IUB Journal of Social Sciences
https://journals.iub.edu.pk/index.php/jss
Vol. 3, No. 2, December 2021, Pages: 10-20

An Econometric Analysis of Investment and Poverty: A Panel-Data Analysis of Selected Asian Economies

Saliha Iqbal[1], Muhammad Akbar[2] and Komal Batool[3]

Abstract

This paper is an endeavor to explore the contribution of investment towards poverty reduction. A balanced panel of fifteen selected Asian countries was developed, covering the annual data of 25 years ranging from year 1993 to 2017. In addition to the investment, analysis was controlled through the inclusion of variables such as inflation rate, employment rate and Human Development Index (HDI). Unit root tests followed by the cointegration tests were applied that verified the existence of long run association between investment and poverty. Furthermore, the coefficients of the variables were estimated through fully modified ordinary least squares (FMOLS) method of panel regression. The findings tend to support the literature and validate that investment reduces poverty significantly. This alludes to the fact that policy makers may design the development policies in a way that could enable the investment as conducive towards poverty reduction and development.

Keywords: Investment, Poverty, Fully Modified Ordinary Least Squares, Asian economies

Introduction

Poverty eradication is a global aim and a key issue of this century's economic policies and development projects. It takes top position in all lists of goals to be met, whether they were the Millennium Development Goals or the Sustainable Development Goals.

According to the World Bank Report in 2018, Asia is the most populated continent, with 4.5 billion people accounting for roughly 60% of the world's current population, with 783 million people living below the poverty line of US$1.9 per day. Asia includes the world's most populous countries, such as China, India, Russia, and Pakistan, among others. Most Asian nations are destitute and lack capital, which is believed to be a fuel in the process of poverty alleviation, and require a major push via public and private, direct and indirect, foreign and domestic investments to develop and break the poverty cycle.

[1] Lecturer in Economics, Punjab HED. Email: saliha_iqbal@yahoo.com
[2] (Corresponding Author) Deputy Secretary Finance, South Punjab. Email: m.akbarpms@gmail.com
[3]PhD Scholar Shenzhan University. Email: Komalbatool198@gmail.com

Poverty reduction can occur both directly and indirectly as a result of investments. Almost all of classical economists' development theories attribute economic growth to investment. Low rates of savings and investment, according to theories like the Vicious Cycle of Poverty, are a major cause of poverty because low savings lead to low investments, which leads to low productivity and low incomes, and the cycle repeats itself when a small portion of income is set aside for savings and investments due to low income.

The Big Push Theory emphasizes the critical need for massive investment to lift underdeveloped economies out of poverty and onto the path of development. Many empirical studies, such as Datt and Ravallion's (2002) analysis of the drivers of poverty reduction for Indian states using data from 1960 to 1994, validate such ideas and notions. The analysis concluded that public investment in Indian states remained a statistically significant and substantial driver of poverty reduction. Fanet al. (1999), Fan et al. (2002), Fan et al. (2004a) and Fan et al. (2004b) all follow the same trend. Their study on different economies, including China, Uganda, Thailand, and India, verified the hypothesis and demonstrated that public investments consistently and significantly led to poverty reduction in the economies investigated. Using cross-sectional data, Gomanee et al. (2003) produced results in favour of a negative impact of government expenditure on poverty.

Recognizing the significance of the issue of poverty in general and in Asia in particular, this article aims to highlight the critical elements for poverty reduction strategy, particularly the function of capital generation or simple investment. The goal of this study is to use panel data to examine the nature of the link between investment and poverty.

2 Literature Review

This paper examines the literature on poverty and investment in general in order to determine the nature of dependency and the relationship between the two variables.

Kwon (2001) used panel data from 25 regions in Indonesia to investigate the influence of road infrastructure on poverty reduction from 1976 to 1996. The study found that provinces with greater road connectivity had lower poverty rates than provinces with poor road access.

