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DETERMINANTS OF MANUFACTURING SECTOR INVESTMENT IN INDIA: AN ARDL BOUND TEST APPROACH

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Abstract: What determines investment is a much-analysed policy question all around the world. Growth and past investments are the primary policy variable used to stimulate current investment. But there is much difference in opinions among policymakers regarding which policy instrument should be emphasised more increase investment. In this analysis, the accelerator theorem of Koyck is validated with data from the Annual Survey of Industries (ASI) by MOSPI. To overcome the problem of the unit root process in data, this analysis employed the ARDL bound test approach to analyse data. Our research found that profit and output affect firms' gross fixed capital formation, while the output is the only variable affecting the firm's investments in the long run. In the short and long run, the bank lending rate doesn't impact the firm's investment decision much. This work shows some light on the debate between output and past investments. As per the results of my work, past investment also doesn't have much impact on the firm's investment behaviour. This may be because fixed capital investment is a long-term process, and its effects cannot be felt in the short or medium run.

Keywords: Investments, Output Gap, Manufacturing Firms, Interest Rate, Profits

JEL Code: E22, E61, D22

1. INTRODUCTION

The recent decision by the Reserve Bank of India (RBI) to keep its policy rate unchanged at a lower level for a longer period has been widely discussed and debated in the policy circles in India (see Rangarajan 2021, Mohanty 2022, Subramanian and Felman 2022). While RBI has kept an accommodative monetary

policy to support domestic growth post covid restrictions, the effectiveness of monetary policy in triggering economic growth is much more complex. According to Papdemos (2003), the monetary policy cannot directly contribute to economic growth but can only create a favourable environment for economic growth by keeping prices stable. The nexus between monetary policy and economic growth is widely discussed in the monetary economics literature. A review of the theoretical and empirical literature on the relationship between monetary policy and economic growth by Twinoburya and Odhiambo (2018) has concluded that even though there is a large chunk of literature analysing the nexus between the monetary policy and economic growth, the relationship is more or less inconclusive. They are of the view that this relationship is weaker in developing countries with underdeveloped financial markets and less integration into the global markets.

There are various transmission pathways for monetary policy to affect the real variables. These pathways are determined by the country's financial and banking sector development. One important pathway through which policy rate affects the investment environment is through the interest rate channel of monetary policy transmission. The Changes in monetary policy are eventually reflected in long-term real interest rate, which influences aggregate demand by altering business investment and durable consumption decisions (Khudrakpam and Jain 2012). The other main transmission channels through which the policy rate affects the investment decisions are the asset price channel and credit channel of monetary policy transmission. Unlike the interest rate channel, Credit Channel assumes that the bank plays a vital role in financial intermediation in an economy. The monetary policy will affect the net market value and income flow of financial intermediaries (banks), affecting the bank's decision to loan funds, which will then be transmitted into the economy via aggregate demand and investment.

The Asset Price channel works when Monetary Policy affects the Stock market prices, impacting macro variables through Tobin's q. A monetary Policy expansion can positively affect the stock price of a firm. This increase in stock price will raise the firm's market valuation compared to the replacement cost of the capital, increasing Tobin's q. When Tobin's q is high (low), firms will be encouraged (discouraged) to undertake investment by issuing equity which will accelerate (decelerate) economic activity in the economy.

This paper analyses the nexus between corporate investment and interest rate in the Indian scenario from 2001. Since the interest rate adjusts itself with the policy rate, the lending rate of the SCBs is used as the independent variable in this paper. Interest rate is one of the main determinants of business investment in many investment models. Since many theories suggest that interest rate plays a significant role in the investment decision in developed economies, the impact of interest rate in an emerging market economy is somewhat mixed (Greene and

Villenueve, 1991). The degree to which the interest rate affects investment decisions in a non-developed country is debatable, mainly because of the underdeveloped financial and banking sectors. The main objective of this study is to analyse the determinants of business investment decisions in India and how interest rate fits in the whole equation.

In the next section, major theories of investment behaviour are discussed, followed by a brief literature review. The subsequent section discusses data and methodology to analyse the model hypothesis, followed by results and concluding remarks.

