AN INTEGRATED APPROACH TO TAXES AND TRANSFERS

JACK HABIB

AN INTEGRATED APPROACH TO TAXES AND TRANSFERS

JACK HABIB

AN INTEGRATED APPROACH TO TAXES AND TRANSFERS

AN INTEGRATED APPROACH TO TAXES AND TRANSFERS

JACK HABIB

To my parents

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

In the 1960s and 1970s the question of adequately providing for the poor
has attracted considerable public and academic interest in many countries.
There has been much discussion of the most effective means of providing
for the poor and the possible implications and consequences of various
approaches. After years of debate and experimentation, many of the basic
issues remain unresolved, and many countries are still groping for adequate
policies.

This book focuses on the experience of Israel in its search for an
adequate policy of providing support to the working poor, who in Israel,
as in many other countries, have in the past been largely neglected. In
examining the Israeli experience, we address a central issue arising in
the design of income-maintenance systems: universality versus selectivity,
that is, the choice between a strategy that provides for the poor within
the framework of services that cover the whole population, and one that
creates separate programs for the poor on the basis of a means test.

Economists have been strongly in favor of the selective approach,
arguing that it is a more efficient way of using resources; other social
scientists have tended to favor the universal approach for its social and
political advantages. This book challenges the view that a universal
income-maintenance strategy is less efficient than a selective one, and
argues that there need not be any conflict between efficiency and social
or political concerns in designing income-maintenance systems.

In Israel, a system has been developing which combines universal

and selective elements. The idea underlying the mixed system is that
working-poor families, who fully participate in the labor force, can be
provided for by the universal component, with other groups of poor
supported by the selective mechanism. In this way, the number of families
dependent on selective benefits is kept small, while the universal component
is freed of the burden of providing a minimum income to families with no
independent sources of support. We argue that the mixed system would
retain much of the social political advantages of the universal approach
while providing additional flexibility to reconcile possibly conflicting
goals or to adapt the system to changing circumstances.

This book combines technical material with material likely to be
more accessible to the non-professional reader. In addition, some sections
are of greater general interest than others. The general reader with an
interest in Israel may wish to focus on Chapters 2 and 6, which describe
the nature of the problem and its solution in Israel, while Chapters 3, 4,
and 5 are more theoretical.

Chapter 2 reviews the problems of poverty and income maintenance in
Israel, while Chapter 6 traces the development of the mixed approach and
points out a number of issues that remain unresolved. Today, the working
poor are to a great extent provided for by the universal component of the
system, and it is shown that they have enjoyed a substantial improvement
in the adequacy of income support. However, there is considerable
confusion regarding the appropriate criteria for examining the development
of transfers. The confusion arises from differences of opinion as to
whether we have surpassed the normative target level of support or whether
this level has as yet been achieved. In Chapter 6, we discuss the various

factors and arguments underlying these different views. We also point to deficiencies in the way in which the universal and selective components are linked, which result in part from the failure to reach a clear consensus on their relative roles.

A fundamental aspect of the income-maintenance approach here advocated is the need to take an integrated view of the tax-transfer structure. Accordingly, Chapters 3 and 4 discuss issues that arise in designing the tax structure. The issue of providing for equity with respect to family size is the subject of Chapter 3, while the choice between alternative ways of providing for progressivity is dealt with in Chapter 4. The treatment of these issues sets the stage for a evaluation of integrated tax-transfer structures, and in Chapter 5 the selective, universal and mixed approaches to income maintenance are compared in this broader context.

CHAPTER 2

POVERTY, INEQUALITY, AND INCOME MAINTENANCE IN ISRAEL

Like many countries, Israel experienced a renewal of interest and concern
with poverty and related social problems in the late 1960s and the first
systematic attempts to define and measure poverty were made in this period.
Two approaches emerged. One measured poverty purely in economic terms,
as a function of family income and the needs of the family as related to
family size; the second measured poverty in terms of a number of
dimensions in addition to income--the educational level of the family head,
the number of children in the family, and housing density--and has its
roots in the literature on multiproblem families.[1]

The first of the studies using the current-income approach was Roter
and Shamai (1971a), which found that 11.1 per cent of families were poor
in 1969 on the basis of a poverty line set at 40 per cent of median
disposable income.[2] Later studies also measured pre-transfer poverty and
it was found that on this basis 18 per cent of all families were poor
(Habib, 1975a). These results conflicted with the prevalent belief that
poverty was a marginal phenomenon confined to the small percentage
(between 3 and 5 in 1966-76) of families receiving support from the
Ministry of Welfare. Naturally one's assessment of the degree of poverty

---

[1] The first approach was developed at the National Insurance
Institute's Bureau of Research and planning; the second emerged in the
School of Social Work at the Hebrew University.

[2] With a near-poverty line of 50 per cent, the proportion is 21
per cent.

depends on where the line is drawn and there has indeed been a great deal
of controversy over this particular standard; it would appear, however,
that the level of 40 per cent (IL 1,527 for a family of 4 in April 1976)
has become widely accepted (see Chapter 6 for a more extensive discussion
of this issue).

Two major groups of poor were identified (see Table 2.1): the aged
(families whose head is aged over 65), who constitute 50 per cent of
pre-transfer poor families; and the working poor (families with an
employed working-age head). The extent of poverty in the latter group
had not been previously recognized and was disturbing to many since it
seemed particularly unfair that a man who was willing to work should not
be able to support his family adequately.[3]

The working poor include a high proportion of large families. The
rate of employment rises with family size among the poor. Irregular
employment also becomes much less common as family size increases. Only
27 per cent of all working poor would be above the poverty line if they
were fully employed and for large families the figure is only 6 per cent
(Doron and Roter, 1974, Chapter 3). Most large working-poor families
were from the Middle East and North Africa. Half of Israel's population
are immigrants, many of whom came during the period of mass immigration,
1948-52, when the population doubled and the immigration rate reached a
peak of 266 per thousand inhabitants. About half the immigrants came
from Europe or America and half from Asia or Africa. The absorption and
integration of the diverge groups is one of Israel's major goals

---

[3] One-parent families, a sizable group among the poor in some
countries, are of little quantitative significance in Israel.

Table 2.1.   Poor Families[a] by Demographic Characteristics and Labor
Force Participation (pre-transfer poverty):   1969

	All poor families (thousands)	Working poor families[b]	
		Per cent of all poor families	Per cent of working poor families
1. Total families (2.+3.)	109.6	44.8	100.0
2. Aged family head[c]	54.9	17.1	19.1
of which: Men	33.1	21.6	14.7
3. Working-age family head	54.7	72.8	80.9
of which: Men	45.7	81.0	75.3
4. Families with children[d]	46.2	75.6	71.3
1-3	22.7	70.8	32.6
4-5	10.5	76.2	16.3
6+	13.0	84.6	22.4
5. One-parent families	6.7	(40.0)[e]	(5.5)[e]

[a] Urban families with income below the poverty line (40 per cent
of median income per standard adult).

[b] Includes all families whose head worked at least one week in the
preceding year;   however in most cases the family head worked throughout
the year.

[c] Aged 65+ (men) and 60+ (women).

[d] Aged 0-17.

[e] Not statistically significant.

Source: Habib (1975a).

and involves overcoming large differences in background. The differences in labor-force skills combined with family-size differences have created a strong association between poverty and continent of birth (see Table 2.2).

A consensus has developed in Israel that poverty should be defined in relative terms. That is, poverty must be defined in relation to the prevailing standard of living. This approach has characterized the various poverty studies and has been institutionalized in the arrangements for linking income transfers to changes in the average wage. The adoption of a relative approach has important implications for the way in which the size and composition of the poverty population can be expected to change over time and for the sort of social policy required to deal with poverty. Unless transfers are increased as a percentage of average wages, their effectiveness in reducing poverty will not improve. The extent of pre-transfer poverty will remain constant unless inequality in the earnings structure declines. Further, the working poor will remain a high proportion of the pre-transfer poor in the absence of changes in the wage structure. This is in fact what has happened, although since 1969 improvements in income transfers have reduced the post-transfer rate considerably. In contrast, pre-transfer poverty counts in countries such as the United States, where poverty is defined in absolute terms, have shown a steady decline in the percentage of working poor.

Similarly, the proportion of families who remain poor year after year will be greater under a relative definition. Of course, the incidence of poverty will vary over the life-cycle with changes in earnings rates, family labor-force participation, and the number of dependants. But large families with low earning capacity are poor over a much greater

Table 2.2. *Continent of Birth and Pre-Transfer Poverty, Selected Indicators*

	Asia-Africa	Europe-America
Whole population		
Education, 1957, per cent of population aged 14+		
Illiterate: Men	25.0	2.2
Women	53.0	6.2
Higher education (men)	0.7	4.8
Family size, 1969, per cent of families with 4+ children	22.4	22.4
Poverty indicators, 1969		
Per cent below poverty line		
All families	26.0	13.0
Families with working head	17.0	4.4
Children	30.0	4.2
Per cent in each continent group		
Poor population	52.4	35.9
Working poor	65.5	21.8
Poor children	77.8	5.2
Families with 4+ children	82.4	3.0

Source: Education, Patinkin (1960); family size, National Insurance Institute (1972); poverty indicators, Habib (1975a).

part of the life-cycle when poverty is defined relatively. There is some evidence that the probability of remaining in poverty strongly correlates with continent of birth. In a study based on a two-year longitudinal survey it was found that 90 per cent of Asia-Africa born poor in one year were also poor in the next, the corresponding figure for the Europe-America born being 50 per cent (Habib *et al.*, 1976).

The structural changes (in wage differentials, skill distribution, or family-size distribution) required to reduce the magnitude of the poverty problem can only be achieved in the long run, if at all. In the short run, poverty can only be alleviated by providing income supplements, but income support is often regarded with suspicion. A common stereotype, whose origins can perhaps be traced to the immigrant camps of the early 1950s, is that of the unskilled family head of oriental origin with many children whose poverty is largely due to lack of motivation and willingness to work. The large number of children is viewed as evidence of apathy towards his own well-being or his children's future. Transfers to this group, it is claimed, would reinforce the unwillingness to work and encourage such people to have more children, and would thus sabotage the efforts to raise living standards in the short run and to carry out the radical solutions required to make the poor self-supporting. Although such attitudes persist, the findings about the nature of poverty have weakened their influence. The finding that the majority of poor oriental large families are *working* poor has challenged the stereotype of the poor and weakened the resistance to income transfers. It has thus been an important factor in creating a climate in which the transfer system could be expanded and reformed. The discovery of the working poor and the

search for a policy that would meet their needs have paralleled
developments in other industrial countries.

The case for increased assistance was also strengthened by the
findings about poverty among children. The realization that half the
poor were under 18 and that almost 20 per cent of all children were in
poverty gave rise to the feeling that the prospects and well-being of a
significant portion of the future generation was at stake. Of the poor
children, 75 per cent were from working-poor families with four or more
children and 80 per cent were from two-parent families whose head was
employed, a fact which again drew attention to the working poor. Moreover,
the overwhelming concentration of these children in oriental families
threatened the prospects of narrowing ethnic disparities.[4] It is often
argued that it would be more efficient to devote most of the available
resources to the long-run solutions of these problems. Nevertheless this
constellation of findings led social policy to a concern with the immediate
alleviation of the condition of the working poor. They deserved to be
helped and had a legitimate claim to a minimum standard of living; they
had to be helped in order to provide assistance to their children and
narrow the gap in the conditions in which children from oriental and
western families were growing up.

---

[4] The studies using a multidimensional approach found that the
multiple incidence of disadvantages was particularly severe in large
families and that almost all children with a combination of two or more
disadvantages were from Asia-Africa families. Of the children from large
families 51 per cent had two or three disadvantages (low income, low
education, or high housing density), compared with 10 per cent of those
children from 1-3 child families. See Rosenfeld, *et al.* (1973), Prime
Minister's Commission (1973), and Habib (1973).

Another important concern is inequality, which has always been a sensitive issue in Israel.[5] The egalitarian ethic has been an important element in Zionism and the kibbutz has been ideologically influential; since its establishment, the State has been led by a socialist labor party and the various coalition governments have often included more leftist parties. Quite commonplace reflections of extremes of income and wealth tend to generate heated public debate and poverty and inequality are prominently featured in the mass media.[6]

The concern with inequality is reflected in the fact that within a period of five years the government appointed two commissions to examine trends in the distribution of income. The basic theme of their conclusions was positive and optimistic. The earlier of the two reported as follows:

> The income distribution in Israel stands out by
> reason of its very small degree of inequality in
> comparison with other countries. The degree of
> income inequality is much smaller than that of
> underdeveloped countries such as Mexico and Ceylon,
> and is no greater, indeed in most cases, it is
> smaller, than that found in developed countries
> such as Italy, Denmark, Sweden, Britain, and the
> United States. Comparison of the distribution of

---

[5] In this respect Israel resembles European countries more than the United States, where the focus of social policy has been on poverty rather than inequality.

[6] As the population became more heterogeneous and as increasing emphasis was placed on economic growth, the influence of the egalitarian ethic weakened. For example, the Histadrut, Israel's monolithic labor union, has from time to time pursued a policy of increasing wage differentials (see Report, 1966).

net income shows that the income tax further reduces
inequality in Israel relatively to other countries
(Report, 1966, p. 3).

It was admitted that income inequality had increased since the early
1950s. However the magnitude of the increase was played down and it was
emphasized that "most of the increase in inequality occurred at the
beginning of the period [1950-58]; in the second half of the period
[1959-65] the rate of increase in inequality was to a large extent slowed
down" (*ibid.*, p. 4). Moreover the sources of the increase were viewed as
uniquely related to the demographic changes that occurred in the period
of mass immigration. They were therefore not inherent in the process of
economic growth and unlikely to continue:

> The increase in inequality must be viewed against
> the demographic, social, and economic changes that
> occurred in Israel, changes rooted primarily in mass
> immigration. Immigration increased the heterogeneity
> of the population; differences in education and in
> working skills and experience increased. The age
> composition changed and labor force participation
> declined (*ibid.*, p. 4).

The later commission emphasized changes in the late 1960s and
asserted that the trend of the 1950s and early 1960s had been reversed
in that inequality was either constant or on the decline. For example,
"among the families of urban Jewish wage-earners ... inequality in income
distribution has steadily diminished in the past few years, and at the
beginning of 1970 the degree of inequality was somewhat smaller than
in 1963/64" (Report, 1971, p. 4).

This view of the evidence was challenged by economists at the

National Insurance Institute. Roter and Shamai claimed that "in the 1960s, and in particularly by the end of the decade, Israel does not have strikingly greater equality than other industrial countries. ... Therefore statements that take pride in Israel's world record for equality are anachronistic and can in the 1970s no longer be backed up" (Roter and Shamai, 1971b, p. 60). They gather evidence that shows a dramatic rise in inequality of over 50 per cent between the early 1950s and late 1960s. While admitting that the rate of increase has slowed down they assert that the increase continued into the late 1960s. This claim is reiterated in a set of dissenting opinions included in the 1971 report. Roter and Shamai (1971b, *loc. cit.*) conclude their article with a stern warning:

> In contrast to the trend of increasing inequality
> in Israel, the data for the United States and
> Canada suggest that inequality has been stable with
> a slight tendency to decline. ... If this trend
> continues in Israel in the 1970s and the opposite
> trend persists [in other developed countries],
> Israel is likely to find herself among the less
> egalitarian of the developed countries.

What is actually happening in the 1970s is unclear. The only data available is from an annual survey of employee families. It shows that in the 1970s there is no clear trend in the distribution of income among employees. There appears to be random variation round some stable level of inequality. This is true for the distribution of both earned and total income.

Yet there is also evidence that in this period survey data became increasingly inadequate as a source of information about the income distribution. A good part of the income increases were in the form of

fringe benefits, many of them not reported in the surveys. Moreover these benefits are regressively distributed (Commission on Tax Reform, 1975).

The conflicting positions of Roter and Shamai and the reports of the income-distribution commissions cannot easily be reconciled. In part, they are related to the use of different data. For the international comparison the 1966 commission made use of income tax data while Roter and Shamai used survey data. Moreover, the sources used to chart the time trend raise serious difficulties of comparability and interpretation. Although a much more careful study must be made before any definite conclusions can be reached, there is no doubt that the dissenting views of Roter and Shamai had a strong impact on public opinion and reinforced the feeling that present efforts at redistributing income were inadequate.

The increased concern with poverty and inequality has led to a re-assessment of existing transfer mechanisms. Over the years Israel has experimented with a wide range of income-maintenance programs. These included public works, sheltered employment, and officially-set wage scales that increased wages with family size, as well as more conventional transfer programs. The system as it existed in 1969, the year for which the first poverty estimates were made, included welfare, low-wage supplements, child allowances, and social insurance (old-age and survivors pensions and work accident insurance).

Welfare, the low-wage supplements, and child allowances were all potential sources of support for the working poor, but in practice each of these programs was quite limited. Able-bodied male family heads employed at low wages have always been included among those eligible for welfare in Israel. Thus some of the more blatant distorting effects

of the restrictions on male family heads frequently imposed by welfare
systems in other countries have been avoided. Yet the number of actual
recipients has been very small, while in many of the recipient families
the head was disabled or aged. In addition earned income was penalized
at confiscatory rates within the welfare system, so that there was little
or no incentive to work.

The system has been criticized for the lack of clearly defined and
objective criteria for assistance, for the failure to supply the funds
required for existing services, for the failure to reach a large percentage
of those eligible for support or in need, for imposing upon the social
worker the role of financial policeman and petty bureaucrat, and for
imposing a serious stigma on the recipient. The overall feeling has been
that welfare neither effectively rehabilitates the poor nor provides
adequately for a minimum level of income or services.[7]

The low-wage supplements were introduced in 1967. The system
underwent several changes but its basic character was preserved. It
provided a fixed grant to all employees earning less than a certain amount;
above this level the grant was reduced, at a rate which varied from period
to period between 100 and 50 per cent. It thus functioned as a negative

---

[7] For a general criticism of the Israeli welfare system see "The
Future of Income Maintenance Services" (1969) and Salzberger and Rosenfeld
(1972). For some proposals to reduce the disincentive effects of welfare
see Doron (1971). For an examination of the criteria on which welfare is
based, both in fact and in theory, see Doron and Rosental (1971). The
existence of a right to welfare in Israel and its link with welfare
criteria is discussed in Shnit (1971). See also Salzberger and Shlonsky
(1974) and Ministry of Welfare (1975).

income tax for employees with rather stiff earnings penalties. It was criticized for these disincentive effects as well as for a low rate of take-up. A survey conducted by the National Institute in 1970/71 found that between one third and one half of the eligible workers did not receive the grants and many of the recipients did not receive the full amount to which they were entitled. The amount of assistance provided was very small and the program has been phased out (Doron and Roter, 1974).

The child allowance program (which aside from minor changes remained in the form in which it had been introduced in 1959) was also too small to provide significant assistance to the working poor. Employee families received an allowance starting from the first child while for the self-employed or unemployed it started only from the fourth.

Two significant findings emerge when the effect of transfers on poverty in 1969 is evaluated (Habib, 1975a). One was that only one third of all poor families were removed from poverty by income transfers. The second was that the reduction in poverty varied significantly by family type. For the working poor with working-age family head the reduction in poverty is only 25 per cent. The rate is similar for large families. The aged, on the other hand, were helped considerably more: 41 per cent of families were removed from poverty and as many as 54 per cent of those in which the aged family head was employed. A direct consequence was that the system discriminated against poor children, only one out of four being removed from poverty by income transfers.

The contribution of transfers should not, however, be measured solely in terms of the reduction in the size of poor population. Transfers also

served to alleviate the poverty of families who remained below the poverty line. The 63 per cent decrease in the poverty gap (a measure that takes into account both the number of poor and the degree to which their incomes fall below the poverty line) is far greater than the decline in the percentage of the population below the poverty line. But the same pattern of discrimination among the poor emerges. For the aged the reduction in the poverty gap is almost 80 per cent, while for the working poor and for large families it is closer to 50 per cent.

The increased awareness of the problems of poverty and inequality and the finding that existing income support programs had not been particularly effective or even-handed had two effects. They resulted in a climate favorable to expanded assistance, and the search for an effective means of providing it was stimulated.

Other factors related to the general social situation also contributed to this development. In the years 1970-1973, Israel enjoyed a period of relative military calm and attention turned to internal problems. At this time there were signs of rising social unrest among the poor, manifested by the establistment of the 'Black Panther' movement. Their complaints about deliberate discrimination and deprivation caused public agitation. There may have been a constellation of factors, with research findings lending a broader quantitative dimension to the public outcry, and the public pressure lending these findings a dimension of urgency. In 1971, a special commission was appointed to look into the poverty problem, with emphasis on the plight of children. It submitted its report in 1973, after two years of work. The commission looked into the issue of income maintenance and made a series of recommendations (see

CHAPTER 3

HORIZONTAL EQUITY WITH RESPECT TO FAMILY SIZE

Horizontal equity is normally defined as a situation in which families
with the same standard of living are treated equally in a system of
transfers and taxes.[1] In other words, families with the same initial
living standard experience an equal change as the result of redistribution.[2]
Horizontal equity is generally related either to factors such as family
size and family composition with alter the living standard associated
with a given income; or to types of income which typically receive special
tax treatment, such as capital gains or the income of secondary earners.
In this chapter the analysis is confined to horizontal equity among
families of different size.

Any attempt to define the degree of horizontal equity associated

---

[1] The concept was first developed by Henry Simons (1938), p. 30.

[2] Equal living standards is a general term that can be interpreted
in many ways. In practice some kind of realized income concept has
served as the basis for ranking individuals and assessing their tax
burden. Recently however, it has been argued that equal earning power
would be the more correct concept; in other words leisure should be
included in the measure of living standards for tax purposes and concepts
of horizontal equity should be adjusted accordingly. In fact once the
concept has been broadened and differences in tastes are taken into
account, there may not be any operational basis for measuring horizontal
equity [see Musgrave (1975) and Feldstein (1975)]. Since the shift to
earnings potential as a basis of taxation would not appear to be a very
immediate possibility we confine ourselves to the more conventional
realized income concept.

with family size must begin by establishing a basis of comparison for the living standards of families of different size. One must be able to define incomes at which the living standard of a family of any size is equivalent to that of a family of some other size. For this purpose equivalence scales have been developed which express the relative needs of families of different size in relation to an arbitrarily chosen base *family size*. The measurement unit is the 'standard adult' which is the equivalent of a person in the base family size. For example, if the equivalence scale assigns a value of 2 standard adults to a family of 2 persons (the base size family) and a value of 1.2 standard persons for a single person family, this means that the relative needs of a one-person family are not the same as those of a two-person family, but greater. Similarly, for a family of 4 persons, if the scale assigns it a value of 3.4 standard adults, then its relative needs are not twice these of a 2 person family but only 1.7 times. Families with equal income per standard adult (p.s.a.) are considered to have equivalent living standards.

Two questions arise in establishing relative needs. First, to what extent, if at all, are there economies of scale in family consumption. Second, do scale economies vary with the level of income, and if so, how; if they do not, a single equivalence scale is applicable at all incomes; we refer to this as the fixed scale. If they do, the equivalence scale varies, and we refer in this case to the variable scale.

In the literature, the degree of horizontal equity has been linked with the pattern of variation of tax reductions with family size and income.[3] The variation of reductions with family size has been compared

---

[3] The tax-reduction may take various forms, such as a reduction in

with estimated equivalence scales. Alternative patterns of variation with income have been proposed. Such proposals have sometimes reflected a concern with vertical equity; when the concern is with horizontal equity, one finds two opposing views. On the one hand, it has been argued that there is no need for reductions for middle or upper income groups--on the other, that the reduction should *rise* with income.

These views are related to different concepts of equivalence. Thus those who argue against reductions at medium and high incomes would take account of the utility from children in determining the relative position of families of different size.[4] At these incomes, having children is considered to be a voluntary decision. Those who argue for increasing reductions tend to refer to the more conventional definition of family consumption and attempts to determine equivalence scales have in practice been based solely on the latter.

But these references to the link between equivalence scales and the reduction pattern have been unsystematic and often misleading. In this chapter we systematically analyse the relationship between assumptions about the equivalence scale and the structure of reductions for family size required for horizontal equity. We are not concerned here with the evaluation of the different views of equivalence between different-sized

---

the income subject to tax (exemption), or a reduction in the calculated tax (credit). For discussion of the structure of reductions, see Lampman (1956); Groves (1963), pp. 18-38; Goode (1964), pp. 222-33; Pechman (1966), pp. 64-75; Hagen (1967); Seltzer (1968), Brannon and Morss (1973), Pogue (1974), and Danziger and Kesselman (1975).

[4] For an early exposition of this view see Simons (1938), p. 140, Chapter IV, and more recently Pogue (1974).

families. Our concern is rather with the appropriate use of equivalence scales for determining the pattern of tax reductions.

Most--if not all--analyses of horizontal equity have failed to recognize the role played by the progressivity of the tax system. We show how the degree of progressivity interacts with the pattern of scale economies and derive the conditions for alternative tax structures with respect to family size and income. We then examine existing approaches in the light of this discussion.

The uses of the analysis are illustrated by an evaluation of the degree of horizontal equity characterizing the Israeli tax-transfer structure in 1969/70. The pattern of divergencies from horizontal equity is examined in order to determine which income levels and which family sizes gain or lose from the absence of complete equity. This enables us to assess the redistributional implications of achieving full horizontal equity.

THE CONDITIONS FOR HORIZONTAL EQUITY

Consider two families of different size but equal income per standard adult (p.s.a.). Let K_i be the number of standard adults associated with family size i (i = n, m; n > m), and let Y_i be the income of a family of size i. Then

$$(3.1) \qquad \frac{Y_n}{K_n} = \frac{Y_m}{K_m}$$

and there are positive economies of scale for family size if

(3.2) $\quad \dfrac{Y_m}{m} > \dfrac{Y_n}{n}$,

i.e., if the smaller family has the greater per capita income.

Similarly, family-size economies of scale are defined as constant with respect to income if the ratio of per capita income between any two family sizes is constant as income p.s.a. varies; the economies of scale increase with income if the ratio rises with income p.s.a.

