Does Taxation Effect FDI in India? An Empirical Study of Hartman Model

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Abstract. In recent years, a large body of academicians and professionals has focused on the effect of tax policy on both inbound and outbound foreign direct investment. This study examines the possible effects of domestic taxes and rates of return on FDI in India. Using the econometric models given by Hartman (1984) for a sixteen-year sample period, i.e. 1992-2007, tax policies are found to be significantly affecting FDI in India. The model was empirically investigated in sixteen forms with different ratio of FDI to different type of GNPs as dependent variables.
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Key Words: Tax Policy, FDI, Hartman, Regression

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1. Introduction

Tax policy toward international investment is an issue which has occupied the attention of Indian policy makers for many years. In recent years, a large body of research has focused on the effects of taxation on both inbound and outbound foreign direct investment. Goulder, Shoven and Whalley (1983) have illustrated the potential importance of foreign direct investment flows for the outcomes of tax policy. They concluded, using simulation analysis, that if foreign investment is highly elastic, its impact could come to dominate other effects of tax changes on economic welfare. Buettner and Ruf (2004), for example, study in how far discrete location decisions are affected by taxes with a panel of German multinationals. The statutory tax rate significantly influences the probability to locate in a country. Bénassy-Quérée *et. al*. (2005), on the other hand, estimate the reaction of FDI flows to corporate taxation in a gravity model of 11 OECD countries abstracting from the discrete location decision problem.

In a study by Hartman (1981), it was shown that domestic investment incentives, in addition to increasing total investment by U.S. firms, tend to attract investment which otherwise would have gone abroad. Hartman's study has led to many subsequent rounds of replication and refinement. So far, almost all studies on the empirical effects of taxes involve U.S. direct

investment abroad or FDI within U.S. With its large and inexpensive labor force and huge potential market, India is holding a significant position among the tops FDI recipients. It would be interesting to find out whether taxes have an impact on the FDI patterns of India. This paper aims at explaining the Hartman's (1984) model and is used for empirical analysis in this study.

2. Literature Review

Increased FDI flows are a global trend and are extensively investigated in the economic literature. Devereux and Freeman (1995) estimated the impact of taxation on FDI flows using data on flows between seven countries for 1984-89, and sophisticated measure of the cost of capital. A similar study relating to FDI conducted in Japan by Weinstein (1996) concluded that the government tax and financial policy affects foreign takeovers in the country. Gropp and Kostial (2001) indicated a strong relationship between FDI and the tax regime of a country by comparing a group of countries with the lowest rates to a group of countries with the highest tax rates.

Blonigen (2005) provides a survey of the two main motives of FDI. Vertical FDI serves to allocate different steps of the production to those countries, where the corresponding production costs are lowest. Horizontal FDI represents just a duplication of the entire production process to a second country in order to be closer to the foreign market. Empirical studies therefore explain FDI by irm level factors and external factors such as the market size to capture horizontal FDI motives and labor costs and taxation to capture vertical FDI motives. Snoy (1975) pioneered a statistical investigation of investment flows over the years 1966-69 from several leading source countries to a number of host country destinations. His explanatory variables included source-host tax differentials bearing on retained earnings or remitted dividends of foreign subsidiaries, as well as other controls such as national growth-rate differentials.

While this theoretical work implies that the elasticity of international capital flows with respect to rates of return is a very important parameter in determining tax effects, almost no information is available concerning this crucial elasticity.

3. The Hartman Model

According to Hartman (1984), analysis of the effects of domestic tax policy on foreign investment will involve testing the traditional proposition that foreign investors base their

decisions on where to make capital investments on the real after-tax rates of return available on alternative investments. In a simplified aggregate model, he used after-tax rates of return on foreigners' investments abroad and in the U.S. to explain the level of foreign investment in the United States.

