Pak J Commer Soc Sci
Pakistan Journal of Commerce and Social Sciences
2013, Vol. 7 (1), 59-69

Impact of FDI on Tax Revenue in Pakistan

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Abstract

The study attempts to find the impact of foreign direct investment on tax revenue in Pakistan. Foreign direct investment and gross domestic product per person employed are used as independent variables and tax revenue is taken as dependent variable. Augmented Dickey Fuller, Phillips-Perron, Ng-Perron and Zivot-Andrews unit root tests are applied to find the level of integration in the time series. Auto-Regressive Distributive Lag and its error correction model are applied to find long run and short run relationships. The study finds the long run and short run relationships in the model. Foreign direct investment and gross domestic product per person employed have positive and significant impact on tax revenue. So, the study concludes the positive contribution of foreign direct investment in tax revenue in Pakistan.

Keywords: FDI, tax revenue, cointegration, stationarity, Pakistan.

1. Introduction

Tax is classified into two main categories that is direct and indirect taxation. Direct tax is imposed on properties, incomes and corporate profits etc. Indirect tax includes value added tax, sales tax and import duty etc. In case of direct taxes, tax revenue depends on a country's policy, either it relaxes the direct taxes for attracting foreign investment or imposes to collect revenue. For example, tax holidays and tax credits for new foreign investment and exemption of import duty in case of imports of raw material and machinery. Secondly, indirect tax depends on the sales of goods and services. FDI has generally positive effect on the economic growth and income levels in a country, so there will be greater aggregate demand and economic activities in a country which could help the government to generate more indirect taxes. In case of Pakistan, major proportion of tax revenue is collected through indirect taxes. So, FDI may have positive impact on the tax revenue in Pakistan.

MacDougall (1960) found that economic welfare could be increased for host countries through tax revenue generated from the profits of foreign investment and larger capital stocks. Kemp (1962) suggested that countries could introduce the optimal tax rate on foreign investment to increase welfare from FDI rather offering subsidies to attract FDI. Streeten (1969) stated that foreign investment generated government revenue and helped in filling saving and foreign exchange gaps.

Caves (1971) claimed that foreign investment had a positive impact of welfare through collection of corporate income taxes. FDI could increase general welfare in the host country through increase in the tax revenue. The welfare decreases when a country offers relaxation in the tax for foreign investment or if there had been a transfer pricing from foreign firms to their mother countries (Kopits 1976). Markusen (1984) claimed that welfare effect of FDI was uncertain. Foreign investment increased welfare through an increase in competition and tax on their profits and reduced welfare through transfer of profits earned by local enterprises to the foreign enterprises.

According to Bond and Samuelson (1986), host countries could lose some tax revenue in short run if tax holidays were given to attract FDI in early period. Tax revenue could increase in the long run because foreign investment would not pull out after that tax holiday period. Brander and Spencer (1987) stated that host countries could attract FDI by imposing tariff on imports and relaxing the tax on local production. It was stated that FDI could enhance national welfare by reducing unemployment, rising productivity through technology transfers and raising government revenue through taxation.

Horstmann and Markusen (1987) analyzed the welfare effect through government revenue, change in consumer surplus and trade policy. The host country government might impose tax on imports and might relax foreign investors from tax. As tariff increased government revenue, so it had better welfare effect than foreign investment with tax concession. So, welfare depended on whether foreign investment took place or imports were continued with tariff. Horstmann and Markusen (1992) found that countries with a single domestic producer had higher level of welfare than two-firm duopoly from which one firm was domestic and the other one was MNE. A country with a single firm (MNE) had lowest level of welfare. Government of the host country could affect welfare through trade policy, supporting education and R&D by offering tax concessions.

