# Chapter Six

## STATE INCOME INEQUALITY IN INDIA

### I. Introduction :

We have seen in Chapter 3 above that there exist significant State Income inequalities in India. Having derived already the series of worker rate, industrial structure, capital intensity and output-capital ratios for different State economies in India in Chapters 4 and 5 above, it is possible for us in the present Chapter to probe into the interesting question as to which of these factors explains a major part of these inequalities in India. In other words, at this stage, we are in a position to find out the exact contribution made by each one of these factors to the State Income inequalities in India.

It may be recalled in this connection that our primary objective is to study the interstate variations in the economic growth and not in the levels of development as such. In the light of this objective, a study of State Income inequalities for its own sake may appear to be an unnecessary digression. However, for appreciating fully the factors responsible for differing growth of income in different State

economies in India during the period 1960-61 to 1970-71, it is important to examine the nature and extent of influence of different factors on the interstate variations in the levels of income in the base year, i.e., the year 1960-61 in our case. It is important because, it is only when we examine the importance of various factors responsible for the State income inequalities in the base year, that we can later on find out whether the same set of factors that is responsible for the major part of the State Income inequalities in the base year, is also responsible for a major part of the inter-state variations in the economic growth or not. This finding will be useful for the policy-makers since it has a potential to suggest the direction in which they should concentrate their efforts in order to achieve a greater degree of equity in terms of income originating among different States in India. Thus, the analysis of the factors responsible for the interstate variations in the levels of per capita income, at least in the base year, is an integral part of the analysis of the interstate variations in the economic growth in India. The present Chapter is therefore devoted to a systematic analysis of the sources of interstate variations in the levels of per capita income in the year 1960-61 in India.

Broadly speaking, in the present Chapter, we have classified the following sources of interstate variations in the level of per capita income: (a) the attitude of people at large to work or the incidence of labour participation which is measured as the overall worker rate in the State economy at a point of time; (b) the varying importance of different sectors or the industrial structure of the State economies which is measured as the proportion of the working population engaged in different sectors of the State economy at a point of time; (c) the skill, dexterity and judgement with which labour is applied in different sectors of the economy or the sectoral productivities in a State economy which is measured as the product per worker in the respective sectors of the State economy.

These factors have been recognised as important in explaining the differences in regional incomes by many scholars in the field. J.G. Williamson finds that "labour participation rates appear to play a significant role in explaining regional dualism at all levels of national development."*1 E.Olsen recognises that per capita incomes

*1 Cf. J.G.Williamson: "Regional Inequality and Process of National Development: A Description of Patterns", in Economic Development and Cultural Change, Vol.13, No.4, Part II, July, 1965.

of regions can differ because of differences in the rates of labour-force participation among regions.*2 M.D.Chaudhry finds that a sizeable portion of the provincial per capita differences in Puerto Rico are explained by differences in the participation rates in the labour force among the provinces.*3 He also considers age composition of the population, level of schooling of the working population and under-employment as the explanatory variables. W.H. Woodward has also considered similar factors besides labour productivity to account for the observed differences in per capita income.*4

Similarly, P.A. Hanna,*5, H.S. Perloff,*6,V.R.Fuchs,*7 B.E.Coates and E.M. Rawstron,*8 etc. have emphasised the

*2 Cf. E.Olsen: "Regional Income Differences Within a Common Market", in H.W.Richardson(ed.): Regional Economics - A Reader (London: Macmillan,1970).

*3 Cf. M.D.Chaudhry: "Economic Distance Among Regions: A Statistical Analysis", in Economic Development and Cultural Change, Vol.19, No.4, July 1971.

*4 Cf. W.H.Woodward: "Regional Social Accounts for the United Kingdom", in National Institute of Economic and Social Research: Regional Paper I (Cambridge,1970).

*5 Cf. P.A.Hanna: State Income Differentials 1919-'54(Durham:1959)

*6 Cf. H.S.Perloff: "Interrelations of State Income And Industrial Structure" in Review of Economics and Statistics,May, 1957. See also H.S.Perloff, E.S.Dunn Jr., E.E.Lampard and R.F.Muth: Regions, Resources and Economic Growth,(Baltimore, Resources for the Future, Inc.,1961).

*7 Cf. V.R.Fuchs: "The Determinants of the Redistribution of Manufacturing in the United States since 1929", in Review of Economics and Statistics, May,1962.

*8 Cf. B.E. Coates and E.M.Rawstron: "Regional Variations in Income", in Westminster Bank Review, Feb.1966.

role of industrial structure (as reflected in the sectoral employment pattern) in explaining the interstate differences in per capita income. As H.S. Perloff puts it, the concept of economic growth "stresses the importance of (1) industrial structure, (2) productivity, and (3) the pattern of demand, in analysing economic growth and differences in the levels of national (or State) income.... It seems to me, however, that the economic-sector concept with its focus on sector productivity and structure of demand does provide a useful frame of reference for certain types of analyses concerned with the level and growth of an area's income."*9

Thus, overall worker rate, industrial structure, and productivity per worker have been recognised to be the main sources of variations in the level of per capita income among different States.However, it is possible to further decompose the last source, viz., the sectoral productivities in a State economy, into two parts which may not always be mutually exclusive. Productivity per worker can be expressed in terms

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*9 H.S.Perloff: "Interrelations of State Income and Industrial Structure", op.cit. For further discussion and references on these factors, see A.J. Brown: "Regional Economics, with special reference to the United Kingdom", in Royal Economic Society: Surveys of Applied Economics, Vol.I, Survey I, (MacMillan: 1973).

of the factor combination and the technological factors governing the productive efficiency of the available techniques of production.

As we have pointed out, it is important to note that these two types of factors are not always mutually exclusive. In fact, their precise contribution to the observed growth rate of an economy can be meaningfully measured separately only when we make the wel-known simplifying assumptions of the neo-classical theory.*10 It is too obvious to be explicitly stated that most of these assumptions hardly hold true for a typically underdeveloped country like India.*11 Moreover, it should be pointed out at this stage that we are interested in the analysis of interstate variations and

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*10 Some of the most important assumptions of the neo-classical theory are perfect substitutability in production, perfect malleability, constant returns to scale, perfect competition, full-employment equilibrium, etc. For a formal list of these simplifying assumptions, See J.E.Meade: A Neo-Classical Theory of Economic Growth, (London: Allen and Unwin, 1961). See also E.F. Denison: Sources of Economic Growth in United States - Alternatives Before us (New York: Committee for Economic Development, 1962); and Bakul H. Dholakia: The Sources of Economic Growth in India, (Baroda: Good Companions, 1974), ch.1.

*11 See, for example (i) G.Myrdal: Economic Theory and Underdeveloped Regions (London, 1957), (ii) D.Seers: "The Limitations of the Special Case" in Bulletin of Oxford Institute of Economics and Statistics, May, 1963. Even Dr. B.H.Dholakia is fully aware of these limitations. cf. Bakul H.Dholakia: The Sources of Economic Growth in India, op.cit., ch.I.

as we have seen in Chapter 3 above, the level of development differs significantly from State to State in India. A uniform set of assumptions for all States, therefore, may lead us to some erroneous results. It is for this reason that the type of lucid and attractive analysis of the growth experience of the nine western countries attempted by Denison,*12 has not attracted our attention to analyse the growth experience of the fifteen States of a country which is essentially an under-developed country. The analysis has got to be more realistic. Perhaps, we may have to enter into a direct trade-off between the reality and the elegance of the analysis, but it seems to be almost inevitable.

However, for the purpose of decomposing the productivity per worker into the factor proportions and the technological factors, we can use capital-intensity*13 and output-capital ratio as proxies for the former and the latter respectively. It should be noted here that capital-intensity incorporates some influence of the technological factors while the output-

*12 Cf. E.F. Denison: Why Growth Rates Differ? - Postwar Experience of Nine Western Countries, (Washington: The Brookings Institution, 1967).

*13 A.J.Brown explicitly recognises capital intensiveness to be an important variable on which variations of net output per head depend. See A.J.Brown: "Regional Economics, with special reference to the United Kingdom," op.cit.

