

## **Pay Inequality in the Indian Manufacturing Sector, 1979-1998**

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### *Abstract:*

This paper presents the trend of changes in pay inequality in the manufacturing sector of India, by regions and sectors, for the years 1979-1998. The decomposability property of Theil index enables us to show that manufacturing pay inequality in India has risen both across sectors and across regions, though more strongly across sectors. We also show that the rise in inequality accelerates in the period following the introduction of reforms, after controlling for changes in the level of real per capita income. It appears that a large part of rising manufacturing pay inequality in the post-reform period can be attributed to rising relative pay in the electricity sector.

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## I. Introduction

Inequality across regions and sectors is a volatile issue in India, and interest in emerging distributional patterns has increased in the wake of the 1991 economic reforms, which affected the monetary, fiscal, and industrial licensing spheres. As the nation is very diverse, widening regional disparities have led the developed states to demand more fiscal autonomy and the underdeveloped states to demand more fiscal support.

India has a good annual expenditure survey that gives an overall picture of the evolution of inequality and a baseline for the analysis of trends in poverty. Those concerned with the specific pattern of regional income changes have relied mostly on information from the national income accounts, particularly measures of State Domestic Product. This study falls between and, we hope, complements these two levels of analysis, by examining the patterns of change in manufacturing pay in India for information on the interaction of regional and industrial change.

India's development experience has been different from that observed in the developed countries and also such Asian industrializing countries as South Korea and Taiwan. India has not followed an export-led model. And instead of moving from agriculture through manufacturing to a service economy, India has moved from agriculture toward manufacturing and services in almost equal measure. This is evident when we have a look at the sector shares in the GNP. In 1950-51 the shares for agriculture and allied activities, for manufacturing and for the services sector were 56%, 15% and 29% respectively. In 1995-96 the shares had become 29.5%, 29% and 41.5%. However the share of the labor force engaged in agriculture remains high: that figure has been hovering around 65% for the last several years.

We do not claim that information drawn from data on manufacturing pay in India will necessarily reflect all movements in the pattern of distribution. There may also be a pattern of bias, as manufacturing is concentrated in certain regions and relatively absent in others. The data in the present study are very far from constituting a representative or sample survey.

We do argue, nevertheless, that shifts in the distributive pattern across sectors and regions within manufacturing contain important information in a form that is measured with reasonable accuracy and consistency over time. And we believe that, in general, given the inter-linkages between manufacturing, agriculture and services, trends observed within manufacturing provide useful (and usefully specific) clues to developments in the broader economy.

## **II. Data on the Indian Manufacturing Sector**

The principal data for the registered manufacturing sector in India are collected from the annual Survey of Industries (ASI) and the National Sample Survey Organization (NSSO). We rely primarily on ASI data here, though with an effort in the appendix to assess the relationship to the broader coverage of the NSSO.

The term registered manufacturing sector covers all industries which are regulated under the Indian Factories Act (IFA), 1948 and the Bidi and Cigar Workers (Conditions of Employment) Act, 1966, employing 10 or more workers and using electrical or mechanical power, or 20 or more workers and not using electrical or mechanical power. In addition all establishments producing electricity are covered.

The ASI uses two methods, called the census method and the sample method. Under the census method factories employing 50 or more workers and using electrical or mechanical power, or 100 or more workers and not using electrical or mechanical power are covered every year. Of non-census sectors not covered by the above criteria (those employing 10-49 workers and using electrical or mechanical power, or 20-99 workers and not using electrical or mechanical power), one third are sample-surveyed every year.

The data are available at the three-digit industrial classification level for All India, and at the two digit industrial classification level for each state. At the three-digit classification level data are available for 176 industrial categories through 1987 and for 195 industrial categories through 1989, when the NIC classification underwent major changes. At the two-digit level the data are available for 25 categories, giving a ceiling of some 625 “sector-state cells” over the 25 states for which we have usable data. At the two-digit level, the manufacturing data covers India’s industry divisions 2 & 3 and major group 97. In our study we have also included electricity (major group 40), gas and steam generation and distribution (major group 41), water works and supply (major group 42), non -conventional energy generation and distribution (major group 43) and storage and warehousing (major group 74).

## **III. Method for Measuring Inequality**

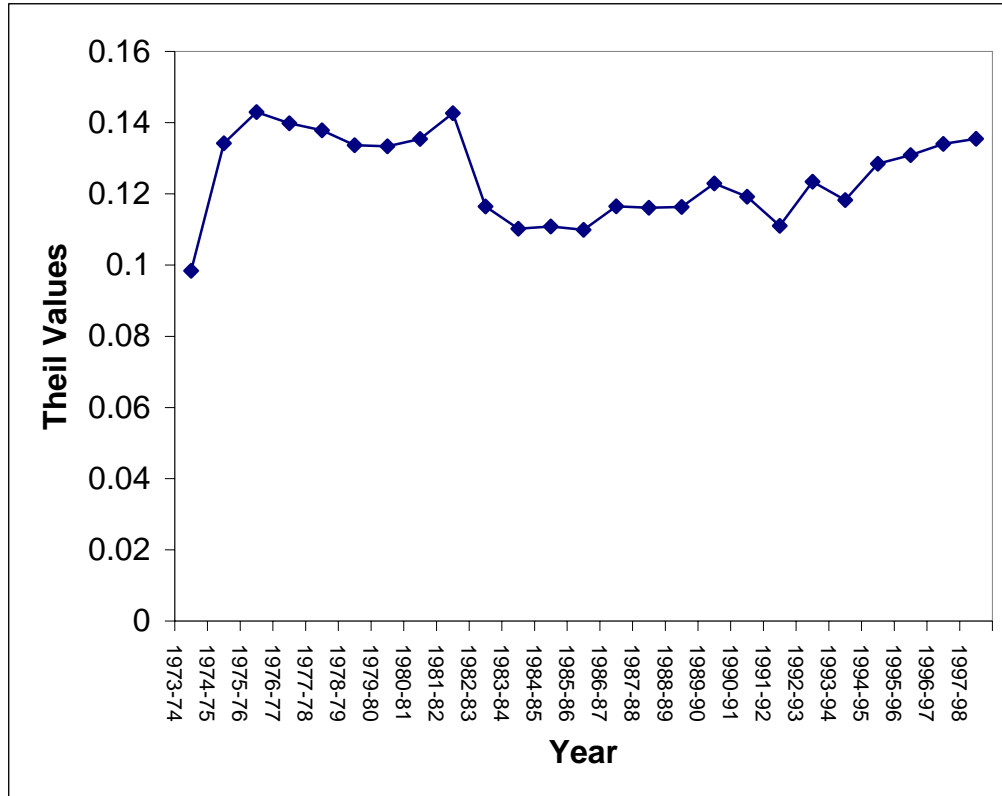
Our method is entirely conventional, and consists of calculating the between-groups component of Theil’s T Statistic, using the “cell” as the fundamental analytical unit. A “cell” may be either a three-digit industrial category at the all-India level, or a two-digit industrial category within the boundaries of an Indian state. The formulae for Theil statistic and its between and within, state and sectoral inequality components are given in appendix C.

The virtue of the Theil method is two-fold: it can be calculated reliably from very limited information, and the statistic can be decomposed and added together in various ways to assess the qualitative patterns of change in distribution. These virtues are documented in the work of the University of Texas Inequality Project, at

<http://utip.gov.utexas.edu> , and we do not see a need to enter into them in detail in the present paper.

We begin by examining the information in the ASI data at the three-digit classification level, for India as a whole. Figure 1 presents the Theil statistic resulting from this exercise.

Figure 1. Inequality of Indian Manufacturing, 1972-1998, By Three-Digit Sector



We observe that the graph shows a sharp upswing in the year 1974-75, remains fairly steady till 1981-82, then drops sharply in the year 1982-83. Thereafter inequality in manufacturing pay remained steady till the year 1993-94, at which point it began creeping upward.

What brought about this pattern of change?

The sharp upswing in the Theil value in the year 1974-75 can be attributed to sharp increases in the payrolls of manufacturing groups like Aluminum, Copper, generation of electricity, minting of coins and printing of currency. All of these groups were fully under the control of the government at that time, or else the government controlled a substantial part of the production capacity. Increases in the pay scales of government-owned companies is essentially a political decision; in this case strong labor

unions were able to extract substantial pay raises without there having been a prior increase in profits. Other groups gaining in relative terms in this period were manufacture of agricultural machinery, cement production, chemical products, non-ferrous metals and man made textile fibers. Thus we have an initial increase in manufacturing pay inequality in India, brought on principally by state action, favoring particularly powerful industrial workers over others less strategically well-placed.