Dunning (1993) observed that welfare effects of FDI in host county depended on bargaining power of host country with foreign investors, either it offered the tax rebates on energy or labor cost to attract foreign investment or imposed tax. Raff and Srinivasan (1998) claimed that government should sacrifice some tax revenue to attract foreign investment because FDI could create employment, local labor's training, transferred technology and better management skills. Mudambi (1999) claimed that countries could increase welfare by choosing appropriate type of foreign investment in appropriate areas of countries and increased tax basis which would help in raising the living standards in backward areas.

Markusen (2001) modeled the welfare effects with a choice amongst FDI, exporting and licensing and found that FDI had the highest level of welfare for the host country. In the Knowledge-Capital Model, welfare effects of FDI with high trading cost was positive for skilled labor abundant countries. Welfare effect of FDI was also positive for large countries and for skilled labor abundant small countries with low trading cost (Markusen et al. 1996; Markusen 1997; Markusen 2002).

There is a limited empirical work on testing the impact of FDI on tax revenue. Gropp and Kostial (2000) used the panel data of nineteen OECD countries to find relationship between FDI and tax revenue. They found a weak correlation between FDI and corporate income tax and found a strong positive impact of FDI inflows on the profit tax and on the total tax revenue.

2. Methodology

To capture the impact of FDI on tax revenue collection, the study uses tax revenue as percentage of GDP as dependent variable and uses FDI as percentage of GDP and GDP per person employed as independent variables.

Model of the study is as follows:

$$TRG_t = f\left(FDIG_t , GDPE_t \right) \tag{1}$$

where,

TRG_t = Tax Revenue as percentage of GDPat time t.

$FDIG_t$ = Foreign Direct Investment inflow as percentage of GDP at time t.

$GDPE_t$ = GDP per person employed at time t.

At first, study discusses the Augmented Dickey-Fuller (ADF) test,it was developed by Dickey and Fuller (1981). It checks the unit root problem in the time series.It proposed the following equation with intercept to detect the unit root problem.

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + ... + \gamma_m \Delta Y_{t-m} + u_t \ , \tag{2}$$

where, Δ is a difference operator, and u_t is a residual at time period t. Y_t denotes the time series. $\gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + ... + \gamma_m \Delta Y_{t-m}$ is used to correct the serial correlation. The equation (2) includes intercept α onlyand it can also be assumed with both intercept and time-trend T. Then, the test is as follows:

$$\Delta Y_t = \alpha + \lambda T + \delta Y_{t-1} + \gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + ... + \gamma_m \Delta Y_{t-m} + u_t \ , \tag{3}$$

ADF test checks the null hypothesis (δ =0). That means, the time series has unit root problem and rejection of null hypothesis proofs the stationarity of a time series.

Phillips and Perron(1988)also proposed the unit root test based on ADF methodology. The difference of Phillip-Perron (PP) test from ADF test is dealing with heteroscedasticity and serial correlation. PP test ignores $\gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + ... + \gamma_m \Delta Y_{t-m}$ from ADF equation (3).It removes the serial correlation by giving ranks to the residuals. Equation of PP test is as follows:

$$\Delta Y_t = \alpha + \lambda T + \delta Y_{t-1} + u_t \ , \tag{4}$$

PP test uses the modified statistic Z_t and Z_δ which are as follows:

$$Z_t = \left(\frac{\hat{\sigma}^2}{\hat{\pi}^2} \right)^{1/2} .t_{\delta=0} - \frac{1}{2} \left(\frac{\hat{\pi}^2 - \hat{\sigma}^2}{\hat{\pi}^2} \right) . \left(\frac{T.SE(\hat{\delta})}{\hat{\sigma}^2} \right) \ , \tag{5}$$

$$Z_\delta = T\hat{\delta} - \frac{1}{2} \frac{T^2 .SE(\hat{\delta})}{\hat{\sigma}^2} \left(\hat{\pi}^2 - \hat{\sigma}^2 \right) \ , \tag{6}$$

where, $SE(\hat{\delta})$ is the standard error of $\hat{\delta}$. $t_{\delta=0}$ is the test statistic under the estimates of $\hat{\sigma}^2$ and $\hat{\pi}^2$, which are given below:

