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# Profitability in India's Organized Manufacturing Sector: The Role of Technology, Distribution, and Demand

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# DEPARTMENT OF ECONOMICS

## Working Paper

**Profitability in India's Organized  
Manufacturing Sector: The Role of  
Technology, Distribution, and  
Demand**

by

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**UNIVERSITY OF MASSACHUSETTS  
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# Profitability in India's Organized Manufacturing Sector: The Role of Technology, Distribution, and Demand

Deepankar Basu<sup>1</sup> and Debarshi Das<sup>±</sup>

## Abstract

Using aggregate data from the Annual Survey of Industries, we analyze profitability in India's organized manufacturing sector from 1982-83 to 2012-13. Over the whole period of analysis, the rate of profit grew at about 1 percent per annum, primarily driven by a rising share of profits. We use structural break tests to identify medium and short run regimes. We find two medium run regimes, one of declining profitability (1982-83 to 2001-02), and another of growing profitability (2001-02 to 2012-13). We find six short run regimes, of which only two are periods of rising profitability, 1987-88 to 1996-97, and 2001-02 to 2007-08. All other short run periods have witnessed declining profitability. Profit rate decomposition analysis shows that both in the medium and short run, technological factors have been the most important determinants of changes in profitability.

**Keywords:** organized manufacturing; India; profitability; technology and distribution

**JEL Codes:** B51; E11.

## 1. Introduction

Right from their inception, theories of economic growth have established a direct, proportional link between the rate of profit and the long run equilibrium growth rate of output. This goes back as far as Ricardo and has been reiterated by later theorists like von Neumann, Harrod, Kaldor and even those belonging to the neo-classical tradition. To avoid problems arising from both oversupply and scarcity of labour, the growth rate of output must be equal to the growth rate of labour supply (in terms of physical units and productivity). If all savings are invested, this will immediately establish a proportional relation

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between rate of profit and the long run rate of growth of the capital stock, as long as the savings propensity is fixed.

For Marx, a crisis comes about when the labour absorption rate, which is the growth rate of the economy, is higher than the growth of labour supply. The excess of the growth of labour demand over labour supply eats into the reserve army of labour. The result is rising wage rates and falling profit rates, which jeopardises accumulation of capital. On the other hand, Kaldor (1961) argued that such a situation of labour scarcity might bring down the profit rate, but this is hardly a crisis. Declining profit rate effected by the rising wage rate would bring about a change in the distribution of income between wages and profits, and that is exactly what is needed to get the economy back onto a new long run equilibrium path. A new steady state would be established after the profit rate declines sufficiently and rate of growth, which is a fraction of rate of profit, becomes equal to the growth of labour supply. Thus, after a transition, which is swift with fixed coefficient production but gradual in a neo-classical model with infinite substitution possibilities between labour and capital, the economy would settle down to a steady state where the growth rate of output is low and this rate is equal to the growth rate of labour.<sup>1</sup>

The upshot is that the rate of profit and the distribution of income (between profits and wages) play vital roles in the determination of growth. While the long run steady state growth rate is proportional to the rate of profit, changes in distributional shares can help the system move towards the steady state if it is off course.

At an operational level, since it is plausible to suggest that firms are, among other things, motivated by the desire and need to make profits, the rate of profit naturally enters as an important determinant of the investment decision. As investment leads to growth of output through accumulation

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<sup>1</sup> What would happen if the new steady state rate happens to be lower than what Kaldor calls 'minimum necessary compensation to the capitalists'? Kaldor's answer is less than convincing here. It is not clear why in such a case growth will take place in periodic spurts as he claimed.

of capital, the rate of profit has a positive effect on the rate of growth *ceteris paribus*. It also affects accumulation through another channel. A high profit rate leads to higher flow of profit income (in proportion to capital invested) and eases liquidity constraints. In the presence of credit market imperfections, this has a positive impact on the ability of the firms to undertake future investments.

The simple positive relationship between the rate of profit and the rate of growth seems to be borne out by data from India's organised manufacturing sector. Figure 1 is a scatter plot of the annual rate of profit (x-axis) and the annual rate of growth of net value added (y-axis) in India's organised manufacturing sector between 1982-83 and 2012-13. Figure 1 also includes the regression line obtained by regressing the growth rate on the profit rate and a constant (estimated with OLS). This simple bivariate regression shows that the rate of profit and the rate of growth of net value added were positively correlated with each other over the 3-decade period, 1982-83 to 2012-13, in India's organised manufacturing sector.

[Figure 1 about here]

It seems natural therefore that research analysing growth would give primacy to the profit rate. However this is seldom the case in the neoclassical growth literature.<sup>2</sup> The heterodox tradition has been more alive to the importance of profitability (Glyn and Sutcliffe, 1972; Body and Crotty, 1975; Weisskopf, 1979; Shaikh, 1987; Moseley, 1991; Duménil and Lévy, 1993; Basu and Vasudevan, 2013). By according the rate of profit an important role in determining the trajectory of capital accumulation and

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<sup>2</sup> For example, the exhaustive survey article by Kotwal et al. (2011) discusses different hypotheses that could explain changing economic growth in recent decades in India. One hypothesis is that import of new capital equipment in a liberalised economy pushed up productivity and growth. Another hypothesis is that reallocation of factors in an efficient way due to heightened competition, which is attributed to liberalization, enhanced the growth rate. It is worth noting that none of these mechanisms would work without healthy profitability. However, profitability does not enter the discussion at all.

through an examination of the determinants of changes in the profit rate, this body of research has made important contributions towards understanding advanced capitalist economies.

Similar studies for developing economies are hard to come by.<sup>3</sup> This is not surprising because capitalism, as a mode of production, has not developed fully in such countries. A large part of the workforce is engaged in the agricultural sector where family labour-based, petty production dominates.<sup>4</sup> In the industrial sector an overwhelming number of firms belong to the unorganized sector. They are small in size and depend on family labour. In India, in 2000-01, for example, unorganized sector accounted for nearly 86 percent of the total manufacturing sector workforce (Marjit and Kar, 2009).<sup>5</sup>

Although capitalism has not developed fully, the size of the capitalist sector is by no means negligible in big economies like India. In 2012-13, the organised manufacturing sector, a subset of the capitalist sector in India, had 222,120 factories employing 10 million workers. In the same year, it produced a net value added of 8602 billion Indian rupees (about 139 billion US dollar) that accounted for about 10 percent of Indian GDP. This is perhaps the reason why studies have appeared from time to time probing the profitability of the organised manufacturing sector in India. Sau (1989) took a subset of the total organised manufacturing sector with data running from 1969 to 1986 and found a non-declining trend of profit rate, which is at variance with the profit rate trend in the advanced capitalist economies till mid-seventies. Sau (1989) attributes this to the ability of the bourgeoisie to reduce the share of labour in national income. In a more recent contribution, Felipe and Kumar (2010) find a mild decline in the profit rate from 1980 to 2001, and a rise thereafter.

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<sup>3</sup> Sau (1989) and Marquetti, Filho, and Lautert (2010) are exceptions in this regard. The former studies profitability trends in a subset of India's organized manufacturing sector and the latter examines the changing trends of profit rate for the whole Brazilian economy.

<sup>4</sup> See Basu and Das (2013) for an analytical exposition.

<sup>5</sup> The unorganised sector comprises of two types of firms: (a) those using power and employing less than 10 workers, and (b) those not using power and employing less than 20 workers.