-capital ratio is also not free from the factor-proportions. Still we are using capital-intensity and output-capital ratio to decompose productivity per worker largely because the capital intensity indicates broadly the overall investment effort undertaken in the economy and the output-capital ratio reflects broadly the efforts on technological improvements.

It is important to note that the factors listed above are not totally independent of one-another. There are reasons to expect some interrelationships among them. In the next section of the present chapter, we examine the interrelationships among different explanatory factors like productivity, worker rate and industrial structure of the State economies for the base year 1960-61. In the third section, an attempt is made to examine the individual explanatory power of these factors on an average for the interstate variations in the levels of per capita income in the base year. In the fourth and final section of this Chapter, the deviation approach*14 based on identity analysis is followed to get a precise idea about the importance of various factors in the observed deviation of the State per capita income from the weighted average for all the fifteen States taken together.

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*14 It is also referred to as shift and share approach, or the standardization procedures in the literature. We prefer to call it deviation approach because it is largely based on taking deviations from the average value or the observed values.

## II. Productivity, Worker Rate and Industrial Structure in Indian States :

We have already derived the required series of per capita State Domestic Product in Chapter 3 above, worker rate and industrial structure in Chapter 4 above, capital intensity and output-capital ratio in Chapter 5 above. Similarly, we can derive average productivity per worker in each of the broad sectors from the estimates of SDP presented in Chapter 2 and the estimates of working force given in Chapter 4 above. Table 6.1 presents the estimates of average productivity per worker, so derived, for the year 1960-61.

From the table, it can be readily seen that, in 1960-61, average productivity in the primary sector was less than the average productivity in the secondary and the tertiary sectors in all the States except Kerala.*15 In Kerala, the average productivity in the primary sector was higher than that in the secondary and the tertiary sector. It is interesting to note that Kerala occupied the second highest place in terms of the average productivity in the primary sector, the top place being occupied by Punjab in 1960-61. The average

*15 This finding is fairly consistent with the one for the United States by S.Kuznets. See S.Kuznets: "Quantitative Aspects of Economic Growth of Nations: III-Industrial Distribution of Income and Labour Force by States, United States, 1919-21 to 1955", in Economic Development and Cultural Change, Vol.6, July 1958.

Table 6.1

Productivity Per Worker In Indian States, 1960-61

(at Current Prices)

( in Rs.)

| States | Productivity Per Worker in | | | |
|---|---|---|---|---|
| | Primary sector | Secondary sector | Tertiary sector | All sectors |
| 1 | 2 | 3 | 4 | 5 |
| 1. Andhra | 420 | 684 | 1171 | 563 |
| 2. Assam | 660 | 1361 | 1327 | 808 |
| 3. Bihar | 370 | 1225 | 1281 | 550 |
| 4. Gujarat | 503 | 2302 | 1699 | 907 |
| 5. Haryana | 757 | 1965 | 1277 | 950 |
| 6. Karnataka | 519 | 1063 | 1397 | 702 |
| 7. Kerala | 955 | 670 | 778 | 839 |
| 8. M.P. | 355 | 1112 | 1182 | 498 |
| 9. Maharashtra | 485 | 1768 | 1767 | 841 |
| 10. Orissa | 420 | 951 | 758 | 516 |
| 11. Punjab | 1081 | 1540 | 1247 | 1203 |
| 12. Rajasthan | 388 | 1552 | 1436 | 586 |
| 13. Tamil Nadu | 604 | 980 | 1153 | 780 |
| 14. U.P. | 472 | 984 | 1106 | 608 |
| 15. W. Bengal | 734 | 2193 | 2122 | 1332 |
| Total | 493 | 1298 | 1333 | 715 |

Source : Table 3.3 and Table 4.8 above.

productivity in the primary sector varied all the way from Rs.355 in Madhya Pradesh to Rs.1081 in Punjab. This broadly speaks about the disparity which existed in terms of the average productivity in agriculture among Indian States. On an average, the productivity per worker turned out to be Rs.493 in the primary sector, Rs.1298 in the secondary sector, Rs.1333 in the tertiary sector and Rs.715 for all sectors taken together. It can be seen that in seven states, viz., Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Orissa, Rajasthan and Uttar Pradesh, the productivity per worker in the primary sector was less than the average in the base year.

In the secondary sector, the productivity per worker varied from Rs.2302 in Gujarat to Rs.670 in Kerala. In seven States, viz., Assam, Gujarat, Haryana, Maharashtra, Punjab, Rajasthan and West Bengal, the productivity per worker in the secondary sector was above the average in 1960-61. As far as the tertiary sector is concerned, the average productivity varied from Rs.2122 in West Bengal to Rs.758 in Orissa. Only in two States, viz., Kerala and Orissa, the average productivity in the tertiary sector turned out to be less than Rs.800; in all other States, it was more than Rs.1100 in 1960-61. However, only in five States, viz., Gujarat, Karnataka, Maharashtra, Rajasthan and West Bengal, the

productivity per worker in the tertiary sector was above the average. From the table, moreover, it can be seen that only in two States, viz., Gujarat and West Bengal, the productivity per worker was higher than the average in all the three sectors of the economy and therefore, only these two States can be truly regarded as the high productivity States. On the other hand, in as many as five States, viz., Andhra Pradesh, Bihar, Madhya Pradesh, Orissa and Uttar Pradesh, the productivity per worker turned out to be below average in all the three sectors of the economy in 1960-61 and therefore, these five States are genuine low productivity States.

If we look at the coefficient of variation of the series of average productivity in the primary, secondary, tertiary and all sectors taken together, to get the idea of interstate variations in the productivity per worker in the year 1960-61, we find that the maximum interstate variation is displayed by the productivity per worker in the secondary sector, its coefficient of variation being 38.04%; and the minimum interstate variation is displayed by the productivity per worker in the tertiary sector, its coefficient of variation being 26.90%. The coefficient of variation of the productivity per worker in the primary sector turns out to be 37.38%

while the same works out at 31.77% for the productivity per worker in the economy as a whole.*16 It is an interesting exercise to correlate the productivity per worker in the economy as a whole with the productivity per worker in the three sectors of the economy. The coefficients of correlation turn out to be +0.7746 with the productivity per worker in the primary sector, +0.6408 with the productivity per worker in the secondary sector, and +0.5575 with the productivity per worker in the tertiary sector of the State economies. It implies that about 60% of the total observed variations in the productivity per worker in the economy as a whole is explained merely by the variations in the productivity per worker in the primary sector which is significant at 1% level of significance. Moreover, it also means that productivity per worker in the secondary and the tertiary sectors also explains on an average about 41% and 31% respectively of the observed variations in the productivity per worker in the economy as a whole, both of which are significant at 5% level of significance.

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*16 These findings are consistent with the findings of S.Kuznets based on cross-country analysis. Cf. S.Kuznets: "Quantitative Aspects of Economic Growth of Nations-II-Industrial Distribution of National Product and Labour Force", in Economic Development and Cultural Change, Supplement to Vol.5, July 1957.

Before we pass on to study the interrelationships among the worker rate, industrial structure and productivity per worker, let us examine the extent of interstate inequality in terms of income per worker and capital per worker in the base year 1960-61. If we look to the coefficients of variations of the productivity per worker and capital stock per worker, they turn out to be 31.77% and 41.39% respectively. It implies that the interstate variations in the former are on an average less as compared to the interstate variations in the latter. However, if we look to the Gini Coefficient of inequality, we find that it turns out to be 15.56% for the productivity per worker and 14.45% for the capital stock per worker in 1960-61. This implies that the State inequality in product per worker is greater than the State inequality in capital stock per worker in the base year. It is worth-noting that this finding is quite consistent with the finding of the previous Chapter that capital stock seems to be more evenly distributed than the total production with respect to population among different States in India in the base year.*17

These findings only suggest that policies followed before 1960-61 in India concentrated more on the means rather

*17 Cf. Section IV of Ch.5 above.

than the end which perhaps reflect the great faith of the government in the 'magic' of investment. The logic of their faith is not apparently inconsistent. One can argue that per capita income differs from State to State because the productivity per worker differs from State to State. Productivity per worker dependsdirectly on the capital employed per worker. Therefore if capital intensity in the economically backward regions is increased by diverting a greater proportion of investment to these regions, the productivity per worker in these regions would increase leading thereby to an increase in their per capita income. Thus, by increasing capital intensity in the economically backward regions, we can generate a tendency towards equity in State Income.