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$$\hat{\sigma}^2 = \lim_{T\to\infty} T^{-1}\sum_{t=1}^{T} E\left[u_t^2\right], \tag{7}$$

$$\hat{\pi}^2 = \lim_{T\to\infty} \sum_{t=1}^{T} E\left[T^{-1}S_T^2\right] \quad , \tag{8}$$

Where $S_T = \sum_{t=1} u_t$ and T is the time-trend. Z_t and Z_μ follows the same distribution as the t-statistic of ADF test under the null hypothesis (δ =0). PP test has an advantage over ADF test that it robust heteroscedasticity in the error term (u_t). Secondly, it does not need to specify the lag length for its estimation.

Ng and Perron(2001) developed efficient and a modified version of PP test by using generalized least square detrending data. This procedure is also efficient for large negative errors and can do better estimation than PP test. The efficient and modified tests are as follows:

$$MZ_\alpha^d = (T^{-1}(y_T^d)^2 - f_0)/2k \ , \tag{9}$$

$$MSB^d = \left(k / f_0\right)^{1/2}, \tag{10}$$

$$MZ_t^d = MZ_\alpha^d \times MSB^d \ , \tag{11}$$

$$MPT_T^d = ((\bar{c})^2 k + (1-\bar{c})T^{-1})(y_T^d)^2 / f_0 \ , \tag{12}$$

where, the statistics MZ_α^d and MZ_t^d are efficient versions of PP test and

$$k = \sum_{t=2}^{T} (y_{t-1}^d)^2 / T^2, \bar{c} = -13.5.$$

$$f_0 = \sum_{j=-(T-1)}^{T-1} \theta(j).k(j/l) \ , \tag{13}$$

where *l* is a bandwidthparameter (whichacts as a truncationlag in the covariance weighting) and θ(*j*) is the *j*-th sample auto covariance of residuals.

Zivot and Andrews (1992) modified the PP and ADF unit root test, which also considers the one-unknown structural break. The ADF test may fail in identifying the true result in the presence of a structural break whether time series is stationary or not. ADF and PP tests do not allow for structural break in data. Zivot-Andrews test uses the sequential ADF test to find the break with the following equations.

$$Model \quad A: \ \Delta Y_t = \mu_1{}^A + \gamma_1{}^A t + \mu_2{}^A DU_t(\lambda) + \alpha^A Y_{t-1} + \sum_{j=1}^{k} \beta_j \Delta Y_{t-j} + \varepsilon_t \tag{14}$$

$$Model\quad B:\ \Delta Y_t = \mu_1{}^B + \gamma_1{}^B t + \gamma_2{}^A DT^*{}_t(\lambda) + \alpha^B Y_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta Y_{t-j} + \varepsilon_t \quad (15)$$

$$Model\ C:\ \Delta Y_t = \mu_1{}^C + \gamma_1{}^C t + \mu_2{}^C DU_t(\lambda) + \gamma_2^c DT_t^*(\lambda) + \alpha^C Y_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta Y_{t-j} + \varepsilon_t \quad (16)$$

where $DU_t(\lambda)$ is 1 and $DT_t^*(\lambda) = t - T\lambda$ if $t > T\lambda$, 0 otherwise. $\lambda = T_B/T$, $T_B$is for a possible break point in the time series. Model (A) allows for a change in the intercept of the series, Model (B) allows for a change in the trend of a series, while Model (C) allows changes in both intercept and trend.