Both of the above studies were motivated by a Marxist theoretical framework. There are other papers which do not work within such a framework but which have, nonetheless, offered analyses that are useful from a Marxist perspective. In their study of organized manufacturing in India, Balakrishnan and Babu (2003) attribute the acceleration of growth after 1991 – the beginning of neoliberal reforms – to the rise in investment (as a share of output). Higher investments was, in turn, driven partly by higher animal spirits (due to policy changes) and higher profitability.

The focus of Kannan and Raveendran (2009) is a little different: employment generation in the organised manufacturing sector. For the quarter century from 1981-82 to 2004-05, as well as the pre and post reform sub-periods separated by the year 1991-92, they find evidence of “jobless growth” that is caused by rising capital intensity at the expense of employment growth. The resulting growth in labour productivity is largely captured by capital, so that labour loses both in terms of employment and an adverse movement of distribution.

This paper analyses profitability trends in India’s organised manufacturing sector over the last 3 decades. We contribute to two sets of literature – the Marxist literature on profitability analysis and the Indian literature on growth & distribution – in several ways. First, we calculate consistent time series of the replacement cost capital stock and the corresponding rate of profit in India’s organized manufacturing sector from 1982-83 to 2012-13. In calculating the rate of profit, we pay close attention to the difference between productive and unproductive labour, an important issue in the Marxist literature. Second, we use our preferred measure of the rate of profit for carrying out a decomposition analysis to understand the underlying drivers of profitability in terms of three distinct factors: technology, distribution and aggregate demand. Our decomposition analysis adds to the existing literature by combining short and medium run perspectives. Interestingly, we find that the most important driver of profitability change with the time frame of analysis. Third, we use an objective

statistical methodology – the recently developed techniques to study multiple structural breaks in macroeconomic time series – to identify breaks in the trajectory of the profit rate over time.

We find that over the entire medium run period from 1982-83 to 2012-13, the rate of profit has a positive trend growth, and that the rising share of profit income seems to be the principal reason behind this. The thirty years period can be broken down into shorter periods depending on changes in the trend of the profit rate. Applying an appropriate “structural break” test, we identify six short run regimes, and complement it with visual inspection to choose two medium run regimes. The medium run regime from 1982-83 to 2001-02 is a period of declining profitability; the second medium run regime from 2001-02 to 2012-13 witnesses rising profitability. For short run regimes, our decomposition analysis shows that in four of the six periods, changes in technology (captured by the full capacity output-capital ratio), rather than distribution (captured by the profit share), had the greatest effect on changes in the profit rate. We do not find changes in aggregate demand (captured by the capacity utilization rate) to be an important driver of profitability in any of these six short run periods.

The rest of the paper is organized as follows. In section 2, we discuss trends in profitability in India’s organized manufacturing sector to motivate the analysis in this paper. In section 3, we outline the methodology of profit rate decomposition, our main analytical framework. In section 4, we present results of profit rate decomposition from a short and medium run perspectives. The last section concludes the paper with some thoughts about future research. Details of data sources and construction of variables in collected in an appendix.



## 2. Trend of Profitability

### 2.1. Measure of the Rate of Profit

In this section we study the trend in the rate of profit,  $R$ , defined as

$$R = \frac{\Pi}{K} \quad (1)$$

where  $\Pi$  is the flow of profit income over an year, and  $K$  is the replacement (current) cost stock of fixed capital at the beginning of the year. To analyse profitability trends in India's organised manufacturing sector, we look at three different measures of the flow of profit income. The broadest measure of profit flow is the difference between net value added and the compensation (wages and benefits) of workers,  $\Pi_1$ . A narrower measure of profit flow removes the compensation of unproductive labour (supervisors & managers) from  $\Pi_1$  to get  $\Pi_2$ . The narrowest measure removes interest and rent payments from  $\Pi_2$  to arrive at  $\Pi_3$ .<sup>6</sup>

The first measure,  $\Pi_1$ , is our preferred measure because it comes closest to approximating the classical-Marxist definition of the rate of profit as the ratio of the surplus value and the stock of capital. Consistent with a Marxist understanding, according to the first measure, surplus value includes compensation of unproductive labour (supervisors & managers), rent & interest payments, and profit of enterprise (that part of surplus value which remains with capital enterprises after paying rent and interest to rentiers).

[Figure 2 about here]

While most of the analysis in this paper works with the first measure, we plot time series of all the three measures in Figure 2. Since other researchers have often used  $\Pi_2$  or  $\Pi_3$  in their analysis,

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<sup>6</sup> Details of data sources and construction of variables are available in the appendix.

Figure 2 will help in comparison with existing results (Sau, 1989; Balakrishnan and Babu, 2003).

Interestingly, all the three profit rates display very similar trends over this 3-decade period. Hence, our analysis of profitability trends is robust to these different measures of the rate of profit. But since the first measure is our preferred measure for theoretical reasons, we will use it for analysis and discussions in the rest of the paper.

## 2.2. Identifying Structural Breaks

Visual inspection of the time series plot in Figure 2 shows that the rate of profit has fluctuated over the past three decades, where periods of declining (or stagnant) profitability have alternated with periods of growth in the rate of profit. While visual inspection can provide us some rough idea of such turning points, it leaves lot of room for error. Hence, we use the methodology of dating structural breaks from the econometrics literature to identify them precisely (Bai and Perron, 2003).

The basic idea behind this methodology is straightforward. Consider the regression of the logarithm of the profit rate on a constant and a linear time trend

$$\log(R_t) = a + bt + u_t \quad (2)$$

with  $t = 1, 2, \dots, T$ . The estimate of  $b$  is the average exponential growth rate of the profit rate over the period in question. Suppose that there are an unknown number  $m$  of breakpoints  $T_1, T_2, \dots, T_m$ , over the sample period, so that there are  $(m + 1)$  segments over which the regression in (2) can be estimated separately. Let  $RSS_j$  denote the residual sum of squares for the regression over the  $j$ -th segment, and let their sum be denoted as

$$RSS(T_1, T_2, \dots, T_m) = \sum_{j=1}^{m+1} RSS_j \quad (3)$$

The problem of dating structural breaks is to find the breakpoints  $\widehat{T}_1, \widehat{T}_2, \dots, \widehat{T}_m$  that minimize the sum in (3) over all possible partitions of the sample period  $t = 1, 2, \dots, T$ . An algorithm to carry out this task was suggested by Bai and Perron (2003) and has been implemented in the R-package “strucchange” (Zeileis, et al, 2003). We use this for the analysis in this paper.

[Table 1 about here]

Results from the dating of structural breaks are reported in Table 1. Since the underlying regression is the model in (2), the results in Table 1 report structural breaks in the exponential growth rate of the rate of profit. From the results in Table 1, we extract break dates for both short and medium run analyses. Our short run break dates come from value of  $m$  that minimizes the sum in (3) without imposing any restrictions. From the results in Table 1 we see that the residual sum of squares (RSS) and the Bayesian information criterion (BIC) are both minimized at  $m = 5$ . The corresponding break dates are 1986-87, 1990-91, 1995-96, 2001-02, and 2005-06. We use these break dates for the short run analysis of profitability.

