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EFFECT OF CORPORATE INCOME TAX ON INVESTMENT DECISIONS OF INDIAN MANUFACTURING FIRMS

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Abstract

This study is an attempt to empirically analyse the effect of corporate income tax on investment of manufacturing firms in India during 2005-2019, using the standard panel two way fixed effects model estimation techniques. It is found that the effective corporate tax has a negative and significant impact on the corporate investment. Moreover, the estimated effective tax elasticity is relatively low as compared to the magnitude found in other countries. Our analysis also indicates that the deduction rate has a positive impact on investment while interest-debt ratio and leverage ratio have a negative impact. The effective rate increases with age and size of firms. It is our hope that these results will be useful to policymakers and other stakeholders to take appropriate strategies to design the corporate tax policy such that it will not hinder business investment in India.

Keywords: *Investment, Effect tax rate, Corporation income tax, panel data methods*

JEL Codes: *D21, E22, E51, H25, C23*

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INTRODUCTION

Public Finance literature argues that almost all taxes except the lump sum tax can lead to the deadweight loss. For instances, by distorting factor prices and return to market activities, they can alter households labour supply decisions and incentives to enrol in higher education as well as firms incentives to invest and to their employees and thus lead to an inefficient allocation of factor inputs including capital investment and lower productivity. The corporation income tax (CIT) is not an exception.

As increased investment rate is a pre-condition for economic growth of a nation, the effect of CIT on investment is one of the central questions in both public finance and development literature over the last 50 years (Djenkov *et. al.*, 2010). Since Hall and Jorgenson's (1967) pioneering study shows that changes in the user cost of capital (UCC) can reasonably explain the aggregate investment, several studies have tried to explain this relationship both theoretically and empirically. Broadly, three types of empirical approaches emerged in the literature, namely Q-theory framework, User cost specification and Natural experiment analysis (see Hassett and Hubbard, 2002 for a review).

In general, these studies show that the CIT leads to lower levels of investment, although there is a significant heterogeneity in the size of their impact (Summers, 1981; Felstein *et. al.*, 1983; Cummins *et. al.*, 1996; Gordon and Hines, 2002; Devereus *et. al.*, 2002; House and Shapiro, 2008; Djankov *et. al.*, 2010; Feld and Heckemeyer, 2011). Amongst the three empirical approaches, the user cost approach is the most popular (and the most appropriate) method to measure the impact of corporate income taxes at industry level or country level. However, various deductions and enhanced depreciation which are claimed by qualifying firms cannot be captured through the UCC. The deduction and depreciation claims vary across firms. Hence, the effective rate is used by studies like Cevik and Miryugin (2018). Studies like Vartia (2008) computes the UCC at industry level and applies in firm-level analysis. The

Q-theory approach is restricted to the subset of firms listed on stock markets and natural experiment approach focuses on specific tax reform episodes (Schwellnus and Arnold, 2008).

In India, the Central (federal) government levies the corporate income taxes. It is widely argued that as India's CIT rate was relatively high as compared to many other nations, it could affect the investment as well as the efficiency of firms. To our knowledge, there is no empirical study on the topic to measure the impact of CIT on investment of manufacturing firms in India. Therefore, in this study an attempt is made to measure the effect of CIT on investment decisions of manufacturing firms in India during 2005-2019. The empirical approach followed in this study is based on past studies on the topic. As it employs the firm level data, it uses the firm specific effective corporate income tax rate as used in Cevik and Miryugin (2018).

This study extends the existing empirical work on this sparsely researched issue in the following ways: This is the first empirical study to quantify the effect of CIT on investment of manufacturing firms in India. While Djankov *et. al.* (2010) and Galindo and Pombo (2011) include data for Indian firms along with data for firms in other countries, they measure the average impact of CIT on investments in sample countries and not for Indian manufacturing firms alone. Although this study relates to India, it has a broader appeal. While the most existing studies analysing firm level data use the UCC, this study uses the firm specific effective rate, which is more appropriate in the firm level analysis.

The rest of this study proceeds as follows. The next Section provides a brief note on the corporate income tax system in India. Following two Sections briefly review the literature on the study topic and explain the empirical model, the data and estimation techniques to be employed in the study. The subsequent Section presents and discusses the empirical results while the final Section provides the concluding remarks of the study.

A NOTE ON CORPORATE INCOME TAX IN INDIA

The Indian Constitution (1950) provided for a two-tier federal system of Governments, namely the Centre (or National Government), and the State (or sub-national) Governments.[1] It assigned separate tax powers and expenditure responsibilities to them. Almost all mobile and buoyant taxes were assigned to the Centre. The CIT, which is one of the direct taxes of the Centre, is levied on the net total income of companies/firms.

