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Measuring Regional Income Disparities in LDCs

by Olaf Hübler, Hannover *

The problem of income disparities in developing countries is constantly gaining in importance. Clearly a pure growth strategy alone cannot be effective and disparities are steadily increasing. What is needed for an effective policy first of all are adequate statistics and indicators.

The widening of the gap between rich and poor is noticeable not only between industrial and developing countries; the same phenomenon is discernible as between individuals and between regions of one and the same LDC. Such wide differences in the standards of living between regions threatens the unity of a country. Agitations spring up for a local autonomy, leading to separatist movements. Phenomena of this kind have been observable again and again in the countries of the Third World during the past twenty years, as for instance in the case of Katanga in Congo, of Bangladesh in Pakistan or of Eritrea in Ethiopia. Backward regions aspire to independence because they feel themselves exploited and neglected. Progressive regions aspire to separate statehood, for they regard the other regions as mere obstacles in the way of their own development. Economic causes, regional disparities always play a part in such developments. In order to be able to make this clear it is necessary to clarify what is meant by the concept "regional gap". The purpose of the exercise is to measure the differences.

Traditional Indicators

The national income (Y) alternatively the Gross National Product (GNP) are most frequently employed to measure the degree of prosperity. A first indicator of a disparity existing between two regions (i, j) would therefore be the relative difference in incomes:

$$I_1 = \frac{Y_i - Y_j}{Y_i + Y_j} \quad (1)$$

In the case of complete income parity is $I_1 = 0$. Even if this is not explicitly stated as the objective to be reached it should in the absence of any statement to the contrary be implicitly interpreted as such. The demand for income equality in all

regions is justified only under strictly limited conditions. At least the importance of the regions, that is the number of their inhabitants (B) and the extent of their territories, must be taken into consideration. As a rule one confines oneself to the number of inhabitants, i. e. the per-capita income of a region ($Y_i/B_i = y_i$) is used as an indicator of the relative prosperity of the region. The difference between the per-capita incomes of two regions are then taken to indicate regional disparity:

$$I_2 = Y_i/B_i - Y_j/B_j = y_i - y_j$$

The statement that a difference exists does not in itself mean that it should be wiped out, and if this is the case, it is still an open question in which of the two regions the correction is to be attempted. Instead of comparing the per-capita income of a region i with that of region j, other comparative values can be used such as the average per-capita income of a country or a national per-capita income considered desirable. The results of calculations of this kind yield different indicator values, but these are in any case partial statements about a region and not a generally valid statement about the regional disparity of a country. The latter can be worked out by scattering the regional per-capita incomes over the average per-capita income of a country (\bar{y}):

$$I_3 = s^2 = 1/n \sum_{i=1}^n (y_i - \bar{y})^2 \quad (2)$$

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¹ The formula is used for instance by N. Sakashita, Regional Allocation of Public Investment, in: Papers and Proceedings of the Regional Science Association, vol. 19 (1967), p. 167.

² Slightly modified is the indicator in J. G. Williamson, Regional Inequality and the Process of National Development: A Description of the Pattern, in: Regional Analysis, ed. by L. Neeldeman, Baltimore 1968, p. 111. He forms the coefficient of variation

$$I_3' = I_3/\bar{y}, \quad \text{with } I_3 = \sum (y_i - \bar{y})^2 B_i/B,$$

i. e. a weighting is made with the population share of the regions (B_i/B).

or employing the Gini coefficient:

$$I_4 = \frac{\sum_i \sum_j |y_i - y_j|}{2 \bar{y} n (n - 1)}$$

n : number of regions.

This yields information about the deviation between regions or about the relative concentration of incomes in individual regions.

Which of the above-mentioned indicators should be judged best can be ascertained by comparing the various indicators for regional disparities. A first attempt in this direction has been made by Champernowne³.

Proceeding from six indicators⁴ he examines with the aid of various theoretical types of income distribution the sensitivity of individual indicators, calling the most useful the one showing the highest degree of sensitivity.

Immaterial which of the indicators $I_1 \dots I_4$ are used, the numerical data will in no case give an adequate picture of the actual regional differences in prosperity. As for GNP, its unreliability as a prosperity indicator has by now become a matter of common knowledge; it therefore need not be discussed here at length⁵. To illustrate the problematical nature of a study of the differences in regional incomes it may be worthwhile to make the following points⁶:

☐ The level of selfsufficiency differs from region to region, a fact for which GNP makes only insufficient allowance. In the case of LDCs this is particularly relevant.

