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A Contribution of Foreign Direct Investment in Poverty Reduction in Pakistan

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Abstract: The study aims to find out the contribution of foreign direct investment in poverty reduction in Pakistan. It takes foreign direct investment, government expenditure on health and education and economic growth rate as independent variable and head-count ration as dependent variable. ADF, PP, Ng-Perron and Zivot-Andrews Unit root tests are used to find the unit root problem. ARDL and its error correction model are used to find the long run and short run relationships. The study finds the long run and short run relationships in the model. Foreign direct investment, government expenditure on health and education and economic growth rate have negative and significant impact on poverty. So, foreign direct investment is helping in reducing the poverty level in Pakistan.

Key words: FDI · Poverty · Economic Growth · Cointegration

INTRODUCTION

To capture the impact of Foreign Direct Investment (FDI) on poverty, the study uses head-count ratio as dependent variable and uses FDI, government expenditure on health and education as percentage of Gross Domestic Product (GDP) and GDP growth rate as independent variables. Government spending on health and education improves the quality of life of the poor people who have not sufficient fund to invest on them. Government in developing countries usually spends on the primary health and education which is helpful in reducing poverty. The relationship between poverty, health and education can also be observed in the health and education standards of rich and poor countries. The high income countries have high life expectancy, low infant mortality rates and high literacy rate.

Economic growth may come with reducing poverty by increasing per capita income and through equal distribution of income and wealth. It would be done if country's abundant factor of production is being utilized in production process. It may increase poverty if growth comes with high income and wealth inequalities. Economic growth with structural change may reduce poverty. For example converting from agriculture to industrial sector can reduce poverty. Labour force from primary sector is also trying to get job in developed sectors to increase their income levels. So, FDI reduces poverty by providing employment. It is also due to the reason that foreign investors usually offer better salaries to domestic work force than domestic employers. FDI is also generating competition with domestic enterprises to attract labour. So, domestic employers also start to give better wages to labor. Through direct and indirect channels, FDI enhances the incomes of poor.

Literature Review: Todaro and Smith [1] and Hayami [2] argued that FDI might use better technologies which would help in increasing productivity. So, FDI might help in breaking the vicious circle of underdevelopment.Its impact depended on recipient country's policies, quality of labor market, level of investment and economic environment Mayne [3]. Nordstrom *et al.* [4] argued that FDI might be helpful in promoting the labour skills, productivity levels and economic growth. It would also be helpful in increasing economic activities and increasing employment opportunities. So, FDI might be helpful in reducing poverty level in a country.Saravanamuttoo[5] argued if rate of investment was greater than population

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growth then it would help in reducing poverty. As FDI is helping in increasing investment level in recipient country so it would help in reducing poverty level in that country. Klein *et al*. [6] argued that FDI would help in raising the quality of economic growth through financial market stability and could help in poverty reduction through availability of finance to poor.

Methodology: To capture the impact of FDI on poverty, the study uses head-count ratio as a proxy for poverty, as dependent variable and uses FDI and government expenditure on health and education as percentage of GDP and GDP growth rate as independent variables.

Model of study is as follows:

$$POV_t = f(FDIG_t, GEHEG_t, GR_t) \quad (1)$$

Where,

POV_t = Poverty measured by head count ratio
$FDIG_t$ = Foreign Direct Investment inflow as percentage of GDP at time t.
$GEHEG_t$ = Government Expenditure on Education and Health as percentage of GDP at time t.
Gr_t = GDP Growth Rate annual percentage at time t.

The study checks the stationarity of data and then applies the cointegration test. The equation of Augmented Dickey Fuller (ADF) unit root test developed by Dickey and Fuller [7] is as follows:

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + \dots\dots + \gamma_m \Delta Y_{t-m} + u_t \quad (2)$$