The CIT revenue (nominal) in India increased from Rs. 5335 crore (1 crore=10 million) in 1990-91 to Rs. 35696 in 2000-01 and further to Rs. 2,98,688 crore in 2010-11. As per the recent budget, it was Rs. 610500 crore in 2019-20 (not shown). The CIT revenue-GDP ratio was 0.93 percent in 1990-91 and increased to 1.67 percent in 2000-01. It reached a peak of 3.97 percent in 2007-08 and then starting declining to 3 percent in 2019-20 (Figure 1).

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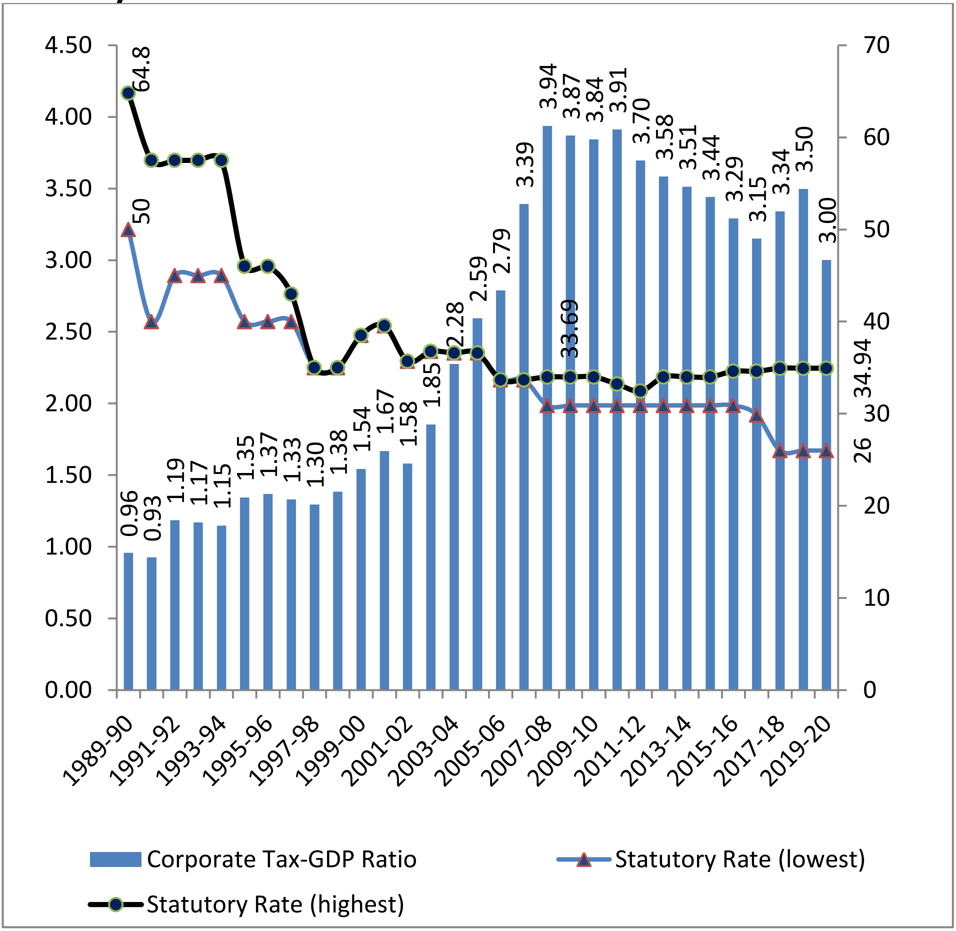
[1]In 1992, the 73rd and 74th Constitutional amendments empowered the urban and the rural local governments as the third tier.

[2]For full derivations, see Eklund (2013).

Figure 1: Corporate Income Tax: Its Revenue-GDP Ratio and Statutory Rate in India



Source (Basic Data): Indian Public Finance Statistics, CSO and Budget Documents (various years).

India's CIT rate has been one of the highest in the world. The actual statutory rate has been higher than basic rate due to cesses and surcharges levied. The statutory rate also varies (highest and lowest) based on turnover and type of companies. According to the Union Budget documents, in 1989-90, the statutory rate (highest) peaked at 64.8 percent and the lowest at 50 percent. Various committees including The

Chelliah Committee (early 90s), Shome Committee (2001) and Kelkar Committee (2002) recommended for reduction in CIT rate. As a result, both highest and lowest statutory rates declined to 35.7 percent in 2002-03. They further declined and the statutory rate (highest) reached 34.9 percent in 2019-20 and the statutory rate (lowest) declined to 26 percent (Figure 1). It is, however, noticed that during our study period the statutory rate has not changed much.

During 2003 to 2019, many other countries also cut their CIT rates to ward off the negative impacts of CIT and to attract foreign direct investment (FDI) and to mitigate outbound FDI. As a result of the tax competition and race to bottom, the average corporate tax rates across regions/continents of the world declined (Table 1). Europe's average tax rate is the lowest at 19.48 percent followed by Asia with 21.21 percent.