The sudden dip in Theil value in 1982-83 is centered on a dip in the values for cotton mills, manufacture of plastics, manufacture of fertilizers, manufacture of industrial machinery, spinning and processing of man made textile fibers. There is also an increase in the Theil value of sugar manufacturing, a low-wage industry at that time (and still). It is notable that the year 1982- 83 saw a general strike in all the cotton textile mills of Bombay, which led to the eventual decline of the textile mills in India. Thus, labor conflict brought about a reduction in measured inequalities at this time – but owing to the failure, not the success, of their confrontation. The measure of overall manufacturing pay inequality then remained fairly stable at the new values for a decade.

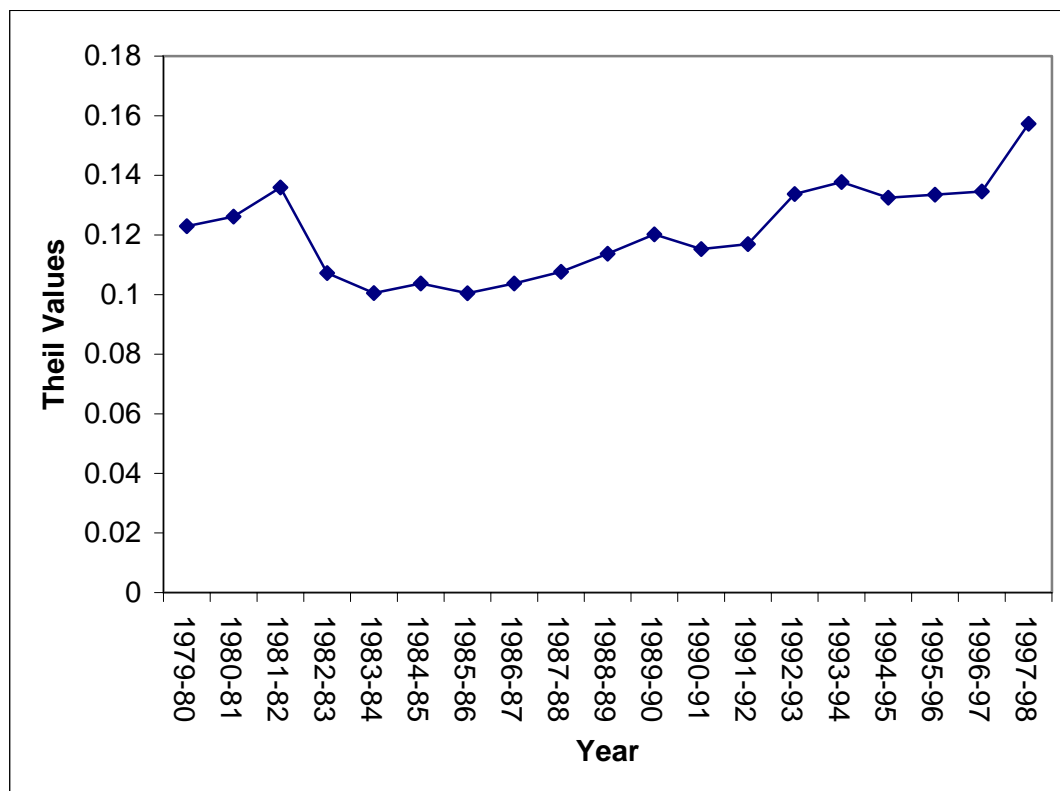
The upward movement from 1993-94 could be due to the economic reforms initiated in the year 1991. The increase in Theil index from 1993-94 to 1994-95 is primarily due to an increase in the Theil element of generation of electrical energy, distribution of electrical energy, manufacture of computers and computer based systems, manufacture of general purpose non electrical machinery and manufacture of motor cars. All of these got a boost after the liberalization of policies regarding production capacities and industrial licensing. The trend continued in 1995-96 with heavy motor vehicles, repair of heavy motor vehicles, manufacture of industrial machinery, machine tools manufacture of electrical plants and production of consumer goods like television sets, air conditioners and refrigerators showing large increases in their Theil elements. In 1996-97 distribution of electrical energy, generation and transmission of electricity, manufacturing of sugar, motorcars, air conditioners and repair of electrical plants make a further contribution to the increase of the index. In 1997-98 it was the chemicals, dairy products, electrical machinery, railway equipment and television sets that contributed most to the trend of increasing inequality of incomes in the manufacturing sector.

We infer from this evidence that one effect of the reforms was to strengthen the market position of those sectors which were already comparatively strong, and so to increase the dispersion of manufacturing pay across India as a whole.

#### **IV. The Evolution of Pay Inequality across States**

The two digit industrial classification available at the state level is similar to the three digit classification available at the national level. But unlike the all-India data which are available for the period 1973-74 to 1997-98, intra-state two-digit data are available only for the years 1979-80 to 1997-98. The data are available for twenty five categories across 25 states for this period, thus 625 state-sector cells.

Figure 2. Inequality in Indian Manufacturing Pay: 2- Digit SIC



The Theil values are naturally somewhat higher when we use the finer grid available at the state level, for two reasons. First, with more cells, more of the underlying inequality is classified as “between-groups.” Second, by introducing a geographic dimension we capture an additional element of the underlying inequality of the subcontinent. The trend through time is similar to the earlier calculation, but it is not identical. In particular, we find that in this data inequality has been steadily increasing since 1985-86, that it took a dip in the year 1990-91 when the Indian economy faced one of its worst crises, and that in the 1990s pay inequality has continued to increase, taking a sharp jump in the final year observed to levels higher than in the early 1980s. Thus the pattern suggests that the regional element of inequality in India started to rise before purely sectoral increases became pronounced – and also before the major economic reforms.

To further examine whether inequality in India is primarily a geographic or a sectoral issue, we aggregate the state-sector elements into two distinct categories, states on the one hand and sectors on the other. As explained above, we have inequality across sectors within states, inequality across states, inequality across states within sectors and inequality across sectors. Figure 3 presents this information.

Figure 3. Pay Inequality Within and Between States and Sectors.

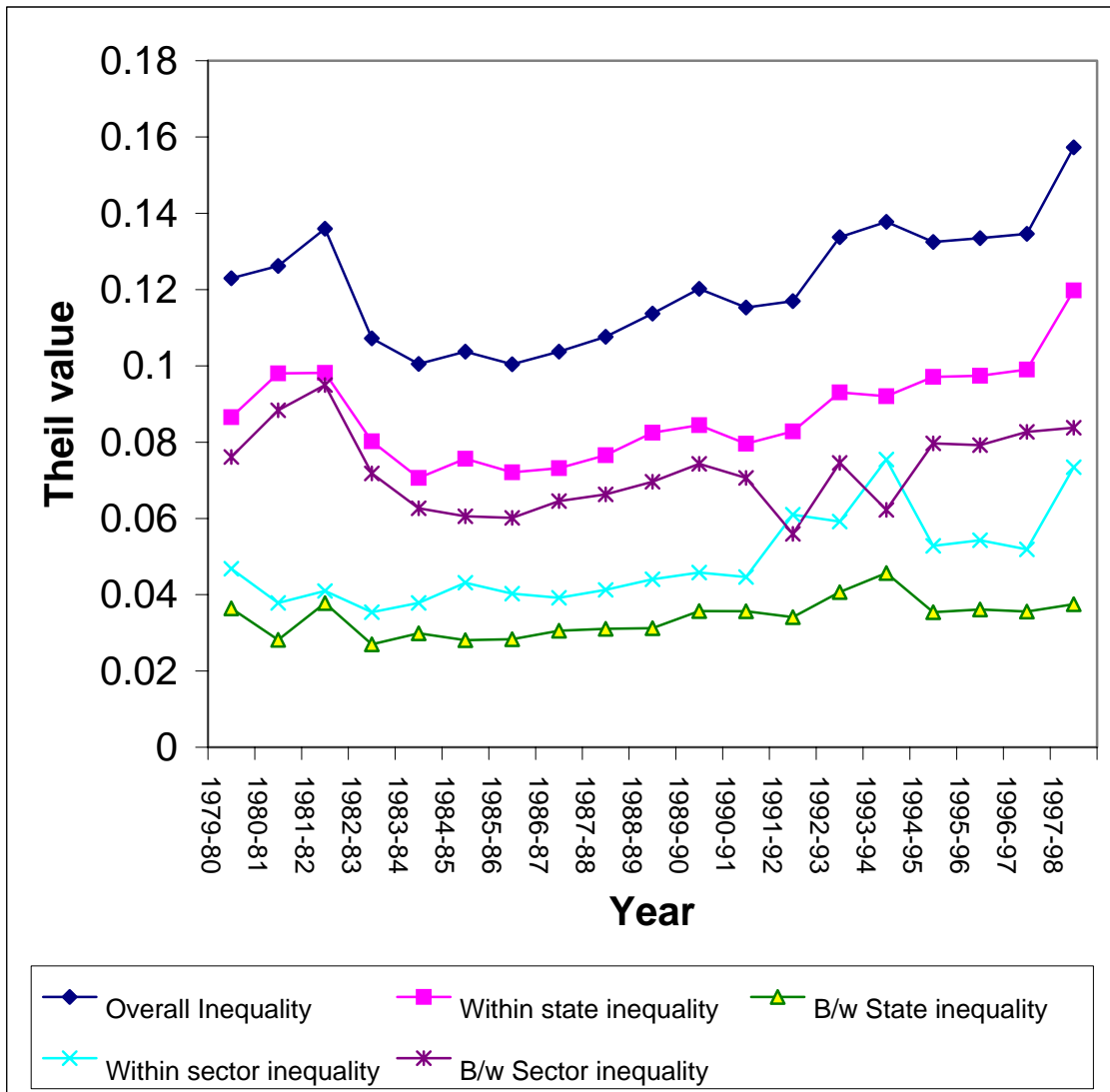


Figure 3 shows that inequality in manufacturing incomes in India is more of a within-state (and between-sector) phenomenon than it is a between-state (and within-sector) one. Further, between-sector inequality contributes much more to rising inequality in India than do increases in regional differentials. This pattern contrasts very sharply with the findings of similar studies on Russia and China (Galbraith, Krytynskaia and Wang, 2004) and suggests that India’s pattern of globalization and liberalization may be quite different from those two examples.

