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ABSTRACT

The paper investigates the impact of liberalisation on the performance of the input based classifications of the registered manufacturing sector in the state of Andhra Pradesh for the period 1980-81 through 2004-05. The study further scrutinises the role of investment climate in enhancing the performance of the registered manufacturing sector.

The performance indicators chosen are the structural ratios - capital-output; capital intensity and labour productivity. Chemical and metal based industries fall under the first group where the increase in labour productivity is because of the increase in capital intensity. Agro-based industries fall under the second group where there is an increase in all the three structural ratios (K/L, O/L and K/O). Labour productivity of all the three input based classifications registered an increase in the post-liberalisation period. While the fixed capital investment is high for the chemical based industry, the growth of employment in this sector is not encouraging. This implies that technological change resulted in increase in productivity coupled with labour displacement. The share of wages in NVA registered a declining trend in the second period over the first period indicating the absence of bargaining power on the part of the labourers. Employment elasticity with respect to output reveal that the chemical based industries perform relatively better compared to the agro-based and metal-based industries in the post-reform period.

Amongst the input-based classifications, chemical industries performed better in the post-reform period compared to the other two classifications in terms of labour productivity, capital investments and also employment elasticity. The investment climate indicators clearly show that the chemical and metal based industries have the potential to grow hence it becomes imperative on the part of the government to encourage these two classifications to improve the overall performance of registered manufacturing sector in AP.

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1. INTRODUCTION

Given the historical developments world over, it is not surprising that growth was identified with industrialisation in all the developing economies. The Indian planners went a step further and talked of industrialisation with an emphasis on heavy industries (Rangarajan, 2006). Since independence, industrial policy in India has stressed rapid industrial growth with diversification of industrial structure as one of the important objectives of industrialisation.

There is a general agreement that while India has achieved a much diversified industrial structure, her growth performance leaves much to be desired, both with regard to the magnitude of the growth rate and its stability over time. It is true that India's overall performance in recent years has been exceptional with the economy growing at roughly 8 percent per annum before the recent recession. One might argue, however, that the growth has been service-led and that manufacturing, considered to be customarily the apparatus of growth in a country at that stage of development, has not been so in India's case. Kochhar et al (2005) argue that while India's share of services in overall GDP increased from 37 to 49 percent in the last two decades, share of manufacturing has remained more or less constant at 16 percent. They also show that the change in the share of manufacturing during this period in India has been about 2.5 percentage points lower than the average country, at the same stage of development, while the change in the services share was about 10 percentage points higher than average. Further, they also point out "in sum then, Indian manufacturing showed signs over the post-1980s period of not keeping up with the average performance in other, similar countries". Within the country also, majority of the fastest growing states have seen either no change or a fall in the share of manufacturing. Thus, it is imperative to realize why in a rapidly growing Indian economy with the right meta-institution for growth, the manufacturing sector has been lagging.

In the 1980s, particularly in the second half, there was a gradual process of liberalisation of economic policies in India. This process gained considerable momentum from 1991, and major far-reaching changes in industrial and trade policies were made in the 1990s. These reforms were aimed at making Indian industry more efficient, technologically up-to-date and competitive with the expectation that efficiency improvement, technological up-gradation and enhancement of competitiveness would enable Indian industry achieve rapid growth (Goldar, 2006). Most notably, economic liberalisation

transformed central-regional relations unleashing unintended and unplanned decentralisation (Sinha Aseema, 2004). The New Industrial Policy of 1991 was a major part of the broad structural adjustment programme in India which was specifically set in motion with a declared objective of transforming the basic nature of functioning of the economy in lieu of planned economic development over the period 1951-1990 (Neogi Chiranjib et al., 1998)

Against this background, the present study investigates the impact of liberalisation on the performance of the input based classifications of the registered manufacturing sector in the state of Andhra Pradesh (AP). Earlier, we mentioned that while India's share of services in GDP increased while the share of manufacturing sector remained more or less constant. Similar is the case with the state of AP, where the share of services in state domestic product (SDP) increased from 5.6 percent in the pre-liberalisation period to 7.3 percent in the post liberalisation period while the share of manufacturing sector in SDP remained more or less constant at around 5 percent during the same period (Chakravarty et al, 2009). This clearly shows that AP has been experiencing a slow but significant structural shift from agriculture to mainly services. In order to maintain the growth in the service sector, the commodity producing sectors, especially the manufacturing sector, need to grow at an adequately faster rate to generate demand for the services. It is in this context, we focus on how the performance of the manufacturing sector can be enhanced so that there is an increase in the overall growth rate of the state.

The performance indicators chosen are capital intensity (K/L), capital output ratio (K/O), labour productivity (O/L) (partial productivity indicator), growth of net value added (NVA), employment and fixed capital. Capital intensity in the production process can be considered as an imperative component of labour productivity. In this context, it becomes highly essential to look at the labour productivity and capital intensity in greater detail. The growth in per capita net value added is mostly determined by growth in labour productivity in industry. For this reason, the sectors are classified into groups based on sources of changes in labour productivity. The second section deals with the sources of data and methodology. In the third section, we study the share and rate of growth of SDP from the manufacturing sector as a whole, the registered and unregistered sectors for the state of AP. The structural ratios, labour productivity and the employment elasticities are discussed at length for the input based classifications in the next section. The role of investment climate in enhancing the performance of manufacturing sector is debated in the fifth section. The last section focuses on conclusions and policy implications.

