INSTRAW

METHODS OF MEASURING DISPARITY BETWEEN MEN AND WOMEN

-A Technical Report-

Pavle Sicherl

REVISED VERSION

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by

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Pavle Sicherl

TABLE OF CONTENTS

C H A P T E R 1

CONCEPTUAL ISSUES IN QUANTIFYING DISPARITIES BETWEEN MEN AND WOMEN

Introduction

The role and position of men and women in society, as well as the disparities between them, represent an important aspect of the process of economic and social development. Research on the advancement of women cannot be undertaken in a vacuum devoid of time and place, that is, without consideration of the historical circumstances in which it takes place. The development perspective should be firmly embodied in the planning and design of research and action programmes, in the search for appropriate methods of analysis, and in the collection and compilation of statistics and indicators on the position of women. Since the researchers and the decision makers will inevitably deal with multidimensional and long-run phenomena, there must be a continuous effort to improve the concepts, the compilation of data and the methodology of analysis to take these characteristics into account in a meaningful and consistent way.

This technical report is a logical sequence to the earlier work undertaken by INSTRAW and the Statistical Office of the United Nations in the field of improving concepts, methods and compilation of data and indicators on women. It deals with the next phase of enquiry: the analysis of existing and newly acquired data, which is the main reason for their collection. Primarily, the report examines various methodologies and

analytical measures which have been proposed and used in national and international studies to measure disparities between men and women, and changes in these disparities over time.

At this stage, the orientation is towards relying on statistical measures and methodologies which describe the disparities in a simple dynamic conceptual and analytical framework, as the causal models are rather complex, country-specific, and at their present level of development hardly suitable for general applicability. This report has been intentionally kept relatively simple, so that it may be applied in developing countries as widely as possible. Nevertheless, it broadens the concept and methodology of analyzing gender disparities - especially with regard to the time dimension of the processes and disparities involved, as well as with regard to the interrelationships between static and dynamic measures of disparities, on the one hand, and the interrelationships between summary measures, measures of disparities at a disaggregated level, and structural characteristics, on the other.

In undertaking an analysis of the position of women or gender disparities, one must go through a series of steps to select: (i) fields of concern, (ii) the level of aggregation, (iii) statistical series, (iv) techniques for cross-section analysis of disparities, (v) techniques for analysis of disparities over time, (vi) the best combination for the given aim, within the limitations of the available data, time and resources.

The general discussion of the fields of concern will be very brief, since the subject has been elaborated upon in

previous studies. It was decided that statistical series to demonstrate the application of statistical measures and methodology should be drawn from education, wages, occupations, and time use. Here it should be emphasized that the series and indicators chosen merely represent illustrations of the use of methodology in a given field; moreover, comments have been included in order to illuminate the technical discussion and to raise some issues, but they should by no means be interpreted as an example of causal analysis.

The emphasis in this report is on techniques for analysis of gender disparities over time - an important aspect which has been rather neglected and underdeveloped, despite the obvious need for a dynamic conceptual and analytical framework which would facilitate the research and policy discussion of gender disparities within a long-term perspective. Time distance as a new statistical measure of the time dimension of disparities is introduced to provide new insights into the perception and evaluation of the degree of gender disparities. Time distance as a statistical measure has a distinct advantage in that it is expressed in years, which represent a common unit of measurement that is easily comprehensible by policy makers as well as lay persons, and is comparable across indicators and across countries.

The techniques for cross-section comparisons are more developed, more easily accessible and are therefore not systematically elaborated in this report. A major issue in all cases is the most appropriate combination of all approaches and a

systematic linkage between them, which is beyond the scope of the present report.[1]

Disparities in Different Fields of Concern

Inequalities are of many different kinds and magnitudes and therefore cannot be expressed by any common index (Malinvaud, 1977). The most obvious aspect of this fact is the need to express such a complex phenomenon as gender disparity[2] by reference to a number of its dimensions. In the field of social indicators, at the highest level of aggregation it is common to refer to these dimensions as areas of social concern. They are discussed in Social Indicators: Preliminary Guidelines and Illustrative Series (UN, 1978), while the companion publication, Improving Social Statistics in Developing Countries: Conceptual Framework and Methods (UN, 1979) provides an adaptation of this framework for developing countries. A draft handbook of social indicators has recently been prepared by the United Nations Statistical Office which attempts to consolidate international statistical experience and indicators requirements within a single framework to avoid overlapping of work (UN, 1986).

An extensive summary of such an approach at the international level is available also in The OECD List of Social Indicators (OECD,1982); and the social indicators obtained from the data available in individual OECD member countries are presented in Living Conditions in OECD Countries (OECD,1986),

which provides much interesting information on gender disparities as well. This compendium of social indicators is of interest also as an example of the degree of effort needed for such a compilation, and of the problems with regard to the availability and comparability of data, even among the developed countries. At the same time, it can be viewed as an illustration of the fact that, at different levels of economic welfare, the relative importance which people and policy makers would attach to various fields of social concern, sub-concern and indicators may be quite different. Such an undertaking in countries with a lower level of economic development should be adjusted to their needs and conditions.

With respect to the development of statistics and indicators on the situation of women, two reports have been prepared within a joint programme of the United Nations Statistical Office and INSTRAW: Improving Concepts and Methods for Statistics and Indicators on the Situation of Women (UN, 1984b) and Compiling Social Indicators on the Situation of Women (UN, 1984a). They discuss a number of indicators relevant to various fields of concern from two points of view: improvements in concepts, definitions and classifications in the future, and improvements in the compilation and analysis of indicators from existing sources.

There is no need to recapitulate the discussion about the multidimensional nature of gender disparities here. Nevertheless, some considerations are important for the descriptive, analytical and programming use of different

indicators in a comprehensive framework. As the ultimate goal is the improvement of the quality of life of all people - men and women - the most appropriate conceptual framework for the analysis of the role and position of women is that of comprehensive socio-economic development. It has become overwhelmingly clear that gender disparities must be studied, and the action programmes to overcome them prepared and executed, within the context of overall development. For, on the one hand, the unequal position of women cannot be eliminated automatically through economic growth alone. And on the other hand, egalitarian processes and policy action to improve the position of women in the developing countries are necessary but not sufficient to increase the quality of life of women in these countries, if the general conditions affecting men and women alike impede them from escaping poverty. As the final users of the data will be concerned with the integration of women in development, the development perspective should be firmly embodied in the conceptualization and design of the research programmes, in the search for appropriate methods of analysis, and in the collection and compilation of statistics and indicators on the position of women.

This leads to two further implications. First, the collection of data on women should be undertaken through a disaggregation of the relevant data gathered in regular collections by sex, which would in principle allow for extensive possibilities of cross-tabulating sex with other important variables. While such an orientation is not disputed in practice, even in the developed countries it is not easy to find consistent

interrelated data for such obvious combinations as wages and salaries, occupations and education in sufficient detail or covering a longer span of time. Second, for the analysis of the position of women in many situations, especially in international and regional (subnational) comparisons, there will be a need to include indicators which are not disaggregated by sex but which are still related to women in a direct way, or are important for bringing into the analysis the variables of the environment in which the interrelationship between the development processes and the advancement of women takes place. The availability of water and sanitation facilities is an example of the first category, and per capita income or consumption of the second.

In view of the great number of indicators which could be considered for the analysis and/or regular collection of data at various levels, it is important to ensure a proper balance between basic and particularized statistics. The statistical needs most vocally pressed in an issue-oriented social and economic climate tend to be those related to women groups of special interest, (e.g. heads of single parent families), those specifically related to female phenomena (e.g. fertility), or those not directly describing women but related to issues of special importance to them (e.g. child-care facilities). However, it has been argued that, without the existence of a sufficiently broad base of basic statistics which provide a general assessment of both the relative position of women and the trends in this respect, and constitute the necessary background for particular statistics, the whole system

of statistics on women becomes fragmentary and suboptimal (Worton, 1985).

A large number of indicators also opens numerous possibilities for comparisons among various indicators representating various dimensions of the position of women. In cross-country comparisons it is expected that the degree of disparity among countries will be very different for different indicators of the position of women, and that a ranking of the indicators by the degree of disparity may be indicative of the country's policy orientation with respect to gender disparities, given its resource constraints. Such analysis can be performed for measures of gender disparities both for cross-section comparisons and for a given country at a given point in time or over a period of time. We will return to such considerations, after a discussion of the dynamic aspects of gender disparity.

Static and Dynamic Dimensions of Disparity

Two requirements for an improved conceptual and analytical framework for measuring gender disparities which follow from the above discussion will be elaborated in this and the next section. First, it is not enough to study the relative position of women in a society, as the welfare of women will depend also on the absolute level attained with respect to various welfare attributes. Second, a comparative analysis of similarities and differences between men and women and between different groups of women has to be undertaken within a dynamic framework, i.e. one needs to analyze the process through time and

not only the position at a given point in time (Sicherl,1985).

An extended conceptual and analytical framework for the analysis of disparities is suggested. It stems from the view that for any satisfactory quantitative analysis of disparities, a certain minimal framework is needed which deals with both the static and dynamic aspects of disparities. To compare the female to male ratio for wages for 1970 and 1980 is interesting but far from sufficient for an understanding of what has taken place in a rapidly changing world. Such a minimal framework would consist of elements from two types of information:

(i) information about the present and intertemporal position of the observed unit, without regard to the position of other units;

(ii) information about the position of the observed unit in relation to other units.

In our case,[3] the first type of information refers to the absolute position of men and to the absolute position of women. The second type of information deals with the relative position of women, i.e. in relation to men or between two special groups of women. An interesting point can be raised about the manner in which people combine the elements concerning their absolute and relative positions in an assessment of their welfare,[4] not to mention the problem of how such a judgement can take into account the large number of welfare attributes. Although this is a field of interdisciplinary research which lies far beyond the scope of this report, this does not mean that

the above considerations should not be kept in mind in a conceptualization of the various measures of disparity. A much more simple issue is the computational relationship between the two types of information. Broadly speaking, if information on the absolute positions of men and women over time is available, various measures of gender disparity can be derived from them but not vice versa. This is a rather unsophisticated point to make, yet in practice it is too often disregarded and leads to a situation where data presented merely in a relative form do not permit the researcher to undertake a more comprehensive dynamic analysis, even when appropriate information has been collected but not made available in the most useful form.

The first type of information can be represented by the level and the growth rate of the analyzed welfare attributes. In evaluating the intertemporal position, the growth experience, the prospects and expectations are important elements since many people may feel quite frustrated by the prospect of decline or stagnation in the future, even though they still occupy a high and comfortable position as far as the level of the indicator is concerned. The absolute level of the indicator is also of considerable relevance, for the same degree of relative deprivation of a certain group in the society at different absolute levels of the welfare attribute may mean a qualitatively different situation. In the analysis of the position of women, the current excessive emphasis on the measures of the relative position of women without a simultaneous analysis of the absolute position, i.e. of the level and growth rate of

the indicator, cannot be considered as a satisfactory approach to a complex reality.

However, even if one turns only to the second type of information and analytical measures, i.e., those related to the relative position of a group in the society, they are biased in another respect. Namely, analytical interest, statistical measures and policy orientation have been mainly concentrated on the static dimension of the disparities, and have neglected the dynamic dimension of the problem. The most common quantitative measures of static relative position between two units are absolute and relative difference at a given point in time.

To arrive at a more comprehensive and realistic picture, the static analysis of disparity has to be supplemented with the dynamic measures of disparity to incorporate the dynamic relative position as an essential element of the analysis. One way[5] to achieve this is to use time distance as a new statistical measure which measures the time dimension of disparity, i.e., it looks at the disparities from perspective of time and complements the existing statistical measures of disparity at a given point in time.

In the case of gender disparity, time distance is defined as the distance in time (measured as the number of years) between the points in time when a specified level of the analyzed indicator is reached by men and women. Looking backwards, it reveals how many years earlier the present position of women was attained by men. While this ex post definition of time distance is particularly useful in descriptive analysis and in assessing

the overall degree of gender disparity, for policy debate, the ex ante definition of time distance, which measures the number of years needed that women would reach the level presently attained by men, is more important.

The degree of disparity between two compared units can thus be expressed simultaneously in (at least) two ways: by a static measure (e.g. that in 1976 the value of the indicator for unit 1 - male wage - was 37 percent higher than that for unit 2 - female wage - see Table 1.1) - and the time distance (e.g. that the lag between unit 1 and unit 2 in the past amounted to 7 years, which means that the level of the female average real wage for 1976 was attained by men already in 1969). Any single measure cannot in itself describe the complex notion of the overall degree of disparity which is a certain combination of static and dynamic measures of disparity. Static measures of disparity as well as time distance play a useful descriptive role in all cases adding information on a particular aspect of disparity.

A Simple Framework for Integrating Static and Dynamic Measures of Disparity

By introducing the time dimension into the analysis of disparities in development and welfare, the existing disparities can be viewed from a new perspective. Therefore, time distance as a new dynamic measure of disparities is meant to complement, rather than compete with, the existing static measures and is suggested only as one of the measures of

disparity, emphasizing a particular aspect of the problem.

If one accepts the hypothesis that disparity has both static and dynamic dimensions, then any single measure - either a static measure or time distance as a dynamic measure - cannot claim to be an appropriate measure of disparity by itself. The task, therefore, is to combine static and dynamic measures in the most useful manner into a comprehensive and consistent analytical framework which could be used also for a systematic discussion of policy alternatives. While the methodology will have to be tailored according to the specific aims of a particular study, two remarks of a general nature are appropriate at this point.

First, with the introduction of time distance, the static and dynamic aspects of disparities can be formally integrated in a consistent analytical framework. A particularly useful formulation relates the relative disparity at a given point in time and the time distance as a measure of the time dimension of disparity with the rate of growth of the analyzed indicator. Second, the normative implications of the new dynamic measure of disparity are much more difficult to establish than the formal mathematical interrelationships between static and dynamic measures of disparity. The overall assessment of the degree of disparity will have to be a weighted combination of its static and dynamic dimensions (Sicherl, 1977). The determination of their relative importance is an assignment for long-term research along inter-disciplinary lines, which is beyond the scope of this report .

In general, time distance measures (for a given level of the indicator) the time span that separates the two compared units. The suggested statistical measure is defined as follows: S-distance in terms of an indicator X (e.g. income, life expectancy, nutritional level) is defined as the distance in time (the number of years) between the points in time when the two units compared (in our case men and women, in general individuals, income, social or ethnic groups, regions or countries) achieve a specified level of the indicator. The observed distance in time (the number of years) is used as a dynamic measure of disparity between the two units in the same way that the observed difference (absolute or relative) at a given point in time is used as a static measure of disparity.

If the growth of the indicator X over time (t) is expressed as $X_1 = f_1(t)$ for the first and $X_2 = f_2(t)$ for the second unit in a simple case of two units,[6] the quantitative estimate of the static and dynamic disparity between the two units is obtained in the following way:

1. When the two functions are compared vertically at a given point of time (t), the static dimension of the disparity is obs ed. The quantitative measures of the static relative positions in this simple case are the absolute static difference

$$A_{12}(t) = X_1(t) - X_2(t) \qquad (1)$$

and the relative static difference

$$R_{12}(t) = X_1(t)/X_2(t) \qquad (2)$$

2. When the two functions are compared horizontally (i.e.

for a given level of the indicator X), the difference represents the time distance between the two units for that level of X. For a given level of X_L,

$$X_L = X_1(t_1) = X_2(t_2) \qquad (3)$$

and the time distance (i.e. the time span that separates the two units at this level of the indicator) will be written as

$$S(X_L) = \Delta t(X_L) = t_2(X_L) - t_1(X_L). \qquad (4)$$

In a more general notation for the case of many units, the respective static measures of disparities between any two units (i,j) can be written as

$$A_{ij}(t) = X_i(t) - X_j(t), \quad R_{ij}(t) = X_i(t)/X_j(t) \qquad (5)$$

and the time span separating unit (i) and unit (j) for the level X_L

$$S_{ij}(X_L) = t_j(X_L) - t_i(X_L) \qquad (6)$$

The three subscripts are needed to indicate: (a) between which two units the time distance is measured and (b) for which level of the indicator (in the same way as the time subscript has been used to identify the static measures).

Time distance as a measure of the time dimension of disparity looks at the disparity from a particular (time) perspective. In performing this role there is no need to relate it to any static measure of disparity or growth rate in a formal way - it can stand on its own as a measure of a particular aspect of disparity.

However, there are certain advantages in combining static and dynamic measures of disparities in a comprehensive and

consistent analytical framework. Such an extended framework for analysis of disparities has implications at the conceptual, analytical and policy level, which seem to be more important than the disadvantages arising from various compromises involved in relating the time distance (which is conceptually defined for a given level of the indicator) to the particular point in time for which the static measures are measured. There are alternative ways of doing this, and this leads in turn to the distinction between ex post and ex ante time distances.

Figure 1 illustrates a possible relationship between the relative static difference, the growth rate of the indicator and the ex post and ex ante time distance for male and female wages.[7] If data on the real wages for men and women are available up to the year (t), ex post time distances can be measured for levels which both units have already achieved, while time distances for higher levels will depend also on future developments (see dotted lines in Figure 1) and their value can still be influenced by policy action. Thus the ex post and ex ante definitions of S-distance relate to different periods, past and future, and have different analytical and policy implications.

If M stands for males and F for females, and if time distances are measured for the current levels of male and female real earnings at a given point in time (t), then the above mentioned ex post time distance for the level of female earnings can be also written as $S_{MFF(t)}$, and the ex ante time distance for the present level of male earnings as $S_{MFM(t)}$.

The time distance $S_{MFF(t)}$ at the level of the lower unit (female wage) at the given point in time (t) is an example of ex post time distance and indicates how many years ago the male wage reached this level. In the example in Figure 1, this amounts to 12 years, which for this case means

$M(t-12) = F(t)$

or, in general for the comparison between two units

$$X_1(t-S_{122(t)}) = X_2(t) \qquad (7)$$

or, alternatively, for any given level of X_L

$$X_1(t-S_{12L}) = X_2(t) \qquad (7a)$$

In the second case the time distance $S_{MFM(t)}$ at the level of the present male wage is an example of ex ante time distance and indicates the numbers of years needed at a given growth rate of female wages to reach the present level of male wage. In the example in Figure 1, this amounts to 10 years

$M(t) = F(t + 10)$

and in general for the comparison between two units

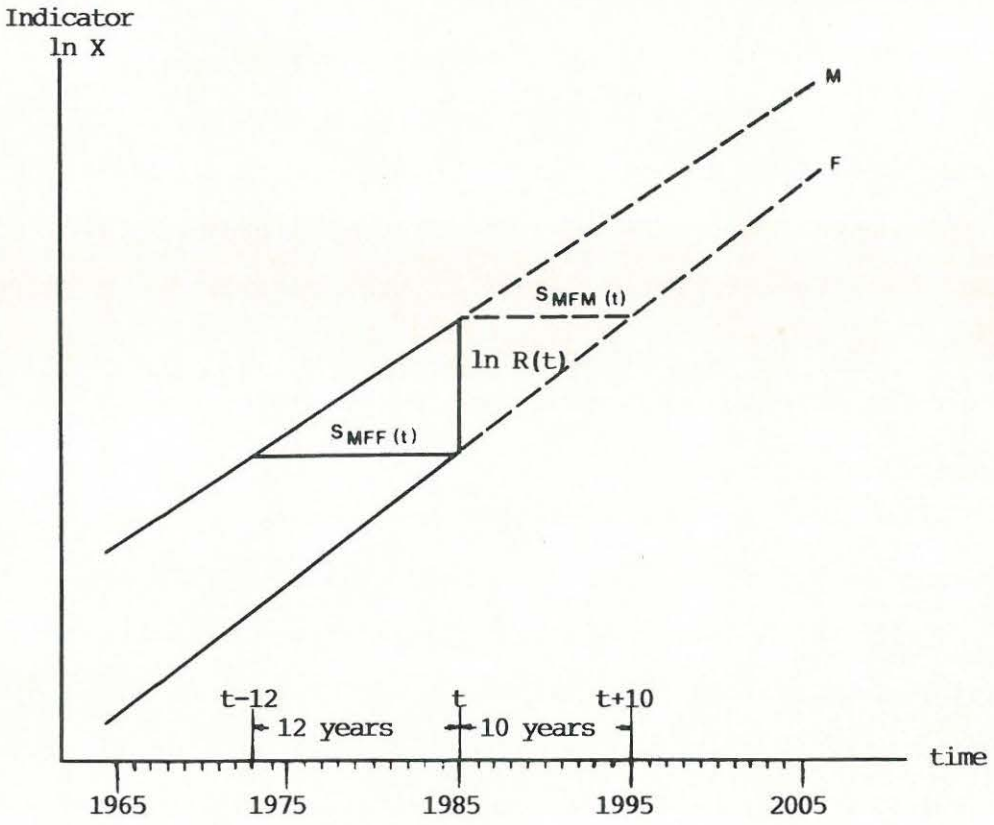
$$X_1(t) = X_2(t + S_{121(t)}) \qquad (8)$$

or, alternatively, for any given level of X_L

$$X_1(t) = X_2(t + S_{12L}) \qquad (8a)$$

While the values of the ex post time distance for various indicators are indicative of the present time dimension of disparities, it is the ex ante concept of time distance which is relevant for the future degree of disparity, as its value can still be influenced by policy decisions. The ex ante time distance, as a projected value for a future period, will thus depend on given conditions, and the assumed policies and measures for its implementation.

Figure 1. Relationship between relative static difference, growth rate of the indicator and ex post and ex ante time distance



Similar relationships can be established for other levels in the past and in the future.[8] A particularly interesting level is that of the average (mean) value of the indicator at the given point in time (t) -- $X_m(t)$ -- which is important, both from the statistical point of view (as many statistical static measures of dispersion are related to this measure of location) and from the point of facilitating comparative analysis (in cross-country comparisons of various measures of intracountry disparities they can be related also to the level of the indicator). In the case of male (M) and female (F) wage comparison, the mean value at time (t) can be written as (T), i.e. average wage for total (male and female). This level is not illustrated in Figure 1 in order not to complicate the graph. However, it can be easily shown that for the average wage level T(t), i.e. average wage for total (not distinguishing men and women) the time distances can be written as

$$M(t-6) = T(t) = F(t+5)$$

and, in general, for the mean value $X_m(t)$

$$X_1(t-S_{1mm(t)}) = X_m(t) = X_2(t+S_{m2m(t)}). \qquad (9)$$

The time distance between male and female wages $S_{MFT(t)}$, which is defined for the level of the mean wage at a given point in time (t) T(t) as

$$S_{MFT(t)} = S_{MTT(t)} + S_{TFT(t)}$$

$$11 \text{ years} = 6 \text{ years} + 5 \text{ years, and in general}$$

$$S_{12m(t)} = S_{1mm(t)} + S_{m2m(t)}, \qquad (10)$$

is thus the sum of the <u>ex post</u> time distance between the unit above average and the mean, and of the <u>ex ante</u> time distance between the mean and the unit below the mean.

For linear functions or linear approximations it is possible to express the interrelationship between static differences and time distance in a rather simple way. The exact nature of the interrelationship will depend upon the particular functional form of $f_1(t)$ and $f_2(t)$ and the corresponding derivatives with respect to time. In this way, the static differences, the time distances and the rates of growth of the analyzed indicator can be integrated in a formally consistent framework.

The general case for various functional forms is discussed in Sicherl (1978). Here only the most frequently used particular functional form of the time trend, i.e. the exponential trend with continuous growth, will be used. The growth rates for the indicator X for the two units r_1 and r_2 (i.e. the corresponding derivatives with respect to time) are in this case constant over time to facilitate the derivations. The particular expressions for the time distances are:

$$S_{122(t)} = (\ln X_1(t) - \ln X_2(t))/r_1 = \ln R_{12}(t)/r_1 \qquad (11)$$

$$S_{121(t)} = (\ln X_1(t) - \ln X_2(t))/r^*_2 = \ln R_{12}(t)/r^*_2 \qquad (12)$$

$$S_{12m(t)} = \ln R_{1m}(t)/r_1 + \ln R_{m2}(t)/r^*_2 \qquad (13)$$

At this point, the asterisk (*) is used to emphasize that this is the future growth rate of the below-the-average unit, which can be still influenced by policy measures, as these are the cases of ex ante time distances. In this simple case, where the rates of growth r_1 and r_2 are constant through time, though different for each unit, the relationship between static difference, rate of growth and time distance is rather

simple. If the natural logarithm of the relative static difference is divided by the appropriate growth rate, an estimate of the time distance can be obtained.

Similarly, in all cases which satisfy or approximate the above assumptions, this interrelationship can be used to combine the assumptions about some of these magnitudes and look at the repercussions in other measures. This makes a contribution to the semantics of the discussion on interrelationships between growth characteristics and various aspects of disparities in various fields of development and welfare, and helps to make the underlying relations explicit. The emphasis is on the changes in the static analytical framework, caused by the different speed of change over time, as well as on the additional insights that can be gained by looking also at the time dimensions of gender disparities.

The analysis of the time dimension of disparity (lead or lag for a given level of the indicator) should be complemented by a measure of a different time span involved in the analysis of disparities. This is the <u>time span needed for full equalization</u> in the levels of the indicator for the two compared units (in our example that male and female wages would be equal). At that time, the time distance defined for a given level of the indicator as well as the static measures of disparity would all be equal to zero.

$$S_{122}(t) = S_{121}(t) = A_{12}(t) = R_{12}(t) = 0 \qquad (14)$$

However, there are two important pieces of information which we would like to have about the prospects of full equalization in a dynamic framework. The first one is the

time needed to achieve the equalization under certain assumptions; and the second is at what level of the indicator the equalization would be achieved. This special case of time distance analysis will thus measure the number of years needed to achieve full equalization from the existing initial (relative) disparity $R_{12}(o)$ from a chosen starting point in time (t=0). By analogy with the time dimension of disparity for a given level of the indicator we shall combine the estimate of the time span needed to reach full equalization with the estimate of the level at which this will be achieved, but now in the reverse order. The distance in time that under certain assumptions about future growth rates separates the present starting point from that point in time when the equalization is projected to occur (the time span needed for equalization at the same point in time, not just reaching the present level of the higher unit!) can be written as

$$S_{12E} = \ln R_{12}(o)/(r^*_2 - r^*_1), \qquad (15)$$

where S_{12E} means the time span needed for equalization between units 1 and 2; $R_{12}(o)$ is the relative static disparity in the starting point in time, and r^*_1 and r^*_2 are projected future growth rates for the two compared units. The time distance in the case of full equalization depends, <u>ceteris paribus,</u> on the difference between the rates of growth for the two units. It can be achieved only if the difference in growth rates $(r_2 - r_1)$ is positive, i.e. in favour of the lower unit.

However, the level at which this equalization might be achieved, depends not only on the difference between the two growth rates $(r_2 - r_1)$ but also on their magnitude:

$$L(S_{12E}) = X_1(o).e^{r_1 \cdot S_{12E}} = X_2(o).e^{r_2 \cdot S_{12E}} \quad (16)$$

As in the earlier case, the analyses of levels, static disparity, growth rates and time distance complement each other, bringing into the discussion various aspects of a rather complex problem.