The next issue we examine is which of the specific states and sectors have contributed the most to rising inequality. We first examine the contribution to the Theil index of individual states.

Figure 4. Contribution of Individual States to Pay Inequality in India

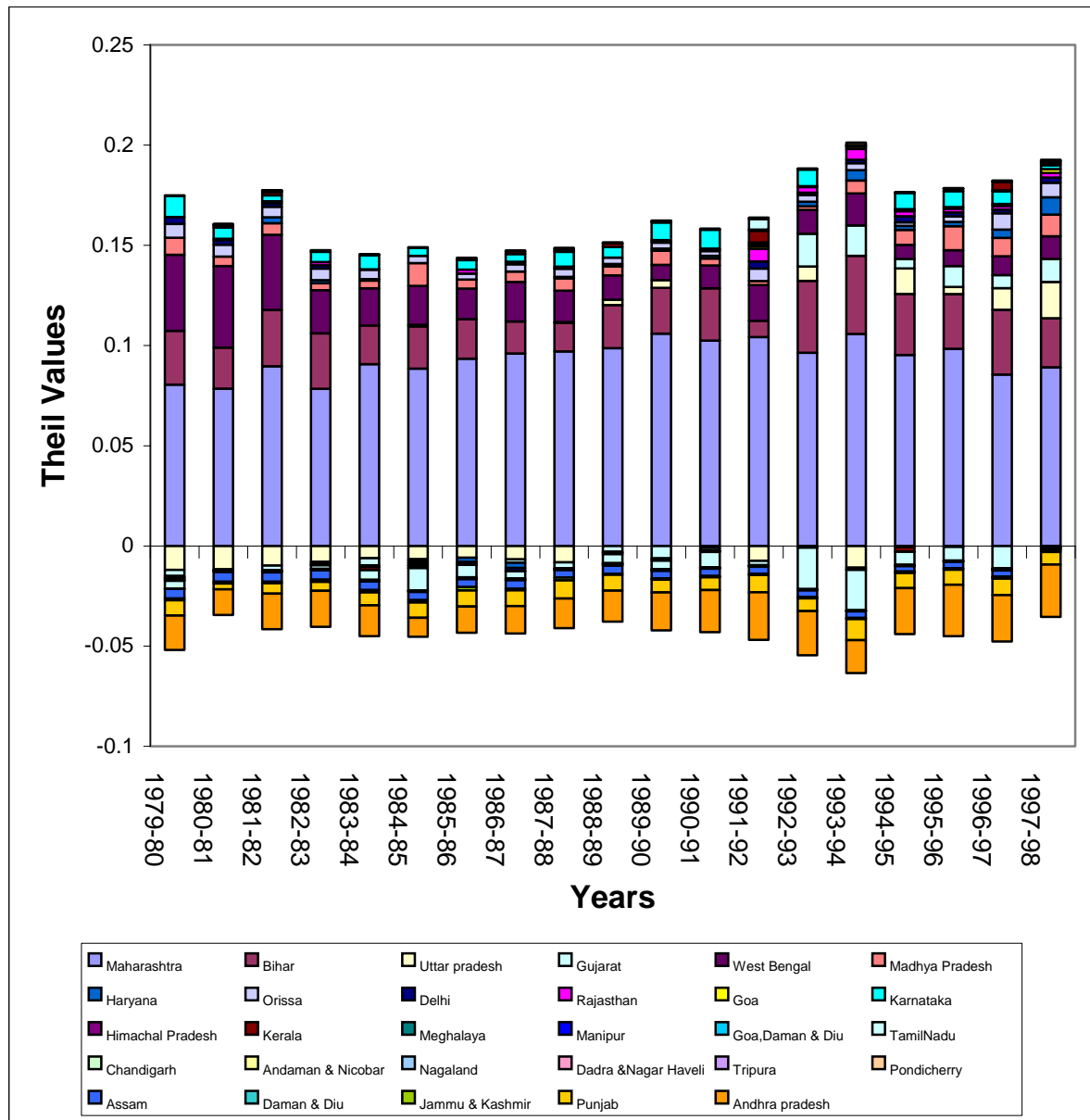


Figure 5 shows the evolving pattern of the distribution of manufacturing pay across India. States whose pay rates exceed the average form elements above the zero line, while states with pay rates below the national average form elements below the zero line. The size of the component attributable to each state represents the combined influence of labor force and relative income, and it is the change in these influences which the figure highlights. The states are ranked by the size of their contribution to interstate inequality in the first year under observation.

Maharashtra makes the largest contribution to inequality during the entire period. This should not come as a surprise as it is the most advanced industrial state in India; all



the leading industrial houses have established manufacturing facilities in the state. Labor in Maharashtra is also highly organized; therefore almost all industrial groups in Maharashtra have pay-rates above the All-India average.

A second and more surprising fact is that some of the industrially backward states such as Bihar, West Bengal, Orissa and Madhya Pradesh nevertheless make a strong positive contribution to manufacturing pay inequality. This is primarily attributable to the fact that most of these states are resource-rich, and that the federal Government had set up a large number of public sector enterprises in the fields of steel, coal and petrochemicals. Labor in these enterprises gets high wages; meanwhile the other industrial groups owned by the private sector are virtually non-existent. Thus, these states make a significant positive contribution to the inequality of manufacturing pay, even though they are not wealthy in overall comparative terms.

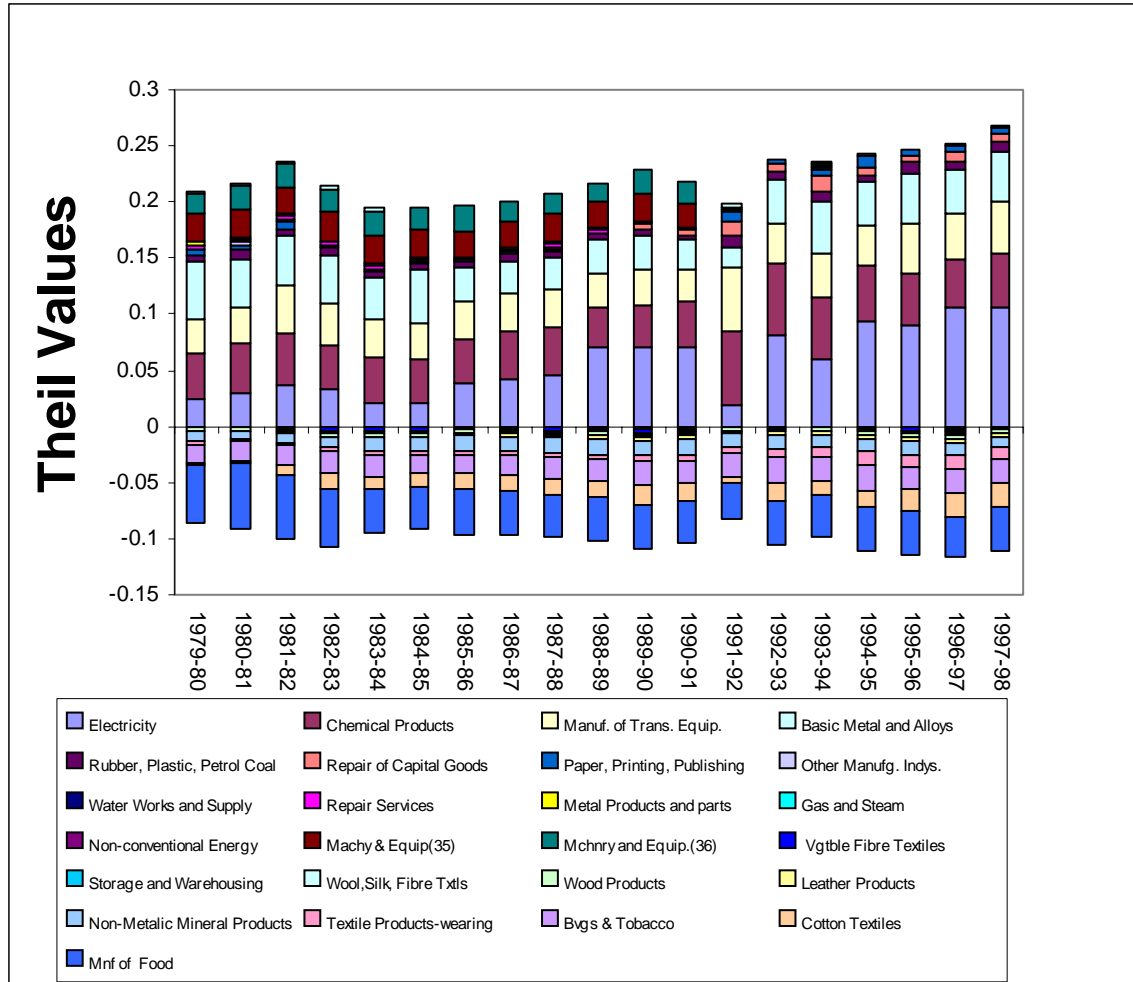
Third, we find that states like Uttar Pradesh and Gujarat made a negative contribution to inequality for most of the period, meaning their pay is below All-India averages. But suddenly they emerge as above average in the mid-1990s. On closer examination, this is due to very high Theil contribution of the electricity sector in UP and of electricity, chemicals and the repair of capital goods sector in Gujarat. It is pertinent to mention, once again, that almost all electricity generation and distribution is in the hands of the state.