2. Data and Methodology

The National Accounts Statistics (NAS) published by the Central Statistical Organisation (CSO) provide time series data for the state domestic product (SDP) in terms of broad industrial classifications at the single digit level. The industrial output figures at the state level are culled out from this source. We estimate the shares and trend growth rates of SDP from the manufacturing sector in Andhra Pradesh (AP) for the period 1981-82 through 2007-08 at 1999-2000 prices. We fitted a semi-log equation to calculate the trend growth rates.

Annual Survey of Industries (ASI), every year, provides detailed information of wages, employment, output, capital formation etc for the factory segment of the manufacturing sector. Currently, the latest year available for the state is 2004-05. The period for analysis chosen is from 1981-82 to 2004-05. This period is further sub-divided into two – 1981-82 to 1992-93 (pre-liberalisation); 1993-94 to 2004-05 (post-liberalisation). We considered the two-digit classification of ASI and NIC classification is 1998. The state-wise wholesale price index in terms of two-digit classification is not available. So, for deflating the current values of output we have used the All India wholesale price index numbers for each industry group with 1981-82 as the base for the first period and 1993-94 as the base for the second period. To deflate the capital assets, we made use of the combined index of electrical and non-electrical machinery. We considered the figures of total persons employed to capture the employment picture. The study makes an attempt to analyse the performance of the input based classifications of the registered manufacturing sector in Andhra Pradesh with the help of percentages and trend growth rates of structural ratios. Employment elasticities with respect to output and fixed capital is estimated using the following equation

$$\ln E = a_0 + a_1 \ln Y - a_2 \ln K \quad \dots(1)$$

where E represents employment, Y represents NVA of the registered manufacturing sector and K stands for fixed capital.

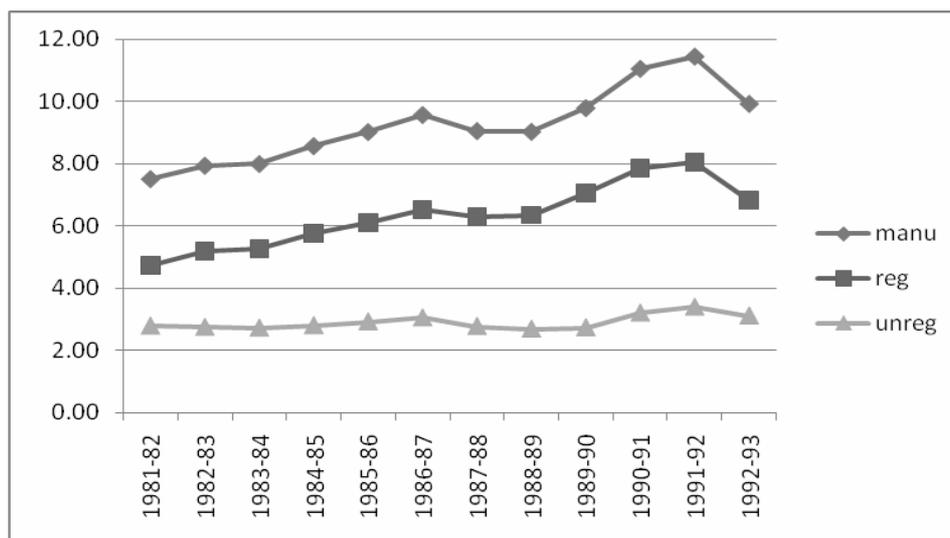
3. Share and Rate of Growth of Manufacturing Sector in State Income

Scrutiny of the share of manufacturing sector in state income reveals that it is the registered sector which dominates the manufacturing activities in the state in both the periods.

In the pre-liberalisation period, we observe that the share of the manufacturing sector as a whole and that of the registered manufacturing sector increased till mid-eighties. Thereafter, we find that the share of SDP from these two sectors declined till early nineties (figure 1). In the post-liberalisation period we find that though till mid-nine-

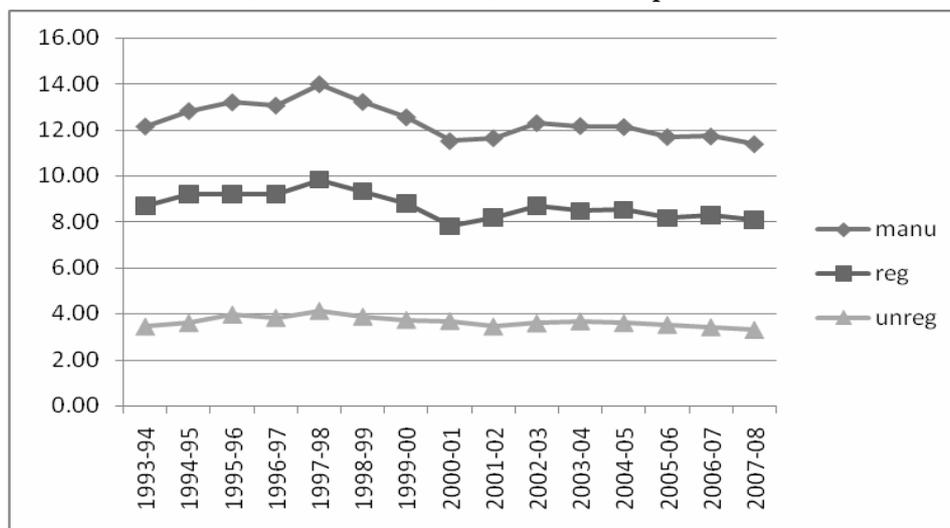
ties share of GDP from these two sectors registered an increase, there after we find that there is a continuous decline in the share of GDP from the manufacturing sector as a whole and the registered manufacturing sector in particular (figure 2 and table 1).

