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## Foreign Aid, FDI, Economic Freedom and Economic Growth in Asian Countries

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## Abstract

This study examines the effectiveness of foreign aid, foreign direct investment, and economic freedom for selected 28 Asian countries in a panel framework. The model includes foreign aid, foreign direct investment, economic freedom, labor force, and capital stock. The estimation procedure was carried out on pooled annual time series data for the period 1998-2007. For the purpose of analysis, we used static and dynamic panel data techniques. The results indicated that an increase in the fiscal freedom, financial freedom and domestic capital stock were significant factors positively affecting economic growth. Freedom from corruption, inflow of foreign direct investment and foreign aid were significant factors negatively affecting economic growth. Further, we found that life expectancy played a significant and positive role in economic growth. Foreign aid had a non-linear impact (negative impact of high aid flows) upon economic growth.

**KEYWORDS:** foreign aid, economic growth, panel data, generalized method of moments

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## 1. Introduction

There are numerous studies that have studied the relationship of economic growth with foreign aid, economic growth along with foreign direct investment (FDI) and economic growth along with economic freedom (openness), by the use of time series or panel framework of analysis. However, these studies got conflicting results, both in terms of significance and in terms of the direction of impact. This paper attempts to measure the impact of foreign aid, FDI, and economic freedom on the economic growth by incorporating all the three variables together at the macro level in the case of Asian countries in the panel framework.

The study attempts to find out if foreign aid, FDI, and economic freedom determine economic growth for Asian countries. Interestingly, the study finds that fiscal freedom, financial freedom, and stock of domestic capital had a positive effect upon the economic growth in these countries. However, freedom from corruption, inflow of foreign direct investment and foreign aid were significant factors negatively affecting economic growth for the panel countries. Perhaps the most interesting finding was the negative impact of high foreign aid inflow on the economic growth of Asian countries.

The studies investigating the linkage between economic freedom and economic growth found a positive impact of various measures of economic freedom on economic growth (Ali and Crain, 2001, 2002; Barro, 1997; Dawson, 1998; De Haan and Siermann, 1998; De Haan and Sturm, 2000; Heckelman and Stroup, 2000). Cole (2003) concluded that "...economic freedom is a significant factor in economic growth, regardless of the basic theoretical framework." Note that the concept globalization is very close to the concept of economic freedom – in general, studies find that globalization increases economic growth. However, deepness of economic freedom can have a negative impact, especially for developing economies, *ceteris paribus*. In this context, Gray (2000) pointed out that "the main mechanisms through which globalization affects development is through greater openness of international trade, greater mobility of financial assets and greater ease of the transfer of bundles of resources through foreign direct investment by multinational firms. The effects of deeper global integration (globalization) fall unevenly on developing countries."

As for as Foreign Direct Investment (FDI) is concerned, it is often argued that FDI has positive impact on the growth performance of the nation through various channels. For example, Trevino and Upadhyaya (2003) have argued that FDI stimulates economic development by complementing itself with the local economy of the host country. Additionally, Dunning (1993) and Borenzstein et al. (1998) have suggested that FDI can increase economic growth by encouraging the incorporation of new inputs and foreign technologies in the production function of the host country, while Mello (1999) has argued that FDI augments the level of

knowledge in the host country through training and skill acquisition among the labor force. Most of the empirical studies have supported the argument that FDI is growth enhancing for host nations. For instance, Borenzstein et al. (1998) analyzed the effect of FDI on economic growth for 69 developing countries over two decades. They found FDI to be an important vehicle for technology transfer and found that it contributed more to growth, as compared to domestic investment. However, they felt that FDI was more successful in enhancing economic growth for the countries where the level of education (a measure of absorptive capacity) was high. Similarly, Bosworth and Collins (1999) examined the effect of FDI in 58 developing countries of Asia, Africa, and Latin America during the period 1978-1995. They found that every one-dollar increase in capital inflow (of all types) was associated with a fifty-cent increase in domestic investment. However, FDI led to a one-to-one increase in domestic investment. Trevino and Upadhyaya (2003) used pooled time series data from five developing Asian countries and found that FDI made a positive contribution to economic growth; further, the impact of FDI on economic growth was more effective than that of foreign aid. However, Gorg and Greenaway (2004) have pointed out that FDI causes negative rather than positive spillovers in the case of transition economies. On a similar line, Findlay (1978) postulated that FDI increases the rate of technological progress in the host country through a “contagion” effect from the more advanced technology, management practices etc. used by the foreign firms. UNCTAD (1999) found that FDI either had a positive or negative impact on output, depending on the variables that are entered alongside it in the test equation. Ghosh and Wang (2009) using data from 25 OECD countries for the period 1980-2004 in a cross-country regression framework found that both inward and outward FDI positively contributed to economic growth in the OECD, and the impact of FDI on economic growth was moderate. Recently, Tiwari and Mutascu (2011) examined the linear and nonlinear impact of FDI and exports on economic growth in Asian countries in a panel framework for the period 1986-2008. They found that though both FDI and exports enhance the growth process, yet they suggested an export-led growth path especially in the initial stage of growth, followed by dependence on FDI in the later period, as a feasible option. Tiwari (2011) examined the impact of tourism receipts, exports, and FDI on economic growth on four Asian countries for the period 1995-2008. By employing Panel ordinary least squares estimation technique in log linear model, the study found that, tourism had a positive impact, while FDI had a negative impact on economic growth in four Asian countries. Further, Tiwari (2011) found that the impact of exports of goods and services on economic growth to be inconclusive. Clark et al. (2011) in their comprehensive survey reviewed FDI as a growth-determining factor. The study found that in general, though FDI lead to economic growth, it was not always true. FDI was found to be associated with positive technological

spillovers that are a development-retarding factor given that they cause an increase in income inequality.

On the role of foreign aid on economic growth and development, Morrissey (2001) pointed out that aid could contribute to economic growth through a number of mechanisms. For example, this could happen by increasing investment in physical and human capital, by increasing the capacity to import capital goods or technology, by not discouraging domestic investment or savings rates through indirect effect and by increasing the productivity of capital and promoting endogenous technical change in the case of aid linked technology transfer programs. Yet, after decades of capital transfers to developing countries, the effectiveness of foreign aid in achieving the objectives of economic development and increase in social welfare remains questionable. Many studies in empirical literature have tried to measure the effectiveness of aid on its predefined objectives. Earlier studies found the relationship between aid and growth to be inconclusive or no impact (Papanek, 1973; Voivodas, 1973; Mosley, 1980; Mosley et al., 1987; Boone, 1996; Jensen and Paldam, 2003). On one side, some studies suggest that the relation is positive (Papanek, 1972, 1973; Singh, 1985; Snyder, 1993; and Fayissa and El-Kaisy, 1999). On the other side, some studies found a negative association between aid and growth (Bauer, 1991; Knack, 2000; Gong and Zou, 2001). In between, however, are some others who argue about the role of economic policy in determining the effectiveness of foreign aid for the recipient country (Burnside and Dollar, 1997, 2000, 2004; Easterly et al., 2004; Murphy and Tresp, 2006; Dalgaard and Hansen, 2001). When focusing on the development / growth enhancing perspective of foreign aid, it was found that the results obtained differed according to the approach used in the analysis. Studies at the micro-level, mainly using cost-benefit analyses, supported the view of positive effectiveness of foreign aid on economic growth. In contrast, the findings of studies at the macro-level- especially ones based on cross-country analysis using panel data estimation technique- gave ambiguous results. This is what Mosley (1986) called micro-macro paradox. Mosley (1986) offered three explanations for this: the first deals with the inaccurate measurement in micro or macro studies (or both); the second looked into the fungibility of aid within the public sector, to see the possibility of diversion of aid from investment to consumption; third and final looked at the backwash effects from aid-financed activities that may adversely affect the private sector. In a recent study, Arndt et al. (2010) reexamined the micro-macro paradox and found that aid had a positive and statistically significant causal effect on growth over the long run. Hence, they pointed out that aid remains a key tool for enhancing the development prospects of poor countries. Tiwari and Kalita (2011) studied another dimension of how governance determines aid flow, in the case of 20 selected Asian countries. They found strong evidence of significantly positive impact of past year's aid flow and regulatory