Break dates for our medium run analysis comes from juxtaposition of visual inspection and break dates obtained above. Visual inspection of Figure 2 suggests that from a medium run perspective, profitability in India’s organized manufacturing sector ( $R_1 = \Pi_1/K$ ) shows two broad regimes: the first from the early 1980s to the early 2000s, when profitability was on a downward trend; and the second from the early 2000s to the current period, when profitability soared. Note that 2001-02 is the break date closest to our intuitive idea of a break in the early 2000s. Thus, the combination of visual inspection and more formal structural break analysis suggests that we can choose 2001-02 as the break date for a medium run analysis.

### 2.3. Broad Trends

Over the whole period of our analysis, 1982-83 to 2012-13, the rate of profit increased at about 1 percent per annum in India's organized manufacturing sector. This three decade period can be broken up into two very different medium run regimes of profitability. The first period from 1982-83 to 2001-02 was a period of declining profitability. The rate of profit fell from 31.3 per cent in 1982-83 to 16.99 per cent in 2001-02. The average exponential rate of growth over this period was -1.30 percent per annum.<sup>7</sup> The period since then, from 2001-02 to 2012-13, has seen a strong reversal of this trend. The rate of profit increased from 16.99 percent in 2001-02 to 32.69 percent in 2012-13. Thus, over this decade long period, the rate of profit has increased at the rate of 5.56 percent per annum.

These medium run periods have, in turn, very different shorter sub-periods. For instance, we can break up the roughly 2-decade period of declining profitability from the early 1980s to the early 2000s into 4 shorter sub-periods: 1982-83 to 1986-87, 1986-87 to 1990-91, 1990-91 to 1995-96, and 1995-96 to 2001-02. In the first period, the rate of profit declined at -8.67 percent per annum; in the second and third period it increased at 1.18 and 4.47 percent per annum, respectively; and in the fourth period, it declined at -8.8 percent per annum. Thus, other than the decade long period of high positive growth from the mid-1980s to the mid-1990s, the 2-decade period from 1982-83 to 2001-02 saw the rate of profit falling in India's organized manufacturing sector.

The medium run period of positive profit growth, period from the early 2000s onwards, can also be broken up into two shorter sub-periods. The first short period runs for 4 years from 2001-02 to 2005-06 and witnessed rapid growth in the profit rate at 15.54 percent per annum. The next 7 years, from

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<sup>7</sup> For any variable, we calculate the growth rate over a period by regressing the logarithm of the variable on a constant and a time trend (estimated by OLS). The coefficient on the time trend is the estimate of the average annual exponential growth rate.

2005-06 to 2012-13 witnessed relative stagnation, with the rate of profit growing at 0.60 per cent per annum.

To summarize the trends about profitability in India's organized manufacturing sector depicted in Figure 2, we note that the period since 1982-83 has witnessed two very different medium run periods. In the first regime, running from early 1980s to the early 2000s, there was an overall downward trend in the rate of profit other than from the mid-1980s to the mid-1990s. The second regime, running from 2001-02 to 2012-13, is one of increasing profitability, with most of the increase concentrated in a 4-year period in the early 2000s. To analyze these divergent empirical trends, we will use an analytical framework organized around profit rate decomposition. We explain this in the next section.

### 3. Profit Rate Decomposition

To understand the underlying drivers of profitability, we will adopt two different time frames. The first will be a long and medium run perspective, where we will abstract from considerations of aggregate demand. This approach has been used to study long run capitalist evolution as also episodes of crises under capitalism (Duménil, *et al.*, 1984; Duménil *et al.* 1985; Michl, 1988; Duménil and Lévy, 1993; Foley and Michl, 1999; Marquetti, *et al.*, 2010; Basu and Vasudevan, 2013). The second will be a short run perspective, where we will allow for the effects of aggregate demand on the rate of profit. Following the pioneering work of Weisskopf (1979), many scholars have used and extended this approach for studying short run capitalist dynamics (e.g., Bakir and Campbell, 2009; Kotz, 2009; Izquierdo, 2013).

#### 3.1. Decomposition from a Medium Run Perspective

To study the drivers of profitability from a medium run perspective, the rate of profit is decomposed into the product of two factors, the share of profit and the output-capital ratio, i.e.,

$$R \equiv \frac{\Pi}{K} = \left(\frac{\Pi}{Y}\right) \times \left(\frac{Y}{K}\right) \quad (4)$$

where  $R$  is the rate of profit,  $\Pi$  is total profits,  $K$  is the stock of fixed capital, and  $Y$  is value added. In decomposition in (4), the profit share,  $\Pi/Y$ , captures the struggle between labour and capital over the distribution of value added, and technology is represented by the output-capital ratio,  $Y/K$ .

To analyze the dynamics of distribution, the profit share is further decomposed as follows:

$$\frac{\Pi}{Y} = \frac{Y-W}{Y} = 1 - \frac{W}{Y} = 1 - \frac{w_r}{y_r} \times \frac{P_w}{P_y} = 1 - \frac{w_r \lambda_{wy}}{y_r} \quad (5)$$

where  $W$  is the total wage bill,  $w_r = W/(L * P_w)$  is the real wage,  $y_r = Y/(L * P_y)$  is the real labour productivity, and  $\lambda_{wy} = P_w/P_y$  is the ratio of the price index of wage goods (we use the consumer price index for industrial workers) and the price index of output (we use the wholesale price index for manufactured products).

It is worth distinguishing between the real wage rate,  $w_r$ , and the product wage rate,  $w_p = w_r \times \lambda_{wy}$ . The real wage rate captures the real purchasing power of the money wage rate and is relevant to analysing the living standard of workers. On the other hand, the product wage rate can be thought of as a measure of the relative bargaining power of capital and labour in an oligopolistic setting. The profit share rises whenever real productivity ( $y_r$ ) grows at a faster rate than the product wage rate, reflecting changes in the mark-up that firms can set on unit costs.

To analyse technical change by disentangling real factors and changes in relative prices, the output-capital ratio is decomposed as

$$\frac{Y}{K} = \frac{Y_r P_y}{K_r P_k} = \frac{y_r}{k_r \lambda_{ky}} \quad (6)$$

where  $y_r = Y_r/L$  is real labour productivity,  $k_r = K_r/L$  is real capital stock per unit of labour, and  $\lambda_{ky} = P_k/P_y$  is the ratio of an price index of capital stock (we use the wholesale price index for machines & machinery) and output.

Our main interest is not in the levels of these variables but in their changes over time. Moreover, we would like to investigate the contribution of different drivers to changes in the rate of profit and its two components, the profit share and the output-capital ratio.