Figure 1: Percentage shares of manufacturing, registered and unregistered in GDP in AP (1981-82 to 1992-93) (1999-2000 prices)



Source: NAS, various issues

Figure 2: Percentage shares of manufacturing, registered and unregistered in GDP (1993-94 to 2007-08) (1999-2000 prices)



Source: NAS, various issues

Table 1: Changes in ratio of registered to unregistered output

Pre-reform	Reg/unreg	Post-reform	Reg/unreg
1981-82	1.70	1993-94	2.53
1982-83	1.89	1994-95	2.56
1983-84	1.94	1995-96	2.32
1984-85	2.06	1996-97	2.41
1985-86	2.09	1997-98	2.38
1986-87	2.14	1998-99	2.40
1987-88	2.26	1999-2000	2.35
1988-89	2.36	2000-01	2.12
1989-90	2.58	2001-02	2.37
1990-91	2.45	2002-03	2.42
1991-92	2.37	2003-04	2.30
1992-93	2.19	2004-05	2.37
		2005-06	2.32
		2006-07	2.42
		2007-08	2.45

We will now look at the sectoral growth rates of GDP from the manufacturing sector. For the period 1970-71 to 1979-80, value added in registered manufacturing sector at constant 1970-71 prices grew at an average rate of 7.7 percent per annum, while that of unregistered sector grew at an average annual rate of 4.3 percent (Krishna, 1989). AP entered the rapid growth phase in the mid-seventies. Net state domestic product (NSDP) of the industrial sector in AP grew at 5.2 percent per annum during 1960-61 to 1970-71. During the same period, the national average was 5.4 percent. Between the two years, 1970-71 and 1982-83, the NSDP of the industrial sector increased from 13 percent to 16 percent (Lakshmana Rao 1989).

Further, the growth rate of GDP from manufacturing sector decreased from around 8 percent in the pre-liberalisation period to nearly 5 percent in the post liberalisation period. Within the manufacturing sector, rate of growth of GDP from registered manufacturing sector declined by almost 4 percentage points in the second period over the first, while the growth rate of GDP from unregistered manufacturing sector also decreased by around 1 percentage point in the post-liberalisation period compared to the pre-reform period (table 1a).

Table 1a: Trend Growth Rates of GDP from manufacturing, registered and unregistered sectors in AP during 1981-82 through 2007-08 (1999-2000 prices) (percent per annum)

Sector	1981-82 to 1992-93	1993-94-2007-08
Total Manufacturing	8.3* (0.006)	5.4* (0.003)
Registered	9.2* (0.006)	5.3* (0.003)
Unregistered	6.4* (0.006)	5.6* (0.002)

*Note: Figures in the parenthesis indicate standard errors; * indicates 5% level of significance
Source: National Account Statistics*

In AP, we observe that the services sector has been growing fast compared to the primary and the secondary sectors. So the decline in the growth rate of GDP from the manufacturing sector is off-set by the increase in the growth of services sector. One of the major sources of the increased growth rate of services sector is the emergence of the IT sector in the state, especially, the Telangana region.

Thus, looking at the growth rates of output from the manufacturing sector in the post-reform period, we can conclude that this period reflects the poor pace of industrialisation in the state.

4. Key Characteristics of AP's factory Sector

Industries can be classified either on the basis of source of input or on the basis of the nature of the final product. In this study, we confine our argument to input based classification since the nature of the data set (two-digit classification of industries of the ASI) that we have used does not allow us to classify the industries based on the final product like consumer goods, intermediates or capital goods.

Before discussing the findings at the two-digit level, let us summarise the details of some of the liberalisation measures, representing attention to some of the sectors at which they were directed. The industries that were delicensed during the reforms period are metal products, chemicals, electrical and non-electrical machinery, non-metallic mineral products, and consumer goods industries. The industries covered by broad banding were mostly chemicals, metal products and electrical and non-electrical machinery. Likewise, restrictions on MRTP firms reduced were mostly in basic metals and alloys and transport equipment. Minimum Efficient Scale (MES) of production

was mostly laid for some of the industries in consumer goods and for the chemical and basic metal industries. Since the reform measures focused on specific sectors, it becomes easy to see the impact of liberalisation on the structural ratios in terms of input-based classification. The input-based classification is broadly categorised into agro-based, chemical-based and metal-based.

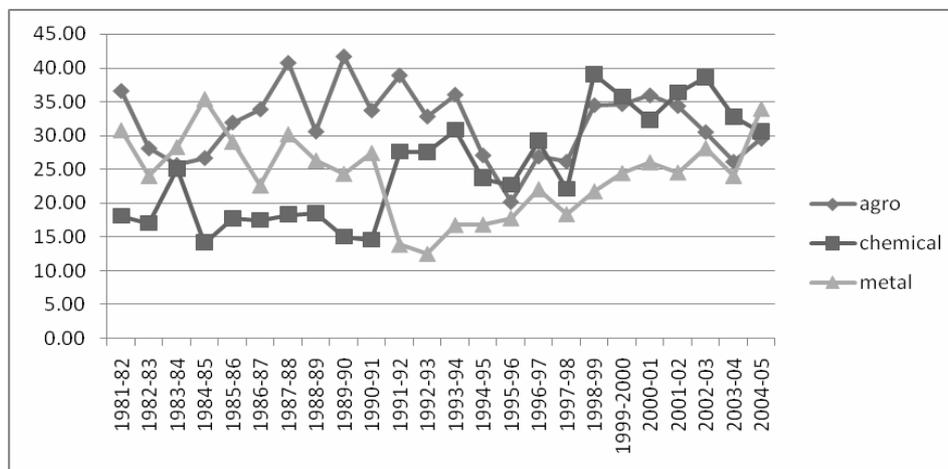
Thus the objectives of the reforms were to increase the utilisation of capacity, increase in efficiency and productivity and encourage modernisation and technical change. We aim to capture these objectives of reforms through the structural ratios like capital intensity (utilisation of capacity), labour productivity (efficiency) and capital output (technology).