Table 1: Average Corporate Tax Rate (percent) Across Regions

Regions	**2003**	**2005**	**2008**	**2010**	**2014**	**2017**	**2018**
Africa	32.36	30.79	28.75	28.49	27.85	28.21	28.26
America	31.29	30.52	28.84	28.28	27.77	28.29	27.89
Asia	30.19	29.79	26.24	23.72	22.00	21.04	21.21
EU	27.95	25.15	23.17	22.93	22.39	21.33	21.29
Europe	26.72	24.03	21.95	21.46	20.42	19.53	19.48
Latin America	30.81	29.68	27.99	27.52	27.31	27.98	27.95
North America	35.30	38.05	36.75	35.50	33.25	33.25	26.75
Oceania	30.20	30.60	29.60	29.00	27.00	28.43	28.43
OECD	30.08	28.37	25.99	25.70	24.98	23.95	23.50
South America	30.81	29.68	27.99	27.52	27.31	27.98	27.95
Global	29.42	28.00	25.66	24.65	23.85	24.04	24.00

Source: Report on Income Tax Reforms for Building a New India, Govt. of India (2018).

In addition to the tax cut, the Government of India announced a new deduction of 30 percent of employee cost for three consecutive years on additional employee cost for newly set up firms from 2016-17.

Three new lower rates were introduced: (i) 25 percent for the manufacturing companies incorporated after 1st March 2016; (ii) 22 percent for all domestic companies from 2019-20 and (iii) 15 percent for new manufacturing companies set up and registered on or after 1st October 2019. However, these lower rates are available without other deductions like enhanced depreciation.

The tax burdens measured by the effective rate of firms would capture the effect of these reforms. However, these new rates are applicable from 2019-20 except 25 percent rate which is applicable from 2016-17 only for companies incorporated after 1st March 2016. These tax rate cuts are criticised. Hence, it is our endeavour to empirically verify whether the effective corporate tax rate affects the firm level investment and assess whether the corporate tax rate cuts are justified or not.

A BRIEF REVIEW OF LITERATURE

(a) Theoretical Literature

Accelerator models are one of the early theories in the field. They emphasise the role of demand conditions as the main determinant of investment. The simple version of this theory suggests that the change in the capital stock is equal to a fraction of the change in output. Most traditional studies employed this approach. However, the most recent investment models are based on the neoclassical theory. Both Keynes (1936) and Fisher (1930) argue that investments are made until the present value (PV) of expected future returns, at the margin, equals the opportunity cost of capital. That is, investments are made until the net present value (NPV) is equal to zero. An investment is expected to generate a stream of future cash flows, $I(t)$. Since the investment (I) represents an outlay at time 0, it can be shown as a negative cash flow ($-I_0$). So the NPV can be written as:

$$\mathrm{NPV} = \int_0^\infty I(t)e^{(g-r)t}\,dt - I_0 \qquad (1)$$

where g denotes the growth rate, and r-the opportunity cost of capital (discount rate). When the expected return on investment i is above r, then investment will be worthwhile. When r=i, the NPV=0. The return on investment i is equivalent to Keynes marginal efficiency of capital and Fisher's internal rate of return. From equation (1), the PV of an investment I can be written as I_1 /(r-g), implying that PV/I=1. The two most commonly used theoretical investment models following the above neoclassical tradition are: the Theory of User Cost of Capital and the Q-theory.

(i) Theory of User Cost of Capital: This theory was introduced by Jorgenson (1963) and Hall and Jorgenson (1967) with basic reasoning that a firm weights the costs and benefits of investment and invests when the benefits exceeds the costs. Thus, if capital inputs can be adjusted freely the marginal product of capita equals the user cost for a price taking firm (Vartia, 2008). The starting point for this theory is the optimization problem of a firm. Maximizing profit in each period will yield an optimal capital stock. Let the production function takes the conventional Cobb-Douglass form:

$$Y(t) = f(K(t),L(t)) = AK^{\alpha} L^{1-\alpha} \tag{2}$$

where Y is firm's output, K is capital and L is labor, all in period t. The profit function for the representative frim can e expressed as:

$$\pi(t) = p(t) Y(t) – s(t)I(t) –w(t) L(t) \tag{3}$$

where $\pi(t)$ is profit, p(t) is the price of outputs, s(t) is the price of capital and w(t) is the wage or labour price.