Fan et al. (2005) investigated how public investments influenced Tanzania's growth and poverty levels. They did so by analyzing data from a household survey and came to the conclusion that public investments in Tanzania were insufficient in all studied regions, with investments in education outperforming in rural areas in particular, while more investment in road infrastructure and agricultural research was required in the country's southern and central regions.

Using data from 2006, Runsinarith (2008) conducted a comparative study on the effects of infrastructure development investments on poverty alleviation in Cambodian provinces, finding that provinces with better infrastructure had lower poverty levels.

Rajkumar and Swaroop (2008) investigated the link between public investments in education and health and poverty using cross section data from 91 countries for three years with a six- to seven-year gap, namely 1990, 1997, and 2003, and found evidence of reverse causality between poverty and health and education investments.

Seetanah et al. (2009) used a panel of 20 nations to examine the impact of government spending in the transportation and communication sector on urban poverty during a 25-year period from 1980 to 2005. The instrumental variable method was used on two models, and it was discovered that government spending on transportation infrastructure decreases poverty, and that the same negative relationship exists between communication sector investment and poverty. Granger Causation test findings further supported the reversed causality between governmental spending in these industries and poverty.

In order to investigate the effects of foreign private investment on poverty alleviation in Nigeria, Okpe and Abu (2009) evaluated the premise that FDI has no influence on poverty reduction. In a regression study of secondary data from 1975 to 2003, it was discovered that FPI and loan inflows played a major influence in the reduction of poverty in Nigeria.

Ogun (2010), using secondary quarterly data from Nigerian cities from 1970:1 to 2005:4, attempted to estimate the impact of social and physical infrastructure on urban poverty and people's living standards, and discovered that social infrastructure investments had a much greater impact on poverty reduction than physical infrastructure investments.

Nagheli et al. (2013) used a panel of eight countries to examine the effects of FDI and regional integration on poverty alleviation for the years 2001 to 2010. The study indicated that through integrating economies, FDI had a critical influence in poverty reduction in the nations analyzed.

Ucal (2014) used an imbalanced panel of 26 developing nations to study the poverty-FDI nexus during a 24-year period from 1990 to 2009. The author estimated a random effect model with employment, GDP growth rate, inflation rate, interest rate, population growth rate, and per capita income as explanatory variables of poverty, as well as the core variable of FDI, and the research concluded with the finding of a negative relationship between poverty and FDI, which simply means that foreign direct investment reduced poverty in the studied country.

Following in the footsteps of Ucal (2014), Moatari and Gaskari (2016) constructed a model to assess the influence of poverty reduction, as well as inflation, GDP growth, population growth, interest rate, employment, and per capita income growth, on FDI in a number of developing nations. The fixed effect model was estimated, and the conclusion was that poverty reduction led to increased FDI inflows in the nations analyzed.

Marinho et al. (2017) used the econometric approach of generalized method of moments (GMM) to estimate a dynamic panel model to see how infrastructure investment expenditures affect poverty in Brazil. They found that poverty decreases as a function of public infrastructure spending. The Granger causality test findings support the same conclusion.

Magombeyi and Odhiambo (2018) investigated the connection between foreign direct investment inflows and poverty alleviation using data from Botswana over a 35-year period from 1980 to 2014. Three proxies of poverty reduction were used in this study: household consumption expenditures, newborn mortality rate, and life expectancy. The ARDL limits test method to the cointegration and error correction model was used to evaluate the influence of FDI inflows on each of three poverty reduction proxies. The first model's findings indicated that FDI

had a negative impact on household consumption expenditures in the short term but had no effect in the long run. The newborn mortality rate was not affected by FDI in the short or long run in the second model, whereas life expectancy was positively related with FDI in the short run but negatively in the long run in the third model.

