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Industrial Development in Andhra Pradesh Inter-Regional Disparities in Post-Reform Period?

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ABSTRACT

The main objective of the present study is to look at how industry is distributed across the three regions - Coastal Andhra, Telangana and Rayalaseema and also few growth centres - Visakhapatnam in Coastal Andhra, Hyderabad, Rangareddy and Medak in Telangana of Andhra Pradesh. In this context, we make an attempt to study the regional inequalities in the post-reform period. We estimate the growth rates of industry and manufacturing for the state as a whole for the period 1980-81 through 2010-11, for the regions and the growth centres for the period 1993-94 to 2006-07. ASI data is analyzed for the period 1980-81 through 2008-09. We also estimate the specialization coefficients and location quotients of industries at 2-digit level classification. The convergence/ divergence of industries are carried out with the help of coefficient of variation of per capita State Domestic Product.

Telangana and Visakhapatnam stand first in the share of manufacturing in GSDP in 2006-07. Rate of growth of industry increased both in Coastal Andhra and Telangana in post-reform period. The growth rate of manufacturing and registered manufacturing sector increased in Coastal Andhra, Telangana and Visakhapatnam increased in the post-reform period when compared to the pre-reform period. Per-worker productivity also increased in the post-reform period across the three regions and the three growth centres of Hyderabad, Rangareddy and Medak.

The presence of registered manufacturing is generally higher in the growth centres compared to the regions, with Medak standing first. While there is hardly any change in the percentage share of registered manufacturing in the three regions as well as in the state as a whole during 1993-94 and 2008-09, the growth centres (Vishakhapatnam and Hyderabad) showed a significant change. The percentage share of registered manufacturing increased significantly in Vishakhapatnam and decelerated in Hyderabad in 2008-09 compared to 1993-94.

Among the three regions and the four growth centres, only Telangana and its three growth centres has higher average capital productivity compared to the state as a whole, while capital per unit of labour is in fact lower with respect to the state average. In the other two regions, Rayalaseema and Coastal Andhra and also in Visakhapatnam, capital intensity per worker is higher compared to the state average and is characterized by lower capital productivity.

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Interestingly, we find no region or growth centre falling in the HH category during 2008-09. Labour productivity increased in the post-reform period and it is highest in Coastal Andhra compared to the other two regions. Within the growth centres, labour productivity declined in Vishakhapatnam in the post-reform period while it increased in the other three growth centres. Coefficient of correlation between per worker productivity and capital intensity is very high and strong in the growth centres in both the periods, while it is weak in regions during the pre-reform period and strong and very high during the post-reform period.

In 2008-09, it is observed that a major chunk of employment comes from the agro-based industries at the state level and also in the regions. For instance, agro-based industries contribute nearly 70 percent of employment at the state level during this year. On the other hand, we find that the share of net value added of agro-based industries registered a decline in 2008-09 at the state level and also in the regions. In case of non-agro-based industries, Rayalaseema stood first in share of workers and also in share of net value added in 2008-09.

In Coastal Andhra and Visakhapatnam food products and beverages dominate with 41 and 24 percent of employment respectively. The same group dominates in Rayalaseema, Telangana and Hyderabad, though with a smaller share. Telangana and Hyderabad have 42 and 44 percent respectively of registered manufacturing sector employment in manufacture of tobacco products. In Medak and Rangareddy we find higher share of employment coming from the chemical based industries. Non-metallic mineral products are the largest industry in Rayalaseema with nearly 44 percent of employment. Industries with significant domination though with smaller proportion of total employment are non-metallic mineral products in CA (11 percent) and in Telangana (7.7 percent), basic metals in Visakhapatnam and Rangareddy (16 percent). At the state level, manufacture of food products and beverages, manufacture of tobacco and manufacture of non-metallic mineral products account for a major share of employment. Out of these product groups, as high as 76 percent of employment comes from the manufacture of food products and beverages, followed by non-metallic and mineral products (around 63 percent).

Industrial base of Coastal Andhra is comparatively wide consisting of 8 out of 12 industries having location quotient more than one. Telangana comes next with 6 industry group having a higher than one location quotient. Rayalaseema has the narrowest industrial base with only 3 product groups having a location quotient greater than one. Rayalaseema has the lowest specialization coefficient for almost all the product groups excepting manufacture of tobacco products and manufacture of non-metallic mineral products. Telangana has the highest specialization coefficient of 0.32 for manufacture of rubber and plastic products followed by a specialization coefficient of 0.26 for manufacture of tobacco. Interestingly, Coastal Andhra has specialization coefficients of 0.16 and 0.12 only for two product groups - manufacture of food products and beverages and manufacture of tobacco products.

1. INTRODUCTION

The link between industrialization and development is an intricate matter which has generated significant deliberations among economists. The vast literature on the significant assessment of the process of industrialization in a number of developing countries has mainly noted two imperative features. First, the rapidity and array of industrialization are notable mostly when compared with underdevelopment and stagnation of the colonial past. Second, the process of industrialization has been bumpy over time and across space, both within and between countries. This pattern of industrialization resulted in significant regional disparities within countries. Uneven industrial development is a consequence of several structural factors such as distance from the market or the capital, infrastructure development, accessibility to critical raw materials, availability of capital and skilled workers and non-structural factors like political motivation (Subrahmanyam et al, 2002).

Backward linkages created from autonomous industrialization lead to the growth of markets for the primary products of the region. A more obvious improvement from this process comes in the direction of infrastructure. As industrialization absorbs primarily local labour, it is likely to reduce disguised unemployment in agriculture and increase agricultural productivity. These and similar arguments urge that industrialization should be considered as an 'opportunity' for the development of the regional economy. Attempts to explain regional growth patterns analytically have always recognized both the potential contribution of international trade theory and its inadequacies. The implications of conventional trade theories applied to regional development are that there would be continual pressures for equalization of regional product prices and factor incomes. However, it has also been recognized that a substantial amount of time might be required for this theoretical prediction to work out (Chakravarty et al.2009).

According to dominant theory of modern economic development, industry is expected to play a major role in creating as well as mitigating disparities among different regions. Industry is seen as the main engine of growth (Kaldor, 1967) and industrial development is subject to cumulative causation to a larger degree than development of other sectors (Myrdal, 1957). Industrial development, and consequently overall economic development of different regions, according to the typical conventional theory of regional

development, is expected to take a path that finally leads to a convergence (See Barro and Sala-i-Martin, 1992 and 1995). To begin with, industrial development takes place as a result of developed infrastructure, agglomeration and linkages, but subsequently, when diminishing returns set in in the more industrialized regions-it shifts to less developed regions. Since diminishing returns set in agriculture much earlier, due to land being fixed in nature and because of limits to technological progress, it is industry with extension of increasing returns for a logically long period of time, that plays the levelling role once the process of its development starts in the poorer regions. The historical experience of development, as a result, has revealed what is called "inverted U-shaped" behaviour of disparities in the long period development (Williamson, 1965; Barro and Sala-I-Martin, 1990; Kuznets, 1955). In a way, this represents the spatial version of Kuznets Hypothesis on income inequality.

Quite contrary to the convergence hypothesis there is an equally strong outlook that puts forward increasing divergence because of technology and agglomeration externalities which make increasing returns possible over long periods. Different regions situated differently in terms of initial levels and capacities for development are thus subjected to "cumulative causation". They not only grow differentially due to internal factors, but differences get reinforced through interaction among them through the mechanism of "back-wash effects" (Myrdal, 1957; Hirschman, 1958; Kaldor, 1967). Differences arise and get perpetuated often by what are called the 'core-periphery' and 'dependency' relationships that apply both internationally and inter regionally (Baron, 1957). Technological change, new forms of organization and transaction costs are also seen by some, specially the post-Fordist scholars, as factors leading to widening of disparities (Piore and Sebel, 1984).

While Myrdal (1957) refers to the forces of convergence and of divergence as spread and backwash effects, Hirschman (1961) describes these broadly as trickling-down and polarization effects respectively. Scrutinizing regional economic literature, one comes across at least three different hypotheses in this regard and these differ on the emphasis given to the relative importance over time of the forces of convergence and of divergence. One of these is the self-perpetuation hypothesis propounded by Hughes (1961) and found empirically valid by Booth (1964) for the USA. According to this view, the forces of divergence dominate over those of convergence and as a result, inter-regional differences in the levels of economic development keep on widening over time. A diametrically opposite view is the convergence hypothesis propounded and found empirically valid by Hanna (1959) and substantiated these days also with the Solovian logic that the rate of economic growth is inversely related to the level of per capita income and hence given identical technologies, preferences and rates of population growth, cotemporaneous differences in per capita incomes between any two regions will be transitory. Considerable

evidence to support the hypothesis empirically has been provided by Hanna (1959), Perloff et al (1960) and more recently by Sala-i- Martin (1996) .The third hypothesis, which is a combination of these two diametrically opposite views is the concentration cycle hypothesis propounded by Williamson (1965). The proponents of this view, point out that inter-regional economic differentials diverge initially to converge later on and thus trace out the famous Kuznetsian inverted U shaped curve over time in the process of national economic development. Considerable empirical evidence in support of such a view emerged as a result of a detailed international study of regional development experiences by Williamson (1965). A new and valid point being stressed in this regard by many including Nair (1982) is that the pattern of regional change depends upon the indicator of development being considered, with different indicators showing different patterns of regional change.