On examining the negative Theil elements we find that two of the agriculturally developed states viz. Andhra Pradesh and Punjab consistently have manufacturing pay rates on the whole below the national averages. This could be primarily due to the lack of large enterprises from either the public or private sectors in these two states. Most of the industrial establishments in these states are quite small and belong to such traditional sectors as food processing.

Finally, most of the smaller states make either no contribution or make a small negative contribution to the Theil index. The smallness of their contribution in absolute value is an artifact of their small weight in overall manufacturing employment in India.

## V. The Evolution of Inequality Across Sectors.

Figure 5. The Evolution of Inequality Across Manufacturing Sectors

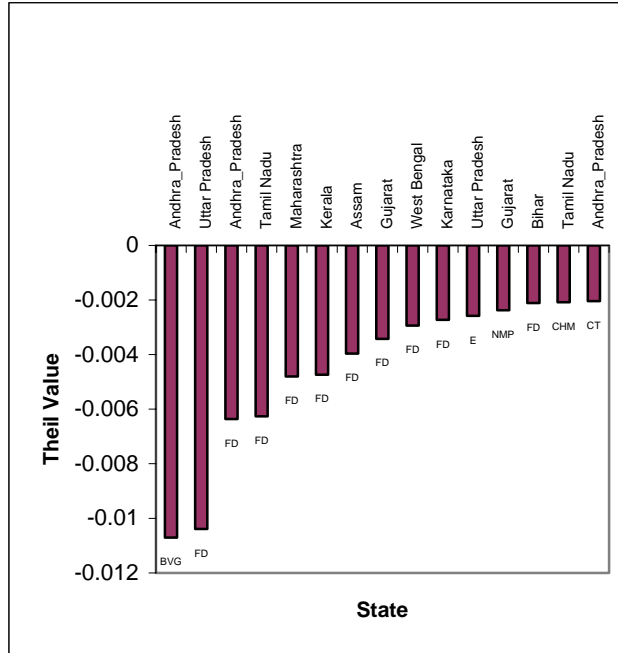


The figure shows the strong position of the public enterprises like basic metal industries, rubber, plastic, petroleum and coal, and electricity generation & distribution, as well as the large-scale modern enterprises in chemicals, transport equipment, and machinery and equipment (both groups 35 & 36). These are the major winners and contributors to the inequality of manufacturing sector incomes. Sectors like food manufacturing, beverages and tobacco, non metallic mineral products, cotton textiles and wood products are the long-standing losers.

Of particular interest is the increasing contribution of the Theil element in the electricity sector over the years, particularly as the sector has become deregulated and increasingly able to assert its monopoly power. Indeed the rise of the power of the power sector is the single largest and perhaps the only significant contributor to the rise of inter-sectoral inequality in Indian manufacturing under the rule of reform.

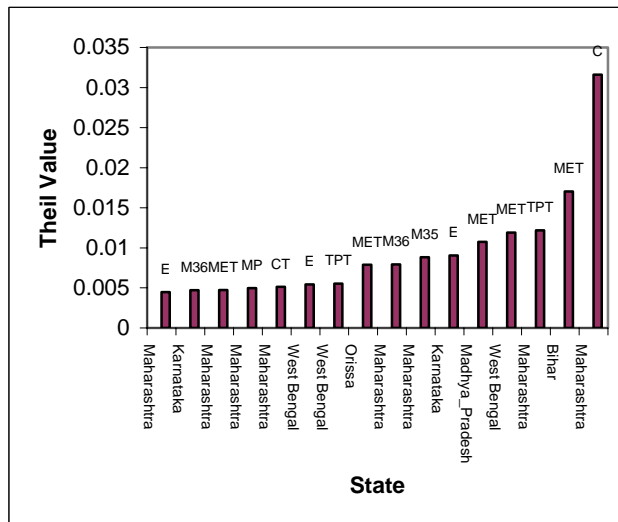
A look at the largest and smallest Theil elements in the beginning and at the end of the period is also interesting. Figures 6 through 9 provide this information.

Figure 6. Contributions to Inequality: Smallest Theil Elements in 1979-80



BVG = manufacturing of beverages; FD = Food; E= Electricity; NMP = Manufacturing of non metallic products; CHM=Chemicals; CT= Cotton Textiles

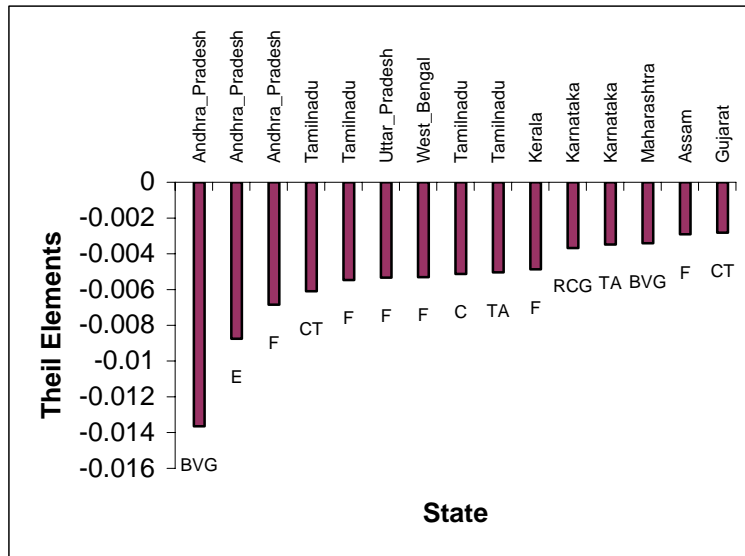
Figure 7. Contributions to Inequality: Largest Theil elements 1979-80



M36 = Machinery other than transport equipment (group 36); MET = Metal; MP = Metal Products; TPT = Transport equipment and vehicles; E = electricity;

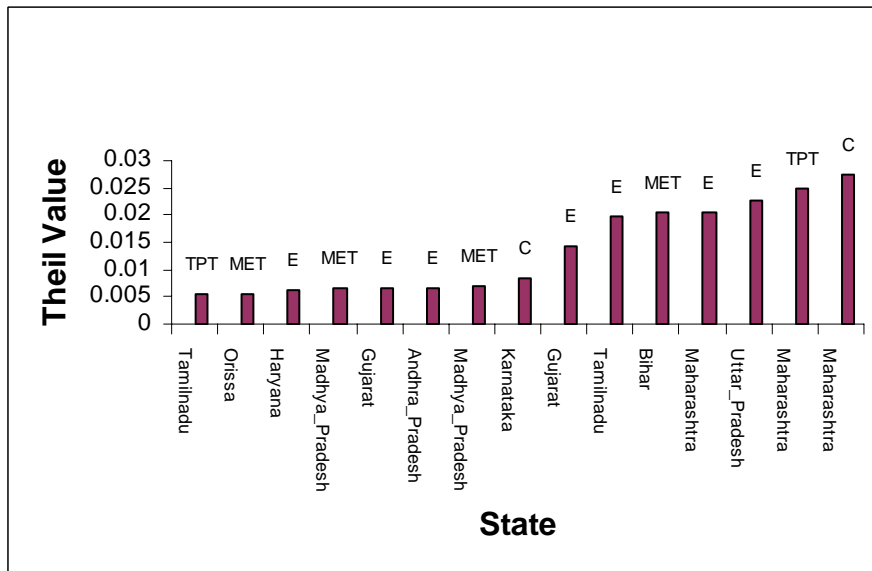
C = Chemicals

Figure 8. Contributions to Inequality: Smallest Theil elements 1997-1998



F= Food; TA = Textiles and Apparel; CT = Cotton textiles; RCG = Repair of capital goods.