(3.3) $\quad \dfrac{Y_{mH}}{m} \div \dfrac{Y_{nH}}{n} > \dfrac{Y_{mL}}{m} \div \dfrac{Y_{nL}}{n}$

where the subscripts H and L indicate high and low income p.s.a. Rearranging and substituting $Y_m/Y_n = K_m/K_n$ [from (3.1)], it follows that

(3.4) $\quad \dfrac{K_{nL}}{K_{nH}} \gtrless \dfrac{K_{mL}}{K_{mH}}$

according as economies of scale rise, are constant, or fall with income.

We can now set out the conditions for horizontal equity. If the pretax situation is described by equation (3.1), horizontal equity requires that $Y_m^*/K_m^* = Y_n^*/K_n^*$ (where the asterisk denotes the after-tax situation), or

(3.5) $\quad \dfrac{Y_m(1 - t_m)}{K_m - \Delta K_m} = \dfrac{Y_n(1 - t_n)}{K_n - \Delta K_n}$,

where t_i is the tax rate on income Y_i, $Y_i(1 - t_i) = Y_i^*$, $K_i - \Delta K_i = K_i^*$, and ΔK_i is the change in the number of standard adults, with the change in income that results from applying the tax. Dividing (3.5) by (3.1) and

rearranging we get

$$(3.6) \qquad \frac{1 - t_m}{1 - t_n} = \frac{1 - \Delta K_m/K_m}{1 - \Delta K_n/K_n}.$$

It can be seen from (3.4) that the right-hand side of (3.6) is smaller than, equal to, or greater than unity according as economies of scale rise, are constant, or fall with income; it follows that

$$(3.7) \qquad t_m \gtreqless t_n$$

for the three cases, respectively.

To simplify the link between the tax rates of the two families (size n and m and equal income p.s.a.), we define the elasticity of the number of standard adults with respect to income, as $\alpha_i = \Delta K_i/K_i \div \Delta Y_i/Y_i$. Substituting $\alpha_i t_i = \Delta K_i/K_i$ (since $\Delta Y_i/Y_i = t_i$), we rewrite the right-hand side of (3.6) as $(1 - \alpha_m t_m)/(1 - \alpha_n t_n)$, and, rearranging the equation, obtain

$$(3.8) \qquad t_m = t_n + \frac{t_n (1 - t_n)(\alpha_m - \alpha_n)}{(1 - \alpha_m) + t_n (\alpha_m - \alpha_n)}.$$

Rearranging again and denoting the fractional term by V, we get

$$(3.8') \qquad t_m - t_n = V,$$

and it follows that $V \gtreqless 0$ according as economies of scale rise, are constant, or fall with income. That is, the smaller family pays the

higher tax rate when economies of scale increase with income and the two families pay the same rate under constant economies (fixed scale).[5] This result has intuitive appeal. If economies rise as income rises, the relative post-redistribution needs of the larger family will rise in response to equal positive tax rates. This increase in needs must be compensated for by a lower rate of taxation on the larger family.

Having established the condition for horizontal equity, we can now apply it to the determination of the pattern of tax reductions for family size. We derive the link between the tax rates of two different-sized families with the same family income from that between two families of equal size and different income.

Consider two families of size m and n $(m < n)$ with the same family income, Y. Their respective tax rates are t_{mH} and t_{nL} (where the subscripts H and L refer to their incomes p.s.a., respectively high and low).

Let us assume that the tax authorities define the desired schedule of tax rates and tax progressivity with respect to a family of size m, which in this sense serves as the base size of the tax rates structure. We have t_{mH} from the schedule; and we now have to find t_{nL}.

We begin by defining Y_{En}, the 'equivalent income' at which a family of the base size m will have an income p.s.a. equal to that of a family of size n, i.e., at which $Y_{En}/K_m = Y_n/K_n$ [by (3.1)], so that

---

[5] Seneca and Taussig (1971), allow economies of scale to vary with income; however, in estimating the divergence from horizontal equity at various incomes and for different family sizes, they overlook the distinction drawn here between the fixed and variable cases

(3.9) $Y_{En} = \dfrac{Y_n}{K_n} K_m.$

The tax rate paid by the base family on Y_{En} is t_{mL}, which is given by
the tax schedule. The relationship between t_{mL} and t_{mH} (the tax
rates for two families of the same size with different income p.s.a.) can
be expressed as approximately

(3.10) $t_{mH} - t_{mL} = (ARP)\Delta Y_E,$

where $ARP = dt/dY$, the average rate progressivity over the range $Y - Y_{En}$,
and $\Delta Y_E = Y - Y_{En}$, the equivalent income differential.[6] The link between
the tax rates of two families of different size and the same income p.s.a.
was given earlier:

(3.8″) $t_{mL} - t_{nL} = V,$

and we get the required relationship between families mH and nL
directly by adding (3.10) and (3.8″):

(3.11) $t_{mH} - t_{nL} = (ARP)\Delta Y_E + V.$

---

[6] The more general formulation is $\Delta Y_E = (Y_m/K_m - Y_n/K_n)\bar{K}$, where
$\bar{K}$ is the number of standard adults associated with the base family size.
When, as here, we compare two families with the same income $(Y_m = Y_n = Y)$,
and when m is taken as the base size, this of course reduces to
$\Delta Y_E = Y - Y_{En}.$

Multiplying both sides by Y, we obtain

(3.12) $(t_{mH} - t_{nL})Y = [(ARP)\Delta Y_E + V]Y = \Delta T,$

the tax reduction required for horizontal equity.

We now relate this analysis to the two issues of designing the reduction structure discussed in the literature: the nature of the pattern with respect to family size and the degree of progressivity respect to income.

THE VARIATION IN HORIZONTAL EQUITY REDUCTIONS WITH FAMILY SIZE

Let us first take the case of economies of scale that are constant with respect to income so that $V = 0$. There are two cases in which there is no need to provide any reduction for family size. First, in the case of a proportional tax, when $ARP = 0$. Second, in the case of extreme economies of scale in which needs do not increase with family size, that is, $K_n = K_m$ so that $\Delta Y_E = 0$. Since ΔY_E is positive in all other cases, the sign of ΔT depends on that of ARP. With progressive taxation, the required tax falls with family size and the reductions are positive. The greater ARP and the smaller economies of scale, the greater are the required reductions for family size. But if desired tax rates are regressive, the family-size pattern of taxes is reversed: larger families must pay more tax and reductions are negative. Thus we see how the pattern of tax reductions for family size is determined by the interaction between the desired average rate progression and economies

of scale for family size.

An additional factor arises in the case of the variable scale $(V \neq 0)$. Other things equal, the tax reduction will be greater if economies of scale rise with income. For example, tax rates will vary with family size (at a given income) even with proportional taxation, the direction depending on whether economies of scale rise or decline with income: if they rise with income, V is positive and taxes will decline with family size. However, the difference in reductions depends not only on the sign of V but also on the difference in ΔY_E between the two scales. This in turn is a function of the difference in scale economies at each income level. A fixed scale should represent an average of the economies of scale displayed by the variable scale at various incomes, at least if they are derived on the same basis.[7] As a result, economies of scale and hence ΔY_E should be the same at some income (near the average) and different at others.

With rising economies of scale the tax reduction will be greater under the variable scale at low incomes both because $V > 0$ and because ΔY_E is greater under the variable than under the fixed scale. At high incomes, the two terms work in opposite directions. Thus while not necessarily leading to greater reductions at all incomes, the variable scale will in any case affect the income pattern of reductions, as is discussed in the next section.

Up to now we have focused on the determination of the sign and size of reductions. Still another aspect is their family-size pattern.

---

[7] See Table 3.2 below. For a further empirical illustration of this point see Habib and Tawil (1974).

To describe this pattern we then define the marginal reduction as the decline in taxes for one additional family member. The issue is whether the marginal reduction should be the same for each additional member or whether it should decline or perhaps rise as family size increases. It has been argued that if the needs per additional family member decline $(K_{n+2} - K_{n+1} < K_{n+1} - K_n)$, so should the marginal tax reduction. Equation (3.12) gives the marginal reduction when $n = m + 1$. The pattern of marginal reductions is then given by

$$(3.13) \qquad Y(t_m - t_n) - Y(t_n - t_{n+1}) \lessgtr 0,$$

with reductions increasing when the expression is negative, and so forth. Using $(t_n - t_{n+1}) = (t_m - t_{n+1}) - (t_m - t_n)$ and substituting from equation (3.12) into (3.13) we get

$$(3.14) \qquad \Delta(\Delta T) = [(ARP)\Delta Y_E + V - (ARP')\Delta Y_E' + V' + (ARP)\Delta Y_E + V]Y,$$

where the prime denotes the values for $t_m - t_{n+1}$. The expression can be generalized as

$$(3.15) \qquad \frac{\partial(\Delta T)}{\partial n} = [\frac{\partial(ARP)}{\partial n}\Delta Y_E + (ARP)\frac{\partial(\Delta Y_E)}{\partial n} + \frac{\partial V}{\partial n} + (ARP)\Delta Y_E + V]Y.$$

Since $\partial(\Delta Y_E)/\partial n = \bar{K}[-(Y/K_m^2)/(K_m - K_n) + (Y/K_n^2)/(K_{n+1} - K_n)] \gtrless 0$ according as $K_n - K_m \lessgtr K_{n+1} - K_n$ $(n = m + 1)$, the sign of the second term does depend on the pattern of scale economies. The sign of the first term, however, is given by $\partial(ARP)/\partial n \gtrless 0$, according as $\partial(ARP)/\partial Y \gtrless 0$.

When progressivity is constant and there is a fixed scale the result
supports the commonly held view that the pattern of needs reflected in
the scale uniquely determines the pattern of required reductions. However,
when progressivity varies, this assertion must be modified. If
progressivity is rising, then one could get rising reductions with family
size despite strong economies of scale. Furthermore, rising economies
of scale with income (V > 0) is also conducive to rising marginal
reductions at any given income level.

In conclusion, we see how the sign, size, and pattern of reductions
cannot be related in any simple way to the economies of scale. Both the
pattern of progressivity and the variation in scale economies with
income are just as important.

THE VARIATION IN HE REDUCTIONS WITH INCOME

The single issue that has received most attention in the literature is
how the reductions vary with income, that is, whether they rise or fall:
when reductions rise there is more family-size differentiation at higher
than at lower incomes.

The variation in the required reduction is obtained by
differentiating (3.12) with respect to Y:

$$(3.16) \qquad \frac{\partial \Delta T}{\partial Y} = (ARP)\Delta Y_E + \frac{\partial (ARP)}{\partial Y}\Delta Y_E Y + \frac{\partial (\Delta Y_E)}{\partial Y}(ARP)Y + \frac{\partial V}{\partial Y}Y + V$$

$$\text{(i)} \qquad\qquad \text{(ii)} \qquad\qquad \text{(iii)} \qquad\qquad \text{(iv) (v)}$$

In the case of the fixed scale, the last two terms (iv and v) are
zero and, assuming ARP ≥ 0 the first term (i) is positive. The third

term (iii) is also positive, since $K_n > K_m$ so that $\partial(\Delta Y_E)/\partial Y = (I/K_m - 1/K_n)K_m > 0$. A sufficient condition for the HE reduction to rise with income is therefore for ARP to rise with income: the greater ARP and the smaller economies of scale, the greater the rise; reductions can fall only when ARP falls.

In the case of the variable scale, the variation of economies of scale with income comes into play, both its direction and its rate of change. These now determine the sign of terms (iii), (iv), and (v). Evaluating (iii) we have

$$(3.17) \qquad \frac{\partial Y_E}{\partial Y} = 1 - \frac{K_m}{K_n} + \frac{Y}{K_n^2} K_m \left(\frac{\partial K_n}{\partial Y}\right),$$

which is positive when economies of scale fall with income since $\partial K_n/\partial Y > 0$. When they rise, the sign of the term is not strictly determinate. However, it will almost always be negative for realistic values.

An additional factor, the rate of change of α_n (the elasticity of the number of standard adults with respect to income) influences the sign of (iv):

$$(3.18) \qquad Y\frac{\partial V}{\partial Y} = Y[\alpha_n \left(\frac{\partial t_n}{\partial Y}\right)(2t_n - 1) + t_n \left(\frac{\partial \alpha_n}{\partial Y}\right)(t_n - 1)],$$

where $\partial \alpha_n/\partial Y$ represents the acceleration of scale economies. The conditions for the sign of this (and the other) terms are summarized in Table 3.1.

It is intuitively tempting to assert that if scale economies rise

Table 3.1. *Conditions for Rising and Falling Tax Reduction* $(\partial \Delta T/\partial Y \gtrless 0)$[a/]

	i	ii	iii	iv	v
$\alpha = 0$	+	+	+	0	0
$\alpha > 0$					
$\partial\alpha/\partial Y = 0$	+	+	+	-	-
$\partial\alpha/\partial Y > 0$	+	+	+	-	-
$\partial\alpha/\partial Y < 0$	+	+	+	?	-
$\alpha < 0$					
$\partial\alpha/\partial Y = 0$	+	+	-	+	+
$\partial\alpha/\partial Y > 0$	+	+	-	?	+
$\partial\alpha/\partial Y < 0$	+	+	-	+	+

[a/] For ARP > 0, $\partial(\text{ARP})/\partial Y > 0$. For definition of α see text,
p. . The column heads refer to the right-hand terms of equation (3.16):

$$(\text{ARP})\Delta Y_E + \frac{\partial(\text{ARP})}{\partial Y}\Delta Y_E Y + \frac{\partial(\Delta Y_E)}{\partial Y}(\text{ARP})Y + \frac{\partial V}{\partial Y}Y + V$$

$$\text{(i)} \qquad \text{(ii)} \qquad \qquad \text{(iii)} \qquad \qquad \text{(iv) (v)}$$

with income (i.e., the relative needs of larger families decline), the reduction required to ensure horizontal equity should also decline, and conversely if economies of scale fall. But it is clear from the table that under varying economies of scale the sign of the reduction is in no case determinate; i.e., reductions do not unambiguously fall with income when economies of scale rise. Term (i) [and, when $\partial(ARP)/\partial Y > 0$, term (ii)] serves to increase reductions no matter what the pattern of scale economies.[8] Moreover the effect of rising economies of scale on reductions works in both directions.

The intuitively expected effect is indeed reflected in (iii), which is positive when economies fall and usually negative when they rise. The opposite effect is reflected in (iv) and (v), which are generally negative under falling economies and positive under rising economies. To understand this we must refer back to equation (3.8'). There we showed that under rising economies the tax rate decreases as family size rises, at a given income p.s.a.; we refer to this as the V factor. This factor was incorporated into equation (3.12), from which it is clear that the greater the income, the greater the effect of V on ΔT. When V itself is a rising function of income the effect is reinforced. This will be so when economies of scale rise at a constant or increasing rate $(\partial \alpha/\partial Y \leq 0)$.

---

[8] Note that (i) would drop out if we were differentiating Δt. It simply reflects the fact that the higher the level of income the higher the absolute reductions required to achieve a given decline in tax rates.

AN EMPIRICAL ILLUSTRATION

A direct implication of our analysis is that the pattern of tax reduction
for family size required for horizontal equity (henceforth HE reduction)
can be determined on the basis of given assumptions about equivalence
scales and the desired degree of ARP. We take an illustration from the
Israeli tax structure of 1969/70. Direct information about desired
progressivity is not usually available and probably does not exist in any
explicit form in the minds of those who plan and legislate the tax
structure. Similarly, there is generally little agreement on the correct
scale and in planning tax policy little use is made of such scales as
have been proposed. In order to determine the pattern of HE reduction
implied by the notion of equivalence and the degree of progressivity the
tax authorities have in mind some assumptions must therefore be made.
The desired ARP can be approximated either by taking an average for
families of different size or simply by adopting the rates that
characterize a particular family size. We have chosen the latter course
and have derived the desired ARP from the rates paid by a family of two.
The ARP that emerges from the tax structure as it was in 1969/70 is shown
in Table 3.2; as can be seen, it has no clear pattern with income: there
is a decline on the whole but at moderately high incomes (IL 1200) there
is a jump to a higher ARP followed by a continued decline.

    We must make an essentially arbitrary assumption about the
appropriate equivalence scale. We employ the two scales presented in the
first part of Table 3.2. Both assume the existence of economies of scale
in family consumption. In the variable scale, the economies increase

Table 3.2.   The Equivalence Scales[a] (standard adults) and ARP (per cent)

Family size	Variable scale				Fixed scale
	Y = 300	Y = 600	Y = 1200	Y = 1800	
Standard adults					
1	0.9	1.0	1.4	1.6	1.2
2	2.0	2.0	2.0	2.0	2.0
3	3.0	2.8	2.5	2.3	2.7
4	4.0	3.5	2.9	2.5	3.4
5	4.9	4.1	3.2	2.8	4.1
6	5.7	4.7	3.5	2.9	4.7
7	6.6	5.2	3.8	3.1	5.3
8	7.4	5.7	4.1	3.3	5.9
ARP					
Per cent[b]	3.4	2.1	2.4	1.3	

[a]   Estimated from the equations:

$$F = \underset{22.58}{-6.08} + \underset{0.05}{0.20}\ C - \underset{0.000018}{0.000038}\ C^2 + \underset{0.94}{27.55}\ N \qquad \text{(variable scale)}$$

$$\log F = \underset{0.17}{1.72}\ \log A + \underset{0.03}{0.49}\ \log C + \underset{0.01}{0.40}\ \log N \qquad \text{(fixed scale)}$$

where F is food expenditure, C is total consumption expenditure, N is family size, A is a constant; and the small numerals are the standard errors of the coefficients.

The fixed scale is that estimated by the National Insurance Institute and used in official analyses of income distribution.

[b]   ARP = $\Delta t/\Delta Y$ for intervals of ΔY = IL 100. The figures for Y = 900   and   Y = 1500   are 2.0 and 1.8 per cent respectively.

with income, and the fixed and variable scales are approximately equal at an income of IL 600 (which was roughly the average wage per employee post).

Using these specific assumptions about progressivity and the equivalence scale and the equity conditions derived above, the required pattern of HE reductions is as shown in Tables 3.3 and 3.4.

The results illustrate very well the analytical relationships established. It was shown that with declining ARP the marginal reduction should fall as family size increases and this is on the whole what we find. As predicted, the decline in the marginal HE reductions with respect to family size is smaller under the variable scale. Moreover, our conclusion that the reductions need not be patterned solely on the equivalence scale is also clearly demonstrated. The total reduction p.s.a. varies considerably under both scales, which indicates that the tax reduction need not vary in proportion to the scale of standard adults. For the fixed scale the reduction p.s.a. falls, implying that it rises more slowly than the number of standard adults. For the variable scale it rises, implying that families gain relative to the tax relief implicit in the scale.

The structure of reductions by income implied by the fixed scale is regressive (Table 3.4) despite the falling pattern of ARP. Not only does the reduction rise--it also rises as a percentage of income; for example, between IL 600 and IL 1,200 the reduction almost doubles as a percentage of income. At higher incomes it is only slightly regressive. The analysis made no clear prediction with respect to the progressivity of the variable scale relative to the fixed scale. We find here that while reductions rise under the variable scale they are less regressive

Table 3.3. *Tax Reduction Required for Horizontal Equity, by Family Size and Income*

Family size and income (Y)	Marginal reduction per family [a/]		Total reduction [b/] p.s.a.	
	Variable scale	Variable scale	Variable scale	Fixed scale
Y = 600				
3 (IL per month)	52.4	22.2	19.7	27.3
Index, family of 3 = 100				
3	100.0	100.0	100.0	100.0
5	108.4	70.2	196.9	87.8
7	83.0	14.9	250.6	79.9
Y = 1200				
3 (IL per month)	146.4	86.1	112.7	92.6
Index, family of 3 = 100				
3	100.0	100.0	100.0	100.0
5	78.0	33.8	142.7	85.9
7	68.4	19.5	168.9	73.4
Y = 1800				
3 (IL per month)	186.8	149.1	176.9	139.6
Index, family of 3 = 100				
3	100.0	100.0	100.0	100.0
5	80.6	40.6	147.9	96.9
7	69.2	21.7	178.2	84.2

[a/] For one additional family member.

[b/] Total reduction relative to base family size, here taken as 2.

Table 3.4. The Total Horizontal-Equity Reduction as Per Cent of Income

Family size and income (y)	Actual reduction	Horizontal equity reduction	
		Variable scale	Fixed scale
Y = 600			
3	4.8	9.2	12.5
5	8.9	26.8	16.4
7	14.0	43.2	19.4
Y = 1200			
3	4.8	23.2	21.2
5	8.4	43.0	27.2
7	14.6	60.3	30.2
Y = 1800			
3	4.5	22.5	21.3
5	7.4	40.1	30.8
7	12.8	55.0	34.8

than under the fixed scale and at high incomes there is a moderately progressive pattern. At high incomes the effect of the lower economies of scale is sufficient to offset all opposing forces.

The variable scale therefore implies a pattern of average rates that is more favorable to large families at a given income level and more progressive with respect to income at a given family size.

THE COMPARISON BETWEEN ACTUAL AND HE TAXES

One way of examining the adequacy of a reduction structure is that of Seneca and Taussig (1971) who directly compare the equivalence scale to what they term "the equivalence scale implicit within the tax structure." They define the implicit scale as the one consistent with the assumption that a given tax structure guarantees HE. Their procedure is to use the assumption that in a tax structure guaranteeing, HE families with equal tax rates have equivalent incomes. This is appropriate for a fixed scale; under a variable scale, however, the required tax rates are themselves a function of economies of scale. There is thus no way of identifying the families assumed equal by the tax structure and so the implicit scale cannot be identified. The only way to proceed is first to estimate the required structure as in the preceding section and to compare it with the actual structure. This is done in Table 3.5, which shows the difference between actual and required HE income tax in the Israeli 1969/70 structure. A positive difference means that the family paid more than required by HE and therefore received too small a reduction.

We see that most of the differences are positive for both the fixed

Table 3.5. Difference Between Actual and HE Income Tax

(IL per month)

Family size and income (Y)	Tax per family		Tax p.s.a.		Tax per family as per cent of income	
	Variable scale	Fixed scale	Variable scale	Fixed scale	Variable scale	Fixed scale
Y = 600						
3	44	12	16	5	7.3	2.3
5	125	14	30	3	20.8	2.1
7	192	-	37	-	32.1	-
Y = 1200						
3	131	71	53	26	10.9	5.9
5	325	99	101	24	27.1	8.2
7	458	61	121	11	38.2	5.1
Y = 1800						
3	170	132	74	48	9.4	7.3
5	435	251	158	61	24.2	13.9
7	607	228	193	43	33.7	12.7

and the variable scale. The implication is that the reductions are generally inadequate to achieve horizontal equity. If full HE is desired it would thus be necessary to devote more revenue to reductions or to raise the taxes on single persons and couples in order to finance the increased reductions for families with children.

Any divergence from full HE implies some pattern of discrimination between family sizes. In our case it is clear from the table that families with children tend to pay too great a tax. The discrimination between families with children is reflected in the variation of the divergence with family size. In order to compare the effect on the relative position of different-sized families we must examine the divergence p.s.a. In the case of the variable scale it tends to increase and thus larger families are relatively worse off, whereas under the fixed scale the divergence p.s.a. tends to decline. Thus the two scales lead to opposite conclusions about the bias between families with children.

A second consideration is the pattern of divergences with respect to income. Note from Table 3.5 (last two columns) that the divergence as a percentage of income rises with income for each family size. The implication is that the shortfall of reductions is progressive within family-size groups in that it hurts high-income more than low-income families. The overall effect on inequality will however be the combined effect of the between family size and within family size divergences.

We have pointed out that considerable divergences from the reductions required for horizontal equity prevailed at various income levels and family sizes. In order to evaluate their overall significance we need some way of summing them up. To do this some kind of index is

required.   One possibility is

$$(3.19) \qquad H = \sum_{ij} \frac{\left| \dfrac{Y_i - T_{ij}}{K_j} - \dfrac{Y_i - T'_{ij}}{K_j} \right|}{\dfrac{Y_i - T'_{ij}}{K_j}} f_{ij},$$

where T'_{ij} is the tax required for horizontal equity, and f_{ij} is the
percentage of families of size j and income i. The numerator measures
the absolute difference between actual taxes and the taxes required for
horizontal equity. On the assumption that the marginal utility of income
rises as income fall, a given absolute divergence reflects a larger
divergence in welfare, the lower the income level. The divergence is
therefore expressed as a percentage of disposable income p.s.a. that is
required for horizontal equity. The whole expression gives the average
relative difference from the target pattern of redistribution.

For the 1969/70 structure illustrated here the average divergence
found by simulation on a sample of families is 30 per cent. In subsequent
chapters we make use of this measure and of the analysis of required tax
reductions, in order to evaluate alternative structures.

CHAPTER   4

THE POSITIVE TAX STRUCTURE

The conclusions drawn from comparisons of tax-transfer structures are
influenced by the method of comparison used. We therefore begin with a
brief critique of existing approaches to the evaluation of tax-transfer
alternatives. We then illustrate the importance of the choice of method
by an empirical evaluation of two issues: first, the choice between
progressive marginal rates and progressive reductions for family size in
the positive tax structure, which is dealt with in this chapter. Second,
the choice between selective and universal strategies for guaranteeing
income to the poor; this is discussed in the next chapter, where the two
issues are also linked.

The relative efficiency of transfer alternatives is frequently
measured in terms of the ratio between the reduction in poverty (the
benefits) and total transfers (the costs).[1] Universal transfers must by
definition be less efficient on the basis of such a criterion. The
implicit assumption here is that all transfers received by the nonpoor are
wasted, an assumption that can be criticized on the ground that the choice
of poverty line, and thus the division between useful and useless transfers
to which it leads, is arbitrary. A more fundamental criticism of this view
of transfers to the nonpoor is that it ignores their contribution to the
broader redistributive goals of the tax-transfer system, such as equality.

---

[1] For a conceptual analysis of existing criteria see Weisbrod (1969).

equity, and the minimization of disincentive effects. This leads us to an evaluation of integrated direct tax-transfer systems.

An equally important problem is that of establishing a basis of comparison. Those studies that have held either total transfers or net revenue constant have generally compared systems on the basis of a limited range of parameters. In consequence, one cannot determine whether the conclusions drawn have general validity or whether they are confined to the specific points compared. There are many ways of combining the parameters of a given system yielding equal costs. The set of feasible parameter combinations must be more fully specified if a comparison between systems is to be comprehensive enough to be of general validity.