What then has been the experience in Andhra Pradesh? Have inter-regional disparities in economic development and industrial activity increased or declined especially since early 1990s when economic reforms were introduced and the state adopted the path of globalisation? There is a view that post- reform regional development is likely to be more evenly balanced" (Elizondo and Krugman, 1992), as a "free flow of goods, services and factors of production" would have strengthened spread affects thus reducing inter-regional disparities (Dholakia, 2009). A study using ASI data has, however, found that the new investments are spatially more concentrated in the post-reform than in the pre-reform period (Chakravorty and Lall, 2007). It is, therefore, interesting to study the pattern of disparities in the post-reform period when most of the "interventionist" measures have been removed in comparison with the pre-reform period when they were in place

Broadly, the study seeks to answer the following questions:

- How is industry distributed across the different regions of AP? What changes have taken place in the share of industries in different regions over the years?
- What has been the performance of different regions in the growth of industry? Have the industrially better developed regions experienced faster industrial growth?
- How does the structure of industries - agro-based and non-agro based differ among regions? Have there been significant changes in recent years? What explains the structural variations in industry among regions?
- Is there convergence or divergence across the three regions?
- How do technical ratios like output-labour, capital-output and capital-labour, differ among regions? Have there been changes in relative position of different regions in these ratios?

- How do the location quotients and specialization coefficients differ among regions?

Andhra Pradesh is divided into three regions on the basis of cultural, socio-economic and region specific resource base: Coastal Andhra (CA), Telangana (TEL) and Rayalaseema (RS) (CESS, 2008). In this paper, we primarily stick to this standard regional classification. Nevertheless, in order to bring in more logical meticulousness, we have also considered a few growth centres separately: Visakhapatnam (Coastal Andhra), Hyderabad, Rangareddy and Medak (Telangana). The growth centres are chosen based on their contribution to AP economy. The existence of public sector undertaking, Iron and Steel industry in Visakhapatnam make it as an important growth centre in CA. Hyderabad, Medak and Rangareddy in Telangana are characterized by the presence of a large number of industrial units making them a cluster of growth centres contributing to the development of AP (Chakravarty, Aivelu, 2009). We bring in the issue of the state as a whole mainly to contrast different regions and growth centres in the context of AP.

This paper is organized in six sections. The next section deals with issues related to data. This is followed by a detailed discussion of industrial development as a whole, along with the service sector, in the three different regions of AP. We also focus on the growth centers separately. We bring out some contrasts between the development of the service sector and the performance of industry in the different regions of AP. Convergence and divergence of industries is analyzed in section four. As registered manufacturing plays the most important role within the industrial sector, the fifth section is devoted to an analysis of the features of this sector in the different regions of AP as well as in the specific growth centres. Section six looks at the performance of the agro-based and non-agro based sectors of the registered manufacturing sector. The overall features of the state will be used as a meaningful benchmark for all the six sections dealing with hard facts. The last section provides the conclusions.

2. DATA AND METHODOLOGY

In order to capture the regional performance of the industrial sector in AP we have to look mainly at two crucial variables relating to this sector, employment and output. The industrial sector comprises mining, manufacturing, electricity, gas and construction. The National Accounts Statistics (NAS) published by the Central Statistical Organization (CSO) provide time series data for gross state domestic product (GSDP) in terms of broad industrial classifications at the single digit level. From this source it is easy to get the industrial output figures at the state level. However, at the district level this data set is available only from 1993-94 onwards.

The period for analysis chosen for SDP in this study is 1980-81 to 2010-11. For District Domestic Product (DDP), the period of study is from 1993-94 to 2006-07, as this data

is available from 1993-94 onwards. In this paper we make an attempt to understand the regional dimension of industrial development in AP in the perspective of the foremost changes in the macroeconomic policy regime of the country. Consequently, we work with two periods: the initial phase of liberalization/pre-economic reform from 1980-81 to 1992-93 and the later phase of liberalization/post-economic reform from 1993-94 to 2010-11 with 1999-2000 as base: we expect to capture changes through relevant comparisons. Considering the significance of the manufacturing sector within the industrial sector in general and registered manufacturing in particular, we decided to narrow down our focus. Another vital reason behind this decision is the availability of a rich data set for the registered manufacturing sector provided by the Annual Survey of Industries (ASI) published by the CSO. ASI provides fairly detailed information regarding output, employment, capital formation, wages etc for the factory sector of manufacturing every year. As 2008-09 is the latest year for which data are available for the districts of Andhra Pradesh, we looked at the ASI data from 1980-81 through 2008-09. While the problems with the district level ASI data are well known (Saluja 2004), this is the only secondary source which gives us information at the district level for the factory sector. The wholesale price index numbers with 1981-82 as base for the first period and with 1993-94 as base for the second period are used for deflating the net value added and the emoluments. We deflate the fixed capital figures by a composite index of electrical and non-electrical machinery. In order to calculate the trend growth rates we fit a semi-log equation.

We estimate the convergence and divergence with the help of coefficient of variation. Location quotients and specialization coefficients are also calculated.

3. INDUSTRIAL DEVELOPMENT IN ANDHRA PRADESH

This section aims at giving a broad sketch of the production performance of the industrial sector in AP. Here, we look at the performances, during 1980-81 to 2010-11, of the manufacturing sector, both registered and unregistered, and of the service sector in some detail. This is sub-divided into two periods - i.e., 1980-81 to 1992-93 (pre-reform) and 1993-94 to 2010-11(post-reform).

Sectoral growth rates of SDP are given in table 3.1. It may be seen that in AP, the industrial growth rate registered an increase of nearly 4 percentage points while that of the manufacturing sector declined by around 2.5 percentage points during post-economic reform period. Within the manufacturing sector, the growth rate of both registered and unregistered sectors decreased with the decline being the highest for the registered manufacturing sector again in the post-reform period. Thus, at the state level, the manufacturing sector which is the driving force of an economy has not performed well in the post-reform period.

Table 3.1: Trend Rate of Growth of State Domestic Product from Industries and Services in AP during 1980-81 - 2010-11 (percent per annum) (1999-2000 prices)

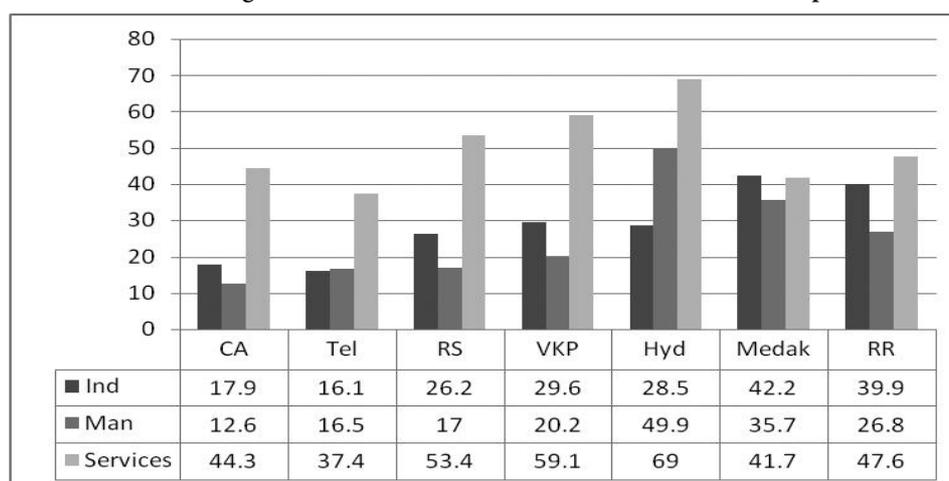
Sector	1980-81 to 1992-93	1993-94 to 2010-11
Industry	6.9* (0.004)	7.3* (0.003)
Manufacturing	8.3* (0.005)	5.8* (0.002)
Registered Manufacturing	9.3* (0.005)	6.0* (0.003)
Unregistered Manufacturing	6.1* (0.005)	5.4* (0.003)
Services	7.2* (0.002)	7.8* (0.001)

Note: Figures in the parenthesis indicate standard errors; * indicates 5% level of significance.

Source: National Account Statistics.