Against this background, the subsequent sections look at the percentage composition of net value added (NVA), fixed capital and employment of the registered manufacturing sector. The linkages between the structural ratios – capital intensity, capital output ratio and the labour productivity are also discussed at length. Further, the rate of growth of fixed capital and rate of growth of employment are analysed. We also made an attempt to see whether the increase in labour productivity contributed to the increase in the share of wages.

4.1 Percentage Composition of NVA, Fixed Capital and Employment by Input Based Classification

Figures (3), (4) and (5) show the performance of the percentage composition of NVA, fixed capital and employment respectively of the registered manufacturing sector in the state of AP by the above mentioned input classification. Here, the NVA has been deflated by the wholesale price index of each industry group while the fixed capital is deflated by a composite index of electrical and non-electrical machinery.

Figure 3: Percentage share of NVA in AP registered manufacturing sector by input based classification



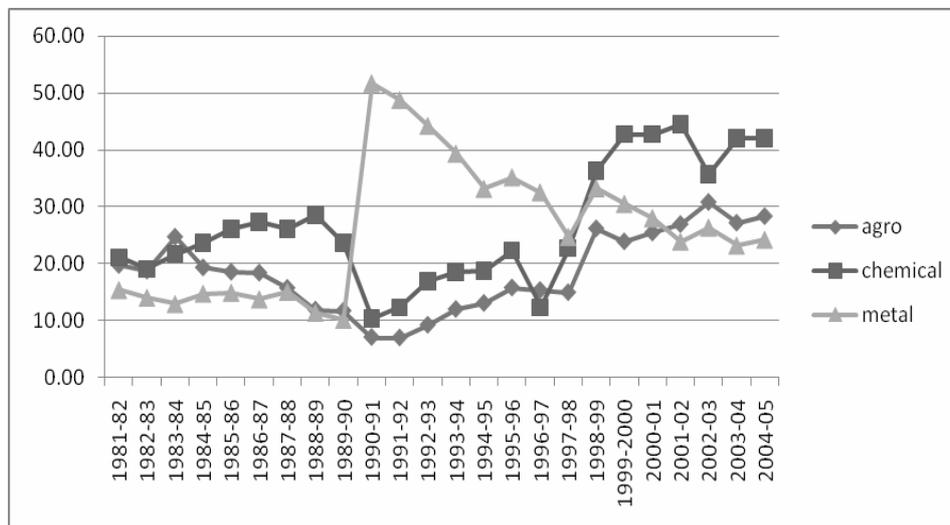
Source: ASI, various issues

Let us now have a look at the percentage composition of net value added. Figure (3) shows that during 1989-90, the percentage share of NVA stood at 40.7 percent. Thereafter, it registered a declining trend. The percentage share of NVA of the metal based industries depicts a fluctuating trend throughout the eighties. It registered a steep decline in the year 1991-92. Though it started picking up from the following year, its percentage share is less when compared to the other two classifications. Percentage share of NVA of the chemical based industries was the lowest in the year 1990-91. Thereafter, this classification registered a steep increase in 1998-99 and 2002-03.

The data on fixed capital shows that during eighties and early part of 2000, the percentage share of fixed capital for the chemical based industry is the highest when compared to the other two input-based classifications. The metal based industry had the highest percentage share of fixed capital in 1991-92. Agro-based industries registered a fluctuating trend of the percentage share of fixed capital (figure 4).

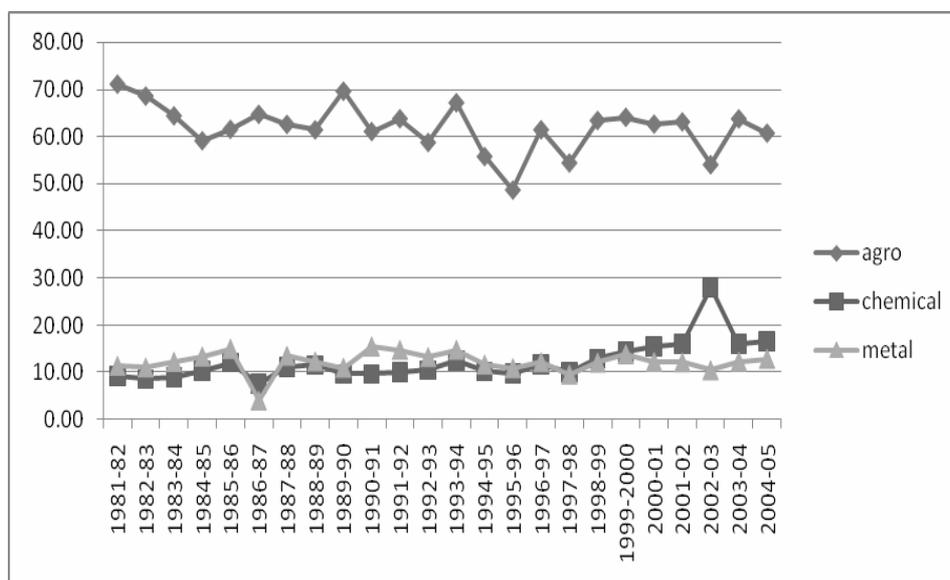
From figure (5), it is clear that the agro-based industries dominate in terms of employment over the other two classifications. On an average, nearly 65 percent of the employment is generated by this sector alone. Within the agro-based classification, the largest contributor to employment is the tobacco industry nearly 34 percent of the employment comes from this sector. A significant proportion of this employment is concentrated in the small bidi making factories of Telangana region.

