

INTRODUCTION: INCOME DISTRIBUTION AND ECONOMICS

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* In writing this Introduction, we have drawn very heavily on the chapters of the Handbook. This will be evident from the extent of cross-references, although we have tried to stop short of the point at which such references become tedious to the reader. We are most grateful to the following for their comments on the first draft of the Introduction: Sam Bowles, Jim Davies, John Flemming, John Micklewright, Christian Morrisson, Sherwin Rosen, Tony Shorrocks and Gert Wagner. None of them should be held responsible for errors or for the opinions expressed.

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The produce of earth—all that is derived from its surface by the united application of labour, machinery and capital, is divided among three classes of the community, namely, the proprietor of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated.

But in different stages of society, the proportions of the whole produce of the earth which will be allotted to each of these classes, under the names of rent, profit and wages, will be essentially different. . . .

To determine the laws which regulate this distribution is the principal problem in Political Economy.

David Ricardo, Preface to *Principles of Political Economy*, 1817 (1911 edition, p. 1).

At the risk of appearing to lack imagination, it is difficult not to begin with this quotation from Ricardo, which is now a commonplace. Indeed, many people feel that it gives a better definition of economics in general than the other commonplace which begins so many textbooks, according to which economics is “the science of allocating scarce resources to competing uses”. But of course these are only two aspects of the same fundamental problem. Scarce resources are controlled or owned by personal interests and allocating them in one way or another modifies individual benefits. The allocation of scarce resources may thus reflect as much the way conflicts of interests are resolved as the pursuit of efficiency. It is difficult to think of economic issues without distributive consequences and it is equally difficult to imagine distributive problems without some allocational dimension.

But distributional issues have not always been regarded as important by the economics profession. There have been times in the postwar period when interest in the distribution of income has been at a low ebb: in the 1950s and early 1960s, and in the 1980s. There are several possible explanations for this lack of interest. In response to the critiques of welfare economics in the 1930s and 1940s, economists could understandably have decided to concentrate on efficiency questions. Indeed, it may have been the case that distributive outcomes were of little social concern, with the social welfare function being explicitly or implicitly indifferent with regard to the distribution of income. At a time of full employment and rapid growth, people may have justified such lack of concern by the argument that those at the bottom would gain more from employment policies and the promotion of economic growth than from redistribution. In many countries, there had been a significant reduction in income inequality between the 1930s and the 1950s. It may have seemed that differences in distributive outcomes were now of second order in comparison with changes in aggregates. Or, on the textbook

efficiency/equality trade-off, the cost of redistribution may have been judged too great in terms of reduced efficiency.

Today, at the end of the 1990s, the position is different. During the last quarter of a century, economic growth proved to be unsteady and rather slow on average. Europe has seen prolonged unemployment. There has been widening wage disparity in a number of OECD countries. It is no longer true of income distribution statistics, as Aaron once said, that “following these data was like watching the grass grow” (1978, p. 17). Rising affluence in rich countries coexists, in a number of such countries, with the persistence of poverty. Policy choices about privatisation, about monetary union, about the future of the Welfare State, all impinge on the distribution of income. It is difficult to think of an issue ranking high in the public economic debate without some strong distributive implications. Monetary policy, fiscal policy, taxes, prices and competition regulation, are all issues which are now often perceived as conflictual because of their strong redistributive content.

Economists have responded quickly to the renewed policy interest in distribution, and the contents of this Handbook are very different from those which would have been included had it been written 10 years ago. A large proportion of the references in this Handbook are to research published in the 1990s. It has now become common to have income distribution variables playing a pivotal role in economic models. The recent interest in the relationship between growth and distribution is a good example of this. The surge of political economy in the contemporary literature is also a route by which distribution is coming to re-occupy the place it deserves. Within economics itself, the development of models of imperfect information and informational asymmetries (see, for example, Chapters 8 and 10) have not only provided a means of resolving the puzzle as to why identical workers get paid different amounts, but have also caused reconsideration of the efficiency of market outcomes. These models indicate that redistribution can increase aggregate income. There may not be an efficiency/equity trade-off; it may be possible to make progress on both fronts.

Despite this, income distribution still remains rather peripheral in economics. We lack research that integrates distribution centrally into the examination of how the economy works. To the extent that it does enter the analysis, distribution is more like an input than an output. Distribution is taken as a parameter which affects the outcome of economic mechanisms. This is significant and has certainly changed our way of looking at many issues. We now understand that asset redistribution may improve allocative efficiency. However, distribution must also be the object of the analysis, or still more fundamentally, distribution must be considered jointly with other economic phenomena. When we look at it from this point of view, we then realize how little is actually understood about the determinants of distribution. The same is true at the empirical level. The conceptual and practical problems in using data on income distribution are not widely understood in the profession. As with the World Tables on economic growth, the ready availability of a secondary data-set such as that assembled by Deininger and Squire (1996), does not guarantee that users are aware of its subtleties. People do not always

stop to ask “inequality of what among whom?”. So that, even though we have made much progress over the last decade, a great deal is still to be done.

The aim of this Handbook is to survey the state of the art with regard to the economics of income distribution, and to provide a basis for the next generation of research in this important topic. Why do we say that it is important? First, as already indicated, the distribution of economic resources is a social phenomenon which has engaged social commentators and policy-makers. We believe that economists should be able to provide an explanation. This view sees distribution as the leading character in the play. We are asking how far economic theory is helpful in explaining the distribution of income, its evolution over time, the way it interacts with other economic and noneconomic phenomena, and the way it is affected by policy. This theoretical inquiry has an empirical counterpart. Statistical institutes or researchers publish evidence on the distribution of income on the basis of various statistical concepts and indices: dispersion of earnings, inequality of households net income after taxes and transfers, inequality of wealth, etc. Newspaper headlines proclaim that “poverty in Europe has increased” or that “the earnings gap is stretching” or that “the North-South divide is widening”. Are such empirical assertions complete and satisfactory? Do we always have the theoretical background to read these data, or is it necessary to generate other types of data to fit the theories we may have in mind?

Instead of having the distribution of income as the leading character of the play, we may have it as a supporting actor (the “input” view of its role). Income distribution assists our understanding of various fields of economics. In some cases, the relation is relatively obvious. It would be difficult to ignore the distribution of income when dealing with political economy mechanisms. In public finance, the design of optimal taxes depends critically on the role of distribution, since without distributional differences a uniform lump sum tax may well suffice. But there are also less visible ways through which income distribution enters the core of economic analysis. Aggregation is the methodological bridge between many distribution issues and more standard economic analysis, with consumer demand as the leading field. But there are other areas where distribution has played or is beginning to play a prominent role. It was clearly central to Marxian economics. It has always been prominent in development economics and it is now featuring in growth economics. Even if there were no ethical reason for studying distribution, it would still be required as a conditioning parameter in other economic phenomena.

This Introduction gives an account of the progress of the study of income distribution in economics and argues strongly in favour of a more systematic interconnection between economic analysis in general and distribution issues. This is done through reviewing the channels through which various fields communicate with each other, the notable achievements of recent years, and what we believe are the directions that research should take in the future. This has led us to consider income distribution issues from various, sometimes overlapping points of view. Intentionally, we have not tried

to avoid these overlaps which are essentially the proof that income distribution issues cannot simply be handled independently of the rest of economic analysis.

Section 1 starts the process of identifying the elements from which we can begin to construct a comprehensive theory of income distribution. Quite substantial progress has been achieved in developing various building blocks but their integration remains extremely difficult. We need to consider the way they should articulate with each other to get the complete picture. To this end, we commence with a simple model, showing how it relates to factor shares, to the unskilled/skilled wage differential debate and to computable general equilibrium modelling. Sections 2 and 3 develop this framework to allow for the accumulation of factors (Section 2), and for a richer treatment of the labour market (Section 3).

Section 4 is concerned with empirical research, illustrated by income distribution data for France in 1994. Finally, we turn to a set of issues which logically could perhaps have come first, and in the Handbook are indeed the subject of Chapter 1. The main character of the play we are watching should really be inequality, but like the “Arlesienne” in Bizet’s opera, one never sees it. Here, it is elusive because it has many economic and noneconomic dimensions. Income dispersion is strictly equivalent to economic inequality only in the most simple version of the standard economic paradigm. As soon as we deviate from this model, income dispersion becomes an approximation—sometimes a bad one—of true inequality. Identifying the sources of inequality, and the relation with theories of justice, are the subjects of Section 5.

The final part of the Introduction, Section 6, provides a guide to the contents of the Handbook.

1. Factor share theories of income distribution

No unified theory of income distribution actually exists. Even though several titles of books and articles announce quite ambitiously the statement of such a “theory of income distribution”,¹ they typically refer to only one part of what should actually be covered by such a theory: the determination of wages in the labour market, factor shares, the accumulation of wealth, etc. Rather than an unified theory, the literature thus offers a series of building blocks with which distribution issues are to be studied. Because of the natural complexity of the subject, however, no serious attempt at integrating them has really been made. We review in this section, and the next two sections, the various blocks and the most obvious links between them.

¹ The bibliography to this introductory chapter contains references to some of the key books and articles in the field. Among the general books in this field are Dalton (1920a), Meade (1964 and 1976), Bronfenbrenner (1971), Pen (1971), Johnson (1973), Blinder (1974), Tinbergen (1975), Thurow (1976), Lydall (1979), Atkinson (1983), Osberg (1984), Lambert (1989), Cowell (1995), Morrisson (1996), Jorgenson (1997), and Piketty (1997b).

1.1. A simple static and competitive framework

We open this review of the various building blocks of a theory of income distribution with a model inspired by the standard static Walrasian framework. This model works back from the end by taking as given the distribution of all productive factors in the economy and focusing on the rate at which they are paid. It is a simple model, but it underlies much of both applied and theoretical literature on income distribution, from the rudimentary practice of considering that income distribution is essentially linked to factor shares in the National Income to more elaborate treatments like the Computable General Equilibrium models of income distribution.

In a static framework, consider an economy made up of I individual units. We do not specify for the moment whether they are persons or households. Each individual i is endowed with a vector of productive factors, with components a_{im} . The number of components, M , of this vector may be large, so that this representation of individual endowments permits us to take into account not only aggregate factors like capital and labour, but also different types of (observable) capital or labour skills or abilities. Let there be K firms, indexed by k , each with some fixed factors of production, f_k , and able to produce various goods with some given technology. To close the model, assume full private ownership of the firms by individual agents and let θ_{ik} be the share of individual i in firm k . Supposing that all these goods and factors may be exchanged on competitive markets, with the vector of factor prices being denoted by w , the primary income of individual i is given by:

$$y_i = \sum_m a_{im} w_m + \sum_k \theta_{ik} \pi_k, \quad (1.1)$$

where π_k is the profit of firm k . The distribution of income $Y = (y_1, y_2, \dots, y_I)$ thus results from the combination of the multidimensional distribution of endowments, the matrix $A = (a_{11}, a_{12}, \dots, a_{1M}; a_{21}, a_{22}, \dots, a_{2M}; \dots; a_{I1}, a_{I2}, \dots, a_{IM})$, and the per unit returns to these endowments, w , and of the distribution of the ownership of firms within the population, that is the distribution of financial wealth, where the matrix is denoted by Θ . In such a framework, a theory of income distribution is essentially a theory of factor rewards, and this explains the location of the subject in many economic textbooks as part of the theory of pricing. Given the ownership distributions A and Θ , knowledge of factor rewards, that is the vector of prices and profits, determines the distribution of income.

Closing the model requires that we specify the way the factor rewards and profit are determined. The competitive equilibrium model is closed by determining the set of prices and factor rewards which equilibrate the demand and supply of the various goods and (variable) factors. This set of prices and factor returns is therefore a function of the distribution of endowments and wealth (ownership shares in firms) among individuals and of the distribution of fixed factors among firms. The reduced form of this competitive

model thus expresses the distribution of income Y as a function of the distribution of endowments, A , of wealth, Θ , and of technological factors summarised by the distribution F of the fixed factors among firms (see Bourguignon and Morrisson, 1990).

$$Y = H(A, \Theta, F). \quad (1.2)$$

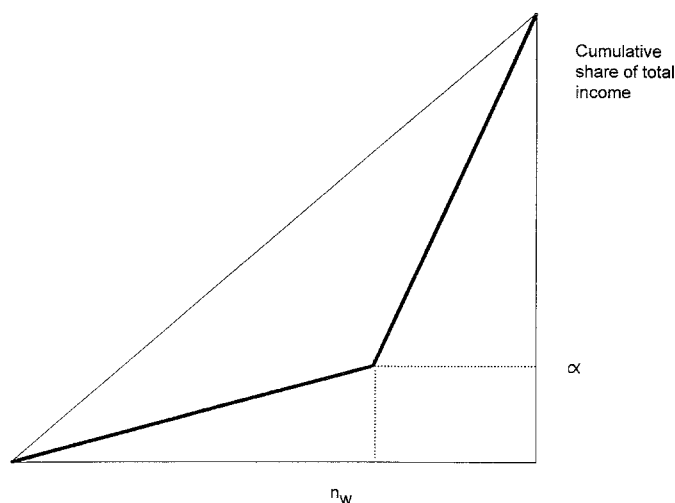
This general equilibrium formulation, or its partial counterpart (1.1) may be seen as the heart of the theory of income distribution and the basis for policy analysis in that field. It is generally used with a small number of dimensions to the key matrices. Consider first the case where there are two factors of production, raw labour supplied by workers who make up a fixed fraction, n_w , of the population and capital owned by capitalists, who do not work and make up $(1 - n_w)$ of the population. Then, according to Eq. (1.1) the relative distribution of incomes in the population depends only on the share of labour, denoted by α , and of capital $(1 - \alpha)$, in total income. This two-class economy (see Chapter 9, Section 2), reminiscent of Ricardo's statement recalled above, is probably the simplest justification for reducing the issue of income distribution to that of factor shares.

The effect of variation in factor shares is shown in Fig. 1, where we have drawn the Lorenz curve for this two-class economy. The Lorenz curve (see Section 3 of Chapter 2) cumulates people below a given income level and shows on the vertical axis the cumulative share in total income of the bottom $x\%$ of the population. Where incomes are unequal, this curve lies below the 45° line (the bottom $x\%$ have less than $x\%$ of total income until we reach $x = 100\%$). If the factor shares and relative population sizes are such that income per head of workers is less than that of capitalists, we have the situation shown in Fig. 1. The slope of the first segment is equal to α divided by n_w ; the slope of the second segment is equal to $(1 - \alpha)$ divided by $(1 - n_w)$. A rise in the wage share moves the Lorenz curve upwards and closer to the line of equal incomes. The overall extent of inequality is often measured by a summary measure, of which one of the most popular is the Gini coefficient, which is the ratio of the area between the Lorenz curve and the 45° line to the maximum such area (see Chapter 2, Section 4). In the present simple case, it is equal to the difference between n_w and α : if the wage share is 75% and workers are 90% of the population, then the Gini is 15%.

At the time that Ricardo wrote, the factor distribution was seen as directly relevant to the personal distribution, in that the different sources were identified with particular classes of people. As Musgrave described it,

For classical economists, this scheme was doubly attractive. For one thing, it was an analytically convenient grouping, the pricing of various factors being subject to different principles. For another, it was a socially relevant grouping, as the division of society into capitalists, landlords and workers gave a fair picture of social stratification in the England of the early nineteenth century (1959, p. 223).

Today, however, this is scarcely adequate, for several reasons. We need to explain the distribution of factor incomes *within* classes, such as the size distribution of wages. Why do Chief Executive Officers receive many times more than teachers? Why do airline



Cumulative proportions of population

Fig. 1. Lorenz curve for a two-class economy.

pilots get paid more than train drivers? In terms of Fig. 1, the Lorenz curves for the two segments are not straight lines but are bowed outwards (the slope of the Lorenz curve at a particular point is equal to the income at that point divided by the mean, so a bow shape indicates that earnings are different). Second, there is human capital: the investment which people make in themselves in the form of education, training or other activities which raise their productivity represents a determinant of production which has analogous features to investment in physical capital, and needs to be incorporated into the production function.