The set of possibilities is a function of the characteristics of the private economy, the policy instruments available to the government, and the constraints on the government's ability to manipulate the instruments. The choice between tax-transfer systems is essentially a choice between alternative sets of instruments.

DESIGNING THE POSITIVE TAX STRUCTURE

We have found it useful to characterize tax-transfer systems in terms of the mechanisms employed to deal with three goals: (1) achieving a progressive distribution of the tax burden in order to reduce inequality; (2) guaranteeing a minimum income and transferring income to the poorest groups; and (3) varying the tax or transfer with family size and composition (horizontal equity).

The positive tax structure is defined in terms of a schedule of

marginal tax rates and provisions for varying the tax according to family characteristics. Marginal tax rates are generally progressive. Most departures from the schedule are designed to reduce tax rates on a given income as family size increases, and may reflect a variety of concerns such as horizontal equity or fertility patterns or the exemption of low-income families. But no matter what their purpose, such reductions often have a significant effect on progressivity as well. For example, a reduction which declines as a percentage of income is an alternative to rising marginal rates as a means of obtaining progressive average tax rates. This is important because the pattern of marginal rates is a determinant of the real cost of the tax system as measured by disincentive effects on work effort and the welfare loss associated with a given net tax burden.[2] In choosing an efficient tax-transfer system an important consideration is to find the marginal-rate pattern which minimizes the real cost of a desired degree of progressivity.

A preliminary step is to establish a measure of progressivity. Strictly speaking, two tax-transfer systems are equally progressive if they yield equal average tax rates at all incomes (which ensures that they generate the same final income distribution); it then follows that the marginal rates at all income levels are also identical. Usually, however, less restrictive requirements are made for tax-transfer systems to be equally progressive. The most common practice has been to consider two different final distributions to have the same degree of inequality if

---

[2] The pattern of marginal rates may have a number of additional behavioral effects such as on fertility or tax avoidance; see for example, Cain (1972) and Allingham and Sandmo (1972).

the differences have offsetting effects on some summary measure of
inequality. As we show in our subsequent empirical analysis, similar
indexes of inequality may be obtained with very different marginal-rate
patterns by varying the structure or level of tax reductions.

An intermediate approach between identical final distributions and
equal indexes of inequality is to define a subset of income levels for
each of which the average rate is constrained to take a predetermined
value. In this case too it is possible to satisfy these constraints with
different marginal-rate patterns.

Thus, it is possible to achieve a given index of inequality or a
given set of average rates for a defined subset of all possible income-
family-size categories with alternative marginal-rate patterns by
altering the progressivity of the reductions. The relative efficiency
of the marginal-rate patterns can then be evaluated.

There are various ways of providing tax reductions for family size
of which the two most important are credits and exemptions. The technical
distinction between them is that exemptions are deducted from the tax base
while credits are deducted from the tax obligation. Exemptions commonly
take one of two forms: either a constant amount or a constant percentage
of income is exempted at all incomes. The amount of tax relief depends
on the marginal-rate schedule; with progressive rates the relief rises
with income. By contrast, a constant credit which is included in the
tax base provides a declining amount of tax relief under progressive
rates (if the credit is not included in the tax base the reduction is of
course constant). Thus the constant credit is much more progressive.
However, a credit can also be structured to rise in value with income

and an exemption can be structured to fall with income. In fact, credits and exemptions can be designed so as to yield any desired progressivity, but such patterns require more complicated structures and are therefore far less common than the constant exemption and the constant credit. The two also differ in their effect on marginal tax rates by family size: exemptions imply a falling marginal rate at many income levels; credits imply a constant marginal rate and, if included in the tax base, a marginal rate that rises as family size increases.

We now proceed to evaluate empirically the effectiveness of introducing progressivity in marginal rates and reductions. Consider a tax system based on progressive marginal tax rates and constant exemptions (E). In addition, there is a selective welfare program defined by the level of a basic income guarantee and the rate at which the selective transfer is reduced as income rises. The tax and selective systems are linked by the stipulation that a family eligible for welfare is exempted from tax.

We introduce a constant credit (C) financed by reducing exemptions so that net revenue is constant. This credit is included in the positive tax base and is taxed at 100 per cent within the selective structure. By gradually increasing the credit we obtain a set of alternative systems, ranging from exemptions alone through various combinations of credits with exemptions to a system in which credits have replaced exemptions. These combinations are simulated on a sample of 2,431 urban families from the 1968/69 family expenditure survey (carried out by the Central Bureau of Statistics).

The analysis proceeds in two stages. At the first stage marginal

tax rates are held constant. At the second, we vary the progressivity
of marginal rates so as to map out the set of possibilities for different
combinations of credits and exemptions.

The levels of E and C consistent with a given net revenue are shown
in Table 4.1.[3] The family-size structure of exemptions or credits is
kept constant for all E-C combinations, i.e., when going from one
combination to the next, the exemption or credit is increased or decreased
by the same percentage for all families with children.[4] The table also
shows the exemptions (credits) in each combination expressed as a
percentage of their maximum, defined as the value of exemptions (credits)
in a system with exemptions (credits) alone and which is consistent with
the budget constraint and the level at which the other parameters have
been set.

We now compare these systems on the basis of three criteria:
horizontal equity, inequality, and disincentives.

Horizontal equity: The term horizontal equity refers to equal treatment

---

[3] The initial values of parameters such as marginal rates and the
family-size structure of child allowances and exemptions, as well as the
revenue constraint, are those prevailing in 1969.

[4] In trading off exemptions and credits, we have kept constant the
exemptions received by families *without* children. However, for families
with children we reduce not only exemptions for children but also those
for their parents. As a result, the relative level of reductions for
families with and without children will shift with changes in the E-C
combinations. This procedure is not meant to suggest that the issue is
unimportant. However, in our analysis we concentrate on alternative
ways of providing tax reductions for families with children.

Table 4.1. Alternative Combinations of Exemptions (E) *and Credit* (C)

E-C combination[b]	IL per family per month, by family size[a]						Index, maximum = 100	
	Exemptions			Child allowances			E	C
	3	5	7	3	5	7		
0 (C = 0)	302	453	655	-	-	-	100	-
1	250	375	541	12	38	64	83	11
2	200	300	433	27	80	137	66	24
3	150	225	325	44	132	225	50	39
4	100	150	216	64	192	327	33	57
5	50	75	108	87	261	443	17	77
6 (E = 0)	-	-	-	113	338	574	-	100

[a] For family consisting of husband, non-working wife, and children under 18.

[b] Combination 1 typifies the tax-structure in 1968/69.

of equals. In other words, families with equal living standards before redistribution should also have equal living standards afterwards. It was demonstrated in Chapter 3 that the family-size variation of tax rates required for horizontal equity is a function of the desired progressivity of average tax rates with respect to income as well as of economies of scale in family consumption. Given assumptions about these parameters it is possible to determine the required pattern.

In comparing actual tax reduction systems one is unlikely to find one unambiguously closest to the required pattern. A system might be adequate at some income levels but not at others. To evaluate the differences between the actual and the required structures it is necessary to take account of the number of families affected. Inadequate tax relief for large families at high incomes will have little practical bearing because of the small number of families affected. The degree of horizontal equity is a function of the interaction between the distribution of families by income and size and the pattern of divergences from horizontal equity. To measure these divergences we develop an index of the percentage divergence between the actual pattern of tax reductions and that required for horizontal equity:

$$ H = \sum \left[\frac{|Y_i^* - \bar{Y}_i|}{\bar{Y}_i} \, f(Y_i) \right] , $$

where Y_i^* is disposable income p.s.a. (per standard adult) of family i, Y_i' is the disposable income p.s.a. of family i required by horizontal equity, $f(Y_i)$ is the percentage of families with income Y_i^*. The minimum value of the expression is zero for complete equity--as the index

increases, horizontal equity decreases.

Inequality: We make use of an index suggested by Atkinson (1970):

$$I = 1 - \sum_{i} [(y_i/\mu)^{1-\varepsilon} f(y_i)]^{1/(1-\varepsilon)}$$

where y_i is income, μ is average income, $f(y_i)$ is the percentage of families with income y_i, and ε is a measure of inequality aversion. When family size is taken into account y_i and μ are defined in terms of income p.s.a.

Disincentives: The measurement of disincentive effects is one of the most problematical aspects of the evaluation of tax and transfer schemes, and despite a great deal of effort and resources invested in the study of these effects very few definite conclusions have emerged. In the absence of adequate evidence on the subject it seems that policy-makers often use average marginal rates as an indicator of disincentive effects and express particular concern over the marginal rates on higher incomes. We too employ a weighted average of marginal effective tax rates and weight them by the family's earned income:

$$D = \sum_{i} Y_i \pi_i,$$

where π_i is the marginal tax rate on income Y_i. This index can be theoretically justified if we are willing to make some strong assumptions. We show in the appendix that, under the assumption of compensated wage rates and income effects which are both constant across individuals and

independent of wage rates and unearned income, the change in hours worked
will be proportional to this average.

Let us now consider the effect of the shift from E to C on each
of these measures.[5] The degree to which horizontal equity is achieved
depends on the total tax reduction for family size and its family-size
and income distribution. The literature on reductions refers to each of
these aspects. Some have compared the reductions for family size to
indexes of the variation of family needs. Others rely on an *a priori*
preference for a particular pattern of variation with income. Thus
authors who prefer a progressive pattern of reductions have advocated
credits rather than exemptions. However, there has been no attempt to
take an integrated view of the links with horizontal equity (see
Chapter 3).

We find that horizontal equity declines with the shift from E to
C but that the change is small: the average divergence from horizontal
equity is 32 per cent in an exemption structure, rising to 37 per cent
in a system based solely on credits.

The shift from E to C will in general reduce inequality. The
change in inequality may be related to changes in inequality within and
between family-size classes. The credit is progressive with respect to
income and thus the shift from exemptions reduces inequality within each
family-size class. If the credit and the exemption follow a similar
family-size pattern (as they do in our simulation), there should be no
offsetting effects on between-class inequality. Overall inequality will

---

[5] The two extreme combinations are compared on the basis of the
asterisked rows in Table 4.2 below.

then decline.[6] As expected, the shift from E to C makes the distribution more equal. The share of the bottom four deciles rises and that of the top five declines (compare the first two columns of Table 4.3 below). The largest percentage gain is in the bottom decile while the loss is spread fairly evenly among the top deciles. The shift from E to C reduces inequality by 16 per cent as measured by the Atkinson index for $\epsilon = 2$.

The shift from E to C will lead to a rise in any weighted average of marginal rates. The effective marginal rate is defined as the net change in taxes resulting from a IL 1 increase in income. For families eligible for welfare, it equals the 100 per cent marginal tax rate of the selective structure. For families subject to tax, it depends on the schedule of marginal rates and exemptions. The shift from E to C raises effective marginal rates by pushing families into higher tax brackets and by taxing previously exempt families. The increase in marginal rates due to these factors is partly offset by the decline in the number of families subject to the 100 per cent marginal rate under the selective structure. The net effect is a 25 per cent increase in average marginal rates.

As seen, the shift from E to C reduces inequality at the cost of increased disincentives and reduced horizontal equity. But this perspective is a limited one. We have not yet considered the fact that each E-C combination has a set of possible outcomes consistent with the given constraint on net revenue. These outcomes can be generated by varying the parameters that have been held constant. Under certain quite

---

[6] More rigorous conditions are developed in the appendix.

prevalent conditions a decrease in marginal-rate progressivity reduces disincentive measures of the type used here;[7] it may therefore be possible in this way to offset the rise in disincentives generated by the shift from E to C. However, it is not possible to determine *a priori* whether disincentives can be fully restored to the level under exemptions. Furthermore, the decrease in progressivity increases inequality and affects horizontal equity in an unpredictable way. Thus even if the initial level of disincentives is restored, there may be a net increase in inequality when going from E to C. To resolve this issue we go on to consider the range of disincentives and inequality obtained by varying the progressivity of marginal tax rates.

The marginal-rate structure is defined by the number of brackets, their width, and the tax rates in each bracket, and is here described by a function that allows for systematic variation in the degree of marginal-rate progressivity. After experimenting with several alternatives, we chose the marginal tax function $\pi_j = \theta \alpha^{j+1}$ (j = 1, 2, 3, ...), where π_j is the marginal rate of tax bracket j and θ and α are parameters (θ determining the level and α the structure of marginal rates). This function was found suitable for two reasons: (a) The two parameters enable us to differentiate clearly between changes in the level and structure of rates. Variation in θ implies a proportional increase in marginal rates, while variation in α alters the rate of change from one bracket to the next and thus alters the progressivity of marginal

---

[7] This is shown for a continuous tax function in the appendix and for a discrete function in Appendix A of Habib (1973b).

rates. When $\alpha = 1$, we have a proportional rate: for $\alpha < 1$ marginal rates are regressive and for $\alpha < 1$ they are progressive. (b) This function is realistic in that it enables us to approximate existing marginal tax rate structures.

The range of possibilities for a given E-C combination is mapped out by systematically varying α and adjusting θ so that net revenue is kept constant. The maximum value of α for each combination is determined by the constraint that the marginal tax rate should be less than 100 per cent, and the minimum value has been set at $\alpha = 1$, that is, we do not at this stage allow regressive marginal rates, which rarely appear in real tax structures.[8] The results for four E-C combinations are presented in Table 4.2.

Figure 4.1 is designed to facilitate the comparison of the set of possibilities. Quadrant III depicts alternative combinations of α and θ consistent with the different levels of E and C and the given net revenue. Quadrant IV shows the associated degree of income inequality in terms of an index of the Atkinson inequality measure ($\varepsilon = 2$). Quadrant II indicates the level of disincentives. The resulting set of feasible combinations of inequality and disincentives is shown in quadrant I.

The initial marginal rate structure is represented by a point X_3 in quadrant III. The various E-C combinations have been generated for this marginal-rate structure and they must therefore pass through this point. Each E-C combination yields a different level of inequality,

---

[8] If we were to allow regressive marginal rates the maximum regressivity would also be constrained by the condition that the marginal tax rate must be less than 100 per cent.

Figure 4.1. Inequality and Labor Disincentives, Different E-C Combinations
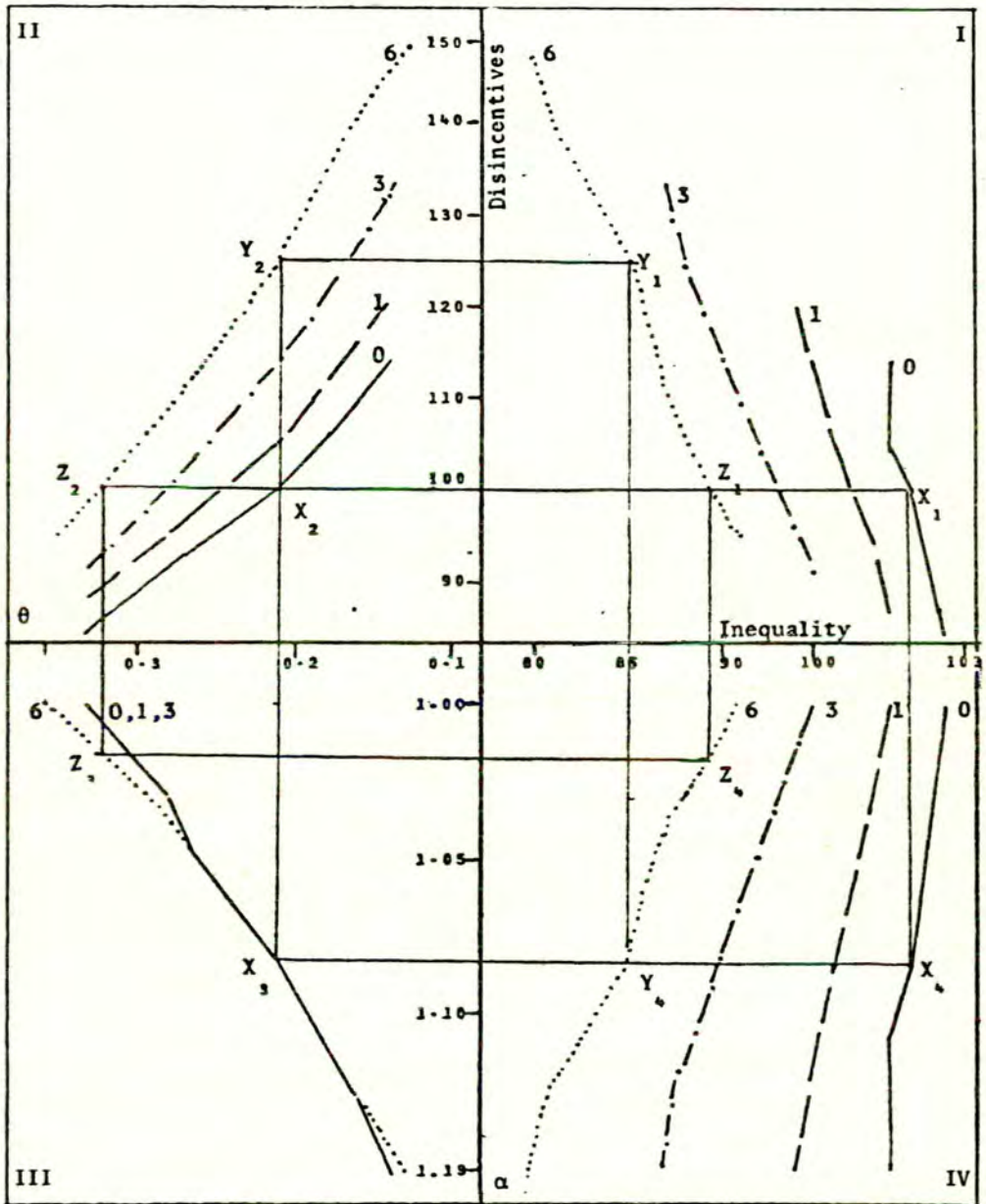
Table 4.2. Effect of Alternative Combinations of α and θ on Selected Indicators, by E-C Combination

α	θ	Marginal tax rate		Horizontal inequity	Inequality, Atkinson's measure (ε = 2)	Index [a]	
		Minimum	Maximum			Atkinson's measure (ε = 2)	Labor disincentive
E-C combination 0 (C = 0)							
1.000	0.337	0.337	0.337	0.331	0.304	102	84
1.035	0.269	0.288	0.466	0.323	0.300	101	93
*1.070	0.211	0.242	0.623	0.317	0.297	100	100
1.090	0.182	0.217	0.724	0.314	0.295	99	105
1.105	0.163	0.199	0.807	0.312	0.294	99	108
1.126	0.139	0.175	0.928	0.310	0.293	99	114
E-C combination 1							
1.000	0.337	0.337	0.337	..	0.294	99	87
1.028	0.282	0.298	0.438	..	0.290	98	95
1.070	0.211	0.242	0.623	..	0.285	96	105
1.098	0.172	0.208	0.768	..	0.282	95	113
1.126	0.139	0.176	0.929	..	0.279	94	120

E-C combination 3

1.000	0.339	0.339	0.339	..	0.283	95	91
1.028	0.283	0.299	0.440	..	0.277	93	100
1.070	0.211	0.242	0.623	..	0.268	90	114
1.098	0.207	0.207	0.767	..	0.262	88	124
1.126	0.139	0.176	0.925	..	0.257	87	133

E-C combination 6   (E = 0)

1.000	0.359	0.359	0.359	0.372	0.271	91	95
1.026	0.296	0.311	0.440	0.368	0.262	88	106
1.035	0.277	0.297	0.480	0.366	0.260	88	111
*1.070	0.211	0.242	0.623	0.367	0.251	85	125
1.105	0.159	0.194	0.785	0.374	0.242	81	140
1.126	0.134	0.169	0.892	0.380	0.237	80	149

a/ The base is E-C combination 0 with α = 1.07 (θ = 0.211).

as shown in quadrant IV, and a different level of disincentives, as shown in quadrant II. For example, combination 0 (C = 0) yields the degree of inequality indicated by X_4 in quadrant IV, while combination 6 (E = 0) yields the point Y_4 in quadrant IV. As can be seen, inequality declines and disincentives increase as we move from exemptions to credits for a given marginal-rate structure.

If we reduce the progressivity of marginal rates (i.e. reduce α), we must raise θ in order to maintain the constant net revenue. The required increase in θ need not be the same for each E-C combination but in practice they are quite similar, as can be seen from the closeness of the curves in quadrant III. Reducing α increases inequality and reduces disincentives (quadrants IV and II respectively). We thus obtain a trade-off between them for each E-C combination, which is traced by movement along the curves in quadrant I (as we reduce α we move down the curves).

Let us return to the comparison between the extreme E-C combinations. By reducing the progressivity of marginal rates from that consistent with point Y_1 we can move to a point such as Z_1 at which the level of disincentives is equal to the combination 0 level of disincentives of the initial marginal-rate structure (X_3). From a comparison of points X_1 and Z_1 we see that it is possible under the system of credits to achieve a lower degree of inequality for a given level of disincentives. However, the feasible disincentive levels do not fully coincide. Because of the requirement that $\alpha \geq 1$, a level of D below the minimum of system 6 can be attained only by adopting one of the systems where exemptions are not zero. In all cases however. it will be

efficient to set credits at the maximum consistent with the given disincentive level. This will determine the degree of marginal rate progressivity. Allowing for regressive marginal rates will extend the range of disincentives covered by each E-C combination, and will allow us to remain closer to the origin in quadrant I.

As noted, the shift from E to C leads to a decline in horizontal equity. The tax-rate adjustments required to keep disincentives constant may also affect the degree of horizontal equity. By altering average rate progressivity they alter the level and pattern of tax reduction required for horizontal equity. Likewise, they alter the actual pattern emerging from given credits or exemptions. As can be seen in Table 4.2, the effect of the changes in the marginal tax rate depends on the E-C combination; for combination 6, horizontal equity does not vary systematically with marginal rate progressivity. By contrast, for combination 0, horizontal equity decreases as marginal rate progressivity increases. In consequence, the horizontal-equity gap between combinations 0 and 6 is widened when disincentives are held constant. For example, horizontal inequity is 16 per cent higher at Y_1 than at X_1 and the gap rises slightly when Z is compared with X. We must therefore qualify our statement about the choice of the most efficient tax structure: it will be efficient to choose the highest level of credits if we put a higher premium on equality than on horizontal equity.

In establishing the relative effectiveness of the alternative E-C combinations we have had to make some assumptions about the criteria applied. In the absence of a general analytical proof, we need some idea of what would happen under different assumptions (see appendix, p.   ).

After experimenting, we found that our conclusions about what constitutes
an efficient system are not affected in any important way. We shall now
describe these experiments briefly.

Our measure of disincentives weights the marginal rate in each
bracket by the total income of families in the bracket. It is shown in
an appendix that this weighting scheme is consistent with the assumption
that the labor-supply substitution effect is constant. We also tried
weighting only by the number of families in the bracket, in other words,
not to give a higher weight to marginal rates at higher earnings; this
would be consistent with the assumption that the substitution effect is
lower at higher incomes. The two weighting systems are very different.
Nevertheless, the results are not affected.

The equivalence scale used to adjust for family size plays an
important part in the measurement of horizontal equity and inequality.
The use of a particular scale implies an assumption of economies of scale
in family consumption; these economies can range from negative through
zero (when per capita income is the relevant measure) to the extreme case
of 'two can live as cheaply as one', when the appropriate measure is
family income. The scale used (fixed scale, Table 3.1) assumes considerable
economies of scale. It was estimated on the basis of data on family size
and consumption available in the 1968/69 family expenditure survey; the
underlying assumption is that families which spend the same percentage
of their income on a basket of basic necessities have an equal standard
of living. As has however been pointed out, there is no real theoretical
basis for this particular principle of equality nor is there any objective

basis for choosing the items to be included in the basket.[9] Moreover, the empirical results are sensitive to the definition of the basket, the specification of the consumption function, and the technique used in estimating the function. It is therefore possible to generate a number of alternative scales but there is little basis for choosing between them.

What has been said is only relevant here if the findings of this study prove to be sensitive to economies of scale. We have tested for sensitivity by repeating the comparison of the extreme E-C combinations on the basis of the extreme equivalence-scale assumptions, per capita income and family income. We find that the H and I measures both change but the comparison between E-C combinations is not affected.

Up to now we have defined changes in the income distribution solely in terms of the Atkinson index when $\varepsilon = 2$. The problem with this approach is that it does not take into account all the dimensions of the distribution with which we are concerned. For example, the lower end of the distribution is generally singled out and various measures of poverty are used. Another example is suggested by the criticism that has been made of proposals which combine a proportional marginal rate and credits. Although such proposals may reduce a given inequality index they have been criticized for reducing the amount of redistribution at the top, i.e., between middle and upper incomes (Lidman, 1972).

Consider the shift in the decile distribution presented in Table 4.3 and which is represented as the shift from X_1 to Z_1 in Figure 4.1. The table shows the net result of the progressive effect of replacing exemptions by credits and the regressive effect of reducing marginal rate

---

[9] See Friedman (1952) and Habib (1973a).

Table 4.3. *Distribution of Disposable Income for the Extreme E-C Combinations*

(per cent)

Deciles of standard adults	0 (C = 0) point X	6 (E = 0)	
		point Y	point Z
1	2.98	3.85	3.72
2	4.37	5.41	5.24
3	5.73	6.34	6.20
4	6.87	7.19	7.03
5	8.14	8.06	7.90
6	9.51	9.22	9.06
7	11.03	10.51	10.35
8	13.05	12.33	12.23
9	15.81	14.95	15.17
10	22.51	22.14	23.10
Total	*100.00*	*100.00*	*100.00*
α	1.07	1.07	1.01
D	100	125	100

The column group header "E-C combinations" spans point X, point Y and point Z.

progressivity. The distribution is more progressive except for the 0.59 percentage point increase in the share of the top decile, which consists of a gain of 1.38 points from the change in tax rates and a loss of 0.79 points from the shift to credits. The evaluation of the change in inequality depends on the weights assigned to the regressive and progressive aspects. We have evaluated these changes using a range of weights, the alternative weights being defined by the parameter ϵ of the Atkinson index: as ϵ is varied from 1.2 to 2.5, the decline in the index from the pure exemption system $E-C(0)$ to the pure credit system $E-C(6)$ varies only from 9 to 11 per cent so that the direction and magnitude of the change are insensitive to variation in the weights. It must however be emphasized that there is a very real problem. The gains at the top of the income distribution would be considerably greater if we had chosen a lower level of disincentives and reduced marginal rate progressivity even further. Politically, it may be difficult to justify redistribution from the middle or upper-middle class to low income families while the upper decile is increasing its income. Thus in some countries proposals to replace exemptions by credits and to adopt a single proportional marginal rate have at times included a special surcharge on very high incomes (United Kingdom, 1972).