Figure 4: Percentage share of fixed capital in AP registered manufacturing sector by input based classification



Source: ASI, various issues

Figure 5: Percentage share of employment by input based classification



Source: ASI, various issues

Analysis of the key characteristics of the input based classification reveals that while the agro-based and metal based industries performed well in terms of output and fixed capital investments in the pre-reform period, it is the chemical-based industries which took lead over the two in the post-reform period both for the output and the fixed capital investments. Drugs and pharmaceuticals is one area where AP is considered to be at dominant position in the country. This could have resulted in the increase in the share of fixed capital investment and output of the chemical based industries. Data on the rate of growth of fixed capital in the next section¹ shows that the metal based industries performed better in this aspect when compared to the chemical based industries.

However, when it comes to the share of employment, agro-based industries provide the highest share of employment both in the pre and post-reform periods when compared to the other two classifications. This is again due to the labour-intensive nature of the agro-based industries.

4.2 Analysis of the Structural Ratios of the Registered Manufacturing Activities

The analysis in this section is based on some important structural ratios such as output-labour ratio (labour productivity), capital-labour ratio and capital-output ratio. Capital-labour ratio is the product of two ratios capital-output and output-labour. In other words, we have the relationship amongst the three structural ratios mentioned above as follows:

$$K/L = K/O \times O/L,$$

Where K represents capital, O stands for output and L stands for labour. K/L represents capital intensity.

Table 2: Capital-labour ratio by input based classifications 1981-82 through 2004-05

Input-based classification	Capital-labour ratio	
	1981-82 to 1992-93	1993-94 to 2004-05
Agro-based	0.2	1.6
Chemical-based	0.4	2.0
Metal based	0.5	2.3

Source: Own calculations based on the data on key characteristics from ASI, various issues

¹ See Table 4

For all the three input based classifications, capital intensity (K/L) registered an increase in the post-reform period, with the increase being significantly high for the chemical and metal based industries (table 2). The reason for this high growth of capital intensity in the chemical and metal based industries is due to the easier terms of import of capital goods during the latter phase of liberalisation.

We will now take a quick look at the performance of the other two structural ratios – capital-output and output-labour or labour productivity. The table below gives labour productivity, share of wages in NVA and the capital-output ratio in two periods for the input-based classification. Let us now see whether any change in the capital-labour ratio would lead to some changes in either one of the ratios (capital-output and output-labour or labour productivity) or both the ratios.

Table 3: Capital-output ratio, labour productivity and wage/NVA by input based classifications 1981-82 through 2004-05

Input based classification	Capital-output ratio		Labour productivity		Wage/NVA	
	1981-82 to 1992-93	1993-94 to 2004-05	1981-82 to 1992-93	1993-94 to 2004-05	1981-82 to 1992-93	1993-94 to 2004-05
Agro-based	12.4	13.8	0.07	1.1	0.40	0.11
Chemical-based	13.0	9.1	1.1	5.5	0.18	0.04
Metal-based	12.7	10.5	0.9	4.2	0.25	0.08

Source: Own calculations based on the data on key characteristics from ASI, various issues

We observe that the labour productivity increased across the three classifications in the post-reform period as a consequence of the increase in the capital labour ratio. But, the capital output ratio does not present a uniform pattern for the three classifications. For the agro based industries, the capital output ratio increased during the post-liberalisation period while for the other two classifications, the K/O ratio registered a declining trend in the post-reform period compared to the pre-reform period. Hence, based on the behaviour of the structural ratios, we can classify the input based classifications into: (i) capital/labour ratio increases with an increase in labour productivity and a decrease in capital/output ratio; (ii) increases in all the three ratios (K/L, O/L and K/O).

Thus, from tables (2) and (3), it is clear that chemical and metal based industries fall under the first category. The increase in labour productivity is because of the increase in capital intensity (in other words, increase in capital per unit of labour). Further, increase

in productivity would have led to increase in the output to such an extent that it led to lowering the effect of the increase in capital per unit of output in the post-reform period. This also implies technological change in the production process. We can substantiate this with the help of rate of growth of fixed capital. The high and significant rate of growth of fixed capital in chemical based industries leads to the conclusion that high investment has taken place in this industry during the first period. For the metal based industries, the rate of growth of fixed capital is high in the post-reform period as against the pre-reform period (table 4). Since this kind of high investment involves a long gestation period, the result on output may be notably delayed.

Table 4: Rate of growth of fixed capital by input based classification

Period	Agro-based	Chemical-based	Metal-based
1981-81 – 1992-93	3.5* (.035)	9.9* (.013)	2.4* (.052)
1993-94 – 2004-05	6.9* (.011)	5.7* (.022)	8.2 (.006)

Source: Own calculations based on the data on key characteristics from ASI, various issues

Agro based industries come under the second category where there is an increase in all the three ratios. In other words, this implies that in this classification, the increase in labour productivity did not result in the decline in capital output ratio. On the other hand, the increase in capital intensity may be due to the change in technical base (tables 2 and 3).