Third, rather than people being identified with a single source of income, they now receive income from a range of sources, so that one individual may be in receipt of wages, interest income and rent (for example, through owning a house). A worker is not simply reliant on wages. This means that we cannot draw any direct implications for the personal distribution from observations of changes in factor prices. Fourthly, there are intervening institutions: the production model referred to above does not explicitly allow for the existence of institutions such as corporations, financial intermediaries or pension funds, which stand between the production side of the economy and the receipt of household incomes. Corporations receive profits, part of which are paid out in dividends, but part is retained for further investment. Pension funds act as intermediaries. They own shares, real property and other assets, receiving the income from these assets and paying it out, or accumulating it, on behalf of the members of the pension schemes. Perhaps the single most significant intervening institution is the state. The gross incomes generated by production are modified by taxation, used to finance public spending, in-

cluding transfers which constitute a major source of personal incomes in industrialised countries.

These mechanisms modify the relation between factor returns and the personal distribution. Suppose that person i has a wage w_i and capital k_i :

$$y_i = w_i + rk_i. \quad (1.3)$$

Taking the coefficient of variation, V , as an alternative measure of inequality,² and defining ρ as the correlation between wages and capital, we find that the square of the coefficient of variation is given by

$$V^2 = \alpha^2 V_w^2 + (1 - \alpha)^2 V_k^2 + 2\rho\alpha(1 - \alpha)V_k V_w, \quad (1.4)$$

where V_w^2 and V_k^2 denote the squared coefficient of variation of wages and capital. The consequences of a rise in the profit share now depend on the relative dispersion of wages and capital and on the correlation between them. Already, the conclusions are becoming complex.

This treatment of distribution may be seen as the starting point of most competitive equilibrium theories of income distribution with a macro-economic focus. Other approaches, too, end up dealing with distributional issues in a similar way. Through the Stolper–Samuelson theorem which determines the way in which factor rewards change with the price of goods in international markets, the preceding formulation includes the analysis of the distributional consequences of international trade. (To introduce trade in the preceding framework, it is sufficient to assume that the prices of some goods are exogenously given and that the corresponding markets equilibrate through imports and exports.) It also includes the public finance approach to the distribution of incomes and the analysis of tax incidence which developed in the tradition of the Harberger model (see Harberger, 1962; Atkinson and Stiglitz, 1980: Lecture 6).

1.2. Skilled/unskilled wage differential

A second direct application of the preceding framework is the case where there are various types of labour, say, in the simplest case, skilled and unskilled labour. Thus, the endowment vector, a , in the preceding expressions has two components which take the value 0 or 1 depending on whether a person is skilled or not. A model of this kind

² The coefficient of variation is the standard deviation divided by the mean. Equation (1.4) is reached by using the formula for the variance of a sum, which is

$$\text{var}(X_1 + X_2) = \text{var}(X_1) + \text{var}(X_2) + 2\text{cov}(X_1, X_2)$$

(where cov denotes the covariance) and dividing by the mean squared. It should be noted that the coefficient of variation for wages is obtained by dividing by the mean *for wages*, which leads to the squared term in α , and the corresponding expression for capital income.

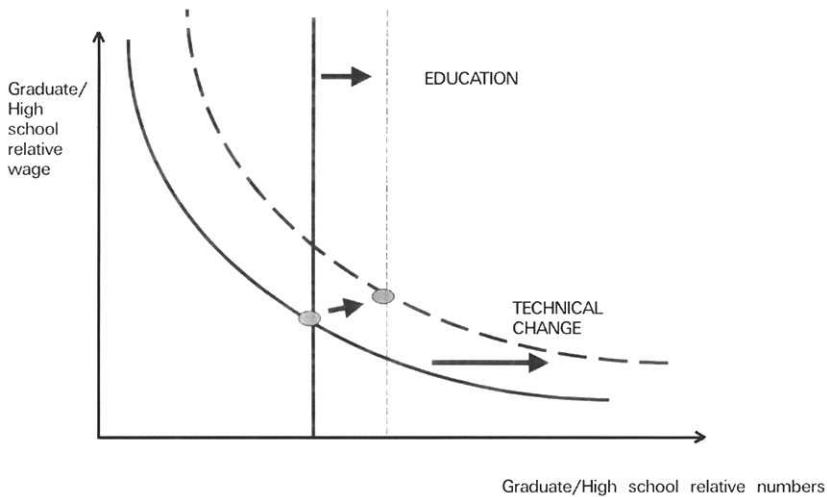


Fig. 2. Race between education and technical change.

was the basis for the “race” between technological development and education described by Tinbergen in his book *Income Distribution* (1975, Chapter 6). He referred to people being educated to graduate, or high-school, level. (The analysis refers to an advanced country, in that it assumes that everyone receives at least a high school education.) Total output is produced using graduate labour, high-school labour and capital. Tinbergen argued that the elasticity of substitution of the production function is sufficiently close to unity to warrant using a Cobb–Douglas form, with constant returns to scale and constant cost shares for graduate labour and for high-school labour. From this, we can obtain the profit-maximising choice of labour by competitive firms. Figure 2 shows the *relative* demands and relative wages of the two types of labour. If the relative supplies are fixed in the short-run, as shown by the vertical line, then we can solve for the market clearing wage ratio as indicated. The race is then between the growth in the relative numbers with graduate education and technological development increasing the importance of graduate labour in production. In the case shown, the demand shifts faster than the supply, so that the wage differential widens.

It is a model of this type which is invoked in the growing literature which tries to explain the recent increase in wage dispersion in several countries. This literature has sought to explain how, despite an increase in the relative supply of skilled workers, the wage differential could have increased over the last two decades, contributing to an increase in the dispersion of earnings. In terms of the preceding model, a natural explanation is that the evolution of technological factors produced a bias in favour of skilled labour, or in a multi-sectoral model, a bias in favour of sectors intensive in the use of skilled labour. An alternative explanation has to do with the effects of international

trade and the drop in the relative price of goods which are relatively intensive in unskilled labour (Wood, 1994). At this point, we should point out that, to avoid overlapping with the forthcoming chapter by Katz in Volume III of the *Handbook of Labour Economics*, we have not covered the empirical literature on earnings in the present volume. The reader is also referred to Levy and Murnane (1992), Katz and Murphy (1992) and Burtless (1995). The theoretical explanation of the earnings distribution as a whole is the subject of Chapter 7.

We have noted the lack of integration of different parts of the income distribution story. The discussion of widening wage dispersion as a result of skill-biased technical change has been conducted largely independently of any consideration of the contemporaneous rise in the real rate of interest, or, in most G7 countries, the rise in the share of nonlabour income. Can the technical change explanation of the shift in demand for unskilled workers be reconciled with the rise in the rate of return and in the capital share? In the competitive equilibrium framework, this depends on the degree of complementarity between factors in the production function. It may also be questioned how far the technological developments to which reference is commonly made, such as the spread of information technology, are well represented by a standard constant returns to scale production function. Network externalities require us to provide a dynamic treatment of the diffusion of an innovation, such as e-mail, and its increasing value as the network becomes more extensive. The explicit modelling of such technical change, and its distributional impact, seems a fruitful area for future research.

1.3. CGE modelling

More elaborate specifications of the preceding model have been used for an empirical analysis of the determinants of the distribution of income and redistributive policies. This is the “computable general equilibrium” (CGE) tradition. In the fields of international trade and taxation, numerical models have been developed which extended the basic principles of factor reward determination beyond the Stolper–Samuelson theorem or the Harberger model to more complex economic structures with more than two factors and two sectors of production (for a survey, see Shoven and Whalley (1984)). These models have had much success in the field of economic development (for a survey of these models, see Robinson (1991)). By distinguishing urban and rural labour markets, skilled and unskilled labour, the land cultivated by peasants or used in large plantations, it is indeed possible to take into account many factors with a direct and strong influence on the overall distribution of income. The topic of income distribution and development is covered here in Chapter 13 and in the *Handbook of Development Economics* by Adelman and Robinson (1989).

1.4. Capitalism and socialism

A variation on the two factor model may be used to examine the difference in distribution between different economic systems. What reason is there to expect less inequality in the personal income distribution under socialism? The most evident contribution to the reduction in inequality is that resulting from the abolition of the private ownership of the means of production. In terms of factor incomes, that part of national income received as profit and rent (both referred to here as “capital income”) in a pure market economy accrues under socialism to the state. Even if none of the spending by the state benefits individual citizens, this elimination of private capital income can in itself be expected to reduce substantially relative inequality.

Let us go back to the earlier class model, and assume, in an over-simplified way, that in a capitalist society a proportion $(1 - n_w)$ of the population receive income only from capital and they are all better off than the remainder who receive only income from work. The share of capital in total income is denoted by $(1 - \alpha)$, this being considerably greater than $(1 - n_w)$, and we have seen that this would lead to a Gini coefficient equal to $n_w - \alpha$. With n_w equal to 90% and α equal to 75%, the Gini is 15%. Suppose, more realistically, that we allow for differences among wage earners (in terms of Fig. 1, we allow the first section of the Lorenz curve to be bowed outwards rather than a straight line). Let the value of the Gini coefficient be G in a socialist society where there are only workers, with the same distribution of earnings as in the capitalist economy, and all capital income accrues to the state (and is not redistributed to the workers). In contrast, in the capitalist society the contribution of wage income to inequality will be proportionately smaller, by a factor $(1 - n_w)\alpha$, but the contribution of capital income will now add a term $(n_w - \alpha)$ to the Gini coefficient. With the figures used earlier, the Gini coefficient in the capitalist society is, as a percentage

$$G \times 0.9 \times 0.75 + 15.$$

If inequality in the socialist economy, G , were 20%, then the capitalist country would have a Gini coefficient of 28.5%. This comparison assumes that the profits accruing to the state provide no direct benefit to individual citizens. If profits accruing to the state were equally distributed to all workers, the difference between the two systems would be still wider. This would reduce the Gini coefficient among a society of pure workers by a factor of $(1 - \alpha)$, and, with the numbers used earlier, would mean a Gini coefficient for incomes of 15%. The combination of the abolition of private ownership, and the use of profits to finance social programmes (such as education, pensions, health care), has, on this basis, a substantial redistributive impact.

This simple model, taken from Atkinson and Micklewright (1992), is not meant to be a realistic description of any actual economy; it is intended only as an expository device. It does not, for instance, allow for profit and other income being appropriated by the ruling elite (on this, see Morrisson, 1984 and Atkinson and Micklewright, 1992, pages

169–170). How far distribution of income was different under Communist regimes, and the impact of transition to market economies, is the subject of Chapter 14.

1.5. Limitations

The limitations of the simple static Walrasian approach to income distribution are obvious. It misses major sources of income inequality or considers them as exogenous. Practically, the capital–labour income dichotomy explains a limited proportion of observed differences among households. Decomposing the dispersion of individual earnings with respect to skill, or more generally education or other definitions of human capital, usually explains a larger share. However, a considerable heterogeneity is left unexplained. It cannot be satisfactory to consider this residual as exogenous or, equivalently, as the result of purely “natural”, that is noneconomic, differences among individuals. This is especially so in view of the changes recently observed in this “unexplained” component of inequality in several countries and of the differences across societies.

To be more concrete, the distribution of income depends on that of personal endowments and assets, but nothing has been said so far about how the latter are determined. To do so, the theory must be made dynamic and must tackle the issue of the accumulation of productive factors. Moreover, the assumptions of competitive behaviour and market clearing may be questioned. In the macroeconomic theory of factor shares there has long been a strand of thinking that has emphasised the role of monopoly power (Kalecki, 1938). More within the mainstream, we may draw on recent work in labour economics, replacing the competitive assumption in the preceding framework by more realistic price, wage and employment determination mechanisms.

These two directions, of the dynamics of income generating factors and the micro-economics of the labour market, are the main aspects that we now consider.

2. Factor accumulation and income distribution

Making the preceding framework dynamic means that we have to model the way in which individuals accumulate the assets generating their current income and their shares in the various firms in the economy, as well as the way firms modify their fixed factors. The standard assumption is that these decisions are based on maximising behaviour, which means that the accumulation equations depend on the sequence of current and expected future factor rewards and prices. The accumulation equations have to be complemented, therefore, by equations giving the equilibrium prices of those factors, assets and firm shares which may be acquired on the market, as well as expectations of their future values. Together with Eqs (1.1)–(1.2), they would provide a full dynamic representation of the economy, the distribution of current income and that of all assets. It is a *dynamic general equilibrium* model of this type which should be invoked to explain the determinants of income distribution at a point of time, and the way it changes over

time with the economy. Clearly, however, this model is much too complicated to be analyzed in general terms and the literature has focused on extremely simplified forms of it. Given the difficulties which economic theorists have found in explaining the dynamic behaviour of aggregates, this may perhaps be forgiven!

In what follows we briefly review the main directions which have been explored. The most elementary version of the accumulation equation—and practically the only one being used—refers to the case of a single asset being accumulated by individuals who are identical apart from their level of assetholding. The canonical model is written in its simplest discrete form as:

$$A_{i,t} = \rho A_{i,t-1} + a + \epsilon_{i,t}, \quad (2.1)$$

where $A_{i,t}$ is the level of assets owned by person i at time t , ρ and a are two positive constants, and $\epsilon_{i,t}$ a random term representing exogenous shocks to the accumulation process. The latter are supposed to have zero expected value and to be identically and independently distributed across periods and persons, with variance σ^2 . In what follows, we shall refer to A as being the total “wealth” of a person, comprising both conventional financial wealth and human capital, except when otherwise specified.

As simple as it may be, model (2.1) can be invoked to represent various theories of income distribution.

2.1. Stochastic theories

Stochastic theories (see Chapters 7 and 11) emphasize the role of the term, ϵ . In the simplest model A stands for the logarithm of wealth, or income, and ρ is equal to unity (and a to zero). The logarithm of wealth thus follows a random walk. After some time, it is distributed lognormally among individuals whereas its variance increases linearly with time. This is simply another statement of the well-known Gibrat’s law (Gibrat, 1931)—see Aitchison and Brown (1957). The model with $\rho < 1$ corresponds to the mean reversion process introduced by Galton (1879)—see also Kalecki (1945). Subtracting the mean of the (log) wealth from both sides of Eq. (2.1) shows that the expected value of the change in the deviation from the mean is negative for persons with wealth above the mean and positive below it. The distribution of wealth or income tends toward some limit which depends only on the characteristics of the distribution of ϵ and on ρ . Writing $\text{var}(A)_t$ for the variance of $A_{i,t}$, we have

$$\text{var}(A)_t = \rho^2 \text{var}(A)_{t-1} + \sigma^2, \quad (2.2)$$

so that the variance of the logarithm of wealth converges to $\sigma^2/(1 - \rho^2)$. There is continuing inequality, but it is generated by the stochastic term. The “economics” that enters via ρ determines the degree of magnification of the inequality due to the stochastic term, and the convergence or otherwise of the process. Where $\rho < 1$, the process converges more rapidly, the smaller is the value of ρ . If $\rho > 1$, then the process is explosive and

leads in infinite time to a degenerate situation of maximum inequality, where the share of total income or wealth owned by the richest tends towards unity. Other models have been built along similar lines. They exhibit different dynamic patterns and limiting distributions. In the model of Champernowne (1953) the distribution tends toward a Pareto distribution rather than a lognormal distribution. This result is obtained by replacing the stochastic specification in Eq. (2.1) by a Markov stochastic process with a particular set of probabilities of transition across discrete wealth intervals of uniform proportionate extent.