Male-Female Wage Disparity as an Example of One Indicator/Two-Unit Case

As an empirical example, various measures of disparity in wage earnings per hour in manufacturing between men and women for an European country will be used. Table 1.1 presents the basic series of wage earnings for total (i.e. average wage without disaggregation by sex), men and women, from which various measures of gender disparity over time will be calculated. The table shows the absolute values of earnings in the respective currency units and constant 1970 prices. In addition, the two most frequently used static measures of disparity -- absolute difference $A_{12}(t)$ and relative difference $R_{12}(t)$ -- as well as the respective relative differences expressed in relation to the average wage, i.e. expressed as the ratio of male or female wage to the average wage: RFT(t) = F(t)/T(t) for females and RMT(t) = M(t)/T(t) for males, are also given.

Figure 2 shows the growth of the basic series over time, and it is obvious that three distinct periods can be distinguished: a period of continuous moderate growth, followed by a considerable acceleration of growth rate for wages, followed

by a period of virtual stagnation for male wages and a very slow increase in female wages. It is interesting to see how variations in the rate of growth of wages affect different measures of gender wage disparity.

Also in this example, different measures of gender disparity show different directions of change over time. The relative difference is continuously falling, and from that point of view, it could be said that the disparity is decreasing. For the period 1958-1976, however, the absolute difference between male and female wage increased and nearly doubled. In the last period, 1976-1981, the absolute differences also started to fall. If we compare only the static measures of gender disparity over time, for the period 1976-1981, the unanimous conclusion of the two static measures is that the male-female differentials have been decreasing. A less favourable picture will emerge, however, when the growth characteristics and the dynamic dimension of disparity are taken into account.

Even before that, an evaluation of the period 1958-1976 where the relative differences were decreasing while the absolute differences were increasing (see Figure 4), calls for a value judgement on which measure or which combination of the two measures one should base the assessment of what has occurred in gender disparity. It will be shown that static and dynamic measures of disparity might in certain situations lead to different conclusions, not only about the degree of disparity but even with respect to the direction of change of disparity over time. The above example shows that a similar assertion, which is easily recognized but often forgotten, holds also for the group

Table 1.1

Earnings per hour in manufacturing (deflated by consumer price index) and absolute and relative static differences between men and women

Years	Earnings in currency units (1970 prices) T(t)	M(t)	F(t)	Absolute static differ. A(t) M(t)-F(t)	Relative static differ. R(t) M(t)/F(t)	Relative to average earnings RMT(t) M(t)/T(t)	RFT(t) F(t)/T(t)
1958	3.21	3.69	2.50	1.19	1.48	1.15	0.78
1959	3.33	3.82	2.57	1.25	1.49	1.15	0.77
1960	3.46	3.96	2.63	1.33	1.51	1.14	0.76
1961	3.65	4.18	2.76	1.42	1.51	1.15	0.76
1962	3.69	4.22	2.77	1.45	1.52	1.14	0.75
1963	3.76	4.28	2.85	1.43	1.50	1.14	0.76
1964	3.86	4.37	2.96	1.41	1.48	1.13	0.77
1965	4.01	4.53	3.08	1.45	1.47	1.13	0.77
1966	4.18	4.71	3.23	1.48	1.46	1.13	0.77
1967	4.28	4.83	3.33	1.50	1.45	1.13	0.78
1968	4.39	4.92	3.41	1.51	1.44	1.12	0.78
1969	4.68	5.24	3.66	1.58	1.43	1.12	0.78
1970	5.06	5.64	3.97	1.67	1.42	1.11	0.78
1971	5.49	6.11	4.33	1.78	1.41	1.11	0.79
1972	5.86	6.51	4.65	1.86	1.40	1.11	0.79
1973	6.13	6.81	4.88	1.93	1.40	1.11	0.80
1974	6.39	7.08	5.12	1.96	1.38	1.11	0.80
1975	6.59	7.30	5.29	2.01	1.38	1.11	0.80
1976	6.65	7.37	5.37	2.00	1.37	1.11	0.81
1977	6.43	7.04	5.23	1.81	1.35	1.09	0.81
1978	6.42	7.02	5.25	1.77	1.34	1.09	0.82
1979	6.67	7.28	5.48	1.80	1.33	1.09	0.82
1980	6.75	7.35	5.54	1.81	1.33	1.09	0.82
1981	6.79	7.38	5.63	1.75	1.31	1.09	0.83

Source: Based on data for a European country, ILO, Yearbook of Labour Statistics, various years.

of static measures: absolute and relative differences at a given point in time (not to mention other static measures) measure the same qualitative aspect in different ways and do not necessarily give the same answer even to the respect of the direction of change.

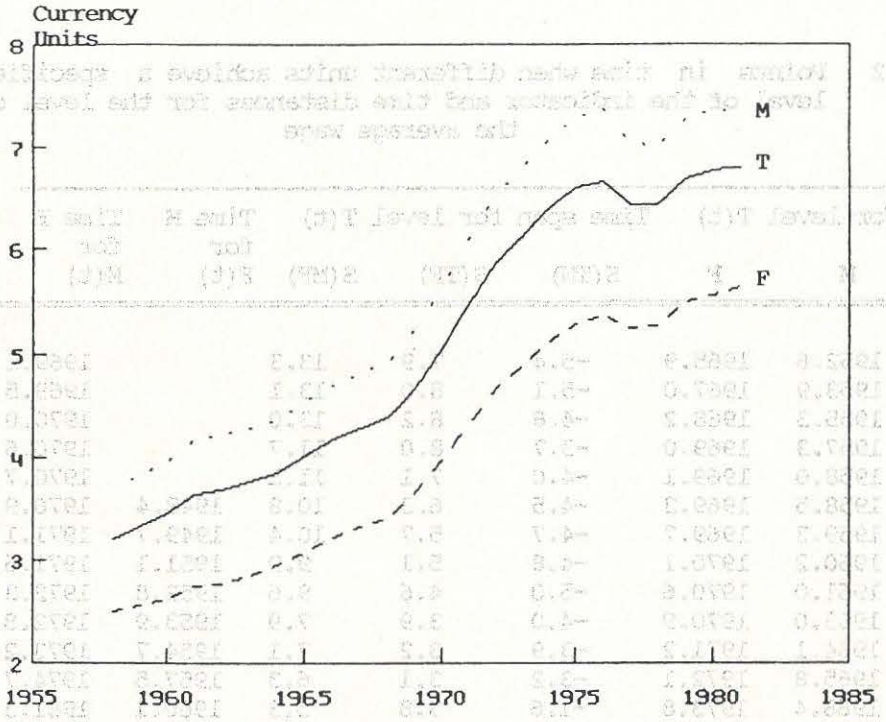
Table 1.2 provides more information on the time dimension of disparities.[9] As mentioned earlier, time distance is defined for a given level of the indicator. In any attempt to combine static measures and time distance in a consistent framework, some compromises have to be made, and there are alternative ways of relating them to each other. The first three columns in Table 1.2 and Figure 3 take the average wage (i.e. the value for total T(t)) as the reference level with respect to which the time distances are estimated. Thus, for instance, the average wage level for 1965 T(1965)=4.01 currency units was achieved by men in 1960 (which means that the lead in time for male wage for that level was 5 years compared to average wage) and by women in 1970 (which means that the lag in time behind the average wage level for women was 5 years). In accordance with equation (10), the time distance between men and women for that level can be estimated as the sum of the respective time distances in relation to the average wage: it amounts to 10 years. In simpler terms, if the point in time at which this level was achieved by men is 1960, and for women 1970, the time span for that level is 10 years. In Figure 3, the vertical

Table 1.2 Points in time when different units achieve a specified level of the indicator and time distances for the level of the average wage

Time for level T(t)			Time span for level T(t)			Time M for	Time F for
T	M	F	S(TM)	S(TF)	S(MF)	F(t)	M(t)
1958	1952.6	1965.9	-5.4	7.9	13.3		1969.1
1959	1953.9	1967.0	-5.1	8.0	13.1		1969.5
1960	1955.3	1968.2	-4.8	8.2	13.0		1970.0
1961	1957.3	1969.0	-3.7	8.0	11.7		1970.6
1962	1958.0	1969.1	-4.0	7.1	11.1		1970.7
1963	1958.5	1969.3	-4.5	6.3	10.8	1948.4	1970.9
1964	1959.3	1969.7	-4.7	5.7	10.4	1949.7	1971.1
1965	1960.2	1970.1	-4.8	5.1	9.9	1951.1	1971.6
1966	1961.0	1970.6	-5.0	4.6	9.6	1952.8	1972.3
1967	1963.0	1970.9	-4.0	3.9	7.9	1953.9	1972.8
1968	1964.1	1971.2	-3.9	3.2	7.1	1954.7	1973.2
1969	1965.8	1972.1	-3.2	3.1	6.3	1957.5	1974.7
1970	1968.4	1973.8	-1.6	3.8	5.3	1960.1	1981.3
1971	1969.6	1979.2	-1.4	8.2	9.5	1963.6	1987.9
1972	1970.5	1984.6	-1.5	12.6	14.2	1965.7	1992.8
1973	1971.1	1988.1	-2.0	15.1	17.1	1967.6	1996.3
1974	1971.7	1991.3	-2.3	17.3	19.6	1968.6	
1975	1972.3	1993.7	-2.7	18.7	21.4	1969.1	
1976	1972.5	1994.4	-3.5	18.4	21.9	1969.3	
1977	1971.8	1991.8	-5.2	14.8	20.0	1969.0	
1978	1971.8	1991.7	-6.2	13.7	19.9	1969.0	
1979	1972.5	1994.6	-6.5	15.6	22.1	1969.6	
1980	1972.8	1995.6	-7.2	15.6	22.8	1969.8	
1981	1972.9	1996.0	-8.1	15.0	23.1	1970.0	

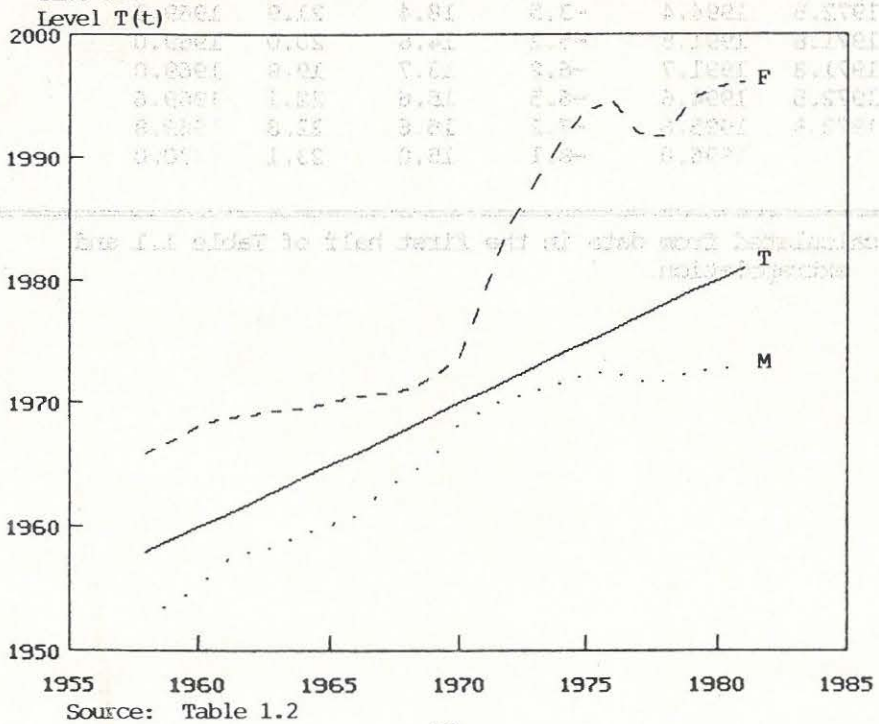
Source: calculated from data in the first half of Table 1.1 and extrapolation.

Figure 2. Male, female and total earnings per hour in manufacturing (1970 prices) for period 1958-1981



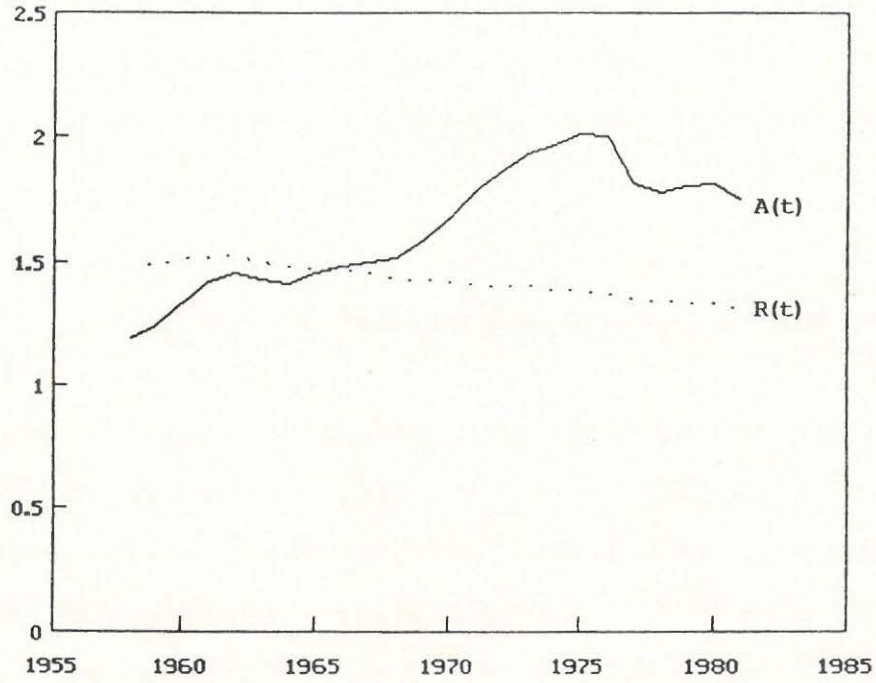
Source: Table 1.1

Figure 3. Points in time when the average wage level (T(t)) is achieved by men and women



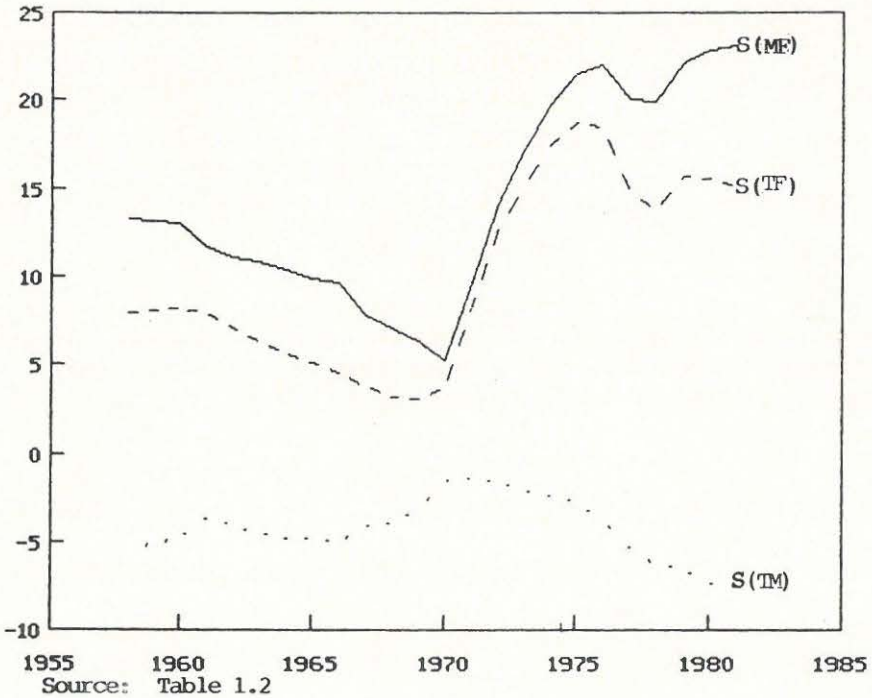
Source: Table 1.2

Figure 4. Absolute and relative static difference between male and female wage (1958-1981)



Source: Table 1.1

Figure 5. Time distance between male, female and total series for the levels of average wage (T(t))



Source: Table 1.2

distance between the respective lines gives an initial impression of changes in the time dimension of gender disparity over time. Before entering into a more detailed discussion of these values, it is necessary to see the growth characteristics of wages over time.

In the period under consideration, the growth of wages in the three subperiods presented in Table 1.3 is quite different. As the table shows, very different situations exist with respect to the absolute changes in wages in the last subperiod, 1976-1981, than in the previous two periods. There is a near stagnation over this five-year period for male wages and a very small increase in female wages. Even when the absolute increase is calculated per year and not per period, the increase

Table 1.3

Growth of wages over time

Period	Change in wages (currency units)			RDFT	Growth rate of wages (percent)			Difference in growth rates
	DT	DM	DF	DF/DT	r_T	r_M	r_F	(r_M-r_F)
1958-68	1.18	1.23	0.93	0.77	3.1	2.9	3.2	-0.2
1968-76	2.26	2.45	1.96	0.87	5.3	5.2	5.8	-0.6
1976-81	0.14	0.01	0.26	1.86	0.4	0.0	1.0	-1.0

DT=T(t)-T(t-n), DM=MT(t)-M(t-n) and DF=F(t)-F(t-n), where n is the number of years in each subperiod.

in the female wages in the last subperiod is only one-fifth of that in the previous subperiod. The relative position of women in relation to the total, calculated on the basis of changes for

the last subperiod, is 1.86; this is much higher than the value of 0.83 for 1981, which relates to the level of female wage rather than to the change in wage. It can be said that, in relation to men, women have gained in the last subperiod; but in comparison to the experience of the past, the growth in wages has been very meager and disappointing in relation to the expectations which were formed in the past.

The last four columns in the table invite discussion on changes over time in terms of growth rates of wages and time distance as a dynamic measure of disparity. In all three subperiods, the rate of growth of female wages was higher than that for male wages, and that difference has even increased over time, from 0.2 percent in the first subperiod, to 0.6 percent in the second subperiod, and to 1.0 percent in the last subperiod. Again, if the only concern is to compare the position of women in relation to men, the situation would seem to be improving, that is, if the difference in the growth rates is taken as an indicator of their relative position in a dynamic framework. The higher growth rate of wages for women than for men by definition also means that the static relative differences will be decreasing over time.

It is argued that not only the difference in the growth rates but also the absolute magnitudes of the growth rates for the two sexes is important, both for the absolute position of men and women and for the time dimension of gender disparities. The growth rates in Table 1.3 and the time distances presented in Table 1.2 can illustrate this point. The three subperiods are very different as far as the absolute magnitude of the growth of

wages is concerned. In the first subperiod, the rate of growth of wages was around 3 percent per year; in the next subperiod, the growth rate increased to over 5 percent per year, and the comparison of these two subperiods can be used as an example of what happens to various measures of gender disparity, if the growth rate of the indicator changes[10]. An even more striking example of changes in the growth characteristics is that of the high 5 percent growth rate of wages in the second subperiod in comparison to the near stagnation in the last subperiod.

The values of time distance in Table 1.2 show a very different picture than the static measures of gender disparity. The ex post time distance can usually be calculated for time series data by simply looking at the tables, to check in which year in the past the male wage was the same as the level of female wages at a given point in time. In this case, comparing the third and the fourth column in Table 1.1, the level of female wages in 1969 was attained by men in 1958 (i.e. 11 years ago), the level of female wages in 1976 in 1969 (i.e. 7 years ago), and that of 1981 in 1970 (i.e. 11 years ago). Thus, even the ex post definition of time distance showed an improvement, when the rate of growth increased, and a deterioration, when the rate of growth decreased.

The above examples show how simple it is in principle to calculate the year when a certain level of the indicator has been achieved by the compared units and to calculate the respective time distances. Problems arise when not all of the compared units have achieved a certain level, or if

information on some periods in the past is not available. The last two columns in Table 1.2 are a good example of such a situation. The last column shows the years when the female wage reached (or is assumed to have reached) a wage level which men attained during the analyzed period 1958-1981. Obviously, even the highest wage attained by women in 1981 only barely matches the male wage in 1970. Thus, if one wishes to calculate the time distance between the male and female wages for higher levels (later periods), one has to make some assumptions about the future growth of female wages. In this section an example has been used to see what would happen if the growth rate for female wages in the future would be about 1.3 percent per year (which is the least squares estimate of the growth rate for female wages for the last observed subperiod 1976-1981).

Even if extrapolated until 1996, at this growth rate the female wage will only reach the male level in 1973, an expected time distance of 23 years. Namely, the respective time distances for the last two columns in Table 1.2 can be calculated by simply subtracting from the values in these columns the calendar time (which is the time when the level at which the comparison is being made is reached by F(t) or M(t), respectively).[11] Similarly, when the female level F(t) is chosen for calculation of time distances between male and female wages (see the second last column in Table 1.2), the history of the movement of male wages over time for these levels is not known before 1958 (not routinely published in statistical publications where usually the concentration is on providing comparable data for shorter periods). Where available, actual data for the past

should be used. As an approximation, a similar (now backward) extrapolation for male wages can be used as the earlier (forward) extrapolation for female wages. This is done in Table 1.2 by extrapolating the male wage backwards down to 1948. Again, by subtracting from this series the calendar time, the ex post distance between male and female wages measured at the female level F(t) would be 15 years in 1963; it would diminish over time to reach a minimum of 5 years in 1973; and it would start increasing again to reach 11 years for the female level in 1981.

As mentioned before, there are some advantages in using the level of the average wage T(t) as the level at which the respective time distances are estimated. The results of forward and backward extrapolation, similar to the one described above, are presented in the first six columns of Table 1.2, and shown in Figure 3 and Figure 5. By comparing Figure 4 and Figure 5, we can observe what has happened with the measures of various aspects of gender disparity in wages over time. The difference in the conclusions based on absolute static difference A(t) and relative static difference R(t) before 1976 has been mentioned before. Time distance $S_{FMT(t)}$, which started at 13 years in the beginning of the period, has been reduced to 5 years (as a combination of a higher female growth rate and, especially, of considerably higher growth rates of both the male and the female wage up till the mid-1970s), and started to increase again sharply with a projected value of 23 years (for the level of average wage in 1981).

From the point of view of static measures of

disparity, the period 1976-1981 - when wages grew very little - would look the best for advancement of women's relative position, as both the absolute and the relative static difference decreased. Only time distance as a dynamic measure of disparity warns that even the statistically measurable ex post time distance has increased again to 11 years. But an assessment of the possible deterioration in the women's dynamic relative position can be evaluated, if one calculates the value of the ex ante S-distance. If the growth rate of wages of female workers observed for the 1976-1981 period prevails in the future, it would take 23 years for the present (1981) level of the real wage of the male workers to be reached. This means a drastic change in expectations, which is not at all observable in static statistical measures of disparity.

A good property of S-distance defined for a given level of the indicator is that it is related to absolute levels, which facilitates comparisons between absolute levels and measures of disparities. This is useful, both for an analysis of disparities within a country or a smaller unit, as well as for cross-country comparisons. An illustration of the importance of taking into account also the absolute levels is that the use of the time span needed for full equalization S_{MFE} as an indication of women's positions without reference to other measures could be misleading.

If the situation from the subperiod 1976-1981 prevailed in the future, the time needed for full equalization would, with a one percent difference in the growth rates for wages in favour of women, amount to about 30 years. However, the

level at which this equalization of male and female wages would occur around the year 2010 would be 7.38 currency units, since the absolute levels of the growth rates are very low. If the situation characteristic for the subperiod 1968-1976 continued in the future, the time needed for full equalization of male and female wages would be about 50 years, to occur around year 2030. But, in the year 2010 the level of female wages would be 36.40 currency units, which is nearly 5 times that of the previous case, though the female wages would still not be equalized with the male wages. It is not difficult to infer which of the two situations would be better or which women would choose, if such a choice were possible. Taking into account the dynamic characteristics of gender disparity time distance S_{MFL} is both a more complex and a more sensitive measure of disparity than the relative static difference R(t) and the time needed for full equalization S_{MFE}. As mentioned before, the aim is to combine them in a comprehensive framework for analyzing gender (and other) disparities. With relatively simple formulations, these static and dynamic measures of gender disparity can be formally integrated into a framework which can provide additional insights to a complex problem.

Normative Considerations

For policy implications, the above described methodology is the most relevant in those situations where it can be combined with normative elements in a meaningful way. While

much of the discussion on policy implications has been in terms of statistical measures of gender disparity which represent the so- called objective type of information, i.e based on observed quantities and values (though with a different degree of coverage and accuracy), it should not be forgotten that the final judgement about and the reaction of people to the degree of disparity is not made only on the basis of "objective" facts but also on the basis of their value judgements.[12] In policy-oriented research, three types of issues are involved: 1) estimation of statistical measures of gender disparities, 2) value judgements associated with them, 3) reactions of people to various situations and incentives and policy measures to bring about changes in the position of women, which are in turn again monitored by statistical measures.

Two further comments are important in this context. First, while the statistical measures of gender disparity - static and/or dynamic - measure the degree of disparity between the two sexes, from the point of view of normative considerations it should not be conceived that the present position of men is necessarily a target for women to strive for. Value judgements change with time and a reassessment of the relative importance of various attributes in the quality of life might be very different if one compares situations over a longer span of time.

Second, it has been stressed that, however factual and objective the basic statistics and measures of disparity may be, their appeal is inherently normative and the assessment of the status of women can with their help still be made only within

a context of normative standards - notions of equity or fairness - which are embodied in the value orientations of a society (Johnston, 1985).

Bearing this in mind, a major conceptual issue in quantifying disparities between men and women is thus the notion of the overall degree of gender disparity as a weighted combination of the static degree of disparity and the time dimension of disparity. While the exact weights which people give to the static and dynamic dimensions of disparity (and these weights might be different for different indicators and/or at different levels of indicators) are not known, without such an extended conceptual and analytical framework, an important dimension of gender disparity would be neglected and our understanding of the situation impoverished.

In analytical work as well as in policy considerations it is of great importance to recognize and take into account the fact that different measures measure different aspects of disparity and should complement one another, to show the complex nature of the problem. Different measures can even show a different direction of change in disparity: it is quite possible to imagine a situation where absolute static differences increased over time, relative static differences remained unchanged, and time distance decreased. The extended conceptual and analytical framework should help the researchers and policy makers to realize the complexity of real life situations in this regard.

It is quite safe to assume that a situation in

which the women's wage is 30 percent lower than the male wage, with an expected time span of 10 years, is preferred to a situation with the same static disparity and the prospects that the current level of male wages would be reached by women only in 30 years. The expression of disparity between two units in terms of time distance for a given level (lead or lag in time) is quite a commonly found way of thinking in everyday life (e.g. in a business towards competitors or in expressing the lag or lead between two countries in certain fields). Similarly, the notion of the number of years needed to reach a certain level of an indicator from a given starting point is implicit or explicit in policy formulation and planning documents. The concept of the time dimension of disparity is thus by no means an unfamiliar notion in everyday and political discussions. Time distance or time span as one of the measures of disparity also has a very distinct advantage in normative and policy discussions in that the concept of lag or lead in time is easily comprehensible by policy-makers as well as laymen, and the same holds for years as the unit of measurement.

However, this does not mean that it is known in what way policymakers and people in general will combine various "objective" measures of disparities with their value judgements into an overall assessment of their relative position, and how they will deduce their position and action with respect to (in)equality at the interpersonal, social, income, ethnic, regional or international levels. Some of these issues can be clarified only through long-term interdisciplinary research.

Two hypotheses are offered here. On the one hand, at the conceptual level, the overall degree of disparity is viewed as a weighted combination of static and dynamic dimensions; in other words, both of them matter. On the other hand, while in their role as descriptive statistical measures all of them are useful describing the existing situation or policy alternatives from various perspectives within the whole range of possible applications, from the individual to the international level, the normative implications will be more important when comparing groups within a country or smaller units than in an international framework.