1.1. Major Theories of Investment Behaviour

Investment is one of the essential components of the domestic product of any country. It is generally accepted that investment in fixed assets is one of the ways to increase productivity growth in the long run (DeLong and Summers 1992). But economists have not yet reached a conclusion on whether investments lead to economic growth or economic growth leads to investments. For example, DeLong and Summers (1992) are of the view that the rate of fixed investment determines the rate of economic growth in a country, while Bloomstrom, Lipsey and Zejan (1996) completely contradict the former view and conclude that economic growth increases further capital investment rather than previous capital formation rates. So, It is necessary to analyse independently the determinants of economic growth in each country to draw suitable policies for economic development. Even though most of the literature differs on what causes economic growth, most of the researchers agree that a high investment rate is a characteristic of a fast-growing economy. But what determines the investment is still a debated topic. Economists from different schools of economic thought have different opinions and arguments about the determinants of investment. Keynes, for example, believed that firms undertake an investment decision by comparing the marginal efficiency of capital with the real rate of interest. The capital stocks, retained profits, cost of capital, interest rate, and fluctuations in the stock market are various investment determinants propounded by different thoughts of school. But many of these investment models have strict assumptions that can only be observed in a developed nation and not in a developing country, especially the assumptions of government investments and a perfect capital market (Green and Villanueva, 1991).

The three major theories of investment behaviour are the flexible accelerator theory of investment by L.M.Koyck (1954), the Neoclassical theory of investment by Dale.W.Jorgenson (1963) and the Q theory of investment by James Tobin (1969).

The Flexible Accelerator Theory of investment is an extension of J M Clark's accelerator theory of investment (1917). The accelerator theory postulated by JM Clark assumes that the firm's desired capital-output ratio is constant, which means

the desired capital stock for any period t is proportional to the firm's output in t. The model simply predicts that investment is proportional to the change in the output in the next period. But later on, many economists worked on this theory and made significant contributions towards developing the accelerator theory by combining it with Keynes multiplier in order to include the lagged response of investment function to the change in output. Koyck's approach was the most accepted one. In Koyck's approach, investment is inversely related to the capital stock of the previous period and positively associated with the output level of the firms in the previous period. Koyck also took account of depreciation into his model.

Neoclassical Theory of Investment by Jorgenson is another theory of investment behaviour. It is based on the determination of optimal or desired capital stock, derived from a firm's profit maximisation function, which is that nothing but marginal revenue equals the rental price of capital. Jorgenson postulated that desired capital stock is a function of the rental price of capital and other inputs such as the price of the firm's final product, cost of other input etc. (Romer, 2007). But since most of the capital is not rented by the firm but owned mainly by the firm itself, it eventually leads to difficulties finding a counterpart for the rental price of capital. This problem is solved by the introduction of the user cost of capital.

According to Jorgenson (1963), the user cost of capital is the shadow price or implicit rental of one unit of capital service per period of time; intuitively, it can be expressed as the rent charged by the firm on itself for using its own capital. The firm usually incurs three major costs for using capital. Interest rate (interest income forgone by the firm if the firm has kept the money and invested in bonds instead of buying capital stock), depreciation, and change in the market price of the capital stock (User cost of capital will decrease if the price of the capital increase because the firm will sell the capital stock in a profit). The tax rate and capital income are kept constant in this model. The user cost of capital will predict the growth in capital stock. The desired capital stock of a firm will be determined by the changes in the user cost of capital.

Tobin's q theory of investment is another investment theory formulated by Tobin (1969) as a counter-theory to the neoclassical investment theory. The neoclassical theory ignores the cost of acquiring and installing capital stocks. Q theory of investment assumes the firm will face a cost for adjusting their capital stocks, a convex function of a rate of change of a firm's capital stock. According to Tobin, a firm's investment decision depends on the ratio of the present value of installed capital to the replacement cost of capital. This ratio is known as Tobin's q. If a firm's q ratio is greater than 1, the firm will increase their capital stock and vice versa.

There are also other theories of investment behaviours like Dusenbery's accelerator theory of investment, financial theory of investment, profit theory of investment etc. But is not discussed in detail in this paper.

In the following section, relevant literature on investment behaviour is reviewed.

