Economics Bulletin

Volume 35, Issue 3

Aid and Per-Capita Economic Growth in Asia: A Panel Cointegration Test

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Abstract

In light of growing skepticism toward aid-effectiveness for economic growth in aid-dependent economies, this paper investigates the aid-growth nexus for a panel of 13 Asian economies that have historically been some of the largest recipients of foreign aid, namely, Afghanistan, Bangladesh, Bhutan, Cambodia, India, Lao PDR, Maldives, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka and Vietnam. The period of study is 1971-2010. Both short-run and long-run effects of foreign aid on economic growth are significantly negative: a 1% rise in aid (in share of GDP) results in 0.18% fall in per-capita real income in the long-run; thus, if the aid-dependent Asian countries continue to receive foreign aid, then over time, per-capita economic growth in those countries will decline. Cointegrating relationships also indicate significantly positive long-run effects of trade openness and domestic investment on per-capita economic growth.

Citation: Rajarshi Mitra and Md. Sharif Hossain and Md. Iqbal Hossain, (2015) "Aid and Per-Capita Economic Growth in Asia: A Panel Cointegration Test", *Economics Bulletin*, Volume 35, Issue 3, pages 1693-1699
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Submitted: June 10, 2015. **Published:** August 12, 2015.

1. Introduction

During the last four decades many developing economies around the world have increasingly implemented a liberal trade policy framework through the formation of numerous trading blocs by monetary and commercial agreements to attract foreign capital for economic growth and development. Although migrant remittances and FDI have usually had a significantly positive effect on economic growth of developing economies, the results of some recent studies have generated skepticism toward the importance of foreign aid for economic growth in the heavily aid-dependent economies. Studies have shown that the more foreign aid a nation receives, the more aid-dependent it tends to become, and the accumulation of foreign aid over time leaves the countries with a massive external debt overhang that exerts a substantial negative effect on economic growth.

Numerous studies have looked at the effectiveness of foreign aid for economic growth in case of individual Asian economies and the results have varied across countries and periods of study. This paper groups together 13 Asian economies that have been some of the largest recipients of foreign aid over the years and investigates the dynamic causal links and the cointegrating relationships between economic growth (per-capita) and foreign aid (as a percentage of GDP). The Asian countries are Afghanistan, Bangladesh, Bhutan, Cambodia, India, Lao PDR, Maldives, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka and Vietnam. The period of study is 1971-2010. The other variables are domestic investment and trade openness (as percentages of GDP). The paper, in particular, examines the short-run and the long-run sensitivity of per-capita economic growth to changes in foreign aid, domestic investment and trade openness. The paper is structured as follows: Section 2 presents a review of empirical literature; Section 3 discusses the data and the estimation method used; Section 4 discusses the results and Section 5 presents the concluding remarks.

2. Literature Review

The results of most recent empirical studies on the relation between foreign aid and economic growth, through both cross-country and country-specific analyses, are mostly mixed and inconclusive. For instance, Murty et al. (1994), Levy (1998) and Gounder (2001) observed a positive relationship between foreign aid and economic growth; Nyoni (1998), Burke and Ahmadi-Esfahani (2006) and Mallik (2008), on the other hand, observed negative or insignificant relationship between the two. The literature provides evidences of mostly positive effects of trade openness and domestic investment on economic growth. Onafowara and Owoye (1998), Foster (2008), Ciftciouglu and Begovic (2008) and, more recently, Yavari and Mohseni (2012) observed a positive long-run impact of trade openness on economic growth. Firebaugh (1992), Ciftciouglu and Begovic (2008) and Adams (2009), amongst others, reported a positive relationship between domestic investment and economic growth.

3. Data and the Model

Annual time series data for 13 Asian developing countries for the period 1971-2010 is used for the dynamic panel analysis. The data source is UNCTAD Statistics. The variables are per-capita real GDP, foreign aid, domestic investment and trade openness. The variables in the model are indexed as PGDP, FAID, DINV and OPEN, respectively. Foreign aid, domestic investment and trade openness are measured as a proportion of the nation's gross domestic product. Except per-capita real GDP which is measured in 2005 constant prices and exchange rates in (US dollars), all other variables are measured in current prices and current exchange rates (in US dollars). Per-capita real GDP is used as a measure of economic growth (per-capita). Foreign aid is the net total overseas development assistance received by a nation. Trade openness measures the degree of trade liberalization and the index is constructed by dividing a nation's total exports and imports by its gross domestic product. The sensitivity of

economic growth to changes in foreign aid, domestic investment and trade openness is examined by estimating the Mallik (2008) aid-growth model specification of the form:

$$\ln PGDP_{it} = \alpha_0 + \alpha_{1i}\ln FAID_{it} + \alpha_{2i}\ln DINV_{it} + \alpha_{3i}\ln OPEN_{it} + \varepsilon_{it} \quad (1)$$

In equation (1), $\alpha_o = \ln(A_0)$, t denotes the time period under consideration, i denotes the ith country, and α_1, α_2 and α_3 are the long-run elasticity coefficients of foreign aid, domestic investment and trade openness respectively.