quality on a current year's aid flow. This finding is particularly related to the persistence of aid flow hypothesis i.e., aid recipient will continue to receive the aid over a long period. It is interesting to note that in recent years there has been a significant increase in aid flows to developing countries, although other types of flows such as foreign direct investment and other private flows have been declining. Since 2001, aid to Africa has more than quadrupled, from \$1.3 billion to \$5.5 billion in FY2008. In the same period, aid to South and Central Asia has increased ten-fold, from \$205 million in FY2001 to nearly \$2.2 billion proposed for FY2008.

The next section presents the methodology. The estimation and analysis of the empirical findings are reported in section 3. Finally, section 4 reports the discussion of the findings and 5<sup>th</sup> section concludes.

## 2. Methodology, Variables description and Data

Suppose, the factors of production and the production technology determine the level of output in an economy which can be summarized as:

$$Y = f(K, L) \dots \dots \dots (1)$$

where Y denotes the output level (i.e., real GDP growth)<sup>1</sup>, K denotes the amount of capital (measured by Gross Capital Formation i.e., GCF), and L denotes the amount of labor (measured by total population i.e., POP). Assuming constant technology, any increase in the amount of labor and/or capital will increase the level of output in the economy. After adding foreign aid (NOD), Foreign Direct Investment (FDI) (measured by net inflow of foreign direct investment as a percentage of GDP) and economic freedom (EF) equation (1) can be written as:

$$Y = f(GCF, POP, NOD, FDI, EF) \dots \dots \dots (2)$$

The most commonly used ways of assessing the relationship between economic growth and its determinants is the static panel data models. There are three types of panel data models namely, a pooled Ordinary Least Square (OLS) regression, panel model with random effects and panel model with fixed effects. Considering the extended production function of equation (2), the specification of a pooled OLS regression can be written as follows:

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<sup>1</sup> Please see Table 1 of appendix 1 defining the variables measurement and data source.

$$Y_{it} = \beta_0 + \beta_1(EF_{it}) + \beta_2(FDI_{it}) + \beta_3(GCF_{it}) + \beta_4(NOD) + \beta_5(POP_{it}) + \varepsilon_{it}, \dots \dots \dots (3)$$

where  $i$  indexes countries,  $t$  indexes time and  $\varepsilon_{it}$  is the error term which is assumed to have a normal distribution and varies over both country and time.

Further, we have considered six measures of EF for the purpose of empirical analysis. The six measures used in the analysis are Investment Freedom (IF), Business Freedom (BF), Trade Freedom (TF), Financial Freedom (FinF), Freedom from Corruption (FC) and Fiscal Freedom (FisF)<sup>2</sup>. Each one of these freedoms is graded using a 0 to 100 scale, where 100 represent the maximum freedom and 0 represents minimum freedom. A score of 100 signifies an economic environment or set of policies that is most conducive to economic freedom and vice-versa. The grading scale is continuous, meaning that scores with decimals are also possible. Following the related literature to date, it is expected that, ceteris paribus, economic growth is an increasing function of each one of these economic freedom measures. Therefore, by incorporating these six measures of EF, equation (3) in expanded form can be written as:

$$Y_{it} = \beta_0 + \beta_1(BF_{it}) + \beta_2(FC_{it}) + \beta_3(FDI_{it}) + \beta_4(FinF_{it}) + \beta_5(FisF_{it}) + \beta_6(GCF_{it}) + \beta_7(IF_{it}) + \beta_8(NOD) + \beta_9(POP_{it}) + \beta_{10}(TF_{it}) + \varepsilon_{it}, \dots \dots \dots (4)$$

However, while using a pooled OLS regression, countries' unobservable individual effects are not controlled therefore; heterogeneity of the countries under consideration for analysis can influence measurements of the estimated parameters (Bevan and Danbolt, 2004). Further, using a panel data model with incorporation of individual effects has a number of benefits for example, among others; it allows us to account for individual heterogeneity. Indeed, developing countries differ in terms of their colonial history, their political regimes, their ideologies and religious affiliations, their geographical locations and climatic conditions etc. (Serrasqueiro and Nunes, 2008). And if this heterogeneity is not taken into account it will inevitably bias the results, no matter how large the sample is (Serrasqueiro and Nunes, 2008). Therefore, by incorporating countries' unobservable individual effects in equation (4) the model to be estimated is as follows:

$$Y_{it} = \beta_0 + \beta_1(BF_{it}) + \beta_2(FC_{it}) + \beta_3(FDI_{it}) + \beta_4(FinF_{it}) + \beta_5(FisF_{it}) + \beta_6(GCF_{it}) + \beta_7(IF_{it}) + \beta_8(NOD) + \beta_9(POP_{it}) + \beta_{10}(TF_{it}) + w_{it}, \dots \dots \dots (5)$$

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<sup>2</sup> To see the more detailed explanation of these variables, please refer to The Heritage Foundation's report of 2009 Index of Economic Freedom.

where  $w_{it} = \mu_i + \varepsilon_{it}$ , with  $\mu_i$  being countries' unobservable individual effects. The difference between a pooled OLS regression and a model considering unobservable individual effects lies precisely in  $\mu_i$ .

To test the relevance of unobservable individual effects we use the Breusch and Pagan's LM test. This tests the null hypothesis of irrelevance of unobservable individual effects, against the alternative hypothesis of relevance of unobservable individual effects. If the null hypothesis is not rejected this will imply that unobservable individual effects are not relevant, and therefore, a pooled OLS regression is an appropriate way of carrying out evaluation of growth determinants. On the contrary, if we reject the null hypothesis of irrelevance of unobservable individual effects, we can conclude that a pooled OLS regression is not the most appropriate way of carrying out analysis of the relationship between economic growth and its determinants i.e., unobservable individual effects are of relevance and should be incorporated in the analysis.

However, there may be correlation between countries' unobservable individual effects and growth determinants. If there is no correlation between countries' unobservable individual effects and growth determinants, the most appropriate way of carrying out analysis is using a panel model of random effects. On the contrary, if there is correlation between countries' individual effects and growth determinants, the most appropriate way of carrying out analysis is using a panel model of fixed effects. To test for the possible existence of correlation, we use the Hausman test. The Hausman test examines the null hypothesis of inexistence of correlation between unobservable individual effects and the growth determinants, against the alternative hypothesis of existence of correlation. If the null hypothesis is not rejected we can conclude that correlation is not relevant and therefore a panel model of random effects being the most correct way of carrying out the analysis of the relationship between economic growth and its determinants. On the contrary, if the null hypothesis is rejected we can conclude that correlation is relevant and therefore a panel model of fixed effects being the most appropriate way to carrying out analysis of the relationship between economic growth its determinants.