Where, $\gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + \dots\dots + \gamma_m \Delta Y_{t-m}$ is used to remove serial correlation. The equation (2) can also be regressed with time trend to check the trend stationary time series. Phillips and Perron (PP) [8] ignore the $\gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + \dots\dots + \gamma_m \Delta Y_{t-m}$ from ADF equation. PP test removes the serial correlation by giving ranks to the residuals. PP test uses the modified statistic Z_t and Z_δ which are as follows:

$$Z_t = \left(\frac{\hat{\sigma}^2}{\hat{\pi}^2}\right)^{1/2} t_{\delta=0} - \frac{1}{2}\left(\frac{\hat{\pi}^2 - \hat{\sigma}^2}{\hat{\pi}^2}\right) \cdot \left(\frac{T.SE(\hat{\delta})}{\hat{\sigma}^2}\right) \quad (3)$$

$$Z_\delta = T\hat{\delta} - \frac{1}{2}\frac{T^2.SE(\hat{\delta})}{\hat{\sigma}^2}\left(\hat{\pi}^2 - \hat{\sigma}^2\right) \quad (4)$$

Ng and Perron [9] developed efficient and a modified version of PP test. This test is more efficient than PP test. The tests of Ng-Perron are as follows:

$$MZ_\alpha^d = (T^{-1}(y_T^d)^2 - f_0)/2k \quad (5)$$

$$MSB^d = (k/f_0)^{1/2} \quad (6)$$

$$MZ_t^d = MZ_\alpha^d \times MSB^d \quad (7)$$

$$MPT_T^d = ((\bar{c})^2 k + (1-\bar{c})T^{-1})(y_T^d)^2 / f_0 \quad (8)$$

Zivot and Andrews [10] test uses the sequential ADF test to find the stationarity of time series with considering one unknown structural break. The set of equations of Zivot-Andrews are as follows:

$$Model\ A: \ \Delta Y_t = \mu_1^A + \gamma_1^A t + \mu_2^A DU_t(\lambda) + \alpha^A Y_{t-1} + \sum_{j=1}^{k} \beta_j \Delta Y_{t-j} + \varepsilon_t \quad (9)$$

$$Model\ B: \ \Delta Y_t = \mu_1^B + \gamma_1^B t + \gamma_2^A DT^*_t(\lambda) + \alpha^B Y_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta Y_{t-j} + \varepsilon_t \quad (10)$$

$$Model\ C: \ \Delta Y_t = \mu_1^C + \gamma_1^C t + \mu_2^C DU_t(\lambda) + \gamma_2^C DT_t^*(\lambda) + \alpha^C Y_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta Y_{t-j} + \varepsilon_t \quad (11)$$

Where $DU_t(\lambda)$ is 1 and $DT_t^*(\lambda) = t - T\lambda$ if $t > T\lambda$, 0 otherwise. $\lambda = T_B/T$, T_B represents a possible break point. Equation is tested sequentially for T_B=2,3,....T-1, where T is the number of observations after adjustment of differencing and lag length *k*.

After testing for unit root problem, the study will apply ARDL cointegration technique developed by Pesaran *et al.* [11] to find the long run and short run relationships. The study uses the Schwartz-Bayesian Criteria (SBC) to find the optimum lag length. F-values generated by Narayan [12] will be used to test the cointegration test. To find the cointegration amongst poverty, FDI, economic growth rate and government spending on health and education, ARDL model is as follows:

$$\Delta POV_t = \delta_{m0} + \delta_{m1}POV_{t-1} + \delta_{m2}FDIG_{t-1} + \delta_{m3}GEHEG_{t-1} + \delta_{m4}GR_{t-1} + \sum_{i=1}^{p}\beta_{m1i}\Delta POV_{t-i}$$
$$+\sum_{i=0}^{q}\beta_{m2i}\Delta FDIG_{t-i} + \sum_{i=0}^{r}\beta_{m3i}\Delta GEHEG_{t-i} + \sum_{i=0}^{s}\beta_{m4i}\Delta GR_{t-i} + \lambda_l D_{POV} + \varepsilon_{mt} \quad (12)$$