It was noted that foreign investment in the country can take the form either of new capital expenditures by foreign investors are of passive investment in existing assets. Casual evidence indicates that both forms of investment are important in the case of India too. It is nevertheless important to maintain the conceptual distinction between them, in deciding how to measure real after-tax rates of return on assets in the country. For firms expanding the operations of existing subsidiaries or otherwise making active capital investments, the current rate of return to foreign-owned assets in the host country would be expected to provide a better measure of the anticipated rate of return than some rate measured for the economy as a whole. Specifically, the foreign firm might possess some advantage in its product, technology, or management which has allowed it to earn a current rate of return higher than that generally prevailing in the economy. This higher rate of return will be an inducement to further investment. Conversely, the measured rate of return most applicable to a firm which is acquiring existing assets might be the overall rate of return to assets in the U.S. In fact, in the empirical analysis to follow, both a general net real rate of return and a foreign-investor-specific rate of return will be allowed to influence foreign investment. The Hartman model leads to the following estimating equation:

$$\ln\left(\frac{\mathrm{I_{re}}}{\mathrm{Y}}\right) = a_0 + a_1 \ln\big(r(1-\mathrm{t})\big) + a_2 \ln\left(r'(1-t)\right) + a_3 ln\left(\frac{(1-\mathrm{t}')}{(1-\mathrm{t})}\right)$$

It was observed by Hartman that the marginal investment decisions of firms which are reinvesting earnings at the margin could be affected differently by taxes from the marginal investment decisions being made by firms which are transferring funds from abroad at the margin. Thus, equation will have coefficients which are particular to retained earnings investment (I_{re}). In the study by Hartman, retained earnings investment were taken as a fraction of U.S. GNP (Y) to allow better comparison with the results on domestic investment.

r(l - t) is the after-tax rate of return actually realized by foreign investors in the host country. *r'(l-t)* is the overall gross rate of return on capital in the host country, reduced by the tax rate appropriate to current income earned by a foreign investor. (1 - t')/(1-t) measures the tax rate

on U.S. capital owned by foreigners (t), relative to the tax rate on country's capital owned by the investors (t'),or equivalently, the net-of-tax rate of return received by domestic investors relative to that received by foreigners, on the same investment, t' is appropriately measured to include all taxes on capital; in particular, it includes taxes paid by the final recipients of the capital income. By including this term, Hartman tried to capture the valuation effect discussed in the previous section: the tax change which causes an investment to become more attractive to a domestic investor but causes no change in the effective tax rate faced by a foreign investor tends, in the short run, to increase the foreigner's cost of acquiring that investment and, thus, tends to reduce foreign investment. Therefore, he expected a_3 to be negative.

The following section will conduct an empirical analysis in case of India, estimating directly the tax effects embodied in equation. This should provide useful information, since the variations in Indian tax rates seem less likely than rates of return to be correlated with events occurring abroad.

4. Estimation of the Hartman Model

This section estimates equation by Hartman (1984) using annual time series data for the 16-year period (1992-2007). The data source for FDI in India includes Economic Survey 2007-08 and various issues of International Financial Statistics, IMF. The data on India's GNP is obtained from Handbook of Statistics on Indian Economy 2008 (www.rbi.org). The data for overall and foreign rates of return are based on the profitability ratios published by Centre for Monitoring Indian Economy (CMIE) (www.prowess.com).

The estimation of the Hartman (1984) log-linear model has been done using the Ordinary Least Square (OLS) regression. One attractive feature of the log-log model, which has made it popular in applied work, is that the slope coefficient a_1, a_2, and a_3 measures the elasticity of the dependent variable with respect to the independent variable, that is, the percentage change in the dependent for a given (small) percentage change in independent. For the purpose of estimation, this study uses four different definitions of GNP and four different measures of rates of return.

i. *Nominal GNP at factor cost (GNP_1)*: it measures the value of goods produced as equal to the sum of the money income received by the factors of production.

ii. *Nominal GNP at market prices (GNP_2)*: it measures the value of goods and services produced in a country at prices at which these are traded.

iii. *Real GNP at factor cost (GNP_3)*: it shows national income during a year in terms of the prices measured in terms of the price level of some base year.

iv. *Real GNP at market prices (GNP_4)*: it measures the value of goods and services produced in a country at prices measured in terms of the price level of some base year.

For computing the overall and specific after-tax rates of return, for measures of profitability are:

i. *Profit after tax/ Gross fixed assets*: Gross fixed assets are net of revalued assets but excludes intangible assets.

ii. *Profit after tax/ Capital employed*: Capital employed is a sum of net worth and long-term borrowings, i.e. excluding short-term borrowing such as cash credit from banks and commercial paper.

iii. *Profit after tax/ Net worth*: Net worth is defined as the paid-up equity and preference capital plus reserves and surplus.

iv. *Profit after tax* / Total assets: Total assets are net of revalued assets and the expenditure to the extent not written off.