Ambia and Sujarwoto (2018) developed a balanced panel of data from Indonesia's provinces from 2006 to 2015 to see how investment expenditures on education, health, and road infrastructure influenced the country's poverty condition. The fixed effect regression approach was used to estimate the model, which included control variables such as gross regional domestic expenditures, locally produced revenue, good governance index, and population, as well as the study's key variables. Based on the findings, it was determined that spending on health and education reduced poverty, whereas spending on road infrastructure had no meaningful impact on poverty reduction.

Based on the material discussed above, it can be stated that public investments are critical for economic growth in general and poverty reduction in particular for all types of economies.

3 Methods and Materials

The research was based on annual data from fifteen Asian countries. The analysis creates a Panel series of 375 numbers by combining data from cross sections (N) of Armenia, Bangladesh, China, India, Indonesia, Kazakhstan, Kyrgyzstan, Malaysia, Mongolia, Nepal, Pakistan, Russia, Thailand, Turkey, and Vietnam with time periods (T) ranging from 1993 to 2017. The majority of the data comes from World Development Indicators (2018), while the HDI data comes from different United Nations Development Program yearly publications.

Table 1 shows the units of measurement and data sources for each variable, followed by the operational description of each variable.

Table 1
Variable Description and Data Sources

Variables	Proxy Indicator	Source
Poverty	Head count ratio	WDI (2018)
Investment	Natural log of Gross fixed capital formation (current US $)	World Development Indicators
HDI	Human development index	UNDP Annual Reports
Employment	Labor force participation rate	World Development Indicators
Inflation	Consumer price index (constant base year 2010)	World Development Indicators

3.1 Poverty

Poverty is dependent variable and measured in terms of head count ratio which is the percentage of the population who are earning less than $1.90 per day at international prices of 2011 (WDI, 2018).

3.2 Investment

Gross fixed capital formation (GFCF) is used as proxy variable of investment which is the core independent variable of this study. GFCF is expressed in current dollars and converted in percentage by applying natural log before use.

3.3 HDI

The first variable to be controlled is The Human Development Index is a composite index of health, education, and income developed by Dr. Mehboob ul Haq and Amartya Sen in 1990 and calculated annually by the United Nations Development Program for all countries around the world to rank them according to their level of living standard and human development. Life expectancy at birth is used to determine how long and healthy a person will live. Adult literacy rate and gross enrollment ratio are two additional aspects of the education index. The natural logarithm of GDP per capita at PPP captures the standard of life. The HDI scale runs from 1 to 0 (100 percent development) (represents underdevelopment).

3.4 Employment

The labor force participation rate, which refers to the proportion of the population aged 15 to 64 who participated in the production of goods and services for monetary gain throughout the year, is used as an indication of employment levels in nations. The second control variable in the model is employment.

3.5 Inflation

Inflation is measured by the consumer price index, which reflects changes in the typical consumer's cost of purchasing a basket of fixed goods and services over a certain period of time. Inflation is the model's third and final control variable to be calculated.

a. The Model

This section builds up the model that will be estimated in the next section, with the goal of exposing poverty's reliance on investment and determining the extent to which investment influences poverty. The following is an example of a model.

$$\text{Poverty} = f(\text{Investment, Inflation, HDI, Employment})$$

or

$$POV = f(EMP, INV, INF, HDI)$$

Prior to estimating any model, it is necessary to confirm the appropriateness of the acquired data for future action, in other words, preliminary data analysis is required. This part applies several panel unit root tests to each series in order to check their sequence of integration so that the proper econometric approach may be used to estimate the model.