What is the scenario at the district level? Since data are available at the district level only from 1993-94 onwards, the percentage shares of industry, manufacturing and service sectors in DDP are analyzed for two points of time: in the early 1990s (1993-94) and in the mid- 2000s (2006-07). Average annual growth rates are analyzed for two periods - 1993-94 to 1998-99 and 1999-2000 to 2006-07.

Figure 1: Percentage Shares of Industry, Manufacturing and Services in Total Domestic Product in Regions, AP and Growth Centres, 1993-94 (1999-2000 prices)

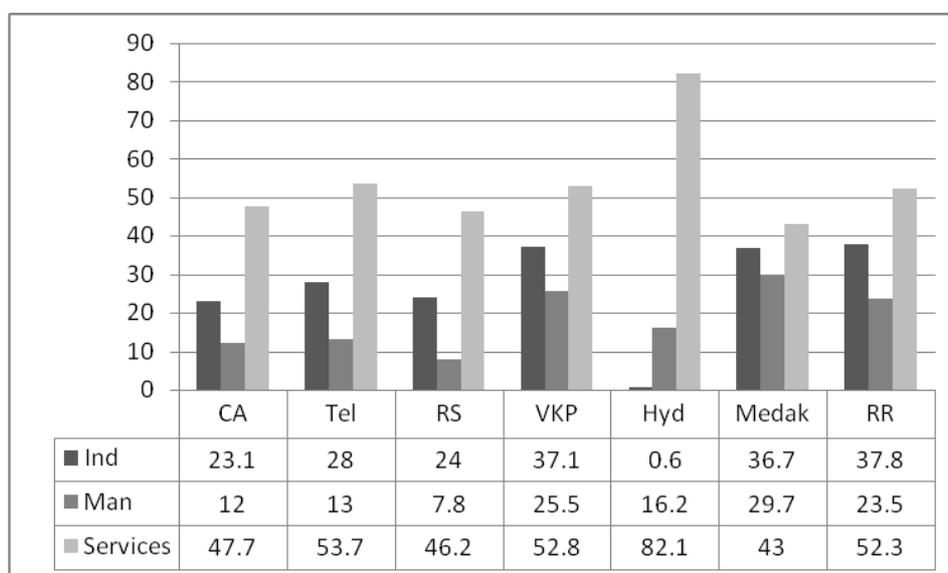


Source: State Domestic Product and District Domestic Product, AP, Several Years

If we look at the state as a whole, there is an increase (13 percentage points) in the share of industry in SDP in 2006-07 over 1993-94, while the share of the manufacturing sector in SDP remained more or less the same in 2006-07 when compared to 1993-94 (Figure 1). The increase in the share of industries in SDP in 2006-07 compared to 1993-94 can be attributed to the increase in the mining and construction activity in the state. Within the manufacturing sector, at the state level, share of registered sector increased while that of the unregistered sector in SDP declined in 2006-07 as compared to 1993-94 (Figure 2). On the other hand, the share of services in SDP registered an increase of nearly 15 percentage points in mid-2000s over the early nineties.

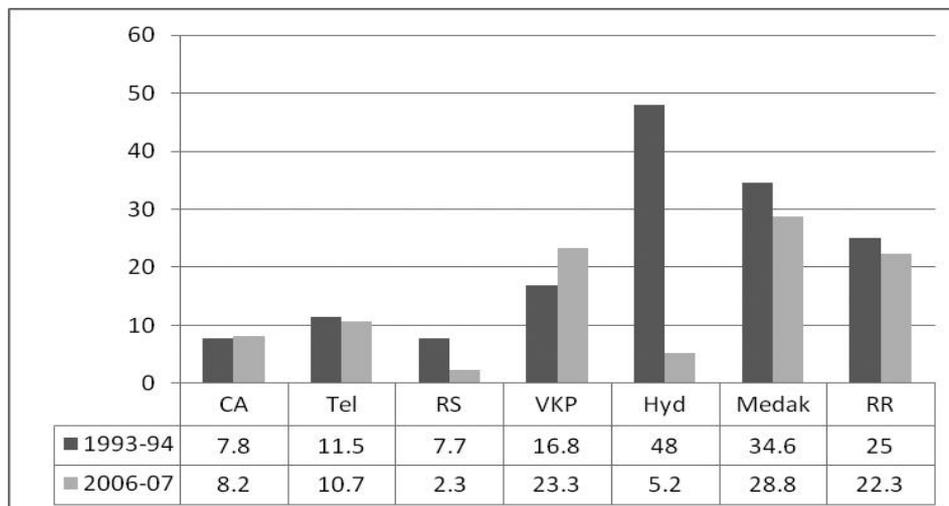
Across the regions of the state, share of the manufacturing sector (registered and unregistered) in SDP declined in 2006-07 vis-à-vis 1993-94 in Telangana and Rayalaseema (Figure 3 & 4) and the share of service sector in SDP increased in all the three regions (Figure 2) in 2004-05 over 1993-94. In the growth centres, share of the registered manufacturing sector in DDP in Visakhapatnam district accounted for an impressive increase of around 8 percentage points, while Hyderabad registered a large decline in the share of manufacturing sector in SDP (34 percentage points) in 2006-07 compared to 1993-94. It is interesting to note that the share of the service sector in SDP in 2006-07 increased in Hyderabad district by as high as 13 percentage points over 1993-94 (Figure 2).

Figure 2: Percentage Shares of Industry, Manufacturing and Services in Total Domestic Product in Regions, AP and Growth Centres - 2006-07 (1999-2000 prices)



Source: State Domestic Product and District Domestic Product, AP, Several Years

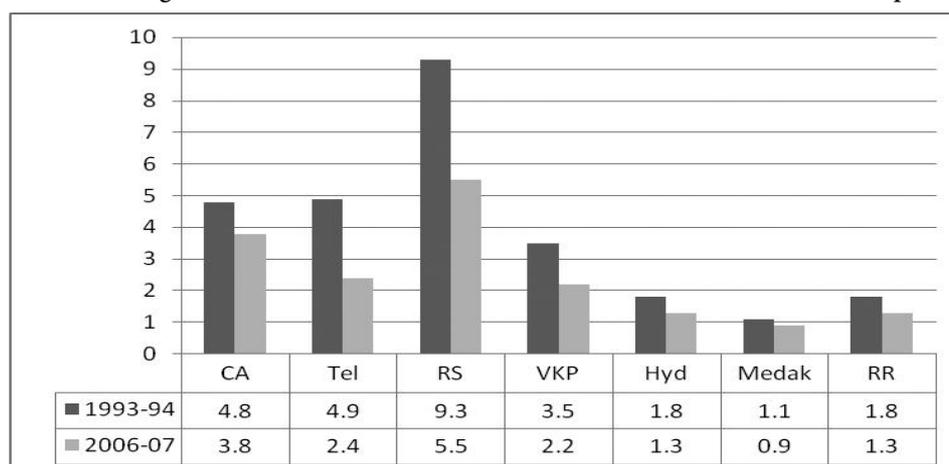
Figure 3: Percentage Shares of Registered Manufacturing Sectors in Total Domestic Product in Regions, AP and Growth Centres in 1993-94 and 2006-07 (1999-2000 prices)



Source: State Domestic Product and District Domestic Product, AP, Several Years

It is evident from the above tables that while development in Coastal Andhra is concentrated in one district (Visakhapatnam), it arises from a cluster of districts (Hyderabad, Medak and Rangareddy) in Telangana. In Visakhapatnam district, industry accounts for nearly 37 percent of SDP in 2006-07, which can be accredited mostly to the presence of the iron and steel industry which is a public sector undertaking.

Figure 4: Percentage Shares of Unregistered Manufacturing Sectors in Total Domestic Product in Regions, AP and Growth Centres in 1993-94 and 2006-07 (1999-2000 prices)



Source: State Domestic Product and District Domestic Product, AP, Several Years

Based on the above analysis, we rank the regions and the growth centres. While CA ranks third in share of total manufacturing in 1993-94, it moved to second position in 2008-09, Telangana moved from second to first position and Rayalaseema moved from first position in 1993-94 to third position in 2008-09. Each of the two segments, registered and unregistered also show very high similarity in ranking with that in total manufacturing. These ranking also remain quite stable in terms of the total manufacturing, as well as its two segments. But ranks changed significantly in growth centres in respect of the registered and unregistered segments. For instance, Hyderabad slid down to the fourth position in 2008-09 from first position while Visakhapatnam climbed to the second position from fourth during the same period in case of registered manufacturing sector (Table 3.2).