For any variable  $x$ , let

$$\hat{x} = \frac{d}{dt} \log(x) = \frac{1}{x} \frac{dx}{dt} \quad (7)$$

denote its growth rate. Then, logarithmic differentiation of (4) shows that the growth of the profit rate is the sum of the growth rates of the profit share and the output-capital ratio

$$\hat{R} = \frac{\hat{\Pi}}{Y} + \frac{\hat{Y}}{K}. \quad (8)$$

Logarithmic differentiation of (3) gives

$$\frac{\hat{\Pi}}{Y} = \frac{W}{\Pi} \times (\hat{y}_r - \widehat{\lambda_{wy}} - \widehat{w}_r) \quad (9)$$

and logarithmic differentiation of (4) gives

$$\frac{\hat{Y}}{K} = \hat{y}_r - \widehat{k}_r - \widehat{\lambda_{ky}} \quad (10)$$

Using (8), (9), and (10), we can study the contribution of different factors to the growth rate of the rate of profit over relevant medium run periods. Thus, the final equation capturing decomposition analysis from a medium run perspective is given by

$$\hat{R} = \frac{W}{\Pi} \times (\hat{y}_r - \widehat{\lambda_{wy}} - \widehat{w}_r) + (\hat{y}_r - \widehat{k}_r - \widehat{\lambda_{ky}}) \quad (11)$$

### 3.2. Decomposition from a Short Run Perspective

This literature on profit rate decomposition from a short run perspective goes back to at least Weisskopf (1979). The key difference from the medium run perspective is to incorporate the role of aggregate demand. Thus, in addition to technology and distribution, the short run decomposition uses a third term to capture demand problems: the capacity utilization rate. Letting  $Z$  refers to capacity output, the three-term decomposition can be written as

$$R \equiv \frac{\Pi}{K} = \left(\frac{\Pi}{Y}\right) \times \left(\frac{Y}{Z}\right) \times \left(\frac{Z}{K}\right) \quad (12)$$

where the first term on the right  $\Pi/Y$  is the profit share, the second term  $Y/Z$  is the capacity utilization rate, and the last term  $Z/K$  is the capacity-capital ratio.

Much as in the medium run analysis, each of the term in the decomposition is further broken into its real and price components for further detailed study. The profit share is decomposed using (5), exactly in the same way as in the medium run analysis. The capacity utilization ratio is not decomposed further, and the capacity-capital ratio is decomposed as

$$\frac{Z}{K} = \frac{Z_r P_y}{K_r P_k} = \frac{z_r}{k_r \lambda_{ky}} \quad (13)$$

where  $z_r = Z_r/L$  is real labour productivity,  $k_r = K_r/L$  is real capital stock per unit of labour, and  $\lambda_{ky} = P_k/P_y$  is the ratio of an price index of capital stock and output.

To analyze growth rates, we use logarithmic differentiation of (12) to decompose the growth of the profit rate as the sum of the growth rates of the profit share, capacity utilization rate and the capacity-capital ratio

$$\hat{R} = \frac{\hat{\Pi}}{Y} + \frac{\hat{Y}}{Z} + \frac{\hat{Z}}{K}. \quad (14)$$



where we know from (9) that

$$\frac{\hat{\Pi}}{Y} = \frac{W}{\Pi} \times (\hat{y}_r - \hat{\lambda}_{wy} - \hat{w}_r)$$

and logarithmic differentiation of (13) gives

$$\frac{\hat{Z}}{K} = \hat{z}_r - \hat{k}_r - \hat{\lambda}_{ky} \quad (15)$$

Using (9), (14), and (15), we can study the contribution of different factors to the growth rate of the rate of profit over relevant short run periods. The final equation for our short run decomposition analysis is given by

$$\hat{R} = \frac{W}{\Pi} \times (\hat{y}_r - \hat{\lambda}_{wy} - \hat{w}_r) + \frac{\hat{Y}}{Z} + (\hat{z}_r - \hat{k}_r - \hat{\lambda}_{ky}) \quad (16)$$

## 4. Results

### 4.1. The Long Run Story

Results of the profit rate decomposition analysis for the organized manufacturing sector in India is collected in Table 2 and 3, the first for the medium run and the second for the short run analysis. Before we look at those results, let us look at the evolution of the rate of profit over the whole period, 1982-83 to 2012-13. The last row of Table 2 shows that over this period, the rate of profit increased slowly at 0.96 percent per annum. Looking at the two components of the rate of profit, we see that the positive growth rate of the rate of profit was entirely driven by the growth in the share of profit, which grew by

1.15 percent per annum over this period.<sup>8</sup> The other component, the output-capital ratio, declined at 0.19 percent per annum. Thus, over the long run period from 1982-83 to 2012-13, profitability in India's organized manufacturing sector has been kept up by a regressive re-distribution of income away from productive labour. India's organized manufacturing sector has not displayed much technological dynamism: the output-capital ratio has, in fact, *declined* over this three decade period.

[Table 2 about here]

What accounts for the rise in the share of profit income? Columns 4 through 7 in the last row of Table 2 shows that over this three decade period, real labour productivity has increased at an impressive rate of 5.81 percent per annum. In contrast, the product wage rate (the sum of columns 6 and 7) has increased at only 2.01 percent per annum. Thus, it seems that firms have been able to increase their mark-up to capture an increasing part of productivity growth. This close to 3-fold difference in the rates of growth of productivity and the product wage rate accounts for the regressive re-distribution of income away from productive labour in India's organized manufacturing sector since the early 1980s.

Two further issues should be noted. First, the average annual increase in the product wage rate, even if less than half that of real productivity, was substantial by itself. But this did not lead to a robust increase in the real wage rate because of adverse movement of relative prices. The consumer price index for industrial workers increased much faster than the wholesale price index for manufactured products (the ratio of the two grew at 1.63 percent per annum). Thus, an average annual growth rate of 2.01 percent in the product wage rate gave only a mild growth rate of 0.38 per cent per annum of the real wage rate.<sup>9</sup> Thus, workers lost not only in terms of the wage share but also in terms of the

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<sup>8</sup> Note that what we are calling the "share of profit" is really the "share of surplus value", where surplus value is the difference between value added and the compensation of productive labour. Thus, what we are calling the share of profit includes not only profit of enterprise but also other forms in which surplus value is redistributed: compensation of unproductive labour, interest, rent, dividend, taxes.

<sup>9</sup> Balakrishnan and Babu (2003) also report this seemingly paradoxical finding: robust growth in the product wage rate but tepid growth of the real wage rate.

purchasing power of their wage. Second, turning to column 9 in the last row of Table 2, we see that the reason for the growth of labour productivity has been capital deepening. The real capital-labour ratio has increased at 6.65 percent per annum.

Thus, the long run dynamics in India's organized manufacturing seems to be a trend of rapid capital deepening leading to rising labour productivity, with the lion's share of productivity growth appropriated as surplus value. There is some evidence of technological stagnation, in terms of a mild fall in the output capital ratio. Taken together, this means that the regressive income redistribution and not technological progress has kept profitability rising over the long run in India's manufacturing sector. Of course, the long run trend hides interesting medium and short run changes. To these we turn next.

#### 4.2. Medium Run Decomposition

Visual inspection and structural break tests suggested that the profitability trend witnessed a break in 2001-02, giving us two medium run periods: 1982-83 to 2001-02 and the years since 2001-02. Results of the medium run decomposition analysis using these two periods are collected together in the first two rows of Table 2. A visual representation of the medium run decomposition is given in Figure 3.

[Figure 3 about here]

The two periods display opposite profitability movements. In the first period from 1982-83 to 2001-02, the rate of profit declined at -1.30 percent per annum; in the next period, 2001-02 to 2012-13, the rate of profit increased at an impressive 5.56 percent per annum. What accounts for the difference between the two periods? Colum 2 shows that the profit share increased over both periods. Hence, the difference comes from movements in the output-capital ratio, as highlighted by entries in column 3.

In the first period, the share of profit increased at 1.35 percent per annum but the output-capital ratio declined at -2.65 percent per annum. Hence, technological problems swamped regressive income distribution and resulted in an overall declining trend in the rate of profit between 1982-83 and 2001-02. In the second period, the profit share increased much more slowly at 0.90 percent per annum, but the output-capital ratio increased at 4.66 per cent per annum. Thus, a mildly regressive income distribution and a significantly progressive regime of technological change boosted profitability between 2001-02 and 2012-13.