**Table 5: Trend growth rate of employment by input based classification
(1981-82 through 2004-05)**

Period	Agro-based	Chemical-based	Metal-based
1981-82 – 1992-93	-0.8 (.005)	0.1 (.011)	1.9 (.030)
1993-94-2004-05	0.5 (.008)	2.1* (.017)	-0.2 (.010)

*Source: ASI, various issues; Figures in parenthesis indicate standard errors; * 5% significance level*

4.3 Growth Rate of Employment and Share of Wages in NVA

Rate of growth of fixed capital is more than the rate of growth of employment in all the three classifications. Further, for the first group, increase in labour productivity in the

chemical based industries, resulted in a significant increase in the rate of growth of employment during the post-liberalisation period. However, economic reforms, though resulted in the increase in labour productivity in the metal based industries, did not contribute to the increase in the rate of growth of employment in this category (table 5).

In the second group, increase in labour productivity amongst the agro based industries led to an increase in the rate of growth of employment in the post-reform period. This increase in the rate of growth of employment can be attributed to the labour intensive nature of the agro-based industries such as the food products, beverages, tobacco etc. However, this increase is insignificant leading to the conclusion that the overall improvement in labour productivity did not have a considerable impact on the employment scenario of this classification in the post-reform period.

Yet another conclusion that can be drawn from the above analysis is that technological change resulted in increase in labour productivity coupled with labour displacement. Then, what about the share of wages in NVA? Here we have to remember the fact that labour productivity has gone up in the post-liberalisation period for the all three input based classifications with the increase being the highest for the chemical based industries. In this context, we can argue that more productive workers will always earn more. However, analysis of share of wages in the net value added, shows that there is a decline in the second phase of liberalisation over the first and the share of wages in net value added has declined the highest for the chemical based classification (table 6). Why this decline in share of wages in NVA? One reason for this decline could be the absence of bargaining power by the labourers leading to the conclusion of the absence of strong labour unions. If we probe further, the presence of more contract labour would have resulted in the absence of strong labour unions. The large units of the chemical based industries would have found it more profitable to go for subcontracting which necessarily reduces the labour cost. It turns out to be so since these subcontracting units time and again work outside the purview of the factory.

**Table 6: Share of wages to net value added by input based classification
1981-82 through 2004-05**

Period	Agro-based	Chemical-based	Metal-based
1981-82 to 1992-93	0.4	0.2	0.3
1993-94 to 2004-05	0.1	0.04	0.1

Source: Own calculations based on the data on key characteristics from ASI, various issues

Summarising the capital-labour and output-labour ratios over the three input based classifications, we find that capital intensity is high for the metal based industries both in the pre and post-reforms period compared to the other two industries. However, trends in labour productivity reveal a different picture. Labour productivity is highest for the chemical industries both in pre and post economic reforms, while that of the metal industry stands next to chemical industry in both the periods. The high capital intensity in the metal industry accompanied with a long gestation lag would not have resulted in a high labour productivity of this group.

Though there is an increase in labour productivity during the study period, this did not contribute to increase in the share of wages within the industrial groups. Further, the economic reforms did not create abundant employment opportunities within the registered manufacturing sector.

4.4 Employment Elasticity

We have seen that the increase in the rate of growth of fixed capital is not accompanied by an increase in the rate of growth of employment. With the help of employment elasticity we make an attempt to study these opposite trends of fixed capital and employment.

The results shown in table (7) shed light on employment elasticity respect to output and fixed capital. For the agro-based industries, employment elasticity with respect to output varied between 0.12 and 0.42 during the pre and post economic reform periods. For the metal based industries while the employment elasticity with respect to output was 0.03 percent during the pre-reform period, it accounted for 0.11 percent during the post-reform period. The employment elasticity with respect to output of the chemical based industries exceeded the agro-based and the metal-based industries in the post-reform period. Again, the chemical based industries performed well in employment elasticity with respect to output (-0.002 percent in pre-reform and 0.29 percent in post-reform period).

For employment elasticity with respect to fixed capital we observe that there is a significant increase in the employment with one percentage increase in fixed capital in the post-reform period over the pre-reform period only for the chemical based industry. In this case, use of fixed capital is complementary to the employment of labour. For the agro based industries, there is an increase in employment given one percent increase in fixed capital in the post-reform period. However, this increase is not significant. This implies that fixed capital is substituted for labour, thus explaining the trend of increasing capital and falling employment in this classification (table 7)

**Table 7: Employment Elasticity for the input based classifications
(1981-82 through 2004-05)**

Input based classifications	Employment elasticity with respect to			
	Fixed Capital		Output	
	1981-82 to 1992-93	1993-94 to 2004-05	1981-82 to 1992-93	1993-94 to 2004-05
Agro based	-0.20*	0.04	0.12	0.42*
Chemical based	-0.09*	0.05* (0.091)	-0.002	0.29*
Metal based	-0.03	-0.07 (0.095)	0.03	0.11

Source: Own calculations based on the data on key characteristics from ASI, various issues

5. Investment Climate and registered manufacturing sector

The crucial question that arises at this juncture is how to improve the performance of the manufacturing sector activity in the state of AP? Since private investment plays a major role in the manufacturing activities, it becomes highly essential to gauge the investment climate of the registered manufacturing sector. A good investment climate encourages higher productivity by providing opportunities and incentives for firms to develop, adapt, and adopt better ways of doing things—not just innovations of the kind that might merit a patent but also better ways to organize a production process, distribute goods, and respond to consumers (World Bank Development Report, 2005). The World Bank Report (2005) also says that government policies and behaviours play a key role in shaping the investment climate.