Table 3.2: Rank Orders of Regions and Growth Centres in Organised Manufacturing in 2006-07

Regions						
	Total manufacturing		Registered manufacturing		Unregistered manufacturing	
	1993-94	2006-07	1993-94	2006-07	1993-94	2006-07
Coastal Andhra	3	2	2	2	3	2
Telangana	2	1	1	1	2	3
Rayalaseema	1	3	3	3	1	1
Growth Centres						
Visakhapatnam	4	2	4	2	1	1
Hyderabad	1	4	1	4	2	2
Medak	2	1	2	1	4	4
Rangareddy	3	3	3	3	2	2

Source: Own calculations based on DDP, AP

The average annual growth rates of industry and manufacturing in SDP increased in CA and Telangana while it registered a negative growth rate in Rayalaseema in the post-economic reform period. The average annual growth rate of industry in SDP increased by more than double in Rayalaseema, while that of the manufacturing sector accounted for a negative growth rate (-2.0) in the same period. The increase in the growth rate of industry in SDP in this region during the post-economic reform period is because of the increase in the mining activity in Kadapa district especially during the period 2005-07. Within the growth centres, Hyderabad witnessed a negative average annual growth rate (-6.6%) of manufacturing sector in DDP in the post-economic reform period,

while Medak accounted for a decrease in growth rates of both industry and manufacturing sector in total DDP. On the other hand, in Ranga Reddy we observe that the growth rates of industry, manufacturing and services registered an increase in the second period over the first (Table 3.3).

Table 3.3: Average Annual Growth Rates of Industry, Manufacturing and Services in Total Domestic Product in Regions AP and Growth Centres during 1993-94 to 2000-01 and 2001-02 to 2006-07 (percent) (1999-2000 prices)

Regions/DDP	Average Annual Growth Rates 1993-94 to 2000-01			Average Annual Growth Rates 2001-02 to 2006-07		
	Industry	Manuf.	Services	Industry	Manuf.	Services
Coastal Andhra	6.4	5.9	7.3	11.9	11.0	8.0
Telangana	6.1	5.5	7.7	9.8	8.5	10.2
Royalaseema	6.2	4.8	6.4	17.8	(-)2.0	7.2
AP	6.1	5.1	7.5	11.5	7.7	9.4
Growth Centres						
Visakhapatnam	13.3	16.4	8.6	15.3	16.7	9.4
Hyderabad	5.0	5.0	10.1	(-) 6.6	1.6	11.3
Medak	8.3	9.6	7.7	7.8	7.8	9.8
Rangareddy	6.2	6.1	8.4	13.9	12.8	14.5

Source: State Domestic Product and District Domestic Product, AP, Several Years

For the manufacturing sector, the data clearly shows that except Royalaseema, in the other two regions, the average annual growth rates of registered manufacturing sector in DDP increased in the second period over the first period. In case of growth centres, we find that except Ranga Reddy, the growth rates of manufacturing sector in DDP decreased in the second period when compared to the first (Table 3.4).

Royalaseema has seen the slowest transformation of the economy. Over a period of time, the contribution of industry, manufacturing and the services sector to the total domestic product registered a decline. Its growth rate, especially that of the manufacturing sector has been the lowest in fact it has been negative (-2.0).

There is one question which has significant concern now with respect to the relationship between structural transformation and growth. (i) Have growth rate and structural transformation taken place together? We will answer the question by taking into consideration the correlation between growth of GSDP and change in shares of industry, manufacturing and services.

Table 3.4: Average Annual Growth Rates of Registered Manufacturing Sector in Total Domestic Product in Regions AP and Growth Centres during 1993-94 to 1998-99 and 1999-2000 to 2006-07 (percent)

Regions	1993-94-1998-99		1999-2000 to 2006-07	
	Manuf.	Registered	Manuf.	Registered
Coastal Andhra	5.9	6.7	11.0	12.8
Telangana	5.5	5.4	8.5	8.7
Rayalaseema	4.8	3.6	(-2.0)	0.1
AP	5.1	4.5	7.7	9.0
Growth Centres				
Visakhapatnam	16.4	19.5	16.7	17.9
Hyderabad	5.0	5.0	1.6	0.6
Medak	9.6	9.8	7.8	7.5
Rangareddy	6.1	6.2	12.8	13.2

Source: State Domestic Product and District Domestic Product, AP, Several Years

The analysis of the correlation matrix indicates that few of the observed relationships are very strong. At the aggregate level, the strongest relationship is between the growth of GSDP and change in share of industry (0.95) and also of services (0.84) during the period 2001-02 to 2006-07. The positive sign of these two indicate that both growth rate and structural transformation of industries and services have taken place together during the second period in the state as a whole. But when we consider the entire period spanning from early nineties to late 2000s, in case of industry and service sectors, the correlation is positive indicating that though the growth and structural formation has taken place together, the relationship is weak indicating that the changes in percentage shares do not have significant relation with the growth rates of these two sectors. The sign of the manufacturing sector in the first and the second period is negative implying that the structural transformation and the growth of the manufacturing sector have not taken place simultaneously (table 3.5).

Table 3.5: Structural change and Rate of Growth of GSDP in AP (1993-94 through 2006 - 07)

Correlation between growth of	1993-94 - 2000-01	2001-02 - 2006-07	1993-94 - 2006-07
GSDP and change in share of industry	-0.58	0.95	0.21
GSDP and change in share of manufacturing	-0.61	-0.36	0.17
GSDP and change in share of services	0.33	0.84	0.19

Source: Own calculations based on DDP, AP Various issues

4. CONVERGENCE OR DIVERGENCE

De la Fuente (2002) reports evidence of convergence across Spanish regions in each of the three decades between 1965 and 1995. Juan-Ramon and Rivera-Batiz (1996) study the states of Mexico over the period 1970 to 1993, and accounts convergence in incomes between 1970 and 1985 and divergence subsequently. Jian, Sachs, and Warner (1996) look at the provinces of China between 1952 and 1993, and finds substantiation of divergence in real per capita incomes, except for the period 1978 to 1990.

The contributions on convergence and divergence can be largely divided into two groups, (i) regression-based approach (ii) measures of inequality approach. The regression-based approach is a corollary of the neoclassical growth theory, which says that due to diminishing returns to capital, regional economies (assumed to be having comparable rates of savings and technical progress) should exhibit convergence over time. This implies that regression based approach defines convergence or beta convergence as a procedure through which the poorer regions grow at a faster rate compared to the richer regions, and hence have a propensity to catch up with them. Cashin and Sahay (1996) test the hypothesis of beta convergence for Indian states over the period 1961 to 1991. Their results suggest that absolute beta convergence is observed during this period. Marjit and Mitra (1996) also study the convergence hypothesis of the Indian states. They focus on the negative relationship between initial incomes and subsequent growth rates, which is a basic characteristic of the regression-based approach. Their results show that there is no evidence of convergence among Indian states for the period under study. Nagaraj, et al. (1998) also uses the regression-based approach but tests for conditional convergence instead of absolute convergence by considering independent variables like agriculture's share in the states output, etc apart from initial values of per capita output for the state. The results of their study show a negative coefficient of the initial per capita output and hence validate the conditional convergence hypothesis for the states of the Indian economy. Rao, Shand and Kalirajan (1999) test the hypothesis of convergence among Indian states for the period 1965-66 to 1994-95 using regression equations and they find divergence across the states. Interestingly, the observed positive relationship appears to have strengthened during the reform process of the 1990s. Another paper Singh, et al. (2003) uses the regression-based approach tests for absolute convergence of per capita consumption expenditures and finds that there is absolute divergence during the 1980s and 1990s.

An alternative approach to convergence is a reduction in the inequality of regional incomes over time. Reduction in regional income inequality is measured in terms of a decrease in the standard deviation of the logarithm of regional per capita incomes. This standard deviation-based approach is also known in the literature as sigma convergence (Barro and Sala-i-Martin, 1995). Cashin and Sahay (1996) use this method and find

that the value of this measure of dispersion increases from 0.29 in 1961 to 0.33 in 1991, indicating sigma divergence. Rao, Shand and Kalirajan (1999) also compute standard deviation of per capita GDP across states from the mid-1960s to mid-1990s. The estimated dispersion shows a steady rise during 1965-66 to 1994-95, indicating strong sigma divergence. Another easy measure that has been used to study this issue is the coefficient of variation. Nagaraj, et al. (1998) uses the coefficient of variation of the real per capita GDP across states to confirm that inequalities have indeed risen over the period 1960 to 1994. Ahluwalia (2000), while attempting to measure variation in growth performance across 14 major Indian states in both the pre-reform (1980s) and post-reform (1990s) years, observed a significant degree of dispersion in growth rates among Indian states during the later period, indicating divergence. Bhattacharya and Sakthivel (2004) observed the pattern of growing disparity among states in India. They show that the average coefficient of variation based on per capita GDP has gone up from 0.22 during the 1980s to 0.43 during the 1990s, almost a two-fold increase.

Rao, Shand and Kalirajan (1999) find that a major source of the steady rise in standard deviation of per capita GDP from the primary sector and the standard deviation of per capita GDP for the secondary sector is relatively stable until 1990 but increased later. As far as the service sector is concerned, no consistent trend was discernible from their study. Das and Barua (1996) use a regression equation and find that the agricultural and services sector inequalities are important factors that explain the aggregate inequality in the Indian context, while total manufacturing does not.