In equation (2), first difference of POV is the dependent variable, the null hypothesis is (H_0: $\delta_{m1}=\delta_{m2}= \delta_{m3}= \delta_{m4}= 0$) and alternate hypothesis is ($\delta_{m1} \neq \delta_{m2} \neq \delta_{m3} \neq \delta_{m4} \neq 0$) which shows existence of long run relationship in the model, δ_{m0} is a constant and å$_{mt}$ is error term. D_{POV} is included in equation for possible structural break and to complete information. This is also shown as $F_{POVt}(POV_t/FDIG_t, GEHEG_t, GR_t)$. If cointegration exists in the model then long run and short run coefficients will be calculated. Error correction term can be used to find the short-run relationship in the model. Error correction model is as follows:

$$\Delta POV_t = \gamma_m + \sum_{i=1}^{p}\beta_{m1i}\Delta POV_{t-i} + \sum_{i=0}^{q}\beta_{m2i}\Delta FDIG_{t-i} + \sum_{i=0}^{r}\beta_{m3i}\Delta GEHEG_{t-i}$$
$$+\sum_{i=0}^{s}\beta_{m4i}\Delta GR_{t-i} + \phi_l D_{POV} + \varphi_m ECT_{t-1} + \zeta_{mt} \quad (13)$$

φ_m is showing the speed of adjustment from short run disequilibrium to long run equilibrium. Afterwards, diagnostic tests will be used to check the normality, functional form, heteroscedasticity and serial correlation in the model. CUSUM and CUSUMsq statistics will be used to ensure the stability of parameters.

Data: Data on Poverty is taken from Jamal [13]. Poverty measured by head-count ratio percentage of population below minimum level of consumption based on calories consumption 2550 per day plus other basic needs at time t. Data on Foreign Direct Investment, government expenditure on health and education, GDP and GDP growth rate are taken from World Bank [14]. Data is taken from 1973 to 2003. Data is not up to date due of non-availability.

Empirical Results: Study uses the Augmented Dickey Fuller (ADF), Phillip-Perron and Ng-Perron tests to check the unit root problem in all variables in the model. Results are given in the Table (1).

Table 1 shows that POV_t, $FDIG_t$ and $GEHEG_t$ are non-stationary at level. GR_t is stationary at 1% level of significance with intercept in ADF, PP and Ng-Perron (MZ_a, MZ_t and MPT) tests and it is stationary at 5% level of significance with Ng-Perron (MSB) test. GR_t is stationary with both intercept & trend at 1% level of significance with ADF and PP tests, at 5% level of significance with Ng-Perron (MPT and MSB) test and it is non-stationary with Ng-Perron (MZ_a and MZ_t) tests.

Table 2 shows POV_t is non-stationary with significant break for the year year 1987 in trend and with significant break in both intercept & trend for the year 1986. $FDIG_t$ become stationary at 5% level of significance with significant break for the year year 1999 in trend and with significant break for the year 1995 in both intercept & trend. $GEHEG_t$ is non-stationary with significant break for the year 1984 in intercept, with significant break for the year 1991 in trend and with significant break for the year 1988 in both intercept & trend. GR_t is stationary at 5% level of significance with significant break for the year 1985 in intercept, with significant break for the year 1986 in trend and with significant break for the year 1986 in both intercept & trend.

Table 3 shows that $dPOV_t$ is stationary at 1% level of significance in all tests except Ng-Perron (MZ_t and MSB) test with intercept in which it is stationary at 5% level of significance. $dPOV_t$ is stationary at 1% level of significance in all tests except Ng-Perron (MSB and MPT) test with both intercept & trend in which it is stationary at 5% level of significance. $dFDIG_t$ is stationary at 1% level of significance in ADF and PP tests and stationary at 5% level of significance with Ng-Perron tests with intercept. It is stationary at 1% level of significance in ADF, PP and Ng-perron (MZ_a and MZ_t) tests with both intercept & trend and stationary at 5% level of significance in Ng-Perron (MSB and MPT) tests. $dGEHEG_t$ is stationary at 1% level of significance in ADF and PP tests and stationary at 5% level of significance with Ng-Perron (MZ_a and MZ_t) tests with intercept and stationary at 5%