As the Hartman model is a log-linear model, the natural logarithms of all the variables have been taken and the modified variables can be defined as follows:

$$\text{LFDI/GN}_1 = \ln \frac{FDI}{GNP_1}$$

$$\text{LFDI/GN}_2 = \ln \frac{FDI}{GNP_2}$$

$$\text{LFDI/GN}_3 = \ln \frac{FDI}{GNP_3}$$

$$\text{LFDI/GN}_4 = \ln \frac{FDI}{GNP_4}$$

$$\text{LPAT/GF}_1 = \ln \frac{Profit\ After\ Tax}{Gross\ Fixed\ Assets}$$ for foreign companies

$$\text{LPAT/GF}_2 = \ln \frac{Profit\ After\ Tax}{Gross\ Fixed\ Assets}$$ for all companies

$$\text{LPAT/CE}_1 = \ln \frac{Profit\ After\ Tax}{Captial\ Employed}$$ for foreign companies

$$\text{LPAT/CE}_2 = \ln \frac{Profit\ After\ Tax}{Capital\ Employed}$$ for all companies

$$\text{LPAT/NW}_1 = \ln \frac{Profit\ After\ Tax}{Net\ Worth}$$ for foreign companies

$$\text{LPAT/NW}_2 = \ln \frac{Profit\ After\ Tax}{Net\ Worth}$$ for all companies

$$\text{LPAT/TA}_1 = \ln \frac{Profit\ After\ Tax}{Total\ Assets}$$ for foreign companies

$$\text{LPAT/TA}_2 = \ln \frac{Profit\ After\ Tax}{Total\ Assets} \text{for all companies}$$

$$\text{LROD/ROF} = \ln \frac{(1-Tax\ rate\ on\ domestic\ companies)}{(1-Tax\ rate\ on\ foreign\ companies)}$$

5. Results for the Hartman Model

The estimated results for the Hartman model given in equation are presented in Table 1.1 to 1.4. Tables include the estimates of regression model with dependent variables as logarithms of FDI to GNP ratios and explanatory variables as the logarithms of four different profitability ratios Profit after tax (PAT) to Gross fixed assets (GF), Profit after tax (PAT) to Capital employed (CE), Profit after tax (PAT) to Net worth (NW) and Profit after tax (PAT) to Total assets (TA). From the foregoing analysis of the results, it is observed that the sign of the regression coefficients on specific rate of returns and relative net-of-tax rates of return are as expected by the Hartman model. While the coefficient signs of general rate of returns obtained are unexpected and are negatives indicating the constant percentage decrease in the FDI GNP ratio as a result of one percent increase in the profitability ratios.

For each regression model *d-w* statistic is found to be indecisive zone about the null hypothesis of no autocorrelation in the residuals. To solve this problem Breusch-Godfrey (BG) testis conducted for testing the null hypothesis of no autocorrelation of any order (See Godfrey, 1978). The test observed the presence of autocorrelation in Regression I and III of table 1.1. Since ρ is significant for these regressions, the Cochrane-orcutt method was used in order to remove serial autocorrelation and the efficient coefficient estimates are obtained.

To test the overall significance of the regression estimates, a joint hypothesis that coefficients are jointly or simultaneously equal to zero is considered which can be tested by the analysis of variance (ANOVA). In all the four regressions of table 1.1, the observed F-value is substantially higher than the critical F-value at both 5% and 1% level of significance, indicating the overall significance of the multiple regression models. Further, the maximum variation in dependent variable is explained by regression II at 73.6%. The estimated elasticity along with standard error and *t*-statistic values of four regression models with the dependent variable as the ratio of FDI to nominal GNP at factor cost and four different profitability ratios as the explanatory variables are reported in table 1.1.