Table 4.1: Coefficient of Variation of Industry, Manufacturing, Registered and Unregistered in CA, Telangana and Rayalaseema in pre-reform and post-reform periods

Regions/ Growth Centres	Pre-reform				Post-reform			
	Ind	Man.	Reg	Unreg	Ind	Man.	Reg	Unreg
CA	0.12	0.12	0.14	0.12	0.19	0.17	0.19	0.13
Telangana	0.11	0.11	0.12	0.11	0.16	0.13	0.14	0.12
Rayalaseema	0.11	0.09	0.11	0.11	0.32	0.10	0.24	0.13
Andhra Pradesh	0.11	0.09	0.04	0.11	0.41	0.29	0.33	0.21

Source: Own calculations based on SDP, DDP, AP, various issuesm

Table 4.1 highlights two points. Firstly, it is obvious that during post-reform period, industry and registered manufacturing sector in Rayalaseema have much higher income inequality compared to the other two regions. Secondly, the table explicitly points to inequality increasing for the aggregate economy as well as its sectors during this period. The rise is the lowest for the unregistered sector where the coefficient of variation has

risen by about ten percentage points, while the coefficient of variation of the registered manufacturing has gone up by 31 percentage points in the post-reform period. Coastal Andhra seemed to be more divergent in post-reform period as far as the manufacturing sector is concerned.

5. THE REGISTERED MANUFACTURING SECTOR

The structural transformation has not been in favor of the manufacturing sector at the state level. It is in this context, it becomes crucial to look at the performance of the registered manufacturing sector. The period chosen for analysis is 1980-81 to 2008-09. 2008-09 is the latest year for which the Annual Survey of Industries (ASI) data are available at the district level. 1980-81 to 1992-93 is taken as the initial phase of liberalization and 1993-94 to 2008-09 as the later phase of liberalization. Structural ratios like per worker productivity (O/L), capital output ratio (K/O) and capital intensity (K/L) are analyzed to look at the performance of the registered manufacturing sector.

Table 5.1: Percentage Share of Registered Manufacturing in Different Regions and Growth Centres, 1993-94 and 2008-09

Regions	Percentage share of registered manufacturing	
	1993-94	2008-09
Coastal Andhra	61.9	68.5
Rayalaseema	45.5	30.0
Telangana	70.2	82.0
Andhra Pradesh	61.2	71.1
Growth Centres	1993-94	2008-09
Visakhapatnam	82.9	91.2
Hyderabad	96.3	80.1
Medak	97.0	97.0
Rangareddy	93.2	94.6

Source: Calculated from District Domestic Product, Andhra Pradesh

Table 5.1 clearly shows the dominance of registered manufacturing in the total manufacturing output of the state, regions and the growth centres. The presence of registered manufacturing is generally higher in the growth centres compared to the regions, with Medak standing first. While there is hardly any change in the percentage share of registered manufacturing in the three regions as well as in the state as a whole during 1993-94 and 2008-09, the growth centres (Vishakhapatnam and Hyderabad) showed a significant change. The percentage share of registered manufacturing increased significantly in Vishakhapatnam and decelerated in Hyderabad in 2008-09 compared to 1993-94.

We now take stock of the situation concentrating only on the latest year for which the ASI data are available for the registered manufacturing sector. It is important to mention here that we have considered net value added figures for output, total persons engaged for labour and the value of fixed capital for capital. Table 5.3 groups different regions and growth centres in relation to the state average in both the components of labour productivity, namely, capital labour ratio and capital productivity, with reference to 2008-09. The values above the state average are grouped under high (H), and the values below the state average are considered to be low (L). This two by two matrix gives us four groups: HH, HL, LH and LL.

Table 5.2: Categorization of Regions according to the behaviour of K/L and O/K in relation to the State averages, 2008-09

		Output/ Capital	
		H	L
Capital/ Labour	H	Nil	RS, CA, Visakhapatnam
	L	Telangana, Medak, Hyderabad, RR	Nil

Source: Calculated and composed from the ASI.

Among the three regions and the four growth centres only Telangana and its three growth centres have higher average capital productivity compared to the state as a whole, while capital per unit of labour is in fact lower with respect to the state average. In the other two regions, Rayalaseema and Coastal Andhra and also in Visakhapatnam, the capital intensity per worker is higher compared to the state average and is characterized by lower capital productivity. Interestingly, we find no region or growth centre falling in the HH category during 2008-09 (Table 5.2).

The presence of iron and steel industry and the Visakhapatnam shipyard in Coastal Andhra together pulled it into the high capital/labour ratio region. But a more detailed analysis is required to argue why Coastal Andhra falls in the group of low capital productivity. One reason could be that the remaining region outside Visakhapatnam in Coastal Andhra is dominated by labour intensive and thus low labour productivity manufacturing. The high capital/ labour ratio in Rayalaseema, the least developed region, may suggest a particular case of state support. The Andhra Pradesh Industry Hand Book in 1984, in fact, mentions that since most of the districts of the Rayalaseema region are classified as 'backward', they could get state and central government incentives in the form of subsidies: these subsidies range from the state government investment subsidy of 10 percent to the central government investment subsidy of 15 percent (Chakravarty *et al.* 2007).

A comparative investigation of the behavior of the critical structural ratios reveal that per-worker productivity/labour productivity (O/L) of the registered manufacturing sector remained constant at 0.1 during the pre-economic reform period and it increased in all the three regions and the state as whole during the post-reform period. The increase in labour productivity is the highest in Coastal Andhra (from 0.1 in pre-reform period to 0.7 in post-reform period). However, the growth centres present a different picture. While in Visakhapatnam, labour productivity registered a decline in the post-reform period, there is an increase in per worker productivity in the other three growth centres during the same period. Medak witnessed higher growth in labour productivity in the post-reform period when compared to the other two growth centers of Telangana region (Table 5.3).

Table 5.3: Capital-Output Ratio and Labour Productivity (O/L) for Different Regions of AP and the Growth Centres (labour productivity is in Rs. lakhs) (1980-81 through 2008-09)

Regions	K/O		O/L	
	Period I 1980-81 to 1992-93	Period II 1993-94 to 2008-09	Period I 1980-81 to 1992-93	Period II 1993-94 to 2008-09
Coastal Andhra	3.0	4.0	0.1	0.7
Rayalaseema	3.2	3.3	0.1	0.6
Telangana	2.3	1.8	0.1	0.5
Andhra Pradesh	2.5	2.5	0.1	0.5
Growth Centres				
Visakhapatnam	31.4	8.9	2.1	1.5
Hyderabad	1.2	0.9	0.2	0.7
Medak	2.0	1.6	0.3	1.1
Rangareddy	2.7	1.8	0.4	0.9

Source: Calculations based on ASI data, various issues

The case of capital output ratio (K/O) reveals that it registered a decline in Telangana, Visakhapatnam, Hyderabad and Rangareddy in the post-reform period as compared to the pre-reform period. On the basis of this evidence we can say that in Coastal Andhra and Rayalaseema more of capital has been used to produce a unit of output in the post-reform period compared to pre-reform period. The reason for this could be that capital innovations on balance served more to replace other factor inputs rather than the output. However, in Visakhapatnam, the balance has been in the reverse direction in the post-reform period - the purpose of capital innovation has been to increase the efficiency of

capital and thus to increase the output rather than to replace other factor inputs (Table 5.3).

Does technological variation explain the above mentioned inter-regional differences in labour productivity of registered manufacturing sector? Taking capital intensity, measured in terms of capital per worker as the indicator of technology, we attempt to examine this question.

Table 5.4: Capital-Labour Ratios for Different Regions and Growth Centres 1980-81 through 2008-09

Regions	Capital / Labour	
	Period I 1980-81 to 1992-93	Period II 1993-94 to 2008-09
Coastal Andhra	0.4	2.3
Rayalaseema	0.3	1.8
Telangana	0.3	0.7
Andhra Pradesh	0.3	1.2
Growth Centres		
Visakhapatnam	6.3	7.1
Hyderabad	0.3	0.6
Medak	0.5	1.7
Rangareddy	0.5	1.3

Source: ASI, AP, various issues

It is a well-known fact that different industries use different levels of technology in production. Simultaneously, it could also be reasonably assumed that a high technology industry would be so, irrespective of its location in one region or the other. Nevertheless, there could be differences from region to region due to, firstly, the factors within the same product growth that a region specializes in production, and secondly, perhaps because of the choice of technology - capital intensive vs. labour - that the entrepreneur may decide to adopt depending on the labour market situation. Thus regions with high capital intensity account for an increase in labour productivity in the post-reform period. Coastal Andhra is a case in point to illustrate the above explanation. However, the increase in capital intensity of registered manufacturing sector in the post-reform period in Visakhapatnam did not result in an increase in labour productivity during the same period (Table 5.4). This may be attributed to the second factor that we mentioned above - choice of technology - labour versus capital intensive.