Further, it is important to mention that static panel (with or without fixed and random effects) models do not allow us to analyze the possible dynamism existing in country growth determinants. Most of the growth regression studies assume that foreign aid is an exogenous variable, even though aid is expected to be endogenous in growth regressions. In addition to that, foreign aid may present issues of reverse causality for example, if aid depends on the level of income, it will necessarily depend on economic growth, and if this kind of reverse causality is not taken into account, it can lead to serious inaccuracies in research results (Moreira, 2005). In such a situation, it is not only that the parameter estimates will be inconsistent (because error term of the growth equation may include factors



that both affect growth and are correlated with aid) but also the magnitude and the meaning of the aid parameter will be altered as well. Therefore, we also employed Arellano and Bond's Generalized Method of Moments (GMM)-type estimator (1991) to deal with the issue of endogeneity in the context of panel data models. In the dynamic framework, equation (5) can be written as follows:

$$Y_{it} = \beta_0 + \beta_1(BF_{it}) + \beta_2(FC_{it}) + \beta_3(FDI_{it}) + \beta_4(FinF_{it}) + \beta_5(FisF_{it}) + \beta_6(GCF_{it}) + \beta_7(IF_{it}) + \beta_8(NOD) + \beta_9(POP_{it}) + \beta_{10}(TF_{it}) + \rho(Y_{i,t-1}) + w_{it}, \dots \dots \dots (6)$$

The GMM-type estimator proposed by Arellano and Bond (1991) is also known as two-step estimation process and are constructed in two phases. Firstly, first differences from the dynamic panel data model are calculated; then, lagged levels of right-hand side variables are used as their instruments. With a lagged dependent variable and other endogenous regressors (as is the case with aid and aid squared), the lagged levels are dated t-2 and earlier (t indexes time). If there are predetermined regressors, all their lagged levels are used as instruments. Evaluation of the equation (6) in first differences allows us to eliminate unobservable individual effects, eliminating in this way the correlation between  $\mu_i$  and  $Y_{i, t-1}$ . The use of lags of the growth and its determinants as instruments allows for the creation of orthogonal conditions between  $\varepsilon_{it}$  and  $Y_{i, t-1}$  i.e., eliminating correlation between  $\varepsilon_{it}$  and  $Y_{i, t-1}$ .

However, Blundell and Bond (1998) concluded<sup>3</sup> that when the dependent variable is persistent i.e., there being a high correlation between its values in the current period and in the previous period, and the number of periods is not very high, the GMM (1991) estimator is inefficient. For this kind of situations Blundell and Bond (1998) have extend the GMM (1991) estimator by considering a system with variables at level and first differences. For the variables at level in equation (6), the instruments are the variables lagged in first differences. In the case of the variables in first differences in equation (6), the instruments are those lagged

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<sup>3</sup> Arellano and Bond (1991) have derived a consistent generalized method-of-moments (GMM) estimator for the model in which the unobserved panel-level effects are correlated with the lagged dependent variables and making standard estimators inconsistent. However, the Arellano and Bond estimator can perform poorly if the autoregressive parameters are too large or the ratio of the variance of the panel-level effect to the variance of idiosyncratic error is too large. Building on the work of Arellano and Bover (1995), Blundell and Bond (1998) developed a system estimator that uses additional moment conditions. This estimator is designed for datasets with many panels and few periods. This method assumes that there is no autocorrelation in the idiosyncratic errors and requires the initial condition that the panel-level effects be uncorrelated with the first difference of the first observation of the dependent variable.

variables at level. However, the GMM (1991) and GMM system (1998) dynamic estimators can only be considered robust if, firstly the restrictions created as a consequence of using GMM (1991) and GMM (1998) are valid and secondly, there is no evidence of second order autocorrelation. To test the validity of the restrictions we use the Sargan test in the case of the GMM (1991) and GMM (1998) estimator. In both cases, the null hypothesis is the restrictions imposed by use of the instruments are valid against the alternative hypothesis that the restrictions are not valid. If the null hypothesis is rejected, we can infer that the estimators are not robust since restrictions imposed by use of instrument are not valid. Moreover, to test for the existence of first and second order autocorrelation we use Arellano and Bond (1991) test. The null hypothesis is that there is no autocorrelation of first and second order against the alternative hypothesis being the existence of autocorrelation. And if the null hypothesis of non-existence of second order autocorrelation is rejected we conclude that the estimators are not robust.

Further, unlike other studies, the empirical model, which we have estimated, is of the following form:

$$Y_{it} = \beta_1(BF_{it}) + \beta_2(FC_{it}) + \beta_3(FDI_{it}) + \beta_4(FinF_{it}) + \beta_5(FisF_{it}) + \beta_6(GCF_{it}) + \beta_7(IF_{it}) + \beta_8(NOD) + \beta_9(\Delta NOD) + \beta_{10}(NOD_{it}^2) + \beta_{11}(\Delta NOD_{it}^2) + \beta_{12}(POP_{it}) + \beta_{13}(TF_{it}) + \rho(Y_{i,t-1}) + \tau_t + X_{it} + w_{it}, \dots (7)$$

This is to incorporate nonlinearities in aid-growth relationship. Further, we have added one additional variable  $X_{it}$ , which represents other growth determinants like life expectancy and fertility rate following Barrow (1991) and Tiwari (2010). However,  $X_{it}$  has not been included in the main model instead has been used to check the robustness of the results of equation (7), which does not include  $X_{it}$ . So, given the lag structure, the immediate i.e., short-run effect of unit change on the NOD/Y ratio on the average growth rate is defined from equation (7), as:

$$\partial Y_{it} / \partial NOD_{it} = (\beta_8 + \beta_9) + 2(\beta_{10} + \beta_{11})\overline{(NOD_{it})}, \dots (8)$$

Where  $\overline{NOD_{it}}$  is the mean value of the NOD/Y ratio, with  $t= 1, 2, \dots$  or  $T$ . And provided the stability condition  $|\rho| < 1$  is satisfied, the total long run effect of a unit change on the NOD/Y ratio on the average growth rate is defined, from equation (7), as:

$$\partial Y / \partial NOD = \beta_8 / (1 - \rho) + 2[\beta_{10} / (1 - \rho)](\overline{NOD}), \dots\dots\dots(9)$$

where  $\overline{NOD}$  is the mean value of NOD/Y ratio. Further, we have expanded equation 7 by incorporating second lag of the dependent variable also in order to analyze the persistence of non-linear impact of aid on economic growth. After incorporation of second lag of dependent variable in the system long-run impact (since equation of short-run impact of unit change on the NOD/Y ratio on the average growth rate will not change) of change on the NOD/Y ratio on the average growth rate is defined as follows:

$$\partial Y / \partial NOD = \beta_8 / (1 - \rho_1 - \rho_2) + 2[\beta_{10} / (1 - \rho_1 - \rho_2)](\overline{NOD}), \dots\dots\dots(10)$$

Provided the stability condition  $|\rho_i| < 1$  is satisfied; where  $i = 1$  and  $2$ ; 1 is for first lagged value of dependent variable (that is growth rate) and 2 is for second lagged value of dependent value of dependent variable.