2. REVIEW OF LITERATURE

Determinants of fixed investment in India were studied by Nair (2005) from 1974 to 2002. Their analysis found that traditional determinants like output and profit still play a significant role in determining investments. Their study also concluded that liberalisation policies undertaken by India in 1991 made a favourable economic condition for investment in the country. The effects of dividends and external finance on investment in the Indian chemical industry from 1962 to 1967 are studied by Krishnamurty and Sastry (1971). The flow of net debt towards the firm is used to measure the value of external finance. They found that the flow of net debt is an essential factor in explaining investment during this period. But their study also found that the debt stock has no significant correlation with the investment behaviour of that firm.

Bhattacharya (2008), Athey and Laumas (1993) and Hosamane and Niranjan (2012) all analysed the importance of internal funds in determining corporate investment in India. All studies concluded that internal funds or profitability of the firm is a crucial factor determining the level of aggregate investment in India. Athey and Laumas (1993) also found that depreciation is a major factor determining private investment in India.

Fazzari *et al.* (1988) distinguished between a firm's internal and external sources of funds in determining investment spending. Their research argued that internal and external sources of funding are not precisely perfect substitutes for each other. They argued that internal finance is less costly than a new share issue or debt financing and firms with exhausted internal finance will be more sensitive to fluctuation in the firm's cash flow. Eisner (1978) also studied the importance of a firm's internal funds for investment. In his basic accelerator-profit investment function, he found evidence that both current and past profit and sales value have a positive and significant impact on a firm's investment functions.

Stiglitz (1989) argues that real interest rate changes have only a minor impact on the fluctuations in investment. According to him, money is not the determinantal factor in economic activity but credit. He concludes that the changes in credit availability will significantly affect economic activity while the changes in a real interest rate have only a minor effect on the economic activity. Based on the evidence from their survey of non-financial firms in the United States, Sharp and Suarez (2013) found that firms are insensitive towards decreasing interest rates. Out of 500 responses from the firm's Chief Financial Officer, they claim that a significant percentage of firms are unwilling to change the investment plans based

on any changes in interest rate. According to their results, investment is also not sensitive to interest rates among firms expecting more growth in revenue.

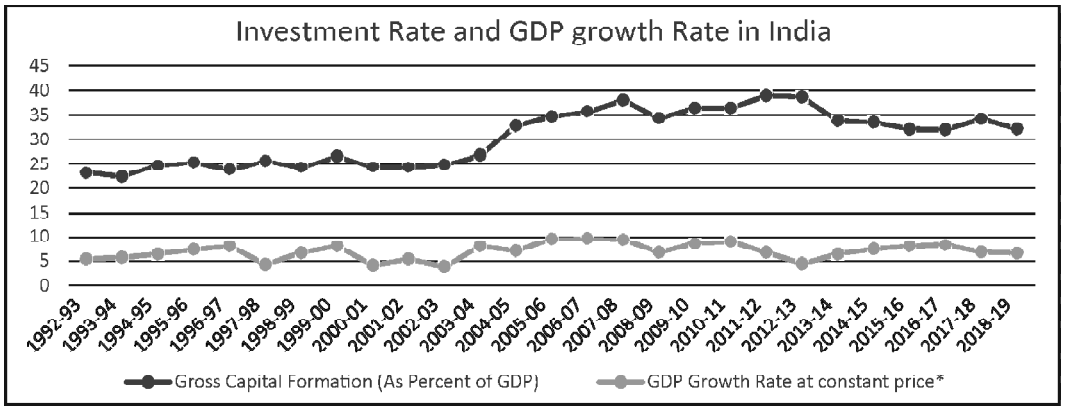
The effect of real interest rate on private sector investment in India is studied by Athukorala (1998). This study analysed the trends and patterns in interest rate, savings and investment in the Indian economy from 1955 to 1995. The results suggest that a high real interest rate actually increases private investment by accumulating the finances necessary for private investment. The interest rate hike will accumulate financial savings, eventually facilitating banks to provide more credit to the private sector.