Figure 9. Contributions to Inequality: Largest Theil elements 1997-98



Of particular note in these figures are the increasing concentration of the lowest paid industries in low-paid states, such as Andhra Pradesh and Tamil Nadu, which indicates increasing regional stratification over time. And also the particularly sharp rise of electricity production as a wealth-concentrating sector, notably in Uttar Pradesh and Maharashtra.

## VI. Inequality within Individual States

Next we examine measures of inequality across sectors within the individual states for the period 1979-80 to 1997-98. For this purpose we calculate the Theil index by taking income and employment in individual sectors as a proportion of total income and employment in a particular state, rather than as a proportion of the national average.

The values for each year are presented in Tables 1 and 2. This inequality statistic has been gradually increasing for 12 of the 18 major states since the economic reforms were initiated in 1991-92. Only in the states of Jammu and Kashmir, Orissa, Madhya Pradesh, Gujarat, Kerala and Punjab does the statistic shows a decline in recent years. The year-wise equality ranks for each state are given in appendix D.

**Table 1 Pay Inequality within States, 1979-1989**

	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
Andaman & Nicobar	0.005	0.004	0.012	0.009	0.019	0.006	0.017	0.007	0.006	0.017
Andhra Pradesh	0.257	0.205	0.265	0.127	0.199	0.193	0.167	0.214	0.221	0.215
Assam	0.132	0.127	0.138	0.110	0.152	0.155	0.194	0.170	0.185	0.216
Bihar	0.111	0.127	0.150	0.106	0.074	0.073	0.067	0.058	0.059	0.059
Chandigarh	0.140	0.037	0.127	0.162	0.146	0.055	0.049	0.067	0.050	0.051
Dadra & Nagar Haveli										0.013
Daman and Diu										
Delhi	0.069	0.046	0.051	0.039	0.038	0.038	0.041	0.039	0.054	0.058
Goa										
Goa, Daman & Diu	0.188	0.133	0.146	0.114	0.056	0.080	0.092	0.066	0.080	0.069
Gujarat	0.064	0.063	0.066	0.071	0.051	0.070	0.070	0.065	0.063	0.070
Haryana	0.022	0.044	0.073	0.034	0.071	0.055	0.068	0.054	0.073	0.074
Himachal Pradesh	0.018	0.020	0.016	0.018	0.023	0.014	0.015	0.051	0.030	0.013
Jammu & Kashmir	0.065	0.060	0.058	0.033	0.043	0.083	0.040	0.060	0.031	0.090
Karnataka	0.140	0.160	0.111	0.092	0.064	0.061	0.065	0.064	0.075	0.065
Kerala	0.258	0.295	0.342	0.192	0.211	0.229	0.215	0.216	0.217	0.206
Madhya Pradesh	0.153	0.144	0.139	0.143	0.124	0.135	0.102	0.085	0.093	0.120
Maharashtra	0.056	0.075	0.068	0.066	0.051	0.051	0.056	0.056	0.059	0.069
Manipur	0.251	0.137	0.020	0.042	0.042	0.048	0.137	0.071	0.019	0.252
Meghalaya	0.080	0.043	0.043	0.038	0.038	0.047	0.043	0.044	0.046	0.080
Nagaland										
Orissa	0.166	0.148	0.125	0.126	0.099	0.130	0.087	0.092	0.108	0.094
Pondicherry	0.024	0.049	0.041	0.037	0.039	0.051	0.061	0.034	0.045	0.053
Punjab	0.029	0.088	0.038	0.046	0.034	0.037	0.043	0.056	0.063	0.066
Rajasthan	0.043	0.041	0.045	0.049	0.028	0.037	0.036	0.042	0.040	0.038
TamilNadu	0.074	0.085	0.077	0.086	0.063	0.077	0.072	0.079	0.078	0.081

Tripura	0.000	0.222	0.179	0.267	0.189	0.174	0.224	0.237	0.281	0.258
Uttar Pradesh	0.085	0.137	0.133	0.086	0.064	0.076	0.079	0.070	0.060	0.096
West Bengal	0.036	0.042	0.043	0.042	0.040	0.039	0.030	0.030	0.040	0.034

**Table 2 Pay Inequality Within States, 1989-1998**

	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98
Andaman & Nicobar	0.014	0.007	0.009	0.009	0.006	0.010	0.024	0.021	0.021
Andhra Pradesh	0.212	0.191	0.158	0.200	0.188	0.171	0.157	0.194	0.226
Assam	0.229	0.210	0.235	0.271	0.228	0.288	0.305	0.299	0.355
Bihar	0.074	0.103	0.073	0.110	0.138	0.133	0.116	0.121	0.149
Chandigarh	0.090	0.078	0.077	0.118	0.137	0.093	0.082	0.086	0.438
Dadra & Nagar Haveli	0.044	0.020	0.007	0.017	0.006	0.015	0.015	0.015	0.008
Daman and Diu	0.015	0.034	0.020	0.017	0.006	0.022	0.012	0.020	0.017
Delhi	0.031	0.040	0.038	0.041	0.033	0.048	0.039	0.042	0.060
Goa	0.093	0.071	0.086	0.053	0.053	0.085	0.069	0.063	0.056
Goa, Daman & Diu									
Gujarat	0.057	0.063	0.036	0.106	0.091	0.087	0.080	0.092	0.083
Haryana	0.067	0.060	0.057	0.067	0.078	0.078	0.072	0.072	0.093
Himachal Pradesh	0.014	0.013	0.013	0.009	0.008	0.008	0.014	0.020	0.076
Jammu & Kashmir	0.032	0.035	0.044	0.027	0.026	0.051	0.039	0.028	0.030
Karnataka	0.104	0.094	0.094	0.113	0.090	0.127	0.143	0.123	0.170
Kerala	0.223	0.257	0.251	0.296	0.330	0.305	0.274	0.314	0.264
Madhya Pradesh	0.091	0.066	0.056	0.055	0.057	0.081	0.096	0.088	0.079
Maharashtra	0.071	0.075	0.097	0.082	0.076	0.077	0.080	0.081	0.084
Manipur	0.059	0.071	0.053	0.051	0.129	0.094	0.072	0.121	0.197
Meghalaya	0.017	0.025	0.022	0.031	0.094	0.025	0.021	0.024	0.023
Nagaland	0.001	0.148	0.101	0.117	0.107	0.127	0.230	0.281	0.218
Orissa	0.093	0.094	0.085	0.095	0.088	0.083	0.098	0.129	0.097
Pondicherry	0.082	0.089	0.079	0.073	0.109	0.097	0.105	0.090	0.049
Punjab	0.052	0.037	0.069	0.029	0.159	0.029	0.040	0.028	0.031
Rajasthan	0.052	0.037	0.042	0.041	0.043	0.043	0.045	0.050	0.059
TamilNadu	0.082	0.073	0.089	0.077	0.080	0.106	0.121	0.099	0.139
Tripura	0.371	0.265	0.272	0.273	0.252	0.226	0.233	0.105	0.233
Uttar Pradesh	0.099	0.062	0.075	0.105	0.059	0.108	0.102	0.099	0.134
West Bengal	0.033	0.035	0.029	0.034	0.034	0.036	0.041	0.045	0.115