☐ The differences in real terms between town and country are distorted by the price differential. The ways of life and thus the shopping baskets vary from region to region.

☐ GNP is not identical with the domestic product of a region. The smaller the region the more significant are the deviations and the less possible is it to use the data of either as an argument in favour of correcting a region's deviation from an-

other. Anyone comparing regions with one another must pay great attention to the demarcation of boundaries. Instead of administrative regions it would be much better to establish nodal regions, but for the latter there is hardly information available.

☐ Distortions result from differences in the regional tax burdens; this becomes apparent when comparisons are made between GNPs of the regions, on the one hand, and their disposable incomes, on the other.

☐ The per-capita comparison is also fraught with problems, and this all the more so, the greater the number of family-sized businesses or farms, that is the more members of the family work on the holding. For it is not easy to assess each member's contribution to the net value added. In LDCs the number of members of the family helping with the work on the farm is generally speaking rather large. In such cases it is therefore advisable to start with working out the incomes per size of family.⁷

The general purpose of the points enumerated above is to explain that regional differences in incomes exist which are not differences in prosperity. These explanations cover, however, only a small part of the existing income disparities. The indicators mentioned so far are incapable of contributing anything to a deeper-going analysis. It is for instance quite possible for the Gini coefficient to remain constant over a longer period, although shifts have occurred in the income disparities or a quantitatively equal change of I_4 has taken place – a change which was due to different causes.

Modified Procedures

Starting from the criticism of the Lorenz-graph⁸ or the Gini coefficient⁹, the first point to bear in mind is that it is not only the overall income disparities as between one region and another that is of interest; equally interesting is a study of some of

³ D. J. Champernowne, A Comparison of Measure of Inequality of Income Distribution, in: *The Economic Journal*, vol. 84 (1974), p. 787 et seq.

⁴ In addition to comparing I_3 , I_3'' and I_4 with similar indicators, he also investigates the quota out of the geometric and arithmetic mean of the incomes, the quota from the harmonic and arithmetic mean of the incomes as well as the entropy coefficient of inequality by Teilsch.

⁵ Exemplary in this field are: E. S. Sheldon and W. E. Moore (ed.), *Indicators of Social Change, Concepts and Measurement*, New York 1968; R. Blum, *Das Sozialprodukt als Entwicklungsindikator (The Social Product as an Indicator of Development)*, in: *Beiträge zur Beurteilung von Entwicklungsstrategien (Contributions to the Evaluation of Development Strategies)*, ed. by H. Priebe, Berlin 1974, p. 27 et seq.

⁶ cf. H. Giersch, Probleme der regionalen Einkommensverteilung (Problems of Regional Income Distribution), in: *Probleme des räumlichen Gleichgewichts in der Wirtschaftswissenschaft (Problems of the Territorial Equilibrium in Economics)*, publ. W. G. Hoffmann, Berlin 1959, p. 85 et seq., and B. Molitor, Das Verteilungsziel in der Regionalpolitik (The Distribution Objective in Regional Policy), in: *Hamburger Jahrbuch für Wirtschafts- und Gesellschaftspolitik (Hamburg Annual for Economic and Social Policy)*, vol. 19 (1974), p. 171 et seq.

⁷ cf. E. Gannage, Distribution of Incomes in Underdeveloped Countries, in: *The Distribution of Income*, ed. by J. Marchal and B. Ducros, New York 1968, p. 326 et seq.

⁸ cf. inter alia: H. Fecher, Inzidenzprobleme finanzpolitischer Mittel zur Vermögensumverteilung (Incidental Problems of Political Means of Property Redistribution), in: *Öffentliche Finanzwirtschaft und Verteilung I (Public Finance and Distribution)*, ed. by W. Albers, Berlin 1974, p. 112 et seq.

⁹ Both figures say the same; they are capable of being turned into one another; cf. M. G. Kendall and A. Stuart, in: *The Advanced Theory of Statistics*, vol. 1, London 1952, p. 49. I_4 corresponds to twice the area between the Lorenz curve and the diagonal representing equal distribution.

the details. According to Champernowne one can distinguish between three types¹⁰, such as:

- ☐ Inequality within the group of regions with the highest per-capita income
- ☐ Inequality within the group of regions with medium per-capita income
- ☐ Inequality within the group of regions with the lowest per-capita income.