4. Dynamic Panel Cointegration and Causal Analysis

4.1 Unit Root Tests: The stationarity of each variable is examined by performing four unit root tests: Levin, Lin and Chu (LLC, 2002), Im, Peasaran and Shin (IPS, 2003), Maddala and Wu (MW, 1999) and Choi (2006). In both Levin, Lin and Chu (LLC, 2002) and Im, Peasaran and Shin (IPS, 2003), the null hypothesis of the existence of a unit root is tested against the alternate hypothesis of no unit root. In Im, Peasaran and Shin (IPS, 2003), the alternate hypothesis differs from Levin, Lin and Chu (LLC, 2002) in that some of the individual series (if not all) may contain a unit root. In Maddala and Wu (MW, 1999) a Fisher-type test is performed. The test is non-parametric, follows a chi-square distribution and is not sensitive to the lag length in the ADF regressions. The results of the unit root tests including the Choi test for each variable at both levels and first differences are reported in Table 1.

Table 1. Unit Root Tests

Constant Only (Level)								
	LLC	prob.	IPS	prob.	MW	prob.	Choi	prob.
lnPGDP	8.13(2)	1.00	10.15(2)	1.00	1.88(2)	1.00	9.55(2)	1.00
lnOPEN	0.60(3)	0.73	1.67(2)	0.95	20.77(2)	0.75	1.68(2)	0.95
lnFAID	-1.24(4)	0.11	-0.92(3)	0.18	39.55*(3)	0.04	-0.85(3)	0.19
lnDINV	-0.85(1)	0.19	-0.33(1)	0.37	31.03(1)	0.23	-0.29(1)	0.38
Constant and Trend (Level)								
	LLC	prob.	IPS	prob.	MW	prob.	Choi	prob.
lnPGDP	-0.22(2)	0.41	-0.70(2)	0.24	27.95(2)	0.36	-0.69(2)	0.25
lnOPEN	0.34(4)	0.63	1.60(4)	0.95	24.56(4)	0.54	1.79(4)	0.96
lnFAID	-1.9*(3)	0.03	0.92(3)	0.18	33.08(3)	0.16	-0.84(3)	0.20
lnDINV	-0.22(2)	0.41	-0.70(2)	0.24	27.95(2)	0.36	-0.69(2)	0.25
Constant Only (First Difference)								
	LLC	prob.	IPS	prob.	MW	prob.	Choi	prob.
ΔlnPGDP	-10.0**(1)	0.00	-13.0**(1)	0.00	200.0**(2)	0.00	-12.0**(1)	0.00
ΔlnOPEN	-19.0**(1)	0.00	-18.0**(1)	0.00	286.0**(2)	0.00	-14.0**(1)	0.00
ΔlnFAID	-21.0**(1)	0.00	-20.0**(1)	0.00	326.0**(2)	0.00	-15.0**(1)	0.00
ΔlnDINV	-19.0**(1)	0.00	-19.0**(1)	0.00	270.0**(2)	0.00	-14.0**(1)	0.00

As the results indicate, the four panel variables are integrated of order one. The cointegration tests are next performed to determine cointegrating relationships between the variables.

4.2 Cointegration Analysis: The Kao (1999) test and the Johansen Fisher panel cointegration test are performed to determine the cointegrating relationships between the four variables. Both the tests are performed with one lag, and the results confirm the existence of cointegrating relationships. The results are reported in Table 2.

In Table 1, * indicates significant at 5% level and ** indicates significant at any level.
The numbers in the parantheses are the optimum lag lengths.

Table 2. Cointegration Test

Kao Test			
t-statistic	probability	lags	
-2.17*	0.02	9	
Johansen Cointegration Test: Model 1			
Cointegrating Equations	Fisher Statistic (Trace Test)	probability	Fisher Statistic (Max.Eigen.)	probability
none	219.9**(1)	0.00	137.9**(1)	0.00
at most 1	132.1**(1)	0.00	83.79**(1)	0.00
at most 2	79.98**(1)	0.00	69.09**(1)	0.00
at most 3	41.06**(1)	0.03	41.06**(1)	0.03
Johansen Cointegration Test: Model 2			
Cointegrating Equations	Fisher Statistic (Trace Test)	probability	Fisher Statistic (Max.Eigen.)	probability
none	254.1**(1)	0.00	139.9**(1)	0.00
at most 1	152.6**(1)	0.00	79.69**(1)	0.00
at most 2	88.37**(1)	0.00	62.43**(1)	0.00
at most 3	54.42**(1)	0.00	54.42**(1)	0.00

Since the results indicate cointegrating relationships between the panel variables, the short-run and long-run dynamics are next examined.