Nothing appears to be wrong in this argument at the first sight. However, there are certain weak links in this argument or we can say that this argument depends on certain assumptions which may or may not hold in reality. To put it briefly, we can say in the first place that productivity per worker is not the only factor influencing the per capita income and the per capita income is not the only thing which gets influenced by the productivity per worker. For example we can say that the overall worker rate is one of the determinants of the per capita income and is inversely related

with the productivity per worker.*18 Therefore, attempts at increasing the productivity per worker alone may not always result in achieving the desired increase in the per capita income. Secondly, we can say that capital intensity is simply one of the determinants of the productivity per worker, the other one being the capital productivity. Other things remaining the same, capital productivity tends to be inversely related to the capital intensity because of the operation of the law of variable proportions. Therefore, a given increase in capital intensity may not always be able to bring desired increase in productivity per worker. However, if investments are also made with a view to improving technology, we may find better fruits of the same investment efforts. But if the investments are made neglecting the technological aspects, the efforts may not yield satisfactory results. Moreover, variables like degree of factor utilization, organizational efficiency, proper balance between sectors, skill component of the labour force, etc. also influence the overall productivity per worker in the economy. However, these factors get reflected through either capital intensity or capital productivity in the system.

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*18 There are several studies which come to this conclusion. For a detailed list of these studies, see foot-note 13 of Chapter 4 above.

Table 6.2

Interrelationships Among Capital Intensity, Capital Productivity and Labour Productivity in 1960-61

| Sectors | Productivity in Respective Sectors | | | |
|---|---|---|---|---|
| | Per Unit of Capital ($Y_i/K_i$) | | Per Unit of Labour ($Y_i/L_i$) | |
| | Coefficient of correlation | Coefficient of Determination | Coefficient of Correlation | Coefficient of Determination |
| 1 | 2 | 3 | 4 | 5 |
| A. Primary Sector | | | | |
| Capital Intensity | -0.5476 | 29.98% | +0.6972 | 48.60% |
| Capital Productivity | - | - | +0.1737 | 3.02% |
| B. Secondary Sector: | | | | |
| Capital Intensity | -0.1693 | 2.87% | +0.8680 | 75.33% |
| Capital Productivity | - | - | +0.3227 | 10.41% |
| C. Tertiary Sector: | | | | |
| Capital Intensity | -0.4274 | 18.27% | +0.6211 | 38.57% |
| Capital Productivity | - | - | +0.4405 | 19.40% |
| D. All Sectors : | | | | |
| Capital Intensity | -0.4959 | 24.59% | +0.8397 | 70.51% |
| Capital Productivity | - | - | +0.0100 | 0.01% |

Source : Table 6.1 and Tables 5.4 & 5.5 above.

It becomes obvious from the above discussion that an examination of the interrelationships among the capital intensity, capital productivity, labour productivity and the overall worker rate is quite important from the point of view of economic policy. Table 6.2 presents the interrelationships among the capital intensity, capital productivity and labour productivity as measured by the coefficient correlation. From the table, it can be readily observed that the Indian experience in the year 1960-61 seems to support the hypothesis of positive relationship between the capital intensity and labour productivity. In fact, the correlations between capital intensity and labour productivity in broad sectors of the economy turn out to be significant at 1% level of significance except in the case of the tertiary sector where it turns out to be significant at 5% level of significance. This only suggests that a significant positive association between capital intensity and labour productivity exists in the base year in India. One may enthusiastically interpret this result as a case for the production function showing constant returns to scale since average productivity of labour turns out to be a function of factor proportions. This may not always be valid, because the table also clearly brings out the fact that the capital productivity and the labour

productivity are not at all significantly associated in the base year. The correlations between the two in all the sectors turn out to be too weak to pass statistical tests of significance. Moreover, the correlations between capital intensity and capital productivity turn out to be negative as expected in all cases though only in the primary sector, the correlation turns out to be significant at 5% level of significance. These findings are not consistent with the hypothesis of a single production function showing constant returns to scale for the Indian States in the base year, because, in that case, a unique curve between $\frac{Y}{L}$ & $\frac{K}{L}$ ensures definite negative relationship between $\frac{Y}{L}$ & $\frac{Y}{K}$ and $\frac{K}{L}$ & $\frac{Y}{K}$, since $\frac{Y}{K}$ is the slope of the radius vector of the curve between $\frac{Y}{L}$ & $\frac{K}{L}$. But, the State data in India in the base year 1960-61 reveal that (i) capital intensity and labour productivity are significantly related, (ii) capital intensity and capital productivity are not significantly related except in the primary sector, and (iii) capital productivity and labour productivity are not at all significantly related. All these findings taken together imply that, if there is a single production function for all the States in India in the base year, the production function does not show constant returns to scale; or that different States in India do not

have the same production function in the base year. In either case, the curve between $\frac{Y}{L}$ & $\frac{K}{L}$ is not unique, so that these findings can be reconciled.

Table 6.3

Relationship of Worker Rate and Industrial Structure with Capital Intensity, Capital Productivity and Labour Productivity in 1960-61

| Factors | Overall Worker Rate | | Share of Primary Sector in Total Employment | |
|---|---|---|---|---|
| | Coeffi-cient of Correlation | Coeffi-cient of Determination | Coeffi-cient of Correlation | Coeffi-cient of Determination |
| 1 | 2 | 3 | 4 | 5 |
| Overall Capital Intensity | -0.7018 | 49.25% | -0.4730 | 22.37% |
| Overall Capital Productivity | +0.1296 | 1.68% | -0.1925 | 3.71% |
| Overall Labour Productivity | -0.7313 | 53.48% | -0.6687 | 44.72% |
| Share of Primary Sector in total employment | +0.6916 | 47.84% | - | - |

Source : Table 6.1, Tables 5.4 & 5.5, Tables 4.7 & 4.8

Having examined the interrelationships among the capital intensity, capital productivity and labour productivity, let us now examine the relationship of the overall worker

rate and the industrial structure as measured by the share of the primary sector in the total employment with the capital intensity, capital productivity and labour productivity in India in the base year 1960-61. Table 6.3 presents the coefficients of correlation and coefficients of determination between these variables. It is clear from the table that overall worker rate is significantly correlated with the capital intensity, labour productivity and industrial structure at 1% level of significance. On the other hand the capital productivity is not at all significantly related with either the overall worker rate or the industrial structure. Moreover, the industrial structure is significantly correlated only with overall labour productivity. Thus, the State data in India in the base year are consistent with the hypothesis that as labour productivity increase, the overall worker rate tends to fall and this fall is further accentuated by the fact that the share of the primary sector tends to fall as the labour productivity increases.