However, it should be stressed that time distance in its analytical application will provide a certain answer which at this stage is not associated with any value judgement. The evaluation of whether such a disparity is tolerable or not will be possible only when a certain set of social values and policy objectives will be introduced, and the outcome of the evaluation will depend on what is the particular set of goals and values which one uses in arriving at the value judgement. In this respect, there is no conceptual difference between time distance and static measures of disparities. Whether a 30 percent discrepancy in the value of a given indicator is acceptable or not requires the same type of criteria exogenous to the analytical framework as the judgement about whether a time distance of 10 years is, in the particular conditions at a given point in time, politically acceptable or not.[13]

Although a conclusion with respect to the relative importance of static comparisons and time distance in the

normative field can not be drawn on a priori grounds, it is possible to explore some implications of the extended conceptual and analytical framework for the formulation of economic and social policy. This subject will be further discussed in the next chapter.

CHAPTER 2

METHODS OF CALCULATING CHANGES IN DISPARITY OVER TIME

Introduction

The complexity and various difficulties of measuring gender disparity over time have already been discussed in the previous chapter. From the conceptual point of view, the three most important factors of complexity identified were the great number of indicators related to various fields of concern, combined with different measures of disparity for each indicator and the normative judgements associated with them. The desired synthesis is still far away.

Better data and improved methods of analysis are needed to contribute to a better understanding of the problem. The analysis of the changes in gender disparity over time can be undertaken at various degrees of complexity of the underlying analytical framework. For purposes of an exploratory analysis of the position of women and gender disparity, a not too complicated statistical approach is elaborated in this report for calculating changes in gender disparities over time. This approach represents a feasible step forward towards a better utilization of already existing data in many countries.

The definition(s) of time distance and formal relationships with static measures of disparity have been outlined in the previous chapter. In the same chapter, a

numerical example of methods of calculating changes in disparity over time for male and female wages has also been presented to serve as an illustration of the new insights and changes brought about by expanding the existing conceptual approach towards measuring disparities through the introduction of the time dimension of disparities. Since the methods of calculating the analyzed static and dynamic measures of disparities have been necessarily incorporated in the explanation of the numerical example, there is no need to repeat them here.

In the present chapter the effects of changes in the growth rates of the analyzed indicator on respective static and dynamic measures of disparities over time will be elaborated, together with the policy implications arising in the discussion of gender disparities when the growth rate of the indicator significantly increases or decreases over time.

As far as the level of the analysis is concerned, these methods can be used in this context for analyzing disparities between men and women, or among various groups of women, at different levels: micro, mezzo and macro. That is, it can be applied at the individual, family or household level, for various levels of (dis)aggregation like local, urban, rural, regional, income, social, ethnic, educational, occupational and other groups, as well as between countries and groups of countries.[1]

In general, an appropriate balance between summary measures, measures of disparity of the disaggregated level, and structural characteristics is needed. All of them have their advantages and disadvantages, and only in combination can they

cover various aspects of changes in disparity over time. Summary measures might be lacking the detailed information required to see at what point in the structure the changes have taken place and what the direction of change for particular groups that might have been offsetting each other in the final result was. However, as the number of groups analyzed increases, the overall position becomes more and more unclear, and more difficult to comprehend. It is therefore highly recommended that, on the one hand, summary measures, measures of disparity at a disaggregated level and structural characteristics are all taken into consideration and analyzed, and on the other hand, that attempts are made to combine them whenever feasible.

Another important distinction is the type of statistical characteristic of an indicator. One group of indicators deals with the presence of women in various activities. The most common form of expression of these indicators is the share (percentage) of women in the total number of the employed, or in the total employment in a certain occupation or sector, or in the total number of pupils enrolled at a certain level, etc. These data usually have the statistical dimension of stock, i.e. quantity at a given point in time. Though important, they only provide information on the presence or absence of women in a certain activity, i.e. on the extent of women's involvement rather than on the intensity of their involvement. Another group of indicators deals with gender position in a more differentiated way, showing values of the indicator per person (wages, income or consumption per person,

life expectancy, etc.). These indicators usually have a wider range of variation than the previous group. Following UNRISD (1985), the two groups will be called indicators of percentage type and indicators of per capita type.

Growth Rate and Changes in Measures of Disparity Over Time

The interrelationships between the static and dynamic measures for the case of exponential trends provide interesting insights into the role of growth rates in the comparative analysis of disparities. Equations (11)-(13) show that for a given relative static disparity, $R_{12}(t)$, the time distance is inversely proportional to the rate of growth of the indicator. A low growth rate thus means, ceteris paribus, a substantial lag in time between the compared units.

The important conclusion is that the S-distance is a decreasing function of the growth rate. Thus, the S-distance as a dynamic measure of disparity offers a quite distinct perspective from that of static measures. This will be of considerable relevance in two fields of analysis.

First, for the case of one indicator, an increase in the growth rate of the indicator for both units which does not change the static disparity reduces the dynamic disparity, since it reduces the S-distance. Although a reduction of the time distance by higher growth rates cannot be an argument against the need to reduce the static degree of gender disparity, the additional effect of the growth rate on the time distance has to be taken in account.

Second, when comparing a set of indicators with respect to the degree of gender disparity, depending on the magnitude of the respective growth rates, indicators which show a high degree of static disparity might show a rather small time distance, and vice versa. The assessment of the degree of disparity with respect to various indicators based on static measures thus might not coincide with the results based on the time distance as a dynamic measure of disparity.[2]

In the analysis of disparities, it is important to distinguish the role played by the difference in the growth rates between the two compared units $(r_1 - r_2)$ and that played by the absolute magnitude of the growth rates (r_1, r_2). The change over time is for static relative disparity $R_{12}(t)$ a function of the difference between the two growth rates $(r_1 - r_2)$, while the change in time distance depends both on the difference between the growth rates $(r_1 - r_2)$ and on the absolute magnitude of the growth rate in question (r_1 for the ex post and r_2 for the ex ante version).[3] If the change of relative static disparity over time from the starting point in time t(o) is written as

$$\ln R_{12}(t) = \ln R_{12}(o) + (r_1 - r_2)t \tag{17}$$

then the corresponding derivatives with respect to time are

$$\frac{d \ln R_{12}(t)}{dt} = (r_1 - r_2) \tag{18}$$

$$\frac{dS_{122}(t)}{dt} = (r_1 - r_2)/r_1 \tag{19}$$

$$\frac{dS_{121}(t)}{dt} = (r_1 - r_2)/r_2 \tag{20}$$

For the case of one indicator and two units, the example of the disparity between male and female wages will be used. In this section the male-female comparisons will be used in general terms to discuss only the direction of change in various measures of disparity. First, the effect of differences between the growth rates for male and female wages will be discussed.

Table 2.1

Change in various measures of gender disparity as a function of the <u>difference</u> between growth rate for men and for women

Measures of disparity	Relationship between the growth rates		
	$r_M > r_F$	$r_M = r_F$	$r_M < r_F$
Absolute difference A(t)	increasing	increasing	decreasing, or increasing first and decreasing later
Relative difference R(t)	increasing	constant	decreasing
Time distance $S_{MF(L)}$	increasing	constant	decreasing

Table 2.1 shows the relationship between the difference between the male and female growth rates and various measures of gender disparity in general terms. It is interesting to observe that the direction of change will, under the above assumptions, be the same for the relative static difference and

the S-distance. In this respect, a similarity exists between relative static measure and dynamic measure of disparity, but not between the two static measures. The observed similarity with respect to the direction of change in relative static difference and S-distance holds for the difference between the male and female growth rates for the indicator in question among these three possible relationships.

However, very different values of S-distance can correspond to the same value of the relative static difference, if the magnitudes (absolute value of the growth rates) are different for different periods for the same indicator or among different indicators. Table 2.2 shows the changes in various measures of disparity as a function of the magnitude of the growth rate for men and for women for a simplified case, where the rate of growth of wages for women is the same as the rate of growth of wages for men. Now the emphasis is on the comparison between the magnitude of the growth rates for wages which prevailed in the past and those which will prevail in the future. In other words, whether the growth rates for wages will be higher in the future period, equal to, or lower than the respective growth rates of wages in the past. The assumption $r_M=r_F$ is made to simplify the exposition. This situation is quite different from that in Table 2.1, where the influence of the difference between the male and female growth rate of wages on the change in direction of various measures of gender disparity was studied.

The case of $r_M=r_F$ is a good general illustration of the complexity of the issues in the measurement of disparities, not to mention its qualitative and normative

Table 2.2

Changes in measures of disparity as a function of magnitude of the growth rates for men and women for the case ($r_M = r_F$)

Measures of disparity	Change in growth rates in time		
	Growth rate higher than in the past $r(II) > r(I)$	Growth rate equals as in the past $r(II) = r(I)$	Growth rate lower as in the past $r(II) < r(I)$
Absolute difference A(t)	increasing	increasing	decreasing or increasing
Relative difference R(t)	no change	no change	no change
Time distance $S_{MF(L)}$	decreasing	no change	increasing

aspects. Let us bring into the picture also the absolute difference at a given point in time and its change over time. Since there is no difference between the growth rates for the two units of comparison, the only change in the degree of disparity can come as a function of the magnitude of the overall growth rate of the indicator. And here we may obtain three completely different results (even as far as the direction of change is concerned):

1. relative static difference R(t) (and similar measures, like the Lorenz curve, the Gini coefficient of concentration, etc.) is completely insensitive to it and shows no change;

2. S-distance as a measure of dynamic disparity is a decreasing function of the magnitude of the overall growth rate;

3. absolute static difference A(t) is an increasing function of the overall growth rate (Sicherl, 1977).

In the dynamic world of today it is hardly satisfactory to rely only on measures of disparity which are insensitive to the changes in the growth rate of the system. In this respect, time distance plays an important role in the analysis of disparities which is quite distinct from that of static measures. While relative measures of disparity are the most frequently used in the literature, the above analysis has shown that they are incapable of distinguishing various situations regarding the change in the magnitude of the growth rates between different periods. From that point of view, it is of no consequence if a situation changes from a low growth to a high growth situation or vice versa. Hirschman (1973) has indicated how different the situation is with respect to the expectations and interrelationship between development and income distribution, in the case of either the first or second type of change. In other words, a situation of growth, stagnation or decline is in such a case undetected by comparing relative static measures of disparity over time.

As mentioned, time distance measures the dynamic relative position with respect to the absolute level of the indicator. In performing this role, there is no need to relate time distance to any static measure of disparity or growth rate; it can stand on its own as a measure of the time dimension of disparity. Still, when combined to study the interrelationship

between various measures of gender disparity under a given set of assumptions, the nature of the functional form of the trend of wages for men and women over time is also important. The trend of the indicator over time is most commonly described by an exponential or linear trend. The choice among these or other functional forms is partly an empirical question, and partly a question of characteristics of change inherited in the attribute described by the indicator. In accordance with the appropriate form of the trend, also the interrelationship between a static measures of disparity, growth characteristics and time distance will have to be specified appropriately.

For an exponential trend, the following relationships could be used (in the brackets, the first letter refers to the type of trend - linear or exponential - and the second to the ex post or ex ante definition of time distance):

$S(ep) = \ln R(t)/r_M$ $\qquad$ $S(ee) = \ln R(t)/r_F$

and for linear trend:

$S(lp) = A(t)/(DM/n)$ $\qquad$ $S(le) = A(t)/(DF/n)$

where n is the number of years in the analyzed period, which means that DM/n and DF/n represent the average absolute increase per year.[4] Similar tables which have been prepared above can be calculated also for linear trends, i.e. if the change in time is better (or alternatively) expressed as average absolute increase per year.

It is important to stress that the estimation of time distances, when estimated directly for a given level from the existing statistical data, is independent of the functional

form of the trends chosen or of any monotonic transformation of the indicator axis in a time-indicator graph. This seems to be a desirable property of S-distance as a descriptive statistical measure, as it does not depend on the above mentioned choice of functional form of the trends or transformations but can still provide a very useful link in the interrelationship between growth characteristics and various measures of disparity when needed.

Policy Implications

The conclusion that S-distance is a decreasing function of the growth rate of the indicator indicates that this dynamic measure of disparity deals with a characteristic of disparities which is quite distinct from that of static measures. This is especially important in a multidimensional analysis across a larger number of economic and social indicators. Namely, indicators which show a high degree of static disparity may at the same time show a rather small time distance, and vice versa. An empirical verification across a large number of indicators of gender disparities is beyond the scope of this report. However, one must bear in mind that it is precisely such a comprehensive multidimensional analysis of the role and position of women that is the purpose of our collecting and compiling statistics and indicators on women (Sicherl, 1985). Viewing the overall picture of gender disparities, the speed of social change might have important repercussions on the dynamic degree of disparity and thus on the overall degree of disparity.

It was shown that if the growth rate of wages for both units increased, e.g., from 3 to 5 percent, different measures show not only a different magnitude but even a different direction of change of gender disparity. It is easy to envisage that different interest groups might utilize the possible differences in the conclusions based on different measures of disparity in policy debates to argue that gender disparities are increasing (taking as the yardstick of comparison absolute static differences from such an example); others would claim that there has been no change (using relative static differences); and a third group might argue that gender disparities have decreased (as time distance decreased). There is no inconsistency in the assertion that one aspect of disparity is increasing at the same time as another is decreasing, if one recognizes that there are more aspects of disparity for a given indicator, which should be approximated by different statistical measures. It seems clear that for any useful discussion of policy alternatives, both static and dynamic considerations should be taken into account simultaneously.

Relative static measures would show the same change over time, if the respective growth rates for unit 1 and unit 2 would be 0 and 2 percent, or 3 and 5 percent. However, time distance would be considerably shorter in the second case. In this framework it is significant for the degree of disparity also how fast and not only how much faster the less privileged unit is growing. It is important to realize that for any given value of relative difference R(t), a higher magnitude of growth

rates brings a net reduction in time distance in addition to whatever reduction in time distance has been achieved by the improvement in the relative difference. In normative terms, the effect of reducing time distance by higher rates of growth should not be used as an argument against the need for improvement in the relative and absolute differences at a given point in time, but its additional effects have to be taken into account when a decision on overall strategy is being considered.[5]

Conceptually and analytically, this opens new avenues to be explored in the relationship between growth and equality. The predominant line of thought in this field is that of trade-off between growth and equality. This dynamic framework points to a new role of the growth rate in distributional considerations. The fact that high growth rates reduce, ceteris paribus, the time dimension of disparity can be taken as an important indication that the conflict between growth and distributional objectives is often exaggerated,[6] and that the real problem is development as a synthesis of economic growth and social progress, and not the growth in itself.

An action programme to reduce gender disparities must be concerned also with the absolute magnitude of the growth rate, and not only with the objective that the female growth rate for an indicator should be higher than that for men, as it affects the time dimension of disparity. Following this line of thought, the connection between overall development and gender disparity can be explored in various ways.

Better practical solutions are to be sought within the general strategic orientation for growth and equity, which means an integration of the activities for the advancement of women in development processes at all levels in everyday life. The importance of growth and efficiency[7] in this context establishes macroeconomic development as an important factor to be studied in the analysis of gender disparities from a dynamic perspective. In general, the position of women in a certain field of concern will depend partly on the level and quality of overall development, and partly on the specific policy orientation and actions undertaken for the improvement of the position of women in a given country.

The macroeconomic conditions depend not only on efficiency but also on resources and the international environment. The deterioration of economic conditions in the current decade, especially in the developing countries, has meant a lower rate of growth (in some countries stagnation or even a decline) of resources available in general and for the improvement of the position of women in particular. One way of quantifying the effect on the disparity between men and women is through time distance. A lower growth rate, ceteris paribus increases the time distance and this increased time distance reflects the perception of increased gender and other disparities within a country, or among countries, if the argument is applied at the international level.

Per Capita Indicators

The purpose of the discussion on the distinction between per capita indicators and percentage type indicators in this chapter is to show some of the similarities and differences in calculating the changes in disparity over time for either type of indicators. In the application of this methodology, in the field of education, for example (discussed in chapter 3), combinations of percentage type of indicators (e.g. enrolment ratios) and per capita type of indicators (e.g. mean years of schooling) will be used as appropriate. Here, however, the numerical examples are separated to illustrate the methodological points. The upper limits of the percentage type indicators and their simple structure allow for the utilization of some simple measures of gender disparity which would not fully utilize the information content of per capita type of indicators.

The numerical example of a per capita indicator - male and female wages - was already elaborated in chapter 1. Gender disparities were analyzed in terms of absolute and relative difference at a given point in time and time distance, while for the time span needed for full equalization various assumptions about future growth rates were used. Technically all the former measures were estimated from the actual values within the range of existing data, outside of that range backward extrapolation of male wages and forward extrapolation of female wages were used for estimation of time distances. The yearly values of these measures based on actual data may be affected by

random variations to such an extent that it represents additional difficulties in identifying and describing the tendencies of change over time.

One way of dealing with this problem is to use the usual statistical techniques to smooth the original data series and calculate the measures of gender disparity from estimated rather than actual values. This will usually produce monotonically increasing (or decreasing) series which will facilitate also the estimation of time distances in the sense that the values will be more indicative of longer term tendencies than of short-term disturbances.

However, as it has been shown in the above example, even if actual data are used the estimation process is relatively simple and straightforward. Data and results are presented in chapter 1. One can only add the calculation of chages in various measures of gender disparity over time DA(t), GR(t) and $DS_{MFT(t)}$ from the results in Table 1.1 and Table 1.2. An example of such calculations will be made in the next chapter for enrolment ratios.

Percentage Type Indicators

Female and male representation rate

As an example of a percentage type indicators, the female representation rate (share of women in total) by occupation for the major groups of ISCO for an Asian country is taken, looking at the change over the period 1960-1980. Table

Table 2.3.

Employment by occupation

Thousands

ISCO major groups		T 1960	M 1960	F 1960	T 1980	M 1980	F 1980
1	PROFESSIONAL W.	169	139	30	581	419	162
2	ADMIN.& MANAGERIAL	92	75	17	134	132	2
3	CLERICAL	190	179	11	1203	803	400
4	SALES WORKERS	588	392	196	1531	992	539
5	SERVICE WORKERS	365	170	195	895	436	459
6	AGRICULTURE&RELATED	4650	3230	1420	4768	2617	2151
7/8/9	PRODUCTION&RELATED	949	803	146	3570	2645	925
	TOTAL	7003	4988	2015	12682	8044	4638

Percentage

		T 1960	M 1960	F 1960	T 1980	M 1980	F 1980
1	PROFESSIONAL W.	2.41	2.79	1.49	4.58	5.21	3.49
2	ADMIN.& MANAGERIAL	1.31	1.50	0.84	1.06	1.64	0.04
3	CLERICAL	2.71	3.59	0.55	9.49	9.98	8.62
4	SALES WORKERS	8.40	7.86	9.73	12.07	12.33	11.62
5	SERVICE WORKERS	5.21	3.41	9.68	7.06	5.42	9.90
6	AGRICULTURE&RELATED	66.40	64.76	70.47	37.60	32.53	46.38
7/8/9	PRODUCTION&RELATED	13.55	16.10	7.25	28.15	32.88	19.94
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

Source: Based on data for an Asian country from ILO, Yearbook of Labour Statistics, 1968 and 1984. Workers not classifiable by occupation, unemployed persons and members of the armed forces are excluded. Classification for 1960 is not the same as for 1980.

2.3 shows employment for the years 1960 and 1980 for total (T), men (M) and women (F), disaggregated by major occupational groups. These are the underlying statistics, from which various row and column shares can be calculated, which are in turn used to calculate the conventional static measures of gender disparities in this field. The lower part of Table 2.3 gives the shares of various occupational categories for total, male and female employment, respectively, for the years 1960 and 1980, from which the dissimilarity indices can be calculated.

Table 2.4 shows the most commonly used indicator on the basis of this type of data - female representation rate, which is defined as the quotient between the number of women and the total number employed in a given category Fi/Ti. In other words, it is a share of women in row total and is usually expressed as percentage of women in total employment for that category for a given point in time. For the whole economy the female representation rate amounted to 29 percent in 1960 and 37 percent in 1980. In practically all occupations the group female representation rate increased (the decrease in administrative and managerial group seems to be an example of problems caused by changes in classification between the two dates).

An increase in the share of women in the total automatically means an equal decrease in the share of men in the total (defined as the sum of men and women). The change of the indicator over time can be measured either by absolute change

(increase or decrease) over time or by relative change over time. The choice between the two opens up the dilemma of percentage indicators in general: whether or not the increase from 10 to 20 percent is to be treated as equal to that between 70 and 80 percent, as in relative terms the first one is greater. For the female representation rate, the theoretical value corresponds to 50 percent and not to 100 percent, as in the case of general rates of access, but the nature of the choice between absolute and relative change in disparity over time is very similar. For development indicators of the percentage type, it has been argued that changes (difference) in percentages (i.e. absolute difference between the two percentage figures) are more appropriate (UNRISD, 1985).

It is suggested here that also for changes in disparity over time with regard to representation in various activities, the difference in percentage points for the female representation rate between the two compared points over time[8] would be the main measure used. Its simplicity is an additional argument in its favour. The increase of the female representation rate for the whole economy from 29 percent in 1960 to 37 percent in 1980, that is by 8 percentage points, automatically means that the corresponding male representation rate decreased from 71 percent in 1960 to 63 percent in 1980, and that the difference between the male and female representation rates decreased from 42 percentage points in 1960 to 26 percentage points in 1980, that is, by 16 percentage points, which is exactly twice the amount of increase in the percentage points for female representation rate between 1960 and 1980. The

changes over time for female representation rates D(Fi/Ti) = Fi/Ti(1980) - Fi/Ti(1960) are given in Table 2.4. The relative rate of change in female representation rates can also be used to supplement this measure.

Table 2.4.

Female representation rates and their change over time

Percentages

ISCO major groups	Female representation rate Fi/Ti 1960	1980	Change in time D(Fi/Ti) between 1960 and 1980
1 PROFESSIONAL W.	17.8	27.9	10.1
2 ADMIN.&MANAGERIAL	18.5	1.5	-17.0
3 CLERICAL	5.8	33.3	27.5
4 SALES WORKERS	33.3	35.2	1.9
5 SERVICE WORKERS	53.4	51.3	-2.1
6 AGRICULTURE&RELATED	30.5	45.1	14.6
7/8/9 PRODUCTION&RELATED	15.4	25.9	10.5
TOTAL	28.8	36.6	7.8

Source: As Table 2.3.

Another useful way of looking at changes over time for this type of indicator is to analyse the changes which have occurred between the two compared points in time, i.e. to use flow figures for new employment or for new enrolments to calculate female representation rates for that period. In Table 2.5 DTi, DMi, DFi represent net changes (gross inflow minus gross outflow) in the employment in various occupational groups in the

period 1960 - 1980. The corresponding female representation rates for the newcomers are much more favourable than those for employed at the beginning of the period. The rule of the relationship between average and incremental magnitudes tells us that if the incremental ratio is higher than the average at the beginning of the period, the average will increase. However, in

Table 2.5.

Changes in employment in the period 1960 - 1980 and the corresponding female representation rate

Thousands

ISCO major groups		Changes in employment DTi	DMi	DFi	Female representation rate for increments DFi/DTi (percent)
1	PROFESSIONAL W.	412	280	132	32
2	ADMIN.&MANAGERIAL	42	57	-15	-36
3	CLERICAL	1013	624	389	38
4	SALES WORKERS	943	600	343	36
5	SERVICE WORKERS	530	266	264	50
6	AGRICULTURE&RELATED	118	-613	731	619
7/8/9	PRODUCTION&RELATED	2621	1842	779	30
	TOTAL	5679	3056	2623	46

Source: As Table 2.3.

the interpretation of these two different sets of female representation rates a caution is needed. An analysis that would be based only on changes might create the erroneous impression that the improvements are progressing more rapidly than they actually are (Boulet and Lavallee, 1984).

Decomposition of change in the aggregate female representation rate over time

Female representation rates for groups and the whole economy are based on information presented by the rows of the tables. They respectively provide information on the presence of women in various groups - i.e. on the disaggregated level - and separately, the average female representation rate for the whole economy. Because the latter represents a weighted average of the group female representation rates, it is possible to combine them with the information on the structure of total employment by occupation in a way which will allow that the ratio of the increase in the overall female representation rate between 1960 and 1980 will be decomposed into the intersectoral and intrasectoral component. The intersectoral component should estimate the influence of the changes in the structure of total employment by occupation between 1960 and 1980 on the change in the overall female representation rate in that period. In other words, it shows what the change would be in the overall female representation rate if the representation rates for each group would be unchanged, i.e. would show the influence of structural change alone. The intrasectoral change would represent a summary measure of the changes over time in female representation rates for each occupational group under the hypothetical situation of unchanged shares of each occupational group in total employment.

The methology used for this decomposition uses the method of aggregate indices and the female representation rates and the shares of occupational groups in the total are taken both

for the initial and the current period, thus the corresponding Laspeyres, Paasche and Fischer indices are calculated (Sicherl, 1971). In this way, the effect of the different weighting schemes are explicitly taken into account. And in this case we have only two points in time. For the case of time series a method using chained Fischer indices has been utilised (see Sicherl et al. 1981) to take advantage of a changing system of weights so that so-called "interaction effect" can be dealt with in a systematic way.

Table 2.6.

Decomposition of change over time in overall female representation rate into intrasectoral and intersectoral components

Actual values		
1960		.2877
1980		.3657
Index of increase	127	
Hypothetical values		
1960 with 1980 structure of total employment		.2516
1980 with 1960 structure of total employment		.4069
Index of intrasectoral component		
Laspeyres	141	
Paasche	145	
Fischer	143	
Index of intersectoral component		
Laspeyres	87	
Paasche	90	
Fischer	89	

This methodology allows us to obtain an estimate of the structural effect on the overall indicator of female representation, as well as an estimate of a synthetic measure of

the intrasectoral change in female representation. The results show a different picture than the examination of the actual values of the female representation rates in isolation. It is shown that the change in the composition of total employment by occupational groups between 1960 and 1980 would in the case of unchanged female representation rates in the groups lead to a decrease in the overall female representation rate. In other words, the increase in the group female representation rates was so strong that it has more than compensated the unfavourable direction of structural change in terms of female representation. In figures, had the occupational structure remained unchanged the overall female representation rate would have increased between 1960 and 1980 by 43 percent, while the observed increase was only 27 percent. Combining structural analysis with the analysis of disparity measures at the disaggregated level and for the economy as a whole can represent a substantial improvement in the understanding of the relationships involved.

Coefficient of female representation

Up to this point, we have been dealing with share of women as part of the total, by groups and for the aggregate. When the classification by occupation is available in greater detail, the female representation rates are used in distinguishing male and female dominated occupations. However, in the literature there is a great emphasis also on the degree of over- and under-representation of women as compared with their share in the total labour force, i.e. on the relative

distribution of the two sexes by occupations. For each group, the coefficient of female representation (CFR) can be calculated; it is defined either as the ratio of the share of women in an occupational group to the share of women in total employment (from data in Table 2.4), or by dividing the share of the group i in total female employment by the share of the same group in total employment (from data in the lower part of Table 2.3.). From either type of information, a summary index - dissimilarity index - can also be calculated.[9] Similar measures are applied also to measure over- or under-representation in school enrolment, see e.g. the use of representation indices for groups or areas in Heyneman (1979), and Maas and Criel (1982). Coefficients above 1.0 indicate over-representation, and those below 1.0 under-representation of women in that particular group as compared to their share in total employment or total enrolment.