Assuming profit mazimisation, the current value of a firm, V(0) can be written as:

$V(0) = \max E_{\Phi 0}$

$$\oint_0^{\infty} \pi(t) e^{-rt} dt = E\Phi 0 \int_0^{\infty} [p(t)Y(t) - s(t)I(t) - w(t)L(t)]\, e^{-rt} dt \qquad (4)$$

S.t. $dK/dt = I(t) - \delta K(t) = \dot{K}(t)$

where δ is the depreciation factor and $\dot{K}$ (t) is growth of capital. The term E is an expectation operator conditional on the information set Φ available for the firm in each period. From the Lagrangian equation, one can obtain the current value of Hamiltonian (H) as:

$$H = p\, f(K,L) - sI - wL + \lambda(I - \delta K) \qquad (5)$$

Differentiating H with respect to I, L, λ and K and equating them to zero, one can show that: [2]

$$f_k' = s[\delta + r - (\partial s/\partial t)/s] / p \qquad (6)$$

Here , Jorgenson's user cost of capital c is defined as:

$$c = s[\delta + r - (\partial s/\partial t)/s] \qquad (7)$$

This means that $p\, f_k' = c$. Further, $\partial Y/\partial K = f_k' = (\alpha Y)/K$ and $\partial H/\partial K = (p\, \alpha\, Y)/K = c$. Solving for K, one can obtain an expression for the optimal capital stock (K^*)as:

$$K^* = \frac{p\alpha Y}{c} \qquad (8)$$

Thus, K^* depends on output, price of output and the UCC.

It is noticed that the investment is the change in capital between two periods is the investment:

$$I = \frac{p\alpha Y}{c} - K^*(t - \tau) \qquad (9)$$

It is noticed that the neoclassical theory assumes that K(t) adjusts instantaneously and fully to K^*(t). The traditional accelerator

[2]For full derivations, see Eklund (2013).

model, first suggested by Clark (1917) and popularized by Samuelson (1939 a,b), is often considered as a special case of the neoclassical theory, where the price variables have been reduced to constants. The price of output is held constant and price variables *s* and *r in* Jorgenson's (1963) user cost of capital, c are fixed, then the equation (8) becomes:

$$K^{*} \alpha Y \tag{10}$$

This accelerator principle thus assumes that desired capital stock is proportional to output. Hence, investment in each period depends on the growth of output, $\dot{Y}$:

$$I = \alpha\dot{Y} \tag{11}$$

(ii). Q-Theory of Investment: The UCC theory and accelerator theory have two main problems: (i) they assume that adjustment of the capital to the desired level or optimal level is immediate and complete in each period and (ii) there is no role for expectations. The solutions to these problems are to add an adjustment cost function (Treadway, 1969) and placing reliance on expected market value of assets (Brainard and Tobin,1968; Tobin 1969). This Q theory approach assumes that firms make investment until the market value of asset is equal to its replacement cost. It is noticed that if a marginal adjustment cost function, $\upsilon(I(t))$ is added to the profit function, the neoclassical theory becomes equivalent to the Q-theory of investment.

In this case, the firm value becomes:

$$V(0)= E\Phi 0 \int_0^{\infty}\left[p(t)Y(t) - s(t)I(t) - \upsilon\left(I(t)\right)s(t)\, I(t) - w(t)L(t)\right] e^{-rt}dt \tag{12}$$

Using the procedures explained earlier, one can show that the investment is an implicit function of marginal q (=q_m):

$$I = \varphi(q_m) \tag{13}$$

and

$$q_m = \lambda/s = \upsilon(I) + \upsilon'(I)I + 1 \tag{14}$$

where, $\lambda = \text{shadow price of capital and}$ s = cost of one additional unit of capital.

where, $\lambda = \text{shadow price of capital and}$ s = cost of one additional unit of capital. Thus, the marginal q is the ratio between the marginal return on capital and the opportunity cost of capital. It is also the marginal version of Tobin Q. Under certain assumptions, one can show that this marginal q ratio is equal to the ratio between the total value of firm and its replacement value of its total capital stock, the so-called average Q. The average Q can be measured by the stock market information on the value of the firm (Hayashi, 1982). [3]

Both the user cost and the Q theory can be adjusted for taxes. In the presence of taxes, there may be an additional effect on firm's investment decision beyond the user cost or average Q as taxes effect the after tax earnings from the existing projects and hence internal funds available to finance future investments. Furthermore, tax policies may have an effect on the financial structure of firms by affecting the choice between debt and equity financing. Thus, the tax adjusted theories suggest that increase in corporation tax (capital depreciation allowances) will reduce (increase) investment and the capital stock.

(b) Empirical Literature

The pioneering study by Hall and Jorgenson (1967) concluded that developments in the user cost of capital could explain aggregate

[3] However, it is in fact difficult to compute a representative and meaningful measure of average Q at the industry level.

investment relatively well. [4] However, this finding was later criticised (e.g., Chirinko and Eisner, 1983) as the user cost specification captured accelerator effects since in their original specification, this variable enters the investment equation as the ratio of output to user costs. When the contribution of user cost in explaining investment was isolated from that of output, it was found that its effect was negligible.