We can use entries in columns 4 through 7 to investigate movements in distribution over the two medium run periods. In the first period, real productivity and the product wage rate increased by 5.87 and 2.38 per cent per annum respectively; in the second period, the corresponding growth rates were 6.50 and 2.32 percent per annum. Thus, the difference between the two growth rates widened as we moved from the first to the second period. This suggests that compared to the first period, labour's bargaining power declined in the second period: capital was able to appropriate a larger share of productivity growth by increasing its mark-up.

Naturally, this worsening in the relative position of labour vis-à-vis capital in the organized manufacturing sector in the years since 2001-02 would have muted real wage growth. This effect was compounded by a rather strong movement in relative prices. Between 2001-02 and 2012-13, the ratio of the consumer price index for industrial workers (CPIIW) and the wholesale price index for manufactured products (WPIMFG) grew at 2.29 per cent per annum, reducing real wage growth to a meagre 0.03 percent per annum. This is not surprising because the 2000s have been a period of rapid increase in food prices – in India and globally – and this, in addition to declining relative bargaining power of labour, has contributed to squeezing real wages.

To understand the patterns of technological change over these medium run periods, we can turn to entries in column 3 and columns 8 through 10. Following Foley and Michl (1999), the pattern of technological change in the first period can be characterised as Marx-biased: labour productivity increased but the output-capital ratio declined. The corresponding entries in columns 8 through 10 show that this was a period of rapid capital deepening (the real capital-labour ratio increased at 9.08 percent per annum) and a fall in the price of machines relative to manufactured products (the relative price of machines declined at 0.56 percent per annum). But the growth of real productivity, at 5.87 percent per annum, was not strong enough. Replacing workers with machines, despite machines becoming relative cheaper, turned out to be costly for the profitability of firms. This is because each unit of capital produced a much lower amount of output.

The second period is very different in terms of the regime of technological change. Even though the real capital-labour ratio grew at a much slower rate at 2.73 per cent per annum, it managed to ensure a higher growth rate in labour productivity (at 6.50 per cent per annum) that made the replacement of workers by machines beneficial for firms' profitability. They were also aided in this by the relative cheapening of machines, the ratio of the price of machines to manufactured products falling at close to -1 per cent per annum. Therefore, it seems that from the early 2000s the organized manufacturing sector in India has managed to generate technological dynamism and shake off the hold of Marx-biased technical change.

But before we can make that assertion with any amount of confidence, we need to turn to a short run decomposition analysis. This is because the medium run dynamics highlighted above might very well hide important shorter run variations.

[Figure 4 about here]

### 4.3. Short Run Decomposition

Results of the short run decomposition analysis are present in Table 3. Structural break analysis, results for which are reported in Table 1, had given us 6 distinct profitability regimes, and Table 3 shows profit rate decomposition for each of these periods. A visual representation of the short run decomposition is given in Figure 4.

[Table 3 about here]

We have seen above that the period from 1982-83 to 2001-02 is a medium run periods marked by declining profitability. From Table 3, we see a finer grained story for this period. The whole 2-decade period is composed of two 5-years periods, at both ends, of large declines in the rate of profit. In between is a decade long period of rising profitability, with the first 5 years of the 1990s being notable in this respect. In a similar vein, the medium run decomposition analysis had shown the period from 2001-02 to 2012-13 to be a period of robust profit rate increase. Table 3 shows that rapid profit rate increase is confined to the first 5 years of the 2000s. The period since 2005-06 is marked by stagnation in the rate of profit.

Entries in columns 2 through 4 show us the decomposition of the growth rate of the rate of profit into distribution (growth rate of profit share), aggregate demand (growth rate of capacity utilization) and technology (growth rate of capacity-capital ratio). For 4 of the 6 periods, the movement in the rate of profit is largely driven by changes, both magnitude and direction, in the capacity-capital ratio. The exception to this pattern are the periods 1986-90 and 1990-95. In the first of these, movement in the profit share is the dominant factor, and in the second both profit share and capacity utilization play almost equally important roles. Thus, columns 2 through 4 suggest that in India's organized manufacturing sector, short run fluctuations in profitability are impacted most by technology (captured by the capacity-capital ratio) and least by fluctuations in aggregate demand (captured by

movements in the capacity utilization), with distribution (measured by the profit share) operating somewhere between these two extremes.

The truly exceptional period that stands out from Table 3 is the early part of the 2000s, when the rate of profit grew by a phenomenal 15.54 percent per annum. Close to 70 percent of this growth rate is accounted for by rapid growth in the capacity-capital ratio at 10.72 per cent per annum. The favourable technological regime was bolstered by a confluence of regressive distribution (the profit share increased at 2.94 percent per annum) and positive aggregate demand (the capacity utilization rate increased at 1.87 per cent per annum). Even though a similar period is also observed in the early 1990s, the magnitude of growth is much lower.

The recognition of the period 2001-02 to 2005-06 allows us to answer the question we posed at the end of the previous sub-section: has India's organized manufacturing sector discovered technological dynamism and robust profitability since the early 2000s? The answer must be an emphatic no. Only the first half of the period since the early 2000s is exceptional; in fact, profitability has stagnated since 2005-06. More importantly, technological dynamism was also short lived: the growth rate of the capacity-capital ratio has collapsed below 1 percent per annum after 2005-06. But even this positive growth in the capacity-capital ratio is misleading, because it is driven by relative price movements and not by real technological change.

To see this, let us turn to data presented in columns 9 and 10 in Table 3. Column 9 shows that the *only* short run period when the real capacity-capital ratio witnessed a positive growth rate was the early 2000s, 2001-02 to 2005-06. In every other period, the real capacity-capital ratio declined. The latter half of the 2000s is no different because the growth rate of real capacity-capital ratio from 2005-06 to 2012-13 was -0.96 percent per annum. Thus, the positive growth rate of the capacity-capital ratio seen in column 3 is driven entirely by a favourable movement in the relative price of capital. As shown in

column 10, the second half of the 2000s saw the ratio of price of capital and the price of manufactured products decline by -1.68 percent per annum.<sup>10</sup>

Turning to the question of distribution, we see that the profit share has increased robustly for three of the six periods: 1986-90, 1990-95, and 2001-05. For the three periods - 1982-86, 1995-01, and 2005-12 - the profit share declined, but the magnitudes of decline were much lower than the magnitude of increases in the other three periods. For the periods of positive profit share growth, the growth rate of real productivity far outpaced the growth rate of the product wage rate. It is interesting to note that such periods also witnessed positive aggregate demand shocks (refer to column 3). On the other hand, for periods of negative profit share growth, the growth rate of the product wage rate only shot up over the growth rate of real productivity by a small magnitude. Therefore, it seems that firms are able to aggressively increase their mark-up during periods of positive aggregate demand growth and appropriate bulk of the productivity growth. On the other hand, periods marked by deficiency of aggregate demand did not see this pattern.

The relative movement of productivity and product wage does not correlate with movements in the real wage rate. This is because of independent, and often offsetting, movement of the relative price of wage goods and the product price. Column 6 shows an interesting pattern: real wage rate has witnessed positive growth other than during a decade long period from the mid-1990s to the mid-2000s. To understand these divergent movements in the real wage rate recall that the growth rate of the real wage rate is the difference of the growth rate of the product wage and the growth rate of the relative price of wage goods.