For the purposes of this study, the regions may be divided up either into equal parts or grouped differently, say in the proportion of 2:4:4 between the three groups.

For each group a separate indicator would have to be ascertained, for which in each case I_4 may well be the basis. Of course, the price index of the regions would have to be used as weighting factor. Alternatively, a weighted sum from all regional per-capita income changes should be worked out. The weighting of the rise in the per-capita incomes of the regions is to reflect the social evaluation of an income increase for the individual regions, allowing for the spatial income distribution. The advantage of such a procedure is that growth and distribution aspects are linked together. The more widely the weighting factors of individual regional groups differ from each other, the more distribution-oriented is the approach. On the other hand, a disadvantage of this procedure is that the weights are subjective by nature.

What neither of these procedures does is to throw light on the causes to which the differences in the per-capita incomes and changes in them are due. One way of tackling this problem might be a cross-section analysis of data from various LDCs – an analysis which would have to be made separately for the three regional groups mentioned earlier-on. In making the regional distribution for all countries it would be necessary to use the same key. The resulting differences in the per-capita income limits between the three income groups in the individual countries would then have to be explained with the aid of various influence factors. Only insofar as the official and other statistics in the LDCs are sufficiently developed to make it possible to assess the various data required is the procedure practicable. Data most likely to be available in these countries are global statistics about such things as the illiteracy quota, the share of industrial output in GNP, population growth as well as an overall per-capita income for the whole country. In the light of a regression estimate an increase in the share in the industrial output may be expected to exert a greater influence than a drop in the illiteracy quota for regions with a high per-capita income. In regions

with a low per-capita income the opposite would seem to be true. However, all in all, these factors will have a greater income-discriminating effect on the national economy than on individual regions. More important indices for regional income disparities may be expected from:

- ☐ interactions between regions
- ☐ the internal regional income differences
- ☐ the functional income distribution in the regions
- ☐ the inter- and intra-sectoral distribution within the regions.

Interactions between regions, whose effects have so far been excluded, are determined above all by the size of imports and exports of regions between themselves, by the mobility of labour and capital and the fiscal horizontal income equalization.

For measuring intra-regional income disparities the same procedures are applicable as those used to determine inter-regional deviations. It would theoretically be possible to proceed to ever smaller territorial units down to single localities and enterprises. This would hardly be practicable, however, nor would it appear to be particularly informative in connexion with an inquiry into a country's general regional disparities.

Empirical Inquiries into Regional Income Disparities

Official statistics in LDCs are generally very little developed, but they are particularly backward for material on regional differences. Whereas on functional and personal income distributions some data are available from a few countries, there exists hardly any meaningful information under regional aspects. For example, Kuznets¹¹ and Williamson¹² have carried out some inquiries into regional disparities and they, too, had access only to data from a limited number of countries. Empirical experience gathered in LDCs is also very scanty so that in drawing any general conclusions from what is available caution is advisable.

Taking as a basis the coefficient of variation $I_{\frac{1}{3}}'$ one finds for the LDCs examined that with overall increasing per-capita incomes (\bar{y}) , $I_{\frac{1}{3}}'$ rises, i.e. the regional differences become greater¹³. This makes it clear that the problem of regional disparities gains in point in LDCs which register an absolute increase in per-capita incomes de-

¹¹ S. Kuznets, Quantitative Aspects of the Economic Growth of Nations: VIII, Distribution of Income by Size, in: Economic Development and Cultural Change, vol. 11 (1963), p. 1 et seq.

¹² J. G. Williamson, Regional Inequality ... op. cit., p. 99 et seq.

¹³ cf. footnote 2.

¹⁰ D. G. Champernowne, op. cit., p. 787.

spite the fact that relatively to the industrial countries their position has deteriorated. In this connexion it is interesting to note that regional income disparities in industrial countries are less than those in LDCs; which means that if per-capita incomes rise further they will tend to move in the direction of regional parity.