These stochastic models have been repeatedly criticised as lacking economic content. According to Mincer,

From the economist's point of view, perhaps the most unsatisfactory feature of the stochastic models ... is that they shed no light on the economics of the distribution process. (1958, p. 283)

By this he means that they do not incorporate individual optimising behaviour:

it is difficult to see how the factor of individual choice can be disregarded in analysing personal income distribution. (1958, p. 283)

From this point of view, the stochastic models are not fundamentally different from assuming that the distribution of productive assets in the economy is exogenous as was done in the preceding section. This criticism can be overstated, in that optimising models may simply push the explanation back one stage. But if we are to go beyond a description of the dynamics of income and wealth, then we need a fuller understanding of the determinants of the distribution of income. If we stick to the simple linear model (2.1), the economic analysis must bear on the mechanisms which determine ρ and whether $\rho \leq 1$.

2.2. *The dynastic consumption model as a benchmark and the ambiguity of bequest theories*

The standard microeconomic model of intertemporal consumption allocation (see Chapter 11) should give some information on the value that may be expected for ρ . However, different assumptions in this model lead to different values. A benchmark is offered by the "dynastic" model where the altruism of a person extends to his/her descendants, their descendants, the descendants of their descendants, and so on for an infinite future. This is equivalent to assuming that the person lives forever and optimizes over an infinite horizon. Under the assumption of strict demographic replacement, the budget constraint is:

$$A_t = (1 + r)A_{t-1} - c_t + \epsilon_t, \quad (2.3)$$

where c_t is the flow of consumption at period t , and, as before, A includes both conventional financial wealth and human capital, and ϵ is the stochastic term. If the utility of consumption is assumed to be additive and quadratic, and if the time discount rate

is assumed to be equal to the rate of return, r , on wealth, then the maximization of the expected value of the discounted sum of utility leads to Eq. (2.1) above with $\rho = 1$ and $a = 0$ —see Deaton (1992, p. 183). In other words, the optimal consumption at each point of time is simply the income flow from wealth. Wealth, income and consumption all follow a random walk. It follows that their variance in the population increases linearly with time.

There is evidence that the dispersion of consumption expenditures tends to increase continuously with age in a given cohort, see Deaton and Paxson (1994). So, the preceding model could be satisfactory for an intragenerational theory of income and wealth distribution. However, it does not seem to fit the most obvious stylized facts of the intergenerational transmission of inequality, and in particular the apparently nonincreasing variance of wealth. The reason why the preceding model may be less adapted for intergenerational issues is that it relies on a rather extreme form of altruism. If agents were selfish agents and indifferent to the fate of their descendants, then with a fixed and certain lifetime, wealth should decrease at the end of one's lifetime and be equal to zero at death. With such a theory, bequests should essentially be involuntary and mostly explained by the natural uncertainty of life duration, coupled with the absence of a good annuity market. But a host of intermediate cases may be envisaged where bequests enter personal utility and transfers to children are made at death or during one's lifetime under the form of human capital. Fertility behaviour must be taken into consideration since the number of descendants directly affects the intergenerational discount rate. Differences in family size are also important. Large families mean that, with equal division, wealth is divided more rapidly; where families die out, on the other hand, wealth passes into other hands.

There is a rich literature on the simultaneous determination of fertility and intergenerational transfers of wealth and/or human capital which has been largely influenced by Becker—see in particular Becker and Tomes (1979, 1986) and Becker and Murphy (1988). This explains why there seems to be regression to the mean in wealth and earnings across generations. However, this finding is consistent with many theories of intergenerational transmission of wealth and human capital and it does not seem to be possible to discriminate in any simple way between them. There remains considerable ambiguity about what motives actually drive bequests—see for instance the survey by Kessler and Masson (1989) and Chapter 11. Consideration has also to be given to the division of estates and the role of social and legal norms—see Meade (1964), Stiglitz (1969), Blinder (1973) and Atkinson (1980). In our view, the role of inheritance is an important area for future research.

2.3. *Heterogeneity in the accumulation factor ρ and human capital theory*

In the previous models, heterogeneity across individuals arises essentially because of the idiosyncratic shocks, ϵ , which are distributed independently across persons, and their accumulation over time through the factor ρ . The economic theory of distribution

thus appears as a theory of the transformation, through wealth accumulation and inter-generational transmission behavior, of these idiosyncratic shocks into some permanent inequality of income and wealth. However, individuals are likely to differ not only in the income shocks that have hit them in the past but also in preferences and tastes. These may correspond to the degree of altruism of persons, their preferences for number of children, or their risk aversion. If there is independence of the idiosyncratic shocks, ϵ , and if ρ is the same and below unity for a group of persons, we know that the distribution of wealth within that group tends asymptotically toward a well-defined limit. With heterogeneity of ρ within the population one can thus say that the overall limit distribution is a mixture of the preceding asymptotic distributions. But short-run dynamics may be much more complex.

Such heterogeneity is behind the theory of human capital and income distribution initially introduced by Becker (1967), which is different from Mincer's (1958) original model where the accumulation of human capital in formal education is not essentially different from the accumulation of another financial asset. Becker's framework is in fact close to the static general model considered above. The total human capital asset owned over his/her lifetime by an individual is determined by the equalization of the (individual specific) marginal return and marginal cost. This essentially makes the total amount of the human capital asset operated by person i an individual specific function of the market prices which are behind the marginal cost and marginal return schedules, that is wage rates and the rate of interest.

An explicitly dynamic human capital accumulation framework with heterogeneity in ρ leads to the cross-over phenomenon of life-cycle earning paths noted by Mincer (1970). If human capital is accumulated continuously during one's lifetime according to a process of type (2.3) but if the return, r , on this investment is individual specific, then the corresponding accumulation speed, ρ , differs across persons. Two persons starting with the same initial human capital will end up with different levels after some time. Moreover the consumption of the more able person will be smaller at the beginning of his/her lifetime, since he/she invests more, and larger at the end since he/she has more capital. It follows—see Chapter 7—that the dispersion of earnings as a function of age is U-shaped, a conclusion different from that obtained above.

In such a model, and in Becker (1967), the cause of income differences, apart from the stochastic terms, is the difference in “abilities”; we have therefore simply pushed the explanation back one stage to the explanation of these ability differences. We return to this in Section 3.

2.4. Market imperfections and wealth dependent accumulation rates

A second source of nonstochastic heterogeneity lies in the initial endowments of wealth. In the shortrun, these are clearly important, and they may leave a long shadow on the distribution. Differences in initial endowments acquire particular interest, however, when there are reasons to expect them to persist. This cannot happen with the simple linear

Eq. (2.1), but allowing ρ to depend on A in Eq. (2.1) makes the difference equation nonlinear and introduces new possibilities. This small change of assumption may allow us to account for what could be called “economic” as opposed to “natural” sources of inequality.

The simplest reason why the accumulation factor may depend on the level of wealth has to do with market imperfections. Because of asymmetries between lenders and borrowers leading to moral hazard and risk selection problems, people with a low level of wealth cannot borrow against future incomes or can do so at a rate of interest which depends negatively on their current wealth used as a collateral. This important aspect of the income distribution is treated in depth in Chapters 8 and 10. For people actually constrained by capital market imperfections, the optimal strategy in the standard life-cycle or dynastic consumption-saving model will be different from that described above, whether accumulation concerns conventional wealth or human capital. The significance of these factors is likely to vary from country to country depending on the institutional arrangements for the financing, in particular, of education.

In the field of human capital, and financing entrepreneurship, these imperfections can perpetuate inequalities. The argument which follows is inspired by Galor and Zeira (1993)—see also the synthetic presentation of this model in Atkinson (1997). Consider the case of human capital accumulation in children, and abstract for the present from stochastic factors. Poor parents are liquidity constrained. Even though accumulation increases with the initial level of capital, A , at rate ρ (assumed to be < 1), it is taking place at a low rate (since human capital and hence earnings are low) and they know that their children will also be constrained. At the top of the distribution, rich parents are not liquidity constrained and do not expect their children to be. Therefore, accumulation proceeds at a higher level, although again it increases marginally with A at rate ρ . In the middle of the distribution, parents are in a situation such that if they accumulate enough, they will be able to borrow to pay for their children’s education, or maybe to free their children from the liquidity constraint. Moreover, the more they accumulate the lower will be the rate of interest on their loan. The rate of return on their savings is thus marginally much higher than in the two preceding cases and they accumulate faster. Instead of being a linear locus in the (A_{t-1}, A_t) space, the wealth dynamic Eq. (2.1) now has the shape shown in Fig. 3. It is nonlinear, and—most importantly—it is nonconcave. There may be one or three intersections with the 45° line. In the case depicted in Fig. 3, there are two locally stable equilibria at points E_1 and E_3 to which individual wealth may converge. In the absence of random shocks, the limiting distribution is determined by the initial distribution: the proportion of people ending up at E_1 is the proportion of people initially on the left side of the unstable equilibrium point E_2 . It is the nonconcavity introduced by the capital market imperfection which is important, as demonstrated by Bourguignon (1981) in a model with a nonconcave savings function which leads to a locally stable equilibrium with persistent inequality among otherwise identical people.

Unlike other models reviewed so far, where income and wealth inequality essentially result from “natural” differences across individual talents, preferences and chance,

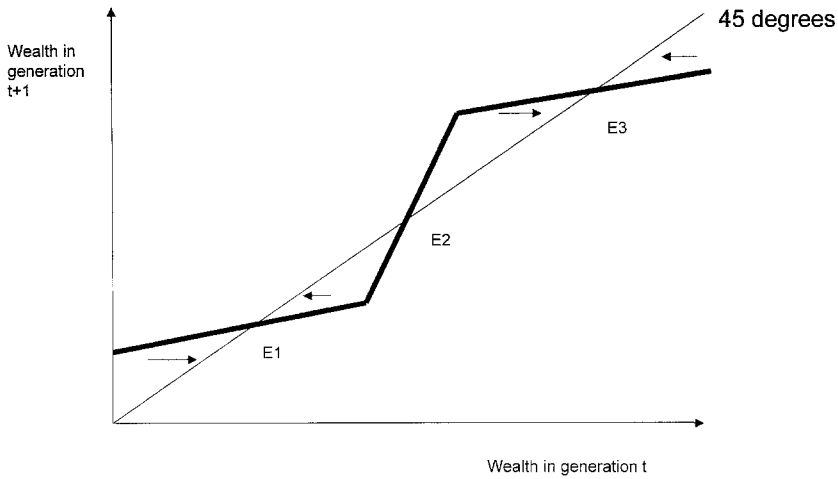


Fig. 3. Wealth accumulation process with imperfect capital market.

possibly compounded by economic phenomena, the nonconcave models just described generate inequality *ex nihilo*. Two persons, or dynasties, with very similar initial wealth, but on different sides of E_2 , end up with different long-run wealth. Some people are “trapped” at a low wealth level. Of course, if we re-introduce stochastic terms into the Galor–Zeira model, then there is a positive probability that a family below E_2 will be taken above by the random shock. In this sense, the notion of a “trap” is a fragile one. One would expect that, taking into account the random shocks, ϵ , the asymptotic distribution of wealth would be a mixture of two distributions defined by the frequency of ϵ and, roughly speaking, centred around E_1 and E_3 .

2.5. Accumulation rates with endogenous prices: distribution and growth

All the preceding dynamic theories of the distribution of productive assets assume that the price system, as summarized by the rate of return on wealth, is exogenous—even when depending on personal wealth as in the preceding model—and independent of this distribution itself. This is in contradiction with the dynamic general equilibrium framework outlined at the beginning of this section, where the personal distribution of assets, the distribution of fixed factor among firms and the price system all depend on each other and change simultaneously, except at a steady state. In this general framework, the rates of return of the various assets as well as their rates of accumulation should all be functions of the distribution of assets itself. A simpler case is when there is a single asset the return on which possibly depends on the total volume available of that asset. By allowing the accumulation rate, ρ to depend on the rate of return to the productive

asset, the individual accumulation Eq. (2.1) then provides a link between growth theory, factor shares and the personal wealth or income distribution.

This relationship was first analyzed within the framework of Solow's aggregate neo-classical growth model by Stiglitz (1969). In the present framework, his argument may be summarized and generalized by rewriting the individual accumulation Eq. (2.1) as, taking A now to exclude human capital:

$$A_{i,t} = \rho[r(K_t)]A_{i,t-1} + \alpha_i(K_{t-1}) + \epsilon_{i,t}, \quad (2.4)$$

where K_t is wealth per capita in the economy, $r(\cdot)$ its rate of return which in the neoclassical model is a decreasing function of the mean wealth, $\rho(\cdot)$ is as before the rate of accumulation of wealth, but its positive dependence on the rate of return r is now explicit, and $\alpha_i(\cdot)$ stands for the effect of nonwealth income—essentially earnings—on accumulation.

The key new feature is the feedback from accumulation to the rate of return. Suppose we ignore the stochastic element. With an identical linear savings relationship, as in the main model analysed by Stiglitz, the behaviour of aggregate capital follows an aggregate version of Eq. (2.4):

$$K_t = \rho[r(K_t)]K_{t-1} + \alpha(K_{t-1}), \quad (2.5)$$

where $\alpha(K_{t-1})$ denotes the aggregate effect. If the aggregate economy converges to a steady-state level of capital, then this implies that $\rho(\cdot)$ is less than unity, and hence that ultimately the individual wealth-holdings also converge. Such steady-state convergence is guaranteed for example where savings are a constant proportion of total income. With no random component, the wealth distribution would tend toward an egalitarian distribution after some threshold of wealth per capita has been reached. Before then, however, $\rho(\cdot)$ is larger than unity so that inequality may initially increase. In summary, this modification of the original linear dynamic Eq. (2.1) consists of finding an economic reason for the accumulation rate ρ to vary over time and to end up at less than unity. The reason given here is the decline in the rate of return on wealth due to the aggregate accumulation.

In the preceding model, it is growth, or economic development, that determines the evolution of the distribution of wealth. Because of the linearity of the individual accumulation Eq. (2.4), the distribution of wealth or income has no impact on the aggregate evolution of the economy. Different results may be obtained by modifying the assumptions about the model of growth and factor shares behind the functions $r(\cdot)$ and $\alpha(\cdot)$. In the model of Bertola (1993), people are identical in all except their wealth and their labour endowment. There are no random disturbances. People are infinitely-lived and maximise identical iso-elastic and additive utility functions. They face the same interest rate, and choose the same rate of growth of consumption. The economy grows steadily at this rate. As Bertola shows (see Chapter 9), nonwealth income is optimally

entirely consumed, so that the $a(\cdot)$ term itself disappears. People with no capital do not accumulate any. On the other hand, those with capital must save in order to keep up, and the initial heterogeneity is perpetuated. There is no feedback from growth to the distribution. On the other hand, Bertola goes on to posit a politico-economic mechanism for the determination by the median voter of taxation which affects the rate of growth. Different people have different interests depending on the ratio of capital to labour in their income. The growth rate is then potentially affected by changes in the location of the preferred choice of the median voter relative to that of a person with a factor bundle equal to the mean. In this way there is a link between distribution and growth.

To be complete, the imperfect capital market theory described earlier can be combined with the preceding endogenous determination of the rate of return on wealth. However, we can no longer simply assume that r and α are determined as previously by the aggregate wealth in the economy. Unlike the preceding models based on Eq. (2.6), there is no dichotomy any more between the (initial) distribution and the equilibrium price system, at least in a closed economy. Following the dynamic general equilibrium specification mentioned earlier, the price system at a point of time is that which equilibrates the demand for investment and the supply of savings. If this is the case, then the imperfection of the credit market implies that the current distribution of wealth and income in the economy affects its rate of growth, and that in turn the growth process modifies the distribution. Recent work on modelling this complex interaction includes Aghion and Bolton (1997) and Piketty (1997a)—see Chapter 8.