## III. Determinants of State Income Inequalities in India, 1960-61 :

In this section, our primary task is to examine the relationship of the State per capita income with some

important factors like capital intensity, capital productivity, labour productivity, industrial structure and overall worker rate in the State economies. It is actually possible to demonstrate by extending the already existing frame-work*19 that these four factors are, in fact, the basic determinants of per capita income. Let $Y_j$ and $y_j$ represent the total and per capita income of the $j^{th}$ State respectively; let $P_j$ and $L_j$ represent the total population and total workers in $j^{th}$ State; let $Y_{ij}$, $K_{ij}$ and $L_{ij}$ represent income, stock of capital and workers in $i^{th}$ sector of the $j^{th}$ State; then,

$$y_j = \frac{Y_j}{P_j} = \frac{\sum Y_{ij}}{P_j}$$

$$= \frac{\sum (Y_{ij}/L_{ij})(L_{ij})}{P_j}$$

$$= \frac{L_j}{P_j} \sum \frac{Y_{ij}}{L_{ij}} \cdot \frac{L_{ij}}{L_j}$$

$$= W_j \sum (p_{ij}) \frac{L_{ij}}{L_j} \qquad \ldots.(1)$$

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*19 Cf. H.S.Perloff: "Interrelation of State Income and Industrial Structure" in Review of Economics and Statistics, May, 1957; F.A.Hanna: "Analysis of Interstate Income Differentials: Theory and Practice", in National Bureau of Economic Research: Regional Income, Studies in Income and Wealth, Vol.21 (Princeton University Press,1957),etc. Further extention of this frame-work is attempted by the present author in an unpublished paper entitled, "A Note on the Interstate Income Differentials in India".

where $W_j$ is the overall worker rate in $j^{th}$ State and $p_{ij}$ is the productivity per worker in $i^{th}$ sector of the $j^{th}$ State.*20 Further,

$$y_j = W_j \sum \frac{Y_{ij}}{K_{ij}} \cdot \frac{K_{ij}}{L_{ij}} \cdot \frac{L_{ij}}{L_j}$$

$$= W_j \sum x_{ij} \cdot z_{ij} \cdot l_{ij} \qquad \ldots\ldots(2)$$

where $x_{ij}$ stands for the capital intensity in $i^{th}$ sector of the $j^{th}$ State, $z_{ij}$ stands for the output-capital ratio or the capital productivity in $i^{th}$ sector of the $j^{th}$ State and $l_{ij}$ stands for the proportion of working force in the $i^{th}$ sector of the $j^{th}$ State.

Thus, the overall worker rate, capital intensity, capital productivity and industrial structure can be regarded as the determinants of the per capita income. Secondly, this identity suggests that, ceteris paribus, there exists a direct relationship between the per capita income and each one of its components except $l_{ij}$. The relationship between the per capita income and the industrial structure is more complex because one cannot study the effect on per capita income of an increase in the proportion of working force, say, in the primary sector with constant proportion of working

*20 cf. Ravindra H. Dholakia: "A Note on the Interstate Income Differential in India", op.cit.

force in the other sectors of the economy. In other words, there is a constraint on $l_{ij}$ such that $\sum l_{ij}=1$. Together with an observation that productivity per worker in the primary sector generally tends to be lower than the other two sectors, this would ensure that a shift in the industrial structure in favour of the primary sector rather reduces the per capita income other things remaining the same.*21 However, as we have seen in the previous section, there exist some interrelationships among these components, too. As a result of these interrelationships, in reality, we may find, for example, an inverse relationship between the overall worker rate and the per capita income of States. It is, therefore, interesting to investigate the type of relationship that exists between the per capita income and each of these components on the basis of the cross section data for a given year. This exercise is again important because it can tell us about the components which explain a significant part of the total variations in the per capita incomes of different

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*21 As Colin Clark points out, the inverse relationship between the per capita income and the share of the primary sector in employment was postulated as long ago as 1691 by Sir William Petty. Colin Clark further elaborated it with the help of income elasticity of demand. See Colin Clark: The Conditions of Economic Progress (London: MacMillan, 1957). Comprehensive empirical evidence on this hypothesis was provided by S. Kuznets in his "Quantitative Aspects of the Economic Growth of Nations" parts II and III, op.cit.

Table 6.4

Correlation Between State Per Capita Income and Each of its Components, 1960-61

| Components | State Per Capita Income | |
|---|---|---|
| | Coefficient of correlation | Coefficient of Determination |
| 1 | 2 | 3 |
| A. Primary Sector : | | |
| 1. Capital Intensity | 0.2975 | 8.85% |
| 2. Capital Productivity | 0.1648 | 2.71% |
| 3. Labour Productivity | 0.4932 | 24.32% |
| 4. Share in Total Employment | -0.3650 | 13.32% |
| B. Secondary Sector : | | |
| 1. Capital Intensity | 0.4242 | 17.99% |
| 2. Capital Productivity | 0.6441 | 41.49% |
| 3. Labour Productivity | 0.7112 | 50.58% |
| 4. Share in Total Employment | 0.5155 | 26.57% |
| C. Tertiary Sector : | | |
| 1. Capital Intensity | 0.4618 | 21.32% |
| 2. Capital Productivity | 0.4679 | 21.90% |
| 3. Labour Productivity | 0.7599 | 57.75% |
| 4. Share in Total Employment | 0.3665 | 13.43% |
| D. All Sectors : | | |
| 1. Capital Intensity | 0.6168 | 38.05% |
| 2. Capital Productivity | 0.2318 | 5.37% |
| 3. Labour Productivity | 0.8624 | 74.36% |
| 4. Overall Worker Rate | -0.2495 | 6.23% |

Source : The same as for Table 6.3 above besides Table 3.1.

States in the base year. In other words, it helps us in describing the nature of the interstate variations in the levels of per capita income in the base year.

Table 6.4 presents the results of the correlation between the State per capita income and each one of its components for the year 1960-61. It can be seen from the table that all correlations, except the share of the primary sector in total employment and the overall worker rate, with the State per capita income turn out to be positive. The two negative correlations are also not statistically significant. In fact, only six out of sixteen correlations are statistically significant. This only implies that although there exists a definite relationship between the State per capita income and these variables, the observed variations in most of these variables individually do not explain a significant part of the total observed variations in the State per capita income in India in the base year 1960-61. The components which explain a significant part of the variations in the State per capita income in India are (i) capital productivity in the secondary sector, (ii) labour productivity in the secondary sector, (iii) share of the secondary sector in the total employment, (iv) labour productivity in the tertiary sector, (v) capital intensity in the economy as a whole and (vi) labour productivity in the economy as a whole.

Now if we consider the following identity with only two factors, viz., the overall productivity per worker and the overall worker rate -

$$y_j = \frac{Y_j}{P_j} = \frac{Y_j}{L_j} \cdot \frac{L_j}{P_j} = p_j \cdot w_j$$

we find that only one of the two components, viz., labour productivity in the economy, is significantly correlated with the State per capita income. All that we can say from this is that overall worker rate seems to be a silent factor in explaining the interstate variations in the per capita income. If we further decompose the productivity part and consider the identity with three factor, viz., overall capital intensity, overall capital productivity*22 and the overall worker rate -

$$y_j = \frac{Y_j}{L_j} \cdot \frac{L_j}{P_j} = \frac{Y_j}{K_j} \cdot \frac{K_j}{L_j} \cdot \frac{L_j}{P_j} = x_j \cdot z_j \cdot w_j$$

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*22 About the nature of the relationship between the per capita income and capital productivity, two contradicting opinions exist. Leibenstein feels that capital-output ratio is large in low income equilibrium economies implying thereby a direct relationship between per capita income and capital productivity. On the other hand, K.Sato argues that "in general, the capital-output ratio and the income level are positively associated" implying thereby an inverse relationship between per capita income and capital productivity. For further details see, H. Leibenstein: Economic Backwardness and Economic Growth, Studies in the Theory of Development (New-York: John Wiley and Sons,Inc.,1957); and K. Sato: "International Variations in the Incremental Capital-Output Ratio", in Economic Development and Cultural Change, Vol.19, No.4, July 1971.

we find that only one out of the three components, viz., overall capital intensity, is significantly correlated with the State per capita income in India. This implies that at the aggregate level, it is the factor proportions which play an important part in explaining the interstate variations in the levels of per capita income rather than technology and attitude of the people to work. If we consider the identity (1) above which is at a disaggregated level, we find that three out of seven components, viz., labour productivity in the secondary sector, labour productivity in the tertiary sector and the share of the secondary sector in the total employment, are significantly correlated with the State per capita income. This implies that the extent of industrialization and the nature of industrialization & diversification explain a significant part of the observed interstate variations in the levels of per capita income in India.

However, if we consider the identity (2) above which is at a more disaggregated level, we find that only two out of ten components, viz., the capital productivity in the secondary sector and the share of the secondary sector in the total employment, are significantly correlated with the State per capita income in India. This implies that it

is the nature of the technology employed in the industry and the extent of industrialization which individually explain a significant part of the interstate variations in the levels of per capita income in India in the base year, 1960-61.