The focus of this chapter has been on the goals of the positive tax structure. We have not gone into the effects of the shift from exemptions to credits on the extent of poverty and the population in need of support from the selective transfer mechanism. For example, we estimate that the poverty population and the number of people on welfare declines by almost 40 per cent as we shift from E to C. The next chapter focuses on the goal of reducing poverty.

CHAPTER 5

ALTERNATIVE TAX-TRANSFER STRUCTURES: AN INTEGRATED APPROACH

There has been considerable debate about how best to transfer resources
to the poor and to guarantee a minimum income. The type of proposal that
has received the most attention has been some form of negative income tax:
a system combining a negative income tax with a positive tax structure
based on exemptions embodies a purely selective strategy of income
maintenance. Another proposal has been to reform the tax-transfer system
by adopting credits that would replace both exemptions in the positive-tax
structure and the selective transfer system. We refer to this as the
purely universal strategy.[1]

A third alternative is a system which combines a credit in the
positive tax structure with a selective-transfer mechanism for guaranteeing
a minimum income. In this type of mixed system, responsibility for the
poor is borne jointly by the credit and the selective transfer.[2]

---

[1] The NIT idea was proposed by Friedman (1962) and later developed
by Green (1967). The term credit is sometimes used to refer to a tax
reduction that cannot exceed the tax obligation. Here we use it to refer
to a demogrant where any excess over the tax obligation is paid out. This
type of credit was suggested by Rhys Williams (1943) and later Rolph (1967)
and is also treated in Green (1967).

[2] This type of strategy has been evolving in Israel over the last
few years; see Roter (1973), Ben-Porath and Bruno (1976), and Chapter 6
below for descriptions of these developments. A variant of the mixed
strategy has recently been proposed for Great Britain (U.K., 1972) and
even more recently for the United States (U.S., 1974).

It is generally believed that a universal strategy of income maintenance is less efficient than a selective one. In this chapter we challenge this view and show how, when costs and benefits are properly measured and variation in both the level of family-size reductions and the marginal-rate structure are considered, the universal strategy could prove more efficient. We also dispute the notion that it implies more redistribution. Still, the universal approach has some disadvantages arising from the small number of parameters available to achieve the various goals of the tax transfer structure. We argue that the mixed system would retain much of the socio-political advantages and efficiency of the universal approach while providing additional flexibility to reconcile possibly conflicting goals or to adapt the system to changing circumstances. It is argued that a particularly attractive feature of the mixed system is that the working poor are provided for by the universal component, while the other groups of poor are supported by the selective mechanism.

SPECIFYING THE UNIVERSAL AND SELECTIVE STRATEGIES

All transfer alternatives have a close algebraic similarity and there is a great deal of confusion about the differences between them.

The universal system is defined in terms of the credit and the marginal tax rates, and may be represented as

(5.1) $P = T - C,$

where P is the net payment, $T = T(Y, \pi)$ is the positive tax obligation

as a function of income, Y, and the vector of marginal tax rates, π, and C is the credit as a function of family size. In Figure 5.1 one such system is described (for a given family size) in terms of the relationship between income before taxes and transfers (Y) and income after it (Y* or disposable income). A family with no income receives a transfer of C. As income rises, disposable income rises at a rate equal to $1 - \pi$. The scheme illustrated in the diagram is a simple variant in which the slope of the Y* function is constant, i.e., there is a single marginal tax rate. The net payment is negative up to income Y_b, at which T = C. At higher incomes, the net payment is positive.

A selective transfer has a similar algebraic form, differing from the credit by the stipulation that $P \leq 0$. In other words, the selective transfer does not serve as a vehicle of positive taxation and must therefore be combined with some form of positive tax structure, which in turn must provide for variation in tax rates with respect to both income and family size. Equations (5.2) and (5.3) respectively define a system. of positive taxes based on marginal rates and exemptions and a system of selective transfers.

In the positive tax structure the net payment is

(5.2) $\quad P_t = T(Y - E, \pi) > 0$ $\qquad\qquad\qquad$ for $Y > E$

$\quad P_t = 0$ $\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ for $Y \leq E$

where the exemption, E, is a function of family size.

Figure 5.1. The Universal Strategy[a]

---
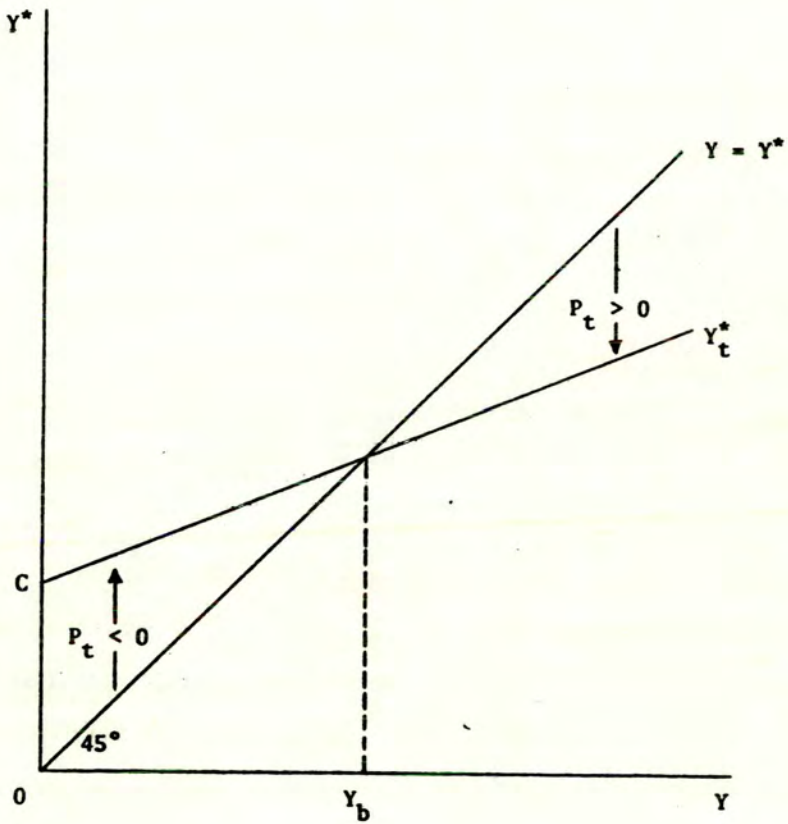
[a] $Y_t^* = Y - (T - C)$.

Under the selective system, the net payment is

$$(5.3) \qquad P_s = T'(Y, \phi) - M < 0 \qquad\qquad \text{for} \quad M > T'$$

$$P_s = 0 \qquad\qquad\qquad\qquad \text{for} \quad M \leq T'$$

where T' is the penalty or tax on income at rate ϕ, M is the minimum guarantee as a function of family size and P and Y are as defined before.

Since the selective system does not necessarily break even at the income for which $Y = E$, the two systems may overlap at some income levels. This point is illustrated in Figure 5.2, which shows the disposable income implied by the tax structure (Y_t^*) and that implied by the selective transfer (Y_s^*). The two systems overlap in the range $Y_1 Y_2$; the net payment under the tax system becomes positive at incomes higher than $Y_1 = E$ (to the right of point H); the selective system breaks even at an income of Y_2 (point J), at which $T' = M$.

If both were applied, i.e., if the selective grant recipient were required to pay tax, the combined penalty rate on additional income would be very high. It is therefore desirable to avoid the overlap and to find a point of transition from the selective to the tax structure. If the transition were made at point J, a move to an income slightly above Y_2 would involve a tax obligation of approximately JK, i.e., disposable income would drop to slightly more than K and the marginal rate would exceed 100 per cent. We therefore relax the restriction on P_s and make the transition at L, the intersection of Y_s^* and Y_t^* i.e., the point

Figure 5.2.   The Selective Strategy
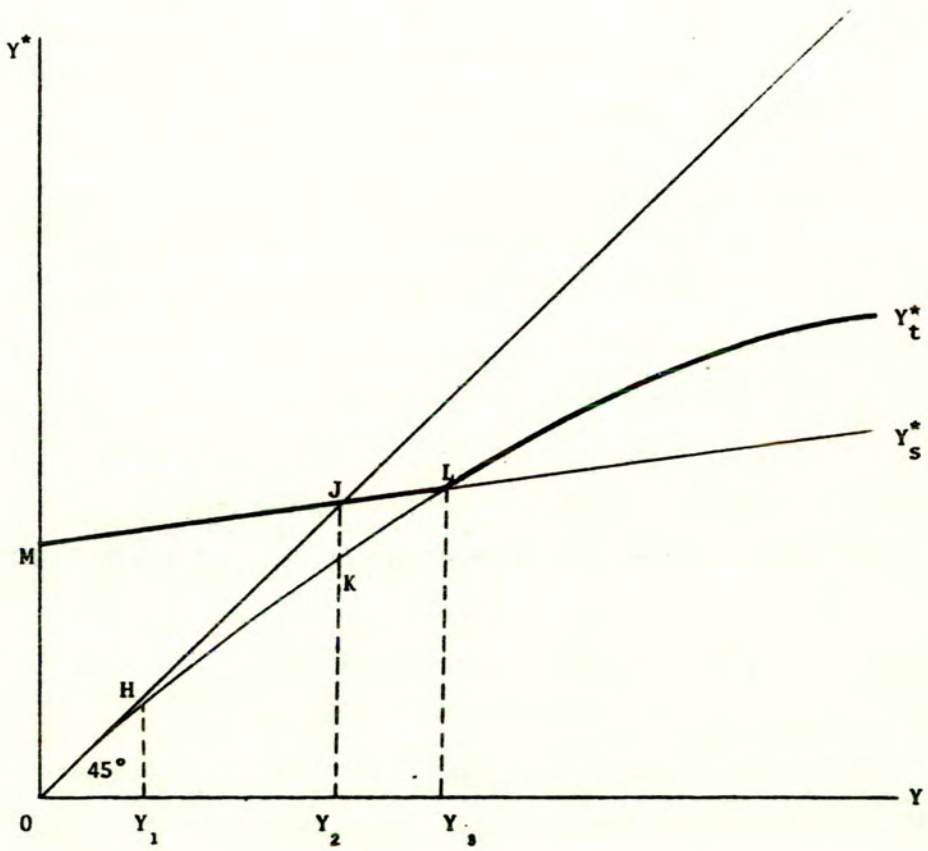
at which $P_s = P_t$, with $P_t < P_s$ at higher incomes. Accordingly, the combined disposable income function is

$$(5.4) \qquad Y^* = Y - T' + M \qquad\qquad\qquad \text{for } T' - M < T$$

$$Y^* = Y - T \qquad\qquad\qquad\qquad\quad \text{for } T' - M \geq T$$

and is shown by the thick curve in the figure.

As has been made clear, each system can be described in terms of a few essential parameters. There are many issues that arise in specifying them aside from the choice between strategies, and before comparing the strategies we consider some of the specification problems.

In designing a selective strategy, the chief problem is the conflict between the amount of the basic guarantee and the penalty on income for a given total budgetary cost; a great deal has been written on this subject. An increase in the guarantee or a decrease in the penalty rate increases the effect of the system on poverty but raises the budget cost and increases the number of eligibles. An increase in the guarantee financed by an increase in the penalty will reduce poverty but increase the disincentives associated with the penalty rate and the number of eligibles.[3]

We examine three selective variants. In all the three, the selective system is combined with a structure based on exemptions, the positive-tax

---

[3] Extensions of the eligible population have often generated public opposition and policymakers are usually concerned with keeping down the number of eligibles. We therefore include the minimization of the eligible population among the program goals.

structure being that of system E-C(0) in the preceding chapter. The
first variant combines a low basic guarantee with a high (100 per cent)
penalty rate (variant LH_s).[4] The second variant has the same basic
guarantee but a low penalty rate (variant LL_s), introducing incentives
and increasing the effect on poverty. The third variant combines a high
basic guarantee with a high penalty rate (variant HH_s), the higher
penalty being designed to keep down both the costs and the number of
welfare beneficiaries. In each case net revenue is kept constant by
adjusting the level of tax rates of the positive-tax structure.

The three variants are compared in Figure 5.3 and Table 5.1. As
we go from LH_s to HH_s, poverty is reduced at the cost of an increase
in disincentives for taxpayers.[5] The number of beneficiaries rises from
6 to 24 per cent of all families. Thus the choice between the variants
depends on one's evaluation of the different elements.

Many issues arise in specifying the parameters of the credit
structure. We stress the choice of marginal-rate progressivity and the
level of the credit.[6] The level of the credit affects progressivity
and poverty and determines the level of marginal rates required for a
given net revenue. Thus an increase in the credit financed by a

---

[4] These are the parameters included in the alternatives defined in
the preceding chapter so that variant LH_s is identical in all respects
with the variant E-C(0) there.

[5] The poverty measure used is the poverty income gap, i.e., the
sum over all poor families of the gap between the poverty line and family
income. In the linear gap the sum is unweighted, while in the non-linear
gap the weight declines as income approaches the poverty line.

[6] Other issues include the family-size structure of the credit or
the choice of a proper tax base, but we do not go into them here.

Figure 5.3. Labor Disincentives and the Poverty Gap

Minimum guarantee
(1) IL 39
(2) IL 64
(3) IL 100
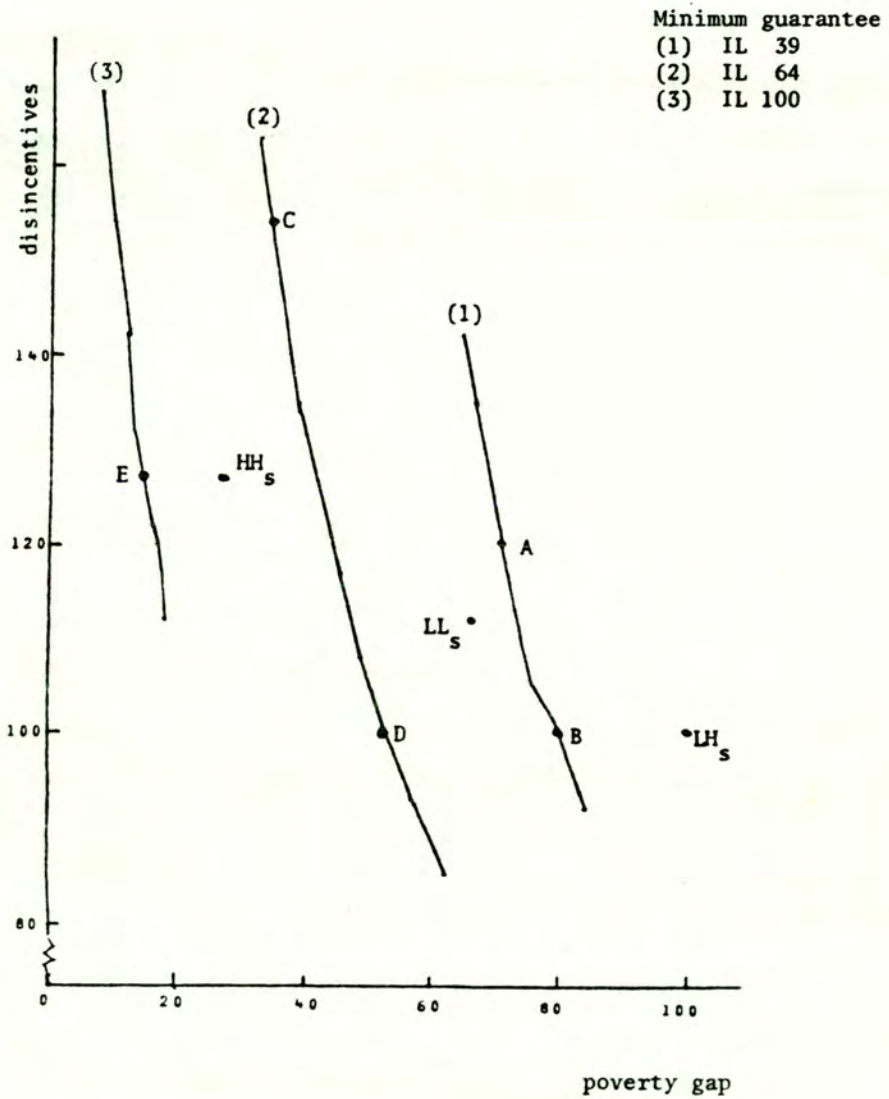
Table 5.1. *Comparison of the Selective and Universal Systems[a]*

	Selective			Universal				
	LH_s	LL_s	HH_s	A	B	C	D	E
Minimum guarantee (IL)	64	64	100	39	39	64	64	100
Penalty rate	1.0	0.5	0.7					
α	1.07	1.07	1.07	1.07	1.02	1.07	0.97	0.96
Disincentives[b]	100	113	127	120	100	154	100	127
Atkinson's inequality measure ($\epsilon = 2$)	0.297	0.258	0.214	0.273	0.292	0.206	0.252	0.192
Welfare beneficiaries (per cent of families)	6	20	24					
Poverty gap (index, $LH_s = 100$)[c]								
Linear	100	66	27	71	80	35	53	15
Non-linear	100	48	11	63	73	24	37	6

a/ Column headings refer to the points in Figure 5.3.

b/ Disincentives as defined in Chapter 4.

c/ The non-linear weighted poverty gap is $\sum_i (S - Y_i/K_i)^\beta n_i$, where S is the poverty line p.s.a., Y is family income and K is the number of standard adults for family size n. See also note 5 in the text.

proportional increase in marginal rates will increase progressivity and
the minimum guaranteed income and reduce poverty. In order to reduce
poverty while keeping overall progressivity more or less constant, one
could trade off a higher credit against reduced marginal-rate progressivity.
Using the format developed in Chapter 4, we now describe a range of credit
alternatives distinguished by the level of the credit and the
progressivity of marginal tax rates.

We consider three levels of monthly credit per standard adult:
IL 39, IL 64, and IL 100. IL 39 represents the credit that could have
been financed by the elimination of the exemptions and the selective
transfer in variant E-C(0) of the preceding chapter; IL 64 is the
minimum income guarantee in the two low-guarantee selective variants;
and IL 100 is the minimum guarantee of the HH_s selective variant. The
outcomes for a range of marginal rate structures are shown for each credit
level in Figure 5.4, which shows the link between disincentives and
inequality in the manner of Figure 4.1. Figure 5.3 above shows the link
between poverty and disincentives.

A rise in the credit shifts the possibility set to the left [compare
curves (1) and (2)] which means that the performance of the credit system
in terms of poverty reduction or equality is improved at a given level of
real costs. This result parallels that of the previous chapter. Just as
it is efficient to shift from exemptions to credits it is efficient to
trade off a higher level of credit against a reduction in the progressivity
of marginal rates, holding disincentives and net revenue constant.

Figure 5.4. Labor Disincentives and Inequality
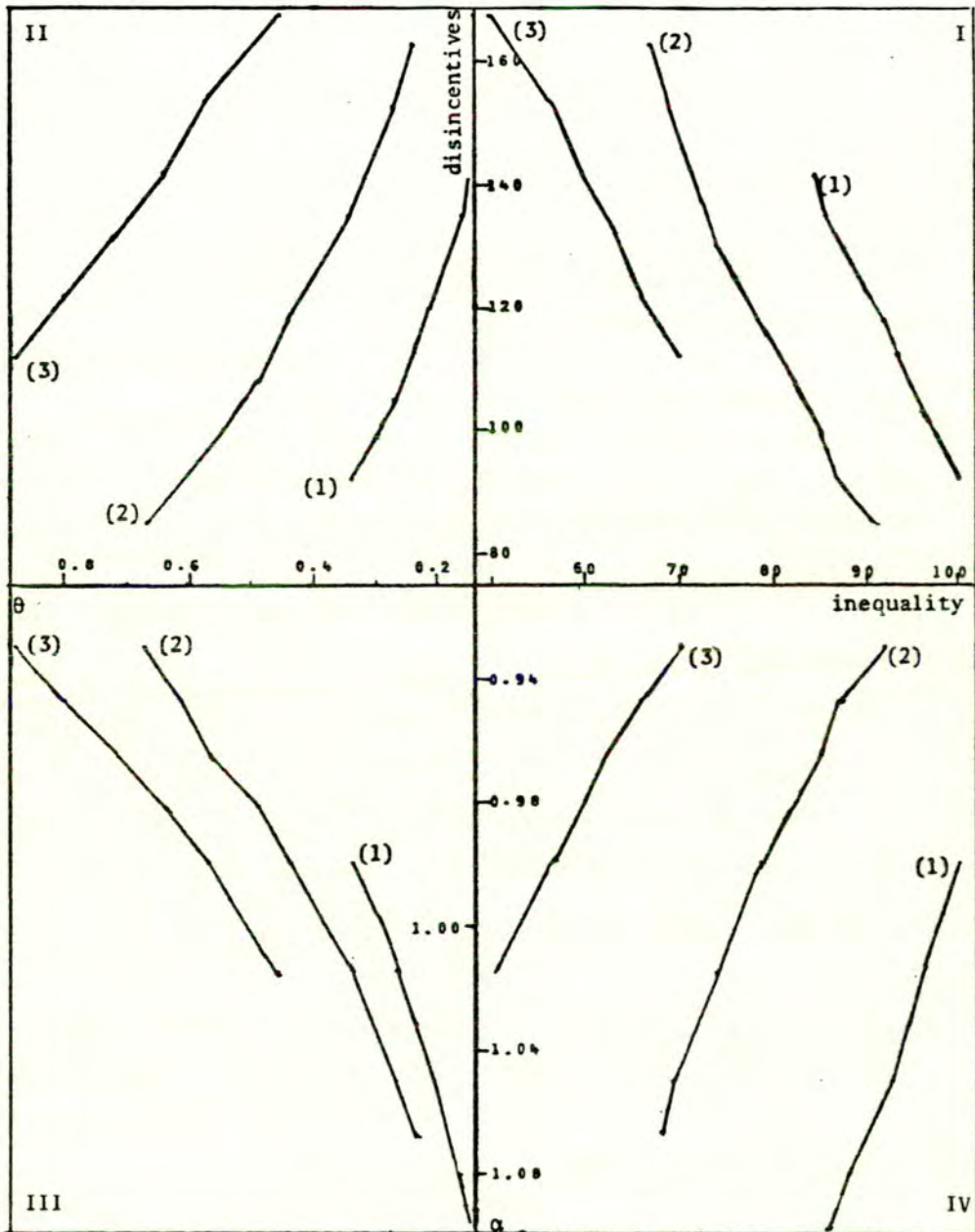
ARE SELECTIVE TRANSFERS MORE EFFICIENT?

Let us now compare the universal and the selective strategy. It has been fairly widely accepted that the universal approach is less efficient. This is argued by, for example, Berglas (1974), Musgrave *et al.* (1970), and Schultze *et al.* (1972). As Schultze puts it

> In general, ... universal payment systems are a very
> inefficient means for helping those with low incomes,
> since the benefits are not concentrated where the need
> is greatest. Large numbers of families would receive
> allowances and at the same time have their taxes
> increased to pay for the allowances. Tax rates would
> have to be raised simply to channel money from the
> family to the government and back to the family again
> (p. 200).

We argue that this conclusion is incorrect and demonstrate that it stems from too narrow a way of comparing the alternatives. Consider what happens when one shifts from a selective transfer system with positive tax structure based on exemptions and progressive marginal rates to a universal credit. One procedure is to replace the selective transfer and the exemptions with a credit while keeping the level and structure of marginal rates and net revenue constant. This is the approach used by Musgrave *et al.* (1970) to evaluate a credit strategy for the United States. He finds that the poverty reduction achievable under the credit is small and far smaller than that achievable under the selective transfer. He concludes that the ratio between poverty reduction and total transfers will be much lower under the credit and that the universal approach is therefore less efficient.

The decline in poverty reduction which he observes is not a generally valid result. The extent of poverty reduction under either system will depend on the basic guarantee and the marginal tax rate applying to the poor. The change in marginal rate paid by the poor associated with the shift from selective transfer to credit is the difference between the penalty rate and the bottom bracket rate of the positive tax structure which will almost certainly be lower. The change in the minimum guaranteed income depends crucially on the ratio of the cost of exemptions to the cost of the selective transfer in the initial system: the higher the level of exemptions, the higher the credit that can be financed by eliminating them. While the guarantee will generally decline, it might not offset the decline in marginal rate. Thus there may be some exemption level for which the credit produces an equal or greater poverty reduction. And indeed our result differs from Musgrave's: as is shown in Figure 5.3 by the shift from point LH_s (the initial selective system) to point A, poverty is reduced by the shift to a credit. The minimum guaranteed income declines from IL 64 to IL 39. However, the reduction in the marginal tax on the poor is sufficient to override this decline. Many poor families who did not receive a transfer under the selective system are now eligible for support. Not all the poor gain. Those with little or no earnings lose. However, these losses are offset by the gains of those who earn more. Even when a greater weight is assigned to the poor with no earnings (as in the non-linear poverty gap), overall poverty declines.

But whether poverty increases or decreases, it remains true that the share of transfers going to the poor or the ratio between poverty reduction and total transfers will have declined considerably under the

credit, and it is this fact on which the opponents of universal transfers base their main argument. The weakness of the argument lies with the assumptions underlying this efficiency criterion. In the first place, money costs are not accurately measured in this comparison. The accurate comparison is between the sum of the exemptions and selective transfers on the one hand, and the cost of the credit on the other. In the experiment described here they must be identical, so that there is no difference in money costs. Thus the relative efficiency will depend on whether poverty rises or falls. As this is an empirical question, it is not possible to argue that the one system is more efficient than the other. Moreover, there is no reason to confine oneself to money costs or to poverty reduction in measuring benefits. It can be argued that the real costs as measured by labor supply and welfare effects are much more important and that the exemptions or credits provided to the nonpoor are instrumental in achieving a number of other goals, such as progressivity or horizontal equity. These additional effects must be considered in a more accurate evaluation of benefits and costs. The credit may or may not be more efficient in reducing poverty, but there is no doubt that the real cost is greater and inequality lower for a shift of the type described here.[7] Thus, an important factor in the choice between the two systems as it emerges here is whether one is willing to pay for the decline in inequality by greater disincentives.