## VII. Time Effects in a Panel Analysis

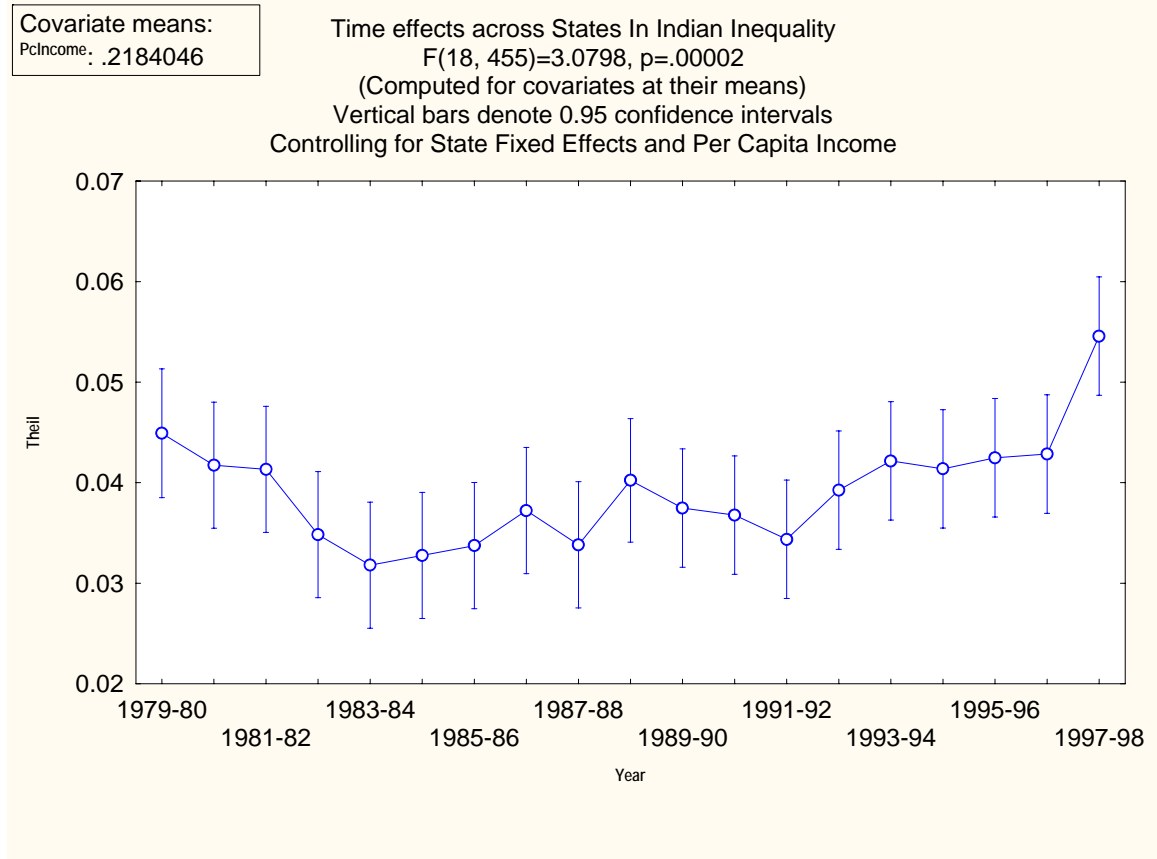
As a final exercise, we estimate a two-way, fixed-effects panel model of the form:

$$T_{it} = A + B_1 * PCI_{it} + B_2 * D_i + B_3 * D_t + e$$

Where  $T_{it}$  is the Theil statistic for state  $i$  in time  $t$ ,  $PCI$  is per capita income, and the  $D_i$  and  $D_t$  represent vectors of dummy variables to capture fixed effects for states and years. The fixed time effects  $D_t$  provide us with a very interesting measure of the rise in inequality common to Indian states, but *not* associated with differences in the change in per capita income.

The pattern of time fixed effects is shown in Figure 10. There is a distinct decline in the early years through 1984, rough stability thereafter until 1991-92, and an inflection point followed by rising inequality, which accelerates toward the end of the decade. The coincidence of the inflection point with the onset of reforms in 1991-92 is probably not coincidental, and tells us that the reform process has generated rising inequality that *cannot* be associated strictly with gains in average income. There has been redistribution – toward the better-off – not compensated by higher average incomes.

Figure 10.



## **Conclusions**

We can safely conclude that inequality in Indian manufacturing sector wages have increased since the 1990s: both all-India and state measures agree on this point. Indian manufacturing however retains many of the characteristics of a planned and a dual economy, with a strong influence of the state on relative wages. For the most part, industries in the public sector serve as islands of high wages amidst much lower wages in the private and competitive sectors. The differential location of these industries in the different states contributes strongly to the patterns of inequality between states. Thus even industrially backward states like Bihar and Orissa have manufacturing wages above the national average, due to the presence of large-scale public sector undertakings within their boundaries.

Although certain parts of India are very much richer than others, India does not show a pattern of rising regional inequality in the last two decades in this data. Instead, the rise in inequality appears – at least within the manufacturing sector – to be a phenomenon of rising relative incomes in sectors with monopoly power, and particularly in the utility and especially the electricity sectors.

Overall, though, inequality has been increasing in manufacturing pay since the early 1980s, with particular increases since the formal beginning of the reforms. This increase cannot be accounted for strictly by increasing average incomes, as the rise in inequality persists even when changes in average income between states is fully controlled for.

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## **Appendix A. Regional Disparities in India: A Brief Literature Review**

Ever since India embarked on the path of economic development in 1950, studies have been conducted of the emerging pattern of income distribution. This interest has intensified with the advent of economic reforms in 1991. Most of these studies have used the State Domestic product figures to study the impact of economic reforms on income distribution across states.

In one of the earlier studies on inter-state inequalities Majumdar (1982) found that disparities in state per capita income had increased gradually and steadily during the period 1962-63 to 1975-76. However, if Punjab and Haryana were excluded from the analysis, the absolute level of coefficient of variation in State per capita income was considerably lower. Majumdar (1982) also found that the disparities in per capita expenditure were much lower than the disparities in per capita income.

Mahajan (1982) observed a trend towards convergence between states, as the coefficient of variation of the value added by manufacture per person engaged for the period 1951-75 declined from 27.5 to 19.8. He attributed this to policy measures taken by the Government to promote regional balance, specifically public investment in state plans



which entailed transfer of funds from the federal government to the state governments, and large scale federal investment in M.P, Bihar and Orissa. These three states together accounted for more than 50% of the total federal investment during the period 1951-1976. In addition, there was the regulation of private investment by giving incentives to invest in backward areas. Mahajan (1982) acknowledged that divergent trends comprising of various social and economic factors were also at play; the net result of these two trends has been that the natural tendency towards the inverted U pattern in the earlier stages of growth has been checked to an extent by the federal government.

Rao et al. (1999) used a convergence regression model to find that per capita state domestic product (PCSDP) tended to diverge during the 1965-1995 period; the growth of PCSDP in states with high initial PCSDP tended to be greater than in those with low initial PCSDP. The trend was not found to be significant from 1985 to 1994 but from 1990-94, the trend towards divergence became significant again. The authors argued that initial income levels reflecting the initial capital stock was an important factor in determining the growth rate. Their study also found that private investment was the most important determinant of income gains from the mid 1970's. They also found that there was significant variation in income from the primary sector during the period 1960-1990 whereas this factor has remained stable since 1990. Meanwhile, the variation in secondary sector incomes increased after 1990, since which time the manufacturing incomes of the better performing states have shot up. Again, private investment was found to be the most important factor. Finally, they argue that government-owned public enterprises do not have a significant linkages with the local economy; moreover the freight equalization scheme which enabled materials like steel and cement to be sold at approximately the same price across the country had allowed the private sector to set up industries in the developed states which were far away from the resource-rich but poorer states.

The intergovernmental transfers from the center to the states were also not enough for the poorer states to provide the same level of services as the richer states; this has acted as a further disincentive to private capital to set up industries in these areas. The richer states with higher levels of per capita government expenditure are able to provide better services. The quality of human capital as a factor has also become significant since the 1980's.

While examining the performance of various states in the pre reform and the post reform period by using the SDP figures Ahluwalia (2002) finds that the rate of growth of combined gross domestic state product has risen from 5.24% during the decade 1980-81 to 1990-91 to 5.90% during the period 1991-92 to 1998-99. The variation in growth performance across states over the two periods has increased significantly in the 1990's. The growth rates for SDP went up sharply for Gujarat (8.2%), Maharashtra (8%), Madhya Pradesh, West Bengal, Rajasthan Tamil Nadu and Karnataka. (approximately 6% for all others) On the contrary the rate of growth for SDP has declined in the post reform period for Bihar, UP and Orissa.

Ahluwalia (2002) broadly credits the superior performance of the fast-growing states to their ability to provide an environment more conducive to reap benefits from the reforms. He assigns a major role to the effect of private capital investment in these states; all states showing improved performance have had significant investment by the private sector. In particular, since the end of industrial licensing private investment has increasingly moved to the developed states. Ahluwalia (2002) also observed that the size of the state plan expenditure does not have a significant relationship with growth; however certain elements of infrastructure (electricity, telecommunications) and to an extent education or literacy levels are positively correlated with growth.

There has been one study which finds that there is no evidence of long run divergence of incomes across states. Singh et al. (2003) find that the Gini coefficient of the top quintile and the bottom quintile income share during the period 1960-2000 has remained unchanged. They also find that there is no increase in disparity in the rural areas but a small increase in disparity in the urban areas in the post reform period; they argue that earlier studies ignore the role of interstate remittances especially from the richer states like Punjab and Maharashtra to the poor states like Bihar. In their view if we look at the broader well being by examining the trend in a composite Human Development Index (HDI), interstate disparities have not worsened in the 1990s. When disparities are examined by studying an economic performance index comprising petrol and diesel sales, bank credit and bank deposit and cereal production, however, certain trends emerge. The western part of the country is gaining over the eastern part, the cities are gaining over the villages, and the rain-fed areas are lagging behind.