Hassett and Hubbard (2002) therefore in their survey concluded that the early studies based on aggregate level analysis were unable to distinguish the effect of various determinants of investment because aggregate variables such as investment and tax policy tend to move together over business cycle. Cummins *et. al.*, (1994) argues that at a disaggregate level, tax policies affect individual firms differently as the composition of the stock of capital varies across firms. Thus, tax policies are likely to be exogenous to firm's investment decisions at the disaggregate level. The firm level data are also useful to analyse whether the corporation tax differs across firms with different characteristics like size and age. An additional advantage of disaggregated analysis is that the problem of measurement errors in the independent variables may be addressed using the panel estimation techniques and disaggregated data as suggested in Griliches and Hausman (1986).

As a result, a new wave of empirical literature emerged to take advantage of the cross section variations of more disaggregated data rather than the time series variations of aggregate data. Chirinko *et. al.* (1999) modify the user cost formula and construct an asset and industry specific measure of user cost of capital. Cummins *et. al.*, (1994, 1996) provide another extension by expressing it at the firm level. They also take a new methodological approach and use major tax reforms as

[4] Studies such as Vartia (2008) also found that taxes have an adverse effect on industry level investment. In Vartia study, the long run user cost elasticity of investment to capital ratio ranged between -0.35 and -1.0. Using the cointegration techniques and time series data over the period 1962-1999 on Canada, Schaller (2006) finds a user cost elasticity of -1.6.

natural experiments to identify the effect of tax-adjusted user cost on investment.

Cevik and Miryugin (2018) used firm level data (7.99 lakh firms) in Asian countries during 1990 to 2014 and panel model techniques. They specifically calculated a firm-specific measure of the corporation tax burden as gauged by ratio of corporation tax expenses to profits before tax and square of this variable to capture the non-linear behaviour in corporate investment decisions. They found that other things remaining the same, taxation does not appear to hinder business investment. However, a higher tax burden adversely affects investment. They also found that high indebtedness is detrimental for new investments

Schwellnus and Arnold (2008) used OECD firm level data for OECD countries excluding Central and Eastern European countries during 1996 to 2004 and a difference-in-difference estimation strategy and found that the long-run elasticity of the investment rate with respect to tax adjusted user cost is -0.69 (i.e., CIT reduces investment through an increase in the UCC).

Djankov *et. al.*, (2010) constructed a new cross sectional data base of average effective corporate tax rates and other taxes imposed on "the same" standardized mid-size domestic firm through survey in association with PricewaterhouseCoopers. The study period covers 2003-2005. They found that the effective corporate tax rate has a large negative impact on aggregate investment. The study covers India also. Galindo and Pombo (2011) also use firm level data from 42 developing countries during 2004-2006 and find that corporate taxes have a negative impact on investment. Bond and Jing (2015) used sectoral panel data for 14 OECD countries during 1982 -2007, and found that the UCC has a negative impact on equipment, but its effect on investment is less clear cut.

A few studies used the natural experiment approach. They focused on episodes where corporate tax changes are accounted for a large share of the variation in the UCC. They also found a strong support for the negative effect of higher corporate tax rate on business investment. Cummins *et. al.*, (1994) used firm level data for the United States during 1953-1988 and episodes of major tax reforms in Unites States and showed a significant negative effect of higher corporate tax on investment at the firm level. Cummins *et. al.*, (1996) using the firm level data during 1982-1992 also confirmed their previous results. House and Shapiro (2008) used reforms of corporate taxation in the United States in 2002 and 2003 and showed a negative effect of the tax adjusted user cost on investment at the sectoral level.

Exploiting 2008 German tax (rate cut) reform and employing the difference-in-difference approach, Dobbins and Jacob (2016) found that domestic firms benefit more than the foreign firms through increase in investment and resultant sales growth in response to tax rate cut. Alstadsæter *et. al.*, (2017) analysed the effect of Sweden's 2006 dividend distribution tax cut using panel data and triple- difference estimator and found differences in investment response of cash constrained firms and cash rich firms. The cash constrained firms invested more than the cash rich firms.

The effect of bonus depreciation of 2002 in US and section 179 expensing of Federal government and its adoption by States was studied by Ohrn (2017). He used a modified difference-in-difference approach. The findings suggest that both policies had positive impact on investments whereas the output and employment responded several years after the adoption of these Federal policies by the States suggesting incentives led to automation of the US manufacturing sector. Ohrn (2018) analysed the effect of Domestic Production Activities Deduction, a corporate tax incentive introduced in 2005 in US using a quasi-experimental approach and found that for 1 percent reduction in tax rates, the installed capital increases by 4.7 percent.