4.3 Short-Run and Long-Run Elasticities: The short-run elasticity coefficients are obtained from the estimation of the following error correction model:

$$\Delta \ln PGDP_{it} = \beta_0 + \sum_{j=1}^{p} \beta_{ij} \Delta \ln PGDP_{it-j} + \sum_{j=1}^{p} \beta_{2j} \Delta \ln FAID_{it-j} + \sum_{j=1}^{p} \beta_{3j} \Delta \ln DINV_{it-j} + \sum_{j=1}^{p} \beta_{4j} \Delta \ln OPEN_{it-j} + \lambda ECM_{it-1} + \varepsilon_{it} \quad (2)$$

where

$$ECM_{it} = \ln PGDP_{it} - \hat{\alpha}_0 - \sum_{j=1}^{p} \alpha_{1j} \ln PGDP_{it-j} - \sum_{j=0}^{p} \alpha_{2j} \ln FAID_{it-j} - \sum_{j=0}^{p} \alpha_{3j} \ln DINV_{it-j} - \sum_{j=0}^{p} \alpha_{4j} \ln OPEN_{it-j} \quad (3)$$

In equation (2), the parameters β_2, β_3 and β_4 represent short-run elasticity coefficients for foreign aid, domestic investment and trade openness, respectively. The variables are integrated of order one; hence, they are included in first-difference form in the model. The sign of the coefficient λ indicates convergence toward long-run equilibrium. The long-run coefficients are obtained from the estimation of the following model:

$$\ln PGDP_{it} = \mu_i + \alpha_1 \ln FAID_{it} + \alpha_2 \ln DINV_{it} + \alpha_3 \ln OPEN_{it} + \sum_{j=1}^{p} \gamma_{ij} \Delta \ln FAID_{it-j} + \sum_{j=1}^{p} \lambda_{ij} \Delta \ln DINV_{it-j} + \sum_{j=1}^{p} \delta_{ij} \Delta \ln OPEN_{it-j} + \mu_{it} \quad (4)$$

In Table 2, Model 1: No intercept and trend in CE and VAR; Model 2: intercept (no trend) in CE-no intercept in VAR; **indicates significant at 5% level.

The numbers in the parantheses in Table 2 are the optimum lag lengths.

In equation (4), α_1, α_2 and α_3 represent the long-run elasticity coefficients for foreign aid, domestic investment and trade openness, respectively. The optimum lag length is determined by both AIC and SBIC. The GMM technique is then applied to estimate the short-run and the long-run coefficients. The results are reported in Table 3 and Table 4.

Table 3. Short-Run Coefficients

	coefficient	t-statistic	probability	lags
∆lnOPEN	0.04*	2.22	0.03	1
∆lnFAID	-0.02*	-4.93	0.00	1
∆lnDINV	0.09*	4.23	0.00	1
ECM	-0.02*	-3.74	0.00	-

Table 4. Long-Run Coefficients

	coefficient	t-statistic	probability	lags
lnOPEN	0.29*	11.24	0.00	1
lnFAID	-0.18*	-8.79	0.00	1
lnDINV	0.76*	12.93	0.00	1

The short-run effect of foreign aid on per-capita economic growth is significantly negative, while that of domestic investment is significantly positive. The short-run effects of both domestic investment and trade openness on per-capita economic growth are significantly positive. The adjustment coefficient 0.02 is significantly negative, indicating rapid adjustment toward long-run equilibrium.

Long-run results indicate that a 1% increase in trade openness (as a share of GDP) results in 0.29% increase in per-capita economic growth. A 1% rise in domestic investment (as a share of GDP) results in 0.76% rise in per-capita per-capita economic growth. On the other hand, a 1% rise in foreign aid (as a share of GDP) will result in 0.18% fall in per-capita real income. Thus an increase in trade openness and domestic investment will expectedly have a positive impact on per-capita economic growth in the 13 Asian countries under study. But an increase in foreign aid will most likely have a negative long-run effect on per-capita economic growth.