Here lies the frontier. Starting from a considerable simplification of the general dynamic specification of the distribution of assets, the literature is progressively integrating an increasing part of the complexity of this process. A better understanding of the basic mechanisms responsible for the evolution and the persistence of inequality has certainly been obtained. The research programme corresponding to the dynamic general equilibrium formulation is, however, far from realised, and further progress is to come. For instance, expectation formation and properties of expectational equilibria are being analysed as a possible cause of persistent inequalities—Piketty (1998) and Chapter 8.

3. Labour market and income distribution

The general static Walrasian theory of income distribution with which we began in Section 1 showed how income accrues to individuals as a remuneration of the various assets they own, which are supposed to be observable, homogeneous and therefore tradable on possibly perfectly competitive markets. Section 2 then reviewed how these assets were accumulated and how their distribution was determined. Such a framework seems adequate to handle income distribution issues where the underlying assets are readily identifiable factors like land or financial assets. For labour earnings, however, things are not that straightforward. Human capital theory allows us to represent that aspect of earnings which results from explicit accumulation behavior in formal education and

further training, but it may be considered as too simple a view for earnings distribution issues. Presumably, there is more than the remuneration of a single factor in individual earnings and any theory of distribution should take explicitly into account such things as natural talents, abilities, or effort, which are commonly invoked to explain why one person earns more than another. In general, these determinants of earnings are not homogeneous within the population, they cannot be accumulated and they often are difficult to observe. There is no market for them and therefore no price, so that the basic income generation Eq. (2.1) above seems inappropriate to deal with such issues.

A possibility would be to simply ignore these factors altogether. Talents are unobserved determinants of earnings; and economic theory should concentrate on observable factors while allowing for some “residual” describing natural disparities among persons. Such a reasoning may be behind the numerous attempts since Pareto (1897) at finding a regularity in the distribution comparable to that of physical characteristics like size or weight. However, as with the stochastic term, ϵ , in the dynamic models above, the issue is whether the observed distribution of earnings is simply that of that random component—conditionally on observable earnings determinants like education or job experience as proxies for human capital—or whether economic mechanisms are responsible for the transformation of the natural distribution of talents and abilities into a distribution of earnings which is more or less skewed. We briefly review the various theories found in the literature, covering ground which is surveyed in detail in Chapter 7.

3.1. *Selection theory as an economic explanation of skewness*

One class of models explains the skewness of the distribution of earnings by the assumption that earnings result from the multiplication of many factors which are themselves independently and approximately normally distributed. This may be seen as largely ad hoc, and somewhat tautological. Although it was long ignored, a more economic explanation of the skewness of the distribution of earnings was offered in the 1950s by Roy (1951) and Tinbergen (1956). This model (see Chapter 7) contains the essence of what is nowadays referred to as “selection” mechanisms, which are at the heart of modern representations of the functioning of the labour market.

Suppose that individuals are endowed with quantities of various homogeneous talents which are distributed lognormally. Suppose also that there are two sectors in the economy which weight differently these talents. The earnings of an individual are y_1 in the first sector and y_2 in the second. If everyone works in the same sector, then the distribution of the logarithm of earnings is normal. But, with free entry and perfect competition in both sectors, each person selects the sector which pays him/her best. His/her actual earnings will thus be given by the self-explanatory “selection” rule:

$$y = \text{Max}(y_1, y_2). \quad (3.1)$$

It is easy to see that, if talents in the two sectors are not perfectly correlated, then the distribution of the logarithm of earnings is skewed to the right (see Heckman and Honoré, 1990, p. 1132). The nature of the sorting which takes place in this model is set out clearly by Neal and Rosen in Chapter 7.

This model may be made more complex by making different statistical assumptions about the primary distributions of earnings in the two (or more) sectors. From an economic point of view, in one sense this selection theory is not far from the basic competitive model (1.1): one could simply say that a person in the labour market is endowed with quantities of two assets which are themselves combinations of his/her innate talents. Each of these assets has a price which is set competitively. Indeed, if firms in sector 1 want to hire more people, they simply increase proportionally all the y_1 , until the selection rule supplies them with as many people, or efficiency units of labour, as they require.³ So each person is remunerated proportionally to the labour asset he/she owns. The difference is that he/she cannot sell both at the same time (being, in effect, rationed) and thus opts for the most remunerative. Choice therefore enters the explanation of the earnings distribution: it is not purely the result of a given distribution. To account for this choice, some form of supply function should be introduced in front of some of the assets in Eq. (1.1), as well as in the market equilibrium equations which determine the rates of return. Of course, things become much more complicated and the results which can be obtained from the standard Walrasian construct may not apply any more.

3.2. *Involuntary selection, segmentation and discrimination*

Interpreting the selection model as some kind of rationing makes it necessary to distinguish between voluntary and involuntary selection. In the preceding model, rationing occurs because a person cannot sell physically his/her labour twice. However, he/she remains free to choose in what sector or occupation he/she actually wants to work. On the contrary, involuntary selection imposes this choice.

This brings us to models of labour market segmentation. Wages are fixed in some firms or some sectors, at a level above the competitive rate for a given type of labour. Workers outside this privileged segment of the labour market would like to enter, but the number of openings is limited and rationing occurs according to some scheme which is arbitrary or partly dependent on the characteristics of the workers. Several mechanisms have been invoked to explain this segmentation of the labour market and the wage dispersion that it creates. Efficiency wages explain why competitive firms may prefer to pay a wage rate higher than that observed in the rest of the market. The existence or the uneven strength of labour unions, and more generally the distinction between insiders and outsiders in the internal labour market made up by large and medium firms, may

³ For an illustration of these mechanisms and their implications for the distribution, as well as for an econometric estimation of the Roy model, see Heckman and Sedlacek (1985).

be another cause of segmentation. On these themes see respectively Akerlof and Yellen (1986) and Lindbeck and Snower (1988).

An extreme case of segmentation is labour market discrimination by which some individuals in the labour force are simply prevented from being hired in some jobs or at some wage levels on the basis of their ethnic origin or their gender. For references to different theories of the economics of racial discrimination, see—in addition to Chapter 8—Becker (1957), Arrow (1972), Phelps (1972), Marshall (1974) and Reich (1981). On gender, see among others, Amsden (1980), Fuchs (1988), Gunderson (1989), Folbre et al. (1992) and Polachek and Siebert (1993, Chapter 6).

3.3. *Imperfect information on workers' and jobs' characteristics: sorting and matching*

It was supposed until now that all players in the labour market had perfect information on the characteristics, ability and skill of employees or potential employees. This is not the case, however. Guessing the productivity in a specific firm of a person being hired is actually difficult not only for the employer but also for the employee. Productivity depends on imperfectly known characteristics of both the worker and the firm. It takes time to realize whether or not a marriage in the labour market is successful. From the point of view of the distribution of earnings, the uncertainty arising from this imperfect knowledge and the strategies to overcome its effects may explain why the shape of the observed distribution of earnings can differ from that of the distribution of abilities or productivities. More or less efficiency in learning about the quality of a match, or in sorting out employees or jobs with higher productivity, may mean more or less inequality in the distribution of earnings.

Matching and sorting models may be considered as dynamic extensions of the basic selection mechanism analyzed above and their distributive implications are similar. To understand the intuition of these models, suppose that the first match of any entrant on the labour market with an employer is random and yields some level of earnings, the logarithm of which is denoted by y_1 . Suppose that another opportunity is given to all employees to change job at a subsequent period after some uncertainty on productivity or job characteristic has been resolved. This is more or less equivalent to assuming that the new matches are drawn randomly. Those finding a better match actually change jobs and others stay with their initial job. If y_2 is the second draw, earnings after round 2 are simply given by Eq. (3.1). If the “natural” distribution of abilities, that is of y_1 and y_2 , is symmetric, then that of actual earnings after period 2 will be skewed. Assuming that new possible matches are drawn at regular time intervals, or equivalently that new information about a given match is revealed, then one should observe that: (a) individual earnings in a cohort increase with age, (b) the skewness of the distribution of earnings increases with age. Actual models are much more elaborate than this simple story, but they lead to the same kind of results (see Gibbons and Katz (1992) and Sattinger (1993)).

In addition to the selection mechanism that produces skewness starting from a symmetric distribution of personal abilities, random information acquisition and optimal dynamic job strategy give an interesting dynamic dimension to sorting and matching theories. They have something comparable to the dynamic models of asset accumulation briefly reviewed in the preceding section, the asset being here the information on the best jobs available. To the extent that this accumulation process is independent of the action of agents, it might enter the class of “stochastic” dynamic models defined above. However, it is possible to introduce in the basic framework described above some choice by employees among different sectors, search behavior and possibly some equilibrating wage setting mechanisms, all these extensions leading to more complex dynamics (see Jovanovic (1979) and Chapter 7).

3.4. Imperfect observability of effort and agency problems

The need to provide incentives to employees because of the unobservability of their effort gives another example of a situation where economic mechanisms introduce a wedge between the natural distribution of productivities and that of earnings. In the canonical model of agency theory of the determination of earnings, the observed productive performance of employees is equal to the sum of the effort they devote to their task and a zero mean stochastic term (“noise”). The latter prevents employers from observing and rewarding effort. To maintain effort incentives, the optimal labour contract consists then of remunerating workers whose performance is above some threshold, z , at a level, y_1 , above the remuneration y_2 given to workers whose performance falls below z . The threshold, z , and therefore the number of workers paid the higher level of earnings, as well as the earnings differential $y_1 - y_2$, depend on the cost of effort for workers and the distribution of the noise term. (For references to contract theory, see Macho-Stadler and Pérez-Castrillo, 1997; Salanié, 1998.)

From a distributional point of view, this theory of earnings determination is interesting because it explains earnings differentials between persons who are strictly identical in the sense that they have strictly the same productivity and offer the same effort. Inequality arises here from the imperfect observability of these characteristics, and the impossibility for workers to insure against the risk of negative noise in the observation of their performance. It might be thought under these conditions that earnings would reflect actual productivities and would be distributed like the noise term in the observation of performances. The theory tells us, however, that this is not the case and that the ex-post distribution of earnings is biased in comparison with the distribution of actual performances, the extent of the bias depending on purely economic factors. Extensions of the preceding basic model to tournaments (Lazear and Rosen, 1981, Green and Stokey, 1983; Nalebuff and Stiglitz, 1983) allows us to understand the determinants of the hierarchical structure of earnings within a company, whereas the extension to an intertemporal framework suggests determinants of individual earnings profiles over their career. Rewards and incentives within teams are discussed in Chapter 10.

3.5. *Conclusion of our theoretical tour d'horizon*

Our tour of various theories relevant to explaining the distribution of income has encompassed a number of theoretical developments in the micro- and macrotheory of factor pricing and factor accumulation. This is not surprising. A theory of income distribution must draw on the union of what is known about the pricing of the assets whose services individuals can sell on the market, to which we should add the possible rents or quasi-rents that may accrue to individuals for noncompetitive positions that they may hold and the dynamics of the competitive structure of an economy. At the same time, it should be clear why we initially referred to “building blocks” of a theory of income distribution rather than to a unique theory. There is at present no unified economic theory of income distribution. This should be seen as the reflection of the complexity of the world in which we are living and not as the sign of some fundamental weakness of economics. As is described in more detail in the following chapters of this Handbook, we have learned a great deal about different pieces in the puzzle. These pieces all help us understand why inequality of income is higher in one country than another, or in one sector than another, or in one period than in another. There is little doubt that some countries are more unequal than others in terms of the distribution of the ownership of land and capital and that this has a direct impact on inequality comparisons. There is little doubt that bequest behavior is important in explaining the persistence of such inequality. There is little doubt that changes in factor shares have on occasions important effects on the distribution of income. There is little doubt that the functioning of the labour-market and its regulation has a direct impact on the distribution of earnings. Taken independently, our theoretical building blocks are thus useful analytical instruments, which have undergone continuous progress over the last two or three decades and continue to do so. Thanks to this progress there are certain things that we now understand much better. But this is not a reason for not trying to integrate more closely all these components of the theory.

4. **Working with income distribution data**

The preceding section reviewed existing economic theories seeking to explain the distribution of income. The empirical counterpart of these theories consists of comparing income distribution data across various societies or at different points of time for the same society. The intellectual challenge is then to try to relate observed differences to a set of exogenous characteristics of the societies being analyzed and to see whether the relationship fits the predictions of the theory. Considerable work has been developed along these lines since the pioneering comparisons undertaken by Pareto (see Chapter 4, and also Lydall, 1968; Creedy, 1977; Brandolini, 1998), but it must be recognized that it does not permit us to identify in more than a rough way the determinants of the distribution of income suggested by the theory. On one hand, this is because the number of observations is limited and the numerous determinants of the distribution are likely

to change over time. On the other hand, switching from the theory to the data opens a large set of new questions—conceptual and practical. We review in this section the main issues arising in the comparison of income distribution data over time or space.

One of the conclusions which the reader will rightly draw from the Handbook is that there has been a very considerable improvement in the availability of data about the distribution of income. Advances have been made at the national level, where in many countries a significant investment has been made in carrying out new surveys, in linking administrative data, and in refining methods of analysis. Just to give one example, the conference volume edited by Gottschalk et al. (1997) contained studies of income distribution based on data for Australia, Canada, the Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Japan, Netherlands, Sweden, the UK and the US. One major step has been the establishment of panel studies such as the Michigan Panel Study of Income Dynamics (see Brown et al., 1996) and the German Socio-Economic Panel (see Burkhauser and Wagner, 1994), which provide data on the same individuals or households over a span of years.

Of particular significance has been the assembly of datasets which can be compared across countries (although it should be stressed that comparability is a matter of degree). Here the way has been pioneered by the Luxembourg Income Study (LIS), which brings together microdata on households derived from sample surveys and other sources. The LIS database provided the basis, for example, for the comparative study of income inequality in OECD countries published by the OECD in 1995 (Atkinson et al., 1995). The PACO project, similarly based in Luxembourg, provides an assembly of panel data. In the European Union, the EUROMOD project to construct a tax benefit model for the European Union, brings together microdata for all member states which will allow analysis of the distributional impact of policy changes in the Union as a whole (see Sutherland, 1997b).

The particular data that we use to illustrate our discussion are drawn from the French household budget surveys, the “Enquête Budget de Famille”, referred to as the EBF, for 1979 and 1994. The EBF is conducted periodically, and information is obtained by interview on expenditure, income and other variables. The initial sample of approximately 20,000 represents around 1 in 1000 households, although nonresponse reduced the effective sample size in 1994 to 11,344 cases. To adjust for differential nonresponse between different types of household in the EBF, a grossing-up procedure is applied to yield re-weighted results representative of the population. It should be emphasised that such re-weighting procedures cannot be relied upon to eliminate the problem. Response may vary not only by the characteristics employed in grossing-up, such as region, or age of head of household, but also by income.

There are other reasons why observed monetary disposable income may give a biased representation of the actual distribution of (monetary) income in a society. One potentially important source of nonsampling error is under-reporting. Comparisons of total household income reported in the surveys generally used to estimate the distribution of income with National Accounts data suggest an average rate of underestimation between

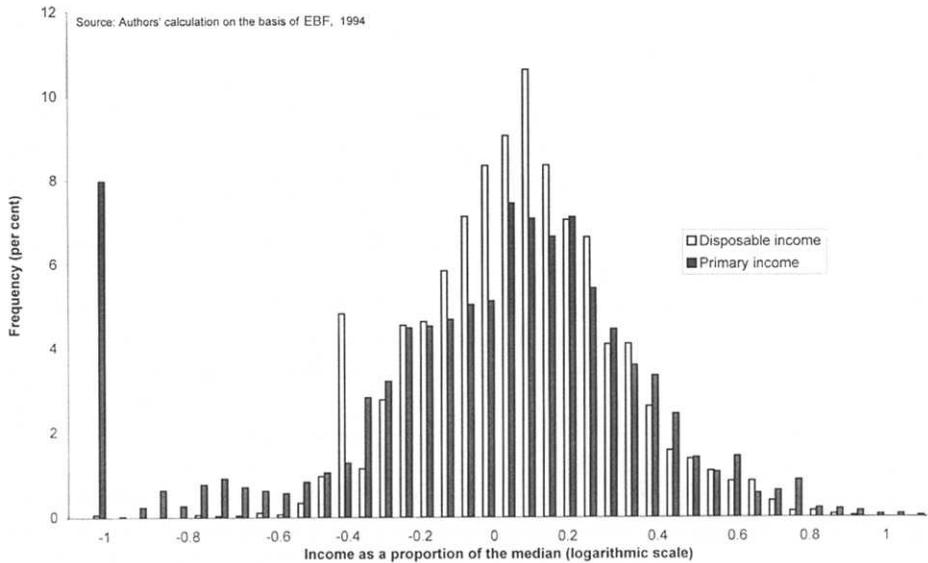


Fig. 4a. Histogram of the distribution of primary and disposable household income per adult equivalent in France (1994).