3. TRENDS AND PATTERNS OF INVESTMENT IN INDIA

Along with private investments, public investments also have a role in driving the growth and productivity of an economy, at least in a developing country. It is generally accepted that public infrastructure development will increase the productivity of various economic sectors (Munnel, 1992). So in this study, determinants of private and public sector investments are analysed. Post liberalisation in 1991, India experienced a jump in productivity in the industrial sector. The average capital formation as a percentage of GDP from 1970 to 1990 was 18.9 (RBI, 2020). But since 1991, the investment rate started to pick up. The investment rate reached 39 per cent in 2011-12. The average investment rate between 2000 and 2010 was 31.7 per cent. But since 2011-12, there was a slight dip in the investment rate, and it reached 32.2 percent in 2018-19 from 39 percent in 2011-12. A reduction of almost 7 percent.

The reduction in the investment rate is reflected in the GDP growth also. In India, the GDP growth was maximum when the investment rate was also increasing. Between 2004-05 and 2010-11, the GDP grew on an average of 8.5

Figure 1: Investment Rate and GDP Growth Rate in India

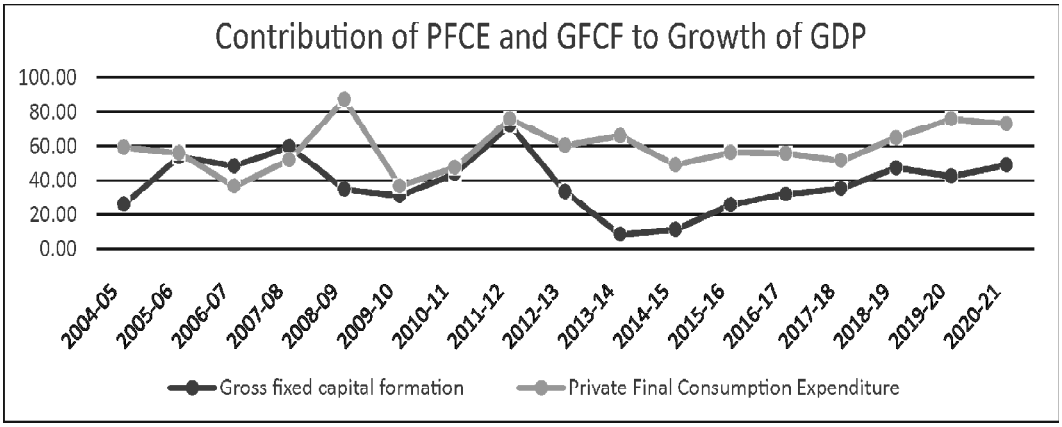


Source: RBI DBIE

percent, while the average investment rate was 35 percent. The contribution of the investment rate to the growth of GDP will explain the importance of investment in economic development.

Investment is one of the significant determinants of economic growth in any country (khan and Reinhart 1990, Greene and Villuneve 1991). The higher savings and investment rate from 2002-to 2003 kept India on a high growth trajectory in the 21st century (Mohan 2008). The contribution of GFCF to GDP growth at market price was 42 per cent in India in 2019-20 (RBI, 2020). Even though India has a consumption-led growth, there were years where the contribution of fixed capital investment to the GDP growth outpasses private consumption, especially from 2005-06 to 2007-08 and 2010-12. Interestingly these were also the years with high GDP growth. This high growth rate is mainly because of the advantages the investments bring, such as increased technological advancement, increased employment, more demand etc.