Auerbach (2018) studied the effect of US Tax Cuts and Jobs Act (TCJA), 2017 and found that they increased US capital investment and thereby wages. On the contrary, Furman (2020) argued that growth rate of the fixed business investment in the post TCJA came down compared to pre TJCA whereas the Federal spending went up. Riris and Etty (2019) found no impact of tax incentives, which reduce the effective tax rates on investment efficiency of manufacturing firms listed in Indonesian Stock Exchange. Kim and Park (2020) analysed the effect of corporate tax reduction on Japanese manufacturing industry using dynamic dual approach and found that tax reduction boost capital investment and employment.

As the Q-theory approach considers only firms listed on stock markets, this approach is useful to study the effect of policy announcements as they have effect on the stock market and consequently on the level of investment. However, empirical studies using this approach to study the effect of tax are very sparse. Srinivasan (1986) shows that small and medium sized manufacturing corporations are dependent on internal funds. Change in corporate tax policy that affect internal fund has greater effect on investment behaviour of small immature enterprises. Fazzari *et. al.*, (1988) show that for firms that face imperfect markets for external finance, the cost of internal finance differs substantially from external finance and their investments depend on cash flow. This brief review highlights that there is hardly any study to analyse the impact of corporate income tax on investment of Indian manufacturing firms. This study is an attempt to bridge the gap in the literature.

EMPIRICAL MODEL, DATA AND ESTIMATION

The empirical approach utilized in this study to examine the effect of CIT on investment of Indian manufacturing firms relies in general on the past studies on the topic. However, it uses a firm-specific measure of the corporation tax burden (i.e., effective tax ratio) as gauged by ratio of corporation tax expenses to profits before tax as in Cevik and Miryugin (2018). As explained above, the firm level analysis is free from aggregation bias and it enables to study the impact of corporate tax on investments across firms with different characteristics.

The study employs the following empirical model:

$$(I/K)_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 (D/K)_{it} + \beta_3 (I/AD)_{it} + \beta_4 CF_{it} + \beta_5 LR_{it} + \beta_6 AGE_{it} + \lambda_i + \mu_t + \varepsilon_{it} \quad (15)$$

where,

I/K_{it} = Gross fixed asset investment of the firm i in the year t as a ratio of Opening balance of Gross fixed asset of the firm i in the year t;

T_{it} = Effective tax ratio measured as the corporation income tax paid by the firm *i* in the year *t* as a ratio of profit before tax in the year t;

D/K_{it} = Deduction of Gross fixed assets of the firm *i* in the year *t* as a ratio of Opening balance of Gross fixed asset in the year *t;*

I/AD_{it} = Total interest expenses of the firm *i* in the year *t* as a ratio of average debt of the firm. Average debt is the average of opening and closing debt balances of the firm *i* in the year *t*;

CF_{it} = net cash flow of the firm i in the year t as a ratio of average Gross fixed asset of the firm i. Average Gross fixed asset is the average of Gross fixed asset in the year t and then year t-1;

LR_{it} = Leverage Ratio of the firm *i* in the year *t* measured as ratio of debt to total assets; and

AGE_{it} = Age of the firm *i* in the year *t* measured as difference between the year of incorporation and the year *t.*

The terms λ_i is the firm specific unobserved heterogeneity term capturing individual specific unobserved characteristics of firms; μ_t is the time or year effect; and ε_{it} is the standard stochastic disturbance term.

It is noticed that the effective tax rate differs from statutory tax rate as each firm has different asset base, types of assets and thereby adopts different rates of depreciation. D/K_{it} *is* considered to capture the deduction of part of gross fixed asset due to obsoleteness and impairment which necessitates new investment. As the interest rate affects the cost of capital, it is included as one of the independent variables. The net cash flow and leverage ratio will determine future investment. The age of the firm can influence on the incremental investments as the new firms likely to make more investments than old firms. However, Fazzari *et. al.*, (1987) argue that new firms in general face a financial hierarchy and so the change in corporate tax policy that affects internal funds will likely to have a much greater effect on their investment behaviours. The firm size matters as the larger firms can make more investments. The size is captured by the log value of sales. To analyse whether the tax effect varies with age and size or not, the age and the size variables are allowed to interact with effective tax variable in an alternative specification of the model.

The study uses the data drawn from the Centre for Monitoring Indian economy (CMIE)-prowessIQ database. The Prowess database reports the accounting information for a large number of firms operating in Indian manufacturing sector (nearly about 17000 firms). But for every year, the data for many firms are not available due to entry /exit issue, missing data problem (particularly corporate tax and depreciation variables) etc. [5] Initially the data were compiled for the period 2004 to 2019. But due to computation of certain average variables, the final data set used in the empirical analysis study is an unbalanced panel, including 11774 firms during 2005 to 2019 (15 years). The total observations used are 79387. Hence, out data set is free from the sample selection bias. Table 2 provides the descriptive statistics of the study variables.