In this context, we intend to look at the impact of investment climate and its outcomes on the performance of the manufacturing activities within the input based classifications. We propose to see its impact with the help of labour productivity which is a crucial variable of capital intensity, the kind of industrial relations that exist in an economy and also the creation of infrastructural facilities. Labour is less mobile across locations than capital as a factor of production and therefore value added per worker is a useful indicator of business productivity when assessing the business environment².

It is already shown that labour productivity increased in the post-reform period in all the three input based classifications. Chemical based industry was at the top, followed by metal and agro-based industries during this period. Nevertheless, we observe that

² Chakravarty et al (2009)

the level of capital labour ratio in the metal based industry is slightly high than that of the chemical based industry during the same period. This leads us to the conclusion that labour productivity may be more despite capital intensity neither remaining high within the input based classification or not varying much across the input based classifications. On the other hand, labour productivity may be high for a particular input based classification due to differences in the quality of management and the supply of productivity of public goods. Thus, by initiating better investment climate practices as a priority within the chemical based industries performance of the manufacturing sector as a whole can be improved.

Capital-labour ratio is another policy variable which enables the government to allocate investment to promote a particular manufacturing activity such that the private investment flows in. In other words, the capital per unit of labour can be increased with an increased dose of investment (Chakravarty et al, 2009). Our data on capital intensity (table 2) shows that the metal based industries followed by the chemical based industries performed better in the post-reform period. So, the metal based industries have the potential of high capital intensity if more private investment flows into this particular manufacturing activity.

Yet another issue which becomes crucial for private investment is the question of industrial unrest. We present the indicators of industrial relations for Andhra Pradesh and other states in Table 8. We look at conventional measures of industrial relations such as the number of strikes, number of lockouts, absenteeism rate, union density, contract labour usage and a measure of the bias of labour regulations towards workers across Indian states, to see how AP fares relative to other states. We normalise strikes and lockouts by the number of factories to make the data comparable across states – more industrialised states are expected to have more industrial disputes. The absenteeism rate is defined as the ratio of man days lost due to absence of workers from work to total man days and union density is the number of workers who belong to an union as a ratio of total permanent workers in that state (in percentage terms). Contract labour usage is the share of contract workers in total workers (including permanent workers) and is usually taken to be a measure of labour market flexibility (Ramaswamy 1999, Ahsan, A. and C. Pagés 2007).

We also measure de jure worker bargaining power or pro-worker labour institutions by the commonly used Besley-Burgess (2004) measure of labour regulation. Industrial relations in India fall under the joint jurisdiction of the central and state governments. The key piece of central legislation in industrial relations is the Industrial Disputes Act (IDA)³ of 1947, which sets out the conciliation, arbitration and adjudication procedures

to be followed in the case of an industrial dispute. For this purpose each state has amended the regulation many times since 1947 (particularly the details and operational aspects of it) in response to their local conditions, and because of that there emerged a natural variation of the IDA across the states, which Besley and Burgess (2004) code each state amendment to labour laws as neutral, pro-worker or pro-employer. For neutral amendments, they assign a score of zero, for a pro-worker amendment a score of +1 and for a pro-employer amendment a score of -1. They then cumulate the scores over time for the period 1947-1997.

The normalised strikes in AP are less when compared to the other states thus creating a viable business environment. However, the Besley and Burgess measure shows that the state amendment to labour is not pro-labour but pro-employer (table 8). Hence, if the government endeavours itself to be pro-worker along with being pro-employer then there can be better investment climate opportunities.

Table 8: Indicators of Industrial Relations, Andhra Pradesh and Other Major Indian States

State Name	Strikes/ factories	Lockouts/ factories	Absente- eism Rate	Union Density	Contract Worker Share	Besley -Burgess measure
Andhra Pradesh	1.92	3.28	6.96	1.23	0.15	-2
Gujarat	4.76	0.57	9.36	n/a	0.26	0
Karnataka	4.71	1.43	6.55	1.07	0.08	2
Kerala	2.68	2.47	11.46	4.64	0.04	-1
Maharashtra	1.40	0.32	10.76	2.52	0.15	0
Tamil Nadu	5.29	1.94	7.66	1.06	0.09	-2

*Notes: Contract worker share is for 1999; strikes/factories is strikes*1000/ factories and lockouts/factories is lockouts*1000/ factories, and the figures are for 2000-01*

Sources: The absenteeism rate and union membership data by state are obtained from the annual Labour Yearbooks published by the Ministry of Labour, Government of India (Ministry of Labour 1998-99 and 2004-05) and the Annual Survey of Industries and are for various years (due to the lack of availability of data for any given year). The contract labour share is obtained from the Annual Survey of Industries. The data on strikes and lockouts is obtained from Indiatat.com and the number of factories from ASI

² The IDA applies only to 'permanent' workers directly employed by the formal sector firms and not to the workers supplied by contractors (intermediaries) or workers employed on a 'temporary' basis. The IDA specifies a multi-tier conciliation cum adjudication system, where the tiers are created and maintained by state governments.