Figure 2: Sectoral Contribution of GFCF to growth in GDP



Source: RBI, DBIE

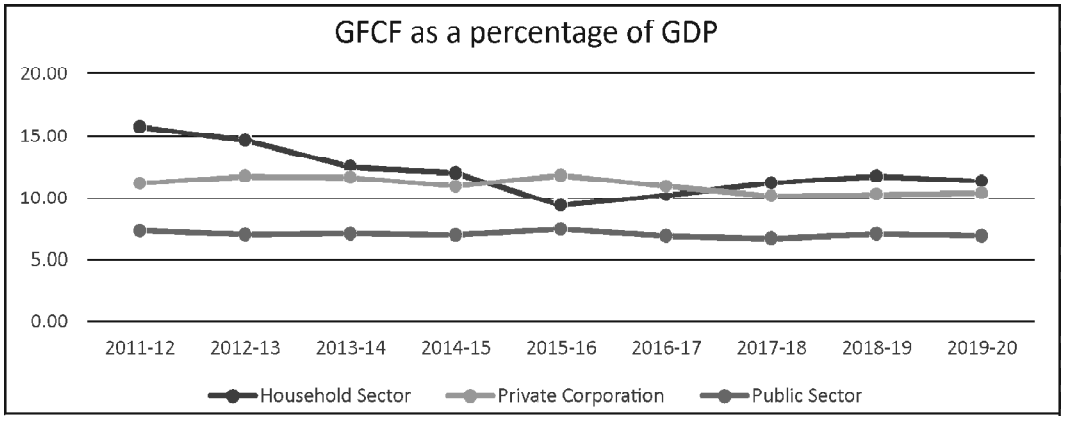
Gross Fixed Capital Formation (GFCF) is generally regarded as equivalent to the investment level of an economy. It is evident from Table 1 that the real estate sector has the largest investment rate than any other economic sector. The household sector is the main contributor to the investment in real estate, ownership of dwellings, and professional services. Investment by the private sector towards real estate is minimal, and the public sector is almost zero. The next activity having the maximum capital formation is the manufacturing sector. Since 2011-12, the GFCF of the manufacturing sector as a percentage of GDP has been around 5 percent. But the trend is coming down for almost all activities. The total GFCF dropped from 34 percent in 2011-12 to 28 percent in 2019-20.

Table 1: Sector-wise analysis of fixed investment in India

Gross Fixed Capital Formation by Industry as a percentage of GDP							
Economic Activity	*2013-14*	*2014-15*	*2015-16*	*2016-17*	*2017-18*	*2018-19*	*2019-20*
Agriculture, Forestry and Fishing	2.86	2.58	2.09	2.18	2.07	2.10	2.14
Mining & Quarrying	1.28	0.54	0.42	0.44	0.49	0.49	0.40
Manufacturing	5.14	5.12	5.21	4.67	4.38	4.29	4.41
Electricity Gas, Water Supply and Other Utility Services	2.79	2.67	2.97	2.36	1.92	2.27	2.00
Construction	1.34	1.12	1.18	1.55	1.83	1.99	1.85
Trade, Repair, Hotels & Restaurant	2.07	2.70	2.69	2.82	3.10	2.90	2.41
Transport, Storage & Communication & Services related to Broadcasting	2.88	1.91	2.63	2.62	3.58	3.80	3.68
Financial Services	0.35	0.33	0.39	0.30	0.22	0.32	0.33
Real Estate, Ownership of Dwelling and Professional Services	8.12	8.63	6.54	6.51	5.86	6.39	6.41
Public Administration & Defence	2.75	2.78	2.78	2.81	2.67	2.67	2.93
Other Services	1.72	1.71	1.84	1.93	2.06	1.96	2.18
Total	31.30	30.08	28.73	28.19	28.18	29.19	28.75