[5]As the data for many firms are not available for continuous years, the dynamic panel model technique is not attempted in this study.

Table 2: Descriptive Statistics of the Study Variables

Variables	Definition	Mean	Std. Dev
I/K	Investment Ratio (percent)	11.3729	21.458
T	Effective Tax Rate (percent)	16.9779	13.974
D/K	Deduction Ratio (percent)	1.9499	10.926
I/AD	Interest-Debt Ratio (percent)	12.779	64.78
CF	Cash Flow Ratio	-0.079	27.421
LR	Leverage Ratio	0 .3949	0.348
AGE	Age in Years	25.1222	17.575
SIZE	Log of Sales (in Rs. million)	6.6478	1.951
N	Total Observations	79387	

The above investment equation (15) can be estimated using the standard (static) panel data estimation techniques: fixed effects (FE) or random effects (RE) method. The former assumes a correlation between the explanatory variables included in the model and the unobserved individual (firm) effect and year effect while the latter assumes no such correlation. The FE model can be estimated using the Least Square Dummy Variable (LSDV) procedure by incorporating firm dummies and year dummies along with other explanatory variables or "within estimation" procedure. The RE model can be estimated using the feasible Generalized Least Square (FGLS) procedure. The Chow test will be used to choose one way or two way model while the Hausman Statistics will be used to select FE or RE model.

EMPIRICAL RESULTS

Table 3 presents the estimation results of investment to capital stock equation for Indian manufacturing firms. Column (1) shows the one way effects model results while Column (2) reports the two way effects model results. Column (3) allows age tax interaction term while Column (4) allows size tax interaction term. Column (5) allows interaction of both age and size variables with tax. For all cases, the Hausman statistics supports the FE model.

Table 3: Two Ways Fixed Effects Model Estimation Results of Investment Equation for Indian Manufacturing Firms (2005 to 2019)

Variables	(1)	(2)	(3)	(4)	(5)
Constant	16.1328 (27.81)	8.3675 (9.22)	9.5915 (10.37)	9.2013 (9.98)	10.13 (10.84)
Effective Tax Rate (T)	-0.0367 (-4.65)	-0.0484 (-6.15)	-0.1263 (-9.11)	-0.1816 (-6.53)	-0.2244 (-7.82)
Deduction Ratio (D/K)	0.2455 (32.43)	0.2399 (31.90)	0.2398 (31.90)	0.2407 (32.01)	0.2405 (31.99)
Interest Debt Ratio (I/AD)	-0.0032 (-2.45)	-0.0036 (-2.80)	-0.0036 (-2.83)	-0.0036 (-2.83)	-0.0036 (-2.85)
Cash Flow Ratio (CF)	-0.0010 (-0.37)	-0.0009 (-0.32)	-0.0009 (-0.35)	-0.0009 (-0.35)	-0.0009 (-0.36)
Leverage Ratio (LR)	-0.9039 (-2.35)	-0.9134 (-2.39)	-0.8964 (-2.35)	-0.8605 (-2.25)	-0.8560 (-2.24)
AGE	-0.1679 (27.81)	0.0530 (1.53)	0.0048 (0.13)	0.0160 (0.45)	-0.0199 (-0.55)
T* AGE	-	-	0.0030 (6.82)	-	0.0027 (6.07)
T* SIZE	-	-	-	0.0195 (4.99)	0.0154 (3.91)
Firm Effects	Yes	Yes	Yes	Yes	Yes
Time Effects	No	Yes	Yes	Yes	Yes
R Sqr. (within)	0.0164	0.0302	0.0309	0.0306	0.0311
F	188.13	110.91	107.77	106.65	103.38
Hausman stat.	149.32	264.00	291.81	286.47	315.58

Number of Observations (N): 79387.

The main variable of interest is the effective corporation income tax rate (T). In all 5 Columns, as expected, the coefficient associated with this variable is negative and statistically significant at 1 percent level of significance. These results imply that the corporate income tax has an adverse negative effect on investment of manufacturing firms in India. The estimated parameter of effective tax rate variable in Column (1) indicates that on an average, a one-unit increase in effective tax rates leads to 0.037 unit decline in investment ratio. The elasticity of the investment rate with respect to effective tax rate is -0.055. In column

(2), the tax coefficient is -0.0484, giving the estimated elasticity value of -0.072.