Table 1. 1: Regression Results of Dependent Variable as Ln(FDI/GNP$_1$)

Dependent variable: **Ln(FDI/GNP$_1$)**	**Explanatory variables (PAT/GF)**							
	Intercept		**Ln [PAT/GF$_1$]**		**Ln [PAT/GF$_2$]**		**Ln [ROD/ROF]**	
	Original	***C-O***	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***
Coefficient	-4.193	2.454	2.828	0.450	-1.239	0.331	-5.368	2.567
S.E.	2.597	1.054	1.280	0.749	0.535	0.413	2.631	2.151
t stat	-1.615	2.329	2.209	0.600	-2.317	0.801	-2.040	1.193
P > |t|	0.132	0.040**	0.047**	0.560	0.039**	0.440	0.064*	0.258
VIF_j			4.324		4.622		1.949	
R-Square- r^2 = 0.497, **F-value** = 3.951 (*p-value .035***), ***d-w* stat** = 0.933, ***B-G* stat** =6.611 (.010**) ρ =.44								
Dependent variable: **Ln(FDI/GNP$_1$)**	**Explanatory variables (PAT/CE)**							
	Intercept		**Ln [PAT/CE$_1$]**		**Ln [PAT/CE$_2$]**		**Ln [ROD/ROF]**	
Coefficient	-0.518		1.002		-1.336		-6.319	
S.E.	1.149		0.574		0.287		1.747	
t stat	-0.451		1.744		-4.650		-3.617	
P > |t|	0.660		0.107		0.001***		0.004***	
VIF_j			1.625		1.370		1.636	
R-Square- r^2 = 0.736, **F-value** = 11.138 (*p-value .000****), ***d-w* stat** = 1.411, ***B-G* stat** =1.594 (.207)								
Dependent variable: **Ln(FDI/GNP$_1$)**	**Explanatory variables (PAT/NW)**							
	Intercept		**Ln [PAT/NW$_1$]**		**Ln [PAT/NW$_2$]**		**Ln [ROD/ROF]**	
	Original	***C-O***	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***
Coefficient	-1.140	1.810	1.007	0.536	-0.915	3.376	-7.171	0.006
S.E.	3.257	-0.244	1.326	0.592	0.570	-0.413	2.574	0.688
t stat	-0.350	0.446	0.760	0.391	-1.606	1.139	-2.786	0.279
P > |t|	0.733	1.056	0.462	1.712	0.134	0.617	0.016**	0.550
VIF_j			2.613		3.340		1.566	
R-Square- r^2 = 0.401, **F-value** = 2.673 (*p-value .094**), ***d-w* stat** = 0.728, ***B-G* stat** =8.590 (.003***) ρ =.65								
Dependent variable: **Ln(FDI/GNP$_1$)**	**Explanatory variables (PAT/TA)**							
	Intercept		**Ln [PAT/TA$_1$]**		**Ln [PAT/TA$_2$]**		**Ln [ROD/ROF]**	
Coefficient	-0.802		1.139		-1.353		-6.365	
S.E.	0.988		0.341		0.340		1.907	
t stat	-0.811		3.335		-3.982		-3.337	
P > |t|	0.433		0.006***		0.002***		0.006***	
VIF_j			1.561		1.880		1.897	
R-Square- r^2 = 0.728, **F-value** = 10.721 (*p-value .001****), ***d*-w stat** = 1.441, ***B-G* stat** =2.115 (.146)								

Note: Durbin-Watson *d* statistic: d_L, d_U for 16 observations are [0.633, 1.446] and [0.857, 1.728] at 1% and 5% level of significance respectively.

Table 1.2 present the results for the Hartman model when the dependent variable is the ratio of FDI to nominal GNP at market prices. The estimated coefficients for overall rate of return determined by profitability ratios of all companies are found significant at 1% level in

regression model II and IV i.e. with explanatory variable represented by PAT to CE and PAT to TA. The coefficient signs of general rate of returns obtained are unexpected and are negatives indicating the constant percentage decrease in the FDI GNP ratio as a result of one percent increase in the profitability ratios. The value of *d-w* statistics were observed to be inconclusive for testing the hypothesis on absence of autocorrelation. Performing B-G test resulted the presence of autocorrelation in regressions I and III. For these regressions, coefficients along with standard error and t-statistic values are obtained by Cochrane-Orcutt method.