Table2
Panel Unit Root Test Results

Variable	Test Specification	Levin, Lin &Chu			ImPesaran& Shin		Conclusion
		C	T	None	C	T	
Poverty	*Level*	0.09 (0.53)	-0.23 (0.40)	-6.35 (0.00)	2.49 (0.99)	-0.96 (0.16)	I(1)
	1st difference	-6.03 (0.00)	-4.97 (0.00)	-9.08 (0.00)	-8.22 (0.00)	-5.38 (0.00)	
Investment	*Level*	0.57 (0.71)	6.18 (1.00)	8.60 (1.00)	3.60 (0.99)	1.48 (0.93)	I(1)
	1st Difference	5.79 (1.00)	8.09 (1.00)	-6.58 (0.00)	-5.37 (0.00)	-3.19 (0.00)	
Human Development Index	*Level*	-3.27 (0.00)	2.55 (0.99)	9.75 (1.00)	1.55 (0.93)	1.25 (0.89	I(1)
	1st difference	-2.41 (0.00)	-2.09 (0.01)	-3.32 (0.00)	-4.5 (0.00)	-2.78 (0.00)	
Inflation	*Level*	5.12 (1.00)	-0.48 (0	7.15 (1.00)	8.82 (1.00)	1.79 (0.96)	I(1)
	1st difference	-4.48 (0.00)	-3.91 (0.00)	-3.54 (0.00)	-3.90 (0.00)	-3.33 (0.00)	
Employment	*Level*	-3.79 (0.00)	-2.00 (0.02)	-0.33 (0.36)	0.16 (0.56)	0.87 (0.80)	I(1)
	1st difference	-2.57 (0.00)	-2.17 (0.01)	-5.22 (0.00)	-4.09 (0.00)	-3.34 (0.00)	

Authors Calculations using Eviews 9
Probability values are given in parenthesis

The unit root test examines the mean, variance, and covariance of a data series to check its trend and capacity to bounce back. For model estimation, a suitable econometric approach is given based on the results of unit root testing. Table 2 gives us insight about unit root tests results and corresponding conclusions.

It can be seen in table 2 , The Levin, Lin and Chu and Im Pesaran & Shin tests statistics and their respective probability values lead to the conclusion that all the series are stationary at first difference i.e., integrated of order one.

The next step is to econometrically make sure that all these integrated of order one series are cointegrated or not. Theoretically, in order to confirm about the existence of long run relationship among these series, cointegration analysis is required to be conducted. Among several cointegration techniques Kao Residual Cointegrated Test is applied on the described model and results are shown in Table 3.

The result of Kao Residual Cointegration Test gives the clear indication of existence of long run association among the understudy variables as the null hypothesis of no cointegration is rejected on the basis of probability of statistic which is less than 5 percent. For further validation

of results, the Pedroni Residual Cointegration test is being applied and results are shown in Table 4.

Table 3
Results of Kao Residual Cointegration Test

Series: POV EMP INV INF HDI
Sample: 1993 2017
Included observations: 375
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-1.764293	0.0388

Authors Calculations using Eviews 9

The results of Pedroni Cointegration test also support the conclusion drawn from Kao test of Cointegration as six out of eleven statistics make the null hypothesis of No Cointegration rejected.

Table 4
Pedroni Residual Cointegration Test

Series: POV EMP INV INF HDI
Sample: 1993 2017
Included observations: 375
Cross-sections included: 15
Null Hypothesis: No cointegration
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Trend assumption: No deterministic trend

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	1.394916	0.0815	0.019405	0.4923
Panel rho-Statistic	0.712691	0.7620	0.307850	0.6209
Panel PP-Statistic	-1.661755	0.0483	-3.495136	0.0002
Panel ADF-Statistic	-2.406700	0.0080	-4.164170	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.839047	0.9670
Group PP-Statistic	-3.441833	0.0003
Group ADF-Statistic	-4.099989	0.0000

Authors Calculations usingEviews 9

4 Estimation and Results

As it is confirmed by both tests i.e., Kao Test and Pedroni Test of cointegration that there exists cointegration among our understudied variables, the next step is to estimate the model by a suitable econometric technique that is Fully Modified OLS here. The table 5 explores the test results consisting of coefficients of variables and their corresponding standard errors, t statistics and probability values.