Source: RBI DBIE

Figure 3: GFCF as a percentage of GDP at Market Prices

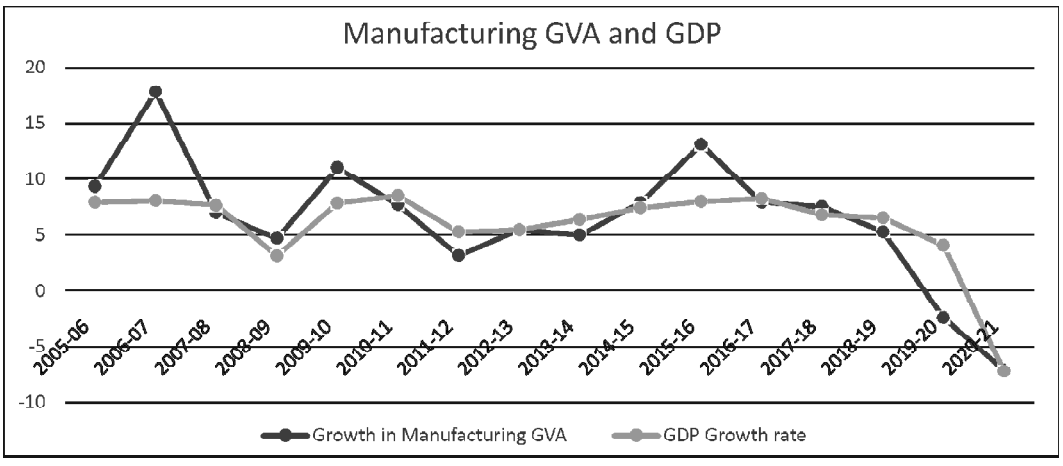


Source: RBI

As mentioned earlier, the household sector has remained the major contributor to the GFCF of India since 2011-12. Capital formation of the private corporation also stayed at a similar level to the household sector but surpassed the household sector in 2015-16 and 2016-17. Most of the household sector investments are in real estate and agriculture. The household sector thus creates a cycle of demand for other sectors. Because real estate investments can increase construction demand, this will drive demand for the steel and iron industry and other sectors. On the other hand, the private sector GFCF was around 11 percent until 2015-16, but it fell and reached 10.4 percent in 2019-20. The public sector GFCF was almost 7 percent throughout the 2010-20 decade.

But the investment or the output growth in the manufacturing sector will bring more positive changes in GDP (Kaldor, 1966). According to Kaldor, Manufacturing Sector is the engine of economic growth. It drives the economic growth and development of any country. Since productivity is higher in the manufacturing sector, Kaldor (1967) believes that growth in manufacturing output will draw labours from other sectors with diminishing productivity, thus increasing the productivity of all other sectors and further increasing growth in the total output of a country. Many studies have analysed the relationship between manufacturing output and GDP (see Thirlwall 2013). In India, these studies have also been carried out and found favourable results by Lopez and Thirwall (2014) and Sankaran and Samataraya (2015). The growth rate of Manufacturing GVA and GDP is plotted in figure 4. It must be noted that there exists a strong correlation of 0.8 between the manufacturing GVA growth rate and GDP growth rate. The movement of both graphs is identical, and the growth rate of manufacturing GVA outpaces the GDP growth rate in most periods. But correlation doesn't imply

Figure 4: Manufacturing GVA and GDP



Source: RBI DBIE

causality, so this article's econometric analysis of the manufacturing sector is well justified, and the determinants need to be carefully examined. In this study, determinants of investment in the manufacturing sector in India are analysed. Various aspects of investment, such as change in output, retained profit and interest rate, are all examined in this study.

4. DATA AND METHODOLOGY

In this study, determinants of investment of manufacturing firms for the period 2001 to 2018 are analysed. The Gross Fixed Capital Formation (GFCF) is the dependent variable in our model. The Annual Survey of Industries (ASI) conducted by MOSPI is India's principal source of industry statistics. ASI provides data on the organised manufacturing sector's growth, composition, and structure (ASI, 2018). In this study, the data for GFCF, change in output and profit are used for analysis. The interest rate and business expectation index data are collected from RBI Database on Indian Economy (DBIE).

The Gross Fixed Capital Formation (GFCF) is the dependent variable used in the model. The GFCF is the addition to the fixed capital stocks of the firms. Since the fixed capital stock has a longer lifetime, GFCF is defined as investments made on assets with long-term returns. In this model, I analyse the determinants of fixed investment in India. The other variables in the model are the change in the value of output, profit and prime lending rate of major commercial banks. The analysis covers a period of 18 years, from 2000 to 2018. The inclusion of variables like change in the value of output and profit validates whether the theories of investment behaviour can be validated in the Indian scenario, especially the accelerator theory of investment and profit theory of investment. Unlike the previous studies, which use firm-level panel data to study the investment behaviour, this study employs a time series analysis of national-level data from 2000 to 2018. The empirical model specified to estimate the determinants of fixed investment in India is

$$\text{GFCF} = \text{f (change in output, profit, lending rate)} + U_t \quad (1)$$

But since this analysis covers a relatively long period, all the variables need to be stationary in order to avoid the complexities of autocorrelated errors. A time series with a stochastic trend may lead to spurious regression, estimating inefficient coefficient or making the usual significance tests invalid (Granger and Newbold, 1974). Usually, cointegration methods are used to overcome the problem of unit root and estimate the coefficient for the long-run relationship. Engle and Grangers (1987) and Johansen (1992) are the frequently used cointegration techniques. But they also have their own limitations. The major drawback of these methods is that they need every variable integrated at order one. To overcome these drawbacks, error correction models are used to analyse the time series model. Apart from

cointegration techniques, error correction models can also explore the short-run relationships between variables in the model. And this model doesn't want the underlying variables to be integrated at a certain order. Autoregressive Distributed Lag (ARDL) model is one such error correction model used to analyse the data in this model.