### 3. Estimation and Empirical Results

Before conducting regression analysis, correlation analysis was carried out in order to find out whether there is any evidence of severe multicollinearity among the test variables, as in the presence of severe multicollinearity the analysis may provide misleading conclusions. Since we do not find evidence of severe multicollinearity, (see appendix 2) regression analysis has been carried out with incorporation of all variables simultaneously. First, we will present the results of the static panel model analysis. Results of static panel data models have been presented in Table 1.

Table 1: Regression results of Static Panel data models

Panel data Models: Dependent variable is GDPGROWTH; t-value in parenthesis					
Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
	OLS	FE-CS	FE-CSW	RE-CS	RE-CS with AR(1)
BF	-0.000246 (-0.75209)	0.000144 (0.48256)	0.000175 (1.0774)	$7.05 \times 10^{-5}$ (0.2523)	0.000428 (1.29)
FC	-0.00083*** (-3.889)	-0.00097*** (-3.065)	-0.0007*** (-3.391)	-0.00099*** (-3.99)	-0.0007564** (-2.01)
FDI	0.000161 (0.271544)	-0.00269*** (-5.307)	$8.02 \times 10^{-5}$ (0.1259)	-0.0022*** (-4.549)	-0.002473*** (-4.50)
FisF	0.000735*** (3.2262)	0.000954*** (3.5469)	0.00066*** (4.039)	0.00089*** (3.7892)	0.0001892 (0.53)
FinF	-0.000205 (-0.9378)	0.000402 (1.55148)	0.000248 (1.3435)	0.000189 (0.871112)	0.0004986* (1.78)
GCF	0.001780*** (4.3539)	0.00252*** (5.5315)	0.00187*** (6.565)	0.00247*** (6.3008)	0.001932*** (3.36)
IF	$5.22 \times 10^{-5}$ (0.203758)	-0.000278 (-1.2131)	$-4.75 \times 10^{-5}$ (-0.379)	-0.00024 (-1.09563)	-0.0002142 (-0.78)
NOD	$-1.33 \times 10^{-11}$ (-0.9867)	$1.57 \times 10^{-11}$ (0.9805)	$5.12 \times 10^{-12}$ (0.5837)	$1.91 \times 10^{-12}$ (0.145953)	$-5.31 \times 10^{-12}$ (-0.31)
D(NOD)	$2.59 \times 10^{-12}$ (0.30585)	$-2.44 \times 10^{-12}$ (-0.3273)	$2.24 \times 10^{-12}$ (0.7205)	$1.49 \times 10^{-12}$ (0.224740)	$4.47 \times 10^{-12}$ (0.36)
NOD×NOD	$1.98 \times 10^{-21}$ (0.339555)	$-6.95 \times 10^{-21}$ (-1.3086)	$-5.26 \times 10^{-21}$ * (-1.940)	$-4.36 \times 10^{-21}$ (-0.8948)	$-1.53 \times 10^{-21}$ (-0.29)
D(NOD)×D(NOD)	$-4.08 \times 10^{-21}$ (-0.69879)	$2.23 \times 10^{-21}$ (0.4717)	$1.93 \times 10^{-21}$ (1.1714)	$4.30 \times 10^{-22}$ (0.094844)	$-8.62 \times 10^{-22}$ (-0.20)
POP	$1.98 \times 10^{-11}$ * (1.6554)	$1.72 \times 10^{-10}$ (0.74686)	$1.99 \times 10^{-10}$ (1.7702)	$8.55 \times 10^{-12}$ (0.441930)	$4.31 \times 10^{-10}$ *** (1.17)
TF	0.000454** (2.5366)	0.000337 (1.6416)	0.000133 (1.2618)	0.000383** (2.1799)	0.0000454 (0.22)
C	-0.014096 (-0.53159)	-0.0894** (-2.3488)	-0.0593*** (-3.013)	-0.050135* (-1.961)	-0.0448027 (-1.23)
Model summary					
R <sup>2</sup>	0.220403	0.662576	0.914115	0.217933	0.1669
F-test	5.176***	10.35817***	56.145***	5.102***	2.82***
BP-LM test	-----	-----	-----	167.25***	-----
Hausman test	-----	-----	-----	30.75***	-----
Fixed effect(F-test)	-----	F <sub>(27,211)</sub> = 10.24***	-----	-----	F <sub>(27,183)</sub> = 5.51***
Wald chi <sup>2</sup>	-----	-----	-----	66.32***	-----
Country included	28	28	28	28	28
Total observations	280	280	280	280	280
Notes: 1. The LM test has $\chi^2$ distribution and tests the null hypothesis that unobservable individual effects are irrelevant in explaining the dependent variable, against the alternative hypothesis of relevance of unobservable individual effects in explaining the dependent variable. 2. The Hausman test has $\chi^2$ distribution and tests the null hypothesis that unobservable individual effects are not correlated with the explanatory variables, against the null hypothesis of correlation between unobservable individual effects and the explanatory variables. 3. The Wald test has $\chi^2$ distribution and tests the null hypothesis of insignificance as a whole of the parameters of the explanatory variables, against the alternative hypothesis of significance as a whole of the parameters of the explanatory variables. 4. The F-test has normal distribution N(0,1) and tests the null hypothesis of insignificance as a whole of the estimated parameters, against the alternative hypothesis of significance as a whole of the estimated parameters. 5. ***, **, and *denote significance at 1, 5 and 10 % level of significance respectively. 6. EF, CS, BP-LM, SD denotes fixed-effect, cross-section, Breusch and Pagan's Lagrange multiplier for random effect, and standard deviation respectively. 7. [----] denotes results are not computed.					
Source: Author's calculation					

From Table 1, it is evident that the results of the Wald and F tests are significant at 1% level of significance. Therefore, we can conclude that we cannot reject the null hypothesis that the explanatory variables do not explain (taken as a whole) the explained variable, and hence the determinants selected in this study can be considered to be enough explanatory of the economic growth. Further, the LM test indicate that we can reject the null hypothesis of irrelevance of unobservable individual effects at 1% significance level that implies that a pooled OLS regression will not be the most appropriate way of carrying out analysis of the relationship between economic growth and its determinants. This shows that country specific heterogeneity is playing significant role on the economic growth and therefore, it should be incorporated in our model. However, the results of the Hausman test show that data provide evidence to reject the null hypothesis (as Hausman test is significant at 1% level of significance) of absence of correlation between countries' unobservable individual effects and growth determinants. Therefore, we can conclude that the most appropriate way to carry out analysis of the relationship between economic growth and its determinants is a panel model with fixed effects. The similarity of the results obtained, using random or fixed effects, shows that the correlation between non-observable individual effects and economic growth determinants is not relevant. Therefore, and given the possible existence of autocorrelation, we assess the fixed effects panel model, consistent with the existence of first order autocorrelation and present result in model 5<sup>4</sup>.

In the next step, we present the results of the GMM (1991) and GMM system (1998) dynamic estimators. The results of GMM (1991) and GMM (1998) have been presented in Table 2.