However, even this view of the two systems is still quite limited

---

[7] As shown in Chapter 4, the differences in horizontal equity are likely to be small on the average and we therefore do not discuss them here.

and is determined by the particular method of comparison that has been described. A different view is obtained if the marginal rate structure is not kept constant and if the credit is allowed to rise. As our previous analysis has stressed, it may be possible to reduce disincentives within a credit structure by reducing marginal-rate progressivity. This possibility is illustrated by the move to point B down curve (1) where disincentives are restored to the level of system LH_s while the gain in poverty reduction is largely preserved. The reduction in marginal-rate progressivity would also increase inequality, but, as can be seen in Figure 5.3, not to the level of point LH_s. Or one could proceed further and restore the level of inequality and reduce disincentives below the initial level.

If we compare the initial system (LH_s) with point B we find that the universal strategy need not be more costly in real terms, is no less efficient in reducing poverty, and could in fact make it possible to achieve any given level of overall inequality at reduced costs. This is a direct consequence of our findings that progressive reductions are more efficient in achieving a given degree of equality than are progressive marginal rates and we see how the evaluation of credit schemes is inevitably linked to the evaluation of tax strategies. Once a wider range of marginal rate structures is considered, there is no reason not to admit higher credit levels. Curve (2) shows the set of possibilities for a credit of IL 64. With the initial marginal rates (i.e. those of point LH_s), disincentives would be much higher (point C). By reducing marginal-rate progressivity we can move down to point D where disincentives are the same as in the initial system, with the same

guarantee and considerably more poverty reduction.

The comparison between strategies is also sensitive to the way in which the selective system is specified. Thus if we had started from system LL_s with a penalty rate of only 50 per cent, the comparison based on the initial marginal-rate structure would lead to the conclusion that there is more poverty under the credit (compare LL_s with point A). However, as just pointed out, we are not confined to point A or even to curve (1), but have better credit options available along curve (2).

Other specifications of the selective system would achieve even more poverty reduction than curve (2). If we were willing to provide higher guarantees and increase total transfers under the selective system as represented by HH_s, poverty could be reduced considerably. However, it is still true that a universal system can be found that provides a greater poverty reduction at the same real cost, provided we allow for the required adjustment in marginal rates. Point E provides more poverty reduction but requires a regressive marginal rate pattern.

Regressive tax rates have not been adopted in actual tax systems; would they pose a problem if they were? To answer this question we first note a more general limitation of our analysis. In comparing the universal and selective strategies we have relied on summary measures of redistributive goals and disincentive effects. While our findings about the relative efficiency of the two systems is important, a more complete assessment emerges when one considers a more refined specification of the goals. For example, the goal of poverty reduction may reflect concern not only with overall poverty but with the level of the minimum guarantee as well; the inequality goal can include concern with the progressivity

of the tax structure over specific income ranges, or horizontal equity may dictate specific reductions for family size in a given income range. Of course the ability of any tax transfer system to comply with a detailed set of specifications is limited. The system rapidly becomes over-specified in the sense that there are too few parameters in relation to the number of constraints. But the systems differ in their flexibility, with important implications for the comparison between them.

The credit system by its very nature is defined by a more limited set of parameters. If we want to provide a given guaranteed income the level and family-size structure of the credits are predetermined and may not be consistent with the requirements of horizontal equity in the positive tax structure. When target levels of inequality and disincentives are added the progressivity of marginal rates is also determined and may be too low in the upper income ranges. This is because, as shown in the last chapter, families at high incomes gain the most from the reduction in marginal-rate progressivity. The problem is particularly severe if one wants a high guarantee and therefore requires proportional or even regressive marginal rates to keep disincentives at the desired level. In general terms, when specifying the parameters of the universal system there may be a conflict between the goals of the tax and transfer systems.

In the selective system there are more parameters and consequently there is more flexibility--the structure of exemptions need not be patterned after the poverty standard. But we should not overemphasize the advantage of the selective approach in these respects. As noted, if the tax and transfer structures overlap, special provisions must be made to avoid exorbitant marginal rates. These provisions extend the break-even

break-even point of the selective system and could raise elegibility levels to unreasonable proportions. Moreover in setting exemption levels and determining their structure the goal of freeing the poor from a tax burden has been emphasized in practice. If these considerations are dominant in any case, there is no reason not to apply them in a credit-based system.

This is an appropriate spot to bring in some of the additional considerations which have been raised in the literature and the public debate on transfer alternatives.

At the heart of the universalist philosophy is a concern with maintaining not only the income of the poor but also their self-respect. The universalists believe that this cannot be done if income support or other social services are divided into services for the poor as opposed to services for the population in general. This view has long been supported by British social scientists (see for example, Titmus, 1968).

The issue of stigma has also played an important role in the discussion of welfare reform in the United States. There have been some outspoken and articulate universalists, such as Alvin Schorr (1968, p. 62), although it has been generally felt that the administrative changes inherent in the adoption of a negative income tax would considerably alleviate the problem.

Weisbrod (1970) has made a useful distinction between internal and external stigma. In transfer programs, benefits are paid on redistributive principles and are not directly linked to the recipient's efforts. Beneficiaries of these programs face *internal* Stigma if they view their benefits as charity even if no one else knows who they are. The internal

stigma will be more pronounced the more extensive and obvious the program's redistributive features are. *External* stigma comes about when individuals who receive transfer benefits have to declare their poverty and need for charity to others.

Internal stigma problems may arise in both universal and selective programs. But the degree of external stigma would seem to be directly related to the existence of a means test which isolates the poor in a special program, since being a participant in the program identifies the individual as poor and in need of special benefits. Weisbrod in fact claims that there is a continuum. The greater the percentage of the overall population that is eligible and therefore the lower the percentage of beneficiaries who are poor, the less one is identified as poor by applying for benefits and the smaller the external stigma.

Another argument of the universalists is based on considerations of the influence of the poor in the political and economic system. Universal eligibility of all income classes for a specific service links the fortunes of the poor to that of the politically powerful middle class. On this basis it is argued that the poor will on the average receive greater benefits. Implicit in this argument are the assumptions that in a universal service benefits will be maintained at higher levels; that the difference in benefit levels will be sufficient to offset the lower share of the poor in the total benefits generated under the service.

Similarly, it is argued that the quality of services will suffer from another form of competition:

> Separate state systems for the poor, operating in the
> context of powerful private welfare markets, tend to

become poor standard systems. In so far as they are able
to recruit at all for education, medical care and other
services, they tend to recruit the worst rather than the
best teachers, doctors, nurses, administrators, and other
categories of staff upon whom the quality of service so
much depends (Titmus, 1968, p. 143).

Finally, it is argued that universal programs enable one to avoid
one difficult practical problem that arises in the administration of
transfer programs: how to guarantee that those who are eligible make use
of them. Failure to do so creates inequalities among the poor and reduces
the effectiveness of the program as an anti-poverty device. The issue of
take-up, as it has been termed, has featured prominently in criticisms of
transfer programs in Israel and elsewhere.[8] There is evidence to support the
argument that the rate of take-up is much higher under a universal
transfer.[9] However there are many factors that affect take-up rates.

---

[8] See Martin Rein's illuminating account of the problems encountered
in implementing a new means-tested program of support for the working poor
in Great Britain. The Family Income Supplements (FIS) program was
introduced in 1971 and the question of take-up became a critical public
issue. Despite strenuous efforts to reach 85 per cent, take-up was in the
vicinity of 50 per cent at the last count (Rein, 1972, pp. 21-26; and
1973, pp. 69-90). Atkinson (1969, pp. 61-77) found that in Britain, the
share of elderly persons eligible for but not claiming income-tested
benefits remained high, even after the introduction of a new supplementary
benefit program that simplified procedures for claiming benefits, clarified
and standardized the conditions for entitlement, and increased the
program's publicity.

[9] In Israel it has been found that in families with six or more
children there is almost complete take-up of child allowances. In
families with four or five children take-up is over 90 per cent. See
Shamai and Waldhorn (1972).

In addition to program characteristics, there are the characteristics of the potential recipient and the amount of benefit for which he is eligible. No serious attempt has been made to sort out these different factors.

The socio-political advantages of the universal approach have generally been weighed against the purported efficiency advantages of the selective approach. Economists tend to give greater weight to efficiency and lean towards the selective approach. Non-economists take the opposite view. Our findings suggest that there may indeed be no trade-off or if there is it may be of insignificant magnitude.

THE MIXED STRATEGY

The mixed strategy combines a selective mechanism with a universal credit which replaces exemptions in the positive tax structure and provides additional income support.[10] There is a large number of variants; we here confine ourselves to a system which has a credit, C, taxable under the positive-tax structure; and a minimum guaranteed income, M, consisting of $G + C$, where G is paid by the selective system. The net payment from the selective system is then

(5.5) $P_s = T' - (G + C)$ for $G > T'$

    $P_s = -C$ for $G \leq T'$

---

[10] The credit can be viewed as part of the tax system [as in equation (5.1)] or as a separate element in the tax-transfer structure. For the sake of clarity it is convenient to view it separately in describing the mixed strategy.

i.e., the selective transfer ceases to apply at the point where
T' - (M - C) = 0 [T' is defined as in equation (5.3)].

The positive tax is

(5.6) $T = T(Y + C, \pi)$,

where π is the vector of marginal tax rates; when $Y = 0$, $T = T(C, \pi)$,
referred to as T_c.

Figure 5.5 illustrates the integration of the selective transfer,
the credit, and the positive tax structure. For $Y = 0$, $Y_s^* = M$
(consisting of $G + C$), while $Y_t^* = C - T_c$. If the guaranteed minimum
income were made up only from the selective system, eligibility for the
selective transfer would end at income Y_3 (point Q); since a transfer
of C is paid under the universal system, eligibility actually ends at
income Y_1, where $G = T'$ (point J'). As can be seen, shifting to the
tax structure at this income entails a decline (of approximately JK) in
Y^* for a small increase in Y; we therefore relax the restriction on
equation (5.5) and postpone the transition to income Y_2, the income at
which Y_s^* and Y_t^* intersect (point L).[11] Note that the family
receives a net transfer up to income Y_4 (point H), since the credit
exceeds the tax obligation up to this point. The combined disposable
income function is

---

[11] If $M = C - T_c$, selective transfers are eliminated, i.e., point
L is on the vertical axis.

Figure 5.5 The Mixed Strategy
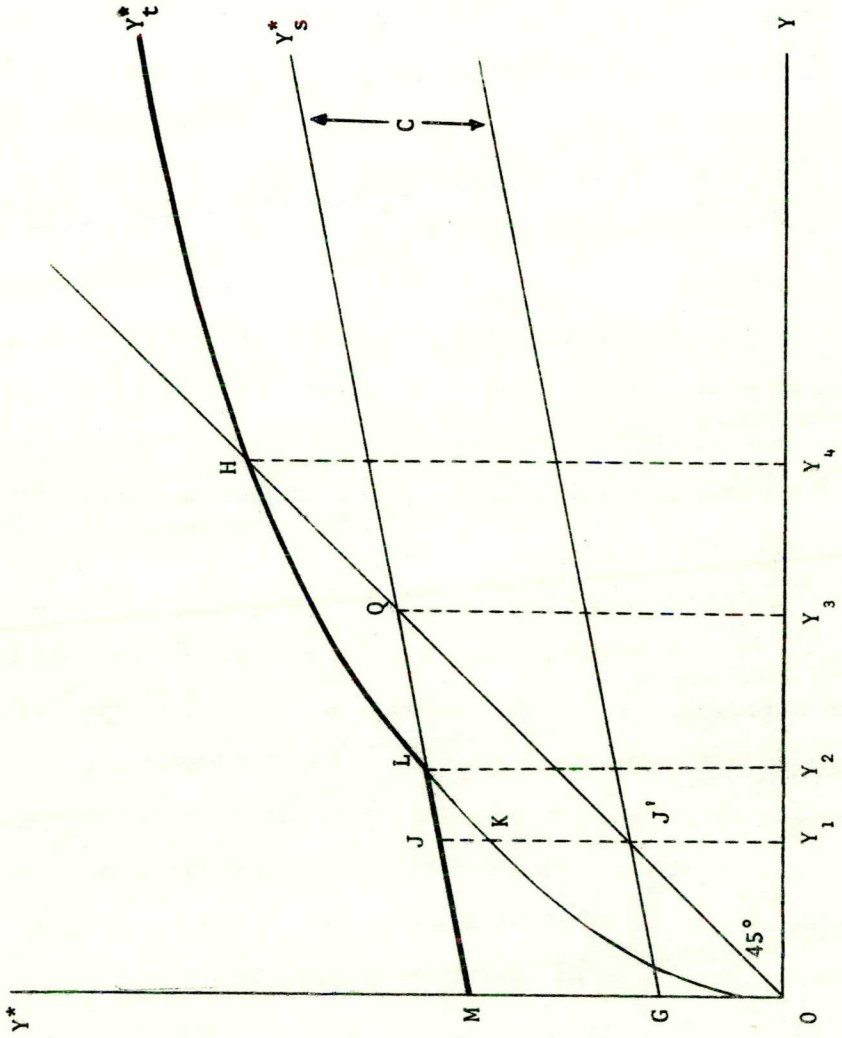
(5.7) $Y^* = Y + C + (G - T')$ for $T > T' - G$

         $Y^* = Y + C - T$ for $T \leq T' - G$

and is shown by the thick curve.

In the preceding chapter, the E-C combinations were all combined with a selective transfer (there held constant). Combination E-C(6), in which $E = 0$, is in fact one variant of the mixed strategy as just defined. By varying the parameters of the selective system, we generate two further mixed variants: the first is LL_m, with the same selective component as LL_s in the preceding section, and the second is variant HH_m, while the E-C(6) combination is variant LH_m.

The performance of these variants of the mixed system is compared with the selective and universal systems in Table 5.2 with disincentives held constant.

How do the mixed and universal systems compare? The degree of poverty is similar in both when they are compared for the same guarantee and disincentive level. Yet, in the mixed system these results are achieved with a much lower universal credit. A high credit is no longer necessary as the minimum income of those with no earnings is guaranteed by the selective mechanism. With a lower credit it is possible to achieve a given level of disincentives with more progressive tax rates. Moreover, because of the fact that the guarantee is provided by the selective system, increasing it requires a much smaller decline in progressivity under the mixed system. Thus in going from a guarantee of IL 64 (L) to IL 100 (H), marginal rate progressivity, measured as the

Table 5.2. *The Effect of Alternative Tax-Transfer Structures on Selected Measures, with Disincentives and Net Revenue Held Constant*

	Selective		Universal	Mixed	
	LL_s	HH_s		LL_m	HH_m
Minimum guarantee (IL)	64	100	64	64	100
Penalty rate in selective system	0.5	0.7		0.5	0.7
α	1.105	1.035	1.000	1.041	1.026
Marginal tax rate					
Minimum	0.22	0.33	0.44	0.29	0.33
Maximum	0.89	0.53	0.44	0.51	0.48
Atkinson's inequality measure ($\epsilon = 2$)	0.255	0.219	0.236	0.236	0.212
Welfare beneficiaries (per cent of families)	20	24 ·	-	11	13
Poverty gap (index, LH_s = 100)[a/]					
Linear	66	27	46	36	19
Non-linear	48	11	32	23	8

[a/] See note c to Table 5.1.

ratio of top to bottom bracket rates, declines by nearly 60 per cent under
the universal system but by only about 16 per cent under the mixed. When
compared with the selective system we see that for equal disincentives
poverty is lower under the mixed system. At the same time, the more
significant difference is in the number of families eligible or requiring
a selective transfer. Thus, the mixed variant with the *high* guarantee
(HH_m) has a considerably smaller number of welfare recipients than the
selective variant with the *low* guarantee (LL_s).

These comparisons illustrate the advantages of the mixed strategy,
which allows one to achieve a high degree of poverty reduction without
imposing so severe a constraint on marginal rate progressivity or unduly
expanding the population dependent on the selective transfer. But the
advantages and rationale of the mixed system cannot be fully appreciated
without reference to the existence of different groups of poor. We
distinguish two such groups: poor families whose head is fully employed
(the working poor); and poor families whose head is at best marginally
employed.

The idea behind the mixed strategy is that the working poor should
be provided for by the universal credit.[12] To meet this goal the credit
would have to be set at a level which would make wages plus the universal
transfer equal the poverty line (this is discussed more fully in the
next chapter). The need for income support to supplement wages of course

---

[12] Recently there has been a great deal of interest in work-
conditioned income support schemes such as wage subsidies and public
employment. The analysis of these alternatives is beyond the scope of
this study. See Barth (1971) and Haveman (1973).

reflects the inequality characterizing the wage structure. The greater the inequality relative to some accepted relative poverty standard, the greater the required supplements. Yet even if the wage structure were to be equalized the need for supplementary support would remain for low-wage families of above-average family size. In countries with a significant percentage of large families and with a high (negative) correlation between wages and family size this problem will be severe. Thus the credit plays the important role of guaranteeing a minimum income to all employed regardless of family size. Those whose attachment to the labor force is more marginal and who earn little or nothing would find themselves eligible for and in need of supplementary support from the selective system.

This division of labor makes sense because the working poor are the group that would appear to be most adversely affected by the selective approach. Historically they have been one of the most neglected and unrecognized groups. Thus it may be particularly important to provide for them in a universal context in which their fortunes are linked to those of the wider population. Because they are fully employed and employable they do not consider themselves as the sort of person who should require welfare benefits and services and they resent being reduced to need by a system that provides inadequate wages. For this reason alone one would expect the take-up rate to be low. But apart from the deterrent effects of these attitudes, the working poor also have fewer positive reasons for seeking assistance. They are in need of supplementary rather than total support so that they can get by, at least to some extent, without welfare.[13] They are not in need of the other services generally

---

[13] For many in this group the need for assistance may be of limited

provided by the selective agency such as personal services or assistance to meet the special material needs associated with disability or ill-health. Correspondingly, from the point of view of the system of social services, there is also less need to use income support as part of the process by which the poor are encouraged to utilize rehabilitative services.

Although the universal approach is better suited to the needs of the working poor, there may be good reason to favor the selective approach for the poor who are not regularly employed. This group is in need of much larger amounts of support. To provide for them within the universal system would require a very high credit level. Keeping them in a separate program frees the universal system from providing a minimum to those with no income. Because their need for both cash and services is great, the take-up problem should be less severe. Moreover even if a problem does remain, it could be dealt with by strenuous efforts to reach out of these groups. Such an effort is difficult and costly to maintain in a purely selective system in which the percentage of eligibles is high. It becomes more manageable in the mixed system because of the smaller number of people involved. Moreover the advantages of such a reach-out program are correspondingly higher because it provides access to a range of social services of which the nonworking poor are in need.

---

duration. Year to year changes in the wage structure, or variation in the adequacy of family earnings over the life-cycle could create considerable variation in the need for supplementary support. These temporary poor are particularly unlikely to apply for the assistance to which they are entitled.

What has here been described is an ideal prototype of the mixed strategy. In practice many considerations will enter into the choice of a specific set of parameters of the selective and universal component. The problems of designing a mixed system are similar to those, described in previous sections, of designing each of the components. However, in setting the parameters, the desired distribution between the selective and the universal transfer of the burden of caring for the poor must also be borne in mind. The lower the ratio of the credit to the minimum guaranteed income (M) and the higher the penalty rate, the smaller the role of the selective transfer. Thus in many cases the credit may be set at a level that is not sufficient to provide an adequate minimum to all the working poor. In this case the selective system may provide for at least part of this group.

This brings us to the problem of how such a system would be adjusted over time. To maintain a given division of labor between the selective and universal systems requires an appropriate policy of adjustment. Under a relative poverty concept, the poverty line would be adjusted for the rise in median or average wages. How much the credit must be raised if it is to continue providing for the working poor depends on what is happening to wages at the bottom of the scale. If wage increases are uniform the credit must be increased at the same rate. If the pattern of wage increases is biased against the working poor the credit will have to increase more than wages. This rule goes well beyond the usual arrangement by which the exemption or credit in the income tax is at best adjusted for prices.

What are the implications for the tax structure? Assume for

illustration that there is a single marginal tax rate in the credit
structure. Then if the credit and average wages rise by the same
percentage the pattern of tax rates will in effect be constant in terms
of relative wage levels. Net revenue as a percentage of total income is
also constant. The implication is that the tax system has no automatic
stabilizing capacity. Moreover there is no long-run autonomous increase
in the share of taxes that could finance an increase in the share of
public goods in total consumption. In order to increase this share tax
rates would have to be increased on a discretionary basis.

This brings us back to possible conflicts between the goals of the
tax and transfer structure. We have already noted a number of possible
limitations of the universal strategy arising from the fact that a small
set of parameters determines both the tax and transfer goals. The mixed
strategy does not necessarily have an efficiency advantage over the
universal strategy. But, as stressed, one of its main advantages is that
it provides additional flexibility. The problem just raised of adjustment
over time provides an additional example. The ability of the universal
system to provide adequately for the poor also depends on the credit being
linked to variations in the level and distribution of wages. If anything
such a provision is more essential in the universal system. Failure to
adjust the credit for wages will mean that the minimum income guaranteed
to all types of poor will be eroded, temporarily or permanently. In the
mixed system the consequences are less severe. As long as the parameters
of the selective system are adjusted for wages the relative minimum of the
system as a whole will be preserved. But at least some of the working poor
will now require a supplement from the selective system to reach this level.

Moreover under the mixed system the family-size structure of the credit can more easily be called upon as an additional means of adjusting the system to changing circumstances. In periods in which the credit does not keep pace with average wages or in which the relative earnings of the poor deteriorate, the credit structure can be adjusted to provide at least partial compensation. The share of total credits received by the poor rises with family size, reflecting the fact that large families are poorer.[14] Thus by varying the share of the credit going to large families the poverty effectiveness of the credit can be maintained or even increased despite a deterioration in the relative value of total credits. These adjustments may not be costless as they adversely affect the goal of horizontal equity (whether in the income-maintenance system or in the positive tax structure) and alter fertility incentives, but they do add additional flexibility. In a universal system they would be more difficult to make as they affect the minimum income guaranteed to families with no other means of support.

---

[14] Eight per cent of families with 1-3 children are poor compared with 36 per cent of those with 4 or more children.

CHAPTER 6

THE REFORM OF TAXES AND TRANSFERS: 1969-1976

In recent years Israel has seen a major shift from a selective to a mixed
income-maintenance strategy.   Income support for families with children
is now provided mainly through universal child allowances.   These were
first introduced in 1959, but did not reach a significant level until the
reform of 1973.   This reform was adopted largely in response to the
persistent lobbying of the National Insurance Institute;   its stated
objectives were to improve the position of families with children and to
meet the needs of the working poor;   child allowances were to be
coordinated with the minimum wage so as to guarantee a minimum living
standard for families of any size whose head is fully employed.   The
reform was part of a broader strategy whereby child allowances and other
social-insurance programs would meet the needs of most categories of poor,
leaving the selective (or welfare) system with a limited residual role.[1]
Another goal of the child-allowance reform envisaged by the National
Insurance Institute was to bring about a more progressive pattern of
benefits for family size.[2]   The National Insurance planners emphasized
the need for a coordinated approach to child allowances and child

---

[1] For an excellent discussion of the rationale behind the reforms
see Roter (1973).   The reform of allowances was also recommended by the
Prime Minister's Commission on Children and Youth in Poverty (1972).

[2] Benefits are here defined to include both the reduction in taxes
due to exemptions for family size and the income received in the form of
child allowances.

exemptions. It was proposed to reduce or even eliminate exemptions along with the expansion of child allowances.

The strategy formulated by the National Insurance Institute was--and is--controversial. It was felt by many that a selective approach to income maintenance would be preferable. Thus in 1972, the Subcommittee on Income Maintenance of the Prime Minister's Commission recommended that a special study should be made of the feasibility of a full negative income tax (recommendation 11), while the Ministry of Welfare was opposed to reducing the welfare entitlement by the increase in child allowances, arguing that the poor would be denied the child allowance received by the nonpoor; in this way they hoped to maintain the role of selective transfers.

The replacement of family-size exemptions by child allowances also met with opposition, particularly from the tax authorities. At the time of the 1973 child-allowance reform, the tax structure was adjusted in order to allow for the effects of inflation on the real value of family exemptions, the tax threshold, and the tax bracket.[3] At this time the cost-of-living allowance (COLA) provided by the escalator clause embodied in collective wage agreements was tax exempt, and thereby provided an automatic mechanism for adjusting the tax threshold to price increases. But although it helped maintain the real value of the threshold, it did not adjust the tax structure for increases in real wages or for price increases not compensated for in the wage agreements. However, its main failing was that the (tax-exempt) COLA did not vary with family size and

_____

[3] For a discussion of the rationale behind these changes see Gabbay (1973).

was therefore not effective in maintaining the real value of tax reductions for children. In response to this problem, the government chose to increase personal and child exemptions while incorporating previous COLA in the tax base and shifting up bracket limits. In this way they indicated their desire to maintain the role of exemptions in the tax system and did not seem to be concerned with whether child-related benefits became more progressive or not.[*] If anything a regressive pattern of child-related benefits may have been preferred in order to increase the relative incentive for high-income families to have children, or because it was viewed as more consistent with horizontal equity. Moreover, the authorities were concerned to cut down on processing the returns of low income earners, particularly the self-employed. According to their estimate, 50,000 earners were removed from the tax rolls by the tax revisions. Another reason for the preference for exemptions over allowances was the authorities' reluctance to increase the income guaranteed to poor families. The reform of child allowances was not designed to raise the minimum guarantee (about 40 per cent of the average wage per employee post for a family of four), but rather to extend the guarantee to workers employed full time at the minimum wage. Any further increase in child allowances would have raised the minimum guaranteed to such families and would have created pressure to extend the higher minimum to families on welfare and other groups.