ARDL method (also known as the bound test) was developed by Pearson and Shin (1996) and Pearson *et al.* (2001). ARDL bound testing helps take care of most of the drawbacks of the earlier cointegration technique, and the ARDL method can have variables integrated at different orders in the model. And also, variables in the ARDL model can have different lag lengths, which is helpful in analysing the short-run and long-run relationship between variables.

In the model, I employ the ARDL model to analyse the long-run and short-run relationship between the GFCF, change in output, profit and lending rate. The optimal lag length of different variables is chosen using the AIC criterion. The ARDL model is ideal for this study because the ARDL model estimates the unbiased coefficients for every explanatory variable even if there are traces of endogeneity in the model. And also, the ARDL model efficiently deals with the omitted lagged variable bias (Inder,1993).

The ARDL model specification is as follows

$$\Delta \ln GFCF_t = \Sigma_{j=1}^{p} \gamma_j \Delta \ln GFCF_{t-j} + \Sigma_{j=0}^{q-1} \delta_j \Delta X_{t-j} + \phi[\ln GFCF_{t-1} - \{\beta_0 + \beta X_{t-j}\}] + \epsilon_t \quad (2)$$

Where t denotes the time period, p represents the lag length of the dependent variable, and q indicates the lag length of the independent variable. lnGFCF is the natural log of the gross fixed capital formation of the manufacturing industries in India. $\boldsymbol{X}_t$ is the vector of other explanatory variables, which includes the change in output, retained profit and the prime lending rate of major commercial banks. All the variables are in their natural logs. γ is the lag coefficient of the investment variable, and φ denotes the short-run coefficient of the explanatory variables. φ represents the speed of adjustment of the model to the long-run equilibrium. β denotes the long-run coefficient of the independent variables that vary across time.

5. RESULTS

The short-run results show that only output and profit have a short-run relation with the fixed investment. The change in output has a significant positive association with GFCF only in the first lag, Which means a one percent increase in the output in the past year can increase the fixed investment in the current year. On the other hand, profit has a significant relation with the GFCF in the current and previous years. But the sign of the coefficient is different for both years. An increase in the past year's profit will increase the current investment by 60 percent, keeping all other variables constant.

Table 2: The results for the Autoregressive Distributive Lag model

lnGFCF	*Coef.*	*Std. Err.*	*t*	*P>|t|*
	Short Run Results			
lnGFCF (Lag 1**)**	0.29	0.16	1.85	0.14
	Change in output (ln)			
Current	0.01	0.05	0.20	0.85
Lag 1	0.16	0.05	2.92	0.04
Lag2	0.08	0.05	1.79	0.15
	Profit (ln)			
Current	-0.66	0.18	-3.58	0.02
Lag1	0.61	0.24	2.56	0.06
Lag2	0.25	0.22	1.12	0.32
	Average Lending Rate (ln)			
Current	-0.17	0.16	-1.05	0.36
Lag1	0.09	0.16	0.59	0.59
Constant	4.50	0.79	5.72	0.01
Error Correction Term	-0.71	0.16	-4.57	0.01
	Long Run Results			
Change in Output (Log)	0.34	0.17	2.03	0.11
Profit (Log)	0.30	0.22	1.35	0.25
Average Lending rate (Log)	-0.10	0.22	-0.47	0.66

On the contrary, the interest rate never had a significant relationship with GFCF in the short run or in the long run. So it can be implied that the interest rate doesn't play any substantial role in the investment behaviour of a firm in the short run. This may be because investment is a long-run commitment, and firms mostly look for other factors such as general economic conditions, the firm's profitability, market power, technological adaptation etc. The short-term interest rate doesn't have much impact on a firm's investment decision. Even in the medium run, the interest rate doesn't seem to have much impact on investment decisions. This result is on par with the earlier works on interest rate transmission. Most of the results concluded that the impact of the interest rate on investment is much minimal in emerging markets because of the underdeveloped financial and capital markets.