Among the two periods of negative real wage growth, there is a key difference. For the period 1995-96 to 2001-02, the product wage rate increased by 1.50 percent per annum and the relative price

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<sup>10</sup> An exactly similar analysis is applicable to the early 1990s.



of wage goods increased by 3.63 per cent per annum. Thus, the positive impact of product wage growth was swamped by the increase in the relative price of wage goods, leading to a fall in the real wage rate. For the next period, 2001-02 to 2005-06, the story is different. The product wage rate fell by -2.09 per cent per annum and the relative price of wage goods also fell by -0.56 per cent per annum. Thus, in this period, the positive impact of wage goods becoming relatively cheaper was swamped by the negative impact of a fall in the product wage rate, leading to a fall in the real wage rate. It is worth noting that the early 2000s is exceptional not only in terms of technological dynamism, which we have seen earlier, but also in terms of the relative weakening of the bargaining power of labour. The only short run period during which the product wage rate declined is between 2001-02 and 2005-06 (even though this was the period of the most rapid growth of real labour productivity).

Among the other four short run periods there are two different patterns. The first and last periods, which witnessed positive real wage growth, share the common pattern that the growth of the product wage was in excess of the growth of the relative price of wage goods. This ensured positive growth in real wages. On the other hand, the two short run regimes that cover the decade-long period from the mid-1980s to the mid-1990s, share a different pattern. Positive product wage growth and a fall in the relative price of wage goods combined to ensure positive growth of real wages.

Finally, there are three periods, 1982-83 to 1986-87, 1995-96 to 2001-02 and 2005-06 to 2012-13, when the wage share rose. These periods also saw a decline or stagnation of the profit rate. A comparison of columns 5 and 6 show that in each of these periods, real wage growth trailed behind growth in real productivity.<sup>11</sup> Therefore, following Weisskopf (1979), one can rule out these periods as one in which labour is “on the offensive”. The rise of the wage share was driven by a rise in the ratio of the consumer price index vis-à-vis manufacturing price index (column 7). Therefore, labour’s victory

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<sup>11</sup> Each of the six short run periods has witnessed real productivity growing faster than real wages. Thus, labour has been constantly on the “defensive” over the last 3 decades in India’s organized manufacturing sector.

over the division of value added was a “defensive” one.<sup>12</sup> This is not surprising. In a labour surplus country like India a rise in wage share can scarcely be attributed to the ability of labours to exact higher rise in real wage rate compared to labour productivity growth. The rise, when it comes about, is because the relative price of wage goods rise vis-à-vis the price of what they produce.

## 5. Conclusion

Growth in capitalist economies are intimately related to profitability. This is because capitalist firms, to a large extent, are motivated by the need and desire to make profits. Even though capitalist relations of production have not fully taken root in the Indian economy – large parts of the countryside remain dominated by the logic of simple commodity production – the organized manufacturing sector is, by all accounts, a capitalist enclave. This means that growth in this sector will be linked to, albeit in complex ways, with profitability. With this motivation, this paper has analysed the underlying drivers of profitability in India’s organized manufacturing sector for a 3-decade long period from 1982-83 to 2012-13 using annual data from the Annual Survey of Industries.

We have found that the rate of profit – defined to closely match the broad Marxist definition of the profit rate as the ratio of the flow of surplus value and the stock of capital – has increased mildly over our period of study at 1 percent per annum. This long run positive trend is largely driven by a secularly rising share of profit income in the sector, which grew at 1.15 per cent per annum over this whole period. Using structural break analysis, we identified 6 short run, and complementing it with visual inspection, we find 2 medium run regimes. Our analysis shows that over medium and short run

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<sup>12</sup> “Under these circumstances relative price changes—whose origins need have nothing to do with workers—have caused a decline in the value of output in terms of its ability to meet workers' consumption needs.” (Weisskopf, 1979)

periods, movements in technology (captured by the output capital ratio for a medium run analysis and the capacity-capital ratio for a short run analysis) is the primary driver of profitability.

The fact that the profit share secularly increased over the whole period of study from a medium run perspective is worth noting. For most advanced capitalist countries, the profit share has displayed medium run fluctuations, falling in the regulated capitalist period and rising in the neoliberal period (Basu and Vasudevan, 2013). Even developing countries like Brazil have witnessed a rising profit share only in the neoliberal period, from 1990 to 2003 (Marquetti et al., 2010). Thus, in this respect, the distribution of value added between the fundamental social classes in India's organized manufacturing sector is strikingly different: labour has been continuously losing over the last 3 decades. In fact, this trend of declining wage share goes back even further. The results in Sau (1989) show that the wage share had declined from the early 1960s to the mid-1980s.

We would like to end with a caveat to and some possible extension of our research, in that order. In this paper, we have often invoked a direct link between profitability and capital accumulation. While we believe that there is certainly a link, it is more complicated than we have probably given due. One important issue in this regard is the distribution of surplus value into interest, rent, dividend, taxes, wages of unproductive labour, and profit of enterprise. Our preferred measure of profit is really an estimate of surplus value and not profit of enterprise. If it is the latter that is more directly relevant for capital accumulation, our measure of profit rate would need to be suitably modified for an analysis of investment behaviour. Since we did not have data to remove many of these forms of surplus value – especially taxes and dividend payments – we leave this as a topic for future research. Investigating the link of profitability and capital accumulation would also require us to engage with an interesting body of recent research that has found financialization to have a negative impact on real investments (Orhangazi, 2008).

In addition to investigating the link between profitability and capital accumulation, two other important issues could emerge as extensions of this paper. First, in this paper we have analysed the organized manufacturing sector as a whole. But there might be interesting variations across different industries within organized manufacturing. For instance, textiles might have a different dynamic from machine manufacture. Thus, one future extension of the current work would be to do a more disaggregated profitability analysis. Second, an important topic that has been discussed with respect to India's organized manufacturing sector is the phenomenon of jobless growth (Kannan and Raveendran, 2009). To understand jobless growth and the employment-generating potential of manufacturing, an investigation of the determinants of capital intensity is called for. A disaggregated analysis of organized manufacturing would be useful in this respect.

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## Appendix

In this appendix, we describe data sources and methodologies for construction of key variables used in our analysis. The main source of data for the analysis in this paper is the Annual Survey of Industries (ASI). It is an annual survey of all industrial units registered under sections 2m(i) and 2m(ii) of the Factories Act, 1948 and Bidi and Cigar establishments registered under Bidi and Cigar Workers (Conditions of Employment) Act, 1966, i.e., all factories in India where “any manufacturing process is being carried on” and which employ 10 or more workers if using power and 20 or more workers if not using power.

ASI time series on principal characteristics, aggregated at the level of the total organized manufacturing sector, was downloaded from the website of the Ministry of Statistics and Programme Implementation, Government of India. This provided data from 1981-82 to 2012-13 on the following variables: net value added; wages of workers; emoluments (wages of workers, and salaries supervisors & managers); benefits of workers, supervisors & managers; number of workers; number of managers & supervisors; rent & interest payment; net investment; and historical cost of fixed capital stock.

We supplemented the ASI data with annual time series of relevant price indexes. The wholesale price index for machines & machinery (WPIMACH) was obtained from the website of the Office of the Economic Advisor, Government of India; the consumer price index for industrial workers (CPIIW), and the wholesale price index for manufactured products (WPIMFG) was obtained from the Handbook of Statistics on Indian Economy, 2014, published by the Reserve Bank of India. All price indexes were recalibrated to a base year of 2004-05.