After testing the unit root problem in the time-series variables, the cointegration test might be applied to find the long-run relationship among the variables. Cointegration states the long-run equilibrium among variables, which may have the shock of disequilibrium in the short-run from long-run, but it will move again in long-run equilibrium Harris and Sollis (2003). The study uses Auto-Regressive Distributive Lag (ARDL) bound testing technique. It has been developed by Pesaran et al. (2001). ARDL can be applied if variables have mixed order of integration i.e. I(0) and I(1). This approach takes the optimum lag length for each variable separately in the model which helps in the data generating process from a general to a specific model. The problems resulting from non-stationarity of data can also be avoided by using an ARDL approach (Laurenceson and Chai 2003). The study uses the Schwarz Bayesian Criterion (SBC) to find the optimum lag length for the ARDL model. To find the cointegration amongst tax revenue, FDI and GDP per person employed, ARDL model is as follows:

$$\Delta TRG_t = \delta_0 + \delta_1 TRG_{t-1} + \delta_2 FDIG_{t-1} + \delta_3 GDPE_{t-1} + \sum_{i=1}^{p} \beta_{1i} \Delta TRG_{t-i}$$
$$+ \sum_{i=0}^{q} \beta_{2i} \Delta FDIG_{t-i} + \sum_{i=0}^{r} \beta_{3i} \Delta GDPE_{t-i} + \lambda\, D_{TRG} + \varepsilon_t \quad (17)$$

In equation (17), first difference of TRG is the dependent variable, the null hypothesis is (H_0: δ_1=δ_2= δ_3= 0) and alternate hypothesis is ($\delta_1 \neq \delta_2 \neq \delta_3 \neq 0$) which shows existence of long run relationship in the model, δ_{f0} is a constant and ε_{ft} is error term. D_{TRG} is included in the equation for possible structural break and to complete the information. This is also shown as $F_{TRGt}(TRG_t/FDIG_t,GDPE_t)$. 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:

$$\Delta TRG_t = \gamma + \sum_{i=1}^{p} \beta_{1i} \Delta TRG_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta FDIG_{t-i} + \sum_{i=0}^{r} \beta_{3i} \Delta GDPE_{t-i}$$
$$+ \phi\, D_{TRG} + \varphi\, ECT_{t-1} + \zeta_t \quad (18)$$

φ 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.

2.1 Data Sources

Data on Foreign Direct Investment, GDP per person employed, GDP and Tax Revenue has been taken from World Bank (2011). Data has been taken from 1972 to 2010.

3. Empirical Results

At first, the study uses the 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 below.

Table 1: Unit Root Tests at Level

Variable	ADF	PP	Ng-Perron			
			MZ_a	MZ_t	MSB	MPT
Model Specification: Intercept						
TRG_t	1.549(1)	-1.543(3)	-4.481(1)	-1.490	0.333	5.479
$FDIG_t$	2.961(6)	-0.777(3)	6.168(1)	22.064	3.570	17.080
$GDPE_t$	-1.392(2)	-1.277(3)	0.634(1)	0.516	0.814	14.991
Model Specification: Intercept & Trend						
TRG_t	-2.276(1)	-2.217(1)	-6.702(0)	-1.806	0.269	13.609
$FDIG_t$	-0.379(4)	-1.919(3)	-12.050(1)	-1.339	0.152	5.962
$GDPE_t$	-0.859(1)	-1.137(3)	-1.886(0)	-0.877	0.470	12.618

Note: *, ** and *** show stationarity of variables at the 0.10, 0.05 and 0.01 level respectively. Brackets include the optimum lag length.

Table (1) shows that all variables at level with all tests used in analysis are non-stationary.

Table 2: Unit Root Test: Zivot-Andrews

Variable	k	Year of Break	α	t_α	Type of Model
TRG_t	5	1997	-0.797	-4.633	A
	5	1988	-1.702	-3.990	B
	5	2000	-0.692	-4.485	C
$FDIG_t$	1	1999	-0.657*	-4.692	B
	4	1995	-1.718*	-5.392	C
$GDPE_t$	4	1999	-0.337	-4.504	A
	4	1996	-0.728	-4.352	B
	4	1992	-0.621	-4.571	C

Note: * and ** show stationarity of variables at the 0.05 and 0.01 level respectively.