For calculation of the dissimilarity index and similar indices, the information on the shares of various occupational groups in the total employment, male employment and female employment are needed and will be described as wTi, wMi and wFi, respectively. These are the column shares presented in the lower part of Table 2.3., obtained by dividing each cell in the upper part of Table 2.3. by their respective column total. Table 2.7. gives the information on the coefficients of female representation and on the differences of the respective shares, which represent the necessary elements for calculation of various definitions of dissimilarity index, the relationship among them will be discussed in greater detail in the next chapter.

Table 2.7.

Coefficients of female representation and elements for calculation of dissimilarity index

ISCO major groups		Coefficient of female representation wFi/wTi		Difference between the share of an occupation in the female and male labour force (wFi-wMi)	
		1960	1980	1960	1980
1	PROFESSIONAL W.	0.62	0.76	-1.3	-1.7
2	ADMIN.&MANAGERIAL	0.64	0.04	-0.7	-1.6
3	CLERICAL	0.20	0.91	-3.1	-1.4
4	SALES WORKERS	1.16	0.96	1.9	-0.7
5	SERVICE WORKERS	1.86	1.40	6.3	4.6
6	AGRICULTURE&RELATED	1.06	1.23	5.7	13.8
7/8/9	PRODUCTION&RELATED	0.53	0.71	-8.8	-13.0
	TOTAL	1.0	1.0	0.0	0.0
				DI=13.9	DI=18.4

ISCO major groups		Difference between the share of an occupation in the female and total labour force (wFi-wTi)		Difference between the share of an occupation in the male and total labour force (wMi-wTi)	
		1960	1980	1960	1980
1	PROFESSIONAL W.	-0.9	-1.1	0.4	0.6
2	ADMIN.&MANAGERIAL	-0.5	-1.0	0.2	0.6
3	CLERICAL	-2.2	-1.0	0.9	0.4
4	SALES WORKERS	1.3	-0.5	-0.6	0.2
5	SERVICE WORKERS	4.5	3.2	-1.8	-1.4
6	AGRICULTURE&RELATED	4.1	8.7	-1.6	-5.1
7/8/9	PRODUCTION&RELATED	-6.3	-8.3	2.5	4.7
	TOTAL	0.0	0.0	0.0	0.0
		DI(FT)=9.9	DI(FT)=11.9	DI(MT)=4.0	DI(MT)=6.5

Coefficients of female representation show the relative degree of female over- or under-representation. As these and other measures indicate for this example at this level of aggregation of occupations, females are over-represented in services and agriculture and under-represented in other groups of occupations. Moreover, as revealed in the values of female representation rates in services and in agriculture, women represent approximately one half of the employment in those groups and are attaining the theoretical level of equal participation in these two groups. The over-representation which is shown by the relative measures is thus over-representation, as compared to a generally lower overall female representation rate, rather than over-representation in terms of surpassing the value of equal participation.

Apart from the discussion of numerical results and the interrelationship between various summary indices which will be reserved for the section on measures in the field of occupational segregation in the next chapter, it is interesting to note the complexity of the problem by discussing briefly the diversity of conclusions which can be reached on the basis of various measures. If the dissimilarity index is taken as a summary index of the change in gender disparity in time, the overall degree of gender disparity has increased as the dissimilarity index increased from 13.9 in 1960 to 18.4 in 1980. However, the change over time in the overall female representation rate from 29 percent in 1960 to 37 percent in 1980 (with the intrasectoral component showing an even greater

hypothetical increase to 41 percent in 1980, with unchanged sectoral composition) very clearly shows an improvement in the women's position and a corresponding decrease in the male representation rates. Obviously, a single measure alone would be inappropriate, and further research and conceptual clarification is needed.

Furthermore, it is extremely interesting to compare the dissimilarity indices between males and females for 1960 and 1980 with a dissimilarity index between the structure of female composition of employment by occupational groups in 1960 and 1980. The value of this dissimilarity index is 24.9, which means that the female distribution by occupational groups in 1980 was less similar to the female distribution 20 years before than the degree of dissimilarity was between male and female distributions either in 1960 or in 1980. Figures 6 and 7 show the big change that occurred between 1960 and 1980 in the structure of occupations[10] in the economy. Figure 8 presentes, for comparison, a situation in a developed European country to indicate the magnitude of further possible structural change, and the fact that at this level of aggregation the gender dissimilarity is much more pronounced (DI=37.7) in comparison with the Asian country.

The problem with this category of relative measures is that their change over time depends only on the <u>difference</u> between the respective rates of growth, i.e. between the rate of growth for men and women and/or between the rate of growth in employment in a given group and that of total respective employment. If the difference in the rates of growth

Figure 6: Female and male representation rates by occupation (ISCO major groups) for an Asian country

1960

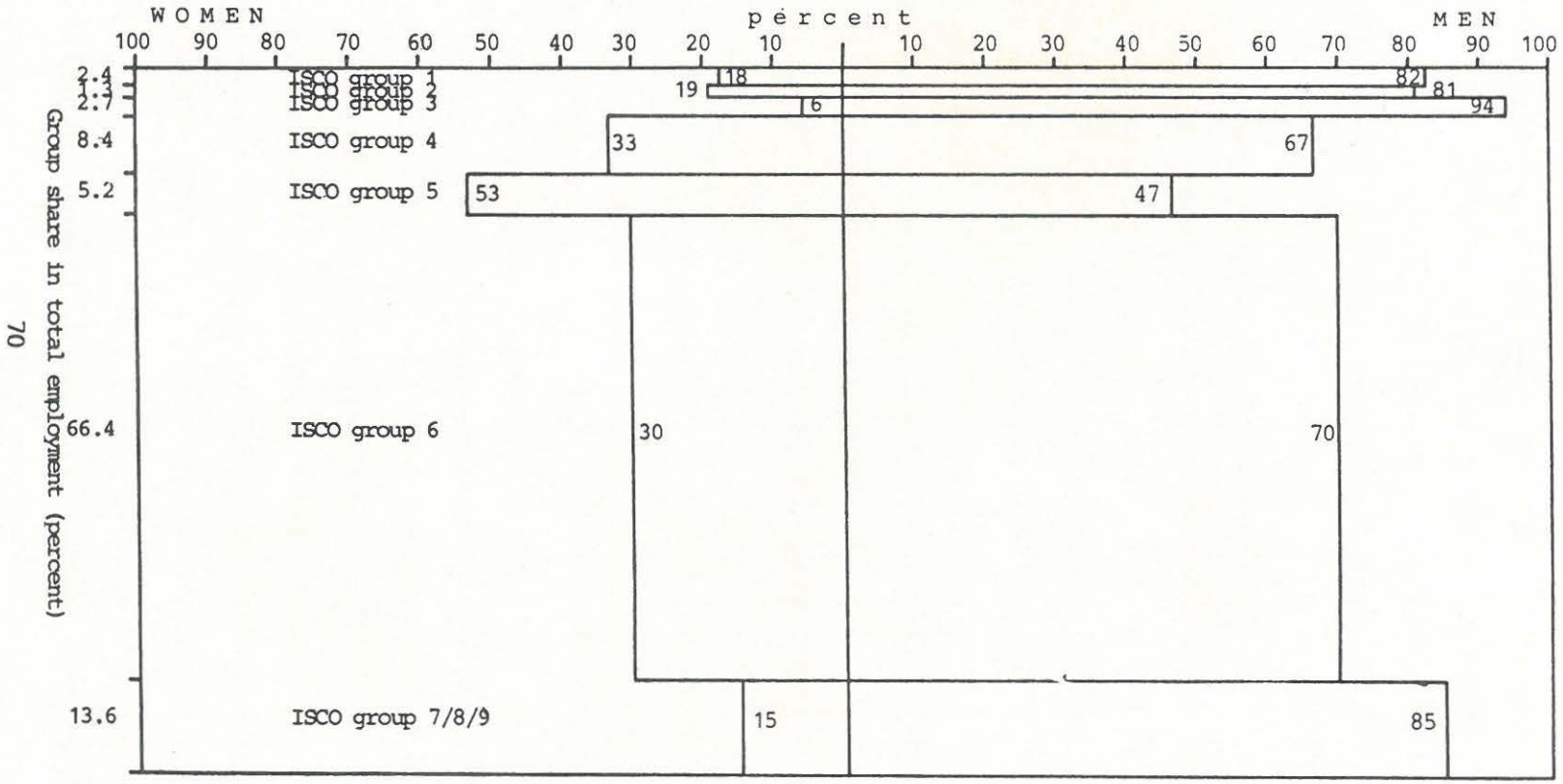


Figure 7: Female and male representation rates by occupation (ISCO major groups) for an Asian country

1 9 8 0

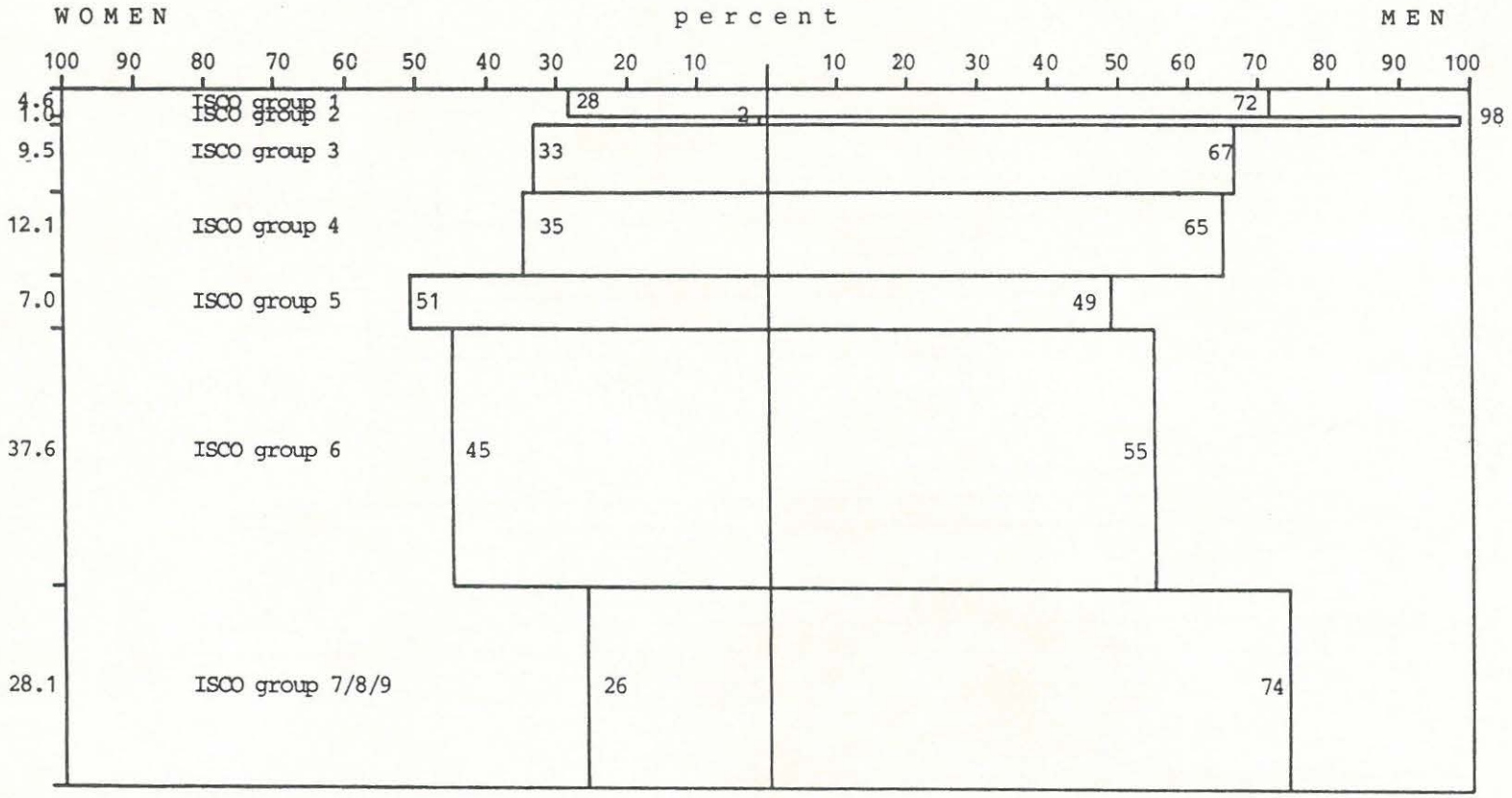
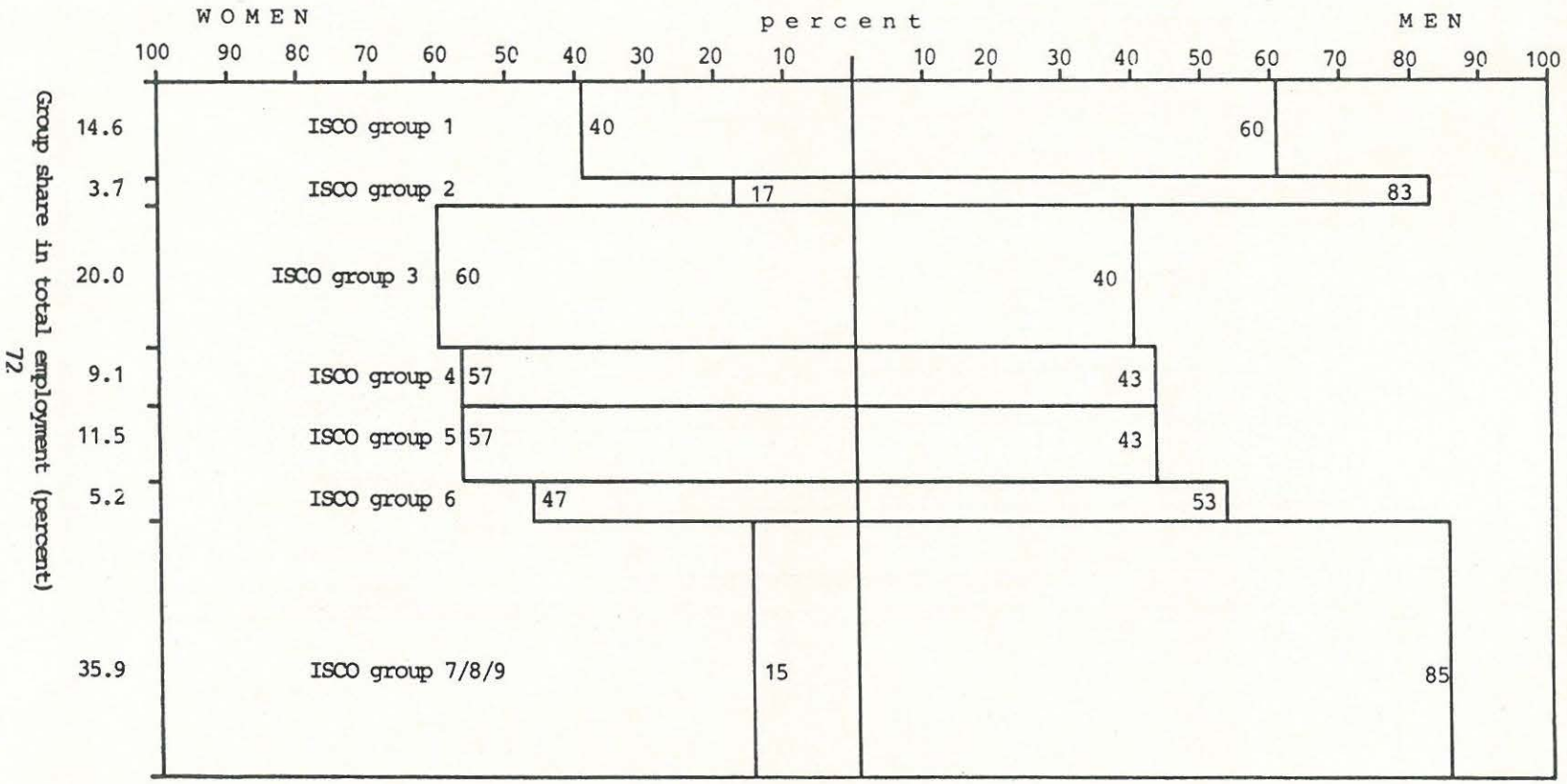


Figure 8: Female and male representation rates by occupation (ISCO major groups) for a developed European country 1982



is 1 percent, the shares will change over time equally, whether this change in the rates of growth will be between 0 and 1 percent or 3 and 4 percent, which is of course quite different for the absolute position of women; and this difference might also show in some other indicators of gender disparity, like participation rates. Notwithstanding these problems, the change over time in the dissimilarity index can also be decomposed into intersectoral and intrasectoral component (but this will be discussed in the next chapter). In order to avoid duplication, further discussion of the growth rate effects, time distance and the time needed for full equalization will not be repeated here. Obviously, the analysis of the percentage type of indicators can also be extended along the lines indicated above, in particular to comparisons of results obtained at various levels of disaggregation and in utilizing the possibilities of the dynamic framework to a greater degree, bearing in mind some specific characteristics of this type of indicators.

C H A P T E R 3

MEASURES OF DISPARITY AND CHANGES IN DISPARITY IN SPECIFIC FIELDS

Introduction

Gender disparity is a multidimensional phenomenon and various fields of concern have to be studied to take into account the different situations of the relative position of women with respect to various attributes. In measuring the gender disparity and the changes in disparity in specific fields a combination of general and specific methodology is usually used. Certain methods of measuring gender disparity are applicable in many fields. It is true that substantive issues in these fields cannot be addressed for policy purpose without different kinds of specialized knowledge. But from a formal point of view, the calculation of measures of gender inequality and their changes over time can be in the first instance treated similarly. At the same time, the differences in conceptualization and type of variables used in different fields (or with respect to different types of indicators within the same field) generate the need for methodology specific to the nature and approach to the problem. On the other hand, sometimes in different fields different terminology is used for similar or even the same measures of gender disparity. For these reasons the examples for specific fields given below will not provide a very comprehensive elaboration of each field, in cases where reference to a formally similar example can be made to an examples in chapters 1 and 2 or in another specific field

treated in another section in this chapter; nor will the examples from the literature aim to be exhaustive, in terms of citing where such methods or similar methods have been utilized, if one case can satisfactorily represent the problem in question.

3.1. Education

The UN report (1984) Improving Concepts and Methods for Statistics and Indicators on Women recommends that we look at four different dimensions in the process of conceptualization of "availability" of educational resources (in absolute terms) and of "equality" of occupational opportunity (in relative terms to men) and at the appropriate indicators representing them:

1. Access rates as reflected in enrolment ratios;
2. Continuation rates dealing with retention within levels and progression between levels;
3. Attainment rates indicating educational levels or years of school completed;
4. Availability of educational options, the extent of availability to women and men alike of the same educational curricula, standards, programme options and quality of education.

Enrolment ratio, or enrolment rate, is a typical example of a percentage type of indicator. It measures the possibility of access to a certain educational opportunity without detailed information about the quality of the educational

service and its success in terms of benefits from it. An associated percentage type indicator of the women's position is the female representation rate at each level. As the latter is a simpler measure with some information on the relative but not the absolute position of the female, it shall be discussed first.

Table 3.1.

Girls as a percentage of total enrolment by level of education

Region	First level			Second level			Third level		
	1960	1970	1980	1960	1970	1980	1960	1970	1980
Developed countries	49	49	49	49	49	50	35	41	46
Developing countries	39	42	44	28	34	39	24	29	34
Africa	36	40	44	29	32	38	17	23	27
Lat.America & Caribbean	48	49	49	47	48	50	30	35	44
South Asia	36	40	41	25	31	36	24	27	31

Source: UNESCO (1983c), p. 15, to be consulted for the composition of regions and the two groups of countries.

The female representation rates presented in Table 3.1. show that in all cases the relative position of women improved over time. As the measure of improvement over time, the change in percentage points between the female representation rate at the beginning and at the end of the period was suggested in chapter 2 (see the example in Table 2.4., last column). This

difference is also used for the analysis of the female enrolment as the percentage of total enrolment at various levels in UNESCO (1983a). The differences in female representation rates between the three points in time in Table 3.1. can be easily calculated. It can be observed that, the full gender equality in enrolment has already been achieved before 1960, for the first and second levels in the developed countries. A similar situation has been observed for the group of Latin America and Caribbean. The higher the level of education, the greater the gender disparity is, as the female representation rates are further away from the theoretical level of 50 percent.

There are also great differences within the group of developing countries. If the average of the group of the least developed countries is compared to the average of the developing countries, the former are lagging behind in female representation rates in 1980 for 6 percentage points at the first level, 14 at the second level and 17 at the third level. The distance to the developed countries is of course much greater.

These data already indicate in an indirect way that the relative rate of growth of female enrolment has been higher than for male enrolment. What we can observe, however, is the effect of the difference in the respective growth rates of the numbers enrolled but not the absolute magnitudes of the growth rate of pupils enrolled which are low to negative for total enrolment for developed countries and high for developing countries.

Table 3.2.

Enrolment ratios for the first, second and third level (1960-2000)

YEAR	DEVELOPED COUNTRIES			DEVELOPING COUNTRIES		
	third level					
	T	M	F	T	M	F
1960	12.8	16.5	9.1	2.0	3.1	1.0
1965	19.6	24.1	14.9	3.3	4.7	1.8
1970	23.4	27.4	19.3	4.3	6.1	2.5
1975	28.3	31.2	25.4	6.1	8.2	3.9
1980	30.0	31.7	28.2	7.4	9.5	5.2
1985	31.5	33.3	29.6	8.7	10.9	6.4
1990	34.2	35.9	32.5	9.9	12.1	7.5
1995	35.6	36.5	34.5	10.9	13.2	8.5
2000	37.6	38.5	36.5	11.8	14.1	9.3
	second level					
	T	M	F	T	M	F
1960	54.8	55.3	54.4	12.7	18.0	7.3
1965	65.2	65.2	65.2	18.1	24.5	11.5
1970	69.9	69.4	70.5	22.0	28.6	15.1
1975	75.6	73.5	77.8	26.3	32.6	19.8
1980	78.3	76.6	80.1	31.2	37.3	24.9
1985	83.2	81.4	85.1	36.9	42.7	30.9
1990	85.2	83.0	87.4	41.7	47.3	35.9
1995	85.9	83.4	88.6	45.5	50.9	39.9
2000	87.3	84.8	89.9	48.8	54.0	43.4
	first level					
	T	M	F	T	M	F
1960	105.9	106.4	105.4	60.2	72.6	47.6
1965	106.4	106.6	106.1	69.7	81.4	57.7
1970	106.3	106.4	106.2	74.1	84.7	63.2
1975	105.3	105.3	105.2	79.8	89.9	69.3
1980	106.6	106.9	106.4	85.9	95.1	76.5
1985	106.7	106.8	106.6	89.4	97.5	80.9
1990	106.3	106.4	106.1	91.9	99.2	84.4
1995	105.6	105.7	105.4	94.2	100.6	87.6
2000	104.9	105.0	104.7	95.7	101.3	89.9

Source: UNESCO (1983c), pp. 56-59.

Enrolment ratio or enrolment rate has a theoretical 100 percent upper limit in measuring access to educational services at various levels. As an example of measures of gender disparity and changes over time, data for the period 1960-1980 and the conditional projections for the period 1980-2000 for the three levels of education and for the group of developed and developing countries from UNESCO (1983c) will be used.

For the period 1960-1980 the trends in enrolment ratios from Table 3.2. are presented in Figure 9; and the projections for the period 1980-2000 in Figure 10. Visually, Figure 9 shows both the magnitude of gender disparity within the group of developed and developing countries and between the two groups of countries. Here the emphasis is on the first type of comparison. The situation with respect to enrolment ratios at various levels of education is different in the groups of developed and developing countries. In 1980, in the developed countries the enrolment at the second level was close to 80 percent and at the third level almost 30 percent. The gap between the levels is much more pronounced in the developing countries. While in 1980 the enrolment rate at the first level is about 85, at the second level it is only about 30 percent and at the third level only 7 percent. The projections for the year 2000 show that full enrolment of the respective female population will still not be achieved, that the total enrolment ratio at the second level will be below 50 percent and that of the third level at about 12 percent only. These differences in the possibilities of formation of human capital at the level of formal education

Figure 9 : Enrolment ratios for the first, second and third level of education, developed and developing countries (1960-1980)

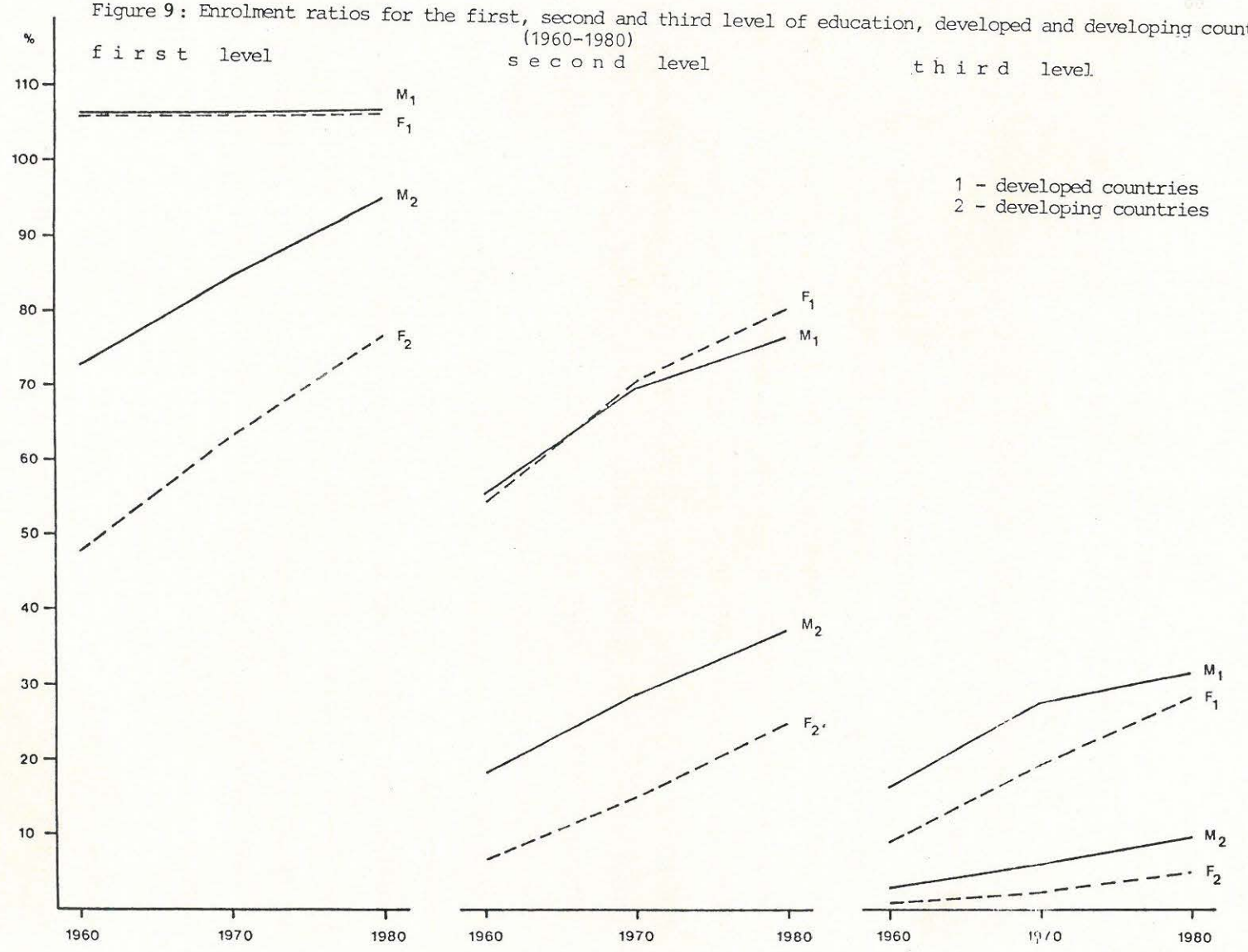


Figure 10: Enrolment ratios for the first, second and third level of education, developed and developing countries
(UNESCO projections 1980-2000)