10 and 20% of total disposable income depending on the country,⁴ and the type of statistical source. With such a gap, it is sufficient that some underreporting be proportionally more important at some levels of income than at others for potential biases in measuring inequality to become sizable. The correction of these biases is not easy, but it is possible to get some idea of the magnitude of the bias by matching various data sources. Note also that these biases are very troublesome when an absolute estimate of the distribution of income and its degree of inequality is needed, as for international comparisons at a given point of time. They may be less of a problem when examining changes in the distribution over time, if they can be assumed to be more or less constant over time, but even this is debatable, since the changes over time will themselves be smaller.

4.1. Representation of the distribution and inequality measurement

A first issue is that of the presentation of income distribution data. In Fig. 4 are shown four different representations which, up to normalisation by the mean, contain the same information: one representation is chosen over another essentially on grounds of practical convenience of comparison.

Traditionally, individual observations were arranged into a vector indicating the proportion of people falling in selected income bands. This is the frequency histogram

⁴ See the estimates in Atkinson et al. (1995: 34). The underreporting is often larger in developing countries.

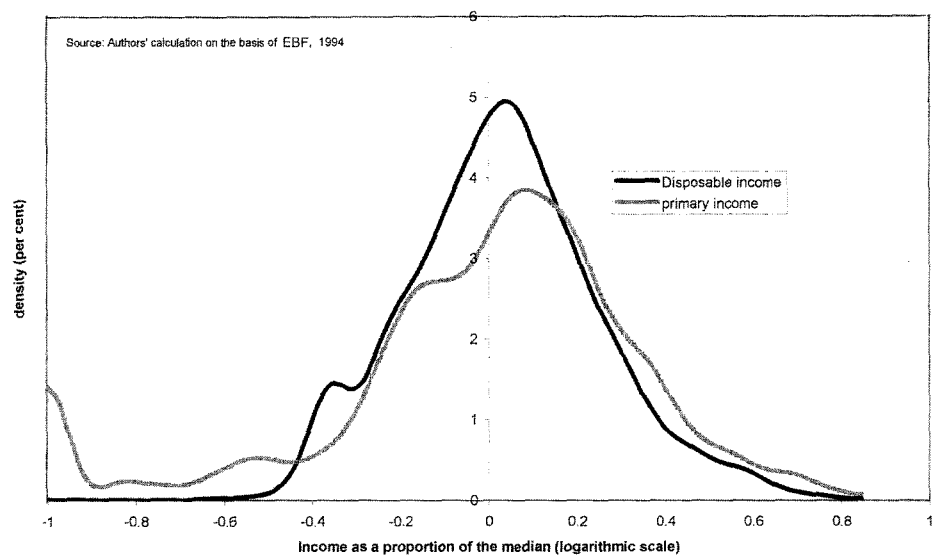


Fig. 4b. Kernel estimate of density of primary and disposable household income per adult equivalent in France (1994).

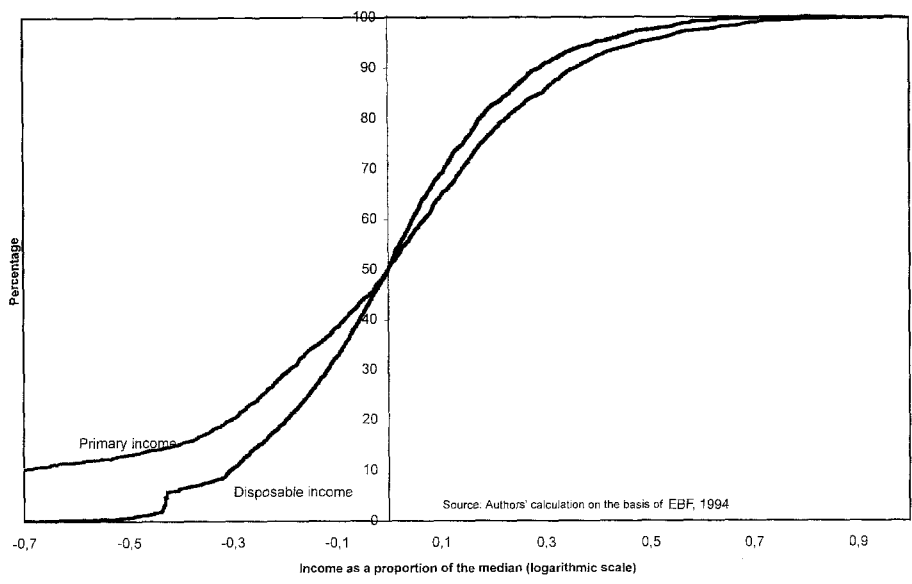


Fig. 4c. Cumulative functions of primary and disposable income per adult equivalent in France (1994).

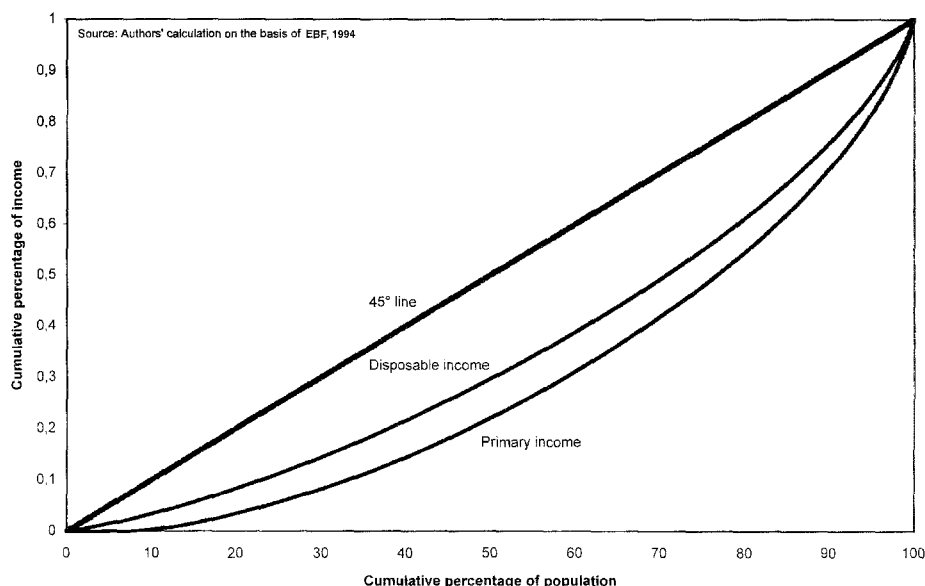


Fig. 4d. Lorenz curves of primary and disposable income per adult equivalent in France (1994).

shown in Fig. 4a for the distribution in France in 1994. The distributions are those of primary income, defined as income from labour and property plus replacement income (pensions and unemployment benefit), and of disposable income. Income is expressed as a proportion of the median on a logarithmic scale. A sizable proportion of the population had zero primary income, as indicated by the spike in the first range for that variable. Nowadays, modern computing possibilities permit us to work directly with the individual observations rather than grouping them and to obtain more flexible estimates of the income frequency function through Kernel techniques. Examples of such Kernel estimates of the “density function” are shown in Fig. 4b. In effect they smooth the histogram. (For a description and discussion of Kernel techniques, see Chapter 2 and Silverman (1986).)

Other representations of the distribution of income in a given sample include the “distribution curve” and the Lorenz curve. The former simply cumulates people below a given income level—see Fig. 4c. Looked at from the vertical axis and from bottom to top, this curve corresponds to the famous parade of Pen (1971) where all individuals in the population march in the order of their size, itself proportional to their income. Each distribution has been normalised to its median, so that the curves intersect at that point. The slope of the cumulative distribution gives the frequency at that point, so that we can work back to the frequency distribution. The small vertical segment at the bottom of the cumulative distribution of disposable income is due to some bunching of individuals around income minima guaranteed by the redistribution system. This bunching is also

apparent on the discrete frequency histogram and the Kernel estimate of the density function.

The Lorenz curve, which we have used theoretically in Fig. 1, cumulating the population in increasing order of income, is depicted in Fig. 4d. Some of the data points for the Lorenz curve are shown in Table 1. For the distribution among persons of disposable income per equivalent adult in 1994 (line 14) the share of the bottom 10 per cent was 3.55%. The share of the bottom 50% was 30.1%. As pointed out earlier, the slope of the Lorenz curve is equal to the income at that point divided by the mean, so that a slope of 0.5 means that people to the left of this point have incomes less than half the mean.

Comparisons of curves like those appearing in Fig. 4 are often unclear or ambiguous because curves are close to each other or cross several times. This is one reason why so many authors prefer to rely on one or a few scalar “inequality measures” which summarize the departure of the distribution from equality and satisfy various basic properties. The Gini coefficient has for long been the most popular scalar inequality measure. The reasons for its popularity are not entirely clear, but may be due, as Cowell speculates in Chapter 2, to its graphical interpretation as the area between the Lorenz curve and the diagonal, relative to the whole triangle. In France in 1994, the Gini coefficient for the distribution of disposable income shown in Fig. 4 was 29.7%.

In considering the wide variety of other summary measures of inequality, one property of interest is the extent to which the measure allows for differing attitudes to inequality. The class of measures, I_ϵ , where the valuation of individual income, y_i , is given by y_i to the power of $(1 - \epsilon)$, as in Atkinson (1970), allows for such differences through the parameter ϵ .⁵ A value of ϵ equal to zero means that society is indifferent about the distribution; the degree of aversion to inequality rises with ϵ ; and as the parameter tends to infinity we reach a situation where society is only concerned with the lowest income group (a “Rawlsian” position). Where μ denotes the mean income, then $\mu(1 - I_\epsilon)$ may be interpreted as the “equally distributed equivalent income”, or the amount of income which, if equally distributed, would be equally valued. This value depends both on the degree of dispersion, and on attitudes to inequality, as represented by ϵ .

A second property of interest is the degree to which the measure allows decomposition (see Chapter 2). Decomposability properties were initially studied by Bourguignon (1979) and Shorrocks (1980), who examined the conditions under which overall inequality could be decomposed in an additive way into inequality within subgroups and

⁵ The formula for the index, I , where $\epsilon \neq 1$, is that

$$[1 - I]^{(1-\epsilon)} = \sum f_i (y_i / \mu)^{(1-\epsilon)},$$

where μ denotes the mean income and f_i is the proportion of the population with income Y_i .

Where $\epsilon = 1$, then

$$\log_e [1 - I] = \sum f_i \log_e (y_i / \mu).$$

Table 1
Various perspectives on income distribution data: France 1979 and 1994

Type of income	Recipient unit	Year	Income share of:						Theil Coef.	Gini Coef.	$I_{0.5}$	I_1	I_2
			Bottom 10%	Bottom 20%	Bottom 30%	Bottom 50%	Top 20%	Top 10%	Top 5%				
Wage (Monthly)	Salaried workers	1979	2.64	7.75	13.91	28.80	40.87	26.76	17.55	0.326	0.096	0.182	0.459
		1994	1.62	5.54	11.27	26.05	42.79	28.01	18.22	0.365	0.121	0.244	0.962
Gross per household	Household	1979	2.92	7.65	13.48	28.38	39.86	25.02	15.68	0.321	0.086	0.164	0.341
		1994	1.67	5.58	10.77	24.92	42.55	26.91	16.87	0.369	0.110	0.234	0.955
Gross per capita	Person	1979	2.14	5.92	10.89	24.42	43.65	27.76	17.66	0.377	0.115	0.220	0.430
		1994	1.55	5.01	9.79	23.16	45.06	29.17	18.65	0.399	0.129	0.260	0.956
Gross per adult equivalent	Person	1979	2.75	7.24	12.91	27.58	40.19	25.13	15.83	0.330	0.089	0.171	0.350
		1994	1.88	5.89	11.30	25.81	41.75	26.29	16.48	0.357	0.103	0.217	0.953
Disposable per household	Household	1979	3.19	8.34	14.65	30.20	37.95	23.60	14.81	0.295	0.076	0.145	0.308
		1994	2.77	7.22	12.93	27.74	40.14	25.18	15.68	0.328	0.090	0.173	0.363
Disposable per capita	Person	1979	3.17	7.86	13.50	27.82	40.74	25.69	16.22	0.328	0.091	0.168	0.319
		1994	3.11	7.68	13.25	27.35	41.71	26.76	16.96	0.338	0.095	0.175	0.326
Disposable per adult equivalent	Person	1979	3.76	9.23	15.60	31.09	37.32	23.12	14.58	0.281	0.069	0.129	0.263
		1994	3.55	8.79	14.97	30.10	38.65	24.26	15.11	0.297	0.074	0.139	0.280
Leisure adjusted disposable per adult equivalent	Person	1979	4.39	10.82	18.02	34.37	34.81	21.46	13.36	0.237	0.052	0.097	0.197
		1994	4.08	9.91	16.64	32.40	36.67	22.85	14.16	0.265	0.060	0.113	0.227

Source: Authors' calculation on the basis of EBF, 1979 and 1994.

inequality between groups. The ability to make such a breakdown, as with analysis of variance, is helpful when seeking to account for inequality differences, but its appropriateness as a judgment is open to question (see Chapter 1). In general, the Gini coefficient is not decomposable by population subgroups. If we insist on this property, and on certain other requirements (see Chapter 2), this means that attention has to be limited to the *generalised entropy* class of measures. This class includes two measures proposed by Theil (1967), as well as measures ordinally equivalent to I_ϵ .

Study of these summary measures has made explicit the underlying values. At the same time, it must be recognised that there may be considerations which they do not capture. We may, for instance, want to allow for social judgments which are concerned with notions of “distance”. This may explain the continued popularity of measures such as the ratio of the top decile to the bottom decile (see Chapter 14). The same applies to measures of poverty (see Chapter 6), where people have sought to replace a simple headcount of poverty (those below the specified poverty line) by measures which reflect the intensity of poverty (see Sen, 1976a). The most straightforward such measure is the average poverty deficit, or the average amount by which the incomes of the poor would need to be increased to bring them to the poverty line. Other measures attach more weight to larger poverty deficits, as with the Sen measure which weights each person’s poverty gap by the person’s rank in the ordering of the poor. This gives a “smoother” measure of poverty, but, as noted in Chapter 6, the headcount continues to be widely used.

Using different scalar inequality and poverty measures to compare distributions may lead to contradictory conclusions, one distribution appearing more unequal than another with respect to one measure, but the opposite being true with another measure. A condition for such a contradiction not to occur, with distributions with the same mean and total population, is that the Lorenz curve for one distribution be everywhere above that of another, a condition referred to as “Lorenz dominance”. Lorenz dominance ensures agreement for a wide class of inequality measures, and this is undoubtedly a central result of the literature on inequality measurement. Interestingly enough, this criterion is also linked to poverty measurement. Indeed, this condition is equivalent to saying (taking distributions with the same mean and total population) that there is *smaller poverty deficit* in the first than in the second distribution *for all possible poverty limits*, from zero to infinity. The same dominance result, with the poverty limit restricted to stay below its predetermined maximum, allows us to conclude that we would get the same ranking for all poverty measures such that the marginal valuation of income is nondecreasing, although it should be noted that this rules out the headcount.⁶

Where distributions differ in their mean incomes, as where comparing different countries, the Lorenz curve may be replaced by the *generalised Lorenz curve* (Shorrocks, 1983).⁷ This replaces the relative percentage of total income on the vertical axis by

⁶ The reformulation in terms of poverty dominance is given in Atkinson (1987) and Foster and Shorrocks (1988a, 1988b). A summary of the results is provided in Chapter 6 and Atkinson (1998).