---

[*] The tax authorities may have wanted to reduce overall progressivity, since they believed that as a result of the secular increase in prices and real wages the tax structure had become more progressive since the last tax revision in 1963/64 (see Gabbay, 1973, and Berglas, 1971).

By the end of 1974, growing pressure for radical tax reform led to the appointment of a commission of inquiry. Its terms of reference were as follows:

> The Commission is required to ensure as far as possible the following aims:
> 1. Equitable distribution of income
> 2. Prevention of distortions and their negative effects on productivity and tax compliance
>   Your proposals must widen the tax base, simplify tax procedures and improve efficiency of collection. The Commission is authorized to propose any necessary changes in the system of transfers.[5]

Four months after its appointment, the commission submitted its recommendations, which were immediately enacted and came into effect in July 1975. The commission took an integrated view of the tax base, the structure of reductions for family size, and the structure of marginal rates. This is reflected in the three basic provisions of the new law: (1) the tax base was broadened substantially to include various payments previously claimed as deductible expenses or tax-free fringe benefits; (2) the personal exemption and the exemption for spouse were replaced by credits, child exemptions were eliminated, and the system of credits and child allowances was coordinated.[6] (3) the number of tax brackets was reduced from twelve to five and marginal rates were made considerably

---

[5] Commission on Tax Reform (1975, referred to as Ben-Shahar Commission). For a description of the work of the commission and its recommendations, see Ben-Porath and Bruno (1976).

[6] In the terminology of the Ben-Shahar Report 'allowances' are what we referred to as credits in Chapter 5 (see note 1 there), whereas 'credit' is a tax reduction which cannot exceed the tax obligation.

less progressive. There were also several recommendations dealing with administrative procedures, such as universal filing and sample assessment of income tax returns; one effect of these recommendations was that exemptions are no longer important as a means of reducing the administrative burden.

These recommendations represented a radical departure from the tax authorities' previous policy. The most problematic and controversial were those dealing with the tax base. However, the recommendation which concerns us most here is the decision to rely more extensively on tax reductions and less on marginal rates to achieve overall tax progressivity. The commission's intention was to maintain the pre-reform structure of average rate progressivity; analysis of the provisions of the law indicate that this was on the whole achieved.[7]

Our concern here is with income maintenance since the reform. On this question the commission confined itself to recommending the early appointment of a commission of inquiry into the income maintenance system. Nevertheless, in replacing exemptions with child allowances it consolidated and reaffirmed the role of the universal component of the transfer system. However, its recommendations have not yet led to a consensus on the level and structure of the allowance. The allowances proposed by the commission were subsequently amended in the legislative process so as to increase those for large families;[8] this amendment, one of the few made during

---

[7] See Ben-Porath and Bruno (1976). For an extensive analysis of the reform see Yitzhaki (1975).

[8] The commission had provided for an increase in the marginal allowance from the second to the third child, but for subsequent children

the legislative review of the recommendations, was controversial.

The linkage provisions of the new law are of particular importance
for the income-maintenance role of child allowances. Previously, personal
and child exemptions were not linked to either prices or wages, while child
allowances were linked to both, being adjusted for price increases during
the year and for any increase in real wages in April of each year. The
Ben-Shahar Commission linked both credits and child allowances to prices.[9]

The apparent intention was that the question of adjustment for real
wage increases should be left to the discretion of the policy makers.
Moreover, the commission took no stand on how often or in what way such
discretion should be exercised. In effect, it left completely open the
question of the appropriate level of credits in relation to wages and
consequently the appropriate role of the universal transfer in providing
for the poor. In periods of rising real wages price linkage implies a
secular decline in the relative level of credits and their role in maintaining
a relative poverty standard for the working poor. In periods of declining
real wages, real income declines even though credits are price linked
and their value rises in relation to wages.[10] In order to maintain their

---

'the allowance was to remain constant. As enacted, the marginal allowance
rises for the fourth and sixth child as well.

[9] Shortly after the tax reform came into effect, the whole linkage
structure was overhauled. Wages, previously linked to the full COL index,
are now linked to 70 per cent of the rise in the index (as are tax
brackets, previously unlinked). For child allowances, 100 per cent
linkage was maintained.

[10] There have indeed been complaints that child allowances are
getting out of hand and should not--at least for small families--carry
full compensation for price increases.

real income, the working poor are forced to turn to the selective system
unless an effort is made to raise minimum wages and reduce wage
differentials.

Still another question that was left unresolved was that of the
appropriate link between the credit-allowances structure and the selective
system. The selective system had of course to make some adjustments in
response to the new tax structure, but these have been *ad hoc* and
unsatisfactory.

This chapter describes how the changes in the transfer structure
have affected low-income families. The level of the guarantee provided
to various groups of poor is examined and estimates of the extent of
poverty are presented. We consider the role of the universal and
selective components of the overall transfer system and how they are
linked. We also present some illustrative examples of systems in which
child allowances fully guarantee a poverty-line income to the working
poor and discuss the appropriate family-size structure of the allowances.

STRUCTURAL CHANGES: 1969-1976

The principal idea underlying a mixed income-support system is that there
are two basic income guarantees, one provided by the universal credit and
wage structure and the other by the selective transfer mechanism. We
begin by tracing the development of these two guarantees. That provided
through the universal transfer depends on its level and on the minimum
wage (or wages at the bottom of the scale). It is also affected by any
direct taxes imposed upon the poor.

Consider the trend in child allowances shown in Table 6.1. The value of child allowances relative to wages has increased steadily since they were introduced.[11] In 1973 (child allowances reform) and 1975 (tax reform) there were particularly large increases. From the start, the allowances were structured so as to increase after the third child. However, there were considerable variations in the family-size structure of allowances. For example, the ratio between the marginal allowances for the sixth and first children, which was 1.4 in 1965, rose to 2.7 in 1973 and declined to 2.5 in 1975.

How have the increases in child allowances affected the adequacy of the income guaranteed to the poor? In order to answer this question the standard of adequacy that has emerged in Israel must be specified. Until the early 1970s, the income guarantee provided by the selective system was generally interpreted as the standard of adequacy. This system provides two main types of support: monthly cash benefits (the welfare allowance) and 'other types of assistance'. These 'other types' include participation in expenses (rent, health insurance, education), exemptions from various fees and levies (property and municipal taxes, radio and television license fees) and benefits in kind (clothing and food, household durables, special medical aid). The monthly cash benefit is computed by deducting a penalty rate on earnings from the guarantee, as in the selective system described in Chapter 5. Also, a certain amount is deductible for work-related expenses.

---

[11] When assessing changes in the relative value of transfers, one must be very careful in choosing the appropriate wage series. See note to Table 6.2 below.

Table 6.1. Marginal Child Allowance: 1960-76 (employees)

(Per cent of average gross wage)

Number of children	1960	1965	1969	1973	1975	1976 (April)
1	-	1.8	2.0	2.5	4.4	4.5
2	-	1.8	1.9	2.4	4.4	4.6
3	-	1.7	2.0	3.6	8.8	9.0
4	2.3	1.9	2.0	6.7	10.0	10.6
5	2.7	2.4	2.1	7.0	9.9	10.6
6	3.1	2.5	2.4	6.8	11.0	11.7

Source: National Insurance Institute (1976).

Several changes were made in the calculation of the monthly benefit after the 1975 tax reform. The penalty on earnings was reduced from 100 to 70 per cent. At the same time the earnings base was redefined. Previously the penalty rate was applied to earnings net of income tax, national insurance contributions, health insurance and compulsory work-related payments such as union dues and pension-fund payments.[12] Since 1975 the base has been gross earnings. To compensate for this change, the deductible work expenses were increased (doubling as a percentage of the average wage).

The level of selective benefits is linked tc the child allowance system. Broadly speaking, the selective transfer is scaled down to the extent that child allowances increase in relation to the average wage.

Given these provisions we can identify two selective guarantees: the minimum income for a family with no earnings (NW) and that guaranteed to the working poor (WP). Before 1973 there was no official policy on the level of the guarantee. In that year a target of 40 per cent of the average wage per employee post was set for a family of four with no earnings. As shown in Table 6.2, this was also the effective rate. The WP minimum was not so explicitly defined, particularly in the case of families whose head is fully employed. The intention can only be inferred from the actual practice of the selective system. Thus, one way to calculate this WP guarantee is to add to the monthly cash benefit the sum given to a working family to compensate for estimated work-related expenses as well as the value of the payments for pension schemes, health insurance,

---

[12] As well as increasing the effective guarantee, this provision ensures a smooth transition from the selective to the tax structure.

and union dues which are in one way or another covered by the selective system. Another way is to calculate the disposable income of a family whose head is fully employed at the minimum wage. This calculation will reflect not only the compensated expenses mentioned above, but also the rate of the penalty on earnings.

Both calculations yield similar results, so that in Table 6.2 we present only the second approach. According to this definition, the level of support to a working-poor family with two children reached 52 per cent of the average wage in 1973, an advantage of 12 percentage points over families with no earnings.[13] Over the entire 1969-75 period, there has been a significant increase in the selective minimum.[14] The increase was greater for working-poor families, which by 1975 received 13-16 percentage points more than families with no earnings. Large families have gained more from the increase, particularly since 1973.

Roter and Shamai (1971a) were the first to propose a standard which is not linked to the guarantee provided through the selective system, but based explicitly on the concepts of poverty and near-poverty. They set the poverty line for a family of four at 40 per cent of median family

---

[13] Some of this difference is more apparent than real since many workers do have work-related expenses. But the calculation serves as basis of comparison with standards that do not allow for all these components, as we shall see below.

[14] Much of the increase in child allowances served to increase the selective minimum, at least for large families. Part of this increase was intentional, for example, that between 1969 and 1973. But part of it stems from the fact that wages have been rising less than prices whereas selective transfers have been fully linked.

Table 6.2. *Poverty Line and Selective Minimum Income as Per Cent of*
Average Gross Wage[a/]

Family size	Poverty line[b/]	Selective minimum			
		1969	1973	1975	1976
A. For families with no earnings					
1	21	14	15	20	21
2	33	21	25	30	32
3	44	23	33	37	40
4	53	26	40	45	49
5	62	32	47	53	58
6	70	38	54	63	68
7	79	46	62	72	78
8	86	51	72	83	90
B. Family head earning minimum wage					
1	21	38	40	35	39
2	33	38	41	46	49
3	44	40	45	53	56
4	53	42	52	58	60
5	62	44	59	67	69
6	70	49	67	76	79
7	79	57	75	86	90
8	86	63	84	96	101
C. Average gross wage		603	1,040	2,354	2,605

Footnotes on next page.

Footnotes to Table 6.2.

a/ There are two principal sources of information on wage trends in
Israel. The first provides a series on wages per employee post based on
employers' monthly returns of taxes deducted at source (see National
Insurance, Quarterly Statistics, various issues, and CBS, 1975). The
second is the annual income surveys of the CBS conducted on a sample of
employees and reporting unearned income as well as income from all jobs
of all family members. The two series do not necessarily follow the same
pattern; thus the income-survey series rose considerably more than the
employee-post series over 1969-73. The income-survey series is the more
comprehensive but is published with a considerable lag. We therefore use
the employee-post series, adjusted where possible on the basis of the
income-survey data.

Dates: in this and subsequent tables, 1973 refers to April-December
(i.e., for the part of the year after the reform of child allowances);
1975 refers to December (the tax reform came into effect in July); 1976
refers to April.

b/ Calculated for 1969 since it is more or less constant for the
whole period.

income and the near-poverty line at 50 per cent of the median.[15]

The comparison between the poverty line and the minimum guarantee
of the selective system is not simple and is a source of much
misunderstanding. Roter and Shamai (1971a) compare the poverty line to
the selective NW minimum. In 1969 the poverty line was almost twice this
standard and 1.3 times as high in 1973 (for a family of 4).[16] For this
reason it was not universally accepted at first an an appropriate standard
for measuring poverty or for guiding income-maintenance effort.

Roter and Shamai's comparison is misleading for several reasons. As
defined, the poverty line is designed to cover the family's need in all
areas. On the other hand, the selective minimum, as explained above, is
designed to cover a basket containing a more limited range of commodities,
which does not include housing expenses and so on: In 1976, average housing
support alone came to about 9 per cent of the average wage. For working
families, Roter and Shamai's comparison is even more misleading. In this

---

[15] In setting the poverty line they were influenced by the
recommendations of a special commission appointed in 1963 to recommend a
minimum income. This commission's recommendations (Report, 1967) were
not adopted. The poverty line is not unusually high by the standards of
industrial countries (ranging between 40-50 per cent of average or median
income).

Since it was first set in 1969, the poverty line has been updated
on the basis of changes in median income as reported in the annual income
surveys. Until the income-survey data become available, it is adjusted
according to wages per employee post.

[16] Note that the selective NW guarantee was based on mean income per
employee post, which is a consistently lower base than median family income.
(In Table 6.2 above the poverty line is also expressed as a percentage of
gross average wage.)

case it is necessary to compare the poverty line with the income guaranteed to a working family by the selective system. On the basis of this comparison, the poverty line was only about 4 per cent higher in 1973 and in 1975 we find that the poverty line was even 8 per cent below the standard guaranteed by the selective system. If we were to add the other forms of support, such as housing assistance, we would find that the poverty line was lower still in comparison with the selective minimum.

The confusion with regard to the relevant standard for evaluating the WP guarantee has led to differences of opinion as to the development of the system. Today, there are those who claim that since the Ben Shahar Commission support levels have exceeded the target levels of the policy makers, as reflected in the earlier Report of the Prime Minister's Commission. Further on we shall see that this argument is true only if we compare the income levels made possible by universal benefits with the selective NW minimum. It is inaccurate if we look at the guarantee to the working poor by the selective system or if we look at the poverty line.

In evaluating the adequacy of the income guarantees we shall make use of two standards, low and high. The first is the selective minimum income for a family with no earnings. The high standard is the poverty line proposed by Roter and Shamai.

Table 6.3 compares child allowances with the two standards. The universal transfer provides a minimum income to all families irrespective of their labor force participation. Since the 1973 increase in benefits, this minimum has become significant in relation to both the standards. But even after these increases, the most a family with 4 children can receive is about 42 per cent of the selective minimum, and a family with

Table 6.3. *Child Allowance as Per Cent of Poverty Line and Selective*
Minimum: *1969, 1973, 1975, and 1976*

Number of children	1969	1973	1975	1976
Per cent of poverty line				
1	4.7	3.9	9.7	10.0
2	7.8	6.5	16.0	16.6
3	10.0	11.3	27.3	28.4
4	11.8	19.6	37.7	39.7
5	13.4	26.5	45.8	48.6
6	15.1	32.2	54.2	57.7
Per cent of selective NW minimum				
1	8.9	5.8	11.5	10.9
2	16.2	9.7	19.0	18.0
3	19.5	16.7	32.0	30.6
4	21.9	28.3	42.4	41.1
5	23.0	37.4	50.0	48.8
6	25.4	43.0	56.4	55.4

1-3 children considerably less. The more important role of the universal
transfer is to supplement the earnings of low-wage employees. Table 6.4
reports the wage at which family income reaches the poverty line and the
selective minimum, given the structure of child allowances and taxation,
but excluding any selective transfers to which the family is entitled; in
other words, it represents the wage required to reach the minimum income
without recourse to the selective system. Taking the poverty line standard,
it is clear that the position of large families has improved. For example,
a family with four children needed 63 per cent of the average wage to
reach the poverty line in 1969, but only 45 per cent in 1975; for small
families the improvement has been much smaller. Taking the selective
minimum standard, there has been little improvement even for large families,
and the wage required for small families to reach the selective minimum
has increased substantially. How can this pattern be explained? Should
not the rise in the relative value of child allowances have brought about
a reduction in the wage required to reach the selective minimum? One
reason it did not is the increase in the selective guarantee as a proportion
of the average wage, an increase that did not occur with the poverty line.
Another explanation, which applies to both standards, is that the impact
on the required wage of even a large percentage increase in child allowances
may be quite small because in 1969 and even in 1973 child allowances were
a small percentage of both the poverty line and the selective minimum,
particularly for small families: if, for example, child allowances are
25 per cent of the poverty line for a given family size, a 1 per cent
increase in child allowances would reduce the break-even wage by only
0.25 per cent of the average wage.

Table 6.4. *The Gross Monthly Wage at which Selective Minimum and Poverty-Line Income is Reached:*[a] *1969, 1973, and 1975*

Family size	(per cent of average gross wage)		
	1969	1973	1975
Selective minimum[b]			
1	14	16	21
2	22	26	31
3	22	32	34
4	22	37	37
5	26	40	37
6	30	40	37
7	36	40	37
8	39	43	37
Poverty line			
1	21	24	21
2	34	37	34
3	43	49	41
4	50	58	46
5	57	64	47
6	63	66	45
7	69	67	44
8	75	68	41

[a] Gross wage at which net income is equal to selective minimum or poverty line, where net income takes account of income tax (including compulsory loans), national insurance contributions, and child allowances, but does not include selective transfers to which the family is entitled.

[b] Minimum for families with no earnings.

However, no conclusion can be reached about changes in the adequacy
of the guarantee for the working poor without examining what has been
happening to low wages. The statutory minimum wage again provides a first
approximation of 'low wages'. When first adopted in 1972, it was set at
about 40 per cent of average wages in 1973, and has since been subject to
minor year-to-year fluctuations. In 1975 it was down to 37 per cent of
the average wage. Compared with the wage required to reach the selective
minimum income, the minimum wage is more than adequate for families with
one or two children but roughly equivalent for larger families. Thus for
those capable of earning the minimum wage, child allowances are successful
in preventing income from declining below the selective minimum as family
size increases.

There has also been a considerable decline in the gap between the
wages required to reach the poverty line and the minimum wage. Equally
significant, the pattern of required wages is much less favorable to
small families than it was in 1969 and 1973. Whereas required wages rose
with family size in 1973 and even more steeply in 1969, in 1975 they were
more or less the same for all families with children. Only families
without children have a clear advantage since they reach the poverty line
income even if they earn the minimum wage. Thus a major thrust of the
reforms has been to equalize guarantees among different-sized families.
This process, which began in 1973, was largely completed by 1975. But
even after the reforms, the goal of guaranteeing the poverty line income
has not been attained.

These conclusions must be viewed with caution. The actual wages of
working-poor family heads may be considerably higher than indicated by

minimum wage rates, if, as has been argued, most earn more than the
minimum wage. On the other hand, there is evidence that the minimum wage
rate is not strictly enforced in some sectors, so that a fully employed
family head may also earn less. Either way, we must look elsewhere for
indicators of the wages earned by the poor. One could examine wage
tariffs in occupations or sectors in which low-skilled family heads tend
to concentrate, or examine survey data on the earnings of all family heads
at the bottom of the wage scale. But even if the necessary data were
available it would still not be easy to decide on the appropriate
statistic, since much depends on a more careful specification of the goal
of guaranteeing income to the working poor.

As stated by the Subcommittee on Income Maintenance of the Prime
Minister's Commission, the goal is that the universal system should
guarantee a poverty line income to every employee, irrespective of how
many dependants he has and irrespective of the labor force participation
of other members of the family.[17]

The goal as stated by the subcommittee emphasizes the guarantee of
a minimum income rather than the elimination of poverty. The earnings
of a fully-employed family head may be inadequate, yet the family's income
may be above the poverty line because of the contribution of additional
earners. Yet the requirement of the committee is that the family head's
earnings should in themselves be adequate in relation to the income

---

[17] "The child allowance must be set at a rate that will remove from
welfare a family of any size in which there is an earner whose income
is no lower than the minimum wage" (Prime Minister's Commission, 1972,
Supplement No. 1, p. 2).

standard. Still another issue is whether the guarantee is to apply to
each family or to the average working-poor family. If to each family,
the level of child allowances must be set on the basis of the lowest wage
rate earned by a family head. If we were satisfied with providing the
guarantee on the average we would want to know the average wage of family
heads at the bottom of the scale. But the exact estimate will depend on
our cut-off point, e.g., on whether we take the bottom 1 or 5 per cent.
In effect, the choice of a cut-off point defines the minimum income
guaranteed to the working poor.

One could argue that the minimum guarantee should be set even higher
within the universal structure, as a hedge against year-to-year
fluctuations in the wage structure which may leave particular groups
temporarily below the poverty line. In this way the degree of instability
as well as the level of the average unskilled wage would be allowed for.
These are issues that have to be resolved in the process of defining a
minimum guarantee or in deciding upon the proper role of the universal
and selective components of the mixed system. So far these issues have
received no attention in discussions on income-maintenance provisions for
the working poor. In the commission's report and in various descriptions
of the income maintenance system, the minimum wage is used as the standard
for designing and evaluating it (e.g., Roter, 1973).[18] It also seems that

___

[18] Our evaluation of the effective guarantee is also limited by the
data available on wage distribution. At the least, we would want the
detailed distribution of hourly wage rates of family heads at the bottom
of the scale. Detailed data are available only for a wage level of 57 per
cent of the average hourly wage: 15 per cent of men (22 per cent of all
employees) have wages below this level. Of these, at least one third are

there is no direct reference to these issues in the general literature on transfer systems.

Another factor which has not yet been treated arises when one attempts to evaluate the developments that have not been treated yet. The manner in which the commission formulated its goal has a further implication for the appropriate way to evaluate the development of the standard guaranteed by the universal system. So far we have compared the wage required to reach the poverty line with actual wages. But the commission's report suggests that the minimum guaranteed by the universal system should be linked to the changes that have occurred in the selective system. And, so long as persons in full-time employment earning at least the minimum wage are still eligible for a supplement from the selective system, the commission's goal has not been achieved. Table 6.5 shows the trend in the break-even level of the selective system in relation to average wages. The calculation is based on the formula used to calculate the selective transfer.

There has clearly been a considerable increase in break-even income. Whereas a family with 4 children was eligible up to 42 per cent of the average wage in 1969, by 1975 it was eligible with earnings as high as 60 per cent. There was a further increase to 66 per cent in April 1976.

The rise in the relative value of child allowances should in principle have considerably reduced the break-even income in this period. If the increase in child allowances had been accompanied by a decline in welfare benefits so as to maintain a given selective minimum, the break-even income

---

heads of families and about 25 per cent are sole breadwinners (Doron and Roter, 1974, Chapter 2).

Table 6.5. *Welfare Break-Even*[a] *as Per Cent of Average Gross Wage*

Family size	1969	1973	1975		1976	
			Formula	Admini- strative as % of formula	Formula	Admini- strative as % of formula
1	23	27	37	92	40	89
2	33	38	51	99	55	97
3	32	45	55	92	60	88
4	33	51				
5	38	54				
6	42	54	60	85	66	80
7	49	54				
8	52	56				

[a] Gross wage at which family ceases to be eligible for selective transfer.

would indeed have declined significantly. But as shown, the selective minimum rose in relation to the average wage. Moreover the 1975 changes in the penalty rate and the deductible work expenses also served to increase the break-even income for most family sizes.

The rising trend of the break-even income has caused considerable concern--in particular fear that the labor disincentives inherent in a selective system would reduce labor force participation. The welfare authorities have responded to this problem by adopting measures which themselves have serious drawbacks. Since 1975, the break-even income has been held down, by administrative fiat, to the equivalent of the tax threshold for head of family and nonworking spouse (IL 1200 in 1975). This has set the break-even income at 85 per cent of that dictated by the selective benefit formula in 1975, and at 80 per cent in 1976 (about 53 per cent of the average wage, and above the minimum wage). As a result, there is a significant range of incomes at which an increase in gross earnings is associated with a drop in disposable income. Another measure has been more restrictive screening of welfare recipients and applicants in order to deny assistance to those suspected of working less. This has increased the stigma inherent in the system and has made the already severe problem of low take-up even more acute. Thus despite the increase in eligibility levels, the number of welfare recipients has tended to decline.

In conclusion, it is not possible to state exactly how many working families fail to reach the poverty-line income and are still in the welfare eligibility range. But it is clear that a wage level beyond the minimum wage is needed in order to achieve these goals. Moreover, the administrative expedients adopted by the welfare system emphasize the fact that the basic

issues of the role of the selective system, its structure, and its links with the positive tax structure have not been resolved.

Before continuing, we briefly describe the changes mentioned in the introduction to this chapter. As point out, the strategy of providing for overall progressivity in the tax structure now places more weight on progressive reductions and less weight on marginal-rate progressivity. Table 6.6 presents the changes in the structure of reductions and marginal rates. Although reductions were somewhat more progressive in 1973 than in 1969 it is clear that the principal shift occurred in 1975. The progressivity of marginal rates was also reduced in 1973, but again, the main shift comes in 1975.

SIMULATING THE EFFECTS ON POVERTY OF THE TAX-TRANSFER SYSTEM

The previous section dealt with the adequacy of child allowances in providing a poverty-line income. As shown, child allowances do not at present guarantee a poverty-line income to the working poor. Yet the actual amount of poverty among families with children depends on factors such as the distribution of wage rates and the percentage of family heads who are not fully employed. This section considers how far we are from eliminating poverty. We also consider the implications of raising child allowances to a level that would guarantee the poverty line income to all working poor.

Approximate estimates can be provided by simulating the changes in taxes and transfers on figures updated from the 1968/69 family expenditure

Table 6.6. *Child-Related Benefit as Per Cent of Income Level and Marginal*
Tax Rates: 1969, 1973, and 1975

Income level[a]	Family with two children[b]			Family with four children[c]		
	1969	1973	1975	1969	1973	1975
Benefit						
20	49	98	92	83	76	94
50	13	13	15	8	20	31
90	10	9	9	11	18	19
120	8	8	6	9	14	13
170	6	7	4	8	12	9
240	5	5	3	7	9	7
350	4	4	2	6	7	5
Marginal tax rate						
20	1.00	1.00	0.74	1.00	1.00	0.74
50	0.23	0.28	0.29	0.23	0.28	0.29
90	0.21	0.33	0.29	0.23	0.31	0.29
120	0.26	0.46	0.39	0.21	0.36	0.39
170	0.44	0.57	0.35	0.39	0.52	0.35
240	0.52	0.62	0.45	0.44	0.62	0.45
350	0.58	0.67	0.60	0.50	0.67	0.60

[a] As per cent of gross average wage.

[b] Child-related benefit is computed as the difference in disposable income resulting from child allowances and selective transfers between a family with two children and a family with no children.