The Table 5 makes it evident that the core variable of this study that is the investments is negatively associated with poverty in general. Specifically 1 percent increase in the level of investments led to 2.28 percent decrease in the level of poverty. The t- statistic and corresponding probability explore that the results are statistically significant.

Table 5
Fully Modified Ordinary Least Square Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Investment	-2.2804	0.7051	-3.2340	0.0013
Inflation	-0.08971	0.02708	-3.3122	0.0010
HDI	-54.7850	27.4500	-1.9958	0.0467
Employment	1.4779	0.2639	5.6003	0.0000

Authors Calculations using Eviews 9

The first control variable that is inflation also pushes the poverty down according to the results shown above in the table which is statistically significant at 0.00 percent level of significance. the coefficient can be interpreted as 1% increase into the level of inflation results in 0.08 % drop in poverty levels and can be justified with the argument that study has mostly utilized the developing countries in which poor people usually earn from the production of basic consumer goods whose price are captured in CPI. When the prices of such goods increases, the increased profit margin lead to the increased income, better living standard and reduced level of poverty. Most of the countries are not suffering from hyperinflation so increase in inflation rate in moderate range is always beneficial for the developing economies.

The coefficient of the third independent variable of model which is HDI is mitigating poverty very sharply in studied countries. The Table 5 reveals that the result for this variable is economically as well as statistically significant.

The coefficient of last control variable shows that employment encourages poverty in the said countries which is apparently looking paradoxical but can be justified as most of the Asian countries are overpopulated and subject to disguised unemployment that's why just belonging to a business or job is not sufficient to ensure better incomes, living standard and low levels of poverty but the increased production is the necessary condition for the achievement of aforementioned goal. The t-statistics and probability value in Table 5 show that estimate is statistically significant.

5 Conclusion, Implications and Agenda for the Future

Using yearly data from fifteen Asian nations from 1993 to 2017, this article aimed to analyze the role of investments in poverty reduction. As a surrogate for investments, the natural log of gross fixed capital creation is employed. Along with investment, the analysis was aided by control variables such as the consumer price index, which served as a proxy for inflation, the

labour force participation rate, which served as an indicator of employment, and the Human Development Index, which served as a combined indicator of income, education, and health status. Following the development of the model, different panel unit root tests were performed on each series to determine the presence of a unit root and to choose the best estimate econometric approach. All series were determined to be integrated of order one after unit root tests verified the presence of a unit root at the level. Furthermore, Cointegration tests were used to ensure that the variables had a long-term relationship, and it was found that investment determines poverty in the long run. The coefficients were calculated using the Fully Modified Ordinary Least Square Method, and the results indicated that investment had a substantial impact on poverty reduction. According to the findings, every economy that is vulnerable to poverty should establish laws and environments that encourage investment.

References

Ambia, A. N. and Sujarwoto, N. I. (2018). Infrastructure Expenditure and Poverty Reduction in Indonesia. *Russian Journal of Agriculture and Socio-Economic Sciences 4(76).*

Datt, G. and Ravallion, M. (2002). Is India's Economic Growth Leaving the Poor Behind?. *Journal of Economic Perspectives 16 (3):* 89–108.

Kwon, E. (2001). Infrastructure, Growth, and Poverty Reduction in Indonesia: A Cross-Sectional Analysis. Mimeo, Manila: Asian Development Bank.

Fan, S., Hazell, P. and Thorat, S. (1999). Linkages between Government Spending, Growth and Poverty in Rural India. *Research Report 110*. Washington, DC: IFPRI.

Fan, S., Zhang, L. and Zhang, X. (2002). Growth, Inequality and Poverty in Rural China: The Role of Public Investments. *Research Report 125*. Washington, DC: IFPRI.

Fan, S., Jitsuchon, S. and Methakunnavut, N., (2004a). The Importance of Public Investment for Reducing Rural Poverty in Middle-Income Countries: The Case of Thailand. *DSGD Discussion Paper 7*. Washington, DC: IFPRI.