## IV. Contributions of Various Factors to the Interstate Income Inequality, 1960-61 :

In the previous section, we examined the relationship between the State per capita income and its various components by the wel-known technique of correlation. However, this analysis does not throw any light on the individual contribution of each one of the components of the State income in the observed State income inequalities in India in the base year 1960-61. In this section, therefore, let us make an attempt to isolate the precise contribution made by the five broad factors, viz., the overall worker rate, industrial structure, capital intensity, capital productivity and labour productivity.*23 In order to isolate the contributions of

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*23 The method followed here is very similar to the standardization or shift-share analysis. For an introductory treatment of this type of analysis, see A. Bendavid: Regional Economic Analysis for Practitioners, (Praeger Publishers, 1974), ch.5. For an exhaustive statistical treatment of this approach, see R.Wceden: "Regional Rates of Growth of Employment: An Analysis of Variance Treatment", in MIESR: Regional Papers III (Cambridge, 1974).

these factors, we have to take the help of the identities developed above in the previous section, especially the identities (1) and (2). If the letters without the subscript j used in these identities denote the same aggregates for the total of the fifteen States, we get,

$$y = W \sum (p_i) \frac{L_i}{L}$$

and $$y = W \sum \frac{Y_i}{K_i} \cdot \frac{K_i}{L_i} \cdot \frac{L_i}{L}$$

$$= W \sum x_i \cdot z_i \cdot l_i .$$

Now, if there are no State income inequalities in India, $y = y_j$ for every j. However, in reality, there are State income inequalities which imply that $y \neq y_j$ for every j. It is, therefore, the extent of divergence between the average per capita income of fifteen States taken together and the per capita income of each of the fifteen States, i.e. $y_j - y$, which needs to be explained in terms of the above-mentioned five factors. There are two possible ways in which we can find out the individual contribution of each of these five factors*24 to the observed deviation of the State per capita

*24 These two ways were recognized by E.F.Denison in his "comments" on F.A. Hanna's paper in NBER : Regional Income (1957) op.cit. However, he has considered only two variables. For the case of more than two variables, these two approaches are elaborated in Ravindra H. Dholakia: "Determinants of Relative Growth of Cities in India", in Vishleshan, Vol.II, No.2, June 1976.

income from the average. One is the partial contribution approach and the other is the total contribution approach. Partial contribution of a factor is obtained by assuming that all other factors remain common to all States, while only that factor is allowed to change from State to State. The resulting change (increase or decrease) in the average per capita income of fifteen States taken together is the partial contribution of that factor in different States.*25 Total contribution of a factor, on the other hand, is obtained by assuming that all other factors are allowed to change from State to State while only that particular factor remains common in all states. The resulting change (with opposite sign) in the per capita income of each State is the total contribution of that factor in different States. Thus, in order to calculate the partial and total contributions of a factor in the observed deviation of the State per capita

*25 Most of the studies made so far in the case of India generally used the partial contribution approach only. See for example-
(i) M.M.Dadi: "Interstate Differences in Income, Productivity and Industrial Structure", in Indian Economic Association, Fifty-Second Annual Conference, Dec.1969.
(ii) M.M.Dadi: "Interrelation of State Income, Industrial Structure Productivity and Labour Participation Ratio" in Indian Journal of Industrial Relations, April 1973.
(iii) Ravindra H. Dholakia: "A Note on the Interstate Income Differentials in India", an unpublished paper.
(iv) M.D.Chaudhury: Regional Income Accounting in an under-developed Economy - A Case study of India,(Calcutta,1966),ch.3.

income from the average per capita incomes, we have to generate 'expected' incomes for each State. For finding out the partial contribution of different factors,*26 we have to genrate the expected incomes for different States in the following way. If we represent the expected income of the $j^{th}$ State due only to worker rate by $E_w y_j$, due only to industrial structure by $E_l y_j$, due only to capital intensity by $E_x y_j$, due only to capital productivity by $E_x y_j$ and due only to labour productivity by $E_p y_j$; then we have

$$(1)\quad E_w y_j = W_j \sum x_i \cdot z_i \cdot l_i$$

$$(2)\quad E_l y_j = W \sum x_i \cdot z_i \cdot l_{ij}$$

$$(3)\quad E_x y_j = W \sum x_{ij} \cdot z_i \cdot l_i$$

$$(4)\quad E_z y_j = W \sum x_i \cdot z_{ij} \cdot l_i$$

$$(5)\quad E_p y_j = W \sum p_{ij} \cdot l_i$$

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*26 As F.A.Hanna points out, these deviations or the standardization procedures "are constructed in much the same way as constant weight index number". For further description of the standardization procedures with their limitations and the problems of interpretation, see F.A.Hanna: "Analysis of Inter-State Income Differentials: Theory and Practice", op.cit.; and 'comments' by R.M. Williams and G.H.Borts on Hanna's paper in the same volume.

Having generated the expected incomes in this way, the partial contribution of each factor for each State is given by the difference between the expected income and the average per capita income for the fifteen States taken together. In terms of notations, (1) $(E_w y_j - y)$ gives the partial contribution of worker rate in $j^{th}$ state; (2) $(E_I y_j - y)$ gives the partial contribution of industrial structure in $j^{th}$ State; (3) $(E_x y_j - y)$ gives the partial contribution of the capital intensity in $j^{th}$ State; (4) $(E_z y_j - y)$ gives the partial contribution of capital productivity in $j^{th}$ State and (5) $(E_p y_j - y)$ gives the partial contribution of the labour productivity in $j^{th}$ State.

Similarly, for finding out the total contribution of each factor in the observed per capita income difference, we have to generate the expected incomes for different states in the following way :

(1) $E'_w y_j = \sum_w x_{ij} \cdot z_{ij} \cdot l_{ij}$

(2) $E'_I y_j = W_{ij} \sum x_{ij} \cdot z_{ij} \cdot l_i$

(3) $E'_x y_j = W_{ij} \sum x_i \cdot z_{ij} \cdot l_{ij}$

(4) $E'_z y_j = W_{ij} \sum x_{ij} \cdot z_i \cdot l_{ij}$

(5) $E'_p y_j = W_{ij} \sum p_i \cdot l_{ij}$

After deriving the expected incomes for different States in this way, we can find out the total contribution of a factor by subtracting the expected income due to that factor from the State per capita income. In terms of notations, (1) $(y_j - E'_w y_j)$ represents the total contribution of worker rate in $j^{th}$ State; (2) $(y_j - E'_i y_j)$ represents the total contribution of the industrial structure in $j^{th}$ State; (3) $(y_j - E'_x y_j)$ represents total contribution of capital intensity in $j^{th}$ State; (4) $(y_j - E'_z y_j)$ represents the total contribution of the capital productivity in $j^{th}$ State and (5) $(y_j - E'_p y_j)$ represents the total contribution of the labour productivity in $j^{th}$ State.*27

The expected incomes derived by following the partial contribution approach are presented below in Appendix Table 6A.1, and the expected incomes based on the total contribution approach are given below in Appendix Table 6A.2. On the basis of these two tables, we can also derive the partial and total contribution of each of the five above mentioned factors. At

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*27 It is important to note here, as V.R.Fuchs points out, that these contributions (partial as well as total) measure only the direct effect of the variables. They do not measure the indirect effects on the morale, the business climate and the like of these variables. Cf. V.R. Fuchs: "The Determinants of the Redistribution of Manufacturing in the United States since 1929", op.cit.