[c] As in note b, difference between a family with four and two children.

survey.[19] Table 6.7 presents estimates of poverty in 1969 and 1973 for families with children. In 1969, 8.7 per cent of these families and 14.7 of the children were poor after transfers. By 1973, the percentage of poor families had declined only slightly, but the percentage of poor children dropped sharply to 9.2 per cent. There was a slight increase in poverty among families with 1-3 children and a considerable decline, from 23 to 11.3 per cent, among large families. The poverty gap (adjusted for the change in prices) follows a similar pattern, but there is less overall improvement, with a decline of only 25 per cent from 1969 to 1973 even among large families. Whereas transfers were equally effective in reducing poverty at all family sizes in 1969, they were much more effective for large families in 1973. This is consistent with the fact that large families gained the most from the increases in child allowances (see Table 6.1).

The 1975 tax reform raised child allowances and eliminated family-size exemptions. Table 6.8 shows two systems for which the total cost of child allowances is close to the 1975 level and which represent two extremes of the family-size structure of allowances.[20] At one extreme, the 1973

---

[19] See Habib (1974) for a detailed description of the procedures used to update the figures and make the simulations.

[20] The fringe benefits included in the tax base after the tax reform are only sporadically reported in the family expenditure survey. There have been some attempts to correct the income distribution data on the basis of the Ben-Shahar Commission's estimates of the distribution of fringe benefits (Yitzhaki, 1975). Our principal concern is with estimating poverty, so that this adjustment is not very important since fringe benefits are negligible at low incomes. Moreover, fringe benefits can only be classified into very broad categories of recipients and even then one is not on very safe ground. For this reason, no attempt was here made to correct the distribution in a similar manner.

Table 6.7. Post-Transfer Poverty: 1969 and 1973[a/]

	Total		1-3 children	4+ children
	Including families with no children	Families with children		
	(1)	(2)	(3)	(4)
1969				
Incidence (per cent of families)	9.4	8.7[b/]	5.4	23.0
Poverty gap (million of 1973 IL)	7.8	6.0	3.1	2.9
Reduction due to transfers (per cent)				
Incidence	19.0	24.3	20.6	27.9
Poverty gap[c/]	43.9	45.5	31.1	55.4
1973				
Incidence (per cent of families)	8.2	7.0[b/]	6.1	11.3
Poverty gap (million of 1973 IL)	8.6	6.2	4.0	2.2
Reduction due to transfers (per cent)				
Incidence	30.2	39.7	15.7	64.6
Poverty gap[c/]	53.0	57.5	33.3	74.4

[a/] Families with working-age head.

[b/] The incidence among children was 14.7 and 9.2 per cent in 1969 and 1973 respectively.

[c/] Linear poverty gap. See also note 5 in Chapter 5.

Table 6.8. *Child Allowances as Per Cent of Average Gross Wage Under Alternative Tax-Transfer Proposals*

	Family size					
	3	4	5	6	7	8
I. Child allowances						
Ben-Shahar	3.8	7.7	15.3	23.9	32.6	42.1
A	3.3	6.6	13.4	26.4	39.9	53.0
C	6.1	11.5	16.6	21.3	25.8	30.1
II. Child and personal allowances						
Ben-Shahar	11.5	15.3	23.0	31.6	40.2	49.8
A	5.7	11.5	23.2	45.8	69.3	91.9
B	9.6	19.2	28.8	38.4	48.0	57.6
C	11.0	20.9	30.1	38.7	46.9	54.7

structure is maintained so that the allowance per child rises quite steeply
with family size (variant A in panel I). At the other, the allowance per
child is linked to a scale of standard adults with considerable economies
of scale; thus the allowance per child declines quite steeply as family
size rises (variant C). The 1975 (Ben-Shahar) structure lies between the
two extremes. While maintaining rising marginal allowances it is
relatively more favorable to small families than the 1973 structure. In
Table 6.9 we present the effects on poverty of these alternatives. If we
had maintained the 1973 child-allowance structure the percentage of poor
children would have declined from the 1973 rate of 9.2 to 6.3 per cent.
If on the other hand we had shifted to a declining pattern, poverty among
children might even have increased slightly. The 1975 reforms are
estimated to have reduced poverty among children to 7-8 per cent.

The Ben-Shahar reform stopped short of providing a full allowance
structure. The credits which replaced the personal exemptions for head
of family and spouse do not serve as transfers, since any excess over the
obligation is not paid out.

In panel II of Table 6.8 we present several full allowance systems.
Here the personal and child exemptions are 'converted' into allowances,
while net revenue is maintained at the same level as before; the
corresponding Ben-Shahar structure is again given for comparison. Variant
A is the most favorable to large families and variant C the least favorable,
while variant B pays each child, beginning with the second, an equal
amount. Are these allowance structures reasonable in terms of the amount
of income transferred to the poor? It is, for example, improbable that
there would be widespread support for guaranteeing an income that exceeds

Table 6.9. Poverty Under Alternative Allowance Structures

	Per cent of children in poverty	Poverty gap (million of 1973 IL)			
		Total	Families with children		
			Total	1-3 children	4+ children
I. Child allowances					
A	6.3	7.0	4.6	3.5	1.1
B	9.3	7.4	5.1	3.0	2.1
II. Child and personal allowances					
A	4.6	5.8	3.4	3.1	0.3
B	4.8	5.3	3.0	2.2	0.8
C	5.7	5.3	3.0	2.0	1.0

Table 6.10. Alternative Allowance Schemes and the Poverty Line

	Family size					
	3	4	5	6	7	8
As per cent of poverty line						
I. Child allowances						
A	8	12	22	37	51	61
C	14	22	27	30	33	35
II. Child and personal allowances						
A	13	22	37	65	88	107
B	22	36	46	55	61	67
C	25	40	46	55	59	63
As per cent of gross average wage (IL 1158)						
Wage at which poverty line is reached						
A(II)	51	55	52	32	12	0
B(II)	45	44	44	42	40	37

the poverty line. Table 6.10 shows that by itself, the allowance provides less than the poverty-line income at all family sizes and in all variants. For variants A and B we have calculated the wage required by a working-poor family to reach the poverty line. There is a considerable difference in the pattern yielded by the two variants. A pattern such as A is extremely biased in favor of large families, while in variant B the required wage is almost the same in all family sizes and is only slightly above the minimum wage rate. Thus judging by the pattern of guarantees to the working poor, variant B seems to be particularly attractive. As regards the size of the poor population, poverty would decline under all variants and there is surprisingly little difference between child-allowance structures. Variant B gives the smallest poverty gap, while the percentage of poor children is only slightly higher than in variant A. Thus it seems that moving to a full-allowance system makes it possible to moderate considerably the rise in the marginal benefit inherent in the existing system, without affecting the goal of reducing poverty.

It can thus be seen that full guarantees for the working poor could be achieved with the same resources devoted in the past to personal and family-size exemptions. Poverty among large families and among children would be reduced to minor proportions: only a small percentage of families would be in need of selective supplementary support.

In a full allowance system marginal tax rates could well be made less progressive. Such adjustments cannot however be considered in a satisfactory manner within the limitations of the income-distribution data employed here. Our concern has simply been to suggest that the complete elimination of poverty among the working poor is attainable.

APPENDIX

TAXES, FAMILY GRANTS, AND REDISTRIBUTION*

1. THE TAX-TRANSFER FRAMEWORK

We shall confine ourselves to the case in which the tax and transfer system
is based on only two main attributes, family income and family size (n).
There are assumed to be v_n families in each size class n and the
original (pretax) income of the ith family in size class n will be
denoted by Y_{ni} (in general, when subscripts are not needed, we simply
write Y). For simplicity, assume i to follow an ordering of families
by increasing income with each n. Next assume the tax-transfer system
to be given by the following components:

E_n = tax exemption (function of n only);

C_n = family grant or tax-credit (again a function of n only);[1]

V_{ni} = taxable income = $Y_{ni} - E_n + gC_n$, where g = 0, 1 according to
whether C_n is nontaxable or taxable (both cases may appear in
practice);

F(V) = continuous tax function with the following properties,

$F \equiv 0$, for $V < 0$

$0 < F' < 1, F'' > 0$, for $V \geq 0$ (increasing marginal tax rate).

---

[1] C_n will be looked upon as a standard family grant (taxable or
nontaxable) paid out to everybody. For a positive tax-paying family, a
nontaxable grant C_n is equivalent to a tax credit of the same amount.

An empirically applicable function that satisfies these properties is the constant-elasticity function

(A.1) $F = AV^{\beta}$, $\beta > 1$,

valid for $0 \leq V < \bar{V} = (\beta A)^{1/(1-\beta)}$. A can be termed the 'tax level' parameter and β the 'progressivity parameter'.[2] Function (A.1) is subsequently used to illustrate some of the results, but we now proceed with the more general case.

The essence of our analysis will consist of working out the effects of simultaneous changes in the tax-transfer system [i.e., the policy instruments E_n, C_n and the parameters of $F(V)$] on some macro measures of inequality and disincentive effects, subject to a given *government budget constraint*:

(A.2) $\sum\limits_{n,i} F(V_{ni}) - \sum\limits_{n} v_n C_n = B_0$,

where B_0 is a constant.

Equation (A.2) simply states the fact that we confine ourselves to compensatory changes within the tax-transfer system without affecting the rest of the government budget.

In this section and the next we shall assume the tax function to be given. Consider now the response of an individual family's net disposable income (denoted by y) to simultaneous changes in the policy parameters E_n and C_n [subject to the budget constraint (A.2)]. We have

---

[2] For $V > \bar{V}$, if needed, one can add a linear branch ($F' < 1$, $F'' = 0$), $F = A\bar{V}^{\beta-1}[V + \beta(V - \bar{V})]$.

(A.3) $y_{ni} = Y_{ni} - F(V_{ni}) + C_n.$

Simple partial differentiation shows that for $V \gtreqless 0$

(A.4) $\dfrac{\partial y_{ni}}{\partial E_n} = F' \geq 0$ and $\dfrac{\partial y_{ni}}{\partial C_n} = 1 - gF' > 0,$

i.e., in general, net income rises if tax exemptions and/or transfers are increased. The case $V < 0$ is covered by writing $F' \equiv 0$ in (A.4).

Most of our subsequent analysis will relate to the case of a simultaneous decrease in E_n and increase in C_n. The change in any y_{ni} in that case is, for $V \gtreqless 0$,

(A.5) $dy_{ni} = F'dE_n + (1 - gF')dC_n = (s_n - F')dw_n,$

where $dw_n = gdC_n - dE_n$ is the increment of taxable income V for class n as a result of the switch from E_n to C_n, and $s_n = dC_n/dw_n$ = rate of substitution of taxable income for the grant C_n in that size class. By (A.5), an individual family's disposable income will rise or fall according to whether the marginal tax rate F' (which itself rises with Y for $V \gtreqless 0$) is less than or greater than s_n. For any n, s_n is exogenously given by the government [subject to an overall constraint (A.2)].

Next consider the effect of the parameter changes on *mean* income of size group n, denoted by $\bar{y}_n = \sum_i y_{ni}/v_n$. By aggregating (A.4) and (A.5) over i we find $\partial \bar{y}_n/\partial E_n = a_n$, $\partial \bar{y}_n/\partial C_n = 1 - ga_n$, and for a combined change in E and C,

(A.6) $d\bar{y}_n = (s_n - a_n)dw_n,$

where $a_n = \sum_i F'/v_n$ = mean maringal tax (MMT) rate for size class n and dw_n is defined as in (A.5). Thus $d\bar{y}_n \gtrless 0$ according to whether $s_n \gtrless a_n$.

From equations (A.5) and (A.6) we can gain some simple insight into the redistributive effect of an increase in family grants C_n (and a corresponding decrease in E_n). Denote the distance of disposable income from the mean by $y'_{in} = y_{in} - \bar{y}_n$. It follows from (A.5) and (A.6) that the effect of a switch on any individual income y_{in} can be written in the form $dy_{in}/dw_n = dy'_{in}/dw_n + d\bar{y}_n/dw_n = [a_n - F'(V_{in})] + (s_n - a_n)$, for all i. This is the sum of a mean-preserving change ($s_n = a_n$) plus the effect of the change of the group mean $d\bar{y}_n/dw_n = s_n - a_n$.

Consider now a mean-preserving switch from E_n to C_n, i.e., $s_n = a_n$. Note that because of marginal tax progressivity ($F'' > 0$), the MMT of any sub-sequence of k families in group n ($1 \leq k < v_n$) satisfies $(1/k) \sum_{i=1}^{k} F' < a_n$. By aggregating the income change (A.5) over the first k families (all arranged by increasing order) we thus find

$$\sum_{i=1}^{k} dy_{ni} = (s_n - \frac{1}{k} \sum_{i=1}^{k} F') > 0, \qquad \text{for all } k(1 \leq k < v_n).$$

But this is precisely the condition for an unambiguous contraction of the Lorenz curve for net disposable incomes in size class n. We thus have the following proposition.

Proposition 1. Within any family-size group, a mean-preserving switch from a tax exemption to a family grant unambiguously decreases inequality in a Lorenz-dominating sense.

This proposition and the preceding discussion will subsequently allow us to concentrate our attention on the effect of a change in group means

$(\bar{y}_n)$. As equation (A.6) shows, mean income by size class will rise or fall according to whether a_n is less than or greater than any given s_n. The s_n for the various size classes are only constrained by the government budget to satisfy

(A.7) $\sum_n v_n d\bar{y}_n = \sum_n v_n (s_n - a_n) dw_n = 0$.

In Section 2 equations (A.6) and (A.7) will be used to give the conditions under which a planned change in the vectors E_n and C_n will bring about a reduction in between-size-group inequality and thus in overall inequality. However, before turning to a more systematic analysis of inequality we should point out the possible simultaneous disincentive effect of a policy change of this kind. This is based on the observation that a reduction in E and/or an increase in C make for a simultaneous increase in the marginal tax rate of each family, since we have

(A.8) $\dfrac{\partial F'}{(-\partial E_n)} = F'' > 0$ and $\dfrac{\partial F'}{\partial C_n} = gF'' \geq 0$.

If disincentives are directly related to F' (which they are generally assumed to be), it is precisely the marginal tax progressivity condition (F'' > 0) making for a decrease in inequality which may simultaneously also increase disincentives.

Compensation for disincentives would thus have to be provided by a suitable adjustment of the parameters of the tax function F(V) itself so as to reduce F'.[3] This will be discussed later in Section 3.

---

[3] This in turn might also affect the overall inequality measure (see Section 3).

2. *ANALYSIS OF SOCIAL WELFARE AND INEQUALITY*

As the preliminary analysis of the previous section has already indicated, it would seem useful to look at the redistributive effects of the suggested alternative policies in terms of a two-way decomposition of its effects, both within and between family-size classes. Moreover it seems that considerable mileage can be got by using a fairly general criterion of inequality, namely that of Lorenz-domination. As Atkinson's analysis (1970) has shown, the unambiguous contraction of a Lorenz curve of individual incomes is equivalent to an increase in the value of any social welfare indicator Z, providing it is quasi-concave in terms of individual incomes (now denoted by x_{ni})[4] and can be written in an additive linear form:

$$(A.9) \qquad Z = \sum_{n,i} U(x_{ni}) f_{ni},$$

where f_{ni} are population weights, here normalized so that $\sum_{n,i} f_{ni} = 1$, and we assume $U' > 0$, $U'' \leq 0$. Following Atkinson (1970), define the level of equally distributed equivalent income (x_e), such that $U(x_e) = Z$. Based on this notion, an index of inequality I can be defined as

$$(A.10) \qquad I = 1 - (x_e/x),$$

where $\bar{x} = \sum_{n,i} x_{ni} f_{ni}$ is the population mean. If $\bar{x}$ stays constant an increase in x_e implies a reduction in I. When $\bar{x}$ changes, this statement has to be modified somewhat (see below). I lies between zero and one.

---

[4] We use a different notation for net income here to allow for suitable weighting of individual family members (see below).

Next we must link net disposable family income (y_{ni}) with the
definition of individual income (x_{ni}) to be used in our welfare measures.
In order to make individuals in different sized families comparable in
terms of welfare, we here follow accepted practice and define a fixed
scaling factor $h(n)$ so that $x_{ni} = y_{ni}/h(n)$. The denominator will be
assumed to satisfy $1 \leq h(n) \leq n$ and $h(n + 1) - h(n) \leq 1$, for all n.
Thus $h(n)$ may correspond to a scale of 'standard adults' such as is often
used.[5] However, we could think of $h(n) = n$ (all family members are
treated the same) or $h = 1$ (only the family counts as an income unit)
as two polar special cases.

Suppose each family appears as a separate observation in the original
distribution Y_{ni} (or y_{ni}). We may now weight each family $(f_{ni} = f_n$,
say, for all i) either by the number of standard adults $[h(n)/\Sigma v_n h(n)]$
or, alternatively, by the number of family members $(n/\Sigma v_n n)$. The latter
weighting considers each family member the same for welfare purposes.[6]
Which is chosen makes no difference to the size-class mean, which is
$\bar{x}_n = \bar{y}_n/h(n)$ under both options. However, it does make a slight difference
to the overall population mean $\bar{x}$, which in the second case need not be
invariant to the changing income distribution, even if the overall mean
family income $(\bar{y})$ stays constant. We here have

---

[5] This is usually based on the assumption of economies of scale in
family consumption. An argument could be made for making $h(n)$ a function
of income level. This, however, has not been attempted here.

[6] Using the words of our colleague Yoram Ben-Porath: "If it costs
less to make a person happy it still does not make him less of a person."

$$(A.11) \quad \bar{x} \doteq \Sigma x_{ni} f_n = \frac{\underset{n,i}{\Sigma} x_{ni} n}{\underset{n}{\Sigma} v_n n} = \frac{\underset{n}{\Sigma} v_n \bar{x}_n}{\underset{n}{\Sigma} v_n n} = \frac{\underset{n}{\Sigma} v_n \frac{n}{h(n)} \bar{y}_n}{\underset{n}{\Sigma} v_n n} .$$

The government budget constraint implies that $\bar{y} = \underset{n}{\Sigma} v_n \bar{y}_n$ stays constant, but this does not necessarily guarantee constancy of $\bar{x}$. This may be of only negligible empirical significance in practice but should in principle be taken account of in the measurement of I when the welfare weighting underlying (A.11) is chosen.[7]

Turning back now to the general welfare indicator in (A.9), we substitute $x_{ni} = y_{ni}/h(n)$ and assume $f_{ni} = f_n = n/\Sigma n v_n$ (for all i). Consider now a policy switch from E_n to C_n in class n as indicated in the previous analysis (Section 1). We get [from (A.9) and (A.5)]

$$\frac{\partial Z}{\partial w_n} = \underset{i}{\Sigma} U'(x_{ni}) \frac{\partial x_{ni}}{\partial w_n} \cdot \frac{f_n}{h(n)}$$

$$= \frac{f_n}{h(n)} \underset{i}{\Sigma} U'(x_{ni}) [s_n - F'(V_{ni})],$$

or, using our previous division into deviations from the mean $(a_n - F')$ and of the mean $[s_n - a_n = d\bar{y}_n/dw_n$, by (A.6)], we have

---

[7] If the first weighting, by standard adults, is chosen, one gets

$$\bar{x} = \underset{n}{\Sigma} v_n \bar{y}_n / \underset{n}{\Sigma} v_n h(n) = \text{constant}.$$

The nonconstancy in the second case does, of course, have a curious economic interpretation: you could raise individual welfare by having small families joining up to form larger ones, the latter being more 'efficient' producers of welfare.

$$(A.12) \qquad \frac{\partial Z}{\partial w_n} = \frac{f_n}{h(n)} \left[\sum_i U' \cdot (a_n - F') + (\sum_i U') \frac{d\bar{y}_n}{dw_n} \right].$$

In order to check the sign of the first term in (A.12) (and also for subsequent propositions) we need the following lemma.

Lemma: Let $\{a_j\}$ and $\{b_j\}$ be two sequences $(j = k, 2, \ldots, q)$ such that

(i) $\qquad \sum\limits_{j=1}^{q} b_j \geq 0;$

(ii) $\qquad b_j > 0$ for all $j \leq m,$ $\qquad\qquad b_j < 0$ for all $j > m;$

(iii) $\qquad a_m = \min\limits_{1 \leq j \leq m} a_j > a_{m+1} = \max\limits_{m+1 \leq k \leq q} a_k \geq 0.$

Then

$$\sum_{j=1}^{q} a_j b_j > 0.$$

Proof:

$$\sum_{j=1}^{q} a_j b_j = \sum_{j=1}^{m} a_j b_j - \sum_{j=m+1}^{q} a_j (- b_j)$$

$$> a_m \sum_{j=1}^{m} b_j - a_{m+1} \sum_{j=m+1}^{q} (- b_j)$$

$$> a_{m+1} \sum_{j=1}^{q} b_j \geq 0. \qquad\qquad\qquad \text{Q.E.D.}$$

Note that the lemma holds *a fortiori* for the product of any two monotonically decreasing (or increasing) sequences, one of which consists

of positive numbers while the elements of the other sum to zero.

Let us now turn back to the analysis of changes in exemptions and transfers leading to equation (A.12). Applying the lemma to the first term in the square brackets of (A.12), U' is a monotonically decreasing sequence for increasing i ($0 \leq i \leq v_n$), while ($a_n - F'$) is monotonically decreasing and sums to 0. It follows from the lemma that the scalar product of the two sequences is positive. If at the same time $d\bar{y}_n/dw_n \geq 0$, we have $\partial Z/\partial w_n > 0$. In other words, any switch from E_n to C_n which increases (or preserves) the class mean income will by itself increase the value of any aggregate additive social welfare function. We note the analogy with Proposition 1. We should also note that if such a switch is done in a way that preserves the overall population mean $\bar{x}$, it also automatically implies a reduction in the inequality measure I defined by (A.12), since $\partial Z/\partial w_n = U'(x_e)(\partial x_e/\partial w_n)$. However, we should also note that an increase in the mean family income of one group ($\bar{y}_n$) must be accompanied by a decrease in the mean income of some other size class ($\bar{y}_m$, say). We therefore turn to the aggregation of simultaneous changes dw_n in all size classes. By aggregation of (A.12) one obtains

$$dZ = \sum_n \frac{\partial Z}{\partial w_n} dw_n$$

(A.13)

$$= \sum_n \frac{f(n)}{h(n)} [\sum_i U'(x_{ni})(a_n - F')]dw_n + \sum_n \lambda_n v_n f_n d\bar{x}_n,$$

where we have substituted $d\bar{x}_n = d\bar{y}_n/h(n)$ and $\lambda_n = 1/v_n \sum_i U'(x_{in})$, and λ_n is the mean marginal utility (MMU) of (standardized) income in size class n.

The first summation in equation (A.13) is the aggregation of the

first ('mean-preserving') terms for all n in equation (A.12) and is therefore always positive (for $dw_n \geq 0$). It is the second term, involving the behavior of between-class means, which is important for the determination of a positive welfare increment. Let us relate the scalar product of the two sequences λ_n and $v_n f_n d\bar{x}_n$ to the sequences a and b, respectively, in the lemma. We have, by differentiating equation (A.11),

$$\sum_n v_n f_n d\bar{x}_n = d\bar{x}$$

Suppose λ_n is roughly monotonically increasing with n, then a monotonically increasing choice of $v_n f_n d\bar{x}_n$ which satisfies $d\bar{x} \geq 0$ will ensure an increase in welfare. In fact, by the conditions of the lemma an even stronger statement can be made.

Proposition 2. For any subdivision of family size groups into N_1 (high MMU) and N_2 (low MMU), such that

$$\min_{n \in N_1} \lambda_n > \max_{n \in N_2} \lambda_n,$$

the rule of choice $s_n > a_n$ ($d\bar{x}_n > 0$) for $n \in N_1$, $s_n < a_n$ ($d\bar{x}_n < 0$) for $n \in N_2$, will ensure a positive increase in social welfare (provided $d\bar{x} \geq 0$ when $d\bar{y} = 0$).

High MMU can usually be expected to go together with relatively low mean class income, and conversely.[8] In the empirical context analysed in

---

[8] The precise statement depends on the utility function and the income distribution. E.g., for a quadratic utility function, MMU is precisely the MU at the mean irrespective of the distribution. For more general utility functions this depends on the form of the distribution. However, for practical purposes it seems reasonable to assume $\lambda_n \simeq U'(\bar{x}_n)$.

the next section there is a very high negative correlation between family size and mean standard income, which might in fact make λ_n a truly monotonic sequence. The rule of Proposition 2 simply implies that any equalizing movement of mean class incomes towards the overall mean is welfare increasing. One could even go one step further and guess what in the absence of any constraints might constitute a welfare maximizing policy: first exchange all exemptions (E_n) for mean-preserving family grants (C_n). This is definitely a Lorenz-dominating policy (by Proposition 1). Then reshuffle, to the extent that this is feasible, the C_n between family-size classes so as to equalize $\lambda_n n/h(n)$ (standardized MMU) among groups (for a proof see the next section). But one is rarely looking for unconstrained welfare-maximizing policies. We shall briefly reconsider optimality after taking disincentive effects into account as well. However, Proposition 2 is of practical use by itself under any set of constraints, providing we require policies to be at least welfare-increasing.

There is a related alternative way of looking at the welfare effects of these policies which can also be used for empirical purposes--in terms of the decomposition of the inequality index I [equation (A.10)] within and between size groups. Define x_{en} to be the equally distributed equivalent income within size class n, i.e., $u(x_{en}) = 1/v_n \sum_i u(x_{ni})$ and the corresponding index of inequality within class n will be $I_n = 1 - x_{en}/\bar{x}_n$. We can now write the welfare function Z in the form

$$Z = U(x_e) = \sum_n f_n v_n U(x_{en}),$$

or

$$Z = U[(1 - I)\bar{x}] = \sum_n f_n v_n U[(1 - I_n)\bar{x}_n],$$

where $f_n = n/\Sigma nv_n$, as before. By total differentiation this in turn
gives

$$dZ = U'(x_e)[-\bar{x}dI + (1 - I)d\bar{x}]$$

$$= \Sigma_n f_n v_n U'(x_{en})[-\bar{x}_n dI_n + (1 - I_n)d\bar{x}_n].$$

The left-hand equality points out the fact that a change in welfare goes
together with a reduction in the overall inequality index I. However, it
also incorporates the effect of changes in the overall mean $\bar{x}$ when these
occur (see the previous discussion on the effect of the welfare weighting
procedure). The right-hand equality yields a convenient decomposition of
the changes in overall inequality,

$$U'(x_e)\bar{x}(-dI) = \Sigma_n f_n v_n U'(x_{en})\bar{x}_n(-dI_n) +$$

(A.14)

$$+ \Sigma_n f_n v_n U'(x_{en})(1 - I_n)d\bar{x}_n - U'(x_e)(1 - I)d\bar{x}.$$

The three terms on the right-hand side of (A.14) are, respectively, the
effect of within-class inequality, between-class inequality,[9] and changes
in the overall mean. For the effect of the first term we have the following
proposition.