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<sup>4</sup> Results of static panel data analysis wherein we assume time specific effect fixed are presented in the appendix 3. From the results we do not find much difference when we assume country specific effect fixed and time specific effect fixed. Only the difference is in the significance of the variable FDI; that FDI is significant when we used country specific fixed while insignificant when we used time specific (period-specific) effects fixed.

Table 2: Results of Dynamic panel data analysis

Panel data Models: Dependent variable is GDPGROWTH; standard error in parenthesis				
Independent variables	Model 1: GMM (1991)	Model 2: GMM (1991)	Model 3: GMM (1998)	Model 4: GMM (1998)
GDPGROWTH(-1)	0.0863272 (0.0763946)	0.0906917 (0.143762)	0.3508318*** (0.0797)	0.3063909* (0.1612333)
GDPGROWTH(-2)	-----	-0.104518** (0.051547)	-----	-0.0508386 (0.0521814)
BF	-0.0000111 (0.000186)	-0.0000197 (0.0002459)	0.0001447 (0.000233)	-0.0002802 (0.0002491)
FC	-0.00086*** (0.00026)	-0.00094*** (0.000313)	-0.000364 (0.0003746)	-0.000864*** (0.0003245)
FDI	-0.001213*** (0.00042)	-0.0016*** (0.0004898)	-0.00181*** (0.00055)	-0.001862*** (0.000591)
FisF	0.0009936** (0.00043)	0.0010993* (0.0005852)	0.000774** (.0003385)	0.0002517 (0.0005349)
FinF	0.000348** (0.000173)	0.0003594* (0.0001973)	0.000503*** (0.00018)	0.0004456*** (.000171)
GCF	0.0016099*** (0.0005)	0.0016698*** (0.00051)	0.001931*** (0.00053)	0.002522*** (.0005596)
IF	-0.000033 (0.0001996)	-0.0000128 (0.0002151)	0.0001117 (0.0002328)	-0.0000358 (.0002174)
NOD	$1.27 \times 10^{-11}$ ( $1.23 \times 10^{-11}$ )	$-4.73 \times 10^{-12}$ ( $7.58 \times 10^{-12}$ )	$2.02 \times 10^{-11}$ ( $1.38 \times 10^{-11}$ )	$-1.42 \times 10^{-12}$ ( $1.03 \times 10^{-11}$ )
D(NOD)	$2.98 \times 10^{-12}$ ( $2.25 \times 10^{-12}$ )	$5.44 \times 10^{-12}$ ** ( $2.62 \times 10^{-12}$ )	$9.03 \times 10^{-13}$ ( $3.61 \times 10^{-21}$ )	$3.16 \times 10^{-12}$ ( $4.38 \times 10^{-12}$ )
NOD×NOD	$-6.60 \times 10^{-21}$ * ( $3.44 \times 10^{-21}$ )	$-2.18 \times 10^{-21}$ ( $1.82 \times 10^{-21}$ )	$-6.88 \times 10^{-21}$ * ( $3.90 \times 10^{-21}$ )	$-2.20 \times 10^{-21}$ ( $2.41 \times 10^{-21}$ )
D(NOD) × D(NOD)	$-2.54 \times 10^{-22}$ ( $2.33 \times 10^{-21}$ )	$-2.31 \times 10^{-21}$ ( $2.41 \times 10^{-21}$ )	$1.21 \times 10^{-21}$ ( $3.11 \times 10^{-21}$ )	$-7.14 \times 10^{-21}$ ( $3.17 \times 10^{-21}$ )
POP	$1.58 \times 10^{-10}$ ( $2.80 \times 10^{-10}$ )	$4.52 \times 10^{-10}$ *** ( $1.67 \times 10^{-10}$ )	$9.74 \times 10^{-11}$ ( $9.57 \times 10^{-11}$ )	$8.90 \times 10^{-11}$ ( $8.94 \times 10^{-11}$ )
TF	0.0001571 (0.0001347)	0.0002069 (0.0001705)	0.0001108 (0.0001704)	0.0002527 (0.0001791)
C	-0.0748056* (0.04347)	-0.0996343* (0.053778)	-0.101878** (0.04484)	-0.0209126 (.054046)
Model summary				
Abond test	Z1= -2.67*** Z2= -0.92924	Z1= -2.0493** Z2= -0.57705	Z1= -2.4278** Z2= -0.36793	Z1=-2.3838** Z2=-0.82531
Sargan test	$\chi^2_{(35)} = 11.67854$	$\chi^2_{(33)} = 15.7502$	$\chi^2_{(43)} = 20.0255$	$\chi^2_{(41)} = 10.28961$
Wald $\chi^2$	34***	81.35***	48.19***	90.27***
Country included	28	28	28	28
Total observations	280	280	280	280
Note: 1. The Wald test has $\chi^2$ distribution and tests the null hypothesis of overall non-significance of the parameters of the explanatory variables, against the alternative hypothesis of overall significance of the parameters of the explanatory variables. 2. The Sargan test has $\chi^2$ distribution and tests the null hypothesis of significance of the validity of the instruments used, against the alternative hypothesis of non-validity of the instruments used. 3. The Z1 test has normal distribution N(0,1) and tests the null hypothesis of absence of first order autocorrelation, against the alternative hypothesis of existence of first order autocorrelation. 4. The Z2 test has normal distribution N(0,1) and tests the null hypothesis of absence of second order autocorrelation against the alternative hypothesis of existence of second order autocorrelation. 5. ***, **, and *denote significance at 1, 5 and 10 % level of significance.				
Source: Author's calculation				

The results of the Wald test in all the models shows that the determinants used in this study can be considered, as a whole, explanatory of the economic growth, as Wald test is significant at 1% level of significance. Further, as the Sargan test is not significant in all models therefore, we can conclude that data do not provide evidence to reject the null hypothesis of instrument validity and consequent restrictions generated from use of the GMM (1991) and GMM system (1998) dynamic estimators respectively. This implies that the instruments and restrictions generated from the use of GMM (1991) and GMM (1998) are valid. Arellano and Bond (1991) (indicated by Abond test) test of autocorrelation shows that in all models data do not provide evidence to reject the null hypothesis of the absence of second order autocorrelation. Therefore, given the validity of the instruments and restriction imposed by GMM (1991) and GMM (1998) and absence of second order autocorrelation, we can conclude that the GMM (1991) and GMM system (1998) dynamic estimators are efficient and robust. Further, from all models it is evident that stability condition is met (that is absolute value of coefficient of lagged dependent variables is less than one); otherwise, we would not have been able to determine the short and long run effect of foreign aid on economic growth.

The presence of a lagged dependent variable among the regressors is a major drawback when using least squares, because it renders the OLS estimator biased and inconsistent. Even so, this estimation method proceeds by essentially treating the variables included in the regression as exogenous and the country-specific effects as homogeneous among different individuals. If these assumptions do hold, there should be no substantial differences between the OLS and the GMM results. As shown in Appendix IV, this is not so. Economic growth does not respond to foreign aid in any of the four OLS regressions; the parameters associated with a dynamic, non-linear aid-growth relationship are highly insignificant. The same goes for some of the control variables, namely openness, government spending, financial depth, and literacy rate. One can therefore conclude that both the issue of endogeneity and country heterogeneity should be taken into account when evaluating the impact of aid on growth.