5. Conclusion

This paper has examined the dynamic cointegrating relationships between per-capita economic growth, foreign aid, domestic investment and trade openness for 13 Asian developing countries for the period 1971-2010. Cointegrating relationships show significantly positive long-run effects of trade openness and domestic investment on economic growth. The long-run effect of foreign aid on economic growth is significantly negative. Long-run estimates indicate that a 1% rise in trade openness and domestic investment (as percentages of GDP) will result in, respectively, 0.29% and 0.76% rise in per-capita real income. Also, a 1% rise in foreign aid (as a share of GDP) results in 0.18% fall in per-capita real income.

There could be numerous reasons for the negative aid-growth relationship. "Loan conditionalities" is widely considered one factor in which the aid-recipient must purchase overpriced goods from the donor countries. In the past the donor countries have used aid as a tool for market protectionism against products from the poor countries, and at the same time, gain access to markets in the same aid-dependent economies. As Boone (1996) and Burnside and Dollar (2000) pointed out, the negative impact of foreign aid on economic growth could be due to the prevalence of a 'bad policy' environment; consequently, aid does not reach the

* in Table 3 and in Table 4 indicates 5% significance level.

poorest that need it the most. The negative effect could also be due to low human capital; consequently, foreign-aid is utilized primarily to meet humanitarian needs (Kosack and Tobin, 2006). Thus policies aimed at increasing domestic savings and investment would possibly reduce the need for foreign aid. The incremental savings and investment generated domestically could be directed toward expansion of productive capacities in domestic industries. Greater participation in international trade also will most likely have a positive impact on the long-run economic growth of the Asian economies covered in this study.

References

Adams, S (2009) "Foreign Direct investment, domestic investment, and economic growth in Sub-Saharan Africa" *Journal of Policy Modeling* **31**, 939-949.

Boone, P (1996) "Politics and the effectiveness of foreign aid" *European Economic Review* **40**, 289-329.

Burke, P. J. and F.Z. Ahmadi-Esfahani (2006) "Aid and growth: A study of South East Asia" *Journal of Asian Economics* **17**, 350-362.

Burnside, C. and D. Dollar (2000) "Aid, policies and growth" *American Economic Review* **90,** 847-868.

Choi, I. (2006). "Combination Unit Root Tests for Cross-Sectionally Correlated Panels" in *Econometric Theory and Practice: Frontiers of Analysis and Applied Research*. Cambridge University Press: Cambridge, 311-333.

Ciftcioglu, S and N. Begovic (2008) "The Relationship Between Economic Growth And Selected Macroeconomic Indicators In A Group Of Central And East European Countries: A Panel Data Approach" *Problems and Perspectives in Management* **6**, 24-30.

Firebaugh, G (1992) "Growth Effects of Foreign and Domestic Investment" *American Journal of Sociology* **98**, 105-130.

Foster, N (2008) "The Impact of Trade Liberalisation on Economic Growth: Evidence from a Quantile Regression" *Kyklos* **61**, 543-567.

Gounder, R (2001) "Aid-growth nexus: empirical evidence from Fiji" *Applied Economics* **33**, 1009-1019.

Im, K.S., M.H. Pesaran and Y. Shin (2003) "Testing for Unit Roots in Heterogeneous Panels" *Journal of Econometrics* **115**, 53-74.

Kao, C (1999) "Spurious regression and residual-based tests for cointegration in panel data" *Journal of Econometrics* **90**, 1–44.

Kosack, S. and T. Tobin (2006) "Funding Self-Sustaining Development: The Role of Aid, FDI and Government in Economic Success" *International Organization* **60**, 205-243.

Levin, A., C. F. Lin and C. J. Chu (2002) "Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties" *Journal of Econometrics* **108**, 1-24.

Levy, V (1988) "Aid and Growth in Sub-Saharan Africa: The Recent Experience" *European Economic Review* **32**, 1777-1795.

Murty, V.N.R., V. Ukpolo, and J.M. Mbaku (1994) "Foreign aid and economic growth in Cameroon: evidence from cointegration tests" *Applied Economics Letters* **1**, 161-163.

Maddala G.S and W. Shaowen (1999) "A comparative study of unit root tests with panel data and new simple test" *Oxford Bulletin of Economics and Statistics* **61**, 631-652.

Mallik, G (2008) “Foreign Aid and Economic Growth: A Cointegration Analysis of the Six Poorest African Countries” *Economic Analysis and Policy* **38**, 251-260.

Nyoni, T.S (1998) “Foreign Aid and Economic Performance in Tanzania” *World Development* **26**, 1235-1240.

Onafowara, O.A. and O. Owoye (1998) “Can Trade Liberalization Stimulate Economic Growth in Africa?” *World Development* **26**, 497-506.

Yavari, K. and R. Mohseni (2012) “Trade liberalization and economic growth: a case study of Iran” *Journal of Economic Policy Reform* **15**, 13-23.