The F-test statistic values for the regressions II and IV at 1% level of significance were found to have sufficient evidences for at least one explanatory variable significantly explaining the dependent variable. For regression I and III, the observed F-value is higher than the critical value at 5% and 10% level of significance respectively. The maximum variations (73.5%) explained by the explanatory variables was observed in regression II. The estimated elasticities with respect to the specific rate of return realized by foreigners are 0.490, 0.998, -0.202 and 1.130 for regressions I to IV respectively. The coefficients with respect to the general rate of return of all companies are 0.323, -1.325, 0.437 and -1.343 and with respect to the relative rate of returns are 2.556, -6.335, 1.017 and -6.390 for regression I, II, III and IV respectively.

Table 1.2: Regression Results of Dependent Variable as Ln(FDI/GNP$_2$)

Dependent variable:	**Explanatory variables (PAT/GF)**							
	Intercept		**Ln [PAT/GF$_1$]**		**Ln [PAT/GF$_2$]**		**Ln [ROD/ROF]**	
Ln(FDI/GNP$_2$)	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***
Coefficient	-4.325	2.359	2.837	0.490	-1.239	0.323	-5.386	2.556
S.E.	2.574	1.049	1.269	0.742	0.530	0.408	2.607	2.133
t stat	-1.680	2.250	2.236	0.660	-2.337	0.792	-2.066	1.198
P > |t|	0.119	0.046**	0.045**	0.523	0.038**	0.445	0.061*	0.256
VIF_j			4.324		4.623		1.949	
R-Square- r^2 = 0.504, **F-value** = 4.066 (*p-value .033***), ***d-w* stat** = 0.935, ***B-G* stat** =6.573 (.010**) ρ =.44								
Dependent variable:	**Explanatory variables (PAT/CE)**			
Ln(FDI/GNP$_2$)	**Intercept**	**Ln [PAT/CE$_1$]**	**Ln [PAT/CE$_2$]**	**Ln [ROD/ROF]**
Coefficient	-0.628	0.998	-1.325	-6.335
S.E.	1.148	0.574	0.287	1.745
t stat	-0.547	1.739	-4.617	-3.630
P > |t|	0.594	0.108	0.001***	0.003***
VIF_j		1.626	1.370	1.636
R-Square- r^2 = 0.735, **F-value** = 11.109 (*p-value .001****), ***d-w* stat** = 1.380, ***B-G* stat** =1.739 (.187)				

Dependent variable:	**Explanatory variables (PAT/NW)**							
	Intercept		**Ln [PAT/NW$_1$]**		**Ln [PAT/NW$_2$]**		**Ln [ROD/ROF]**	
Ln(FDI/GNP$_2$)	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***
Coefficient	-1.296	1.743	1.024	-0.202	-0.918	0.437	-7.201	1.017
S.E.	3.235	0.538	1.317	0.590	0.566	0.390	2.556	1.707
t stat	-0.401	3.241	0.777	-0.343	-1.622	1.121	-2.817	0.596
P > |t|	0.696	0.008***	0.452	0.738	0.131	0.286	0.016**	0.564
VIF$_j$			2.614		3.340		1.566	
R-Square- r^2 = 0.406, **F-value** = 2.738 (*p-value .090**), ***d-w* stat** = 0.636, ***B-G* stat** =8.520 (.004***) ρ =.65								
Dependent variable:	**Explanatory variables (PAT/TA)**			
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Ln(FDI/GNP$_2$)	**Intercept**	**Ln [PAT/TA$_1$]**	**Ln [PAT/TA$_2$]**	**Ln [ROD/ROF]**
Coefficient	-0.906	1.130	-1.343	-6.390
S.E.	0.986	0.341	0.339	1.903
t stat	-0.918	3.317	-3.961	-3.357
P > |t|	0.377	0.006***	0.002***	0.006***
VIF$_j$		1.561	1.881	1.897
R-Square- r^2 = 0.728, **F-value** = 10.724 (*p-value .001****), ***d*-w stat** = 1.412, ***B-G* stat** =2.262 (.133)				

Note: Durbin-Watson *d* statistic: d_L, d_U for 16 observations are [0.633, 1.446] and [0.857, 1.728] at 1% and 5% level of significance respectively

Table 1.3 present the results for the Hartman model when the dependent variable is the ratio of FDI to real GNP at factor cost. The estimated coefficients of specific rate of returns for the foreign companies have the expected positive signs except in regression III with explanatory variables as profitability ratio of PAT to NW. The estimated coefficients for overall rate of return determined by profitability ratios of all companies were found having the expected signs except in II and IV regression models. The negative sign indicates the constant percent decrease in the FDI to real GNP ratio as a result of one percent increase in the profitability ratios. Further these coefficients of the II and IV regression models were observed significant at 1% level.