Table (2) shows the TRG_t is non-stationary with significant breaks in intercept for the year 1997, in trend for the year 1988 and in both intercept and trend for the year 2000. $FDIG_t$ become stationary with significant break in trend for the year 1999 and with significant break in both intercept and trend for the year 1995. $GDPE_t$ is non-stationary with significant break in intercept for the year 1999, in trend for the year 1996 and in both intercept and trend for the year 1992.

Table 3: Unit Root Tests at First Difference

Variables	ADF	PP	Ng-Perron			
			MZ_a	MZ_t	MSB	MPT
Model Specification: Intercept						
$dTRG_t$	-6.797**(1)	-6.793**(1)	-17.167**(0)	-2.897**	0.168**	1.544**
$dFDIG_t$	-5.067**(4)	-3.421**(6)	-139.200**(1)	-26.35**	0.018**	0.032**
$dGDPE_t$	-4.803**(1)	-4.913**(3)	-16.454**(1)	-2.865**	0.174**	1.499**
Model Specification: Intercept & Trend						
$dTRG_t$	-6.737**(1)	-6.720**(1)	-27.094**(0)	-3.914**	0.141**	4.031**
$dFDIG_t$	-6.983**(4)	-4.281**(5)	-212.840**(1)	-10.295**	0.048**	0.483**
$dGDPE_t$	-4.828**(1)	-4.925**(3)	-18.050*(1)	-2.995*	0.167*	5.404*

Note: *, ** and *** indicate stationary at 10%, 5% and 10% level of significance. Bracket contains optimum lag length.

Table (3) shows that $dTRG_t$ and $dFDIG_t$ are stationary at 1% level of significance with all tests. $dGDPE_t$ is stationary at 1% level of significance with intercept, it is stationary at 1% level of significance with ADF and PP tests and stationary at 5% level of significance with Ng-Perron test with both intercept and trend. There is the evidence for mix order of integration, because $FDIG_t$ becomes stationary at level with structural break. 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_{TRG} in the ARDL model to complete the information in the model. Optimum lag length is 2 for $dTRG_t$, 0 for $dFDIG_t$ and 1 for $dGDPE_t$. The study selects the year 2000 for break period and puts 0 from 1972 to 2000 and 1 afterwards in D_{TRG}. The calculated F-statistic for selected ARDL model is given in table (4).

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

VARIABLES (when taken as a dependent)	F-Statistic	At 0.05		At 0.01	
		I(0)	I(1)	I(0)	I(1)
$D(TRG_t)$	9.261**	3.615	4.913	5.018	6.610

** Means at 1%, 5% significant levels reject the null hypotheses of no cointegration
* Means at 5% significant level reject the null hypotheses of no cointegration

Table (4) shows that F-statistic is 9.261. It is greater than upper bound value. So, null hypothesis of no cointegration is rejected at 1% level of significance and long run relationship exists in the model.

Table 5: Long Run Results: Dependent Variable is TRG_t

Regressor	Parameter	S. E.	t-Statistic	P-value
$FDIG_t$	0.657**	0.306	2.144	0.039
$GDPE_t$	$2.14E^{-3}$**	$8.01E^{-4}$	2.676	0.012
C	14.011***	0.952	14.717	0.000
D_{TRG}	-2.952***	0.592	-4.985	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 (5) shows the long run estimates on the basis of selected ARDL model. Results show that the coefficient of $FDIG_t$ is positive and significant at 5% level of significance. It means FDI is positively contributing in tax revenue. The coefficient of $GDPE_t$ is positive and significance at 5% level of significance. So, GDP per person employed has a positive and significant contribution in tax revenue. Intercept (C) is positive and significant at 1% level of significance. The coefficient of D_{TRG} is negative and significant at 1% level of significance. So, intercept is changed after the year 2000.