Table 1: Unit Root Tests at Level

			Ng-Perron			
Variable	ADF	PP	MZ_a	MZ_t	MSB	MPT
Model Specification: Intercept						
POV_t	-1.257(0)	-2.125 (1)	-0.205 (0)	-0.148	0.723	30.978
$FDIG_t$	-2.187(1)	-2.185(1)	-2.037(0)	-0.919	0.451	11.134
$GEHEG_t$	-2.099(1)	-2.047(2)	-4.584(1)	-1.707	0.279	4.471
GR_t	-4.945**(1)	-5.173**(2)	-14.429**(1)	-2.707**	0.178*	0.643**
Model Specification: Intercept & Trend						
POV_t	-2.310(0)	-2.331 (0)	-6.682(0)	-0.889	0.529	11.764
$FDIG_t$	-2.781(0)	-2.646(2)	-10.867(0)	-2.136	0.196	9.297
$GEHEG_t$	-2.125(1)	-2.081(2)	-7.412(1)	-1.905	0.257	12.329
GR_t	-5.471**(0)	-5.470**(1)	-12.328(0)	-1.943	0.151*	5.732*

Table 2: Unit Root Test: Zivot-Andrews

Variable	k	Year of Break	α	t_α	Type of Model
POV_t	1	1987	-0.497	-2.839	B
	1	1986	-0.439	-2.691	C
$FDIG_t$	3	1999	-1.252*	-4.739	B
	3	1995	-1.523*	-5.206	C
$GEHEG_t$	1	1984	-0.476	-3.272	A
	0	1991	-0.621	-3.097	B
	0	1988	-0.773	-3.159	C
GR_t	5	1985	-2.080*	-4.486	A
	5	1986	-2.350*	-4.624	B
	5	1986	-2.602*	-5.058	C

Table 3: Unit Root Tests at First Difference

			Ng-Perron			
Variables	ADF	PP	MZ_a	MZ_t	MSB	MPT
Model Specification: Intercept						
$dPOV_t$	-4.099**(0)	-4.083**(2)	-13.289**(0)	-2.578*	0.194*	1.844**
$dFDIG_t$	-8.222**(1)	-9.079**(2)	-13.239*(1)	-2.517*	0.190*	2.063*
$dGEHEG_t$	-7.627**(2)	-7.598**(1)	-13.849**(0)	-2.611**	0.189*	1.825*
dGR_t	-6.732**(1)	-8.726**(3)	-14.273**(1)	-3.173**	0.097**	0.662**
Model Specification: Intercept & Trend						
$dPOV_t$	-8.604**(1)	-9.402**(2)	-24.319**(0)	-4.445**	0.148*	5.594*
$dFDIG_t$	-7.494**(2)	-7.494**(1)	-19.956**(0)	-2.913*	0.180*	5.474*
$dGEHEG_t$	-6.632**(1)	-6.832**(2)	-17.843**(0)	-3.157**	0.103**	5.183**
dGRt	-6.632**(1)	-6.832**(2)	-15.843**(0)	-3.157**	0.103**	5.183**

Table 4: ARDL Bound Test: Using ARDL(1,2,0,0)

VARIABLES		At 0.05		At 0.01	
(when taken as a dependent)	F-Statistic	I(0)	I(1)	I(0)	I(1)
d(POVt)	8.542	3.615	4.913	5.018	6.610

Table 5: Long Run Results: Dependent Variable is POV_t

Regressor	Parameter	S.E.	t-Statistic	P-value
$FDIG_t$	-2.316**	1.099	-2.106	0.045
$GEHEG_t$	-3.042***	0.899	-3.381	0.002
GR_t	-0.321*	0.171	-1.881	0.072
C	25.781**	12.376	2.083	0.049
DPOV	5.797***	0.884	6.557	0.000

Note: *, ** and *** show statistically significance of parameters at the 0.10, 0.05 and 0.01 respectively. S. E. is standard error.

Table 6 Error Correction Model: Dependent Variable is $dPOV_t$

Regressor	Parameter	S. E.	t-Statistic	P-value
$dFDIG_t$	-1.453	1.129	-1.1286	0.210
$dFDIG_{t-1}$	-2.437	1.396	-1.746	0.093
$dGEHEG_t$	0.651	0.568	1.146	0.267
dGR_t	-0.321	0.171	-1.881	0.071
dC	0.339	0.071	4.797	0.000
dDPOV	0.643	3.937	0.163	0.872
ECT_{t-1}	-0.273	0.127	-2.172	0.039