⁷ This idea, like many others in the field of inequality measurement, is contained in Kolm (1969).

the absolute total income per head, so that it is now denominated in currency. (For cross-country comparisons, this clearly raises issues of the appropriate conversion rate.) This amounts to multiplying by the mean the share in the standard Lorenz curve. The condition for one distribution to rank ahead of another is then that its generalised Lorenz curve be everywhere above. So that, comparing France and the US, we ask whether the absolute living standard of the bottom 10% (20%, ...) in the US is higher than that of the bottom 10% (20%, ...) in France. The country with the higher mean cannot be dominated, since the end point of the generalised Lorenz curve is the overall mean, but if its income is more unequally distributed then it may not itself dominate.

Even though the use of these instruments is spreading only slowly among empirical analysts of distribution issues, there is no doubt that considerable progress has been achieved over the last decades in the field of inequality measurement and the comparison of income distribution. (The reader is referred for fuller discussion to Chapter 2, Lambert (1989) and Sen and Foster (1997).) This is true to such an extent that one may wonder whether the problem may not be any more that of *how* to measure and to compare income distributions but that of *what* to measure and compare. This is the subject of the rest of this section.

4.2. *The recipient unit*

As a first element in answering the “what to compare” question, we consider the definition of the recipient unit. This was deliberately ignored in the preceding theoretical sections so as not to mix issues, but empirical analysts generally have to choose between a range of alternatives, depending on the data at hand and the issue to be addressed:

- individuals, whether they have an income or not;
- individual income recipients;
- families, of related adults and dependent children;
- spending units, that is individuals pooling their income together and sharing the same consumption budget; and
- households, that is people living at the same address.

These definitions may lead to different evaluations of the degree of inequality of a distribution, and possibly to different representations of its evolution over time. Yet, they are often confused.

The main difference between distribution data defined with reference to these various recipient units has to do with the “matching” of individual earners into households and the size of these households. Clearly, if all households had the same size, if the number of earners were the same, and if individual earnings within a household were perfectly correlated—i.e., perfect “homogamy”—then there would be a straightforward relation between the definitions. On the other hand, random marriage, and independence between household size and the income of the adults in the household, would lead to a different relationship between the different definitions. Practically, the real world is at a changing position somewhere between these two extremes. The four first rows of Table

I compare the distribution of individual earnings in France and that of the gross income of households in 1979 and 1994. Even though the Gini coefficient happens not to be very different for the two distributions, closer inspection reveals substantial differences. However, nothing general can be said of the direction these differences should take.

We must stress the gap between the empirical definition of the distribution of income and the theory reviewed in the preceding sections of this Introduction. In order to analyze and understand the evolution of the distribution of household income, a model of income generation at that level is required. Two factors make such a model substantially different from the basic model (1.1) above. On the one hand, it is necessary to correct the total income that a family gets from the assets and the talents of its members by its size or composition. We have to look at fertility, and, more generally, household formation and dissolution, and their correlation with the earnings potential and the assets of the household. On the other hand, labour supply becomes a key variable to explain differences in total monetary income across households since some members with given abilities choose not to work or to work part time, changing the relation between the individual and household distributions. These two dimensions are seldom considered explicitly, but it is increasingly realised that they are of considerable importance.⁸ The last rows of Table 1 compare the distribution of income in France depending on whether differences in labour supply are or are not taken into account. Imputing some implicit income equal to the prediction of a conventional earning equation to nonparticipating household members contributes to a substantial equalization of the distribution.

The choice of recipient unit depends on the issue which is addressed. Individual earnings data are better adapted to positive studies focusing on the labour market, whereas household income may be more appropriate in normative studies addressing the issue of inequality in living standards, although this is influenced by the degree to which resources are shared within the household. What is appropriate for the Mr and Mrs Blanc and their children aged 2 and 5 may not be applicable to friends sharing an apartment but nothing else. In the former case we may want to aggregate the total household income; in the latter case we may want to look at their individual incomes. Even in the case of the Blanc family we may be interested in individual incomes if there is substantial inequality within the family (see, for example, Jenkins (1991) and Sutherland (1997a)). How far it is possible to calculate individual incomes depends in part on the nature of that income. Earnings are typically received on an individual basis, but income from investments may be in the joint names of a couple.

Whatever unit is chosen, an adjustment has to be made for the differing needs of units of different size and composition. The most meaningful concept from that point of view is the distribution of "equalised incomes" where total income is expressed per adult

⁸ See for instance the recurrent debate on the influence of wives' earnings on household income inequality. An early treatment is provided by Smith (1970) and Layard and Zabalza (1978). For an illustration of the role of the change in the correlation between spouses' earnings on the distribution of family income, see Karoly and Burtless (1995). A decomposition method permitting the isolation of these phenomena is proposed in Bourguignon et al. (1998).

equivalent. One such adjustment is to take per capita income. This is illustrated by rows 3–6 or 9–12 in Table 1. Here again there is no presumption on the consequences of this change of income definition upon the appraisal of inequality. In the French case, moving from household income to incomes per capita unambiguously increases inequality when considering gross income whereas the change is somewhat ambiguous when disposable income is considered. Per capita income makes no allowance for economies of scale, and a commonly used alternative adjustment is to divide total household income by the square root of the household size, so that the income of a family of 4 is divided by 2. It must be kept in mind, however, that the definition of an equivalence scale is problematic and that there is some ambiguity in the concept of adult equivalent. There is a voluminous literature on equivalence scales: see, for example, Pollak and Wales (1979), Deaton and Muellbauer (1980), Jorgenson and Slesnick (1984), Fisher (1987) and Blundell and Lewbel (1991). See also the discussion in the next section.

There is a further choice to be made, which is the weighting to be given to each unit. It is still quite common for income distribution statistics to treat each household as 1, so that we are considering the distribution among households: i.e., the Blancs appear once in the figures. But the welfare economic approach might lead more naturally to treat each person as 1, so that we impute to every member in the household the per adult equivalent income: i.e., the Blancs appear four times in the figures. This choice of weights should not be confused with that for the equivalence scale, and there is no necessary reason why total equivalent income for the household has to add to the household total. It may be quite legitimate to look at the distribution among individuals of household income divided by equivalent adults, so that the Blanc family is treated as 4 people each with an income equal to the total divided by 2 (if the equivalence scale is the square root of household size). Table 1 compares the distribution of income among individuals when the income concept is household income per capita or household income per adult equivalent. Because individuals living in numerous families tend to be poorer in terms of income per capita, moving from the former to the latter definition of income generally produces an unambiguous improvement of the distribution.

To sum up, in using income distribution data, one must ask—what unit, how is income adjusted for unit size and composition, and how are units weighted? The answers to these three questions must be clearly signalled when reporting empirical findings: for example, the distribution of wage income among individual wage-earners, or the distribution of total household income among households, or the distribution of household income per equivalent adult among persons.

4.3. *Definition of income*

To a large extent, the definition of income in distribution data parallels that of the recipient unit. Earnings data generally refer to individuals whereas more comprehensive definitions of income apply to households. There are, however, different definitions of

household income, leading in turn to different evaluation of income inequality and its evolution over time.

Total family income can come from various sources. Labour income and the issue of the labour supply of household members—to which we should logically add that of unemployment—have already been discussed above. The other source of primary income is capital and other property. It is much more difficult to measure. On one hand, capital income is generally paid on a less regular basis than earnings and therefore more difficult to observe in data sources other than income tax returns. On the other hand, it is often virtual rather than real. A person who has taken out a private pension for instance is receiving every year some income on the total accumulated savings, but by the very nature of the contract this income is automatically reinvested and will appear neither in income tax returns nor as a spontaneously reported income source. The same is true of nonrealized capital gains or losses on a portfolio of equities and bonds. For households who own their house, the same is true of the potential capital gain, or loss, and may be true of the implicit rent (although some surveys attempt to estimate such imputed rent).

For all these reasons, capital income is generally underestimated in distribution data, which probably means that the observed income distribution understates the dispersion of current incomes. The figures reported in Table 1 do not include any correction for this underestimation. A recent attempt has been made to correct capital incomes by type of assets so as to make them consistent with National Accounts data (INSEE, 1997, p. 37 and Appendix V). It suggests that the Gini coefficient of the distribution of household incomes in the original household budget survey could be underestimated by 2 percentage points. It must be noted, however, that the correction involved there is concerned only with taking into account the actual income of all financial assets owned by households and not all the virtual income like undistributed dividends or implicit rents. This imperfect observability of capital income may explain why the strong macroeconomic fluctuations in factor shares observed in most developed countries over the past 20 years have failed to produce the sizable change in income distribution that theory would predict.

There are situations where labour and property income are difficult to distinguish. Self-employment is the most obvious. In this respect, the case of farm households in developing countries is quite typical. Defining the income of these households often requires imputing values to flows of goods which do not go through the market and therefore have no explicit prices. The assumptions behind these imputations are debatable. Should income be estimated by imputing a value to the labour expended on the farm and a return to land and equipment? Or should it be estimated by imputing a price to all outputs produced in the household and subtracting the cost of market inputs? Considerable ambiguity may appear because of these imputations.

A different source of income is the transfers made by the public sector towards persons or households in specific situations. These transfers (discussed in Chapter 12) are often considered as part of the redistribution system and as such not directly comparable to “primary income” from labour or capital. Different cases must, however, be

distinguished. The majority of transfers are the counterpart of contributions paid by beneficiaries at an earlier stage of their lifetime to insure themselves against unforeseen accidents like unemployment or invalidity, or simply for their old age. These schemes are generally administered by the State and the correspondence between contribution and payments is therefore less direct, but conceptually pension payments by the social security system should not be considered as different from capital income or annuities received by persons who would live partially or completely on their savings after retirement, even though not determined in the same way.

This being said, there often is some "redistributive" component in contributory transfer incomes which stems from the lack of direct correspondence between the contributions made by a person to an insurance scheme and the benefit to be obtained from it. This component is difficult to calculate, and it makes this replacement income not directly comparable to more obviously redistributive transfers like child benefits, income supplement or welfare support given to needy families on a noncontributory basis. In theory, this public transfer income should include the imputed value of publicly provided consumption goods like education or a national health service. The impact of noncash subsidies for health, education and housing is investigated by Smeeding et al. (1993). Although seldom observable, "private" transfers made directly between households should also be included under this heading, since they may be substitutes or complement to transfers made by the public sector. Several studies have shown how these transfers could modify our view of the distribution of income both in developing and in developed countries. See Cox and Jimenez (1986) and INSEE (1997).

Disposable income is typically defined as the sum of the preceding "primary" and transfer incomes minus the total amount of direct taxes paid, including income tax and social security contributions. Not only is this widely used definition incomplete in ways that we have already discussed, but it also fails to allow for indirect taxes which affect the purchasing power of households in a nonneutral way, or for spatial or other differences in the structure of prices, in the availability of public goods, or in the consumption of leisure. Several studies have done so. They generally have to rely on some extraneous tax or price incidence assumptions and to use additional information from other data sources, for instance household expenditure surveys. Because of this, they are not strictly comparable with other sources on income distribution and they tend to appear in the literature which specialises on redistribution. But, the fact that the concept of monetary disposable income does not rely on (possibly) debatable economic assumptions does not make it conceptually more appropriate than more sophisticated real income concepts. Given the diversity of rankings of distributions induced by the various concepts of income, this is certainly an issue about which practitioners should be more aware.

4.4. The time dimension

Income data generally refer to a well-defined observation period: the week, the month, or the year. There are good reasons to believe that the length of the unit-period is not

without influence on the estimation of the distribution of income and its inequality. In the case of sample surveys, collecting earnings information for a current pay period, such as a month, may be less subject to inaccuracy than if the survey asks respondents to provide information for a longer period such as the previous calendar year. (This problem would not arise with administrative data, such as those from income tax records.) Working in the opposite direction is the fact that, the shorter the observation period, the more contaminated are the data by transitory income components—premium payments, sickness leave, delay in transfer payments, etc. In the case of investment incomes, payments may only be made annually.

Pushing the transitory argument further provides a rationale for using observed consumption expenditures rather than income to estimate income inequality. Indeed, according to the well-known permanent income hypothesis (Friedman, 1957), differences in consumption expenditures over time and between agents should reflect differences in permanent disposable household income rather than transitory shocks to income. As a matter of fact, it is typically true that the distribution of consumption expenditures is less unequal than that of current income, whatever the periodicity of observation.⁹ Where people plan their consumption over the life-cycle (see, for example, Chapter 11), current income reflects the accumulation of assets with age. The resulting dispersion of current wealth is a compound of such age factors and the distribution of earnings: in the simple model of Flemming (1979), for example, the range of current wealth is at least twice that of earnings, even though the latter is the sole source of inequality. This being said, the use of consumption rather than income data raises problems of definition and observation. The main conceptual problem is the treatment of durables and the necessity of imputing a value for their services. The main observational problem is the infrequency of purchase. Other definitional problems for consumer expenditure are fully similar to those already stressed for income, and to this extent there is no clear advantage in using expenditure rather than income in studying distributional issues.

Another important issue related to the time dimension of income distribution data is whether it is justified to mix all age groups in the same analysis. The situation of a 60-year-old person is not comparable to that of a 25-year-old. Their income may well be unequal when observed in the same year, but this inequality is totally artificial if, 35 years from now, the 25 year old enjoys the same real income as the 60 year old today. In other words, it might be justified to restrict the analysis of income distribution to persons with the same age (or families whose head has the same age) and to distinguish between intragenerational and extragenerational inequality. It is important to stress that it is not necessary to rely on panel data for such an analysis. “Pseudo-panel” data provided by the repetition of cross-section surveys at various points of time allow us to follow the evolution of the mean income and the income inequality of various successive cohorts. Deaton and Paxson (1994) show that the dispersion of consumption expenditures tends

⁹ For discussion of the differences found in using expenditure rather than income, see Cutler and Katz (1992), Goodman et al. (1995), and Johnson and Shipp (1997).

to increase with the age of a cohort, in conformity with standard life-cycle consumption theory. This dynamic dimension of repeated cross-sections should be increasingly exploited in the future as the number of available surveys increases.

Panel data do, however, ease, or at least transform, many of the preceding problems. Such data have been available for individual earnings for a rather long time in selected countries. Studies of the dynamics of individual earnings over a few years, along the lines of Eq. (2.1) above, confirm the presence of a sizable transitory component at all levels. Atkinson et al. (1992, p. 93) find that the share of the transitory component in the variance of the logarithm of earnings is quite similar across the samples and studies which they survey, ranging from 15–20% for homogeneous highly educated groups to around 35% for much more heterogeneous groups. Mobility means that the dispersion of earnings measured over a longer period is less than the average dispersion in individual years, with the extent of the reduction depending on the measure used and on the sample studied (see Atkinson et al., 1992, Table VIII).

For household incomes, panel studies such as those cited earlier (the Michigan Panel Study of Income Dynamics and the German Socio-Economic Panel) have been joined by others, which have proved a rich-yielding investment. Other nonlongitudinal surveys have increasingly made panel data available for short time intervals, say one to three years, thanks to rotating sampling techniques in essentially cross-sectional surveys. Administrative data also provide an important source of panel data. These confirm the presence of a sizable transitory component at all levels of income and a lower degree of income inequality when income is averaged over a longer period of time. However, the extent of mobility should not be exaggerated. In the UK, for example, Hills (1998) has pointed out that, while 35% of people in the bottom fifth leave from one year to the next, the occurrence of low income is far from random: 61% of observations of low income over a 4-year period were accounted for by people who were in the bottom fifth 3 or 4 times. Moreover, there are potential measurement problems. Use of panel data introduces the risk that there is a higher noise-to-signal ratio when considering differences in income. In the absence of a perfect capital market, the appropriate valuation of income streams is unclear, and different procedures may be appropriate at different points in the income scale. In the case of household incomes, the analysis is made difficult by the fact that the composition of households is changing over time, possibly in a way that is endogenous to the earnings dynamics of its members.