Table 5.5: Correlation Coefficient between per worker productivity and capital intensity in registered manufacturing during 1980-81 through 2008-09 in regions and growth centres

	1980-81 - 1992-93	1993-94 - 2008-09
Regions	-3.93	0.98
Growth centres	0.99	0.94

Source: Calculations based on ASI data, various issues

Coefficient of correlation between per worker productivity and capital intensity is very high and strong in the growth centres in both the periods, while it is weak in regions during the pre-reform period and strong and very high during the post-reform period (Table 5.5). Thus technology, insofar as it is pointed out by capital labour ratio, elucidates a great element of the inter-region variations in productivity in manufacturing industries in the registered sector. Influence of local factors, together with working environment and customs in leading to differences in productivity even with the use of comparable technology in an industry, however, cannot be ruled out.

6. AGRO-BASED AND NON-AGRO BASED INDUSTRIES

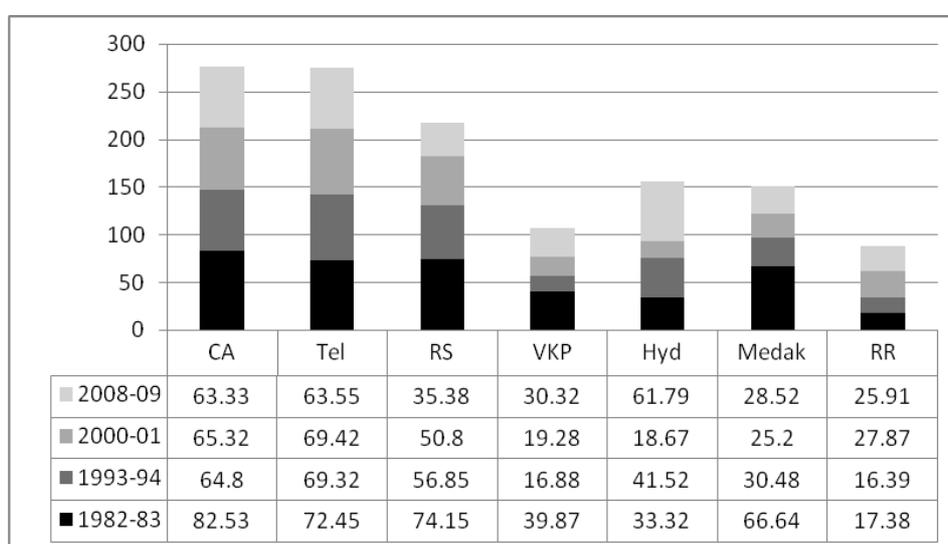
Since registered segment now comprises of a considerably large part of total manufacturing in the state (accounting for 71 per cent) and also a huge part of the unregistered sector is found to be linked with the registered sector, it would be significant at this juncture to go into some added particulars as regards the product structure of this sector. This is taken care here in respect of two features of the product groups. In the first case, we try to broadly classify industries into two groups-agro-based and non agro-based, the former consisting of product group 15 to 25 and later 26 to 37¹, according to the National Industrial Classification (NIC) 1998. Subsequently, we identify major product groups (at 2-digit level) of different regions and growth centres in order to examine industrial diversification and specialization of regions and industries. We make use of the location quotients and coefficients of specialization/diversification to further sharpen our analysis.

Agro-based products have always dominated the Indian as well as the state's manufacturing industry in terms of employment, employing majority of workers working in the sector. Around 61 percent of the workers are employed in agro-based industries in 2008-09 at the state level. Though the shares of employment declined in 2008-09 when compared to 1982-83 in CA, Telangana and RS, we still observe that the major chunk of employment comes from agro-based industries. Rayalaseema witnessed a huge decline in share of workers in 2008-09; it declined by almost half compared to 1982-

¹ See appendix - 1

83. Within the growth centres, the share of employment of the agro-based industries is highest in Medak in 1982-83, while it declined by more than half in 2008-09, during this year, we observe that there has been a huge decline in the share of workers in the product group - manufacture of food products and beverages. On the other hand, in Hyderabad, we find that the share of workers in agro-based industries doubled in 2008-09, because of high share of workers in manufacture of food products and beverages and manufacture of tobacco products (Figure 5).

Figure 5: Share of employment by Agro-based industries in registered manufacturing sector

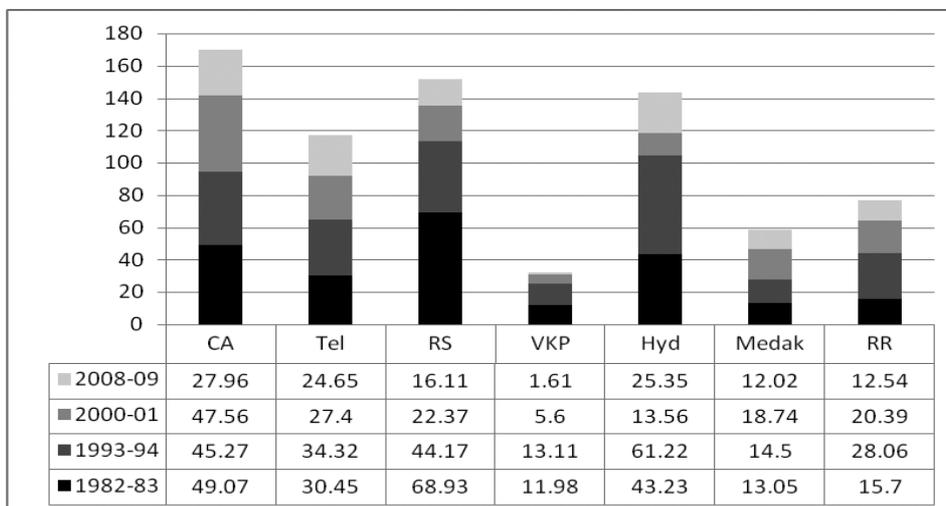


Source: ASI, AP, various issues

When we take a close look at the NVA of the agro-based industries at the state level, we find that their share in gross value added in manufacturing has, however, declined to less than half in 2008-09 compared to 1982-83. Share of NVA of agro-based industries declined in all the three regions in 2008-09 compared to 1982-83 and the decline is highest in Rayalaseema where the share declined by nearly 18 percentage points. Within the growth centres too, the share of NVA of agro-based industries registered a huge decline in 2008-09 as compared to 1982-83 (figure 6). In aggregate, we can conclude that agro-based industries contribute less to gross value added (25 percent) than to employment (61 percent) reflecting lower productivity.

In case of non agro-based industries, Rayalaseema stood first amongst the regions in the share of number of workers in 2008-09, while Rangareddy topped within the growth centres in the same year. When we look at Visakhapatnam, it is observed that it had the

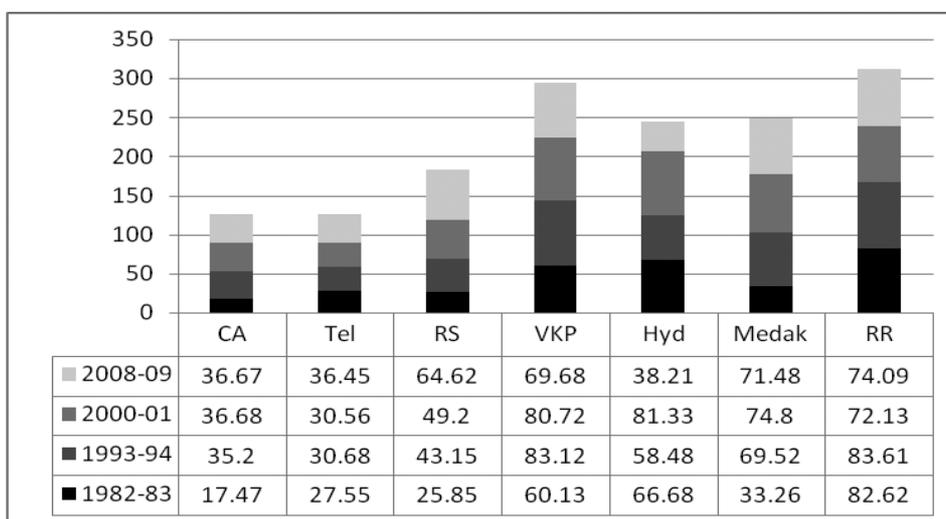
Figure 6: Share of Agro-based industries in registered manufacturing sector (NVA)



Source: ASI, AP, various issues

highest share of workers during 1993-94 (83 percent) and also in 2000-01 (81 percent), its share decreased to 70 percent during 2008-09 (Figure 7).