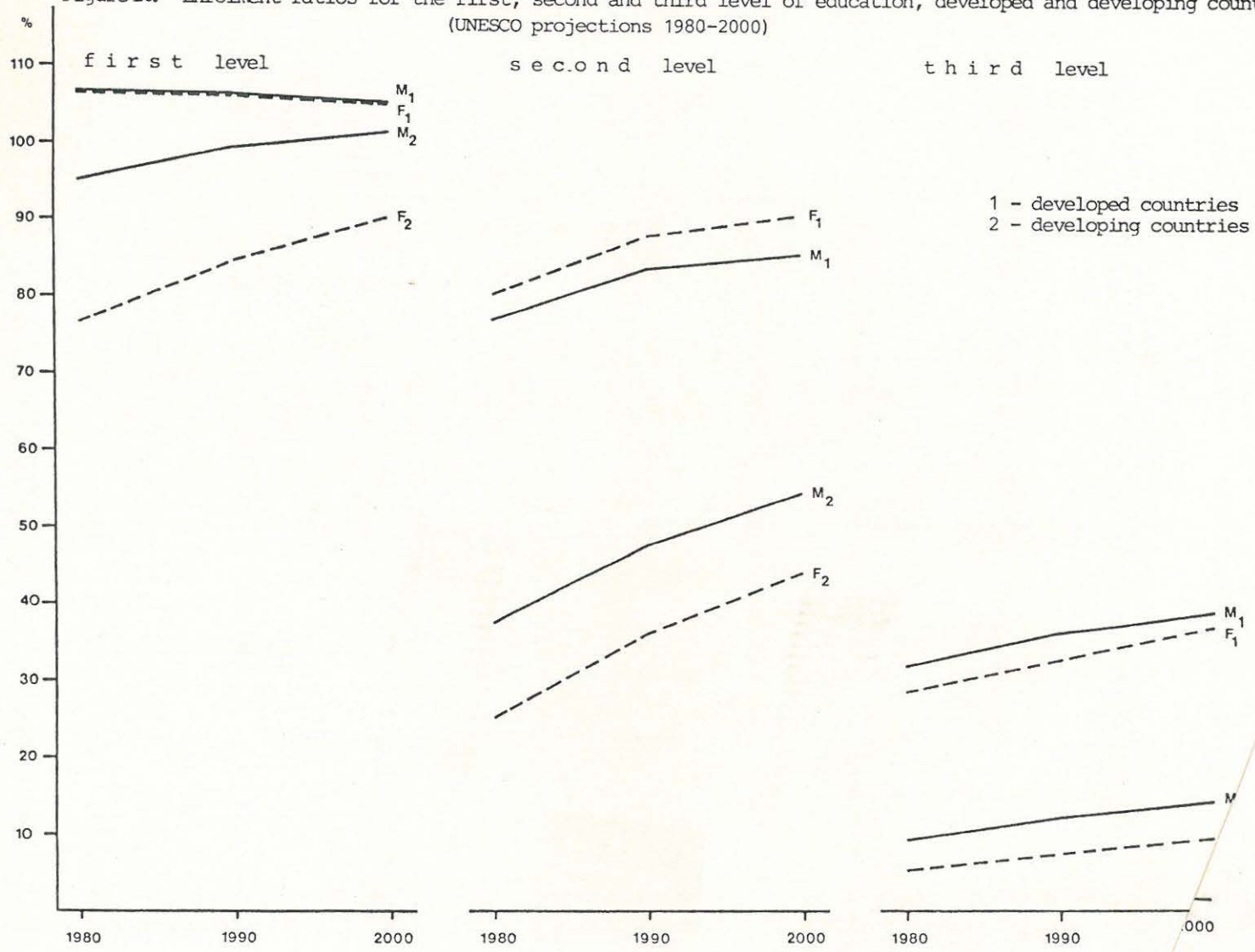


Table 3.3. Measures of disparities for the first, second and the third level (1960-2000)

	DEVELOPED COUNTRIES			DEVELOPING COUNTRIES		
	third level					
	A(t)	R(t)	$S_{MFF(t)}$ years	A(t)	R(t)	$S_{MFF(t)}$ years
1960	7.4	1.81	(5)	2.1	3.10	(7)
1965	9.2	1.62	(6)	2.9	2.61	(9)
1970	8.1	1.42	9	3.6	2.44	(12)
1975	5.8	1.23	9	4.3	2.10	13
1980	3.5	1.12	9	4.3	1.83	14
1985	3.7	1.12	13	4.5	1.70	15
1990	3.4	1.10	8	4.6	1.61	17
1995	2.0	1.06	8	4.7	1.55	19
2000	2.0	1.05	5	4.8	1.52	21
	second level					
	A(t)	R(t)	$S_{MFF(t)}$ years	A(t)	R(t)	$S_{MFF(t)}$ years
1960	0.9	1.02	0	10.7	2.47	(8)
1965	0	1.00	0	13.0	2.13	(10)
1970	-1.1	0.98	-1	13.5	1.89	(12)
1975	-4.3	0.94	-6	12.8	1.65	14
1980	-3.5	0.96	-3	12.4	1.50	15
1985	-3.7	0.96	(-16)	11.8	1.38	13
1990	-4.4	0.95	(-19)	11.4	1.32	12
1995	-5.2	0.94	(-18)	11.0	1.28	13
2000	-5.1	0.94	(-18)	10.6	1.24	15
	first level					
	A(t)	R(t)	$S_{MFF(t)}$ $years^2$	A(t)	R(t)	$S_{MFF(t)}$ years
1960	1.0	1.01	-	25.0	1.53	(14)
1965	0.5	1.00	-	23.7	1.41	(14)
1970	0.2	1.00	-	21.5	1.34	(15)
1975	0.1	1.00	-	20.6	1.30	(17)
1980	0.5	1.00	-	18.6	1.24	18
1985	0.2	1.00	-	16.6	1.21	21
1990	0.3	1.00	-	14.8	1.18	21
1995	0.3	1.00	-	13.0	1.15	23
2000	0.3	1.00	-	11.4	1.13	25

Source: Calculated from data in Table 3.2.

are a very important issue of development strategy on the national and international levels but their elaboration is beyond the scope of this report.

Table 3.3. shows the time series of some measures of gender disparity for every five years in the period 1960-2000, combining the existing data for the period 1960-1980 and the above mentioned projected values for the period 1980-2000. At the first and the second levels in the developed countries the problem of gender disparity does not exist at the level of access to education; the differences which might exist with respect to some qualitative aspects of education must be studied in a different context. Thus, for the developed countries only the values of gender disparity in enrolment ratios at the third level are relevant. At the third level, in the developed countries there is a tendency for further decrease in gender differences in enrolment ratios as measured by the three measures of disparity presented: the absolute and relative static difference and the time distance are decreasing over time.

In the developing countries, the situation is quite different. If one looks at the absolute differences in enrolment ratios between the two sexes, the greatest difference is at the first level, followed by the second and the third levels. This fact is not a result of a particularly high priority given to female education at the third level but rather a consequence of low absolute values of enrolment ratios at the second and especially at the third level. The relative static difference shows a more normal picture. It is falling over time in all three cases and is the lowest for primary education and

Table 3.4.

Average increase in enrolment ratio per year
(1960-2000)

PERIOD	DEVELOPED COUNTRIES			DEVELOPING COUNTRIES		
	t h i r d l e v e l					
	DM/n	DF/n	DM/n-DF/n	DM/n	DF/n	DM/n-DF/n
1960-65	1.52	1.16	0.36	0.32	0.16	0.16
1965-70	0.66	0.88	-0.22	0.28	0.14	0.14
1970-75	0.76	1.22	-0.46	0.42	0.28	0.14
1975-80	0.10	0.56	-0.46	0.26	0.26	0
1980-85	0.32	0.28	0.04	0.28	0.24	0.04
1985-90	0.52	0.58	-0.06	0.24	0.22	0.02
1990-95	0.12	0.40	-0.28	0.22	0.20	0.02
1995-2000	0.40	0.40	0	0.18	0.16	0.02
	s e c o n d l e v e l					
	DM/n	DF/n	DM/n-DF/n	DM/n	DF/n	DM/n-DF/n
1960-65	1.98	2.16	-0.18	1.30	0.84	0.46
1965-70	0.84	1.06	-0.22	0.82	0.72	0.10
1970-75	0.82	1.46	-0.64	0.80	0.94	-0.14
1975-80	0.62	0.46	0.16	0.94	1.02	-0.08
1980-85	0.96	1.00	-0.04	1.08	1.20	-0.12
1985-90	0.32	0.46	-0.14	0.92	1.00	-0.08
1990-95	0.08	0.24	-0.16	0.72	0.80	-0.08
1995-2000	0.28	0.26	0.02	0.62	0.70	-0.08
	f i r s t l e v e l					
	DM/n	DF/n	DM/n-DF/n	DM/n	DF/n	DM/n-DF/n
1960-65	0.04	0.14	-0.10	1.76	2.02	-0.26
1965-70	-0.04	0.02	-0.06	0.66	1.10	-0.44
1970-75	-0.22	-0.20	-0.02	1.04	1.22	-0.18
1975-80	0.32	0.24	0.08	1.04	1.44	-0.40
1980-85	-0.02	0.04	-0.06	0.48	0.88	-0.40
1985-90	-0.08	-0.10	0.02	0.34	0.70	-0.36
1990-95	-0.14	-0.14	0	0.28	0.64	-0.36
1995-2000	-0.14	-0.14	0	0.14	0.46	-0.32

Source: Calculated from data in Table 3.2.

the highest for the third level at a given point in time. In 1980 ex post time distance was 14 years for the first level, 15 years for the second level and 18 years for the third level.

Table 3.4. shows the average increase in the enrolment ratio per year as an indication of the growth characteristic of the analysed indicator. From the methodological point of view, it is important to look at the most appropriate description of the trend in the indicator. As discussed earlier, the two most commonly used forms are the linear and exponential trend. In the example of wages in chapter 1, the exponential trend for various subperiods was considered a more appropriate description of the developments in the indicator through time. Enrolment ratio is an example where the linear trend seems to be more appropriate. Average annual rates of growth (percentage per year) of enrolment by level of education seems to be falling in time according to UNESCO projections (see UNESCO, 1983c, Table V). Also the examination of the enrolment ratios for the period 1960-1980 and for the period 1980-2000 gave us the impression that the linear form of trend would be appropriate for most geographical regions. Therefore, the comparison of growth characteristics of enrolment ratios will run here in terms of absolute average increase of enrolment ratio per year. The form of the trend appropriate for the attribute in question is thus a choice which demands careful analysis.

In the developed countries there is no growth in the enrolment ratio at the first level, as education at that

Table 3.5.

Change of measures of gender disparity over the subperiod (1960-2000)

PERIOD	DEVELOPED COUNTRIES			DEVELOPING COUNTRIES		
	third level					
	DA(t)	GR(t)	$DS_{MFF(t)}$	DA(t)	GR(t)	$DS_{MFF(t)}$
			years			years
1960-65	1.8	0.89	1	0.8	0.84	2
1965-70	-1.1	0.88	3	0.7	0.93	3
1970-75	-2.3	0.87	0	0.7	0.86	1
1975-80	-2.3	0.92	0	0	0.87	1
1980-85	0.2	1.00	4	0.2	0.93	1
1985-90	-0.3	0.98	-5	0.1	0.95	2
1990-95	-1.4	0.96	0	0.1	0.96	2
1995-2000	0	1.00	-3	0.1	0.98	2
	second level					
	DA(t)	GR(t)	$DS_{MFF(t)}$	DA(t)	GR(t)	$DS_{MFF(t)}$
			years			years
1960-65	-0.9	0.98	0	2.3	0.86	2
1965-70	-1.1	0.98	-1	0.5	0.89	2
1970-75	-3.2	0.96	-5	-0.7	0.87	2
1975-80	0.8	1.01	2	-0.4	0.91	1
1980-85	-0.2	1.00	-13	-0.6	0.92	-2
1985-90	-0.7	0.99	-3	-0.4	0.95	-1
1990-95	-0.8	0.99	1	-0.4	0.97	1
1995-2000	0.1	1.00	0	-0.4	0.98	2
	first level					
	DA(t)	GR(t)	$DS_{MFF(t)}$	DA(t)	GR(t)	$DS_{MFF(t)}$
			$years^2$			years
1960-65	-0.5	1.00	-	-1.3	0.92	0
1965-70	-0.3	1.00	-	-2.2	0.95	1
1970-75	-0.1	1.00	-	-0.9	0.97	2
1975-80	0.4	1.00	-	-2	0.96	1
1980-85	-0.3	1.00	-	-2	0.97	3
1985-90	0.1	1.00	-	-1.8	0.98	0
1990-95	0	1.00	-	-1.8	0.98	2
1995-2000	0	1.00	-	-1.6	0.98	2

Source: Calculated from data in Table 3.3. DA(t)=A(t)-A(t-n), GR(t)=R(t)/R(t-n), DS(MFF(t))=S(MFF(t))-S(MFF(t-n)), n=5 years.

level has already been attained in the past. However, in the developing countries at this level some progress still has to be made. A similar situation exists at the second level, only that the rate of increase for developed countries is still positive. The greatest differences are at the third level, where the situation is reversed: the increase in the enrolment is much greater in developed countries than in the developing countries, thus broadening the gap between them at the higher level of education.

The differences between the two sexes in the average increase in the enrolment ratio is favourable for females, although in developing countries at the third level the male enrolment ratio is increasing faster than the female enrolment ratio. Table 3.5. confirms the results from Table 3.3. and Table 3.4. The change in absolute static gender difference in enrolment ratios is declining in all cases except in the developing countries at the third level; in relative terms it is declining or staying unchanged for all levels, all subperiods and for both groups of countries; and the time distance is increasing only in developing countries, mainly as an effect of the slower average rate of increase projected for the future.[3] The absolute level of S-distance is not low in the developing countries. If the UNESCO conditional projections will realize, even at the end of the century the female enrolment rate will still lag (ex post) behind the male enrolment rate 25 years at the first level, 15 years at the second level and 21 years at the third level. Obviously, similar analysis can be performed for gender disparity at the level of macro regions, at the national level or

subnational levels, like regional or urban-rural differentials and their change over time.

However, enrolment indicators as such do not tell us about the success or quality of education. One of the problems is the question of retention rates, drop-outs and repeaters, all of which can significantly change the impression obtained by looking at the enrolment ratios. Among other things, enrolment ratios are usually calculated for the beginning of the school year, which means that they exaggerate the average enrolment over the whole school year. An indication of the differences in the survival rates between developed and developing countries is presented in Table 3.6. Further information on these and related ratios is provided, for example, in UNESCO (1983c, pp. 28-32), UNESCO (1983a, pp. 57-64), and in UNESCO (1976), where various methods and the interrelationship between these ratios are shown.

The analysis of the degree of disparity and its change over time in the education survival rates can in formal terms simply follow the methodology used for enrolment ratio, as this is also a percentage type indicator, the methods for which need not be repeated here. The conclusions in this respect are similar: the gender disparity has decreased over time, although at a low rate and the discrepancy between the situation in developed and developing countries is alarming in the early age category. Within the developing countries the male-female difference is not high but the time distance is still between 10 and 20 years.

Table 3.6.

Percentage of pupils aged 6-11 and 12-17 in 1960, 1970, 1980 and 1990 respectively, who remain in school six years later

Region	Sex	1960	1970	1980	1990
			aged 6-11		
Developed countries	male	86	89	94	91
	female	84	92	97	99
Developing countries	male	61	62	63	66
	female	54	59	61	63
			aged 12-17		
Developed countries	male	39	40	43	44
	female	29	36	39	41
Developing countries	male	29	32	36	37
	female	23	27	30	31

Source: UNESCO (1983c, p. 44).

Another indicator of success at the lower level of education is the literacy rate. Technically, literacy rates are again a percentage type of indicator and can be analysed in the same way as the above example of enrolment ratios. Data on illiteracy rates, especially for the least developed countries are presented in UNESCO (1983a). An important qualitative conclusion which can be drawn from those data and the analysis of enrolment ratio above is that the degree of disparity in illiteracy is higher than that in the enrolment at the first level confirming the earlier hypothesis that enrolment ratios generally show the quantitative and not the qualitative aspect of the education process.

Another indicator in the educational field is school life expectancy, which is measured in years and is formally similar to the life expectancy in the field of demographic statistics. For calculation and examples of school life expectancy in relation to the total population, and of school life expectancy in relation to the enrolled population, see UNESCO (1975).[4] The question of educational attainment can in quantitative terms be discussed either in terms of levels completed or in terms of years of schooling completed. The first one generally changes in steps (for the great differences among the countries in the classification in original source documents from which the data on educational attainment, i.e. the levels and years of education, were collected see UNESCO, 1983b), while the second one is closer to a continous variable. They both have advantages and disadvantages, and the question of levels and years can be viewed upon from various angles (see Galtung, Beck, Jaastad, 1973). In some developed countries the difference between the average number of years of regular education between men and women is negligable and in some even the average number of years for women is slightly higher than that for men (OECD, 1986).[5] If good time series data on years of regular education completed would exist, it could be analysed in the same way as the example of wages in chapter 1, as this is also a per capita type of indicator. Multiplying the numbers of people and average number of years of education completed, we can get a composite variable expressing the number of years of education as an approximation of the human capital embodied in certain groups or in the total population.

With a higher level of development and/or policy priorities, the more the quantitative aspects of female education show little difference as compared to the male, the more it becomes important to look also at other aspects of difference between men and women in the educational field. One of these aspects is the availability of educational options. An example of this may be the difference between men and women in the field of study chosen at the third level of education, where most of the differences between the two sexes in the developed countries still exist. Statistically this can be looked upon as the differences in the distribution of male and female students among different fields of education, which can be measured by

Table 3.7.

Distribution by disciplines of university degrees (excluding post-graduate level)

	1965			1980		
Numbers(000)	136.1	26.3		285.0	93.7	
			percent			
	wMi	wFi	wFi-wMi	wMi	wFi	wFi-wMi
Humanities	10.6	48.1	37.5	7.9	43.8	35.9
Social sciences	49.6	5.0	-44.6	50.1	15.2	-34.9
Education	5.6	23.5	17.9	4.5	20.3	15.8
Science	3.1	2.2	-0.9	3.4	2.1	-1.3
Technology	22.0	0.5	-21.5	25.5	0.9	-24.6
Medical science	3.6	9.2	5.6	4.0	7.6	3.6
Law	5.6	10.6	5.0	4.8	10.1	5.3
			DI=33			DI=30

Source: Calculated from OECD (1984, p. 98).

dissimilarity index and similar measures, as for the case of distribution of male and female labour force by occupation in chapter 2. A more elaborated discussion of these methods will follow in the next section dealing with occupations. Here, only an example for a developed Asian country will be given (Table 3.7).

The differences between the sexes in some fields are quite remarkable and not very much change in the relative composition has occurred over the 15 year period, although there has been an increase from 16.2 percent in 1965 to 24.7 percent in 1980 in the female representation rate with respect to university diplomas obtained. Similar data can be obtained also in EUROSTAT (1981) and in UNESCO (1985). From the information in the latter publication on the distribution of students by field of study for the whole student body and the percentage of females in each field of study for 1975 and the latest year available, similar measures of differences between the two sexes with respect to the field of study can be calculated for many countries.[6] The technical aspects are similar to that for the analysis of differences in occupation which follows in the next section.

3.2. Occupation

A very important part of the differences in the position of women and men arises from the different work they do. This is especially true when also work in the household is taken into account. Statistically, much of women's work is underreported or not reported at all. Most of the literature

deals with sexual segregation in the so-called labor market only. Although the technical aspects with respect to measures of disparity may be very similar, from the conceptual point of view it is important to emphasize the difference between work and employment. Since the question of gender differences in occupation has already been dealt with to a considerable extent in chapter 2 as an example of a percentage type of indicator, only some additional clarifications are needed to show the basic development in this field.

There are many statistical measures of the differences between the distribution of men and women throughout the entire occupational structure. However, a major conceptual problem in this field is the evaluation of the extent to which these differentials are due to differences in factor endowments, sex stereotypes and traditional attitudes, and to what extent they would still exist as a matter of free choice, even if all other barriers to equal participation in all occupations would be removed. An equally important issue is how to evaluate the importance of a given degree of difference in the distribution of men and women among the various occupations. Let us take an extreme example to highlight this point. If all occupations would enjoy the same social status and bring the same income and other benefits, would the sexual (or any other) segregation still matter? Apart from some indexes of occupational segregation as statistical measures of the degree of differences, one needs also some means of evaluating and summarizing the importance of these differences. While the value judgements associated with such

differences cannot be measured in a way needed for such a procedure, income received or various quantitative measures of status of an occupation can be used to approximate the importance of a given sex segregation with respect to some aspects of the gender disparity like income or status.

There are also many possibilities with respect to the classification of work according to which sex segregation can be measured, the most commonly used are by occupation, sector of activity, position in work (higher or lower grades within a given occupation, management position and subordinate positions), educational or other qualifications needed for a certain type of work. A distinction is made between horizontal segregation (male versus female occupations) and vertical segregation (higher versus lower grades), although it is not always easy to separate them. The choice of their classification and possible combinations of them depends on the nature of the problem and availability of data. But in this choice it must be taken into account that the degree of sex segregation will depend also on the degree of disaggregation. With a more detailed breakdown, an increase of occupational segregation might be expected; and changes in various measures of disparity over time might be influenced by the number of categories used in the process of aggregation and disaggregation.

There is a need both for measures of sex differences in work at the disaggregated level and for summary measures at the aggregated level. Especially interesting analytically are those measures where the indicators at the group level can be combined in the summary measure by using some

additional information on the structure of employment or its changes over time, or on the income level of a category, so as to allow for a combination of elements of structural analysis and elements of analysis of disparity even at a relatively simple level of computational requirements. An example of such a combination for analysis of occupational disparity was presented in chapter 2 for the case of decomposition of change over time in the overall female representation rate.

The female representation rate at the sectoral level (industry, occupation, grade, qualification) FRRi(t) = Fi(t)/Ti(t) and at the aggregate level FRR(t) = F(t)/T(t) is the most simple and understandable measure of occupational sex segregation. It is also known under a variety of other terms, like percent of women or share of women in (sectoral or aggregate) total employment or enrolment (see e.g. EUROSTAT, 1981), feminization rate (e.g., EC Canada, 1984), sex ratio (e.g., Hakim, 1979). By itself it gives an information of the relative female representation in various categories and is a base for separating male and female dominated occupations (or other categories) into groups with a different degree of concentration by other sex. The discussion in chapter 2 covers the basic approach to this type of measure. If the tables are presented in such a way as above, a simple way of expressing the information content of the female representation rate for a sector is to say that it depends only on the information on the number of women and both sexes employed in that sector, without the need for information about other sectors or the total economy.

Another sectoral measure of gender disparity is the coefficient of female representation CFR(t) (and the corresponding coefficient of male representation CMR(t)):

$$CFRi(t) = wFi(t)/wTi(t) \qquad CMRi(t) = wMi(t)/wTi(t)$$

or alternatively,

$$CFRi(t) = FRRi(t)/FRR(t) \qquad CMRi(t) = MRRi(t)/MRR(t)$$

The CFRi shows the degree of female representation in a sector relative to the female representation rate for the whole aggregate (an example is presented in Table 2.7). It is built up from a different type of information; it cannot be calculated only on the basis of the information on the sector in question, but also on the respective magnitude for the whole aggregate. It is a ratio (relative difference) of two relative measures in either of the two definitions.

A similar measure of expressing the gender disparity is the absolute (not relative) difference between shares of the sector i in the respective totals of male, female and overall level of employment (the shares are given in the lower part of Table 2.3 and the respective differences in Table 2.7). The degree of gender disparities can be thus expressed in more ways - absolute or relative, on the one hand, and in a more direct or indirect way, i.e., directly between the values for the two sexes or indirectly by looking the difference between the values for the two sexes and that for the total, on the other hand. This extremely simple relationship between various possible measures of gender disparity in occupational (sectoral, grade,

qualification) distribution has not been used, most probably for the simple reason that there was an over-concentration on the women's side, without looking at the same time also at the measures of the male position and relating them to each other.

The first of the three possible differences is the difference between the share of one sector (occupation) in the total female and total male labor force, which can be expressed as the difference of two other differences in the shares of one sector (occupation) in respective totals:

$$(wFi - wMi) = (wFi - wTi) - (wMi - wTi)$$

The corresponding values for ISCO major groups for the example used are given in Table 2.7. There are two summary indexes which are frequently used and discussed in literature. The first one is the dissimilarity index

$$DI = 1/2 \sum_{i=1}^{i=n} |wFi - wMi| ,$$

and the second the so-called OECD index or WE index used in the OECD (1980), which was designed as a weighted sum of the absolute deviations from unity of the coefficients of female representation, the weights being the proportion of the total labor force in each category. In our notation

$$WE = \sum_{i=1}^{i=n} |CFRi - 1| \; wTi$$

or half of that value, which was, for example, in Jonung (1983) called index of concentration,

$$C = 1/2 \sum_{i=1}^{i=n} |wFi - wTi|$$

It has also been shown (e.g. Skrede, 1984) that WE and DI indexes can be related to each other

$$WE = 2DI\ (1 - FRR)$$

It must also be said that the value of WE index will be closer to DI index, the closer the female share of employment is to 0.5.

However, extending the idea to the symetrical male summary index as it was done above for the three differences at the sectoral level it can be shown that a straightforward relationship between three summary indexes of occupational segregation exist:

$$DI(MF) = DI(FT) + DI(MT)$$

where DI(MF) means in the usual notation dissimilarity index DI, in this notation it is made explicit that the measure of dissimilarity relates to the sectoral distribution of employment between male and female labor force, in order to distinguish from the two other cases where the degree of dissimilarity between the sectoral distribution of female and total labor force is measured - DI(FT) - as well as between male and total labor force - DI(MT).

In terms of individual contributions to the corresponding summary measures of dissimilarity

$$1/2\sum_{i=1}^{i=n} |wFi - wMi| = 1/2\sum_{i=1}^{i=n} |wFi - wTi| + 1/2\sum_{i=1}^{i=n} |wMi - wTi|,$$

or in the example from Table 2.7

for 1960 $13.9 = 9.9 + 4.0$

for 1980 $18.4 = 11.9 + 6.5.$

The increase in the dissimilarity index between the female and male distribution of labor force for the ISCO major groups between the two years was achieved in such a way that both male and female distribution moved further away from the distribution of total labor force (showing the characteristics of the whole economy) in 1980 than this was the case in 1960. One should not forget, however, that all three distributions have changed over time themselves, which should also be studied.

The advantage of these group and summary measures of occupational segregation is their simplicity and a possible intuitive interpretation. On the other hand, they also show deficiencies in various respects. The value of dissimilarity index DI(MF) can be interpreted as the proportion of total female labor force which has to change the occupations to make the distribution of female and male labor force across occupations identical (wFi = wMi). The values of dissimilarities indexes DI(FT) and DI(MT) show the respective proportions of the total female and of the total male labor force which have to change the occupations to make the distribution of female and male labor force across occupations identical and at the same time leave the sectoral distribution of the total labor force the same as before the transfer. The illustration of this point will be done on an example of segregation of employment by sector of activity.