In order to attract entrepreneurs to venture into the manufacturing activities the government has to create better infrastructural facilities. Physical and social infrastructures are important for economic growth and higher human development. Economic infrastructure like transport, communication and power facilitates and accelerates the growth of economic activities and contributes to national or state GDP (Dev and Ravi, 2009). In AP, the contribution of the transport and communication sector to total GSDP at current prices was 6.31 percent in 1960-61 and it increased to 7.94 percent in 2004-05 (Aivelu et al, 2010).

Table 9 Indicators of Infrastructure - AP and Other Major Indian States

State Names	Road Length per 100 square kms.	Transmission and Distribution Losses (per cent)	Cost of Power Supply
Andhra Pradesh	74.94	26.81	360.7
Gujarat	73.29	26.87	365.4
Karnataka	104.34	33.83	374.6
Kerala	368.67	32.21	347.3
Maharashtra	88.62	37.28	357.5
Tamil Nadu	131.34	16.06	309.8

Notes: Cost of power supply is in Paise per Kilowatt Hours and is for 2001

Sources: Cost of power supply is from Planning Commission (2002). Transmission and distribution losses is obtained from Indiatat.com (2001-02), Road length per 100 sq.km is drawn from Indiatat.com and is for the year 2003-04

When we compare the infrastructure indicators of AP with the industrially developed states of Gujarat and Maharashtra and also the Southern states, we find that AP has a long way to go in terms of road length. Though the percentage of transmission and distribution losses are low when compared to the majority of the states mentioned, the costs of power supply is not satisfactory. This is one area which requires greater scrutiny by the state government (table 9).

To conclude, we can say that labour productivity is a better measure of assessing the investment climate of a particular group of industries as labour is less mobile than capital. Our analysis here clearly shows that in this aspect, chemical based industry is at the top followed by the metal based industry. Capital intensity is also another policy variable as by increasing private investment, capital per unit of labour can be raised. In this context, our study clearly shows that the metal based industries performed better. In addition, the state of Andhra Pradesh is considered to be a better investment climate

avenue because of the presence of healthier labour relations within the industrial sector. The government has to pay more attention in creating better infrastructural facilities so as to attract more private investors into the manufacturing activity.

6. Conclusions and Policy Implications

It is quite obvious from the analysis that while the registered manufacturing sector dominated the manufacturing activities in the state, the growth rate of GDP from the manufacturing sector as a whole and that of the registered and unregistered manufacturing sectors accounted for a decline in the post-reform period.

Chemical and metal based industries fall under the first group where the increase in labour productivity is because of the increase in capital intensity. Agro-based industries fall under the second group where there is an increase in all the three structural ratios (K/L, O/L and K/O). Labour productivity of all the three input based classifications has gone up in the post liberalisation period.

Despite the labour productivity being high for all the input-based classifications, the share of wages in NVA has in fact declined in the post-reform period. Employment elasticity with respect to output reveals that it is the chemical based industries which perform relatively better in the post-reform period when compared to the agro-based and metal-based industries.

A comparative analysis of the behaviour of the crucial structural ratios over the pre and post reform periods of the study will help us in understanding the behaviour of the capital intensity, which in turn allows us to scrutinise the labour productivity in detail. We have already seen that the labour productivity of all the three input based classifications registered an increase in the post-reform period and the labour productivity of the chemical based industry is the highest compared to the other two input based classifications. The metal based industries have performed better in terms of capital intensity compared to the other two. From our analysis on the growth rate of GDP from the registered manufacturing sector, it is clear that there is a decline in the growth rates in the post-reform period. If there has to be an increase in the growth rates of GDP from the registered manufacturing sector, it becomes essential on the part of the government to focus more on the chemical based and metal based industries as they have the potential to attract more private investment from the analysis of the structural ratios.

Further, creation of better investment climate in the form of improved infrastructural facilities, aiming to enhance the labour productivity, adopting pro-worker attitude would go a long way in improving the performance of the registered manufacturing sector.

In addition, the government can think of creating more industrial parks for the chemical and metal based industries which will increase their export potential. In the Industrial Policy 2005-10, Government of Andhra Pradesh identified 6 industrial clusters for development under “Industrial Infrastructure Up-gradation 30 Scheme”. Of which, two clusters namely Pharma Cluster near Hyderabad and Auto Components Cluster in Vijayawada have already been approved by Government of India for assistance and they are in process of development.

The Industrial Policy 2005-10 is now shifting its focus to one of the most promising industry of the future bio-technology (constituent of chemical based), which is seen as a high growth potential industry. AP with its vast resources can create a good environment for biotech companies. Andhra Pradesh’s advantage is its vast reservoir of scientific human resource with reasonable costs, wealth of R&D institutions, centres of academic excellence in bio-sciences. A vibrant pharmaceutical industry, and fast developing clinical capabilities collectively points to a promising biotechnology sector and places AP favourably in the global market. In view of this potential, a separate Directorate for Bio technology is being created by the state government. This apart, Government will come out with a new bio-tech policy with attractive benefits soon after announcement of Bio-tech policy by the Government of India to accelerate the growth of bio-tech industries in the state.

To conclude, analysis of the chemical based industries clearly shows that employment elasticity with respect to output is the highest, the fixed capital investment is also more and also the labour productivity is highest for this sector when compared to the other two classifications. Since, all these are the pre-requisites for a better investment climate; the government should endeavour to concentrate more on the development of this classification so that this will lead to the overall improvement of the performance of the registered manufacturing sector. Since the capital intensity is high for the metal based industries and as this is again another prerequisite for good investment climate, the government needs to focus on this classification as they have the potential to increase the overall growth rate of the registered manufacturing sector in Andhra Pradesh.

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