#### **Appendix B. Annual Survey of Industries (ASI) Data vis-à-vis National Sample Survey Organisation (NSSO) Data on Employment in Indian Industries.**

The National Sample Survey (NSS) was set up in 1950 in India to conduct large scale surveys to provide data for the estimation of national income and other related aggregates, especially those related to the unorganized sector of the economy, and for planning and policy formulations. The NSS was reorganized in 1970 by compiling all aspects of survey work into a unified agency, known as National Sample Survey Organisation (NSSO) under the Department of Statistics, Government of India. NSSO has four main divisions. They are:

1. Survey Design and Research Division;
2. Field Operations Division;
3. Data Processing Division; and
4. Coordination and Publication Division.

The Annual Survey of Industries (ASI) is one of the large-scale sample surveys carried out by the Field Operations Division of the NSSO, which was launched in 1960 with 1959 as the reference year and it continues since then except for the year 1972. The ASI aims at collecting data and hence comprehensive information regarding registered factories in India on an annual basis. The ASI is the primary source of data that facilitate the estimation of the contribution of manufacturing industries to national income, systematic study of the structure of industries, analysis of various factors influencing the

Indian industries and also providing comprehensive, factual and systematic basis for the formulation of industrial policy. Currently, the ASI covers most of the country except for the States of Arunachal Pradesh, Mizoram, Sikkim and the Union Territory of Lakshadweep Islands.

This appendix examines how far the NSSO data and ASI data on employment in the factory sector of India are mutually compatible. We use data on employment at two-digit level across States and Union Territories for the three years, 1983-84, 1987-88 and 1993-94. The data for the years 1983-84 and 1987-88 are classified under the scheme of National Industrial Classification (NIC) 1970, whereas the data for the year 1993-94 is classified under the scheme of NIC 1987. The data used here are in concordance to the two-digit International Standard Industrial Classification (ISIC) sector code.

We use the NSSO data and ASI data on sectors including manufacturing, transport, storage and communication, and other services across States and Union Territories. The manufacturing sector includes the sub-sectors (20-39) under two-digit sector code, manufacture of food products (20 & 21), beverages, tobacco and related products (22), cotton textile (23), wool, silk and man-made fiber textile(24), jute and other vegetable fiber textile (except cotton) (25), textile products (including wearing apparel) (26), wood and wood products, furniture and fixtures (27), paper and paper products and printing publishing and allied industries (28), leather and leather products, fur and leather substitutes (29), basic chemicals and chemical products (except products of petroleum and coal (30), rubber, plastic, petroleum and coal products; processing of nuclear fuels (31), non-metallic mineral products (32), basic metal and alloys industries (33), metal products and parts, except machinery and equipment (34), machinery and equipment other than transport equipment (35 & 36), transport equipment and parts (37), other manufacturing industries including manufacturing of scientific equipment, photographic/cinematographic equipment and watches and clocks (38), and the repair of capital goods (39). The transport, storage and communication sector includes only the sub-sector of storage and warehousing services (74) under two-digit sector code. The other services sector includes the sub-sectors (40-43, 97) under two-digit code, electricity (40), gas and steam generation and distribution through pipes (41), water works and supply (42), non-conventional energy generation and distribution (43), and repair services (97). In this case we have ASI data on entire country except for the states of Arunachal Pradesh, Mizoram, Sikkim and the union territory of Lakshadweep Islands. However, the NSSO includes data on even those states and union territory, which ASI has not covered, as mentioned above. Moreover, we have data for the union territory of Goa, Daman and Diu for the year 1983-84 and for the state of Daman and Diu and state of Goa for the years 1987-88 and 1993-94.

Comparing the ASI figures of total employment in manufacturing sector with that of NSSO for the years 1983-84, 1987-88 and 1993-94 we get the following results:

- ASI total employment in the manufacturing sector (20-39) for the year 1983-84 is 26.9% of that of NSSO total employment in the manufacturing sector;
- ASI total employment in the manufacturing sector (20-39) for the year 1987-88 is 24.85% of that of NSSO total employment in the manufacturing sector;

- ASI total employment in the manufacturing sector (20-39) for the year 1993-94 is 21.87% of that of NSSO total employment in manufacturing sector.

Comparing the ASI figures of total employment in sub-sector 74 with that of NSSO figure for the years 1983-84, 1987-88 and 1993-94 we get the following results:

- ASI total employment in sub-sector 74 of the transport, storage and communication sector for the year 1983-84 is 22.66% of that of NSSO total employment in that sub-sector;
- ASI total employment in sub-sector 74 of the transport, storage and communication sector for the year 1987-88 is 24.64% of that of NSSO total employment in that sub-sector;
- ASI total employment in sub-sector 74 of the transport, storage and communication sector for the year 1993-94 is 24.81% of that of NSSO total employment in that sub-sector.

Comparing the ASI figures of total employment in the sub-sectors 40, 41, 42, 43 and 97 for the years 1983-84, 1987-88 and 1993-94 we get the following results:

- ASI total employment in sub-sectors 40-43 and 97 of the other services sector for the year 1983-84 is 42.08% of that of NSSO total employment in those sub-sectors;
- ASI total employment in sub-sectors 40-43 and 97 of the other services sector for the year 1987-88 is 41.07% of that of NSSO total employment in those sub-sectors;
- ASI total employment in sub-sectors 40-43 and 97 of the other services sector for the year 1993-94 is 27.48% of that of NSSO total employment in those sub-sectors

We calculate the state-wise share of employment of each sub-sector (two-digit code) in total employment in that sector (e.g. the share of employment of sub-sector 23 in total employment in manufacturing sector or the share of employment of sub-sector 40 in total employment in other services sector) for each year from the ASI data and the NSSO data and compare them. The results are shown in table 1(B). In this comparison we consider only the manufacturing and the other services sector. The transport, storage and communication sector is excluded since we have the data for only the sub-sector 74 in case of ASI data. For this comparison we derive the Pearson's correlation coefficients between the ASI and NSSO figures on the state-wise share of employment of each sub-sector in total employment in that sector for the three years 1983-84, 1987-88 and 1993-94 and we get the results (state-wise correlation coefficients) as shown in table 1(B). We test the level of significance at 0.05, 0.01 and 0.001 levels.

Observing the results we can say that for the year 1993-94 the ASI data on the state-wise share of employment of each sub-sector (two-digit code) in total employment in that sector matches well with that of the NSSO data except for Dadra & Nagar Haveli and Nagaland. The correlation coefficients are high as well as significant mostly at the 0.001 level. In case of the year 1983-84 the match is good for most of the states and union territories except for Bihar, Goa, Daman & Diu, Karnataka, Manipur, Orissa,

Punjab, Tripura, Uttar Pradesh and West Bengal. However, in case of the year 1987-88 the match is good for only nine states and union territories. Overall we can observe that for Andaman & Nicobar Islands, Delhi, Himachal Pradesh, Jammu & Kashmir, Maharashtra, Meghalaya and Tamil Nadu the ASI figures match well with that of the NSSO figures in case of all the three years.

In table 2(B) the Pearson's correlation coefficients between the ASI and NSSO data on the state-wise share of employment of each sub-sector (two-digit code) in total employment in that sector for all the states and union territories for the years 1983-84, 1987-88 and 1993-94 are given. From the figures we can say that the overall match for the years 1983-84 and 1987-88 is good and for the year 1993-94 the correlation coefficient is low, but it is significant at the 0.05 level.

**Table 1(B)**

State (S) / Union Territory (UT)	N	Correlation Coefficient $r_{83-84}$	$p$ Value for $r_{83-84}$	Correlation Coefficient $r_{87-88}$	$p$ Value for $r_{87-88}$	Correlation Coefficient $r_{93-94}$	$p$ Value for $r_{93-94}$
Andaman & Nicobar Islands (UT)	9	0.750	0.020*	0.849	0.004**	0.855	0.003**
Andhra Pradesh (S)	22	0.426	0.048*	0.322	0.144	0.974	0.000***
Assam (S)	23	0.555	0.006**	0.089	0.688	0.917	0.000***
Bihar (S)	23	0.219	0.315	0.216	0.322	0.956	0.000***
Chandigarh (UT)	18	0.794	0.000***	0.171	0.496	0.559	0.016*
Dadra & Nagar Haveli (UT)	12					-0.112	0.728
Daman & Diu (UT)	14					0.662	0.010**
Delhi (S)	22	0.858	0.000***	0.532	0.011*	0.808	0.000***
Goa (S)	16					0.592	0.016*
Goa, Daman & Diu (UT)	17	-0.150	0.566				
Gujarat (S)	22	0.472	0.026*	0.330	0.133	0.975	0.000***
Haryana (S)	22	0.420	0.051	0.336	0.126	0.925	0.000***