4.5. Conclusion

To conclude this brief review of empirical issues and problems in the analysis of income distribution, we should stress the multiplicity of perspectives offered by the available data and the way they are used and interpreted by statisticians and economists. Given the different perspectives offered by economic theory to explain the distribution of income, this may seem only natural. Empirical work is a matter of choosing the definition of data which fits the theory one wants to test or apply. Things are not that simple, however.

On one hand, empirical data may call for theories more complex and sophisticated than those so far developed. This seems to be the case, for instance, with household income data and the gaps in our understanding about household decision-making. On the other hand, the available data may not allow us to get close enough to the concepts put forward by the theory. The cure seems, simply, to lie in more work being undertaken to improve the adequacy of both theory and observation.

In the meantime, caution needs to be exercised in drawing conclusions about causal mechanisms and about even the extent of inequality. Definitional issues are too serious to be left to footnotes—or ignored altogether. Data on inequality are meaningless if they do not specify “of what among whom”. Statements that one society is more unequal than another, or that it has become more unequal over time, cannot be based on data where definitions are different. Nor should we rely on a single definition. The picture may look different for one concept of income than for another; looking at households may conceal what is happening within the household unit. Lorenz dominance is seen as a better analytical tool than single income inequality measures because it encompasses most well-behaved inequality measures. Likewise, income distribution analysts should make use of alternative approaches to measurement, using a range of data and of definitions.

5. Income distribution, economic inequality and social justice

We have until now taken a largely positive view of income distribution, but there would be something paradoxical in not going beyond such a perspective, since income distribution may be considered the normative economic issue “*par excellence*”. It is indeed rather difficult to study how the total produce of a society is shared among its members without having to consider whether it is “just” or “unjust”, “fair” or “unfair”. In our own case, even though we have tried in the preceding parts of this Introduction to avoid use of the word “inequality”, because of its normative connotation, it proved unavoidable, and the discussion of measurement inevitably went beyond description to evaluation. In this section, we face this head on and review the main issues in the vast literature which bears upon the normative issues associated with income distribution.¹⁰

The elementary distributive issue is the “cake division problem”, that is the allocation of a fixed resource among various individuals, under the key assumption that this allocation is without effect upon the total to be allocated. There is no equity/efficiency trade-off. This problem may be considered as the starting point of the theory of economic inequality and social justice. It provides the normative background for income inequality measurement, and we have learned a lot about these issues. There are, however, important aspects on which we have only touched so far, notably that a particular sized slice of the cake may mean different levels of well-being for different people. One standard slice may mean much more to Mr Noir, a single person, than to Mr and Mrs Blanc and

¹⁰ Our coverage is very incomplete. The reader is referred to such recent works on economic theories of justice as those of Sen (1992), Kolm (1996a), and Roemer (1996).

their 2 children. This is one example of the problem of heterogeneity among individuals which is discussed later.

Division of a fixed cake provides a starting point but some of the key problems only become evident when the size of the cake is variable. This is apparent when there is a trade-off between the size of the cake and the fairness of its distribution. Much of the public finance literature has been concerned with the costs of redistribution in terms of reduced efficiency (see Atkinson and Stiglitz, 1980, Chapter 11). As, however, we have already stressed, and is developed in several chapters of this Handbook, redistribution may have a positive effect on the size of the cake. This causes us to have a different view of the problem.

The variable size of the cake introduces a second important set of issues, which is the relation between individual contributions and economic productivity. Individuals differ in their endowed productive abilities and in their effort. These two forms of heterogeneity are different, in that the former is not under the control of the individual, and we may want to distinguish between them in a normative evaluation. This is discussed later.

5.1. The cake division problem: utilitarianism, welfarism and the measurement of inequality

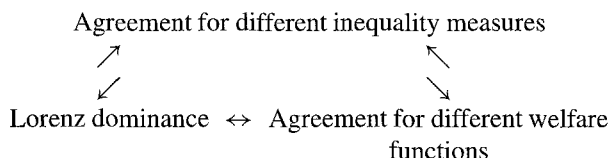
Consider first a fixed cake, that is a sum of money, and two allocations of that sum among individuals (the “Irene and Janet problem” of Chapter 2) who may be considered as identical in all respects except the share they receive. Assume that all individuals value the income they receive according to the same increasing and concave utility function. The standard maximisation of the corresponding utilitarian objective, that is the sum of individual utilities, leads to an optimal distribution which is perfectly egalitarian. Inequality may then be measured as the distance between the actual distribution and this egalitarian reference. Between two distributions with the same mean or total income, the socially preferred one is therefore the least unequal on this account. These are the ideas originally expressed in a utilitarian framework by Pigou (1912) and Dalton (1920b).

A broader welfarist perspective was developed at the end of the 1960s by Kolm (1969) and Atkinson (1970). In this framework, the utility function is to be interpreted as the way in which society, rather than individuals themselves, values individual incomes. More generally, the sum of society valued individual utilities can be replaced by a non-decreasing Schur-concave (s -concave) social welfare function with individual income as its arguments (Kolm, 1969; Dasgupta et al., 1973).¹¹ In that case too, maximum welfare under a fixed total income constraint is achieved with perfect equality. For a given total income, inequality can then be measured as some transformation of the gap between the level of social welfare corresponding to the observed distribution and this maximum.

¹¹ s -Concavity is weaker than quasi-concavity, as may readily be seen in the two person case: quasi-concavity requires that the social indifference curves be convex to the origin, whereas s -concavity requires only that a move towards the 45° line raise social welfare.

Social welfare itself may be expressed as a function of total or mean income and that inequality index.¹²

Given this one to one correspondence between social welfare functions and inequality measures, it is natural to expect that the same kind of dominance properties apply to social welfare functions as we considered in the case of inequality measures in the previous section. A distribution of income is said to dominate another if and only if social welfare is greater for the former for all possible social welfare functions in some given class. The main class of social welfare functions considered is that of nondecreasing, s-concave functions described in the previous paragraph (referred to as the class W_2). A central result of the literature is that, for constant total income and population, dominance of distribution A over distribution B for the class W_2 is equivalent to dominance of the Lorenz curve for A over that for B , the descriptive test described in Section 4. Moreover, this is equivalent to it being possible to reach distribution A from distribution B by making a series of mean preserving equalising transfers. (Where the means are different, the generalised Lorenz criterion applies: dominance of distribution A over distribution B for the class W_2 is equivalent to dominance of the generalised Lorenz curve for A over that for B .) We have therefore completed the triangle:



Alternative normative measures of inequality rely on different classes of social welfare functions, such as those that, either explicitly or implicitly, allow the valuation of individual incomes to depend not only on the income of that individual but also on the income of others. For instance, the Gini coefficient may be interpreted as a transformation of an index of “envy” evaluated through the comparison of the income of an individual and that of all other individuals richer than him/her.¹³ More formally, some authors have considered the case where the utility depends on both income and the rank on an individual in the distribution. A more general formulation leads to the introduction of the whole distribution as an argument of individual utility, as in Kolm (1969) and Thurow (1971).

¹² Dalton (1920b) used the gap between total utility and egalitarian utility. As explained earlier, Atkinson (1970) defines inequality, I_e , as 1 minus the ratio to mean income of the equally distributed income giving the same social welfare as the actual distribution. In this framework, an income measure of social welfare is directly given by $\mu(1 - I_e)$. Sen (1976b) proposed the same combination of the Gini index and the mean income as a measure of social welfare. A general treatment of this point was provided by Blackorby and Donaldson (1978).

¹³ A related concept is that of “relative deprivation”, see Runciman (1966). See also the axiomatic justification of the Gini coefficient by Sen (1976b) which relies on this kind of externality between individuals.

5.2. *Extending the concept of income to economic well-being and coping with heterogeneity*

The issue of measuring income inequality and social welfare among otherwise identical individuals now seems satisfactorily understood. Widely accepted analytical tools, firmly linked to theories of justice, have been available for some time to make comparisons between distributions, even though they are still too rarely used. The situation is much less favourable when one wants to extend the definition of well being so as to take into account other dimensions of welfare than income or the natural heterogeneity among individuals.

In a perfectly competitive environment, and with identical individual preferences, there should be no difference between inequalities in income and inequalities in material well-being. If individuals have the same preferences among the goods and services they consume and if there is no restriction on buying and selling goods at posted prices, material well-being is a function of income and prices (the indirect utility function). If everybody faces the same prices, then differences in material well-being arise only from differences in income as was supposed in the preceding section. If prices differ across consumers, a correction of individual incomes becomes necessary to allow them to continue to express differences in well-being. As long as there is an unambiguous way to combine income and prices so as to express all differences across individuals in the single dimension of "real" income, it is possible to use the income inequality framework discussed before (although the concept of a fixed total income does not really make sense in that situation since changing the distribution of prices in the population changes total real income).

It would seem that the preceding argument might generalize to other situations where individuals do not face the same "market" conditions, as for instance with the rationing of some goods or the presence of public goods. Unfortunately, things are not that simple. Under the assumption of common preferences, it is in theory possible to define an indirect utility function of income, prices, rations and public goods available which represents well-being and makes individuals mutually comparable. The only issue is that of the form that this indirect utility function should take. Observed market behaviour may permit us in some cases to estimate an (ordinal) indirect utility function of income, prices and rations, and to agree on a particular cardinal representation. But this is much more debatable for nonmarket goods like most public goods. The original problem then becomes much more complicated.

Heterogeneity across individuals could be taken as a limit of the preceding case. Kolm (1972) noted that, conceptually, the assumption of identical preferences is not restrictive provided that preferences could be defined on a sufficiently rich vector of observed personal characteristics including taste for pleasure, handicaps, talents and the like. Since there is no market for variation in these characteristics, however, we cannot really envisage estimating an indirect utility function that would allow aggregation of these characteristics together with income and prices into some "super real income".

More assumptions are definitely needed; it is not clear, however, what these assumptions should be. The estimation of equivalence scales provides a case in point. Observed consumption behaviour allows us to recover an indirect utility function consistent with the conditional preferences over market consumption goods of households with different characteristics, but it gives no information whatsoever on cardinal utility. As in the case of otherwise identical households receiving different incomes, some normative assumption is necessary to compare the level of utility that is reached. In the present case, this assumption must also encompass the way different characteristics affect this cardinal utility. Normative judgments cannot be avoided. From that point of view, using an equivalence scale whereby a family of N persons needs \sqrt{N} more than a single person is no more or less arbitrary than, say, counting a second adult for 0.7, and each child for 0.5 adult.

What can be done if different judgments about equivalence scales, or other adjustments for heterogeneity, lead to opposite conclusions when comparing two income distributions? A natural answer to this question seems to lie in a generalization of the social dominance criterion to other dimensions than income. Atkinson and Bourguignon (1987) provided such an extension in the case where an agreement may be obtained in ranking different households by increasing “needs”—this concept itself involves various dimensions like family size, age or health condition.¹⁴ On the assumption that increasing needs are interpreted as meaning that the marginal social welfare of income, at the same income level, is higher and declines at a slower rate in more needy families, they showed that social dominance was equivalent to a sequential Lorenz dominance criterion whereby generalised Lorenz dominance should obtain for any subset of the original population that would comprise all the households with greater than a specified level of need. Suppose that this approach is applied to compare two distributions A and B with, say, three different groups, in increasing order of “need”: single persons, couples and couples with children. We should first compare the generalised Lorenz curves for couples with children, then compare curves for couples and couples and children combined, and finally compare the curves for the whole population. Dominance requires that A be superior to B on all three tests (or vice versa). This is a strong requirement but it is weaker than requiring that dominance hold for each group separately.

The basic assumption leading to the criterion just described could be seen strictly as utilitarian, but it is important to stress that it is in fact consistent with the idea forcefully emphasised by Sen of the need for the distribution of income to *compensate* for differences in absolute levels of well-being across heterogeneous individuals (see the Weak Equity Axiom in Sen (1973, 1997)). Take for instance the simple case where the well-being of two individuals depends on their income plus a constant representing

¹⁴ This extension derived from a previous attempt at comparing multidimensional distributions of various characteristics defining the well-being of an individual, see Atkinson and Bourguignon (1982). Other authors have pursued this direction of multidimensional inequality essentially by preimposing some aggregator function allowing the problem to be reduced to a single dimension. See in particular Maasoumi (1986) and Tsui (1995).

the effect of some noneconomic characteristics. If social welfare is then defined as a nondecreasing, s -concave function of individual levels of well-being, then assuming that the social marginal welfare associated with the income of the first person is always larger, at the same income level, than that with the second is equivalent to assuming that the noneconomic component of well-being is smaller, in some unknown amount, for the first person than for the second person. But of course, differences in marginal social welfare may also come from differences between the two persons in getting more well-being out of an increase in their income. The preceding dominance criterion thus includes both these aspects of inter-personal comparisons across persons with different characteristics.

Assuming that it is indeed possible to find some agreement on the ranking of persons according to needs, in the precise sense given to that concept above, a limitation of the sequential Lorenz dominance criterion is that it only allows for comparison of populations with the same distribution of needs. Indeed comparing distributions with distinct marginal distributions of needs requires making assumptions on the absolute level of well-being of households with different needs. Not being able to do so may not be too much of a problem if one is essentially interested in income redistribution issues within a given population. From an economic policy point of view, this is already of considerable interest. But comparing distributions where both the structure of income and that of personal characteristics or needs are different is sometimes necessary. Some generalisation of the sequential Lorenz dominance to cover such a situation has been proposed for some particular situations. Research in this domain is presently very active.¹⁵

5.3. *From the inequality of incomes to that of opportunities and social justice*

Recognizing that individuals or households differ by nonmarket characteristics and that this difference must be taken into account in comparing income distributions is conceptually clear when differences may be cast in terms of needs or innate abilities or handicaps: i.e., uncontrollable factors. Other sources of difference are less clear. Suppose that there are two low wage earners of whom one is handicapped and the other lazy. Compensating the former for his/her bad luck seems natural, but, for the majority of people, doing the same for the latter would seem to go against basic principles of justice. In other words, differences in innate abilities, needs or handicaps would seem to require some kind of income compensation, but not differences in effort, resulting from differences in tastes or preferences (see, for a discussion in terms of equality of opportunity, Roemer (1998)).

The distinction between heterogeneity in preferences and in innate abilities/handicaps is fundamental. Many authors in the literature on economic justice deem the former to be "irrelevant" and suggest that measures of economic inequality should be exclusively

¹⁵ On the generalization of the sequential Lorenz dominance criterion to the case of different marginal distributions of needs, see Jenkins and Lambert (1993). On the general issue of comparing distributions when needs differ see Ebert (1995, 1997).

concerned with the latter. Loosely speaking, the basic idea is that preferences are under the full individual responsibility of individuals who should be given full liberty to exert them. Differences in economic outcomes attributable to differences in preferences must thus be considered essentially as the expression of individual liberty and diversity in a society rather than as a sign of inequality. An obvious example is that of a society where individuals would differ only by their preferences over leisure and consumption. In such a society income disparities should not be considered as economic inequalities. Suppose that, in an oil-rich country, oil revenues are divided equally, allowing some people not to work, while others choose to do so. We will then observe an unequal distribution of money income, but no equity significance need be attached. If all individuals have the possibility of earning the same income by working the same number of hours, this should be the only thing that matters. Individuals may decide to work more or to work less because they find more satisfaction in doing so, but this has nothing to do with social "equity".