In the final step we have checked the robustness of the results reported by GMM (1991) and GMM (1998) by incorporating two additional variables in the system of equations -namely the fertility rate and life expectancy (following Barrow, 1991 and Tiwari, 2010) as these two variables are also considered as important variables in economic growth. The results of sensitivity analysis are reported in Table 3.

Table 3: Dynamic panel data- Sensitivity analysis

Panel data Models: Dependent variable is GDPGROWTH; standard error in parenthesis				
Independent variables	Model 1: GMM (1991)	Model 2: GMM (1991)	Model 3: GMM (1998)	Model 4: GMM (1998)
GDPGROWTH(-1)	0.0381458 (0.093301)	-0.2802785 (0.2829655)	0.4529156*** (0.147498)	0.3687835*** (0.121544)
GDPGROWTH(-2)	-----	-0.30434*** (0.083759)	-----	-0.1448874** (0.070732)
BF	-0.0001189 (0.000195)	0.0002919 (0.0002614)	-0.0000857 (0.000332)	-0.0003738 (0.000332)
FC	-0.0009143*** (0.000236)	-0.000817*** (0.00027)	-0.00097*** (0.00037)	-0.0009185** (0.000433)
FDI	-0.0016778*** (0.000363)	-0.00135*** (0.000492)	-0.000893 (0.0007385)	-0.0018631*** (0.00057)
FisF	-0.0001087 (0.000469)	-0.0000683 (0.0004366)	0.0000173 (0.0004784)	-0.0002087 (0.0004601)
FinF	0.0002857 (0.0001975)	0.0001314 (0.0001553)	0.000495** (0.000215)	0.0004285* (0.0002289)
GCF	0.0017647*** (0.0004603)	0.0004515 (0.000579)	0.0010704 (0.0007002)	0.0020885*** (0.000450)
IF	0.0001647 (0.0001961)	0.0001957 (0.0001866)	0.0001808 (0.0002434)	-1.93×10 <sup>-6</sup> (0.0002591)
NOD	-5.86×10 <sup>-12</sup> (1.29×10 <sup>-11</sup> )	-2.76×10 <sup>-11**</sup> (1.14×10 <sup>-11</sup> )	1.49×10 <sup>-11</sup> (1.61×10 <sup>-11</sup> )	1.83×10 <sup>-12</sup> (1.08×10 <sup>-12</sup> )
D(NOD)	4.08×10 <sup>-12*</sup> (2.28×10 <sup>-12</sup> )	6.85×10 <sup>-12*</sup> (3.8210 <sup>-12</sup> )	8.63×10 <sup>-13</sup> (4.82×10 <sup>-12</sup> )	5.97×10 <sup>-13</sup> (5.08×10 <sup>-12</sup> )
NOD×NOD	-1.09×10 <sup>-21</sup> (3.88×10 <sup>-21</sup> )	5.04×10 <sup>-21*</sup> (2.92×10 <sup>-21</sup> )	-5.48×10 <sup>-21</sup> (4.46×10 <sup>-21</sup> )	-1.27×10 <sup>-21</sup> (2.86×10 <sup>-21</sup> )
D(NOD) ×D(NOD)	3.35×10 <sup>-22</sup> (2.24×10 <sup>-21</sup> )	-2.53×10 <sup>-21</sup> (2.08×10 <sup>-21</sup> )	7.69×10 <sup>-22</sup> (3.79×10 <sup>-21</sup> )	1.56×10 <sup>-21</sup> (3.45×10 <sup>-21</sup> )
POP	-3.42×10 <sup>-10***</sup> (1.26×10 <sup>-10</sup> )	3.56×10 <sup>-11</sup> (1.51×10 <sup>-10</sup> )	1.55×10 <sup>-10</sup> (2.15×10 <sup>-10</sup> )	1.39×10 <sup>-10</sup> (1.97×10 <sup>-10</sup> )
TF	-0.0000491 (0.0001064)	-0.0000245 (0.0001028)	-2.61×10 <sup>-6</sup> (0.000165)	0.0002171 (0.0001834)
FR	0.0194603 (0.0160507)	0.0860305*** (0.01852)	0.0099619 (0.015899)	0.0313555 (0.0190859)
LE	0.019453*** (0.0049041)	0.036184*** (0.009546)	0.006651*** (0.00217)	0.0072869** (0.003156)
C	-1.29577*** (0.341491)	-2.62335*** (.6658)	-0.48771*** (0.18148)	-0.5668807** (0.278413)
Model summary				
Abond test	Z1= -2.4754** Z2= -1.0324	Z1= -.74714 Z2= .22873	Z1= -1.9228* Z2= -.24061	Z1= -2.4253** Z2= -.08214
Sargan test	chi <sup>2</sup> <sub>(35)</sub> = 9.364971	chi <sup>2</sup> <sub>(33)</sub> = 11.2136	chi <sup>2</sup> <sub>(43)</sub> = 9.6121	chi <sup>2</sup> <sub>(41)</sub> = 10.92409
Wald chi <sup>2</sup>	120.70***	188.35***	93.55***	118.87***
Country included	28	28	28	28
Total observations	280	280	280	280
Note: 1. The Wald test has $\chi^2$ distribution and tests the null hypothesis of overall non-significance of the parameters of the explanatory variables, against the alternative hypothesis of overall significance of the parameters of the explanatory variables. 2. The Sargan test has $\chi^2$ distribution and tests the null hypothesis of significance of the validity of the instruments used, against the alternative hypothesis of non-validity of the instruments used. 3. The Z1 test has normal distribution N(0,1) and tests the null hypothesis of absence of first order autocorrelation, against the alternative hypothesis of existence of first order autocorrelation. 4. The Z2 test has normal distribution N(0,1) and tests the null hypothesis of absence of second order autocorrelation against the alternative hypothesis of existence of second order autocorrelation. 5. ***, **, and *denote significance at 1, 5 and 10 % level of significance.				
Source: Author's calculation				



As in the earlier case, even in this case the Wald test in all the models is significant, Sargan test of instrument validity and consequent restrictions generated from use of the GMM (1991) and GMM system (1998) dynamic estimators and Abond test of autocorrelation are insignificant. Therefore, we can conclude that the GMM (1991) and GMM system (1998) dynamic estimators are efficient, robust and determinants used in this study can be considered, as a whole, explanatory of the economic growth. In this case, we also find from all models, that stability condition is met (that is absolute value of coefficient of lagged dependent variables is less than one).

#### **4. DISCUSSION OF THE RESULTS**

In the next step, we present the comparison of the results of the various models analyzed above. First of all, we shall compare the results of the static panel models, then we will compare the results of the dynamic panel estimators, and then we go on to compare the results of the static and dynamic panel estimators and finally, we will compare the results of sensitivity analysis of dynamic model to those in which addition control variables has not been incorporated.