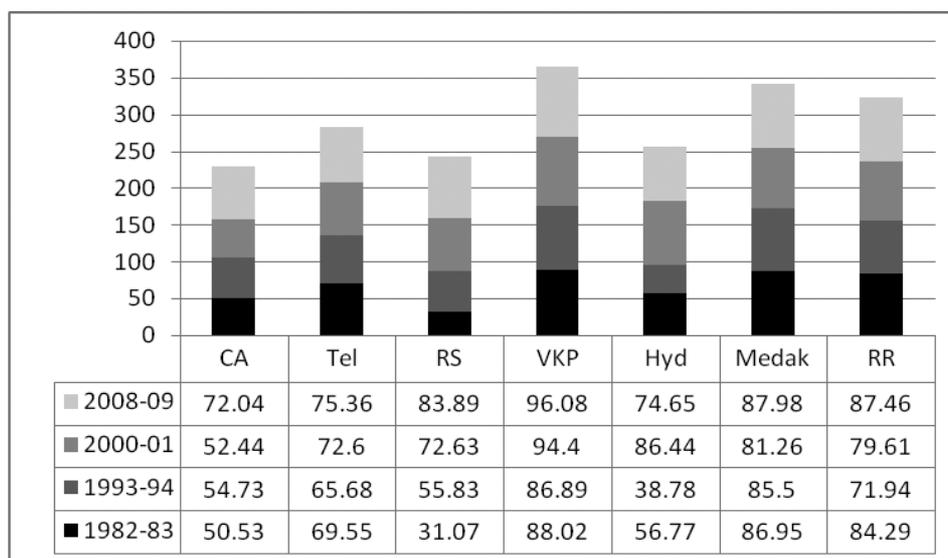
Figure 7: Share of Non Agro-based industries in registered manufacturing sector (number of workers)



Source : ASI, AP, various issues

Interestingly, Rayalaseema had the highest share of NVA in 2008-09 and it increased by almost two and a half times when compared to 1982-83. As far as the growth centres are concerned, Visakhapatnam's share of NVA of non agro-based industries increased from around 88 percent in 1982-83 to 96 percent in 2008-09. Hyderabad registered the highest share of NVA in the non-agro based industries in 2008-09, it increased by nearly 18 percentage points compared to 1982-83 (Figure 8).

Figure 8: Share of Non Agro-based industries in registered manufacturing sector (NVA)



Source : ASI, AP, various issues

6.1 Inter-Regional Differences in Structure and Specialization: Top 5 industries

Just like the case of the composition of manufacturing industry in terms of agro-based and non agro-based groups, industrial structure of regions differs in terms of product groups at more disaggregated (2-digit) level. We look here at the top five industry groups with regard to their contribution to employment in registered manufacturing in Andhra Pradesh to see to what degree the product groups featuring in this group differ from region to region and also in the growth centres. We also work out to see the degree of specialization or diversification of the manufacturing sector in the state, as represented by the percentage of employment asserted by the five top industries. this analysis is carried out for the year 2008-09.

Table 6.1: Top five industries in terms of workers in registered manufacturing (2008-09)

Regions/Industry	15	16	24	26	27	Total of five
CA	41.05	4.58	1.04	11.22	9.63	67.52
Telangana	11.40	42.38	2.04	7.69	2.39	65.90
Rayalaseema	23.06	1.65	3.57	43.91	3.98	76.17
AP	75.52	48.61	10.54	62.82	16.00	
Growth centres						
Visakhapatnam	24.26	0.00	0.50	5.72	26.00	56.48
Hyderabad	16.01	43.58	2.12	0.26	6.56	68.53
Medak	7.43	5.21	18.79	5.64	3.73	40.80
Rangareddy	9.60	0.25	15.82	5.64	15.93	47.24

Note: 15- Manufacture of food products and beverages, 16 - manufacture of tobacco products, 24 - manufacture of chemicals and products, 26 - manufacture of non-metallic mineral products, 27 - manufacture of basic metals

Source: Calculations based on ASI data, AP, 2008-09

The regions and the growth centres show diverse patterns as far as the largest product group is concerned. At the state level, manufacture of food products and beverages (15), manufacture of tobacco (16) and manufacture of non-metallic mineral products (26) account for a major share of employment. Out of these product groups, as high as 76 percent of employment comes from the manufacture of food products and beverages, followed by non-metallic and mineral products (around 63 percent). In CA and Visakhapatnam, food products and beverages dominate with 41 and 24 percent respectively. The same group dominates in Rayalaseema, Telangana and Hyderabad, though with a smaller share. Telangana and Hyderabad have 42 and 44 percent respectively of registered manufacturing sector employment in manufacture of tobacco products. In Medak and Rangareddy, we find higher share of employment coming from the chemical based industries. Non-metallic mineral products are the largest industry in Rayalaseema with nearly 44 percent of employment. Industries with significant domination though with smaller proportion are of total employment are non-metallic mineral products in CA (11 percent) and in Telangana (7.7 percent), basic metals in Visakhapatnam (26) and Rangareddy (16 percent) (Table 6.1).

The above features advocate a high degree of specialization in the product structure of the three regions. The same is also revealed by the high proportion of total employment accounted for by the largest five industry groups. Among the three regions, Rayalaseema has over 75 percent of their registered manufacturing employment concentrated in top

five groups - (i) manufacture of food products and beverages, (ii) manufacture of tobacco and tobacco products (iii) manufacture of basic metals (iv) manufacture of chemicals (v) manufacture of non-metallic mineral products. CA comes close to Rayalaseema with 67 percent and Telangana with 66 percent of the employment. What about the growth centres? Hyderabad shows high degree of employment concentration (69 percent) followed by Visakhapatnam (56 percent). As such no region shows diversified industrial employment structure. Interestingly, the largest group which accounted for similar share in total employment in registered manufacturing in the state is food products.

6.2. Industrial Base and Specialization

Industrial base of a state has been identified in terms of the group of industries which claim a higher share in the region's industrial structure than in the industrial structure of the state as a whole and is measured by location quotients of individual industries. Location quotient is one for an industry if its share in the region is the same as in the state, is less than one if this share is lower and more than one if it is higher than in Andhra Pradesh. Industries having quotient value of one or higher are considered to constitute the industrial base of the state/region or growth centre.

Table 6.2: Location Quotient of different product groups² in different regions (2008-09)

Regions/Industry	15	16	17	20	21	24	25	26	27	28	29	35
CA	1.63	0.28	1.38	1.72	1.45	0.30	1.28	0.54	1.81	0.60	1.33	1.75
Telangana	0.45	2.62	0.67	1.21	1.31	1.69	0.64	0.37	0.45	1.89	1.38	0.77
Rayalaseema	0.92	0.10	0.96	0.08	0.24	1.02	1.08	2.10	0.75	0.51	0.29	0.49

Source: Calculations based on ASI data, AP, 2008-09

At this juncture, it must be noted that the location quotients measure industrial base of a region only relative to the industrial structure of the state. Those industries which have a higher share in the region does than in the state's industrial structure constitute this base and these industries need not necessarily be the largest in the region. Location quotient, in fact, reflects the region's relative specialization vis-à-vis the industrial structure of the state and is acknowledged in terms of value of the quotients, and defines industrial base in a relative and not in absolute sense. In other words, it also means that more industrialized regions would have a wider industrial base in terms of having a larger number of industries with value of location quotients higher than one.

Industrial base of Coastal Andhra is comparatively wide consisting of 8 out of 12 industries having location quotient more than one. Telangana comes next with 6 industry

² See appendix

group having a higher than one location quotient. Rayalaseema has the narrowest industrial base with only 3 product groups having a location quotient greater than one (Table 6.2).

Let us now see how similar or different the industrial structure of a region is vis-à-vis that of the state as a whole. To arrive at this, shares of different industries in the total industrial employment in a region are compared with the corresponding shares at the state level. We make use of coefficient of specialization to sum up the differences between the two. When the value of this coefficient is zero, then the industrial structure of the region is exactly similarly diversified as that of the state as a whole. If it is one, then that region has one industry which is present in that region only. In between, the values of coefficient show the degrees of specialization of regions in relation to the industrial structure of the state.

Table 6.3: Coefficient of specialization of different product groups² in different regions (2008-09)

Regions/Industry	15	16	17	20	21	24	25	26	27	28	29	31	35
CA	0.16	0.12	0.04	0.00	0.01	0.02	0.01	0.10	0.04	0.01	0.01	0.00	0.01
Telangana	0.14	0.26	0.04	0.00	0.01	0.02	0.32	0.13	0.03	0.02	0.02	0.01	0.00
Rayalaseema	0.02	0.15	0.00	0.00	0.01	0.00	0.02	0.23	0.01	0.01	0.01	0.01	0.00

Source: Calculations based on ASI data, AP, 2008-09

When we consider specialization coefficient, we observe that Rayalaseema has the lowest specialization coefficient for almost all the product groups excepting manufacture of tobacco products and manufacture of non-metallic mineral products. Telangana has the highest specialization coefficient of 0.32 for manufacture of rubber and plastic products followed by a specialization coefficient of 0.26 for manufacture of tobacco. Interestingly, CA has specialization coefficients of 0.16 and 0.12 only for two product groups - manufacture of food products and beverages and manufacture of tobacco products. It is surprising to note that basic metals have a specialization coefficient of only 0.04 (Table 6.3). This implies that no forward linkages are taking place in CA despite the presence of the Iron and Steel industry in VKP. Further, it also means that this particular product group is concentrated in VKP which is the growth centre of Coastal Andhra.