B-G statistics and p-values indicate the sufficient evidences of the presence of autocorrelation in regression I and III. For these regressions, coefficients along with standard error and t-statistic values are obtained by Cochrane-Orcutt iterative method. Further, it was noted that R-square values of all the models are less than d-w statistics indicating none of the model contain spurious results. The F-test statistic values for the regressions II and IV at 1% level of significance were found to have sufficient evidences for at least one explanatory variable significantly explaining the dependent variable. For regression I and III, the observed F-value is

higher than the critical value at 10% level of significance. The maximum variations (77.2%) explained by the explanatory variables was observed in regression II.

Table 1. 3: Regression Results of Dependent Variable as Ln(FDI/GNP$_3$)

Dependent variable:	**Explanatory variables (PAT/GF)**							
	Intercept		**Ln [PAT/GF$_1$]**		**Ln [PAT/GF$_2$]**		**Ln [ROD/ROF]**	
Ln(FDI/GNP$_3$)	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***
Coefficient	-6.215	2.252	3.533	0.206	-1.502	0.470	-6.333	2.686
S.E.	3.393	0.862	1.673	0.775	0.699	0.434	3.438	2.098
t stat	-1.832	2.613	2.112	0.266	-2.149	1.083	-1.842	1.280
P > |t|	0.092*	0.024**	0.056*	0.796	0.053*	0.302	0.090*	0.227
VIF$_j$			4.324		4.623		1.949	
R-Square- r^2 = 0.464, **F-value** = 3.467 (*p-value .051**), ***d-w* stat** = 0.780, ***B-G* stat** =7.821 (.005***) ρ =.55								
Dependent variable:	**Explanatory variables (PAT/CE)**							
Ln(FDI/GNP$_3$)	**Intercept**		**Ln [PAT/CE$_1$]**		**Ln [PAT/CE$_2$]**		**Ln [ROD/ROF]**	
Coefficient	-1.970		1.439		-1.777		-7.709	
S.E.	1.351		0.676		0.338		2.054	
t stat	-1.458		2.130		-5.260		-3.752	
P > |t|	0.171		0.055*		0.000***		0.003***	
VIF$_j$			1.626		1.370		1.636	
R-Square- r^2 = 0.772, **F-value** = 13.552 (*p-value .000****), ***d-w* stat** = 1.488, ***B-G* stat** =0.875 (.350)								
Dependent variable:	**Explanatory variables (PAT/NW)**							
	Intercept		**Ln [PAT/NW$_1$]**		**Ln [PAT/NW$_2$]**		**Ln [ROD/ROF]**	
Ln(FDI/GNP$_3$)	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***
Coefficient	-2.249	1.417	1.166	-0.248	-1.078	0.404	-8.665	0.663
S.E.	4.250	0.409	1.730	0.610	0.743	0.410	3.359	1.650
t stat	-0.529	3.462	0.674	-0.406	-1.450	0.985	-2.580	0.401
P > |t|	0.606	0.005***	0.513	0.693	0.173	0.346	0.024**	0.696
VIF$_j$			2.614		3.340		1.566	
R-Square- r^2 = 0.364, **F-value** = 2.789 (*p-value .098**), ***d-w* stat** = 0.489, ***B-G* stat** =9.910 (.002***) ρ =.74								
Dependent variable:	**Explanatory variables (PAT/TA)**							
Ln(FDI/GNP$_3$)	**Intercept**		**Ln [PAT/TA$_1$]**		**Ln [PAT/TA$_2$]**		**Ln [ROD/ROF]**	
Coefficient	-2.181		1.594		-1.756		-7.582	
S.E.	1.162		0.402		0.400		2.243	
t stat	-1.877		3.969		-4.395		-3.380	
P > |t|	0.085*		0.002***		0.001***		0.005***	
VIF$_j$			1.561		1.881		1.897	
R-Square- r^2 = 0.766, **F-value** = 13.067 (*p-value .000****), ***d*-w stat** = 1.514, ***B-G* stat** =1.453 (.228)								

Note: Durbin-Watson *d* statistic: d_L, d_U for 16 observations are [0.633, 1.446] and [0.857, 1.728] at 1% and 5% level of significance respectively

Table 1.4 present the results for the Hartman model when the dependent variable is the ratio of FDI to real GNP at market prices. The estimated coefficients of specific rate of returns for the foreign companies have the expected positive signs except in regression III with explanatory variables as profitability ratio of PAT to NW. The estimated coefficients for overall rate of return determined by profitability ratios of all companies were found having the expected signs except in II and IV regression models. The negative sign indicates the constant percent decrease in the FDI to real GNP ratio as a result of one percent increase in the profitability ratios.