In Column (3), the tax age interaction term is positive and statistically significant at 1 percent level of significance, indicating that effective tax rates increases age. That is, the effective rate is higher in older forms than in young firms. Also this interactive age variable with effective rate greatly increased the magnitude of the tax coefficient. After taking into the role of both tax and the age interaction term, the net effect of tax on investment ratio is -0.059 and the estimated elasticity is -0.076. In Column (4), the size tax interaction term has a positive and statistically significant coefficient, implying that effective rate increases with increased sales volume. The net effect of tax on investment is -0.05197 and the elasticity is estimated at-0.078. In Column (5), both age tax interaction term and size interaction term are having positive and statistically significant coefficients. In this case, the net tax effect on investment ratio is -0.0542 and the estimated elasticity of the investment rate with respect to effective tax rate is -0.081.

As the estimated elasticity of the investment rate with respect to effective tax rate ranged between -0.072 and -0.081, it is evident that a one percent increase in effective tax rate would lead to 0.07 percent to 0.08 percent percent decline in the investment ratio of Indian manufacturing firms during 2005 to 2019. It is noticed that the magnitude of elasticity is relatively low as compared to the magnitude shown in other past studies on the topic, because almost all other studies except Cevik and Miryugin (2018) use either user cost of capital or effective tax rate computed at industry/sector level.

As expected, the deduction rate (D/K) has a positive and significant effect on investment ratio at 1 percent level of significance in all five Columns. The magnitude of the coefficient implies that on an average one unit increase in deduction ratio leads to 0.24 unit increase in investment ratio. The interest debt ratio (I/AD), as expected, has a negative and significant effect at 1 percent level of significance in all Columns except in Column (1) where it is significant at 5 percent level.

Unexpectedly, the Cash flow variable does not play a significant role in determining the investment ratio of manufacturing firms in India. As expected the leverage ratio (LR) has a negative effect on the investment ratio in all Columns and this effect is significant at 5 percent level of significance.

As expected, the firm's age has a negative impact on investment at 1 percent level of significance in the one way FE effects model in Column (1). This result implies that the investments are higher in young firms than in age-old firms. However, in other Columns, the age coefficient is not statistically significant even at 10 percent level of significance. But it is noticed that the age effective tax interaction term in Columns (3) and (5) has a positive and significant parameter at 1 percent significance level, indicating that the effective tax rate increases with age. Also the net effect of age on investment is positive, but the magnitude of the effect is low. As expected, the size tax rate interaction term in Columns (4) and (5) has a positive and significant coefficient at 1 percent significance level, implying that the effective rate increase with sales volume of manufacturing firm in India. Further these results imply that sales variable has a positive impact on investment.

SUMMARY AND COLCLUSION

In this study an attempt has been made to analyse empirically the impact of corporation income tax on investment decisions on manufacturing firms in India during the last 15 years (i.e., from 2005 to 2019). Following the tradition of past studies, it has specified an investment ratio function which depends on the effective corporate income tax rate, the deduction ratio, interest-debt ratio, cash flow ratio, leverage ratio, age and size of firms. The investment equation is estimated using the standard two way fixed effects estimation technique.

The empirical results provide a strong support for the theoretical prediction that corporate income tax has an adverse negative impact on investment decisions of Indian manufacturing firms. The estimated investment elasticity with respect to effective corporation tax ranges between -0.072 and -0.081, implying that a 1 percent increase in effective rate would lead to 0.07 percent to 0.08 percent fall in the investment ratio. It is noticed that the magnitude of the elasticity estimated in this study is relatively low as compared to other past studies mainly because they use either user cost of capital or effective rate at industry level. Another reason for the low effect of tax could be that the average effective tax rate (of 16.97 percent) is only 50 percent of statutory corporate tax rate, due to various deductions etc. The only study that can be compared with this study is Cevik and Miryugin (2018). But this study finds a positive impact of effective rate on investment of Asian firms. However, a higher tax burden raises the user cost of capital and affects investment negatively.

As expected, the deduction rate has a positive impact on investment while interest-debt ratio and leverage ratio have a negative impact. The cash flow and age play a little role in determining the investment decisions of manufacturing firms in India. Both Age and size interaction terms with effective tax rate indicate that the effective rate increases with age and size of firms. Thus two major policy implications emerged from the study are: (i) (i) As the corporate tax has an adverse negative impact on firms' investment, the tax cut is justifiable; and (ii) there is a need to provide more support to encourage age-old and larger firms to increase their investments.

To our knowledge, this is the first study on the topic in the context of Indian manufacturing firms. One of major limitations of the study is that it computes firm specific effective tax rate using the data reported in CMIE Prowess database. Many argue that the tax expenses reported are only approximate figures and accurate figure net of refunds are available in Tax Returns. But in India, the Tax Returns details are unavailable due to the confidentiality concerns. But in countries like UK, there are researches based on Tax returns. If tax returns data are accessible to researchers in India, more accurate impact of effective rate can be estimated. Despite this data limitation we hope that that the findings of this study will be useful to policy makers, international agencies and others researchers to take appropriate strategies to design the corporate tax policy such that it is not a hindrance to the investment options of manufacturing firms in India.

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