## Table 6.5

Partial Contribution of Various Factors in the Observed State Income Differences - 1960-61

(in Rs.)

| States | $Y_j-Y$ | $E_wY_j-Y$ | $E_1Y_j-Y$ | $E_xY_j-Y$ | $E_zY_j-Y$ | $E_pY_j-Y$ | Residual (R) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1. Andhra | - 15 | + 64 | - 1 | - 43 | - 21 | - 63 | - 14 |
| 2. Assam | + 42 | + 2 | - 18 | - 24 | + 90 | + 55 | - 8 |
| 3. Bihar | - 79 | - 11 | - 23 | - 32 | - 9 | - 45 | - 4 |
| 4. Gujarat | + 65 | - 13 | + 4 | + 69 | + 4 | + 76 | + 1 |
| 5. Haryana | + 53 | - 36 | - 2 | +247 | - 59 | +111 | - 97 |
| 6. Karnataka | + 12 | + 18 | - 6 | - 40 | + 54 | + 2 | - 14 |
| 7. Kerala | - 27 | - 69 | + 94 | - 81 | +173 | + 78 | -144 |
| 8. M.P. | - 46 | + 67 | - 31 | - 46 | - 10 | - 62 | - 26 |
| 9. Maharashtra | + 96 | + 36 | + 3 | - 32 | +109 | + 50 | - 20 |
| 10. Orissa | - 82 | + 5 | - 10 | - 61 | - 19 | - 78 | + 3 |
| 11. Punjab | + 67 | - 84 | + 52 | +508 | - 72 | +191 | -337 |
| 12. Rajasthan | - 28 | + 33 | - 31 | + 96 | - 83 | - 13 | - 43 |
| 13. Tamil Nadu | + 48 | + 19 | + 35 | - 23 | + 36 | + 8 | - 19 |
| 14. U.P. | - 69 | - 27 | - 13 | + 26 | - 56 | - 37 | + 1 |
| 15. W.Bengal | +135 | - 70 | + 54 | + 72 | + 90 | +172 | - 11 |

Note: For the Symbols used, see the text.

Source : Appendix Table 6A.1 below.

## Table 6.6

**Total Contribution of Various Factors in the Observed State Income Differences - 1960-61** ( in Rs.)

| States | $Y_j - E'_w Y_j$ | $Y_j - E'_l Y_j$ | $Y_j - E'_x Y_j$ | $Y_j - E'_z Y_j$ | $Y_j - E'_p Y_j$ | Residual (R') | $Y_j - Y$ |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1. Andhra | +50 | - 2 | -52 | -24 | -77 | +13 | -15 |
| 2. Assam | + 2 | -16 | -36 | +63 | +58 | + 9 | +42 |
| 3. Bihar | - 9 | -24 | -41 | - 8 | -46 | + 3 | -79 |
| 4. Gujarat | -17 | + 6 | +71 | + 7 | +75 | - 2 | +65 |
| 5. Haryana | -48 | = 9 | +151 | -131 | +91 | +90 | +53 |
| 6. Karnataka | +18 | - 8 | -57 | +45 | 0 | +14 | +12 |
| 7. Kerala | -81 | -18 | -125 | +83 | -31 | +114 | -27 |
| 8. M.P. | +47 | -37 | -75 | - 7 | -75 | +26 | -46 |
| 9. Maharashtra | +42 | + 5 | -63 | +91 | +57 | +21 | +96 |
| 10. Orissa | + 4 | - 8 | -61 | -14 | -77 | - 3 | -82 |
| 11. Punjab | -142 | +13 | +152 | -192 | +114 | +236 | +67 |
| 12. Rajasthan | +27 | -46 | +65 | -118 | -26 | +44 | -28 |
| 13. Tamil Nadu | +20 | +21 | -53 | +37 | - 8 | +23 | +48 |
| 14. U.P. | -23 | - 8 | +20 | -55 | -30 | - 3 | -69 |
| 15. W.Bengal | -131 | +72 | +92 | +82 | +163 | +20 | +135 |

Note: For the symbols used, see the text.

Source: Appendix Table 6A.2 below.

this stage, it is important to note that "the basic limitation of both these approaches is that both of them are derived from the concept of 'total differential' in Differential Calculus which assumes that the changes in the variables are insignificantly small. However, in reality we generally do not come across 'insignificantly small changes' in variables, with the result that interaction among changes in different variables becomes significant and appears as residual in the above-mentioned two approaches."[*28] Table 6.5 presents the partial contribution of the five factors along with their cross-effects or what is popularly referred to as residual for each of the fifteen States in India in the base year 1960-61, and Table 6.6 presents the total contribution of these five factors along with the residual for all the fifteen States in India in the year 1960-61.

A close look at the two tables reveals that the cross effects or the residuals with partial approach or the total approach turn out to be moderate for most of the States. Only in the case of four States, viz., Haryana, Kerala, Punjab and Rajasthan, the residual turns out to be greater

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*28 Cf. Ravindra H. Dholakia: "Factors Influencing the Relative Growth of Urban Areas" in Economic Times, Vol.XVI, No.77, May 22, 1976.

than 10% of the average per capita income (Rs.307) for the fifteen States taken together in 1960-61. In these four States the capital intensity and the capital productivity have large contributions to make with opposite signs.Another interesting observation to make from the twin tables is that the residuals based on the two approaches have opposite signs in all cases without exception. It is to be noted that this is not a coincidence, it is but natural.*29 However, barring a few excep-

*29 In fact, it can be demonstrated with the help of algebra in the following way. Let $x_1$, $x_2$ and $x_3$ be independent variables and y be a dependent variable, then $y=f(x_1,x_2,x_3)$ therefore $dy = f_{x_1}.dx_1 + f_{x_2}.dx_2 + f_{x_3}dx_3$ if $dx_1$, $dx_2$ and $dx_3$ are insignificantly small, but in reality these changes are not small so that an interaction term does exist, let it be called R.

$\therefore dy = f_{x_1}dx_1 + f_{x_2}dx_2 + f_{x_3}dx_3 + R$, where $f_{x_1}dx_1$ will represent the partial contribution of $x_1$ and so on. Now, R can be further decompose into four parts, i.e.

$$R_{x_1x_3} + R_{x_2x_3} + R_{x_1x_2} + R_{x_1x_2x_3} = R.$$

In the total contribution approach, contribution of $x_1$ will be represented by $(f_{x_1}dx_1 + R_{x_1x_2} + R_{x_1x_3} + R_{x_1x_2x_3})$ and so on. Hence,

$$dy = (f_{x_1}dx_1 + R_{x_1x_2} + R_{x_1x_3} + R_{x_1x_2x_3}) + (f_{x_2}dx_2 + R_{x_2x_3} + R_{x_2x_1} + R_{x_1x_2x_3}) + (f_{x_3}dx_3 + R_{x_3x_1} + R_{x_3x_2} + R_{x_1x_2x_3}) + R'$$

where R' is the residual ,ile.,

$$dy = dy + R_{x_1x_3} + R_{x_2x_3} + R_{x_1x_2} + 2R_{x_1x_2x_3} + R'$$

$$\therefore 0 = R + R_{x_1x_2x_3} + R'$$

$$\therefore R' = -(R + R_{x_1x_2x_3})$$

...cont.

tions, the magnitude of the residual differs in the case of the two approaches.*30 Similarly, almost for all States and all factors, the sign of the contribution turns out to be the same in the two approaches, though the extent differs. Thus, these two approaches provide us with a sort of an upper limit and a lower limit of the individual contributions of different factors in different States. It becomes, therefore, possible to eliminate these residuals by imputing the cross-effects to specific variables and arrive at the exact contribution of each factor in the observed divergence in the State per capita incomes.*31 The method followed to arrive at the exact

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∴ R' and R generally have opposite sign since $R_{x_1x_2x_3}$ is of third order and is likely to be negligible. Theoretically, it is possible to conceive of a case where R' and R have the same sign, but it seems to be only a theoretical possibility. Even this possibility does not disturb our method to eliminate residual. Here we have considered the case of three variables precisely to show that it is possible to generalize this conclusion without any difficulty to include n variables.

*30 A.J.Brown: "Regional Economics- with special reference to the United Kingdom", op.cit., has demonstrated that the residuals in the two cases will be "equal in magnitude and opposite in sign." This result, however, obtains only when there are two variables. If there are more than two variables, it is not necessary that the residuals in the two approaches will have the same magnitude. (see foot-note 29 above). Once this is accepted, a simple average of the total and partial contribution, as suggested by E.F.Denison in his "Comment" on Hanna's paper (op.cit.) will not remove the residual completely. Nor is the solution suggested by A.P.Thirlwall to distribute the residual equally is acceptable, because it is too arbitrary and sometimes inconsistent. (See A.P.Thirlwall: "Weighting System and Regional Analysis: A Reply to Mr. Cunningham", in Oxford Economic Papers, Vol.21, March, 1969).