#### **COMPARISON OF THE RESULTS OF STATIC PANEL MODELS**

In static panel data analysis, we have analysis five models. The First model is based on pooled OLS, second is based on panel model with fixed effects, third is based on panel model with fixed effects but giving cross-section weights, fourth is based on panel model with random effects and fifth model is based on panel model with random effect but making period specific effect fixed. Results of all these models are presented in table 1. By comparing all the models, we find that sign of the coefficient of BF is negative (but not significant in all cases) in case of pooled OLS and positive in all other cases; coefficient of FC carries negative sign and significant in all models; FDI is insignificant in pooled OLS and in case of panel model with fixed effects but giving cross-section weights (though carries positive sign) but in all other case its coefficient is not only significant but also carries negative sign; FisF and GCF carries significantly positive coefficient in all cases (except in model 5 where FisF is insignificant); FinF is insignificant in all cases though carries positive sign (except in the case of model 5 where its coefficient is significant); IF, NOD and square of first difference of NOD is insignificant in all cases but sign of the coefficient is varying with specifications; square of NOD is significant with negative sign in case of panel model with fixed effects but giving cross-section weights and in all other cases it is insignificant; population carries positive sign in all models but significant only in case of pooled OLS and panel model of fixed effect with first order autocorrelation i.e., model 5;

TF carries positive sign in all cases but coefficient is significant only in case of pooled OLS and panel model with random effect.

Therefore, by considering the relevance of unobservable individual country specific effects and presence of correlation between countries' unobservable individual effects and growth determinants (given by the results of the LM test and Hausman test respectively), we can draw the following conclusions from the results of the static panel models: 1) there is a positive and statistically significant relationship between GCF, POP and FinF and economic growth; 2) there is a negative and statistically significant relationship between FC and FDI and economic growth of panel countries.

### **COMPARISON OF THE RESULTS OF THE DYNAMIC PANEL ESTIMATORS**

In case of dynamic panel estimators, analysis has been carried out by using first one lag and then using lag two for both cases i.e., GMM (1991) and GMM system (1998). If we compare the estimates of GMM (1991) and GMM (1998) with one lag we will find two differences. First, the impact of lagged value of economic growth rate on growth rate is insignificant in GMM (1991) but in GMM (1998) it is significant and second, FC is significant with negative sign in GMM (1991) but not in case of GMM (1998). And if we compare the results of GMM (1991) and GMM (1998) with two lags we will find that basically four major differences. First, in case of GMM (1991) 2<sup>nd</sup> year's lagged GDP growth rate is positively significant while in case of GMM (1998) just past years GDP is positively significant; second, in case GMM (1991) FisF is significant but FisF is insignificant in case of GMM (1998); third, in case of GMM (1991) first difference of NOD is negatively significant while it is not the case with GMM (1998) and fourth, in case of GMM (1991) coefficient of POP is positively significant while its coefficient is insignificant in case of GMM (1998).

If we do model by model comparison of sensitivity analysis with normal model, we will find that all models have suffered from the inclusion of additional two variables namely FR and LE. Addition to that we will find that Life Expectancy (LE) plays positively significant role in the economic growth of cross-section of countries while Fertility Rate (FR) does not. Further, from the aid effectiveness results presented in table 4 we can conclude that impact of aid on economic growth rate is negative in most of cases but negligible.

Further, the GMM results presented above (Table 2 and 3) allow us to calculate the macroeconomic contribution of foreign aid to the economic growth of developing countries in both the periods in the short and long run. The information reported in Table 4 is obtained by using the regression parameters from Table 2 and 3 and the mean value of aid for the sample countries. For the

short-run results, the mean aid value was computed from aid figures of the last year of each country, whereas for the long run results it was computed from averages across all years. As Table 4, indicates that an increase in the NOD/Y ratio of one-percentage point has very negligible negative impact on the economic growth rate of 28 Asian countries as a whole. However, in some case we find positive but negligible impact (for example, in model 2, 3 and 4 of sensitivity specification) on the economic growth rate of Asian countries in our sample. Further, we find that the total impact on growth rate of a one-percentage point increase in the NOD/Y ratio oscillates between -9.99 and 7.32 percentage points, depending on the specification of regression model analyzed<sup>5</sup>.

Table 4: Aid Effectiveness Results

Regression specification	M1: GMM(1991)	M2: GMM(1991)	M3: GMM(1998)	M4: GMM(1998)
Short-run impact of aid	-9.99	-7.50	-7.45	-4.70
Long-run impact of aid	-8.50	-3.40	-1.14	-4.20
Aid Effectiveness Results of Sensitivity analysis specification				
Short-run impact of aid	-1.45	2.16	7.31	7.32
Long-run impact of aid	-2.16	2.61	-2.84	-2.00

So, by considering Wald test, Sargan test, Abond test, sensitivity model and aid effectiveness results we can draw the following conclusions from the results of the dynamic panel models: 1) there is a positive and statistically significant relationship between GCF, FisF, FinF and FR and economic growth of panel countries; 2) there is a negative and statistically significant relationship between FC and FDI and economic growth of panel countries; 3) past two years GDP also plays significantly positive role on the current years economic growth; 4) direction of impact of NOD remained inconclusive in the panel of countries; 5) total impact on growth rate of a one percentage point increase in the NOD/Y ratio oscillates between positive and negative percentage points, depending on the specification of regression model analyzed.

## 5. Conclusions

This study has attempted to identify the direction of the impact of foreign aid, FDI, and various dimension of economic freedom on economic growth of 28 Asian countries in a panel framework. For the analysis static and dynamic panel

<sup>5</sup> It is important to mention that values reported in Table 4 are scaled down to \$ units as we have results like, for example,  $-9.99 \times 10^{-9}$  (in case of model 1 and short run impact of aid on GDP growth rate). Since the unit of measurement is the U.S. dollar (in billions) therefore, in order to improve readability of the study we multiplied each value by  $10^9$  and then reported the results.

data models were utilized. However, given the relevance of countries' unobservable individual effects and absence of correlation between unobservable individual country specific effects and growth determinants not only a pooled OLS regression is inappropriate way to carry out analysis between economic growth and its determinants in the panel of countries but also the panel models with fixed effect is equally unsuitable.

The results obtained by the two estimators by using GMM (1991) and (1998) are not identical concerning the signs and significance of the statistically significant parameters in both cases (i.e., when lag one is used and when lag two is used for analysis) for all modes. Comparing the results of the random effects panel model, the GMM (1991) and GMM (1998) dynamic estimator and sensitivity analysis, we find that in most of the cases: 1) there is a statistically significant negative relationship between freedom from corruption and economic growth; 2) there is a statistically significant negative relationship between foreign direct investment and economic growth; 3) there is a statistically significant positive relationship between fiscal freedom and economic growth; 4) there is a statistically significant positive relationship between financial freedom economic growth and; 5) there is a statistically significant positive relationship between economic growth and gross capital formation; 6) there is a statistically significant inconclusive results about the direction of impact of foreign aid on economic growth. Moreover, from the sensitivity analysis model we find that Life Expectancy (LE) plays positively significant role in the economic growth of panel of countries while Fertility Rate (FR) does not. In addition to that, we also present empirical results of non-linearity (negative effects of high aid inflows, which we have attempted to measure by the squared aid term that provides evidence for decreasing returns to aid) in the aid-growth relationship and we emphasis that country heterogeneity, and endogeneity of foreign aid should be incorporated when assessing the impact of foreign aid on the economic growth of developing countries. Further, we show that the immediate and overall impact of aid on economic growth rate not only differs in terms of magnitude and direction, but also it is negligible.