In our analysis, the rate of profit is measured as the ratio of profit income over a year and the replacement (current) cost stock of fixed capital at the beginning of the year. We measure profit income in three different ways. The broadest definition of profit,  $\Pi_1$ , is the difference between net value added

and the compensation of productive workers. A narrower definition of profit is  $\Pi_1$  less compensation of supervisors & managers; we denote this as  $\Pi_2$ . The narrowest definition of profit is  $\Pi_2$  less rent and interest payments; we refer to this as  $\Pi_3$ .

Our preferred measure of the rate of profit is  $R_1 = \Pi_1/K$ , where  $K$  is the replacement cost stock of fixed capital, and  $\Pi_1$  is net value added less compensation of productive workers. This is because this definition is the closest approximation to the Marxist definition of the profit rate as the ratio of “surplus value” and capital stock. Moreover, it is the broadest measure of the rate of profit and captures the maximal rate of expansion of capital.

Our preferred measure of the rate of profit requires us to calculate the compensation of productive workers. We form an estimate of this by adding the wages *and* benefits of productive workers. While data on wages of productive workers is available, we form an estimate of the benefits of productive workers by multiplying total benefits – since we only have data on total benefits for workers, supervisors & managers all together – with the ratio of wages and emoluments (wages of workers, and salaries supervisors & managers). Adding this to wages of productive workers gives us the compensation of productive workers. This essentially assumes that total benefits is divided between workers and supervisors & managers in the same ratio as their wages and salaries.

We calculate the replacement cost value of the capital stock using the perpetual inventory method recursively as

$$K(t + 1) = K(t) \times \left\{ \frac{P(t)}{P(t-1)} \right\} + I(t) \quad (\text{A1})$$

where  $K(t + 1)$  and  $K(t)$  are the current cost net capital stock at the beginning of periods  $(t + 1)$  and  $t$  respectively,  $P(t)$  and  $P(t - 1)$  are the values of the wholesale price index for machines & machinery in periods  $(t)$  and  $(t - 1)$  respectively, and  $I(t)$  is net investment in period  $(t)$ . For our data set, the



recursion (A1) starts in the initial period 1981-82 and  $K(0)$  is the historical cost fixed capital stock in this initial period.

In our profit rate decompositions from a short run perspective, we use the capacity utilization rate. We calculate the capacity utilization rate as the ratio of net value added and its trend, where the trend is computed by fitting a Hodrick-Prescott filter to the time series of net value added.

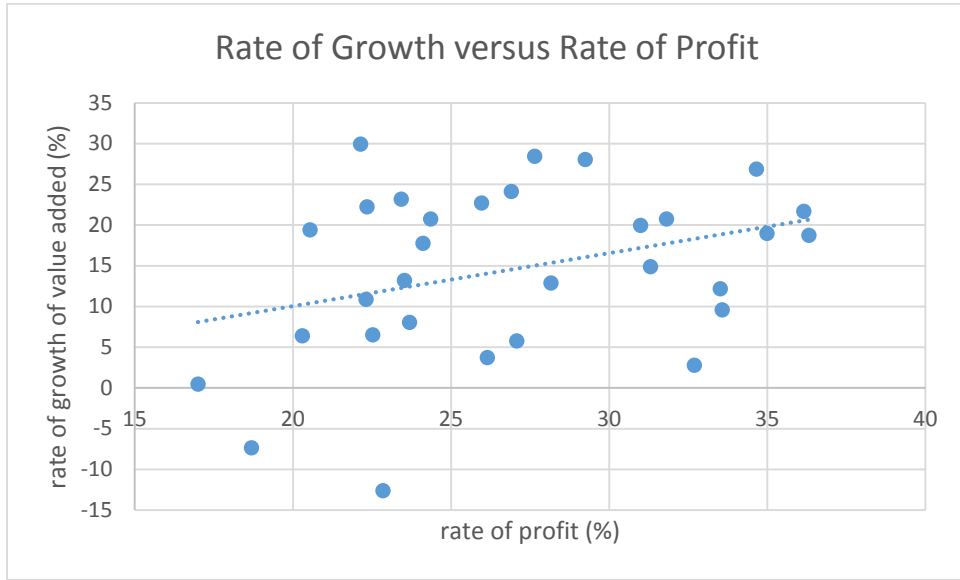


Figure 1: Scatter plot of the annual rate of growth of value added versus the annual rate of profit in the organized manufacturing sector in India, 1982-2012. The linear regression line has a slope of 0.61 with a standard error of 0.303 (p-value=0.053). Source: authors' calculations.

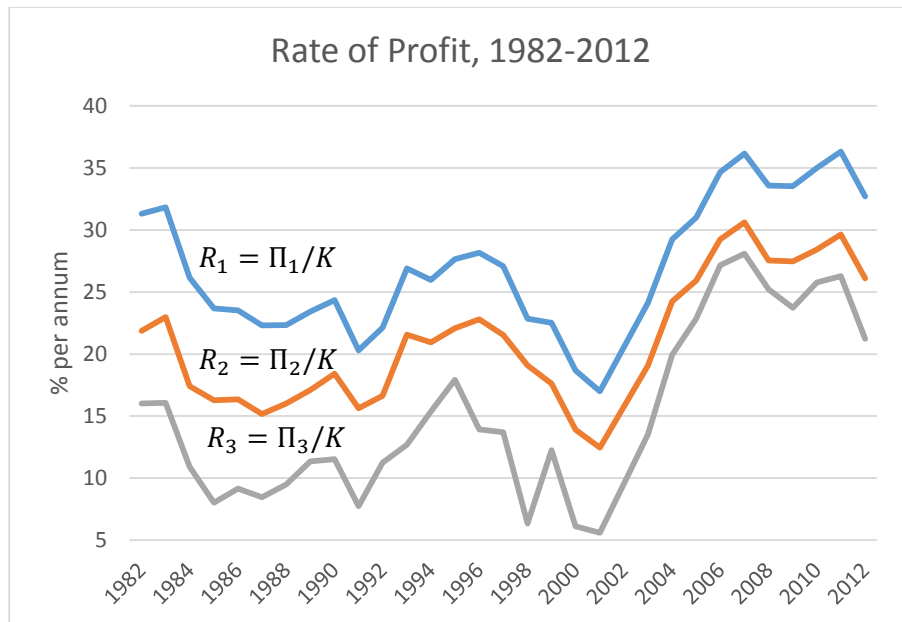


Figure 2: Rate of profit (various measures) in the organized manufacturing sector in India, 1982-2012.  $K$  is the current cost net stock of fixed capital;  $\Pi_1$  is net value added less compensation (wages and benefits) of productive workers;  $\Pi_2$  is  $\Pi_1$  less compensation of supervisors & managers;  $\Pi_3$  is  $\Pi_2$  less rent and interest payments. Source: authors' calculations.