"Equity" or "fairness", and "envy-freeness" in more recent literature, is the economic concept corresponding to the preceding ideas. The first statement was made by Tinbergen,¹⁶ and developed in different forms by Foley (1967), Kolm (1972), Varian (1974) and others. It has now given rise to an abundant literature (see, among recent contributions, Baumol (1986), Arnsperger (1994), Young (1994) and Kolm (1996a and 1996b)). An allocation of goods is defined as *equitable* if there exists a common choice set such that every individual in that economy would have freely chosen in that set the bundle of goods actually allocated to him or her. The interest of this general nontechnical definition is to emphasise the direct relationship of equity with the concepts of liberty and equality (Kolm, 1972): all participants are *free* to choose their preferred bundle in a choice set which is *equal* for all. More technically, an equitable allocation of goods is "fair" if it is Pareto efficient. It is easily seen that the egalitarian allocation of existing supplies of goods is a fair allocation, as are all the allocations derived from it through competitive exchange. So, the notion of equity or fairness allows the introduction of the egalitarian allocation as a benchmark to evaluate other allocations without making use of cardinal utility functions defined on identical individuals as in the utilitarian or welfarist tradition. Even in a world of heterogeneous preferences and without invoking any interpersonal comparison rule, the egalitarian distribution of resources stands out.

The shift to considering commodity bundles as the primitive concepts with which we are concerned is an example of a move outside the welfarist approach based on personal utilities, but looked at in this way there is perhaps little difference from a social welfare function defined over individual incomes (not utilities), as previously discussed. More far-reaching is the move to considering the whole choice sets open to a person, and not just the actual outcome. One interpretation of the "capability" approach advocated by Sen (see below) is that we are concerned with the full set of options actually open to

¹⁶ The "exchange principle" of Tinbergen is described in Pen (1971: pp. 303–305), who says that Tinbergen was influenced by his teacher, the physicist Paul Ehrenfest. See also Kolm (1996b: p. 202).

an individual to “function” in a given economic and social environment and not simply with the vector describing the functioning of the individual, however detailed might be that description. Other authors refer to the set of opportunities or resources offered to individuals to achieve their ends and to the *equality of opportunities or resources* (see Dworkin (1981a and 1981b), Arneson (1989)). Consider for example the leisure-consumption problem where some individuals in the population are unable to sell as much of their time as they wish because of rationing on the labour-market. In the standard indirect utility approach, no distinction would be made between the “unemployed” time of rationed individuals and voluntary consumption of leisure. Within an equity approach, on the contrary, the fact that individuals do not face the same choice set would be explicitly taken into account in evaluating that situation.

Accepting differences in preferences as irrelevant and considering differences in the choice sets on which these preferences must be applied as the true object of inequality measurement does not make measurement easier. In the simple case where innate productive abilities or handicaps determine the space where individuals must choose a particular consumption-leisure combination, standard income inequality measures provide a way of evaluating the inequality of opportunities offered to individuals. But what should be done if innate consumption abilities or handicaps make these consumption-leisure spaces noncomparable? Equivalently, how should noneconomic dimensions of choice sets be taken into account in economic analysis? Other things being equal, a disabled person cannot move as easily as another person and thus has a restricted set of opportunities. How much additional income capacity is necessary to compensate for being disabled, living in a polluted environment, or being responsible for a large family? There clearly cannot be a single and undisputed answer to such questions.

We are thus back to the problem we started from. Heterogeneity in preferences among individuals can be accommodated as long as they bear on goods and services which are freely exchanged. Heterogeneity in the capacity of individuals to generate income may then be considered as the unique source of inequality. But heterogeneity in the consumption ability of individuals or, equivalently, heterogeneity of preferences over goods or characteristics which are outside their control, reintroduces the initial ambiguity of income comparison. It is necessary to adopt a multidimensional framework where multiple trade-offs describing the frontier of the space of individual capabilities would have to be defined. For the moment, we lack the elements necessary to make these trade-offs explicit on a more or less consensual basis. This is probably the area in the measurement of inequality where progress is most needed.

The need to enrich the informational basis for welfare judgments is emphasised by Sen in Chapter 1 (see also Sen, 1992), which draws on his extensive contribution to the development of a nonwelfarist approach. In rejecting welfarism, Sen is not alone. The difference principle of Rawls (1971) is concerned with the position of the least advantaged defined not by personal welfare, but by “primary goods”, or “things that every rational man is presumed to want”. This takes us outside the traditional scope of welfare economics. The rejection of the welfarist approach is similarly to be found in

Marxist theories of exploitation, relating social judgements to the historical information that capital represents the product of past labour. Nozick's entitlement theory of justice (1974) is quite different but equally appeals to historical information. For him, it is not the distribution of income that matters but the *process* by which it is brought about, people being "entitled" to resources that were justly acquired or that were transferred to them according to a just process, even if this means they will be immensely rich, and that their riches may be of no benefit to the poor.

It is in his alternative to welfarism that Sen is distinctive. This is based on "capabilities", to which reference has already been made. He has made a forceful case that assessment of the standard of living should focus on

neither commodities, nor characteristics (in the sense of Gorman and Lancaster), nor utility, but something that may be called a person's capability. (Sen 1983, p. 160)

Capability refers to the freedom that a person has in terms of choice of functionings. Sen illustrates this by the example of a bicycle:

It is, of course, a commodity. It has several characteristics, and let us concentrate on one particular characteristic, viz., transportation. Having a bike gives a person the ability to move about in a certain way that he may not be able to do without the bike. So the transportation *characteristic* of the bike gives the person the *capability* of moving in a certain way. (Sen 1983, p. 160)

He recognises that the capability may generate utility, but argues that it is the capability to function that comes closest to the notion of standard of living. The challenge which this raises is to translate this concept into one which can be implemented in empirical analysis of distributional issues. There is scope for a great deal of future research.

We conclude this brief review of normative theories by some consideration of the issues of uncertainty and dynamics. Ever since Vickrey (1945), Harsanyi (1953 and 1955) and Rawls (1971), the theory of social justice has been intimately mixed with the theory of choice under uncertainty. Utilitarian social welfare is equivalent to expected income utility when the density associated with each income level is equal to the density of the population at that income level, and this can be seen as the criterion applied when a person has no knowledge of his/her position in society, other than the overall distribution. It follows that social welfare dominance is equivalent to stochastic dominance in the theory of choice under uncertainty. It also follows that it is possible to define social aversion toward inequality in line with the equivalent definition of individual aversion toward risk. A maxi-min principle of justice theory, maximising the welfare of the worst off in society, may be interpreted as infinite aversion towards risk, and therefore towards inequality.

Referring to uncertainty to justify theoretical principles for the comparison of distributions of certain incomes is one matter; comparing distributions of uncertain incomes is another, where we do not know much. Yet, this may be necessary. Measuring the inequality of "chances" among children born from different ethnic groups or in different social classes requires taking into account not only the inequality of their expected income but also that of the risk that they end up more or less far from the mean. A

related domain is the measurement of income mobility over time or across generations. The existing theory of inequality measurement is static. However, the situation in which individuals are observed at a given point of time is most often temporary. Averaging over several periods may not be satisfactory, for reasons outlined in Section 4. It may be the case that situations of extreme poverty entail irreversible health or psychological costs which could not be compensated by better incomes at a later stage. Evidence of strong intergenerational associations of economic status mean that we have to address the normative issues surrounding inheritance. We cannot simply assume that all such equity issues were resolved at some primeval date. If one believes that preferences are transmitted by parents to their children, or the product of the social class to which one belongs, then they cannot be considered as irrelevant any more (on this see Arneson (1989) or Roemer (1985)). The social origin of individuals might have to be taken into account when comparing their present situation, thus leading to an intergenerational concept of inequality.

5.4. Conclusion

To conclude, the normative theory of income distribution and, more generally, of economic inequality, has been a very active domain of economic research over the last 30 years. Impressive progress has been made in the understanding of the issues at stake, and in some instances in developing the appropriate quantitative instruments. The difficulties which have been pointed out in the last sections of this Introduction are, however, equally impressive. They are true challenges to the economics profession.

6. Guide to the Handbook chapters

The first chapter, by Amartya Sen, covers in depth the issues which we have just been considering: the relation between ideas of social justice and the analysis of income distribution. One of the main conclusions is that we need to “liberate” the analysis of economic inequality from confinement to the space of incomes or commodity bundles. Income is only relevant, Sen argues, as an instrument to ends and the freedom to achieve ends. It is indeed true that much conventional analysis of inequality closes its eyes to the difficulties which Sen outlines so clearly. We therefore urge readers to study carefully his strictures on applied welfare economics. At the same time, we hope that this will not cause them to stop reading the rest of the volume. Sen himself has emphasized

the danger of falling prey to a kind of nihilism (which) takes the form of noting, quite legitimately, a difficulty of some sort, and then constructing from it a picture of total disaster. (Sen 1973: p. 78)

We need to be aware of the limitations of current measures, and to seek to refine them, not to throw in the towel.

In Chapter 2, Frank Cowell starts from the premise that we have a satisfactory measure of each individual’s status and sets out the basis for comparing different dis-

tributions and measuring inequality. The chapter, whose content we have previewed in this Introduction, will be useful to those who wish to understand the formal relation to underlying axioms and welfare judgments; it will be useful to those who wish to apply the measures in practice. As we have noted, a number of the innovations have taken time to be adopted by practitioners, and this chapter should speed their diffusion.

The tendency for income distribution to go in and out of fashion means that a sense of history is especially important. Chapters 3 and 4 provide a historical perspective. In Chapter 3, Peter Lindert covers no less than three centuries, courageously starting with the 1688 estimates for England and Wales. From this rich account of inequality changes in Britain and the United States, he concludes that “the Kuznets curve flickers” and identifies the intriguing paradox that “Robin Hood’s redistributive army is missing when and where it is most needed”. In Chapter 4, Christian Morrisson presents evidence for mainland Europe, with particular reference to the explanation of developments over time within and between sectors. Going back as far as the early 1880s, he finds that the inverse U-curve hypothesis is verified in Finland, France, Germany and Sweden. He explains these changes by political factors as well as by economic ones (diffusion of education, accumulation of capital and dualistic development). The exploitation of historical evidence, especially through further use of fiscal data, is a potentially fruitful area for future research.

These OECD countries are among the twenty five studied in Chapter 5 by Peter Gottschalk and Tim Smeeding, who present evidence on the current level of inequality and on the changes since 1970. (The chapter illustrates the application of a number of the tools described in Chapter 2.) Such a comparability exercise is now possible as a result of the improvements in data availability noted earlier, notably the Luxembourg Income Study. The data indicate that the degree of income inequality varies considerably across countries, and that the changes over time are more similar, though not universally so. There is a lot to explain.

Chapter 6 by Sheldon Danziger and Markus Jäntti looks in detail at the bottom of the income distribution in advanced countries, drawing on the same kind of internationally comparable data source. Conceptual issues in the measurement of poverty, to which we have already alluded, are set out in greater depth, as are the practical problems in implementation which are faced by official and independent investigators. Among the interesting elements are the dynamics of poverty over time, the identification of poverty risks and the impact of public policy on poverty.

In Chapter 7, the volume turns to the theory of income distribution, starting with the distribution of earnings. Derek Neal and Sherwin Rosen provide a succinct account of different types of models which seek to explain the observed features of the earnings distribution. These models, which we have previewed in Sections 2 and 3, include stochastic theories, selection models, sorting models, human capital formation and agency models. Given the balkanisation of much of the journal literature, it is particularly valuable to have these approaches set side by side, helping the reader identify their relative strengths and weaknesses.

Earnings are brought together with wealth in Chapter 8 by Thomas Piketty, which deals with intergenerational mobility and the persistence of advantage or disadvantage from generation to generation. As he brings out clearly in the opening section, there are sharply conflicting claims about both theory and evidence regarding mobility in industrial societies. The chapter first considers models based on Pareto-efficient markets, and then goes on to theories based on market inefficiencies, this being—as we have signalled—one of the most important recent developments. The chapter is wide-ranging in that it not only covers both theory and evidence, but also covers sociological as well as economic research. Openness to other social science disciplines is a feature which we very much welcome in the current literature on distribution.

Chapter 9 relates the theory of distribution to other recent areas of economic research: growth theory and political economy. Giuseppe Bertola begins by noting that the macroeconomics of distribution is almost an oxymoron, but his chapter is highly successful in bringing together the two fields of macroeconomics and income distribution. The first part is concerned with the interaction of income and wealth distribution with aggregate accumulation and growth, which we have introduced earlier. The second part is concerned with the imperfections and/or incompleteness of capital markets, covering from a macroeconomic perspective elements which also appear in Chapter 8. The third part explores the political economy of taxation and redistribution; and the final section reviews empirical evidence about growth and inequality.

The role of distribution in a world where market outcomes are not Pareto efficient has already been evoked in Chapter 8. This subject is developed further by Pranab Bardhan, Samuel Bowles and Herbert Gintis in Chapter 10, where they examine the relation between redistribution of assets and productivity enhancement. They cover a variety of contexts including credit markets, farm tenancies, incentives in teams and local public goods. They show that where there is asymmetric, or nonverifiable, information, then an inequality-reducing redistribution of assets may be productivity-enhancing (in the sense defined). (See also Putterman et al., 1998). Again the chapter is welcome evidence of the willingness of economists to take on board the contributions of other disciplines, political scientists, sociologists and psychologists all being cited, but its implications are of central importance for economics.

Assets feature in all of the preceding theoretical chapters, but the distribution of personal wealth is the specific concern of Chapter 11 by Jim Davies and Tony Shorrocks. They summarise the evidence about the distribution for a number of countries, concluding that material wealth is more unequally distributed than labour income and that, while there has been a general downward trend in inequality, there have been interruptions and reversals. They review a range of theories that can explain observed wealth-holding, covering both intra-generational accumulation and inter-generational transmission. As they point out, there are a number of areas where future research promises to be fruitful, including the intriguing suggestion that economists should make more use of the information on the wealth of named persons published by *Fortune* and other sources.

In Chapter 12, entitled “Redistribution”, Robin Boadway and Michael Keen start from the motives for redistribution. The first of these—the pursuit of social justice—harks back to the issues considered in Chapter 1. In treating the second—achieving mutually advantageous efficiency gains—the authors develop a theme central to Chapter 10, with interesting applications to social insurance and other fiscal instruments. The third—the politics of redistribution—puts public choice considerations in centre stage, linking up with Chapter 9. As they point out, the distinctions between different motives become quickly blurred, but they provide a valuable organising framework.

The relationship between income distribution and economic development is clearly too important for the subject not to be covered even if we risk overlapping the territory of other Handbooks. In Chapter 13, Ravi Kanbur examines the distribution across countries and the distribution within developing countries. There are clear links with other chapters—with the long-run analyses in Chapters 3 and 4, with the measurement of poverty in Chapter 6, with growth theory in Chapter 9—but it is very valuable to view the material from a different perspective. Once again, our survey brings out the many challenges which remain.

Finally, in Chapter 14, John Flemming and John Micklewright survey the relation between economic systems and income distribution, with particular reference to the impact of transition from communism.¹⁷ They first re-assess the starting point in socialist economies, drawing on material which was not available prior to 1990, emphasising the variety of experience. They then consider the distributional implications of transition and the role of policy intervention, followed by a review of the empirical evidence about earnings and incomes, underlining the problems of measurement and of interpretation. Earnings inequality appears to have increased during the 1990s, but the scale of the rise varied across countries, and the impact on household income was more modest (except in Russia). Transition may by definition be an impermanent field of economics, but it highlights in an acute way some of the key questions of distribution and brings the reader back to a number of the fundamental issues raised in Chapter 1.

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¹⁷ A special case of particular interest is the reunification of East and West Germany. See Hauser et al. (1994) and Hauser and Becker (1997) for analysis of the changes in income inequality.

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