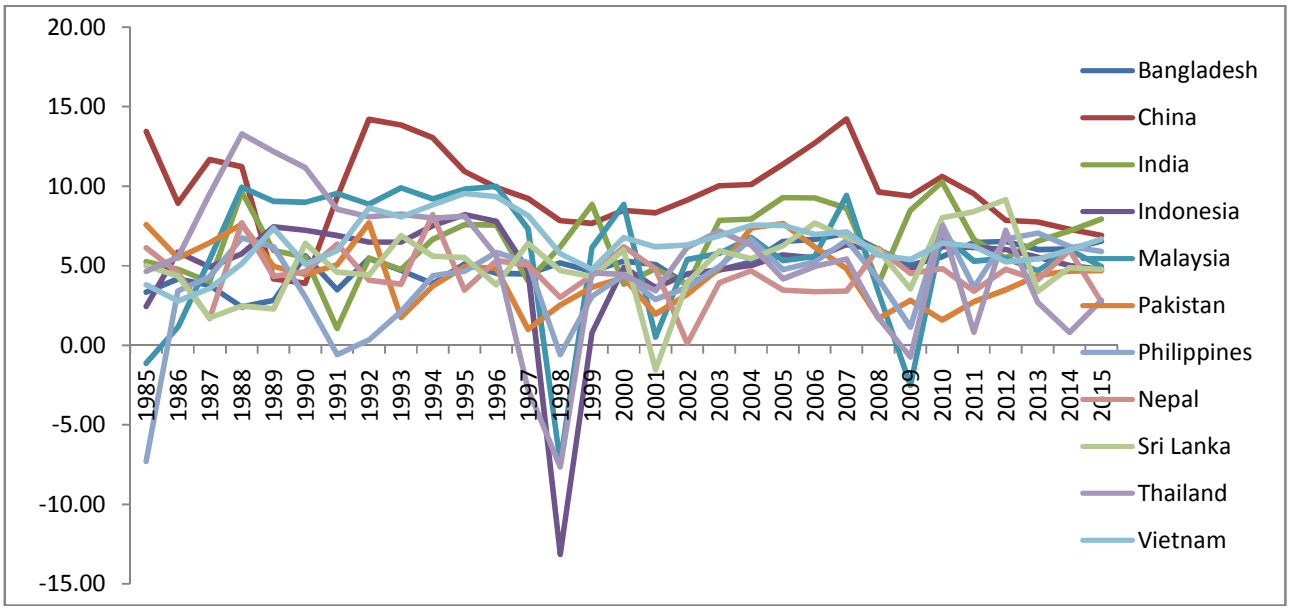

Figure 5: FDI inflows as a percentage to Domestic gross Capital formation of Asian countries

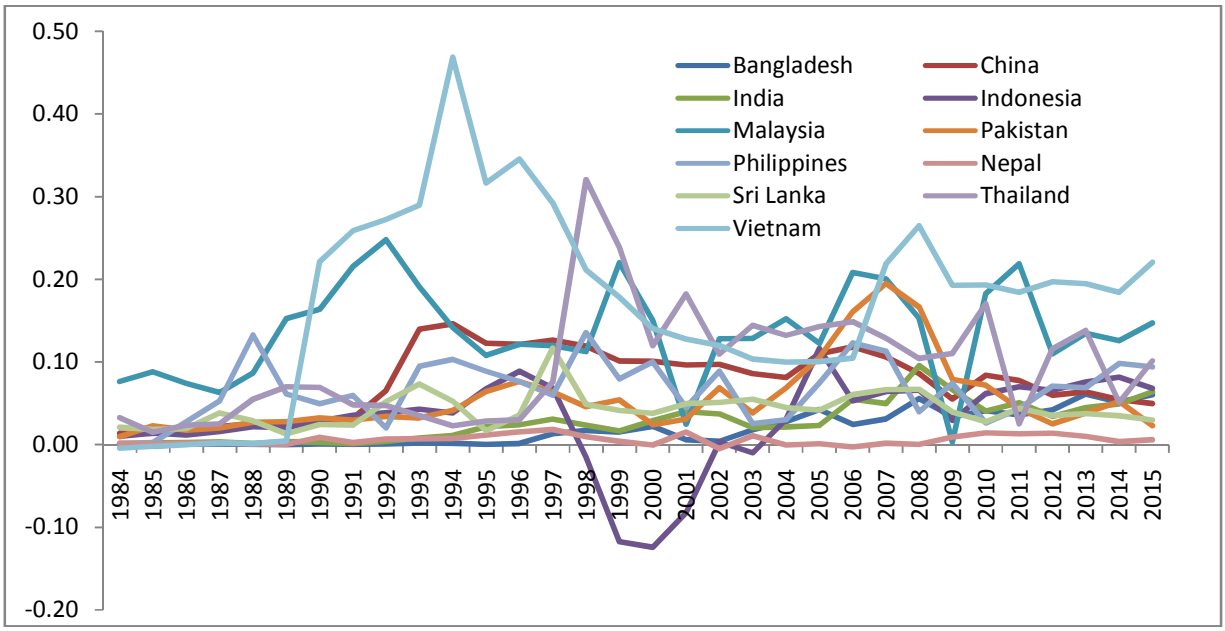

Figure 6: Conditional Standard Deviation derived from GARCH estimation based on Equation 1

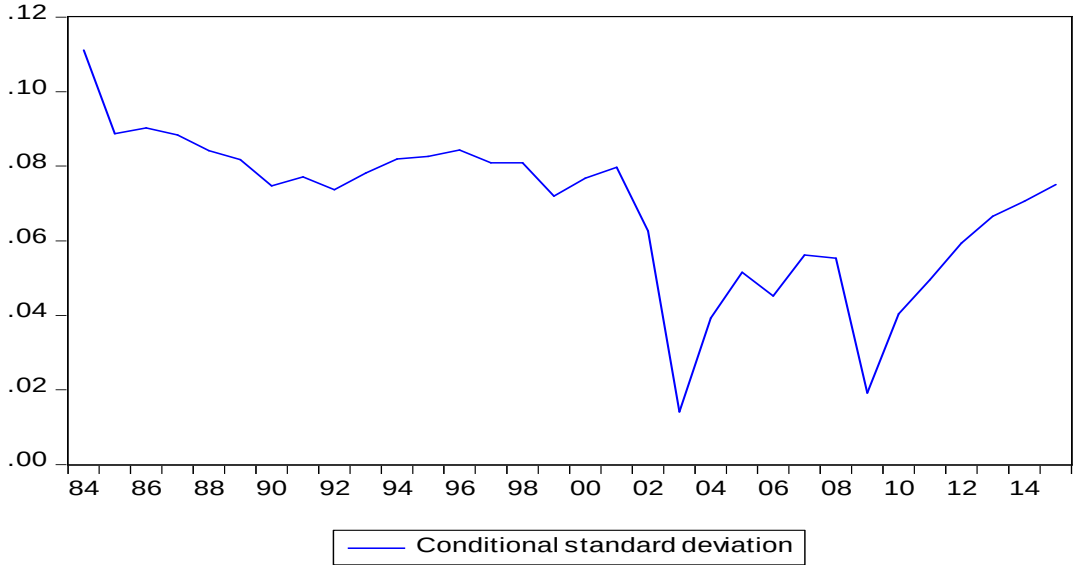

Figure 7: Conditional Variance derived from GARCH estimation based on Equation 1