From the results from ARDL bound, The F value is greater than the critical value; thus, a long-run relationship is sustained in this model. The long-run results of the ARDL model suggest that only the output has any relation with the fixed investments in the long run. The change in output value has a t-value greater than

2; the variable is statistically significant. An increase in one percent of the output gap will increase the gross fixed capital investments by 34 percent while keeping everything constant. The profit and interest variable has no long-run relationship with the firm's investment decision in the long run. To test the robustness of this model, I also ran a model using the dynamic ARDL model by Kripfdanz and Scheneider (2020), and the results are almost similar. And when an ARDL model excluding lending rate gives similar results, but profit and output show a significant coefficient.

Lag GFCF also doesn't have much impact on the current GFCF. This result may be because fixed investment is a long-term investment; its effects may not be seen in the short or medium- run.

Error Correction term captures the speed at which deviation from the short-run equilibrium returns to its equilibrium position. Generally, a negative and significant error correction term means a long-run causal relationship. In my model, the error correction term projects a significant negative coefficient, which means a long-term causal relationship exists between variables. The error correction coefficient can be interpreted as if there exists any disequilibrium in the short-run, the model will tend back to its long-run equilibrium level by 71 percent in the next period.

6. CONCLUSION

The manufacturing sector is one of the primary drivers of economic growth. So the determinants of manufacturing sector growth need to be carefully analysed to formulate effective policy. In this analysis, my results conclude that only output and profit have a significant relationship with the Gross Fixed Capital Formation in the short run, and only output has a positive relationship with the GFCF in the long run. While my results also showcase the lending rate's ineffectiveness in driving investments in India. In a developing country like India, where financial and capital markets are still not developed to their potential, the interest rate may not be a relevant instrument to aid economic growth. The government policies and programmes to effectively drive investment should focus more on increasing aggregate output rather than an accommodative monetary policy. The results show that neither past investments nor profits are significant determinants for future investment growth; all that matters most is output. So this analysis shows more light on the debate of growth vs investment for future investment growth. Formulating policies by changing the lending rate may not always bring positive results. The interest rate transmission channel is weak in developing countries like India. So the main emphasis for the policymakers should be to increase the aggregate demand in the economy so that the industrial output can be raised, which will help raise the general investment level of a country.

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APPENDIX

Table 3: Unit Root test Results

Augmented Dickey-Fuller Test for Unit Root				
Variable	*I(0)*		*I(1)*	
	Test Statistic	*p-value for z(t)*	*Test Statistic*	*p-value for z(t)*
lnGFCF	-1.3	0.63	-5.41	0
Change in output (ln)	-1.54	0.51	-7.01	0
Average Lending Rate (ln)	-0.94	0.77	-5.46	0
Profit (ln)	2.13	0.99	-4.12	0

Table 4: Lag-Order Selection Criteria

Lag	*LL*	*LR*	*FPE*	*AIC*	*HQIC*	*SBIC*
			lnGFCF			
0	-30.77		0.74	2.54	2.55	2.59
1	-0.75	60.02*	.07*	.22*	.25*	.38*
2	-0.66	0.19	0.08	0.29	0.33	0.44
3	-0.61	0.10	0.08	0.37	0.42	0.56
4	-0.56	0.10	0.09	0.44	0.51	0.69
			Change in output (ln)			
0	-18.69		0.69	2.46	2.46	2.51
1	-11.96	13.45*	0.34	1.75	1.75	1.84
2	-10.22	3.48	.31*	1.65*	1.66*	1.80*
3	-10.09	0.26	0.34	1.76	1.77	1.95
4	-10.09	0.02	0.39	1.89	1.90	2.13
			Profit (ln)			
0	-37.25		1.25	3.06	3.07	3.11
1	4.55	83.60	0.05	-0.20	-0.18	-0.11
2	6.71	4.31*	.04*	-.30*	-.263*	-.15*
3	6.85	0.29	0.05	-0.23	-0.17	-0.03
4	6.95	0.20	0.05	-0.16	-0.09	0.09
Average Lending Rate (ln)						
0	5.61		0.04	-0.37	-0.36	-0.32
1	19.65	28.07*	.01*	-1.41*	-1.38*	-1.31*
2	19.65	0.00	0.02	-1.33	-1.29	-1.19
3	19.81	0.32	0.02	-1.26	-1.21	-1.07
4	19.90	0.17	0.02	-1.19	-1.12	-0.95

* optimal lag