Understandably still fewer data are available about income variations within a region. The only kind of statistical information LDCs supply are data about the different levels prevailing in town and country¹⁴. These show that as a rule incomes are more concentrated in urban areas than in the country. Frequently, however, it makes no sense to divide a region into town and country areas. Among the LDCs which have divided their regions into urban and country areas for administrative convenience there is only one whose statistics are useful from our point of view, that is Brazil. For the purpose of this inquiry we divided 20 Brazilian regions into five groups according to the average product per worker. Using the Gini coefficient it turned out that regional income disparities decrease as output-per-worker increases. This result is thus in contrast to the interregional comparison for various LDCs and could therefore be regarded as fortuitous. On the other hand, what seems to be valid for Brazil has also been shown to apply to Italy and the USA. It might be possible, that such a result was caused by sectoral or functional income distribution trends.

To investigate the distribution of functional incomes in regions at varying stages of development, it seems appropriate to begin by separating property incomes from earned incomes¹⁵. Regional data on precisely this point are unavailable. Yet empirical data make it possible to arrive at a conclusion by deduction. The share of income from property in a country's total income is not significantly affected by the level of development the country has reached; if it is affected at all, then it is that with a country's improving development level the share of income from property tends to decrease. Since incomes from property show a still greater concentration than earned incomes, it is fair to assume that in backward regions the share of incomes from property cause greater income disparities than it does in more developed regions.

Data for comparison between sectors are by and large available only for the agricultural and non-agricultural sectors in their entirety. Small wonder then that the agricultural sector provides the lion's share of income¹⁶. This is caused by the high proportion of the working population earning their living in agriculture. This statement applies to the entire national economy. Data relating to the regional distribution of agricultural employment in

LDCs are to hand only for Brazil and Spain, and Spain is hardly a developing country any more. When compared with industrial countries, the studies made of these two countries do not admit of any unequivocal conclusions, that is they show no overall correlation between the regional distribution of the various kinds of occupation and a country's level of development¹⁷.

Although the absolute income totals derived from agriculture dominate, the average single incomes in the industrial sector are several times as high as in the agrarian sector¹⁸. The reason for this is probably that work in industry is more productive. This was only to be expected. Besides, incomes earned in industry are not as widely dispersed as farmers' earnings. This applies to LDCs just as much as to industrial countries. A comparison of the intra-sectoral income distribution shows that as a rule incomes in the agricultural sector are less unequally distributed than in the other sectors¹⁹. In LDCs the inequality of the non-agrarian sector is greater than in industrial countries²⁰. Herein lies at least part of the explanation of the apparent contradiction that, on the one hand, agriculture's share in the total economy is greater in LDCs than in industrial countries and that the inequality is less in the farming sector than elsewhere. On the other hand, inequality is greater in LDCs than in industrial countries.

The inquiries undertaken so far show how little has been done to advance the study of regional income disparities in LDCs. This is first of all due to the fact that official statistics, and particularly regional statistics are little developed. But it is also to be regretted that, generally speaking, the one side has made only isolated and rudimentary attempts at discussing distribution while the other confines itself to discussing growth and development. What is needed is an integrated attempt by all concerned.

¹⁴ cf. M. S. Ahluwalia, 'Ungleichheit der Einkommen: Einige Dimensionen des Problems (Inequality of Incomes - Some Dimensions of the Problem)', in: *Finanzierung und Entwicklung*, vol. 11 (1974), No. 3, p. 8.

¹⁵ A more detailed examination with a break-down in accordance with the social structure is available for Chile: A. Foxley and O. Munoz, 'Income Redistribution, Economic Growth and Social Structure', in: *Oxford Bulletin of Economics and Statistics*, vol. 56 (1974), p. 21 et seq.

¹⁶ cf. M. S. Ahluwalia, op. cit., p. 7. Covering Mexico, Malaysia and Chile he splits up the incomes into six economic sectors. The share of agriculture varies in the three countries between 45 and 56 p. c.

¹⁷ This result is arrived at by calculating the standard deviations for regional shares of employment.

¹⁸ E. Gannage, op. cit. p. 338. He mentions for Latin America three or four times as much.

¹⁹ cf. H. Chenery, M. S. Ahluwalia, C. L. G. Bell, J. H. Duij, R. Jolly, *Redistribution with Growth*, New York 1975, p. 21, particularly Table I, 4.

²⁰ As the case of Columbia shows - A. Berry, 'Changing Income Distribution Under Development: Columbia', in: *The Review of Income and Wealth*, vol. 20 (1974), p. 289 et seq. - there has admittedly been in recent years, i.e. between 1955 and 1965, an improvement in income distribution in the agricultural sector, while the disproportions have further increased.