For the case of segregation of employment with respect to sectors of activity, a very simple example of disegreggation in only two sectors is used to show the interrelationships between some measures of occupational sex

Table 3.8.

Some measures of occupational segregation by sector of activity

	Number of employed (000)					
	1980			1984		
	T	M	F	T	M	F
Productive activities	4709	3262	1447	5162	3480	1682
Non-prod. activities	972	400	572	1062	419	643
Aggregate	5681	3662	2019	6224	3899	2325
	Female representation rate (percent)					
	35.5	30.7	58.9	37.4	32.6	60.5
	Shares of sectors in the respective aggregates (percent)					
	wTi	wMi	wFi	wTi	wMi	wFi
Productive	82.9	89.1	71.7	82.9	89.3	72.3
Non-prod.	17.1	10.9	28.3	17.1	10.7	27.6
Measures of segregation	DI(MF) 17.4	DI(MT) 6.2	DI(FT) 11.2	DI(MF) 17.0	DI(MT) 6.4	DI(FT) 10.6

Source: Data for an European country, national statistical yearbook 1985.

segregation, since in such an example most of the calculations can be made on the back of an envelope and yet the basic principles can easily be grasped. Table 3.8. shows the employment for 1980 and 1984 for two type of activities,

"productive" and "non-productive" activities as defined by the material concept of classification of economic activities.

From the above example, the values of respective dissimilarity ratios can be quickly calculated. For instance, the dissimilarity between male and female sectoral distribution for 1980 is in the case of the first sector the difference between 71.7 and 89.1 percent, which amounts to -17.4 percent. This means that females are under-represented in productive activities, and at the same time over-represented in non-productive activities by 17.4 percent (since there are only two sectors, the value of one of the two differences is at the same time the value of the dissimilarity ratio between men and women). Similarly, the difference between the female share and the total share of productive activities is -11.2 percent (71.7 - 82.9) whose absolute value is the value of the dissimilarity ratio between female and total distribution DI(FT), i.e. the value of the concentration index C or one half of the OECD summary index WE. For the dissimilarity ratio between male and total distribution DI(MT) the corresponding value is 6.2 (89.1 - 82.9), representing the over-representation of men in productive activities. The values for 1984 are derived in the same way.

The value of dissimilarity index of 17.4 percent for 1980 means that that proportion of total female labour force would have to change the sector of economic activity in order to achieve an equal sectoral distribution of employment to that of men. In numbers, this means that 351 thousand women would have to move from non-productive activities, where they are over-represented, to productive activities so that in both sectors the

female representation rate would be equal to the total female representation rate of 35.5 percent. However, this would leave only 221 thousand women in non-productive activities and the share of men and women employed in non-productive activities would fall to 10.9 percent, which is much below 17.1 percent which was the share of employment in this activities in the total employment before the transfer. The share of productive activities in the total employment would increase to 89.1 percent and thus considerably change the structural characteristics of the economy. Obviously, this is not a very practical way of achieving equal sectoral distribution of employment for men and women,[7] although the interpretation of the dissimilarity index in these terms is intuitively clear.

However, with the introduction of the two other dissimilarity indexes DI(FT) and DI(MT), another possibility of transfer of both men and women becomes more clear. The value of DI(FT) of 11.2 percent means that this proportion of total female labour force would have to change its sector of economic activity with the same number of men which, however, represents 6.2 percent of the total male labour force, i.e. the value of DI(MT). For 1980, this means that 227 thousand men and women would have to change their sector of economic activity by women going to productive activities and men going to non-productive activities, which would make the female representation rate 35.5 percent in both sectors; and, at the same time, the distribution of total employment between produtive and non-productive activities would remain unchanged.

In comparing the values of dissimilarity indexes between 1980 and 1984, one can see that the value of the dissimilarity index between the female and male sectoral distribution of employment has decreased slightly from 17.4 to 17 percent, which is a result of two factors: the distribution of female employment in 1984 was closer to that of the total distribution than in 1980 (10.6 and 11.2, respectively, for DI(FT)), and the distribution of male employment was slightly more dissimilar than the total distribution of employment (the values of DI(MT) are 6.4 for 1984 and 6.2 percent for 1980).

The relationship between the three dissimilarity indexes can be expressed also for the formulation using the coefficients of male and female representation CMRi and CFRi:

$$1/2\sum_{i=1}^{i=n}|CFRi-CMRi|\ wTi = 1/2\sum_{i=1}^{i=n}|CFRi-1|\ wTi + 1/2\sum_{i=1}^{i=n}|CMRi-1|\ wTi,$$

which can be easily verified also in the above example. Thus the calculation of the above dissimilarity indexes can be alternatively done from the sectoral shares in the respective totals or from the coefficients of female and/or male representation which have, however, to be weighted by the sectoral shares in total employment wTi.

There are other possibilities of calculating summary indexes of occupational representation which start by first separating the occupations into disproportionately female and disproportionately male occupations and the summary index of occupational segregation is calculated as the sum of the absolute deviations from unity of measures of over-representation and under-representation in particular occupations (Hakim, 1979 and

1981). Another possibility of looking at the segregation is the degree to which the group of workers are concentrated in a small number of occupations.

There are other possibilities of applying the dissimilarity index in a more general context and also as a cell index of dissimilarity (Sakoda, 1981). It has to be realized, however, that the dissimilarity index is a measure which is based only on some relative relationship between the observed variables, and that it is formulated in a very simple way, which must mean that it is open to many objections. The disadvantages are well known and need not be discussed here again (see for instance, Jonung (1983), Skrede (1984) and UN (1985)). It is obvious that it is suitable mostly for exploratory analysis where it is important that the first impression can be based on simple measures with an interpretation which could be understood also by wide groups of users.

In the literature the changes over time in the dissimilarity index have been decomposed into three parts: one part due to the change in the representation rates within employment categories, and another part due to change in the employment structure and an interaction term. However, the methods used are neither systematic in the sense that both the weights of the beginning and of the end year would be used, on the one hand, nor very clear in the interpretation, if one takes into account the rough nature of the sectoral elements contributing to the dissimilarity index, on the other. It is therefore much more advisable before the methods could be

improved to utilize the type of the composition of the overall female representation rate which was presented in chapter 2 or a similar decomposition used in Huet, Marchand, Salais (1982). One should also take into account that, if there has been a very substantial structural change in the sectoral composition over time, as in our example in chapter 2, the weights of such distant points in time might provide a very different assessment of the importance of the structural component for the change in the dissimilarity index.

A much more difficult question is how to evaluate the importance of a given degree of gender segregation in occupations. For instance, if the differences in the male and female distribution across occupations would only change the sign - i.e. where women were under-represented they would become over-represented by the same degree, and the opposite change would happen to men - the dissimilarity index, which is based on the absolute values of differences in the sectoral shares for the two sexes would remain unchanged. This means that it is really insensitive to whether the women (and men) are under-represented or over-represented in occupations which offer higher incomes and higher status. As it was said before, there is a need to have a certain set of weights (in addition to those related to the elements of the dissimilarity index) which would distinguish which occupations are more favourable than the others, and in this way allow for a ranking of occupations in the sense of whether it is advantageous for a population group to be over-represented or under-represented in a given occupation.

Table 3.9.

An evaluation of the importance of the degree of gender disparity in distribution across occupations by using the average annual earnings by occupations as weights

	1970		
	M	F	M/F (ratio)
Actual earnings	19024	8118	2.34
Male earnings, female distrib. of occupations	16687		
Female earnings, male distrib. of occupations		9356	
Index of structural component	114	115	
Earnings ratio for standardized distribution of occupations			2.04
DI(MF)=35.4 percent			

	1980		
	M	F	M/F (ratio)
Actual earnings	34520	18253	1.89
Male earnings, female distrib. of occupations	32324		
Female earnings, male distrib. of occupations		18947	
Index of structural component	107	104	
Earnings ratio for standardized distribution of occupations			1.80
DI(MF)=15.9 percent			

Source: based on data for 20 highest paid occupations for an American country.

If one looks only at the differences in the distribution of men and women by comparing the twenty highest paid occupations, in the exploratory phase of analysis one could look at the dissimilarity index; the conclusion would be that the dissimilarity was considerably lower in 1980 than in 1970, as the dissimilarity index decreased from 35.4 percent to 15.9 percent. If one takes the earnings by occupations as an indication of the relative importance of the difference in the degree of female and male representation in a given occupation, one can arrive at an evaluation of the relative proportion of the overall male/female ratio in annual earnings, which can be attributed to the differences in gender representation across the whole range of the analysed occupations. Technically, there are two sets of weights for each occupation, male earnings and female earnings. Therefore, two values of the index of the structural component are calculated. For 1970 it is estimated that for the values of earnings in that year the average female earnings would be 15 percent higher if the distribution of females would equal that of males with the same level of female earnings in each occupation. Similarly, the average male earnings are 14 percent higher than in a situation with the distribution of men across occupation which would equal that of women in this year with the level of male earnings remaining unchanged. In other words, in 1970 the difference in distribution of the two sexes in this range of occupations means higher income of about 15 percent in the aggregate. In the same way, this difference would amount to a higher income of about 5 percent in the aggregate in 1980.

From the methodological point of view, it is very important that the decomposition of male/female earnings ratio in each of the two years into a summary measure of intraoccupational male/female earnings ratios and into a summary measure of the effect of gender differences in distribution across occupations, can represent a means to interrelate the issues of gender disparity in occupation with the issues of gender disparity in earnings in a meaningful way, which reflects from the nature of the problem. The combination of the two fields has important implications for the collection and analysis of data, as the need for harmonization of statistics on the wages and earnings, on the one hand, and on occupations, sector of activity or position in activity or occupation, on the other, is now much more apparent from the user side. It is very difficult to find consistent data in the existing sources, even though the interrelationships between the respective variables is very obvious in everyday life.

3.3. Wages

Wages, salaries, earnings, income and similar variables are per capita type of variables and the section on the per capita type of indicators has already shown the various measures of gender disparities and the relationship among them for earnings per hour in manufacturing. This means that the exposition presented there is sufficient for the case of gender disparities at an aggregate level. In this section, some additional problems of measurement of gender disparities for a

greater number of categories for each year will be discussed and the connection with the analysis of gender disparity in occupation will be elaborated further.

The most commonly used indicator of gender disparity in wages in the literature is the female-male wage ratio, i.e. female wage is expressed as a percentage of the male wage. In chapter 1 the relative difference in wage between the two sexes was defined as $R(t)=M(t)/F(t)$, which means that the female wage was taken as the base for comparison. This choice was made in order that an increase (or decrease) in the relative difference would mean an increase (or decrease) in this aspect of disparity. In this way an increase (or decrease) in the static absolute difference $A(t)$, in the static relative difference $R(t)$, and in the S-distance would mean an increase (or decrease) in an aspect of disparity. In other words, the direction of change would have the same meaning for all three measures. The above mentioned expression of the relative difference between the wages, for the two sexes, where the base of comparison is the male wage, will be written as $IR(t)=F(t)/M(t)$, i.e. as inverse relative difference because of the connection $R(t)=1/IR(t)$. The use of either of the two measures does not, of course, change the degree of gender disparity, although it presents it in a different way. If we take the year 1958 in Table 1.1., for example, the relative static disparity can be expressed either as $R(1958)=1.48$ or as $IR(1958)=0.68$. Sometimes the relative difference is expressed in percentage terms. In such a case, the statement would be that male wages were 48 percent higher than the female wages or that female wages were 32 percent lower than

the male wages, using the first or the second way of expressing this disparity.

Another way of expressing relative positions of the two sexes can be by comparing male and female wages with the level of the average wage (in Table 1.1. labelled as T). When the male or the female wage will be expressed in relation to the total wage a symbol RMT(t)=M(t)/T(t) will be used for measuring male relative position with respect to total value and RFT(t)=F(t)/T(t) for measuring female relative position. All these measures are, of course, interrelated: R(t)=RMT(t)/RFT(t). For practical purposes, however, it is important to emphasize that the values of relative static difference between the two sexes R(t) or its inverse value IR(t) can be derived, if the static relative positions with respect to the average value is known, but not vice versa. If only relative static difference between the sexes is known, one needs also the information on the relative size of male and female employment to be able to arrive at the value of the average wage T(t).

In the previous section it was shown that the analysis of gender disparities in earnings at the group and at the aggregate level can be combined with analysis of gender disparities in distribution across occupations in a meaningful way to enhance the understanding of the situation in both fields. The decomposition of the relative difference in wages for the two sexes into the intrasectoral and structural component for 1970 and for 1980, the main elements of which are presented in Table 3.9., can be also used as a method of analysing the relative

changes in average male-female wage ratio, in its intrasectoral component and in its structural component over time.

Table 3.10.

Decomposition of change in male-female average earning ratio over time into the change in group male-female earning ratios (intrasectoral component) and in the change in male-female difference in occupational structure (intersectoral component)

	M/F ratios 1970	M/F ratios 1980	Growth ratio GR(1980/1970)
Intrasectoral component (standardized occupational structure)			
Male weights	2.055	1.771	0.862
Female weights	2.033	1.822	0.896
Fisher index	2.044	1.796	0.879
Structural component (standardized group earnings)			
Male weights	1.152	1.038	0.901
Female weights	1.140	1.068	0.937
Fisher index	1.146	1.053	0.919
Relative difference R(t)	2.343	1.891	0.807

Source: Calculated on the basis of data as Table 3.9.

The change in the relative difference R(t) over time shows a decrease of about 19 percent (index 1980/1970 is 80.7 percent). This is partly due to the decrease in the summary index of group relative differentials in earnings, which decreased by about 12 percent (index 1980/1970 is 0.879), and partly due to a decrease of the gender differences in occupational structure, which decreased by about 8 percent over the decade (index 1980/1970 is 0.919). In terms of growth ratios GR(1980/1970), the following multiplicative decomposition holds:

$$0.807 = 0.879 \times 0.919,$$

expressing the growth ratio of the relative difference in 1980 to that of 1970 as a product of the corresponding growth ratios for the intrasectoral component and structural component. The conclusion is that the relative difference in wages between the two sexes decreased between 1970 and 1980 and that the decrease was observed also for the summary measure of group differentials in earnings as well as for the summary effect of changes in occupational structure. If the same method of the decomposition is applied to the inverse value of the relative difference, i.e. to the female-male wage ratio IR(t), the following relationship between the respective growth ratios holds:

$$1.239 = 1.138 \times 1.088,$$

which are the inverse values of the respective factors in the relationship for relative difference R(t).

Table 3.11. uses a smaller example of gender disparities in pay for only 3 categories, skilled, semi-skilled and unskilled workers, which allows for an easier examination of the various measures in a disaggregated framework. The first three columns of the second part of the table show the distribution of total male and female manual workers by qualification. There are considerable differences between the two sexes in this regard, as most of the male manual workers are in the skilled category and most of the women in semi-skilled category. The dissimilarity ratio is high (DI=44.8) and it can be expected that the difference in the gender distribution by

Table 3.11.

Full time manual workers' monthly pay by qualifications (industry, building and civil engineering)

QUALIFICATION	Employment (persons) T	M	F	Monthly pay (money units) T	M	F
SKILLED	2197777	2000709	197068	3599	3668	2852
SEMI-SKILLED	1203368	715629	487738	2847	3044	2545
UNSKILLED	557628	314548	243079	2570	2700	2404
TOTAL MANUAL	3958772	3030887	927885	3246	3437	2578

p e r c e n t

	wTi	wMi	wFi	IRi	RMTi	RFTi
SKILLED	55.52	66.01	21.24	77.75	101.92	79.24
SEMI-SKILLED	30.40	23.61	52.56	83.61	106.92	89.39
UNSKILLED	14.09	10.38	26.20	89.04	105.06	93.54
TOTAL MANUAL	100.00	100.00	100.00	75.01	105.88	79.42

p e r c e n t

	FRRi	FSHARE WF	RGAi	Ri	MGAi	FGAi
SKILLED	8.97	7.11	96.47	128.61	106.72	110.63
SEMI-SKILLED	40.53	36.23	89.72	119.61	88.57	98.72
UNSKILLED	43.59	40.78	84.24	112.31	78.56	93.25
TOTAL MANUAL	23.44	18.62	100.00	133.32	100.00	100.00

Source: Data for an European country, Eurostat (1983).

qualification will have an impact on the degree of gender disparity in the average monthly pay, which will be shown in the value of the structural component of the relative difference in the average levels.

The women's pay as percent of men's pay IR(t) for the aggregate is 75 percent, while for different

qualifications IRi(t) it is 78 percent for skilled, 84 percent for semi-skilled and 89 percent for unskilled category. The same relative degree of gender disparity at the aggregate and group level can be expressed in at least two more ways. One is the relative difference R(t) at the aggregate level (average male pay is 133 percent of average female pay) and Ri(t) at the group level, which amounts to 129 percent for skilled, 120 percent for semi-skilled and 112 percent for unskilled category. The other possibility is to express the relative degree of gender disparity by comparing the aggregate or group pay for each of the two sexes with the average pay for the same category. This relative difference between the male pay and the corresponding average pay for both men and women is expressed as RMT(t) for the aggregate values and RMTi(t) for group values. The corresponding ratios for women are RFT(t) and RFTi(t).

$$RMTi(t) = Mi(t)/Ti(t) \qquad RFTi(t) = Fi(t)/Ti(t)$$

Numerical values are presented in the last two columns in the second part of Table 3.11. The average value for male manual workers is about 6 percent higher than the average value for all manual workers, and the average value for women is about 29 percent lower than that for all manual workers. These ratios depend only on values within the given category (i.e. they are calculated by rows - qualifications). They are calculated in a similar way as the male or female representation rates were calculated in the case of the percentage type of indicator. It can be repeated that these measures of relative

position of the two sexes with regard to the group average values (Ti(t)) provide enough information that either expression of the direct relative comparison between men and women - IRi(t) and/or RI(t) - can be calculated for each group, but not vice versa.

$$Ri(t)=Mi(t)/Fi(t)=RMTi(t)/RFTi(t)$$

$$IRi(t)=Fi(t)/Mi(t)=RFTi(t)/RMTi(t)$$

Another type of information of interest with respect to gender disparity in a disaggregated framework is the relative comparison among qualifications as far as the degree of gender disparity is concerned. An examination of the values Ri(t) and/or IRi(t) can give the answer to this question. It is of interest to note that the male-female relative difference for each qualification is lower than that for all the manual workers. If the relative gender difference in pay for all manual workers is taken as a yardstick of comparison, the corresponding group values of relative gender differences in pay can be expressed in relation to this value to show an above or below the average degree of gender disparity. The corresponding ratios are calculated as

$$RGAi(t) = Ri(t)/R(t)$$

and are presented in the third part of the table. As said before, all of them are smaller than that for the average manual workers. This can be explained if we take into account also the differences in the structure of qualifications between the male and the female manual workers. Using the method of multiplicative decomposition of the difference between the male

and female average pay into intrasectoral and structural component explained above, the following relationship holds in this case

$$1.33 = 1.23 \times 1.08.$$

This means that, with standardized structure of qualification, the summary value of gender disparities in pay (index of intrasectoral component) would be 1.23 and that the difference in the structure of qualification for men and for women (index of structural component) would amount to 1.08. In other words, the female pay would be about 8 percent higher if their qualifications would be equal to that of men. The corresponding decomposition for the inverse indicator - female wages compared to male wages IR(t) - would be

$$0.75 = 0.82 \times 0.92.$$

As explained above, these values were derived as a geometric average of the values based on male and female set of weights, respectively, to simplify the exposition. The methodology, however, allows both sets of weights to be used and suggests how the problems of the differences between the weighted and unweighted averages in earnings presented for comparison in the literature (e.g. Paukert (1985), UN (1985), OECD (1985)) can be approached in a systematic way, and at the same time combines the measures of gender disparity in the field of earnings with those in the composition of the labour force by sector or occupation or age.

The last two columns in Table 3.11. do not show the degree of gender disparity but the degree of disparity in pay among different occupations for the same sex. These relative earnings are represented by the ratio of the pay for each occupation to the average level for the same sex, i.e. as a ratio of group value to the aggregate value for the same sex

$$MGAi(t) = Mi(t)/M(t) \qquad FGAi(t) = Fi(t)F(t)$$

This information about relative group earnings was used in Paukert (1985) and EUROSTAT (1983), for example, where also coefficients of variations (CV) were used to indicate the degree of dispersion of earnings within a certain sex group (see also EUROSTAT, 1981). For male-female comparison the measure (mean (M)-mean(F))/mean (M), which in the notation used here is 1 - IRi(t) - i.e. the absolute difference in pay for the two sexes expressed as percentage of male wage in the respective group - has been used.[8]

Last but not least, the share of the female wage fund in the total wage fund can be calculated from the information on female representation rate FRRi(t) and relative position of female wage to total wage in the group RFTi(t);

wage fund(female)/wage fund(total)=(emp(Fi)/emp(Ti)) x (Fi/Ti),

or

wage fund(female)/wage fund(total)=FRRi(t) x RFTi(t).

Numerical values are given in the third part of Table 3.11. While the female share of the total wage fund for all manual

workers is only 19 percent, for the semi-skilled category it is 36 percent and for the unskilled 41 percent. As female earnings are smaller than male earnings for all occupations, the female share of the total wage fund is generally expected to be lower than the corresponding female representation rate.

Table 3.12. shows the series of the women's share of wage and salary income and trends in this share for non-agricultural activities for an African country, an Asian country, and an European country. From the data on paid employment and wages for non-agricultural activities in these countries, by multiplication it is possible to calculate the nominal value of the wage fund for each year and each sex. However, following the earlier derivation of the share of the female wage fund in the total wage fund as a product of the female representation rate in the non-agricultural sector FRR(t) and of relative ratio of female wage to total wage RFT(t), it would be also possible to calculate the shares of female wage fund in the total wage fund from these two ratios if the absolute values are not known. There are considerable differences in the shares of the female wage funds in the total wage funds among the three compared countries. In the African country the share increased but is low at only 16 percent of total wage fund, and the total wage fund by itself is a smaller proportion of total national income as in the case of the other two countries at a much higher level of economic development. The increase in the share over time in country A is a result of the increases in both the female

Table 3.12.

Non-agricultural activities: paid employment, wages and share of female wage fund in total wage fund

employment (000)

Year	Country A			Country B			Country C		
	T	M	F	T	M	F	T	M	F
1977	642.6	540.5	102.1	47070	29850	17220	6012	3276	2763
1978	668.6	558.7	109.8	47750	30030	17720	6094	3317	2806
1979	717.8	598.2	119.6	48670	30520	18150	6171	3352	2850
1980	774.4	642.5	131.9	49590	31000	18590	6242	3377	2895
1981	788.8	645.4	143.4	50240	31310	18930	6294	3386	2938
1982	814.1	665.2	148.9	50900	31560	19340	6327	3392	2966
1983	862.2	702.5	159.7	52010	31940	20070	6370	3406	2997

wages (currency units)

Year	Country A			Country B			Country C		
	T	M	F	T	M	F	T	M	F
1977	986.5	996.8	932.4	219620	253698	141644	2447	2860	1957
1978	1066.7	1093.5	930.2	235378	271121	152420	2521	2947	2016
1979	1162.5	1197.1	989.9	247909	289018	158825	2583	3021	2067
1980	1299.5	1346.4	1071.1	263386	309218	166397	2640	3090	2114
1981	1522.2	1561.5	1345.7	279096	328001	174895	2678	3141	2149
1982	1608.2	1657.6	1387.4	288738	341246	180080	2740	3213	2198
1983	1707.8	1753.2	1508	297269	352537	183989	2788	3272	2238

percent

Year	Country A			Country B			Country C		
	FRR	RFT	FSHARE W FUND	FRR	RFT	FSHARE W FUND	FRR	RFT	FSHARE W FUND
1977	15.89	94.51	15.02	36.58	64.50	23.59	45.96	79.98	36.76
1978	16.42	87.20	14.32	37.11	64.76	24.03	46.05	79.97	36.82
1979	16.66	85.15	14.19	37.29	64.07	23.89	46.18	80.02	36.96
1980	17.03	82.42	14.04	37.49	63.18	23.68	46.38	80.08	37.14
1981	18.18	88.40	16.07	37.68	62.66	23.61	46.68	80.25	37.46
1982	18.29	86.27	15.78	38.00	62.37	23.70	46.88	80.22	37.61
1983	18.52	88.30	16.36	38.59	61.89	23.88	47.05	80.27	37.77

Source: ILO Statistical Yearbook 1984; country A is an African country, country B is an Asian country and country C is an European country (socialised sector).

representation rate and in the female relative position with respect to the total wage. There is a substantial difference in the share of female wage fund in total wage fund also between the two developed countries, arising from the higher values in country C of both female representation rate and a more favourable position of women with respect to wage differentials. This approximation for calculation of the share of female wage fund in the total wage fund is not very demanding in terms of information of gender disparities in the employment and in earnings, yet not very many countries have systematic, published information on these indicators, judging by the series available in the ILO yearbook. A rough orientation with respect to this share would be the value of the female representation rate, which is to be considered as an upper limit which has to be decreased by the degree of disparity in earnings.

The trends in gender disparity in the field of earnings are not very clear or universal. Various publications like ILO and INSTRAW (1985), UN (1985) and OECD (1985) show no general conclusion in this respect: in some countries the female position has improved, in others there has not been a significant change in this regard. For the developing countries, reported earnings differentials show considerable instability, so that there is the question of how accurate the ratio for any one particular year is. Still, there appears to be a definite trend over time toward greater equality in some countries and in no country analysed in the study (Anker and Hein, 1985) is there a negative trend toward greater disparity.

Another possibility of analysing gender disparities in wages is through the data on frequency distribution of male and female wages by income class (see e.g. EUROSTAT, 1983). This data can be analysed in various ways. The differences between the two distributions can be measured in a very simple way by dissimilarity index, by measures derived from the representative quartiles or deciles or by a method estimating economic advantages between the groups, especially for interval-to-interval comparisons which can be sometimes more informative than a single aggregative measure (see e.g. Vinod, 1985 and Gastwirth, 1985). For the application of time distance analysis to quartiles or other representative points in the distribution see Sicherl (1977).

There are also other more complex methods of analysis which could treat the male-female differentials in earnings in the context of a more general analysis of disparities. As examples one could mention the partitioning of the Gini coefficient into between - group and within - group disparity, analysis of the variance approach, decomposition of the Theil coefficient (see e.g. Mourits-Ruiter and Driel, 1984) or regression analysis (see e.g. Selen, 1985). However, these more complicated methods of analysis generally go beyond the descriptive statistical approach and are a part of the substantive research in this specialized field.

3.4. Time Use

The statistics on the use of time constitute an underdeveloped but potentially extremely important component of social and economic statistics. As any activity has dimensions of time and space, time is an important criterion for locating and interrelating events. However, time is much more than that, it is also a basic unit of measurement of the duration of an activity. As such, time is potentially a very important device for a more precise measurement of many social and economic activities and for combining quantities and time use into composite magnitudes expressed in units of time in a similar way as quantities and prices are combined to arrive at composite magnitudes expressed in monetary units.

For instance, in the field of economics the time of utilization of available capacity is a major factor of efficiency. In the field of social indicators time has important role to play, only some aspects of which can be mentioned here. As explained above, time is a unit of measurement for time distance as a measure of gender disparity, and as such facilitates the comparison of this dimension of disparity across indicators and across countries.