B-G statistics and p-values indicate the sufficient evidences of the presence of autocorrelation in regression I and III. For these regressions, coefficients alongwith standard error and t-statistic values are obtained by Cochrane-Orcutt iterative method. Further, it was noted that R-square values of all the models are less than d-w statistics indicating none of the model contain spurious results.

The F-test statistic values for the regressions II and IV at 1% level of significance were found to have sufficient evidences for at least one explanatory variable significantly explaining the dependent variable. For regression I, the observed F-value is higher than the critical value at 5% level of significance. The maximum variations (77.0%) explained by the explanatory variables was observed in regression II.

Table 1. 4: Regression Results of Dependent Variable as Ln(FDI/GNP$_4$)

Dependent variable:	**Explanatory variables (PAT/GF)**							
	Intercept		**Ln [PAT/GF$_1$]**		**Ln [PAT/GF$_2$]**		**Ln [ROD/ROF]**	
Ln(FDI/GNP$_4$)	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***
Coefficient	-6.201	2.192	3.492	0.261	-1.485	0.457	-6.283	2.692
S.E.	3.304	0.871	1.629	0.767	0.680	0.429	3.348	2.090
t stat	-1.877	2.517	2.143	0.340	-2.182	1.067	-1.877	1.288
P > |t|	0.085*	0.029**	0.053*	0.740	0.050*	0.309	0.085*	0.224
VIF_j			4.324		4.623		1.949	
R-Square- r^2 = 0.473, **F-value** = 3.586 (*p-value .047***), ***d-w* stat** = 0.792, ***B-G* stat** =7.698 (.006***) ρ =.54								
Dependent variable:	**Explanatory variables (PAT/CE)**							
Ln(FDI/GNP$_4$)	**Intercept**		**Ln [PAT/CE$_1$]**		**Ln [PAT/CE$_2$]**		**Ln [ROD/ROF]**	
Coefficient	-1.965		1.399		-1.732		-7.620	
S.E.	1.333		0.666		0.333		2.027	
t stat	-1.474		2.099		-5.198		-3.760	
P > |t|	0.166		0.058*		0.000***		0.003***	

VIF_j		1.626		1.370		1.636	
R-Square- r^2 = 0.770, **F-value** = 13.374 (*p-value .000****), ***d-w* stat** = 1.455, ***B-G* stat** =1.029 (.310)							
Dependent variable:	**Explanatory variables (PAT/NW)**						
	Intercept		**Ln [PAT/NW_1]**		**Ln [PAT/NW_2]**		**Ln [ROD/ROF]**	
Ln(FDI/GNP_4)	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***	**Original**	***C-O***
Coefficient	-2.331	1.390	1.175	-0.212	-1.072	0.402	-8.587	0.656
S.E.	4.146	0.418	1.688	0.605	0.725	0.406	3.277	1.650
t stat	-0.562	3.328	0.696	-0.351	-1.478	0.991	-2.620	0.398
P > |t|	0.584	0.007***	0.500*	0.733	0.165	0.343	0.022**	0.698
VIF_j			2.614		3.340		1.566	
R-Square- r^2 = 0.371, **F-value** = 2.363 (*p-value .121*), ***d-w* stat** = 0.500, ***B-G* stat** =9.766 (.002***) ρ =.73							
Dependent variable:	**Explanatory variables (PAT/TA)**						
Ln(FDI/GNP_4)	**Intercept**		**Ln [PAT/TA_1]**		**Ln [PAT/TA_2]**		**Ln [ROD/ROF]**	
Coefficient	-2.181		1.549		-1.716		-7.520	
S.E.	1.146		0.396		0.394		2.212	
t stat	-1.903		3.911		-4.358		-3.400	
P > |t|	0.081		0.002***		0.001***		0.005***	
VIF_j			1.561		1.881		1.897	
R-Square- r^2 = 0.764, **F-value** = 12.917 (*p-value .000****), ***d*-w stat** = 1.481, ***B-G* stat** =1.613 (.204)							