Fan, S., Zhang, X. and Rao, N. (2004b). Public Expenditure, Growth and Poverty Reduction in Rural Uganda. *DSGD Discussion Paper 4*. Washington, DC: IFPRI.

Fan, S., Nyange, D. and Rao, N. (2005). Public Investment and Poverty Reduction in Tanzania,*DSGD Discussion papers 18,* International Food Policy Research Institute (IFPRI).

Gomanee, K., Morrissey, O., Mosley, P. and Verschoor, A. (2003). Aid, Pro-poor Government Spending and Welfare. *CREDIT Research Paper 3*. Nottingham: University of Nottingham, CREDIT.

Green, W. (2003). Econometrics. Prentice Hall, New York.

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

Kao, C. (1999). Spurious Regression and Residual Based Tests for Cointegration in Panel Data, *Journal of Econometrics, Vol. 90.* 1-44.

Levin, A. and Lin, C.F. (1992).Unit Root Tests for Panel Data: Asymptotic and Finite Sample Properties, University of California at San Diego, Discussion Paper no. 92-93.

Magombeyi, M. T. and Odhiambo, N. M. (2018). FDI Inflows and Poverty Reduction in Botswana: An Empirical Investigation. *Cogent Economics & Finance Vol(6).*

Marinho, E., Campelob, G., Francaa, J. and Araujoc, J. **(**2017). Impact of Infrastructure Expenses in Strategic Sectors for Brazilian Poverty, *Economia, Vol (18*), 244-259.

Moatari, B. and Gaskari, D. R. (2016). The Relationship Between Foreign Direct Investment and Poverty Reduction in Developing Countries, *International Journal of Humanities and Cultural Studies,* ISSN 2356-5926.

Nagheli, S., Nagheli, E. and Sadeghi, B. (2013). The Impact of Foreign Direct Investment and Regional Integration on Poverty Reduction, Case study: D8 countries, *Advances in environmental Biology, 7(8),* 1412-1420.

Ogun, T.P. (2010). Infrastructure and Poverty Reduction—Implications for Urban Development in Nigeria. *UNU-WINDER Working Paper, 43*.

Okpe, I. J. and Abu, G.A. (2009). Foreign Private Investment and Poverty Reduction in Nigeria (1975 to 2003), *Journal of Social Sciences, 19:3*, 205-211.

Pedroni, P. (2000). Fully Modified OLS for Hetrogeneous Cointegration Panels, *Advances in Econometrics, Vol. 15,* 93-130.

Pedroni, P. (2004). Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis, *Econometrics Theory, Vol 20*, 597-625.

Rajkumar, A. S. and Swaroop, V. (2008). Public Spending and Outcomes: Does Governance Matter*?, Journal of development economics (86),* 96-111.

Runsinarith, P. (2008). Infrastructure Development and Poverty Reduction: Evidence from Cambodia's Border Provinces. Graduate School of International Studies. Nagoya University.

Seetanah, B., Ramessur, S. and Rojid, S. (2009). Does Infrastructure Alleviate Poverty in Developing Countries?, *International Journal of Applied Econometrics and Quantitative Studies,V6-2.*

Sen, A., (1976). Poverty: An ordinal approach to measurement. *Econometrica, 44(2):* 219-231

Todaro, M. P. and Smith, S. C. (2003). Economic Development. Pearson Education Limited

Ucal, M. S. (2014). Panel Data Analysis of Foreign Direct Investment and Poverty from the Perspective of Developing Countries. *Procedia – Social and Behavioral Sciences, 109*, 1101-1105.

https://www.worldbank.org/en/news/press-release/2018/09/19/decline-of-global-extreme-poverty-continues-but-has-slowed-world-bank

https://databank.worldbank.org/data/reports.aspx?source=world-development-indicators

www.hdr.undp.org/