*31 It is interesting to note that Phyllis Deane: "Regional variations in U.K. Incomes from Employment", in Journal of the

contribution (i.e. average contribution) of each factor can be conveniently described by the following illustration.

Suppose, the partial contribution of worker rate is $W_p$ and the total contribution of the worker rate is $W_t$ in a given State similarly, let the residual based on partial approach be $R_p$ and based on total approach be $R_t$ in that state. The problem is to find out an exact (average) contribution of the worker rate which presumably lies between $W_p$ and $W_t$ and therefore can be expressed as a weighted average of the two, the weights being positive. Now, we know that $R_p$ and $R_t$ have opposite signs. If we want the average value of the residual to be zero, we can find out the corresponding weights for the residuals, since

$$K R_t = (1-K) R_p \text{ ; where K is the weight of } R_t.$$

$$\therefore \frac{K}{1-K} = \frac{R_p}{R_t}$$

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Royal Statistical Society (A), 1953, pp.123-135, resolves the problem of residual by studying the ratio rather than the difference, and by applying the technique of index numbers. G.M. Farooq: "Economic Growth and Changes in the Industrial Structure of Income and Labour Force in Pakistan", in Economic Development and Cultural Change, Vol.21, No.2, Jan.1973, also resolves the problem of residual in much the same way by taking the geometric mean of the two indices. Complications of calculations in these methods mount once we have more than two variables.

Table 6.7

Average Contribution of Various Factors in the Observed State Income Differences - 1960-61

| States | Observed Deviations of State PCI from Average PCI in 1960-61 | Average Absolute Contribution in observed Deviations from Average PCI of | | | | | Percentage to Average PCI of Average Contribution of | | | | | Percentage to Average PCI of the observed Deviations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Worker Rate | Industrial Structure | Capital Intensity | Capital Productivity | Labour Productivity | Worker Rate | Industrial Structure | Capital Intensity | Capital Productivity | Labour Productivity | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1. Andhra | -15 | +57 | - 2 | -48 | -22 | -70 | +18.57 | - 0.65 | -15.64 | - 7.17 | -22.80 | - 4.89 |
| 2. Assam | +42 | + 2 | -17 | -30 | +871 | +57 | + 0.65 | - 5.54 | - 9.77 | +28.34 | +18.57 | +13.68 |
| 3. Bihar | -79 | -10 | -24 | -37 | - 8 | -45 | - 3.26 | - 7.82 | -12.05 | - 2.61 | -14.66 | -25.73 |
| 4. Gujarat | +65 | -14 | + 4 | +70 | + 5 | +75 | - 4.56 | + 1.30 | +22.80 | + 1.63 | +24.43 | +21.17 |
| 5. Haryana | +53 | -42 | - 6 | +197 | -96 | +101 | -13.68 | - 1.95 | +64.17 | -31.27 | +32.90 | +17.26 |
| 6. Karnataka | +12 | +18 | - 7 | -49 | +50 | + 1 | + 5.86 | - 2.28 | -15.96 | +16.29 | + 0.33 | + 3.91 |
| 7. Kerala | -27 | -76 | +32 | -106 | +123 | +17 | -24.76 | +10.42 | -34.53 | +40.07 | + 5.54 | - 8.79 |
| 8. M.P. | -46 | +57 | -34 | -60 | - 9 | -69 | +18.57 | -11.07 | -19.54 | - 2.93 | -22.48 | -14.98 |
| 9. Maharashtra | +96 | +39 | + 4 | -47 | +100 | +53 | +12.70 | + 1.30 | -15.31 | +32.57 | +17.26 | +31.27 |
| 10. Orissa | -82 | + 5 | - 9 | -61 | -17 | +78 | + 1.63 | - 2.93 | -19.87 | - 5.54 | +25.41 | -26.71 |
| 11. Punjab | +67 | -118 | +29 | +299 | -143 | +156 | -38.44 | + 9.45 | +97.39 | -46.58 | +50.81 | +21.82 |
| 12. Rajasthan | -28 | +30 | -38 | +81 | -101 | -20 | + 9.77 | -12.38 | +26.38 | -32.90 | - 6.51 | - 9.12 |
| 13. Tamil-Nadu | +48 | +19 | +29 | -37 | +37 | 0 | + 6.19 | + 9.45 | -12.05 | +12.05 | 0.00 | +15.64 |
| 14. U.P. | -69 | -26 | -12 | +25 | -56 | -31 | - 8.47 | - 3.91 | + 8.14 | -18124 | -10.10 | -22.48 |
| 15. W.Bengal | +135 | -92 | +60 | +80 | +87 | +167 | -29.97 | +19.54 | +26.06 | +28.34 | +54.40 | +43.97 |

Source : see the text.

$$\therefore \frac{1-K}{K} = \frac{R_t}{R_p}$$

$$\therefore \frac{1}{K} - 1 = \frac{R_t}{R_p}$$

$$\therefore \frac{1}{K} = \frac{R_t}{R_p} + 1$$

$$\therefore K = \frac{R_p}{R_t + R_p}, \text{ and } (1-K) = \frac{R_t}{R_t + R_p}.$$

If we assume that these weights also apply for each factor, we can find out the exact (average) contribution of, say, worker rate in the given state by the following equation: $W_A = KW_t + (1-K)W_p$, where K and (1-K) are exactly the same as derived above.*32 Similarly, we can derive the exact (average) contribution of other factors also. The average contribution, so derived, of the five above-mentioned factors are presented in Table 6.7.

From the table, it can be seen that only in seven States, viz., Andhra Pradesh, Haryana, Kerala, Madhya Pradesh, Orissa, Punjab and West Bengal, the contribution of worker rate in the observed divergence of State income is more than 10% of the average per capita income of the fifteen States taken together. Similarly, the contribution of the industrial structure is more than 10% of the average per capita income

*32 It is important to note that K will differ from State to State.

only in four States, viz., Kerala, Madhya Pradesh, Rajasthan and West Bengal.*33 On the other hand, the contribution of labour productivity is less than 10% of the average per capita income only in four States, viz., Karnataka, Kerala, Rajasthan and Tamil Nadu. Thus, labour productivity seems to be a very significant factor responsible for interstate variations in income in the base year 1960-61.*34 If we decompose labour productivity into capital intensity and capital productivity, we find that the contribution of the former is less than 10% of the average per capita income only in two States, viz., Assam and Uttar Pradesh; while the contribution of the latter is less than 10% in four States, viz., Bihar, Gujarat, Madhya Pradesh and Orissa. It can be seen that capital intensity and capital productivity, jointly as well as individually, play a very important role in the observed interstate variations in the levels of per capita income in India in the base year 1960-61.

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*33 It is interesting to note that K.Sreedumoni: "Interstate Differences in Manufacturing and Workers' Earnings", in Economic and Political Weekly, 31st May, 1969, p.911; finds that variations in the manufacturing wages are largely due to variations in industrial structure in India in 1963.

*34 Simon Kuznets also finds that it is the sectoral productivity rather than employment pattern which is the major source of international differences in overall labour productivity. Cf. S. Kuznets: "Quantitative Aspects of Economic Growth of Nations - II", op.cit.

Another interesting thing to observe from Table 6.7 is the relative position of each factor compared to the average in each State. A classification of the fifteen States according to favourable and unfavourable factors is presented below in a tabular form :

| | Favourable x | | Unfavourable x | |
|---|---|---|---|---|
| | Favourable z | Unfavourable z | Favourable z | Unfavourable z |
| Favourable W | | | | |
| Favourable l | - | - | Maharashtra, Tamil Nadu | - |
| Unfavourable l | - | Rajasthan | Assam, Karnataka | Andhra, M.P., Orissa. |
| Unfavourable W | | | | |
| Favourable l | Gujarat W.Bengal | Punjab | Kerala | - |
| Unfavourable l | - | Haryana, U.P. | - | Bihar |

Note: x, z, W and l stand for capital intensity, capital productivity, overall worker rate and industrial structure respectively.