Note: Durbin-Watson *d* statistic: d_L, d_U for 16 observations are [0.633, 1.446] and [0.857, 1.728] at 1% and 5% level of significance respectively

6. Results and Conclusion

In general, the regression results in Table 1.1 to 1.4 shows the expected signs for specific rate of returns, overall rate of returns and relative tax term with some exceptions. Table 1.5 shows the summary of the signs obtained from the regression results.

Table 1. 5: Summary Results of Estimated Coefficients.

S. No.	**Explanatory Variables**	**Dependent Variables**					
		ln(**FDI/GNP_1**)	ln(**FDI/GNP_2**)	ln(**FDI/GNP_3**)	ln(**FDI/GNP_4**)	**Total**	
						(+)	**(-)**
1.	ln(**PAT/GF_1**)	(+)	(+)	(+)	(+)	**4/4**	**Nil**
	ln(**PAT/GF_2**)	**(+)**	**(+)**	**(+)**	**(+)**	**4/4**	**Nil**
	ln(**ROD/ROF**)	**(+)**	**(+)**	**(+)**	**(+)**	**4/4**	**Nil**
2.	ln(**PAT/CE_1**)	(+)	(+)	(+)*	(+)*	**4/4**	**Nil**
	ln(**PAT/CE_2**)	(-)***	(-)***	(-)***	(-)***	**Nil**	**4/4**
	ln(**ROD/ROF**)	(-)***	(-)***	(-)***	(-)***	**Nil**	**4/4**
3.	ln(**PAT/NW_1**)	(+)	**(-)**	**(-)**	**(-)**	**1/4**	**3/4**

	ln(**PAT/NW$_2$**)	**(+)**	**(+)**	**(+)**	**(+)**	**4/4**	**Nil**
	ln(**ROD/ROF**)	**(+)**	**(+)**	**(+)**	**(+)**	**4/4**	**Nil**
4.	ln(**PAT/TA$_1$**)	(+)***	(+)***	(+)***	(+)***	**4/4**	**Nil**
	ln(**PAT/TA$_2$**)	(-)***	(-)***	(-)***	(-)***	**Nil**	**4/4**
	ln(**ROD/ROF**)	(-)***	(-)***	(-)***	(-)***	**Nil**	**4/4**
	Foreign Companies Total (+)	**4/4**	**3/4**	**3/4**	**3/4**	**13/16**	
	(-)	**Nil**	**¼**	**1/4**	**1/4**		**3/16**
	All Companies Total (+)	**2/4**	**2/4**	**2/4**	**2/4**	**8/16**	
	(-)	**2/4**	**2/4**	**2/4**	**2/4**		**8/16**

Tax policy toward international investment is a critical issue which occupied the attention of Indian policy makers for many years. This study examines the possible effects of domestic taxes and rates of return on FDI in India. Using the econometric models given by Hartman (1984) for a sixteen-year sample period, i.e. 1992-2007, tax policies are found to be significantly affecting FDI in India. The model was empirically investigated in sixteen forms with different ratio of FDI to different type of GNPs as dependent variables. Some of the key findings are us under:

- The *specific rate of return* gives the expected sign positive signs with very few exceptions indicating that foreign firms having specific advantages in production or technology are responsive to rates of return realized by foreign investors in India. The unexpected negative elasticities were found to be insignificant.
- Half of the times the overall rate of return does not give an expected sign and its significance indicate that an increase in overall rate of return on capital in India leads to a fall in FDI. A possible reason could be the required FDI for superior technology in an attempt to sustain their economic development. Foreign firms investing in India generally posses some advantage in their product, technology or management over domestic companies. Consequently, they are interested in earning a rate of return higher than the overall rate of return for the economy as a whole to cover the costs of and get the advantages of bringing in new technology.
- The relative tax return in all cases indicates the responsiveness of FDI in India implying that an increase in tax rate faced by an Indian investor relative to the tax rate faced by a foreign investor tends to cause a significant increase in the level of foreign investment.

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