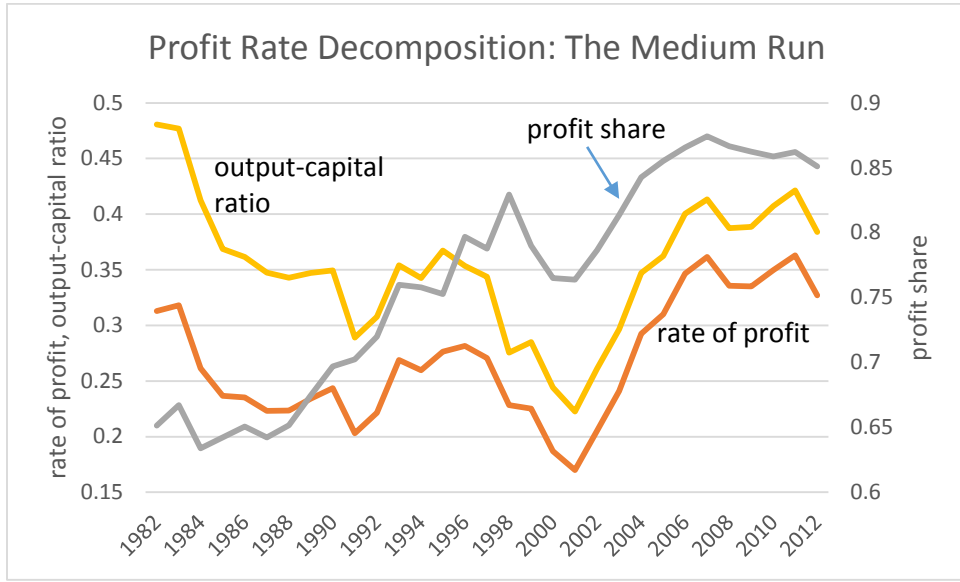


Figure 3: Decomposition of the rate of profit (R1 in Figure 2) from a medium run perspective. The rate of profit is decomposed into the profit share and the output-capital ratio. Source: authors' calculations.

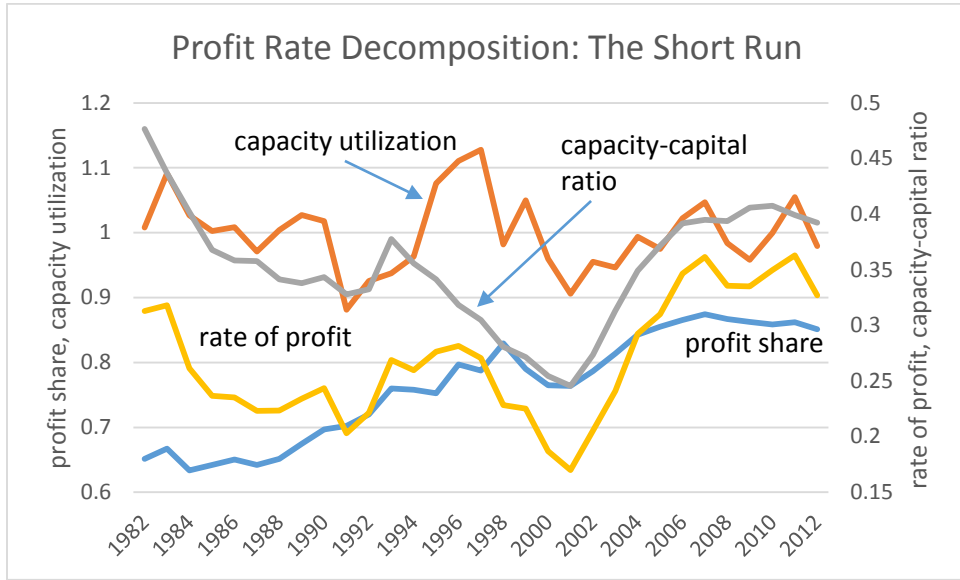


Figure 4: Decomposition of the rate of profit (R1 in Figure 2) from a short run perspective. The rate of profit is decomposed into the profit share, the capacity utilization rate (ratio of actual and potential output), and the capacity-capital ratio (ratio of capacity output and capital stock). Source: authors' calculations.

**Table 1: Structural Break Test**

<b>Number of Breaks</b>	<b>RSS</b>	<b>BIC</b>	<b>Break Dates</b>
0	1.024454	-7.42851	
1	0.405826	-25.8322	2003
2	0.221062	-34.3623	1992, 2002
3	0.132786	-39.8612	1992, 1999, 2006
4	0.077653	-46.1901	1987, 1996, 2001, 2005
5	0.043541	-53.8229	1986, 1990, 1995, 2001, 2005
6	0.045577	-42.1049	1986, 1990, 1995, 2000, 2004, 2008

Note: this table reports structural break tests for a regression of log-profit rate on a constant and a linear time trend; the sample period is 1982-2012 and the analysis has been carried out in the R package "strucchange".

**Table 2: Medium Run Decomposition and Contributions (average annual growth rate, % per annum)**

	Rate of Profit			Profit Share				Output-Capital Ratio		
	(1)=(2)+(3)			(2)=(7)*[(4)-(5)-(6)]				(3)=(8)-(9)-(10)		
	Rate of Profit	Profit Share	Output-Capital Ratio	Real Labour Productivity	Real Wage Rate	Ratio of CPIIW and WPIMFG	Geometric Mean of Wage/Profit	Real Labour Productivity	Real Capital-Labour Ratio	Ratio of WPIMAC and WPIMFG
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1982- 03	-1.30	1.35	-2.65	5.87	0.99	1.39	0.39	5.87	9.08	-0.56
2003- 12	5.56	0.90	4.66	6.50	0.03	2.29	0.18	6.50	2.73	-0.90
1982- 12	0.96	1.15	-0.19	5.81	0.38	1.63	0.29	5.81	6.65	-0.65

Source: authors' calculation; growth rate of any variable x is obtained by regressing  $\log(x)$  on a constant and a time trend; CPIIW = consumer price index for industrial workers; WPIMAC = wholesale price index for machines and machinery; WPIMFG = wholesale price index for manufactured products.

**Table 3: Short Run Decomposition and Contributions (average annual growth rate, % per annum)**

	Rate of Profit		Profit Share			Capacity-Capital Ratio				
	(1)=(2)+(3)+(4)		(2)=(8)*[(5)-(6)-(7)]			(4)=(9)-(10)				
	Rate of Profit	Profit Share	Capacity Utilization Rate	Capacity-Capital Ratio	Real Labour Productivity	Real Wage Rate	Ratio of CPIIW and WPIMFG	Geometric Mean of Wage/Profit	Real Capacity-Capital Ratio	Ratio of WPIMAC and WPIMFG
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1982- 86	-8.67	-0.41	-0.84	-7.42	6.22	4.84	2.15	0.54	-7.55	-0.13
1986- 90	1.18	1.87	0.75	-1.44	7.13	3.89	-0.56	0.51	-1.11	0.33
1990- 95	4.47	1.90	1.59	0.98	7.42	2.61	-0.31	0.37	-0.43	-1.41
1995- 01	-8.80	-0.13	-3.14	-5.53	0.99	-2.13	3.63	0.27	-6.51	-0.98
2001- 05	15.54	2.95	1.87	10.72	10.75	-1.53	-0.56	0.23	9.63	-1.09
2005- 12	0.60	-0.14	0.02	0.72	4.11	1.07	3.89	0.16	-0.96	-1.68

Source: authors' calculation; growth rate of any variable x is obtained by regressing log(x) on a constant and a time trend; CPIIW = consumer price index for industrial workers; WPIMAC = wholesale price index for machines and machinery; WPIMFG = wholesale price index for manufactured products.