From this classification, it becomes very obvious that there is no State in the base year 1960-61 where all the four crucial factors are favourable, while, there does exist a State, viz., Bihar, where all these four factors are unfavourable, compared to the average. In Andhra Pradesh, Madhya-

Pradesh and Orissa also except worker rate, all other factors are unfavourable. These four States can justifiably be regarded as economically most backward States of India in the base year 1960-61. On the other hand, Gujarat and West Bengal can be regarded as economically most advanced States of India. The remaining States fall in between these two extremes. Five States, viz., Maharashtra, Tamil Nadu, Assam, Karnataka and Kerala, displayed fairly good potentialities for rapid development if only adequate amounts of investment were diverted to these States, because in the base year they had unfavourable capital intensity as compared to the average. Rajasthan, Punjab, Haryana and Uttar Pradesh suffered on account of technological factors in the base year.

Before we conclude this Chapter, it will be an interesting exercise for us to investigate the nature of each of the components of the per capita income from the viewpoint of the interstate income inequalities. In other words, we can investigate the question as to what would be the income inequalities had only one of the factors been varying from State to State or only one of the factors been not varying from State to State. For this purpose we require the Gini Coefficients of the expected incomes based on the partial approach as well as

total approach. The relevant expected incomes are given below in Appendix Tables 6A.1 & 6A.2. Table 6.8 presents the Gini Coefficients of inequality for the expected incomes in the base year 1960-61.

Table 6.8

Gini Coefficients of State Income Inequality in India for the year 1960-61 (in per cent)

| Per capita Expected Income Due to | Gini Coefficient of Inequality | |
|---|---|---|
| | Partial approach | Total approach |
| 1. Worker Rate | 7.94 | 16.43 |
| 2. Industrial Structure | 5.22 | 9.70 |
| 3. Capital Intensity | 12.95 | 14.27 |
| 4. Capital Productivity | 11.60 | 11.21 |
| 5. Labour Productivity | 12.75 | 6.67 |
| Observed Income | 12.93 | |

Source: Appendix Tables 6A.1 and 6A.2 below.

From the table, we can see that if only one factor is allowed change from State to State (Partial Approach ), the State income inequality would be least when only industrial structure varies from State to State; and the State income inequality would be highest when only capital intensity varies from State to State, Other things remaining at the

average level. This implies that there are no substantial interstate variations in the industrial structure, while there are marked interstate variations in the sectoral capital intensity in India in the base year. From the point of view of income inequality, we can say that worker rate, capital intensity and capital productivity taken together proved to be most unfavourable in the sense that because of the interstate variations in these factors the income inequalities have increased from 5.22% to 12.93%; while worker rate, industrial structure and capital productivity taken together proved to be only marginally favourable in the sense that the interstate variations in these factors have reduced the State income inequalities from 12.95% to 12.93%.

If we look to the total approach, we find that interstate variations in (i) the worker rate and (ii) capital intensity, have proved to be favourable from the point of view of equity in State income in the sense that income inequalities would have been much higher than what it actually was, had these factors not changed from State to State.*35

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*35 It should be pointed out here that the contribution of overall worker rate in the State income inequalities has been worked out by several authors. See, for example, A.G.Green: "Regional Inequality, Structural change, and Economic Growth in Canada - 1890-1956", in Economic Development and Cultural Change, Vol.17, No.4, July 1969; M.D.Chaudhry: "Economic Distance Among Regions: A Statistical Analysis", op.cit.,; (contd.)

Industrial structure, capital productivity and labour productivity turn out to be unfavourable from the point of view of equity in State income in the base year 1960-61. Thus, it is the interstate variations in structural and technological factors which largely account for the extent of State income inequalities in the base year 1960-61. Had there not been the compensating variations in the worker rate and capital intensity, the extent of State income inequalities would have been much larger than the one actually observed in the base year 1960-61.

In the light of the above analysis for the base year 1960-61, let us now examine the interstate variations in the economic growth during 1960-61 to 1970-71 in the next Chapter.

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F.A.Hanna: "Analysis of Interstate Income Differentials: Theory and Practice", op.cit.; etc. Their method is to find out the effect of overall worker rate by comparing the State inequalities in income per capita and income per worker. This is an indirect method. However, it also gives directional idea about the effect of overall worker rate on the State income inequalities. Thus, for example, we found earlier in this Chapter that Gini Coefficient for State inequality in income per worker is 15.56% which is much greater than the one for income per capital (12.93%). This implies that variations in the overall worker rate have contributed toward reduction in State income inequality.

Appendix Table 6A.1

Expected per Capita Incomes Based on Partial Approach - 1960-61

| | Obser-ved PCI in 1960-61 | Expected Per Capita Income Due only to | | | | |
|---|---|---|---|---|---|---|
| | | Worker Rate | Indust-rial Struc-ture | Capital Inten-sity | Capital Produc-tivity | Labour Producti-vity |
| | (Y) | ($E_w$Y) | ($E_l$Y) | ($E_x$Y) | ($E_s$Y) | ($E_p$Y) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Andhra | 292 | 371 | 306 | 264 | 286 | 244 |
| 2. Assam | 349 | 309 | 289 | 283 | 397 | 362 |
| 3. Biher | 228 | 296 | 284 | 275 | 298 | 262 |
| 4. Gujarat | 372 | 294 | 311 | 376 | 311 | 383 |
| 5. Haryana | 360 | 271 | 305 | 554 | 248 | 416 |
| 6. Karna-taka | 319 | 325 | 301 | 267 | 361 | 309 |
| 7. Kerala | 280 | 238 | 401 | 226 | 480 | 385 |
| 8. M.P. | 261 | 374 | 276 | 261 | 297 | 245 |
| 9. Mahara-shtra | 403 | 343 | 310 | 275 | 416 | 357 |
| 10. Orissa | 225 | 312 | 297 | 246 | 288 | 229 |
| 11. Punjab | 374 | 223 | 359 | 815 | 235 | 498 |
| 12. Rajas-than | 279 | 340 | 276 | 403 | 224 | 294 |
| 13. Tami-Nadu | 355 | 326 | 342 | 284 | 343 | 315 |
| 14. U.P. | 238 | 280 | 294 | 333 | 251 | 270 |
| 15. W.Bengal | 442 | 237 | 361 | 379 | 397 | 479 |

Source : See the text.

## Appendix Table 6A.2

### Expected Per Capita Incomes Based on Total Approach - 1960-61

( in Rs.)

| States | Observed PCI in 1960-61 (Y) | Expected Incomes Due only to Worker Rate ($E'_w Y$) | Industrial Structure ($E'_1 Y$) | Capital Intensity ($E'_x Y$) | Capital Productivity ($E'_2 Y$) | Labour Productivity ($E'_p Y$) |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Andhra | 292 | 242 | 294 | 344 | 316 | 369 |
| 2. Assam | 349 | 347 | 365 | 385 | 266 | 291 |
| 3. Bihar | 228 | 237 | 252 | 269 | 236 | 274 |
| 4. Gujarat | 372 | 389 | 366 | 301 | 365 | 297 |
| 5. Haryana | 360 | 408 | 369 | 209 | 491 | 269 |
| 6. Karnataka | 319 | 301 | 327 | 376 | 274 | 319 |
| 7. Kerala | 280 | 361 | 298 | 405 | 197 | 311 |
| 8. M.P. | 261 | 214 | 298 | 336 | 268 | 336 |
| 9. Maharashtra | 403 | 361 | 398 | 466 | 312 | 346 |
| 10. Orissa | 225 | 221 | 233 | 206 | 239 | 302 |
| 11. Punjab | 374 | 516 | 361 | 222 | 566 | 260 |
| 12. Rajasthan | 279 | 252 | 325 | 214 | 397 | 305 |
| 13. Tamil Nadu | 355 | 335 | 334 | 408 | 318 | 363 |
| 14. U.P. | 238 | 261 | 246 | 218 | 293 | 268 |
| 15. W.Bengal | 442 | 573 | 370 | 350 | 360 | 279 |

Source : See the Text.