In the same way, the time units facilitate the comparison among various fields to which the time use analysis can be applied. One of the special characteristics of time use analysis is the fixed ceiling of 24 hours per day, or the corresponding ceiling per week, month or year. This is an important point which has to be taken into account in the

analysis of the time budget, as distinct from the analysis of the consumer money budget where the budget constraint can be changed over time. From this point of view, the time constraint is the binding constraint in the final analysis, since no matter how rich one can be in money terms he or she has no more than 24 hours per day at his/her disposal. While having an easier access to opportunities which depend on resources, the time constraint remains the same for all. Thus the preferences revealed by the use of time are, ceteris paribus, more characteristic for the lifestyle of a given group than their consumption pattern in terms of monetary expenditures. Needless to say, they are not independent of each other, and the freedom of choice may be severely limited by the available resources, as the lifestyle will in turn influence the utilization and availability of resources.

A further importance of time use data is to be found in the possibility of more precise measurement of socio-economic activities and in utilizing the time use information as a means for cross-checking other statistics and indicators, and combining them into a more consistent and reliable framework. With time use data the multidimensional character of women's (and men's) activities can be expressed and measured in a more satisfactory way, and more flexible and accurate measures of participation in work of various kinds can replace the present rigid delineations between these activities. Instead of the "yes" or "no" type of question with regard to participation status, "how much" would give a more accurate and a much wider range of possible answers (a dichotomous variable can become a

continuous, though constrained, variable in the time use framework). The employment or participation rate is a much more crude method of measurement than the corresponding time use information. Full-time and part-time employment are not the same, and their quantitative difference can be approximated by hours worked. The difference in hours worked and their change over time is increasingly becoming a part of official statistics, and thus opens possibilities for analysis of composite magnitudes, like the total of hours worked by men and women in paid employment (in this case), in a way similar to that of the women's share of total wage fund discussed in the previous section, besides the more conventional type of per capita indicators like the average number of hours worked by each sex in paid employment.

The time use data are one of the most suitable tools for cross-checking and integrating statistics and indicators from related fields. A woman who works part-time in paid employment, and works on the farm in the afternoon, as well as on household chores, will be very difficult to classify by the field of activity of her work or to register the amount of work, if at least at some point in the process of estimation the duration of these various activities are not taken into account. Whether she is registered only in one field or in all of them, the measurement of her work is bound to be rather inaccurate as only the stock dimension (presence or absence) and not the flow dimension (duration of work in the reference period) is taken into account. This is very important for the measurement of the informal sector of economic activity, as well as for integrating

economic and non-economic activities within the time framework. One may not wish to stop at the time use data in evaluating the importance of unpaid work or leisure by calculating imputed income or trade-off between various alternatives. Such methods permit more sophisticated ways of weighting different kinds of work and other activities, but have also the disadvantage that it is very difficult to verify the appropriateness of the assumptions used in such calculations. Time use data offer a simple but more reliable framework, which is suitable for exploratory analysis and cross-checking with other statistics and indicators.

While the potential importance of time use data is obvious, the situation with regard to availability and accuracy of this type of data is in sharp contrast to its desirability. The time use data is very difficult and expensive to collect as well as to interpret, as far the factors responsible for differences in time use or its changes over time are concerned. While some activities are under-weighted, the most comprehensive international comparative project in time use is still the one undertaken by UNESCO (Szalai, 1972), based on data which are now about 20 years old. More recent examples are the chapter on time and leisure in the compendium of social indicators prepared by the OECD (1986), and an on-going study under the auspices of the European Foundation for the Improvement of Living and Working Conditions (Gershuny, 1984 and 1985).

There are still unsettled methodological problems and practical difficulties with data collection. The broad groups used in Szalai (1972) were economic activity, housework,

child care, and free time. OECD used the following categories: necessary time, contracted time, committed time, and free time, as defined in As (1982). The latter categorization emphasized the point that freedom of choice is limited, and that long time perspective and short time perspective are to be distinguished in this respect.[9] The problems with questionnaires and a time diary can be formidable, if the communications between interviewer, respondent and user of data are not clear; some possible consequences in this respect are discussed in Anker (1983).

Great care must also be taken in treating the various cycles involved. One of such cycles is the distinction between daily and weekly cycles of activities. In the rural area, the cycle of peak and slack periods of activities is important. The structure of the population with respect to age groups might be important in a comparison between countries or communities, as the use of time is expected to be different in different phases of the life cycle of a woman. The more difficult problem is that of value judgements, preferences and other factors behind the decisions which resulted in a given composition of time use. The choice between income (or other benefits from an activity) and leisure is a well-known problem (for discussion of this issue at the macro level see e.g. Beckerman, 1978). Apart from cultural factors, economic factors will influence households in their choice between leisure and other goods which can be purchased by income from paid work or can be received in kind. Evenson (1984) analyses three broad categories of countries, developed market economies, developed centrally planned economies, and developing economies, and

concludes that the ratio of leisure time for men to the leisure time of women is 0.94 for developed market economies, 1.03 for developing economies, and 1.06 for developed centrally planned economies. He discusses the importance of various exogenous and endogenous factors influencing the decisions of a household, and the importance of wage incomes in this regard.

The above mentioned study is also an example of various methods of measuring gender disparity in time use. Apart from absolute differences for various categories of time use it uses also the relative difference R(t). While in general the time use indicators, like the amount of free time (see As, 1982), are of per capita type, the slow change in time use over

Table 3.13.

Average minutes for person per day in work and non-work activities for women and men in a rural area of an African country

	F	M	wFi	wMi	(wFi-wMi)
	minutes			p e r c e n t	
A Production, sypply distribution	367	202	25.5	14.0	11.5
B Crafts and other professions	45	156	3.1	10.8	-7.7
C Community	27	91	1.9	6.3	-4.4
D Household	148	4	10.3	0.3	10.0
E Personal needs	158	269	11.0	18.7	-7.7
F Free time	77	118	5.3	8.2	-2.9
Residual	618	600	42.9	41.7	1.2
					DI=22.7
Total work (A,B,C,D)	587	453	40.8	31.4	9.4
Total per.needs and free time (E,F)	235	387	16.3	26.9	-10.6
Residual	618	600	42.9	41.7	1.2
					DI=10.6

Source: Data as presented in Dixon-Mueller (1985, p. 44), residual is calculated as the difference between 1,440 minutes and all items presented in the table.

time and the 24-hour ceiling imposed by the nature of the time allocation problem make the gender differences in the structure of time use a very convenient method of measuring gender disparities.

Table 3.13. shows the estimated use of time in minutes per person per day in a rural area of an African country. The upper part of the table shows a categorization of time use into 7 categories, and the lower part aggregates them in only 3 categories. The major distinction is that women do more work than men, and men devote more time to personal needs and free time than women. When the work is more disaggregated, women do more work in production, supply and distribution, and in the household, while men do more work in crafts and other professions, as well as in community activities. The measures of gender disparity at the level of each category of time use is either the difference in minutes (Fi - Mi) or the difference in the respective weights for each category in the total time allocated by women and men (wFi - wMi). The summary measure of gender disparity could be dissimilarity index DI, since the total time allocated by women and men is the same by definition. The difference between the value of the dissimilarity index for the breakdown of the time use into seven categories DI=22.7 and that of the breakdown into only three categories DI=10.6 is also an example of the earlier statement that the degree of gender difference in composition by categories usually increases with the number of categories used in the classification.

Table 3.14. shows the time used in the average daily time budget of employed men, employed women and housewives

Table 3.14.

Average daily time budget of employed men, employed women, and housewives in 12 countries (in hours)

Activities	Employed men	Employed women	House-wives
On workdays (employed people and weekdays (housewives)			
A Paid work and ancillary tasks (work brought home, journey to work, workplace chores, etc.	9.4	7.9	0.2
B Housework and household obligations (not including child care)	1.0	3.3	7.5
C Child care	0.2	0.4	1.1
D Sleep, meals, personal hygiene and other personal needs	9.9	9.9	11.2
E Free time (i.e.remaining disposable time)	3.5	2.5	4.0
TOTAL	24.0	24.0	24.0
On days off (employed people) and Sundays (housewives)			
A Paid work and ancillary tasks (work brought home, journey to work, workplace chores, etc.	0.9	0.4	0.1
B Housework and household obligations (not including child care)	2.3	5.1	5.2
C Child care	0.3	0.6	0.7
D Sleep, meals, personal hygiene and other personal needs	12.2	11.9	11.7
E Free time (i.e.remaining disposable time)	8.3	6.0	6.3
TOTAL	24.0	24.0	24.0

Source: Szalai (1972) as reported in UN (1980).

in 12 countries, based on the above-mentioned international comparative project (Szalai, 1972). The distinction of the three categories allows for interesting comparisons, both among these

three categories for workdays or days off on the one hand, and for each category between the workdays and days off (or Sundays for housewives), on the other hand.

The corresponding differences and possible summary measures of gender disparity in the use of time are presented in Table 3.15. In the first part of the table the differences (in hours) between the three groups for workdays, in the second part the differences between the same groups for days off (or Sundays) are presented. The differences in time use between employed men and employed women on workdays and to a lesser extent also on days off are reasonably similar; the values of the corresponding dissimilarity index are DI=10.4 and DI=12.9, respectively. The difference in the use of time between employed

Table 3.15.

Differences in average daily time use of employed men, employed women and housewives in 12 countries (in hours)

Activities	Emp.men minus emp.women	Emp.men minus house-wives	Emp.women minus house-wives
On workdays (employed people and weekdays (housewives)			
A Paid work and ancillary tasks (work brought home, journey to work, workplace chores, etc.	1.5	9.2	7.7
B Housework and household obligations (not including child care)	-2.3	-6.5	-4.2
C Child care	-0.2	-0.9	-0.7
D Sleep, meals, personal hygiene and other personal needs	0	-1.3	-1.3
E Free time (i.e.remaining disposable time)	1	-0.5	-1.5
$1/2\sum_{i=1}^{i=n}\|t1-t2\|$ (in hours)	2.5 DI=10.4	9.2 DI=38.3	7.7 DI=32.1

Table 3.15. continued

Activities	Emp.men minus emp.women	Emp.men minus housewives	Emp.women minus housewives
On days off (employed people) and Sundays (housewives)			
A Paid work and ancillary tasks (work brought home, journey to work, workplace chores, etc.	0.5	0.8	0.3
B Housework and household obligations (not including child care)	-2.8	-2.9	-0.1
C Child care	-0.3	-0.4	-0.1
D Sleep, meals, personal hygiene and other personal needs	0.3	0.5	0.2
E Free time (i.e.remaining disposable time)	2.3	2.0	-0.3
$1/2\sum_{i=1}^{i=n}\|t1-t2\|$ (in hours)	3.1	3.3	0.5
	DI=12.9	DI=13.7	DI= 2.1

Activities	Employed men	Employed women	Housewives
Workdays versus days off			
A Paid work and ancillary tasks (work brought home, journey to work, workplace chores, etc.	8.5	7.5	0.1
B Housework and household obligations (not including child care)	-1.3	-1.8	2.3
C Child care	-0.1	-0.2	0.4
D Sleep, meals, personal hygiene and other personal needs	-2.3	-2.0	-0.5
E Free time (i.e.remaining disposable time)	-4.8	-3.5	-2.3
$1/2\sum_{i=1}^{i=n}\|t1-t2\|$ (in hours)	8.5	7.5	2.8
	DI=35.4	DI=31.2	DI=11.7

Source: Calculated on the basis of data in Table 3.14.

men or employed women on the one hand, and housewives on the other, is much greater; the respective values of dissimilarity index are DI=38.3 and DI=32.1, which is more than three times higher than in the comparison between employed men and employed women. For the days off or Sundays, the big difference between the employed women and housewives observed for workdays is practically eliminated and the use of time for both categories is practically the same, DI=2.1.

Very interesting is also the comparison of the difference in time use between workdays and days off for the same category, which is presented in the last part of Table 3.15. The difference for either employed men or employed women between their workday schedules and days off schedules is as great as the difference between either of these two categories and housewives during workdays (DI=35.4 for employed men and 31.3 for employed women, which is very similar for the values of the dissimilarity index in comparison with housewives on workdays). Even housewives have not the same use of time on workdays or Sundays as DI=11.7, which is the order of difference between employed men and employed women during workdays.

As the measure of gender disparity in time use at the level of each category, the difference between the hours allocated to this category by the groups compared is simply used. For the summary measure of the disparity between two groups in the use of time, two possible measures are suggested. The first one is the dissimilarity index DI. The second one is calculated as one half of the sum of the absolute differences between the two groups' overall categories, which is in its form similar to

the dissimilarity index, but is expressed simply in hours (i.e. units of time) and not in terms of weights which add up to 100 percent, as is the case with the dissimilarity index. This special application in the case of disparity in time use is possible because the total allocation of time for all groups is always the same and fixed (in this case 24 hours, and in the case in Table 3.13 1,440 minutes). This summary measure is shown in the table as $1/2 \sum|t1-t2|$. The interpretation of this measure is how many hours would have to be changed in the current composition of time use to arrive at an equal allocation of time across various categories of time use by the two compared groups.

C H A P T E R I V

POTENTIAL APPLICATIONS IN OTHER FIELDS

Review of Possibilities of Application in Other Fields

The aim of this chapter is to provide a brief review of possibilities of developing countries to apply such measures of disparities in other fields of statistics and indicators on women. The minimum dynamic conceptual and analytical framework discussed above is meant to refer especially to such indicators on women which can satisfy the three technical criteria of the quality of an indicator as specified in the draft handbook of social indicators (UN, 1986, p. 21):

(a) Be available for the entire country;

(b) Permit disaggregation to show sub-national or population group distribution of some kind;

(c) Be reliable enough to use as a time series.

Specifically for indicators on women, the framework outlined here suggests a way to simultaneously study the absolute position of women and their relative position as compared to men or among specific groups of women, both at a given point in time and over time. As the examples shown above include indicators of both percentage and per capita type, it is natural to expect that the measures discussed within the minimum framework can be fruitfully applied in the analysis of the situation of women in many fields using the existing data. However, in many cases, the required data are not yet available, or do not satisfy the basic condition of comparability over time.

The qualitative judgement whether for a certain set of statistics and indicators on women the quality of data and comparability over time are satisfactory or not in the existing data is country and field specific. With improvement in data, in the long run the area of applicability will certainly be widened, both in terms of the number of fields of social concern and of the number of indicators within each field which would have adequate data for application of such measures of women's position and gender disparity. A few possibilities can be mentioned here to indicate some directions of possible extention of application of these measures.

First, one could mention further possible applications which cut across fields. Analysis of gender disparity at sub-national levels is such a case. The degree of disparity between men and women in rural and in urban areas can be studied, as well as the degree of disparity between women (or men) in urban and rural areas. Such comparisons can be made at the level of regions, administrative units, local communities, between and within households. The conceptual and analytical framework is applicable to most of such situations, depending on the nature of the problem analyzed. The connection between group measures and measures for the aggregate studied can be established in many cases, and can be analysed either through the corresponding decomposition procedure outlined in this report or by using some other partitioning techniques.

Similar possibilities exist for comparisons between the two sexes at the disaggregated levels for various

categorizations like age groups, occupation, status in employment, industry, qualification, type of work, type of household or between different categories of women for a given classification. These differences can be compared at a given point in time and over time, combining whenever possible the measures of disparity in a certain attribute (e.g. representation rates) and the corresponding differences in the structure of various population groups with respect to the analyzed categorizations (e.g. with regard to occupation).

For most, if not all, such comparisons the estimation of absolute and relative static differences, magnitudes and differences in the growth rates, time distances, and considerations of absolute levels of the indicators is relevant, at least as a description of various aspects of gender disparity.[1] When the analysis is made in terms of frequency distributions or cumulative frequency distributions, or various multivariate models, the above framework is relevant as a way of presenting and discussing such results. For indicators expressed in value terms, it is important that they are expressed in real and not nominal values, besides the general requirements of comparability over time.

Health, health services, and nutrition represent a field of social concern where the application of the methods of measuring gender disparity and their changes over time is rather straightforward. Life expectancy and per capita consumption of calories and/or animal protein per day by sex are two most important indicators in this field, and it would be of great interest to compare various measures of disparity in these

indicators to those in other fields. Both of them are indicators of the degree of satisfaction of essential needs and as such are very relevant in the analysis at sub-national, national and international levels. Further examples of possible application of the methodology would be infant mortality rates and mortality rates of children in the 1-4 year age group by sex,[2] and not the ratio of infant mortality per 1,000 female births to infant mortality per 1,000 male births, as used as an illustration in UN (1984a). Namely, these ratios would emerge as one of the measures of disparity (IR(t)) which could be chosen as the most representative one; but other characteristics could be calculated as well, if one treated the two trends in infant mortality separately for any further in-depth analysis.

Proportion of men and women immunized against specific diseases as a positive indicator or the proportion of men and women suffering from defined disabilities as a negative indicator can be usefully analyzed in the way described for indicators of the percentage type. Frequency and kind of illness, and cause of death can also be treated in a similar way. Indicators like maternal mortality rate, percentage of life birth under 2,500 grams, or percentage of pregnancies delivered by trained personnel are examples of indicators where the main point of analysis is that of change over time (besides comparison between different units like urban-rural).

In a similar way, a number of indicators from other fields can be mentioned. In the field of indicators on economic activity this study has been concerned more with

occupations and wages. A natural extension of the methodology would be to apply it to the labor force participation rate as defined now and for data based on broader definition of activity (see e.g. ILO-INSTRAW, 1985, and Anker, 1983a), and combine this with estimates of income in the informal sector, as an extension of the employment compensation aspect (and working conditions and training) in the formal sector. In the same way as the decomposition of the relative difference in male and female average wages into the intrasectoral and structural component was done for the more narrow field of paid employment, the difference in male in female average income (registered or imputed) could be analyzed as a combination of the gender disparity in income for a given type of work and of gender disparity in the kinds of work which men and women perform (and its hypothetical effect on the difference in income), if such data would be available.[3]

This is a possible connection between the field of economic activity and that of income, consumption and wealth. The important matter is the appropriate conceptualization and availability of reliable information on work in general and not only on employment, on various types of income and implied benefits in non-monetary activities, and on the multidimensional activities of women and men. If these data would be available, the analytical framework could be applied to them, and both static and dynamic aspects of gender disparity could be elaborated if such information would also pass the test of comparability over time. When disparity issues would be combined with those of general development strategy, many other statistics

and indicators either from the field of social statistics, like housing and sanitation facilities, or from the general economic statistics, like the level and structure of the economy, can be analyzed in a similar way and compared with those discussed above.

Comparisons Among Indicators

The application of the described conceptual and analytical framework to more indicators and more fields would provide - besides an examination of gender disparities for these indicators in individual fields - also information for a comparative analysis of various aspects of gender disparities across a number of indicators in a given field, and across various fields of concern.

At the national level, the indicators can be compared among themselves for the degree of gender disparity and related characteristics. Thus various indicators could be ranked by the value of relative difference between the values for men and for women R(t), from that indicator where this measure of gender disparity is greatest to the indicator which shows the lowest relative difference between the two sexes. This would show in which fields or for which indicators within a given field the gender disparity is greater or smaller, taken this measure of disparity as the criterion for the ranking of indicators. A similar ranking of indicators could be made with respect to S-distance as a measure of the time dimension of disparity. A

indicators the country in question is in a relatively better or relatively worse situation. This type of analysis shows the specific characteristics of a given country as distinct from the general pattern, and can be very useful for policy makers to see their own position against the background of experience of the mainstream of other countries and to make a decision in which fields the deviations are desirable and in which fields an action to correct the situation is needed. The comparability of data across countries and over time at this moment most probably does not yet allow to undertake such a truly multidimensional and comparative analysis of the position of women and of the degree of gender disparities at the international level. Nevertheless, it is still useful to outline the scheme for such a comparison, in order to indicate the need for improvement in the data required.

Multivariate Analysis

There are many factors that influence the level and change over time in gender disparities and the choice of these factors and of the appropriate methods of analysis is the domain of researchers in different specialised fields. However, even before one comes to the causal models, there is a possibility of an intermediate stage of analysis which has, with availability of modern data processing capabilities, become a feasible project. The data collected contain much more information than could be published and disseminated in the traditional way, and allow for many more cross-classifications in

a multidimensional framework, which is beyond the possibility of double-entry tables of comprehensible magnitudes. This stage represents an initial exploratory processing of the available data with the aim of descriptive statistics, although even descriptive analysis must be conceived with some conceptual framework in mind (Malinvaud, 1984). The question in which way and to what extent such analysis could and should be performed by national statistical offices will be more and more present in discussions of the optimal use of existing information.

These questions are dealt with in EUROSTAT (1984), Recent Developments in the Analysis of Large-scale Data Sets, which presents the proceedings of a seminar aimed to provide exchange of ideas between institutions in different countries engaged in developing new methods of data analysis but giving emphasis to different techniques. The emphasis is on exploratory analysis, to help the user of the data to detect the patterns present in large data sets. Various methods were discussed, like orientation methods (visual analysis and ridit analysis), classification methods (cluster analysis and stepwise selection methods), quantification methods (log-linear analysis, correspondence analysis and regression analysis). Comparison between them showed that no "optimal" or "ideal" method is evident (Israels, ed., 1984).

Some methods present the existing data in various ways, others use mathematical models to estimate the relationships between variables and present the estimated values in such a way that the user can get a first glance at what seem

to be the more important or less important classifications or variables in a given set of data. An important aspect is the summarizing power of such methods, to present large sets of structured data in as easily comprehensive manner as possible. The participants thought that it would be useful if the official departments would undertake some data analysis on the socio-economic statistics which they produce.

It was realized, however, that the use of new forms of descriptive analysis could be only a gradual process. On the one hand, it is a question of expertise and testing; and on the other, the question of absorptive capacity of the users for these new developments. It was also noted that, as time was needed in the past for such techniques as indices, regression lines and log scales, the new techniques will also take a certain amount of time to establish themselves as part of the general culture of politicians and administrators, businessmen, professionals and the general public, so that there are risks involved in the premature employment without adequate precaution of what may be perfectly valid new concepts (Zighera, 1984).

Different users have different requirements and it may be possible that some of them would need the summary of the pattern embodied in the data at a rather aggregate level, while others are interested in only some parts of the information at a very disaggregated level. In a certain way, the modelling used is similar to ideas involved in the standardization analysis (an example of which was used above in decomposition of the change in the female representation rates) or conditional projections. Estimating partial coefficients in a multivariate framework

depends on the appropriateness of the model specification and estimation technique, and thus has the advantages and disadvantages of similar approaches. As mentioned above, there are various methods of multivariate/desciptive analysis and an example of one of such method offering also an interesting graphical representation will be presented in the next section. The output of such an analysis, e.g. estimates of wages for men and women standardized for level of education, age and for region of work, can then be used to calculate the various measures of gender disparity proposed in the above minimal conceptual and analytical framework. The difference will be in the data input: the unadjusted data refer to the average values for a certain category or group, while the data adjusted for the influence of various factors by the means of model estimation will be an attempt to use refined information. The methods of describing and analysing gender disparities in a dynamic framework can be usefully applied to either set of data, only the qualitative side of the interpretation will change accordingly.

An Example of Multivariate Analysis and Description

An example of the use of regression analysis for summarizing and describing differences and their changes over time among various population groups is presented in Selen (1985). Data from a standard of living survey on the percentage of people with reduced capacity to move are used as an example of a possible multidimensional description of social indicators.

With the help of dummy variables the information on three types of questions was extracted from a multidimensional table:

1. Is the proportion or level changing over time?
2. Are there any relative differences among population groups?
3. Are the differences among population groups changing over time?

A multiplicative model is specified which describes relative differences as against an additive model which would describe absolute differences. There are two possible approaches in using such a model. One is to use the saturated model which, however, gives no gain in parsimony since the number of coefficients is equal to the number of cells in the table, although the description given by the coefficients is better structured and still gives a complete description. The second approach used in the article excluded statistically redundant coefficients; and for a simplified description the model was reestimated without higher order interactions, with the aim that 162 groups' proportions were described by few independent variables in a reasonably uncomplicated way.

In the example, the 162 population groups are composed of 2 groups for sex, 3 for age, type of community, social class, taken for 3 years of observation: 1968, 1974 and 1981. The estimated coefficients of the logarithmic model representing the average effect, main effects and interaction effects of the first order are given in Selen (1985, p. 440). From the same source, the graphical presentation is reproduced in Figure 11 and shows an interesting quick visual impression of the differences involved and their changes over time. The first

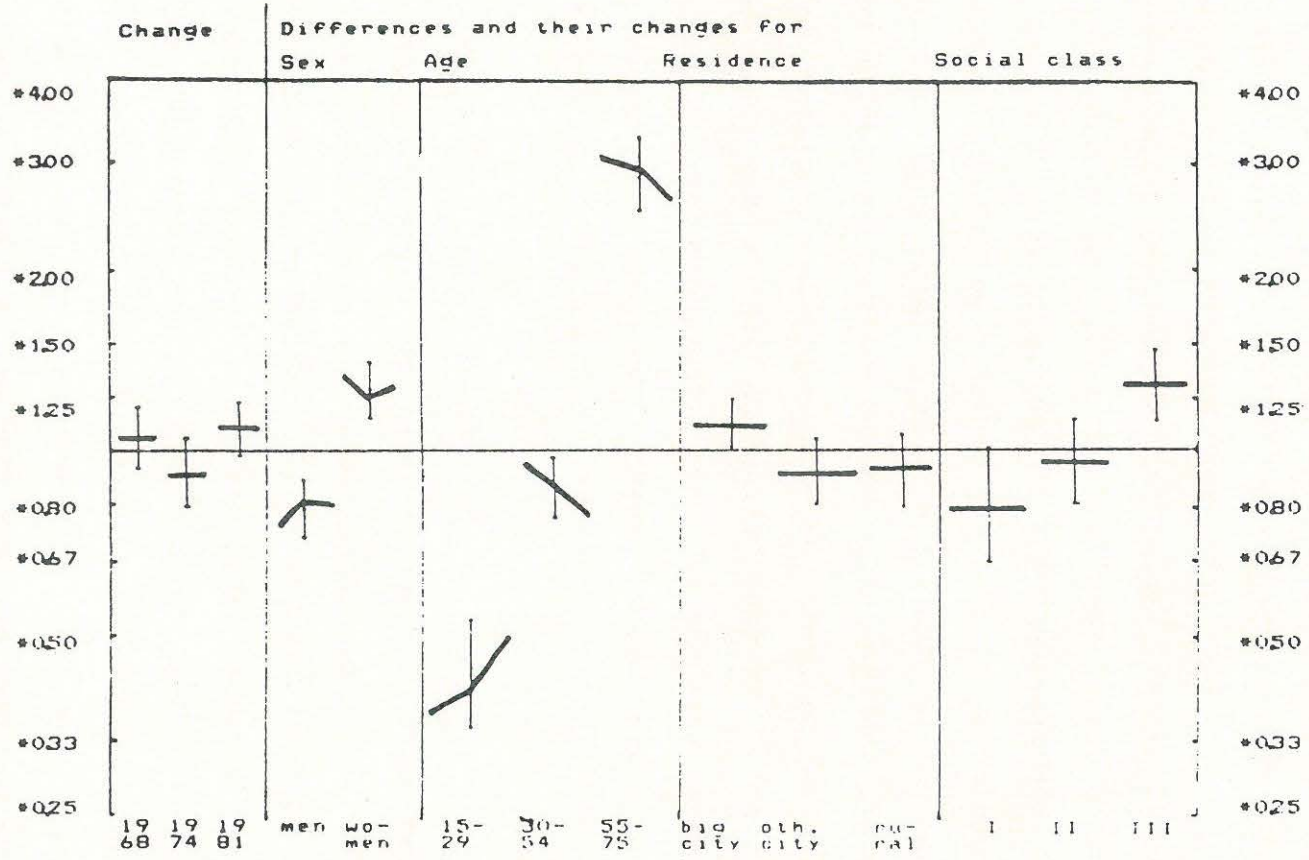
section on the left shows the situation with respect to the change over time of the indicator, which means that it provides an answer to the first type of questions asked. If the levels for different years shown by thick lines are not the same, then there has been a (relative) change in time.