Table 7: Diagnostic Tests

	LM version	P-value
Serial Correlation (χ^2)	1.332	0.248
Functional Form (χ^2)	0.132	0.716
Normality (χ^2)	2.817	0.245
Heteroscedasticity (χ^2)	0.190	0.663

with Ng-Perron (MSB and MPT). It is stationary at 1% level of significance in ADF, PP and Ng-perron (MZ_a) tests with both intercept & trend and stationary at 5% with Ng-Perron (MZ_t, MSB and MPT) tests. GR_t is stationary at 1% level of significance with all tests. There is evidence for mix order of integration I(0) and I(1). So, ARDL model is suitable to apply here. The study finds the optimum lag length for ARDL model by using SBC and then includes dummy variable D_{POV} in the ARDL model to complete the information in the model. Optimum lag length is 1 for $dPOV_t$, 2 for $dFDIG_t$,0 for $dGEHEG_t$ and 0 for dGR_t. The study selects the year 1986 for break period and put 0 from 1972 to 1986 and 1 afterward in D_{POV}. The calculated F-statistic for selected ARDL model is given in Table (4).

Table 4 shows that F-statistic is 8.542. Which is greater than upper bound value and null hypothesis of no cointegratien is rejected at 5% level of significance and it is an evidence for long run relationship in the model.

Table (5) shows that coefficient of $FDIG_t$ is negative and significant. So, FDI is helping in reducing poverty level. The coefficient of $GEHEG_t$ and dGRtare negative and significant at 1% and 10% respectively. So, government expenditure on health and education and GDP growth rate is helpful in reducing poverty level. Intercept (C) is positive and significant at 5% level of significance. The coefficient of D_{POV} is positive and significance at 1% level of significance. It is showing change of intercept after 1986.

Table (6) shows that coefficients of $dFDIG_t$, $dGEHEG_t$ and dD_{POV} are statistically insignificant. The coefficients of $dFDIG_{t-1}$, dGR_t and dC are significant at 10%, 10% and 1% respectively. Results show that dGR_t and lagged value of $dFDIG_t$ are helping in reducing poverty level in short run. The coefficient of ECT_{t-1} is negative and significant at 5% level of significance. It is showing the short run relationship in the model and also showing the speed of adjustment from short run disequilibrium to long run equilibrium in 27.3% in a year.

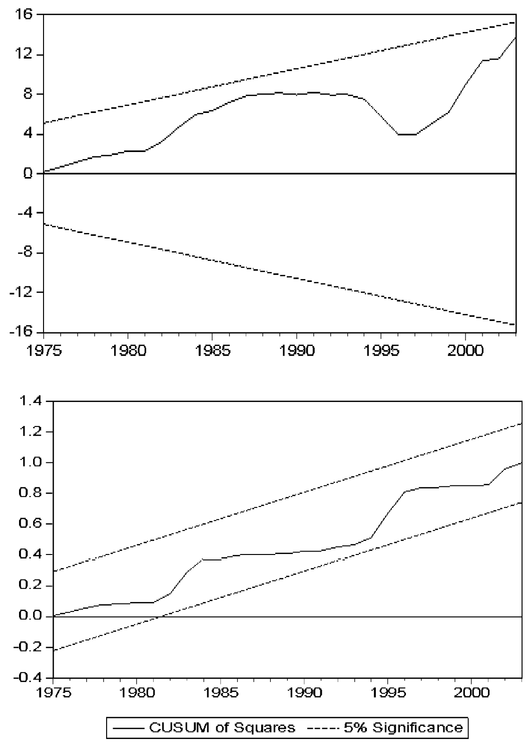

Fig. 1: CUSUM and CUSUMsq Tests

Figure (1) show CUSUM and CUSUMsq test. Figures show that CUSUM and CUSUMsq do not exceed the critical boundaries at 5% level of significance. This means the model of poverty is correctly specified and long run coefficients are reliable.

CONCLUSIONS

To check the impact of foreign direct investment on poverty, the study uses FDI and government expenditure on health and education as percentage of GDP and GDP growth rate as independent variables and head count ratio, proxy for poverty, as dependent variable. The study uses ARDL cointegration technique and its error correction model to check the long run and short run relationships respectively. Results of poverty model show the existence of long run and short run relationships. FDI, government expenditure on health and education and GDP growth rate have negative and significant impact on poverty. So, these are helping in reducing the poverty level in Pakistan.

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