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

Regressor	Parameter	S. E.	t-Statistic	P-value
$dTRG_{t-1}$	-0.395**	0.178	-2.226	0.034
$dFDIG_t$	0.064**	0.024	2.645	0.013
$dGDPE_t$	$-1.44E^{-3}$**	5.7^{-4}	-2.515	0.017
dC	-2.763	1.925	-1.435	0.161
dD_{TRG}	0.156	0.464	0.334	0.739
ECT_{t-1}	-0.173**	0.083	-2.083	0.046

Table (6) shows that all coefficients, except dC and dD_{TRG}, are statistically significant. Results show that FDI has positive and significant impact on tax revenue in short run. GDP per person employed has a negative and significant impact on tax revenue collection. The coefficient of ECT_{t-1} is negative and significant at 5% level of significance. It is showing short run relationship in the model and also showing speed of adjustment 17.3% in a year from short run disequilibrium to long run equilibrium.

Table 7: Diagnostic Tests

	LM version	P-value
Serial Correlation (χ^2)	0.244	0.621
Functional Form (χ^2)	0.175	0.678
Normality (χ^2)	3.459	0.116
Heteroscedasticity (χ^2)	2.497	0.177

Results of table (7) show that all p-values are greater than 0.1. So, the problems of serial correlation, functional form, normality and heteroscedasticity are not found in this model.

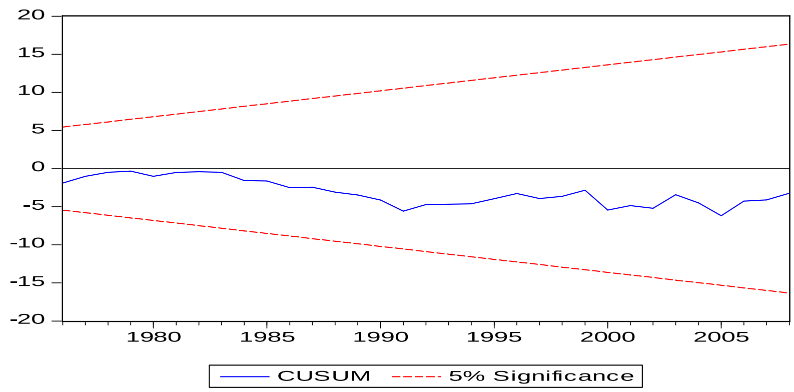

Figure 1: CUSUM Test

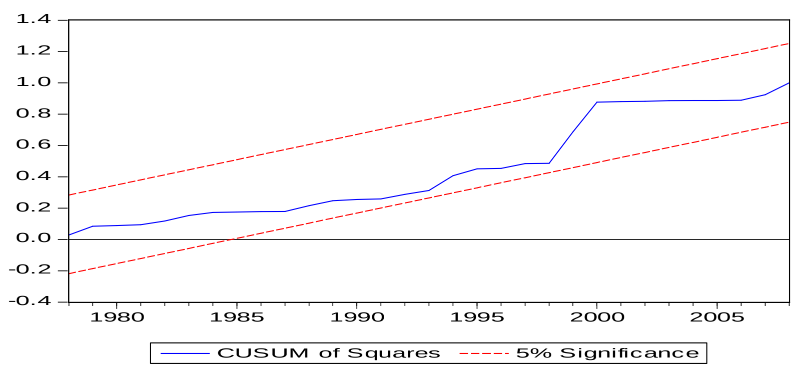

Figure 2: CUSUMsq Test

The figures 1 & 2 show that CUSUM and CUSUMsqtest do not exceed the critical boundaries at 5% level of significance. This means that the model of tax revenue is correctly specified and long run coefficients are reliable.

4. Conclusion

To check the impact of foreign direct investment on tax revenue, the study uses FDI and GDP per person employed as independent variables and tax revenue as dependent variable. ARDL and its error correction model are used for long run and short run relationships in tax revenue model. Results indicate that long run and short run relationships exist in the tax revenue model. FDI has a positive and significant impact on tax revenue, so the FDI is helpful in raising general welfare through raising the tax revenue to the government. GDP per person employed has a positive and significant impact on tax revenue, so it also helps in raising tax revenue.

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