The next four sections to the right answer the question whether there is any relative difference among the population groups specified by sex, age, residence and social class, respectively. The difference between the thick lines show the magnitude of relative differences between various groups. The slopes of the thick lines in these four sections of the figure provide the answer to the question of whether the relative differences between the various population groups have changed over time. If these lines are sloping away from each other, this means, that the relative differences have increased; if they slope towards each other, the relative differences have decreased; and in case of a horizontal line, no significant change in time has been detected.

Each of the thick lines shows the relative position with respect to the three respective points in time: the left point refers to 1968, the middle point to 1974 and the right point refers to 1981. The vertical lines within each field are interval estimates for corresponding factors.

The differential effect between men and women is shown in section two of the figure. A quick look at the situation indicates that the proportion of women with reduced capacity to move is higher than for men, but that this difference

Figure 11: A description of the differences and changes of the percentage with reduced capacity to move.



Source: Selen (1985) in Social Indicators Research.

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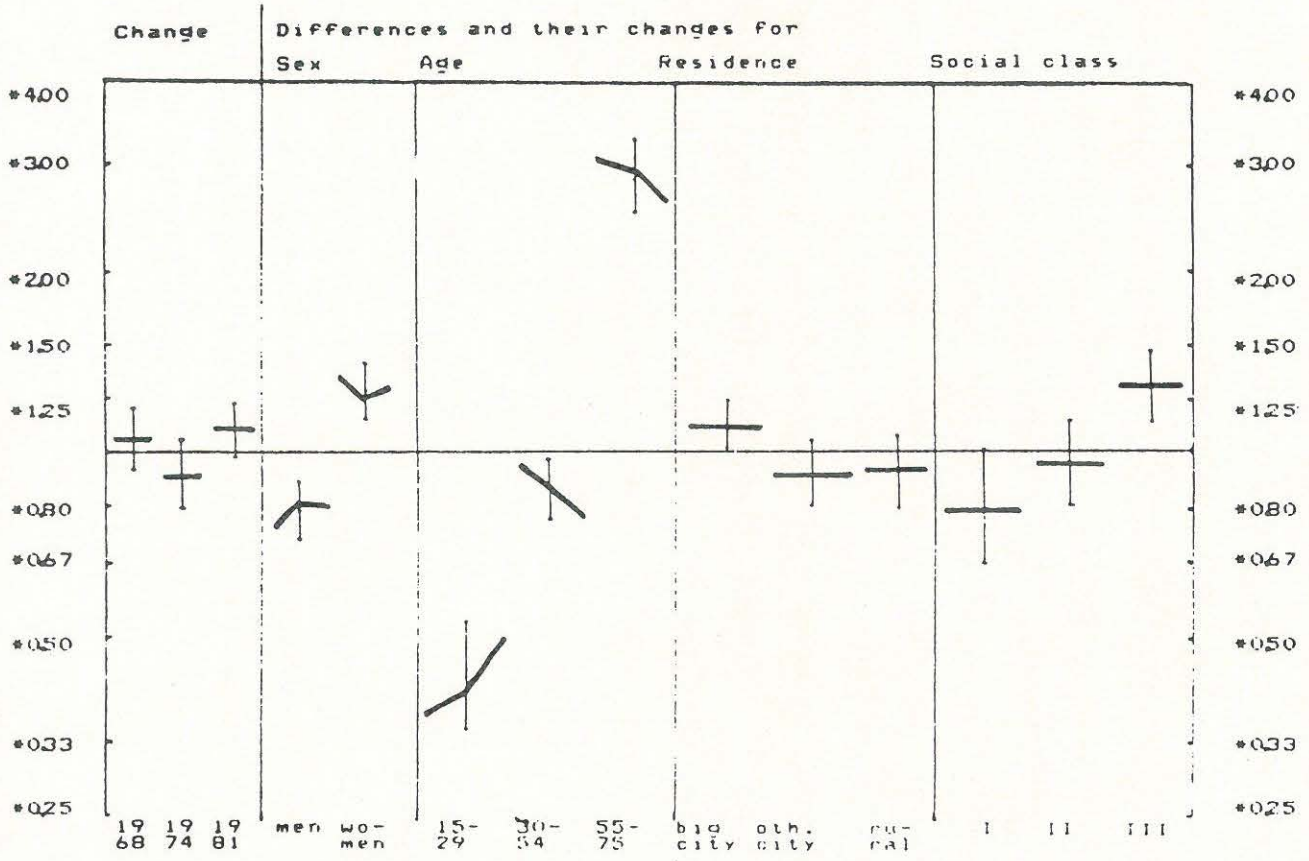

Source: Selen (1985) in Social Indicators Research.

is now smaller than in 1968. As the model and the figure deal with relative differences apportioned among more factors, it is not possible to see immediately from the figure whether the absolute value of the indicator for men or for women has increased or decreased over time, or what the value of the percentage with disablement for men and women is. It requires a somewhat more complicated procedure - to multiply the effect for men (or women) with the interaction between men (or women) and any given year, as well as with the coefficient for the constant in the equation if the absolute value of the indicator is to be obtained.

The method aims at describing and summarizing results from the large multidimensional table emphasizing lucidness against the wealth of details, to make the description of social indicators more accessible to a wider audience. As indicated before, results from such regression models can be translated again in absolute values and analysed with the help of measures of gender disparity elaborated in previous chapters.

Information Content and Requirements

One possible way for substantiating the need for a dynamic conceptual and analytical framework for the analysis of gender disparity is the amount of information which is provided by (and required for) various measures of gender disparity. A time series of static measure of gender disparity is a poor substitute for a comprehensive dynamic framework, since it

contains only the information on the differences between the two sexes. From this information it is not possible to infer whether the changes in the degree of static disparity have been taking place in the context of growth, stagnation or even decline in the field which the indicator is describing. Neither does it reveal at what level of the indicator these changes have occurred, although this may be very relevant for the evaluation.

There are many interrelationships between growth and (in)equality. The simple model outlined here helps to conceptualize and quantify of some of them. It provides a framework for describing and presenting some aspects of disparity in terms of statistical measures and thus, naturally, shows the effects rather than the factors which have led to such developments. The interconnection between this framework of measuring gender disparities and dynamic causal models is twofold. One the one hand, the results of various simulations of dynamic causal models form the basis for the calculation of various measures of gender disparities, associated with alternative assumptions about the conditions and policy measures, and thus the description of the expected effects of various alternatives on gender disparities. On the other hand, various measures of disparity can be used already in the construction phase of such models, either as dependent or explanatory variables. A further extension of the use of these statistical measures is in the setting of targets in plans and other policy documents and in monitoring their implementation in the course of time.

The immediate operational use of dynamic causal

SUMMARY AND CONCLUSIONS

Gender disparities must be studied, and the action programmes to overcome them prepared and executed, within the context of comprehensive socio-economic development. The development perspective should be firmly embodied in the planning and design of the research programmes, in the search for appropriate methods of analysis, and in the collection and compilation of statistics and indicators on the position of women. Since development is a multidimensional and long-run phemomenon, there must be a continuous effort to improve the methodology of analysis to take these characteristics into account in a meaningful and consistent way.

Firstly, it is not enough to study the relative position of women in a society, as the welfare of women will also depend on the absolute level attained with respect to various welfare attributes. Secondly, a comparative analysis of similarities and differences between men and women and between different groups of women has to be undertaken within a dynamic framework, i.e. one needs to analyze the process through time and not only the position at a given point in time.

An extended conceptual and analytical framework for the analysis of disparities is suggested. It stems from the view that for any satisfactory quantitative analysis of disparities, a certain minimal framework is needed which deals with both the static and dynamic aspects of disparities. Such a minimal framework would consist of elements from two types of information: 1) information about the present and intertemporal

position of the observed unit, without regard to the position of other units; 2) information about the position of the observed unit in relation to other units.

The first type of information refers to the absolute position of men and to the absolute position of women. In the analysis of the position of women, the current excessive emphasis on the measures of the relative position of women without simultaneous analysis of the absolute position - i.e. of the level and growth rate of the indicator - cannot be considered as a satisfactory approach to a complex reality.

The second type of information has largely neglected the dynamic dimension of the problem. The most common quantitative measures of static relative position between two units are the absolute and relative differences at a given point in time. To arrive at a more comprehensive and realistic picture, the static analysis of disparity has to be supplemented with the dynamic measures of disparity to incorporate the dynamic relative position as an essential element of the analysis. One way to achieve this is to use time distance as a new statistical measure to measure the time dimension of disparity.

In the case of gender disparity, the time distance is defined as the distance in time (measured as the number of years) between the points in time when a specified level of the analyzed indicator is reached by men and women. Looking backwards, ex post definition of time distance tells how many years earlier the present position of women was attained by

men. Looking into the future, the ex ante definition of time distance measures the number of years needed for women to reach the level presently attained by men. Time distance as a new statistical measure of disparities expresses the lead or lag between the two compared units in number of years. They represent a common unit of measurement, easily understandable by policy makers as well as laymen, and comparable among different indicators and among countries, which is a very useful property of a statistical measure.

If one accepts the hypothesis that disparity has both static and dynamic dimensions, then any single measure - either a static measure or time distance as a dynamic measure - cannot claim to be an appropriate measure of disparity by itself. A major conceptual issue in quantifying disparities between men and women is thus the notion of the overall degree of gender disparity as a weighted combination of the static degree of disparity and the time dimension of disparity. There is no inconsistency in the statements that one aspect of disparity is increasing at the same time as another is decreasing, if one recognizes that there are more aspects of disparity even for a given indicator, which should be approximated by different statistical measures. It seems clear that for any useful discussion of policy alternatives, both static and dynamic considerations should be taken into account simultaneously.

When the analysis is extended to a large number of indicators, the assessment of the degree of disparity with regard to various attributes based on the static measure may not coincide with the results based on the time distance as a dynamic

measure of disparity. In looking at the overall picture of gender disparities, the speed of social change might have important repercussions on the dynamic degree of disparity and thus on the overall degree of disparity.

There are many interrelationships between growth and (in)equality. The simple model outlined here helps to conceptualize and quantify some of them. It provides a framework for describing and presenting some aspects of disparity in terms of statistical measures, but also has important policy implications. An action programme to reduce gender disparities must be concerned also with the absolute magnitude of the growth rate, and not only with the objective that the female growth rate for an indicator should be higher than that for men, as it affects the time dimension of disparity. The importance of growth and efficiency in this context establishes also macroeconomic development as an important factor to be studied in analyzing gender disparities from a dynamic perspective.

The discussion of conceptual issues in quantifying disparities between men and women shows that to deal with great number of indicators related to various fields of concern in combination with different measures of disparity for each indicator and normative judgements associated with them, is a very complex and difficult task. For statistical purposes, a not too complicated approach, is elaborated in this report for calculating changes in gender disparities over time. This approach represents a feasible step forward towards a better utilization of already existing data at the micro, mezzo and

macro level in many countries. It is also highly recommended that summary measures, measures of disparity at a disaggregated level and structural characteristics are all taken into consideration and analyzed, and that attempts should be made to combine them whenever feasible.

Methods of calculating changes in disparity over time are discussed for two groups of indicators: the percentage type and the per capita type, because of their different statistical characteristics. To avoid duplication, some methods elaborated for one example were not repeated in other examples, if there were not new substantive issues involved in further applications. In the examples, which represent illustrations rather than attempts at causal analysis, the data were disaggregated only into a few occupations, sectors, or qualifications for the sake of clarity; however, in the actual analysis one would usually like to take into account the male-female disparity at a lower level of aggregation.

For the percentage type indicator employment (economically active population) by major ISCO groups was taken as an example. In addition to the conventional measures, the change over time in the female representation rate was decomposed into intrasectoral and structural components, and the conclusions compared with the dissimilarity index, to show that a single measure alone would be inappropriate and that further research and clarification is needed.

Wages were used as an example of an indicator of per capita type, and various measures of gender disparity were calculated. The effect of the different growth rates in

different sub-periods on various measures of gender disparity was shown for the example, as well as a general scheme of changes in the various measures of gender disparity, as a function of the difference between the growth rates for men and for women, on the one hand, and as a function of the magnitude of these growth rates, on the other, were presented.

The change in the magnitude of growth rates between different periods may provide three completely different results for different measures of disparity: 1) the relative static difference (and similar measures, like the Lorenz curve, the Gini coefficient of concentration, etc.) is completely insensitive to it and show no change; 2) the S-distance as a measure of dynamic disparity is a decreasing function of the magnitude of the overall growth rate; and 3) the absolute static difference is an increasing function of the overall growth rate. In the dynamic world of today it is hardly satisfactory to rely only on measures of disparity which are insensitive to the changes in the growth rate of the system.

The importance of the functional form of the trends in the indicators for men and women through time is underlined. The time needed for full equalization between men and women for a given indicator is presented as a possible supplementary measure. The question of possible new methods of multivariate analysis which could in the future be used by national statistical offices with the aim of providing descriptive statistics in a multidimensional framework beyond the possibility of current methods of publishing and dissemination of

data was reviewed.

Measures of disparity and changes in disparity over time in specific fields were elaborated for the areas of education, occupations, wages and time use. For each of them, the existing measures are included in the example and some suggestions for further improvements are made. The field of education is also used to illustrate, with the example of developed and developing countries the change in various measures of gender disparity over long period of time. In the case of occupations, a relationship between various measures of dissimilarity at the group and aggregate level was established, which clarifies the situation with respect to this type of measures of gender disparity. And in the field of wage differentials, a new way was suggested to deal with the differences between weighted and unweighted averages for male and female wages. For time use data, a special form of dissimilarity index was suggested as a possible summary index of gender disparity in the time use pattern.

The difficult question of how to evaluate the importance of a given degree of gender segregation by occupations was posed - i.e. which set of weights could distinguish (and summarize) which occupations are more favourable than others, in the sense of whether it is advantageous for a population group to be over-represented or under-represented in a given occupation. Average earnings were suggested as such a set of weights. From the methodological point of view, it is very important that the decomposition (based on aggregate indices of Laspeyres, Paasche and Fisher type) of the male-female earnings ratio in each of the

years analyzed into a summary measure of intraoccupational male-female earnings ratios, and into a summary measure of the effect of gender differences in distribution across occupations, represents a way in which the issues of gender disparity in occupation are interrelated with gender disparity in earnings in a meaningful way which reflects for the nature of the problem. The combination of the two fields has important implications for the collection and analysis of data, as the need for a harmonization of the statistics on wages and earnings, on the one hand, and on occupations, sector of activity or position in activity or occupation, on the other, is now much more apparent from the user side.

Potential application of the measures of gender disparity and their changes over time in other fields was discussed. The first requirements for the dynamic analysis of disparity is a satisfactory comparability of data over time. Possible uses in the field of health and nutrition, economic acitivty, and income and consumption were indicated. Also, there are further possible applications which could be suggested in all fields, that is, the analysis of gender disparity at sub-national level and at more disaggregated levels for many possible categorizations.

Comparison among indicators with respect to the degree of gender disparity at sub-national, national, and international levels was indicated as a useful approach to combine the analysis of general tendencies in the development pattern with the analysis of the deviations of individual

countries from such a pattern, which could lead to an elaboration of country profiles with respect to the position of women and degree of gender disparity. The problem of data comparability over time and across countries for international comparisons will have to be solved before such an analysis can be made for many indicators.

A more comprehensive analysis of indicators over time also bears implications for the design, collection, systematization and presentation of statistical data and indicators. If people are assessing the degree of disparity also from the long-term perspective, and not only at a given point in time, this means that the comparability of data over a longer time span will have to be given a higher priority in the work of statisticians. An important recommendation in this regard is to change the manner of publication and presentation of available data, as well as the measures of disparity, in such a way as to ensure that not only data and measures on the relative position of women but also data on their absolute position over time and the corresponding growth characteristics are made available for a more comprehensive analysis.

The conceptual and analytical framework outlined in this study was intentionally kept simple in order that it could be applied also in developing countries as widely as possible. At the same time, it offers both the producers and users of statistics and indicators on women an orientation not only for combining static and dynamic measures of gender disparity, but for discussing this issue within a longer-term perspective and relating it to other development issues.

NOTES

C H A P T E R I

1. One should be aware of the limitations of the different approaches and levels of analysis. See, for example, Dogan and Rokkan (1969), for possible dangers of inferences from among various levels of analysis or from one sub-population to another; and Ruggles and Ruggles (1977), for a demonstration of how a cross-section of wage earnings profiles and a birth cohort earnings pattern lead to substantially different conclusions.

2. In this report the difference between men and women for a given indicator will be referred to as gender disparity rather than gender inequality, as this difference may not necessarily mean discrimination. Such a difference may, namely, be partly explained by factors other than sex. Similarly, a divergence from exact parity is not an indication of inequity, if it is a consequence of free choice. Quantitative measures have to be complemented by qualitative analysis.

3. The same argument has been used for more general applications in Sicherl (1977) or Sicherl (1978).

4. Leibenstein (1962) examines in more detail the ways in which individuals make comparisons between their income and the income of others.

5. Another approach is a dynamic mobility framework which is based on mobility matrices. Mobility between (income) classes is expressed either as the probability of transition from one class to the other or as the average time spent in a class, or mean first passage time (see e.g. Szal and Robinson (1977)). If appropriate data on individuals over time are available, the time distance approach outlined here can be easily applied to them. For an application of S-distance to distributions, see Sicherl (1977) or Sicherl (1978). One can also compare movements of individuals against group averages over time, in order to distinguish two situations where the disparities between group averages are similar, but the individual (upward and downward) mobility is higher in one case than in the other case.

6. For a more detailed elaboration of the methodology, especially for the cases of n-units and frequency distributions, see Sicherl (1977) or Sicherl (1978).

7. See also Sicherl (1985).

8. This explanation has been put forward for the most common case, where the trend rate of growth of the indicators on men and women are usually positive. It can be easily

adjusted for indicators measuring undesirable characteristics such as mortality, illiteracy, unemployment, poverty and the like, where the improvement is indicated by a negative growth rate. However, when comparisons are made among indicators (see e.g. chapter 4), it may be advisable to transform the data so that the direction of improvement would be the same for all indicators. S-distance has a very desirable characteristic for a descriptive statistical measure, in that it stays unchanged for monotonous transformations; this means that the time dimension of disparity between two units is the same whether one measures infant mortality or infant survival (1000 - infant mortality).

It is another matter if, for an indicator for which the increase in its value means improvement, the value of the indicator begins to decrease for one or both units (except for cyclical variations which can be smoothed out by calculating trend values). If the indicator for both units, like men and women, decreases, some levels of the indicator will be reached by the same unit at two points in time and multiple measures of time distance will appear. Which of these is the most relevant for the analysis in question would be decided on a qualitative basis. Such a situation was not uncommon during the recent economic recession, when in some countries the real wages of both men and women, for example, decreased. If the more advantageous group has a positive growth rate, and the less advantageous group experiences a negative growth rate, then the ex post time distance can be defined and will increase continuously, while the ex ante time distance cannot be determined, as in such situation as the latter group will not be able to reach the present level of the former group.

9. I am grateful to Paul McGuire of the Economic Growth Center, Yale University, for his assistance in computer programming, using GAUSS for calculation of time distances in Table 1.2. However, as the use of GAUSS requires a mathematical co-processor and knowledge of this particular programming language, the number of users which can profitably use the time distance approach is much greater than the number of those who can meet those conditions. For the majority of users a conditional vertical (horizontal) look-up routine of any good spreadsheet programme can be used to calculate the time distance over the range for which data exist. As time distance is a measure of a long-term phenomenon, it is not necessary to have very precise estimates (like decimal points for years in Table 1.2) to be able to take advantage of this dynamic approach. This means that in cases when no computer programme is available, the calculations of time distance can be made by hand, simply by looking at the two compared series in the table and checking for any chosen level of the indicator in which year it was attained by men and women, and then subtracting the two respective years.

10. The change in the growth rate for wages between the analyzed subperiods is a result of the changes in the economy as a whole, as the differences in growth rates between the three subperiods is much greater than the difference in the growth rates of male and female wages within a given subperiod.

11. If the female wages would grow in the future at, for example, a rate of 2 percent per annum, in 1995 it would reach the male level of 1981, which would result in a time distance of about 14 years, which is still higher than at the beginning of the period and much higher than the lowest value of almost 5 years in 1970.

12. At the conceptual level, this dynamic framework also provides possibilities of discussions related to expectations, past growth experiences and future prospects. The importance of expectations in the interrelationship between growth and equality in income distribution is emphasized by Hirschman (1973) in his work on the changing tolerance for income inequality in the course of economic development. It is an excellent example in the developmental context of a very different reaction of people to the degree of inequality in different phases of the development process.

13. See Sicherl (1973).

CHAPTER II

1. Apart from an analysis of gender disparities at the macro level with internationally comparable data, the most promising trend in flexible adjustments of data for policy analysis in individual countries in the future is the mezzo level, i.e. various disaggregations and combinations of disaggregations between the macro and micro level which are most suitable for the particular problem in question. The flexibility allowed by the power of computers means at the same time, a greater diversity and the need to combine the parts of the mosaic in the overall picture. The emphasis on the multidimensional, long-term and disaggregated (but related to the overall situation) approach will become more and more pronounced in the future.

2. Because of wide differences in the growth rates for different indicators in the course of economic development, such differences in conclusions based on static measures of disparity or time distances across indicators are in reality the rule rather than the exception. For some analysis with regard to regional disparities and disparities between two countries covering a number of socio-economic indicators, see Sicherl (1973) and Sicherl (1980).

3. For details see Sicherl (1978).

4. $DM = M(t) - M(t-n)$, $DF = F(t) - F(t-n)$

5. See Sicherl (1973).

6. Sicherl (1973). The main trade-off to be resolved is now between the absolute static differences and the time distance, since they move in different directions when the overall growth increases or decreases over time. However, in essence this is the same type of a problem to be resolved as the question whether the static degree of disparity should be measured by absolute or relative difference or in which particular combination.

7. Efficiency in carrying out both specific women's programmes and in running the whole economy will have an effect on the growth rates for various indicators and on the growth rate of the resources which could be used for the advancement of women and for the welfare of the population in general. Higher efficiency is thus not only a means of reaching higher levels of satisfaction of needs faster but also an instrument for alleviating the problem of disparities, at least one dimension of it.

8. In this example the change over two decades (1960-1980) is measured. If the observed period is not the same throughout the analysis the difference in percentage points per year rather than per period may be more appropriate.

9. Here only an example of the method will be discussed briefly; in the next chapter the measures of occupational segregation will be discussed in more detail.

10. The distribution of total employment by ISCO groups is shown on the vertical axis of the figures. As in the course of economic development labor force moves out of agriculture, the share of ISCO group 6 diminishes in both comparisons: the comparison between Figure 7 and Figure 6 shows the change in a developing Asian country over two decades, and the comparison between Figure 7 and Figure 8 shows the difference between a developing and a developed country at a given point in time.

CHAPTER III

1. The original data in UNESCO (1983c) are given for years indicated in Table 3.2. For calculation of time distances the intermediate years were obtained by linear interpolation. When the value of time distance in Table 3.3 appears in brackets this means that it has been obtained by extrapolation outside the period 1960-2000. For instance, the value of 6 years for the third level for developed countries in 1965 was obtained by extrapolating the level of male enrolment ratio for 1960 16.5 percent backward by the average increase in enrolment ratio per year for the period

1960-1965 1.52 from Table 3.4 to obtain the level of the female ratio for 1965 of 14.9 percent. Namely, the calculation (16.5 - 14.9)/1.52 gives the answer of approximately 1 year, which means 1959, and the ex post time distance of 6 years.

Needless to say, the conclusions for the group of developed and the group of developing countries as a whole do not mean that each individual country within either group has shown the same tendencies.

2. The differences in this case are very small and the figures unreliable, so that it is not worthwhile to estimate time distances.

3. At the third level this is also a consequence of the increase in the static difference over time.

4. See also Schultz (1987).

5. For data on some developing countries see Psacharopoulos and Arriagada (1986).

6. For data on OECD countries see also OECD (1986a).

7. Another question is whether an equal sectoral distribution of employment between men and women is an aim to strive for. The measure is still useful, however, for descriptive purposes.

8. EUROSTAT (1983).

9. See As (1982), p. 93.

CHAPTER IV

1. As indicated in chapter 1, gender disparity does not necessarily mean gender inequity. An additional point to consider is that as in the national economy there is also a division of labor in the family. It may but need not be discriminatory. Such a specialization may be a result of rational choice to increase the welfare of the family. Thus equalization in consumption, education, health and similar welfare attributes has normative implications, while disparities in occupational distribution (and similar "intermediate" income generating activities) do not lead directly to such conclusions. See also the comment on interpretation of disimilarity indices and representation rates.

2. For a new index of infant and child mortality see UNICEF (1987).

3. Unfortunately, data on informal sector are difficult to obtain and it may take some time before the activities to improve this situation will produce satisfactory results on the international level. But this approach could be applied at lower levels of aggregation.

4. With analogy to consumer behavior it may be expected that disparities will be the least in the indicators related to the essentials (and to the quantitative aspects) and will be greater for "luxury" items (or for indicators of quality aspects in a given field).

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EXPLANATION OF SYMBOLS

t	time
r	rate of growth
X	value of the analyzed indicator
M	value of the indicator for males or number of males
F	value of the indicator for females or number of females
T	value of the indicator for total (i.e. average value without disaggregation by sex) or total number
A(t)	absolute static gender difference M(t)-F(t)
R(t)	relative static gender difference M(t)/F(t)
$S_{ij}(X_L)$	time distance for units i and j, for indicator level X_L
$S_{MFF}(t)$	male-female time distance for indicator level F(t)
$S_{MFM}(t)$	male-female time distance for indicator level M(t)
$S_{MFT}(t)$	male-female time distance for indicator level T(t)
S_{12E}	time needed for full equalization between units 1 and 2
RFT(t)	relative static difference females to total F(t)/T(t)
RMT(t)	relative static difference males to total M(t)/T(t)
IR(t)	female to male ratio F(t)/M(t)=1/R(t)
Ri(t)	rel. static gender difference for group i Mi(t)/Fi(t)
D..	absolute difference over the specified period of time
GR..	growth ratio over the specified period of time
wTi	share of category i in total
wFi	share of females in category i in total for females
wMi	share of males in category i in total for males
FRR(t)	female representation rate at the aggregate level F/T
FRRi(t)	female representation rate for category i Fi/Ti
CFRi(t)	coefficient of female representation FRRi(t)/FRR(t)
CMRi(t)	coefficient of male representation MRRi(t)/MRR(t)
wFi-wMi	absolute gender difference in shares of category i
DI	dissimilarity index
DI(MF)	dissimilarity index for male and female distributions
DI(FT)	disimilarity index for female and total distributions
DI(MT)	dissimilarity index for male and total distributions
RGAi(t)	relative group(category) to average gender disparity
FGAi(t)	relative group to average disparity for females
MGAi(t)	relative group to average disparity for males

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