² See appendix

6. CONCLUSIONS

Explanation and examination of various features of industrial development in different regions and growth centres of Andhra Pradesh, even though, not showing obvious patterns, divulge the following trends:

- All the three regions and the four growth centres, have witnessed shift from the industries to the service sector, with the shift being the largest in Telangana and Visakhapatnam. There is a shift in favour of manufacturing only in Visakhapatnam
- Rates of growth of industry and manufacturing sector increased in Coastal Andhra and Telangana in the post-reform period. In the growth centres, though Hyderabad witnessed a steep decline in the growth rate of manufacturing during the same period, it is compensated by an increase in the growth rate of services sector
- Growth rates of registered manufacturing sector show that the growth has been highest in Coastal Andhra, followed by Telangana, Visakhapatnam had a high growth rate and Rangareddy followed Visakhapatnam during 2001-02 to 2006-07. Registered sector accounts for major share of the District Domestic Product in manufacturing, the highest being in Telangana in 1993-94 as well as 2006-07
- During post-reform period, the industry and registered manufacturing sector in Rayalaseema had much higher income inequality compared to the other two regions. Secondly, the data explicitly points to inequality increasing for the aggregate economy as well as its sectors during this period.
- Among the three regions and the four growth centres only Telangana and its three growth centres have higher average capital productivity compared to the state as a whole, while capital per unit of labour is in fact lower with respect to the state average. In the other two regions, Rayalaseema and Coastal Andhra and also in Visakhapatnam, the capital intensity per worker is higher compared to the state average and is characterized by lower capital productivity. Interestingly, we find no region or growth centre falling in the High-High category during 2008-09.
- Per worker productivity increased in all the three regions and the state as a whole in the post-reform period, with the increase being highest in Coastal Andhra during the post-reform period. Quite interestingly, in the growth centres, Visakhapatnam's per worker productivity declined while it increased in the three growth centres of Telangana in the post-reform period. Capital output ratio declined in Telangana, Visakhapatnam and Rangareddy in the post-reform period. Increase in labour productivity is accompanied by an increase in capital intensity (technological variation) in all three regions and growth centres except Visakhapatnam

- Around 61 percent of the workers are employed in agro-based industries in 2008-09 at the state level. Rayalaseema witnessed a huge decline in the share of workers in 2008-09; it declined by almost half compared to 1982-83. Within the growth centres, the share of employment of the agro-based industries is highest in Medak in 1982-83, while it declined by more than half in 2008-09. On the other hand, in Hyderabad, share of workers in agro-based industries doubled in 2008-09, because of high share of workers in manufacture of food products and beverages and manufacture of tobacco products
- Share of net value added of agro-based industries declined in all the three regions in 2008-09 compared to 1982-83 and the decline is highest in Rayalaseema. Within the growth centres too, the share of net value added of agro-based industries registered a huge decline in 2008-09 as compared to 1982-83
- In case of non agro-based industries, Rayalaseema stood first amongst the regions in the share of number of workers in 2008-09, while Rangareddy topped within the growth centres in the same year. When we look at Visakhapatnam, it is observed that it had the highest share of workers during 1993-94 (83 percent) and also in 2000-01 (81 percent), its share decreased to 70 percent during 2008-09. Rayalaseema has the highest share of net value added in 2008-09 and it increased by almost two and a half times when compared to 1982-83. Visakhapatnam's share of NVA of non agro-based industries increased from around 88 percent in 1982-83 to 96 percent in 2008-09. Hyderabad registered the highest share of NVA in the non-agro based industries in 2008-09.
- The regions and the growth centres show diverse patterns of employment as far as the largest product group is concerned. At the state level, manufacture of food products and beverages, manufacture of tobacco and manufacture of non-metallic mineral products account for a major share of employment. Out of these product groups, as high as 76 percent of employment comes from the manufacture of food products and beverages, followed by non-metallic and mineral products (around 63 percent). In Coastal Andhra and Visakhapatnam, food products and beverages dominate with 41 and 24 percent respectively. The same group dominates in Rayalaseema, Telangana and Hyderabad, though with a smaller share. In Medak and Rangareddy higher share of employment comes from chemical based industries. Non-metallic mineral products are the largest industry in Rayalaseema with nearly 44 percent of employment. Industries with significant domination though with smaller proportion are of total employment are non-metallic mineral products in CA (11 percent) and in Telangana (7.7 percent), basic metals in Visakhapatnam and Rangareddy (16 percent)

- Among the three regions, Rayalaseema had over 75 percent of their registered manufacturing employment concentrated in top five groups. Coastal Andhra comes close to Rayalaseema with 67 percent and Telangana with 66 percent of the employment. Hyderabad shows high degree of employment concentration (69 percent) followed by Visakhapatnam (56 percent). As such no region shows diversified industrial employment structure.
- Industrial base of Coastal Andhra is comparatively wide consisting of 8 out of 12 industries having location quotient more than one. Telangana comes next with 6 industry group having a higher than one location quotient. Rayalaseema has the narrowest industrial base with only 3 product groups having a location quotient greater than one. Rayalaseema has the lowest specialization coefficient for almost all the product groups excepting manufacture of tobacco products and manufacture of non-metallic mineral products.
- Telangana has the highest specialization coefficient of 0.32 for manufacture of rubber and plastic products followed by a specialization coefficient of 0.26 for manufacture of tobacco. Coastal Andhra has specialization coefficients of 0.16 and 0.12 only for two product groups - manufacture of food products and beverages and manufacture of tobacco products. It is surprising to note that basic metals have a specialization coefficient of only 0.04. This implies that no forward linkages are taking place in Coastal Andhra despite the presence of the Iron and Steel industry in Visakhapatnam.

Amidst various findings, as mentioned above, regions and growth centres have performed differently in terms of growth of manufacturing industries and changes in their structure. It is quite clear from the analysis that there are regional inequalities; major development in registered manufacturing had essentially taken place in a few pockets of the state and not in any region as a whole. The small region among the three, Rayalaseema, did not have a manufacturing growth centre, rather it is the mining activity which dominates the industry sector in this region, especially during the recent times. Even after a decade of economic reforms, we find that industrial activity is concentrated and divergent in few product groups; industrial base is narrow, high degree of specialization takes place only in five product groups, namely, food products and beverages, tobacco products, non-metallic and mineral based industries, metal based industries and rubber and plastic products. Within the regions, Rayalaseema has the narrowest industrial base and also the lowest specialisation coefficient. Telangana has the highest specialization coefficient for manufacture of rubber and plastic products followed by manufacture of tobacco. CA has higher specialization coefficients for manufacture of food products and beverages and manufacture of tobacco products. There is divergence of industry, manufacturing and registered manufacturing sectors in the post-reform period in the state as a whole when compared to the pre-reform period.

Appendix 1

Classification at 2-digit level (NIC 1998)
Division Classification at 2-digit level (NIC 1998)

15	Manufacture of Food Products and Beverages
16	Manufacture of Tobacco Products
17	Manufacture of Textiles
18	Manufacture of Wearing Apparel Dressing and Dyeing of Fur
19	Tanning and Dressing of Leather Manufacture of Luggage, Handbags, Saddler, Harness and Footwear
20	Manufacture of Wood and Products of Wood and Cork, Except Furniture, Manufacture of Articles of Straw and Plating Materials
21	Manufacture of Paper and Paper Products
22	Publishing, Printing and Reproduction of Recorded Media
23	Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel
24	Manufacture of Chemicals and Products
25	Manufacture of Rubber and Plastic Products
26	Manufacture of Other Non-Metallic Mineral Products
27	Manufacture of Basic Metals
28	Manufacture of Fabricated Metal Products, Except Machinery and Equipments
29	Manufacture of Machinery and Equipments N.E.C
30	Manufacture of Office, Accounting and Computing Machinery
31	Manufacture of Electrical Machinery and Apparatus N.E.C.
32	Manufacture of Radio, Television and Communication Equipments and Apparatus
33	Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks
34	Manufacture of Motor Vehicles, Trailers and Semi-Trailers
35	Manufacture of Other Transport Equipment
36	Manufacture of Furniture; Manufacturing N.E.C.
37	Recycling

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