Himachal Pradesh (S)	21	0.604	0.004**	0.674	0.001***	0.976	0.000***
Jammu & Kashmir (S)	20	0.628	0.003**	0.477	0.033*	0.808	0.000***
Karnataka (S)	23	0.385	0.070	0.375	0.078	0.917	0.000***
Kerala (S)	22	0.664	0.001**	0.360	0.100	0.964	0.000***
Madhya Pradesh (S)	23	0.650	0.001***	0.319	0.137	0.980	0.000***
Maharashtra (S)	23	0.528	0.010**	0.452	0.030*	0.969	0.000***
Manipur (S)	11	0.115	0.737	0.885	0.000***	0.950	0.000***
Meghalaya (S)	11	0.907	0.000***	0.658	0.028*	0.769	0.000***
Nagaland (S)	8					0.493	0.214
Orissa (S)	23	0.164	0.453	0.568	0.005**	0.869	0.000***
Pondicherry (UT)	19	0.867	0.000***	0.162	0.507	0.692	0.001***
Punjab (S)	23	0.402	0.057	0.378	0.075	0.909	0.000***
Rajasthan (S)	22	0.604	0.000***	0.344	0.117	0.943	0.000***
Tamil Nadu (S)	24	0.566	0.004**	0.462	0.023*	0.981	0.000***
Tripura (S)	17	0.389	0.123	0.386	0.126	0.947	0.000***
Uttar Pradesh (S)	23	0.357	0.094	0.113	0.606	0.965	0.000***
West Bengal (S)	23	0.316	0.141	0.287	0.184	0.955	0.000***

$r_i$  = Pearson's Correlation Coefficient between ASI and NSSO data on the share of employment in sub-sectors with respect to the total employment in the sector for each State and Union Territory in the  $i$ th year, for all  $i = 1983-84, 1987-88$  and  $1993-94$ . \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

N= Number of sub-sectors for each State or Union Territory. UT implies Union Territory and S implies State

**Table 2(B)**

	N	Correlation Coefficient R	p Value for the correlation coefficient
1983-84	502	0.514	0.000***
1987-88	485	0.500	0.000***
1993-94	539	0.093	0.030*

R = Pearson's Correlation Coefficient between ASI and NSSO data on the share of employment in sub-sectors with respect to the total employment in that sector (i.e. Manufacturing, Transport, storage and communication and Other services) in the *i*th year, for all States and Union territories taken together. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ . N= Number of sub-sectors for all states and union territories taken together.

### Appendix C. Theil's T Statistic and its components.

The between-groups component of Theil's T is given by the formula:

$$T = \sum \log \left\{ \frac{(Y_i/Y)}{(P_i/P)} \right\} * Y_i/Y$$

Where:

$Y_i$  = Payroll share of the  $i^{\text{th}}$  cell.

$Y$  = Total payroll across all cells.

$P_i$  = Number of employees in the  $i^{\text{th}}$  cell.

$P$  = Total number of employees in across all cells.

We refer to the term within the summation sign for the  $i^{\text{th}}$  cell as the "Theil element" for that cell.

The index is very flexible and can be applied to many different classification schemes; the sole requirements are a group structure and employment and total payroll for each group.

At the All-India level we are able to examine the performance of various manufacturing groups over the period 1973-74 to 1997-98, a period of 25 years of annual observations, from well before until quite recently in the age of reforms.

The 25 sector decomposition available at the two digit level across 25 states enables us to construct a time series measure of T that makes visible both the geographic and the sectoral dimensions of change, annually for the period 1979-80 to 1997-98. This makes it possible to pinpoint quite specifically when and where and under what influences pay inequality in India increased or decreased during this period.

Further, is changing inequality in India primarily a geographic or a sectoral question? We can approach this issue by aggregating the state–sector elements into their two distinct groups, viz. states and sectors. The formulae are as follows:

*Within Sectors Inequality*

$$T_{Wsectors} = \sum Y_i/Y * T_i$$

Where  $Y_i$  = Payroll share of the  $i^{th}$  sector  
 $Y$  = Total payroll of all sectors  
 $T_i$  = Theil index of the  $i^{th}$  sector

*Between Sectors Inequality*

$$T_{Bsectors} = T - T_{Wsectors}$$

Where  $T$  = overall Theil index for that year i.e. simple summation of all Theil elements across state-sector cells.

Similarly, we have:

*Within States Inequality*

$$T_{Wstates} = \sum Y_j/Y * T_j$$

Where  $Y_j$  = Payroll share of the  $i^{th}$  state  
 $Y$  = Total payroll of all states  
 $T_j$  = Theil index of the  $i^{th}$  state

*Between States Inequality*

$$T_{Bstates} = T - T_{Wstate}$$

Where  $T$  = Theil's  $T$  for that year i.e. simple summation of all Theil elements across states and sectors.

Finally:

**Within State Inequality**

Finally, we may examine pay inequality within each state by calculating Theil indices for individual states according to this formula:

$$T_j = \sum_i \log \{ (Y_{ij}/Y_j) / (P_{ij}/P_j) \} * Y_{ij}/Y_j$$

Where  $Y_{ij}$  = Payroll share of the  $i^{th}$  industrial group in state  $j$ .



$Y_j$  = Total payroll of the entire manufacturing sector in state j  
 $P_i$  = Number of employees in the  $i^{\text{th}}$  manufacturing sector in state j.  
 $P_j$  = Total number of employees in the manufacturing sector in state j.

A similar formula governs the inequality within each sector (measured across states). This study is also done for the period 1979-80 to 1997-98.

#### Appendix D. Equality Rankings of the States.

**Table 1(D) Equality Rank of States, 1979-1989**

	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
Andaman & Nicobar	1	1	1	1	1	1	2	1	1	3
Andhra Pradesh	23	23	24	21	24	24	22	23	23	22
Assam	16	16	19	18	22	22	25	22	22	23
Bihar	15	15	22	17	18	15	13	11	12	11
Chandigarh	18	3	17	23	21	11	9	14	10	7
Dadra & Nagar Haveli	0	0	0	0	0	0	0	0	0	2
Daman and Diu	0	0	0	0	0	0	0	0	0	0
Delhi	11	7	9	7	5	5	4	4	5	9
Goa	0	0	0	0	0	0	0	0	0	0
Goa, Daman & Diu	21	17	21	19	13	18	19	13	19	15
Gujarat	9	11	11	13	11	14	15	12	15	16
Haryana	4	9	13	4	17	12	14	20	16	17
Himachal Pradesh	2	2	2	2	2	2	1	8	3	1
Jammu & Kashmir	10	10	10	3	10	19	6	21	4	6
Karnataka	17	22	15	16	15	13	12	2	17	12
Kerala	24	25	25	24	25	25	23	25	24	24
Madhya Pradesh	19	20	20	22	20	21	20	18	20	5
Maharashtra	8	12	12	12	12	10	10	9	11	14
Manipur	22	19	3	9	9	8	21	16	2	25
Meghalaya	13	6	7	6	6	7	8	7	9	18
Nagaland	0	0	0	0	0	0	0	0	0	0
Orissa	20	21	16	20	19	20	18	19	21	20
Pondicherry	3	8	5	5	7	9	11	5	8	8
Punjab	5	14	4	10	4	3	7	10	14	13
Rajasthan	7	4	8	11	3	4	5	6	7	10
TamilNadu	12	13	14	15	14	17	16	17	18	19
Tripura	0	24	23	25	23	23	24	24	25	26
Uttar Pradesh	14	18	18	14	16	16	17	15	13	21
West Bengal	6	5	6	8	8	6	3	3	6	4

**Table 2(D) Equality Rank of States, 1989-1998.**

	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98
Andaman & Nicobar	1	1	2	1	1	2	6	5	3
Andhra Pradesh	24	25	25	25	25	25	24	25	26
Assam	25	26	28	27	27	28	28	28	27
Bihar	15	23	24	23	24	23	21	23	20
Chandigarh	19	19	15	22	21	18	13	13	28
Dadra & Nagar Haveli	8	4	1	3	2	3	2	2	1
Daman and Diu	4	7	7	5	5	12	3	4	2
Delhi	6	6	10	14	10	9	7	8	7
Goa	22	15	19	11	11	15	11	11	9
Goa, Daman & Diu	0	0	0	0	0	0	0	0	0
Gujarat	10	13	11	20	15	13	14	15	12
Haryana	12	11	13	13	13	10	12	12	15
Himachal Pradesh	3	3	3	2	3	1	1	3	11
Jammu & Kashmir	2	2	5	4	4	4	4	1	5
Karnataka	23	21	22	19	22	22	23	21	21
Kerala	26	27	27	28	28	27	27	27	25
Madhya Pradesh	20	14	14	12	12	14	17	16	13
Maharashtra	13	18	20	15	14	11	16	14	14
Manipur	11	16	12	10	23	17	15	22	22
Meghalaya	5	5	4	6	6	8	5	6	4
Nagaland	0	24	23	24	19	24	25	26	23
Orissa	21	22	18	17	16	16	18	24	16
Pondicherry	16	20	16	16	20	19	20	17	8
Punjab	9	10	8	8	7	5	10	7	6
Rajasthan	14	9	9	9	9	7	9	10	10
TamilNadu	17	17	17	18	18	20	22	19	19
Tripura	27	28	26	26	26	26	26	20	24
Uttar Pradesh	18	12	21	21	17	21	19	18	18
West Bengal	7	8	6	7	8	6	8	9	17

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