**Appendix 1: List of Variables and Sources**

Variable name	Description	Source	Units of measurement
GDPGROWTH	Annual growth rate of real per capita GDP at PPP prices (2005 international \$).	World Bank (2010)	Billion.
POP	Total population.	World Bank (2010)	Billion.
GCF	Gross capital formation as percentage of GDP	World Bank (2010)	Billion.
FDI	Net inflow of foreign direct investment as a percentage of GDP)	World Bank (2010)	Billion.
NOD	Net official development assistance and official aid received (constant 2007 US\$)	World Bank (2010)	Billion.
FR	Fertility rate, total (births per woman)	World Bank (2010)	Billion.
LE	Life expectancy at birth, total (years)	World Bank (2010)	Billion.
BF	which reflects the individual's right to freely conduct entrepreneurial activities, e.g., starting and operating a business firm without government interference.	Heritage Foundation	0-100 (scale)
FC	Corruption is defined as dishonesty or decay that is it may be failure of integrity in the system or political corruption or any activities that infects all parts of an economy unless the market is allowed to develop transparency and effective policing.	Heritage Foundation	0-100 (scale)
FisF	Measures freedom from government on the revenue side, i.e., it reflects freedom from the tax burden.	Heritage Foundation	0-100 (scale)
FinF	This reflects prudential supervision of banks and other financial services provided by nation.	Heritage Foundation	0-100 (scale)
IF	This reflects an assessment of freedom of the flow of capital (particularly foreign capital), the absence of restrictions on foreign ownership and investment and legal equality between domestic and foreign firms.	Heritage Foundation	0-100 (scale)
TF	This reflects the openness of an economy to imports of goods and services from around the world and the ability of citizens to interact freely as buyers and sellers in the international market- place.	Heritage Foundation	0-100 (scale)

**Appendix 2: List of countries included in the analysis, descriptive statistics and correlation analysis**

List of countries included in the analysis					
Armenia	Georgia	Kazakhstan	Sri Lanka	Turkmenistan	Pakistan
Azerbaijan	India	Kyrgyzstan	Syria	Malaysia	Uzbekistan
Bangladesh	Indonesia	Lebanon	Tajikistan	Mongolia	Vietnam
Cambodia	Iran	Philippines	Thailand	Nepal	
China (PRC)	Jordan	Saudi Arabia	Turkey	Oman	

Descriptive statistics											
	GDP Growth	BF	FC	FDI	FF	FF1	GCF	IF	NOD	POP	TF
Mean	0.0628	57.87	28.481	3.856	77.185	39.393	24.31223	41.286	6.12×10 <sup>8</sup>	1.22×10 <sup>8</sup>	61.16
Median	0.0584	55	27	2.794	77.517	30	22.6992	30	3.07×10 <sup>8</sup>	20046348	65.9
Maximum	0.345	85	70	45.15	99.41	90	57.99046	70	2.95×10 <sup>9</sup>	1.32×10 <sup>9</sup>	85.6
Minimum	-0.1313	30	4	-14.37	38.21	10	3.408148	10	-8.74×10 <sup>8</sup>	2318235	0
Std. Dev.	0.0468	10.52	15.263	5.302	13.19	18.703	7.979092	14.68	6.74×10 <sup>8</sup>	2.97×10 <sup>8</sup>	16.89
Skewness	0.9786	0.185	0.914	3.486	-0.721	0.1706	0.740477	0.3420	1.391688	3.229545	-1.155
Kurtosis	10.46	3.146	3.591	24.69	3.762	2.367	4.322125	2.5606	4.143231	11.95855	3.881
J-B test	693.98	1.848	43.06	6054.5	31.013	6.038	45.98112	7.7123	105.6319	1423.047	71.29
P-Value	0	0.397	0	0	0	0.0488	0	0.0212	0	0	0
Observations	280	280	280	280	280	280	280	280	280	280	280

Correlation matrix : Spearman correlation													
	GDPGROWTH	BF	FC	FDI	FF	FF1	GCF	IF	NOD	DNOD	POP	TF	
GDPGROWTH	1												
BF	-0.168	1											
FC	-0.188	0.521	1										
FDI	0.1990	0.008	-0.048	1									
FF	0.087	0.230	0.282	0.165	1								
FF1	-0.1054	0.420	0.357	0.221	0.342	1							
GCF	0.295	-0.040	-0.027	0.370	-0.194	-0.039	1						
IF	-0.180	0.330	0.232	0.004	0.148	0.683	-0.108	1					
NOD	-0.035	-0.239	-0.145	-0.127	-0.170	-0.011	0.208	0.143	1				
DNOD	-0.032	0.013	-0.009	0.011	0.019	0.001	-0.047	0.011	0.239	1			
POP	0.0962	-0.148	0.000	-0.127	-0.142	-0.116	0.363	-0.024	0.586	-0.097	1		
TF	0.0449	0.241	0.306	0.154	0.256	0.331	-0.101	0.141	-0.339	0.0464	-0.367	1	

**Appendix 3: Regression results of Static Panel data models**

Panel data Models: Dependent variable is GDPGROWTH; standard errors in parenthesis		
Independent variables	Model 1	Model 2
	FE-PE	FE-PW <sup>@</sup>
BF	-0.000257 (0.000325)	-0.000177 (0.000316)
FC	-0.000785*** (0.000211)	-0.000709*** (0.000195)
FDI	0.000125 (0.000587)	0.000423 (0.000513)
FisF	0.000485** (0.000238)	0.000401* (0.000216)
FinF	-0.000218 (0.000219)	-0.000201 (0.000204)
GCF	0.001528*** (0.000411)	0.001165*** (0.000390)
IF	0.000217 (0.000266)	0.000163 (0.000252)
NOD	$-1.83 \times 10^{-11}$ ( $1.34 \times 10^{-11}$ )	$-1.51 \times 10^{-11}$ ( $1.18 \times 10^{-11}$ )
D(NOD)	$3.86 \times 10^{-12}$ ( $8.50 \times 10^{-12}$ )	$2.64 \times 10^{-12}$ ( $7.61 \times 10^{-12}$ )
NOD×NOD	$4.10 \times 10^{-21}$ ( $5.79 \times 10^{-21}$ )	$3.06 \times 10^{-21}$ ( $5.09 \times 10^{-21}$ )
D(NOD)×D(NOD)	$-6.29 \times 10^{-21}$ ( $5.90 \times 10^{-21}$ )	$-5.62 \times 10^{-21}$ ( $5.63 \times 10^{-21}$ )
POP	$1.98 \times 10^{-11}$ * ( $1.18 \times 10^{-11}$ )	$2.31 \times 10^{-11}$ ** ( $1.09 \times 10^{-11}$ )
TF	0.000361** (0.000181)	0.000396** (0.000162)
C	0.012096 (0.027456)	0.017449 (0.025500)
Model summary		
R <sup>2</sup>	0.265455	0.274317
Fixed effect(F-test)	F <sub>(8,230)</sub> = 1.763*	F <sub>(8,230)</sub> = 2.039**
Country included	28	28
Total observations	280	280
Notes: 1. The F test has normal distribution N(0,1) and tests the null hypothesis of insignificance as a whole of the estimated parameters, against the alternative hypothesis of significance as a whole of the estimated parameters.2. ***, **, and *denote significance at 1, 5 and 10 % level of significance respectively. 3. FE, PE and PW denote fixed-effect, period-effect (time-effect) and period weights respectively. 4. @ Period weights (PCSE) standard errors & covariance (d.f. corrected).		
Source: Author's calculation		

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