Proposition 3. Any reduction in a with-class inequality index (I_n) *will,*
ceteris paribus, *reduce overall inequality* (I).

This follows directly from the fact that the terms multiplying $-dI_n$

---

[9] Note that this is not the same decomposition of terms as equation
(A.13) since we discuss the complete effect of changes in s_n both within
and between classes and do not single out the partial within-class effect
of a mean-preserving change $s_n = a_n$.

and $-dI$ in (A.14) are positive, so that $dI_n < 0$ leads to $dI < 0$. We can write out dI_n by differentiating the expression $U[(1 - I_n)\bar{x}_n] = [\sum_i U(x_{in})]/v_n$ with respect to w_n. This gives, after suitable substitution,

$$h(n)U'(x_{en})\bar{x}_n \sum_i = \frac{1}{v_n} \sum_i U'(s_n - F') - U'(x_{en})(1 - I_n)(\frac{d\bar{y}_n}{dw_n}).$$

The right-hand side of this equation naturally differs from the welfare increment (A.12) by the net welfare effect of the change in the mean. Alternatively, the equation can be written in the form

$$h(n)U'(x_{en})\bar{x}_n(-\frac{dI_n}{dw_n}) = \frac{1}{v_n} \sum_i U'(a_n - F') +$$

(A.15)

$$+ [\lambda_n - U'(x_{en})(x_{en}/x_n)](s_n - a_n),$$

where λ_n = MMU, as before.

The first term on the right-hand side of (A.15) is always positive (mean-preserving switch) as in equation (A.12). The second term depends on the sign of the expression $[\lambda_n - U'(x_{en})(x_{en}/x_n)]$, which in turn depends on the nature of the welfare function[10] and on the sign of $d\bar{y}_n/dw_n = s_n - a_n$.

For the between-class inequality effect [second term in equation (A.14)], one could formulate a proposition that is analogous to Proposition 2 by making $d\bar{x}_n$ (or $d\bar{y}_n$) positive or negative according to whether $f_n v_n U'(x_{en})(1 - I_n)$ is 'large' or 'small'. This rule, however, would be less intuitively obvious than the one discussed under Proposition 2.

---

[10] E.g., if λ_n is more or less equal to the MU at the mean $\bar{x}_n$, this expression will be positive or negative according to whether the elasticity of MU is less than or greater than unity [the latter determines whether $U'(x)x$ is an increasing or decreasing function of x]. Remember that $x_{en} \leq \bar{x}_n$.

In the last section[11] we apply a version of equation (A.14) empirically for the case of the specific Atkinson measure I with iso-elastic MU. In that case $x_e^{1-\epsilon} = \sum_{n,i} x_{ni}^{1-\epsilon} v_n f_n$ (ϵ = elasticity of MU), and we can write, after some manipulation,

$$(A.16) \qquad (1 - I)^{1-\epsilon} = \sum_n (\frac{\bar{x}_n}{\bar{x}})^{1-\epsilon}(1 - I_n)^{1-\epsilon} f_n v_n,$$

where

$$(A.17) \qquad I_n = 1 - [\sum_i (\frac{y_{ni}}{\bar{y}_n})^{1-\epsilon} \cdot \frac{1}{v_n}]^{1/(1-\epsilon)};$$

and for changes in inequality we get

$$-dI = (1 - I)^{\epsilon}[\sum_n (\frac{\bar{x}_n}{\bar{x}})^{1-\epsilon} v_n f_n (1 - I_n)^{-\epsilon}(-dI_n)$$

$$(A.18)$$

$$+ \sum_n (\frac{\bar{x}_n}{\bar{x}})^{-\epsilon} v_n f_n (1 - I_n)^{1-\epsilon} d(\frac{\bar{x}_n}{\bar{x}})].$$

The first term on the right-hand side of (A.18) is the effect of within-class inequality and the second is the remaining effect of between-class mean changes (with respect to the overall mean).

3. DISINCENTIVES AND VARYING TAX PROGRESSIVITY

Suppose population characteristics and s_n policy rules satisfy the conditions laid out in the preceding section so that a gradual movement from E to C does, in fact, reduce inequality (I). Obviously equity may have to be bought at the expense of disincentive effects. We have already shown in Section 1 that such a policy raises effective marginal

---

[11] Section 5 of the original paper, not included here.

tax rates for all families for which $V > 0$. Thus any index of disincentives that is a positive function of marginal tax rates will show an increase.

There are two kinds of disincentive effects which may in principle be functions of marginal tax rates: labor supply (or earned income) and tax evasion. Unfortunately there is little in the way of empirical basis for the construction of suitable indexes, at least for the empirical context to be discussed in the next section. In the absence of such a basis one has to resort to *a priori* reasoning. We shall here suggest simple linear indexes based on the weighting of marginal tax rates by some measure of family income, while admitting that more sophisticated measures could also be justified. We start with the labor supply effect.

As in the usual textbook model, consider an individual maximizing utility from consumption and leisure who earns (and consumes) a gross wage of w per unit of time. Assume that w for different individuals depends only on exogenously given characteristics, and only the labor supply L can be varied. Gross income will be $Y = wL$. Under utility maximization, with a given tax function $F(V)$ (V is taxable income, as before), the individual will be in equilibrium with the marginal rate of substitution between consumption and leisure (p_1, say) equal to the marginal net wage

(A.19) $\qquad p_1 = w(1 - F')$.

Suppose the amount of labor supplied at that point is L_1. Consider now the compensated supply curve for labor (or the demand curve for leisure) passing through the point (p_1, L_1). Denote its slope by $(\partial L/\partial p)_{\bar{u}}$. The curve implies compensating changes in net income which keep the individual at a constant utility (or income) level, so that only the substitution

effect takes place. If the existing income tax were collected in an equivalent lump-sum form, the marginal rate of substitution between consumption and leisure would be p_0, say, and p_0 = w. The amount of labor supplied would be $L_0 \geq L_1$. By approximation, we can write for the change in labor supply

$$\Delta L = L_0 - L_1 \simeq \left(\frac{\partial L}{\partial p}\right)_{\tilde{u}} (p_0 - p_1) = \eta L F',$$

where η = the (compensated) supply elasticity $(w/L)(\partial L/\partial p)$, and we have made use of the fact that $p_0 - p_1 = wF'$. The real output loss (ΔY) is given by

(A.20) $\Delta Y = w\Delta L = \eta Y F'.$

If η were approximately the same for all individuals, the aggregate output loss would be proportional to the following index (D),

(A.21) $D = \sum_{n,i} Y_{ni} F'(V_{ni}).$

We propose to use D as one of our simplified measures of disincentive. One could, of course, make an empirical argument for using varying η for different parts of the labor force (e.g., higher for women, lower for men), but this would require more sophisticated theoretical and empirical analysis. Let us also note that confining oneself to real output effects may be misleading from a wider welfare point of view, in that the compensatory effects of increased leisure are ignored. An alternative would be to use Harberger's (1964) measure based on the notion of the excess burden. If, in fact, in the above model we were to measure the area of the 'Harberger triangle' (ΔS) under the supply curve between

L_1 and L_0, we would get

$$\Delta S = \tfrac{1}{2}\Delta L \cdot \Delta p = \tfrac{1}{2}(\frac{\partial L}{\partial p})_{\bar{u}} (wF')^2 = \tfrac{1}{2}\eta Y(F')^2.$$

With the same assumption about η one could thus apply an alternative aggregate index weighting the *square* of the marginal tax by income level. In the present context social welfare is anyway defined only on individual money income, ignoring other nonpecuniary factors. Thus there is some advantage for internal model consistency in considering also the potential net loss only in terms of marketable output.

It can be claimed that the actual labor supply response to high marginal tax rates is quite small in practice. On the basis of casual observation it would seem, at least in the Israeli case, that high marginal tax rates do not necessarily push people out of the labor market or reduce hours of work, but do in fact drive people in nontaxed income activities, thus causing tax evasion or tax avoidance. The accompanying loss in tax revenue is a real loss to the extent that there is an administrative or political constraint on the ability of government to collect taxes. In a high-tax, high-public-expenditure country this may be a very important limitation.

An analysis by our colleague Yitzhaki (1975), based on Allingham and Sandmo (1972), suggests various ways in which a measure of tax evasion, involving marginal tax rates, could be justified. We shall here confine ourselves to a rationalization of the simplest applicable linear measure. Suppose we denote *declared* taxable income by V^0 (while actual taxable income is V) and assume that the proportion of income not declared is constant at different income levels, i.e., $(V - V^0)/V$ = constant, say,

d_0. Using the Allingham and Sandmo (1972) model, this will be the case if individuals show constant relative risk aversion. The amount of taxes evaded by each individual will thus be approximately equal to $F' \cdot (V - V^0) = d_0 VF'$. For the aggregate the amount evaded will be proportional to

$$(A.22) \qquad Q = \sum_{n,i} V_{ni} F'(V_{ni}).$$

By the same token we could use V^0 (declared taxable income) instead of V (since they are assumed to be proportional). The index Q is, of course, very similar to D [equation (A.21)] except for the weighting by V instead of Y. The economic rationale behind Q is, of course, very different. Using an index Q of marginal rates weighted by *taxable* income yields a very simple and intuitively appealing result for the case of the constant elasticity function (A.1).

Applying the special tax function (A.1) would give [using (A.2) and assuming $V < \bar{V}$]

$$(A.23) \qquad Q = \beta \sum_{n,i} A V_{ni}^{\beta} = \beta (B_0 + \sum_n v_n C_n).$$

The implication of (A.23) is direct. As we increase transfers, Q increases directly with the economy-wide transfer total $(\sum_n v_n C_n)$, the factor of proportionality being β, the progressivity parameter. [12]

Suppose we now introduce a compensatory policy mechanism. As is

---

[12] The alternative index D, using Y_{ni} as weights, would give $D = Q + \sum_n E_n v_n a_n$. As C_n increases there is a somewhat weaker response on D (as E_n are reduced simultaneously) but the result obtained is very similar.

suggested by (A.23), we have to reduce β in the tax function if the disincentive index is to remain invariant.[13] However, in order to preserve the budget constraint (A.2) the average tax parameter A will have to be increased simultaneously. In fact, we must have

$$(A.24) \qquad \left.\frac{dA}{d\beta}\right|_{B_0} = -\frac{A \sum_{n,i} V_{ni}^{\beta} \log V_{ni}}{\sum_{n,i} V_{ni}^{\beta}} < 0.$$

This combined change in the parameters of the tax function will obviously reflect itself back in an increase in I.[14] The interesting question is, of course, whether one could keep disincentives constant and yet achieve a net total reduction in I. If so, this would imply that at the initial state the economy is not on an efficient policy frontier. Such a finding characterizes the empirical study but is difficult to spell out in general analytical terms. However, one could at least point out an illustration of it by means of the special case underlying equation (A.23). Assume that C_n is nontaxable, and keep A, β, E_n unchanged. Now reshuffle C_n among size classes while keeping the sum $\sum_n v_n C_n$ constant. Unless the distribution of C_n already happens to be 'optimal', it is easy to envisage a reshuffling that will decrease I while Q is

---

[13] A strict application of (A.23), for Q = constant, would require $d\beta = -(\beta \sum_n v_n dC_n / (B_0 + \sum_n v_n dC_n)$. In the case of D = constant, we must subtract $[\sum_n (-dE_n)v_n a_n + \sum_n E_n v_n da_n]$ from the numerator above.

[14] We now have, for the additional response on y_{ni},

$$dy_{ni} = -V_{ni}^{\beta} dA - AV_{ni}^{\beta} \log V_{ni} d\beta = -V_{ni} d\beta [A \log V_{ni} - (-dA/d\beta)],$$

and $dy_{ni} \lessgtr 0$, according to whether $\log V_{ni} \lessgtr (1/A)(-dA/d\beta)$ for all n,i.

kept constant. Moreover, one can in this special case go one step further
and partially solve the following optimization problem.

Maximize

(A.9) $Z = \sum_{n,i} U(x_{in}) f_n,$

subject to

(i) $\bar{y} = \dfrac{\sum\limits_{n} v_n \bar{y}_n}{\sum\limits_{n} v_n} = $ constant

[assuming the government budget constraint (A.2)], and

(ii) $\beta(B_0 + \sum\limits_{n} v_n c_n) = $ constant

[assuming given level of disincentives (A.23)]. Denoting the respective
Lagrange multipliers by μ_1 and μ_2, and the resulting Lagrangian
expression by Z', one obtains, after some manipulation,

$$\frac{\partial Z'}{\partial C_n} = \frac{v_n f_n \lambda_n}{h(n)} - \frac{\mu_1 v_n}{\sum\limits_{n} v_n} - \mu_2 v_n \beta,$$

or

(A.25) $\dfrac{\partial Z'}{\partial C_n} = \dfrac{v_n}{\sum n v_n}[\lambda_n' - \mu_1' - \mu_2'\beta],$

where

$$\lambda_n' = \frac{n \lambda_n}{h(n)} = \text{standardized MMU,}$$

$$\mu_1' = \frac{\mu_1 \sum n v_n}{\sum v_n} = \text{modified shadow price of government budget,}$$

$$\mu_2' \;=\; \mu_2 \cdot \Sigma n v_n \;=\; \text{modified shadow price of disincentives.}$$

Likewise,

$$\frac{\partial Z'}{\partial E_n} \;=\; \frac{f_n}{h(n)} \sum_i \mu F' \;-\; \frac{v_n a_n}{\Sigma v_n} \mu_1,$$

which can be written in the form

$$(A.26) \qquad \frac{\partial Z'}{\partial E_n} \;=\; \frac{v_n}{\Sigma n v_n}\left[\frac{n}{h(n)} \text{cov}_n\,(U',\,F') + (\lambda_n' - \mu_1')a_n\right],$$

where

$$\text{cov}_n\,(U',\,F') \;=\; \frac{\sum_i U'F'}{v_n} \;-\; \lambda_n a_n$$

equals covariance of U' and F' for group n. This covariance will always be strictly negative unless we have full income equality. From (A.25) and (A.26) one obtains the following partial characterizations of the optimum solution.

1. From equation (A.25) it follows that $\partial Z'/\partial C_n \lessgtr 0$ according to whether $\lambda_n' \lessgtr \mu_1' + \mu_2'\beta$, for all n. Now $\partial\lambda_n'/\partial C_n < 0$. The first-order condition for a maximum w.r.t. C_n thus dictates a policy which should tend to equalize the λ_n' (standardized MMUs) among size classes. Because of the special form of (A.23), this property is the same as for unconstrained ($\mu_2 = 0$) maximization (cf. the discussion in Section 2). If this is feasible we must in the optimum have, for all n,

$$(A.27) \qquad \lambda_n' \;=\; \mu_1' + \mu_2'\beta \;=\; \text{constant.}$$

2. In the case in which there is no disincentive constraint ($\mu_2 = 0$) and

no feasibility constraint on the increase of C_n (i.e., $\lambda_n' = \mu_1'$), we get from (A.26) that $\partial Z'/\partial E_n < 0$. In that case the optimum policy is to reduce E_n to zero. This substantiates the statement made in Section 2. The only rationale for keeping positive exemptions is a tax system is the existence of a disincentive constraint. Assuming the latter and equating both (A.25) and (A.26) to zero, we find, for all n,

$$(A.28) \qquad - \frac{n}{h(n)} \operatorname{cov}_n (U', F') \cdot \frac{1}{a_n} = \mu_2 \beta = \text{constant},$$

.i.e., the standardized covariances of U' and F' must in the optimum be proportional to the MMTs (a_n).

We must note that any increase in the transfer budget $\Sigma v_n C_n$ can, in the constrained (A.23) case, come about only by a suitable reduction of β. A full optimum for all parameters (including β and A) requires looking also at $\partial Z'/\partial \beta = \partial Z'/\partial A = 0$. However, the resulting expressions do not lend themselves to any straightforward analytical solutions. Finally we note the special assumptions underlying the tax function (A.1) and the form of disincentives (A.23) used here. Any more general analytical treatment would no doubt carry one into rather deep waters.

REFERENCES

Allingham, Michael G., and Agnar Sandmo. "Income Tax Evasion:
A Theoretical Analysis," *Journal of Public Economics*, I (November
1972), 323-38.

Atkinson, A.B. *Poverty in Britain and the Reform of Social Security.*
Cambridge: Cambridge University Press, 1969.

————. "On the Measurement of Inequality," *Journal of Economic Theory*,
II (September 1970), 244-63.

Barth, Michael C. "Cost, Coverage, and Antipoverty Effect of a Per Hour
Wage Subsidy." Unpublished doctoral dissertation, City University
of New York, 1971.

Ben-Porath, Yoram, and Michael Bruno. "The Political Economy of a Tax
Reform: Israel 1975," *Journal of Public Economics*, VII (1977),
285-307.

Berglas, E. "Reform in Income Tax," *Economic Quarterly* (Hebrew), XVIII
(No. 71-72, November 1971), 232-39.

————. "Aspects of Guaranteed Income Plans," *Economic Quarterly*
(Hebrew), XXI (No. 82; September 1974), 169-80.

Brannon, Gerard M., and Elliott R. Morss. "The Tax Allowance for
Dependents: Deductions Versus Credits," *National Tax Journal*, XXVI
(December 1973), 599-609.

Bruno, Michael, and Jack Habib. "Taxes, Family Grants and Redistribution,"
Journal of Public Economics, V (January-February 1976), 57-79.

Cain, Glen G. *The Effect of Income Maintenance Laws on Fertility in the
United States.* (Institute for Research on Poverty Discussion Paper
No. 117-72.) Madison: The University of Wisconsin, 1972.

Central Bureau of Statistics. *Surveys of Employee Earnings 1972; 1973.*
(Special Series No. 478.) Jerusalem: 1975.

Commission on Tax Reform. *Proposals for the Reform of Direct Taxes.*
(Ben-Shahar Report.) Jerusalem, 1975. (English translation, 1976:
Ministry of Finance, State Revenue Administration, Jerusalem.)

Danziger, Sheldon, and Jonathan R. Kesselman. *Personal Exemptions and
Per Capita Credits in the U.S. Income Tax.* (Institute for Research
on Poverty Discussion Paper No. 271-75.) Madison: University of
Wisconsin-Madison, 1975.

Doron, A. "Work Incentives Through Welfare Aid," *Economic Quarterly*
(Hebrew), XVIII (No. 69-70; June 1971), 55-60.

————, and Rami Rosental. *The Responsibility for Relatives in Israel's
Welfare System.* (Paul Baerwald School of Social Work: Welfare and
Social Work Series No. 5.) Jerusalem: The Hebrew University, 1971.
(Hebrew.)

————, and Refael Roter. *Supplementary Benefits to Low Wages Paid
Through Employers.* Jerusalem: National Insurance Institute and
The Hebrew University, 1974.

Feldstein, Martin. *On the Theory of Tax Reform.* (Harvard Institute of
Economic Research Discussion Paper No. 408.) Cambridge, Mass.:
Harvard University, 1975.

Friedman, Milton. "A Method of Comparing Incomes of Families Differing
in Composition." In *Studies in Income and Wealth,* Vol. 15.
New York: National Bureau of Economic Research, 1952. Pp. 9-20.

————. *Capitalism and Freedom.* Chicago: University of Chicago
Press, 1962.

"The Future of Income Maintenance." (Lectures given at a workshop held
    at the Paul Baerwald School of Social Work, June 4, 1969.)
    Jerusalem: The Hebrew University, 1969. (Hebrew.)

Gabbay, J. "Changes in Public Investment and Fiscal Policy 1949-1972,"
    Economic Quarterly (Hebrew), XX (No. 77; April 1973), 120-32.

Goode, Richard. *The Individual Income Tax.* Washington D.C.: The
    Brookings Institution, 1964.

Green, Christopher. *Negative Taxes and the Poverty Problem.* Washington
    D.C.: The Brookings Institution, 1967.

Groves, Harold M. *Federal Tax Treatment of the Family.* Washington D.C.:
    The Brookings Institution, 1963.

Habib, Jack. *Children in Israel: Preliminary Report.* (Szold Institute
    Research Report No. 168.) Jerusalem, 1972. (Hebrew with English
    summary.)

————. *The Determination of Equivalence Scales With Respect to Family
    Size: A Theoretical Reappraisal.* (Discussion Paper No. 733.)
    Jerusalem: Falk Institute, 1973a.

————. *The Efficiency of Alternative Tax-Transfer Structures.*
    (Discussion Paper 735.) Jerusalem: Falk Institute, 1973b.

————. *The Reform of Taxes and Transfers: 1969-1973.* (Discussion
    Paper 745.) Jerusalem: Falk Institute, 1974.

————. "Poverty in Israel 1964-1974 in the Light of the Development
    of the Income Maintenance System," *Social Security* (Hebrew with
    English summary), No. 8 (March 1975), pp. 5-21. (1975a.)

————. "Transfers and the Poverty Problem: An Evaluation of Alternatives."
    In *Issues in the Economy of Israel.* Edited by Nadav Halevi and Yaakov
    Kop. (Jerusalem: Falk Institute, 1975.) Pp. 129-50. (1975b.)

Habib, Jack, Meir Kohn, and Robert Lerman. *The Effect on Poverty Status in Israel of Considering Wealth and Variability in Income.* (Discussion Paper No. 7-76.) Jerusalem: Brookdale Institute, 1976.

————, and Yossi Tawil. *Equivalence Scales for Family Size: Findings from Israeli Data.* (Bureau of Research and Planning Discussion Paper No. 1.) Jerusalem: National Insurance Institute, 1974.

Hagen, Ole. "Is Australian and New Zealand Income Taxation Fair to Families?" *Economic Record,* XLIII (March 1967), 129-30.

Haveman, Robert H. "Work-Conditioned Subsidies as an Income-Maintenance Strategy: Issues of Program Structure and Integration." In U.S. Congress. Joint Economic Committee. *Studies in Public Welfare.* (Paper No. 9, part 1.) 93rd Cong., 1st Sess., 1973. Pp. 33-67.

Lampman, Robert J. "The American Tax System and Equalization of Income," *Proceedings of the National Tax Association* (1956), pp. 271-80.

Lidman, Russell. *Cost and Distributional Implications of a Credit Income Tax Plan.* (Institute for Research on Poverty Discussion Paper 131-72.) Madison, Wis.: University of Wisconsin, June 1972.

Ministry of Welfare. *Resort to the Welfare Bureau.* (Publication No. EJM/478/H.) Jerusalem: 1975. (Hebrew.)

Musgrave, Richard A. *E.T., O.T. and S.B.T.* (Harvard Institute of Economic Research Discussion Paper No. 405.) Cambridge, Mass.: Harvard University, 1975.

————, Peter Heller, and George E. Peterson. "Cost-Effectiveness of Alternative Income Maintenance Schemes," *National Tax Journal,* XXIII (June 1970), 140-56.

National Insurance Institute, Bureau of Planning and Research. *Families with Children in Israel 1969-1970.* (Survey No. 7.) Jerusalem, 1972. (Hebrew.)

————. Bureau of Planning and Research. *Quarterly Statistics,* various issues.

Patinkin, Don. *The Israel Economy: The First Decade.* Jerusalem: Falk Project, December 1960.

Pechman, Joseph A. *Federal Tax Policy.* Washington D.C.: The Brookings Institution, 1966.

Pogue, Thomas F. "Deduction vs. Credits: A Comment," *National Tax Journal,* XXVII (December 1974), 659-62.

Prime Minister's Commission on Children and Youth in Poverty. *Report Submitted to the Prime Minister.* Supplement No. 1: *Report of the Subcommittee on Income Maintenance.* Jerusalem, October 1972. (Hebrew.)

————. *Report Submitted to the Prime Minister.* Jerusalem, 1973. (Hebrew.)

Rein, Martin. "The Negative Income Tax as Supplement and Incentive in Britain and the United States." (Prepared for the Nuffield Canadian Seminar on Guaranteed Annual Income: An Integrated Approach.) The Canadian Council on Social Development, 1972.

————. "Recent British Experience with Negative Income Tax," *Journal of Human Resources,* VIII (supplement 1973), 69-90.

Report of the Commission of Inquiry into the Distribution of the National Income in Israel. (Horowitz Report.) Jerusalem, 1966. (Hebrew.)

Report of the Commission on the Needs of the Poor. (Submitted to the Minister of Welfare.) Jerusalem: Ministry of Welfare, 1967. (Hebrew.)

Report of the Committee on Income Distribution and Social Inequality. (Chairman D. Horowitz.) Tel Aviv, 1971.

Rhys Williams, Lady. *Something to Look Forward To.* McDonald, 1943.

Rolph, Earl R. "The Case for a Negative Income Tax Device," *Industrial Relations,* VI (February 1967), 155-65.

Rosenfeld, Jona M., and Lotte Salzberger, with Judah Matras. "Family Needs and Welfare Provisions." (Final Report.) Jerusalem: The Paul Baerwald School of Social Work, The Hebrew University, n.d. [1973.]

Roter, R. "Reform of Children Allowances in Israel," *Social Security* (Hebrew with English summary), No. 4-5 (July 1973), pp. 70-91.

―――, and N. Shamai. "Patterns of Poverty in Israel--Preliminary Findings," *Social Security* (Hebrew with English summary), No. 1 (February 1971), pp. 17-28. (1971a.)

―――, "The Distribution of Personal Income in Israel--Trends in the 1960's," *Social Security* (Hebrew with English summary), No. 1 (February 1971), pp. 55-62. (1971b.)

Salzberger, L., and J.M. Rosenfeld. "The Anatomy of Social Welfare Agencies in Jerusalem," *Social Security* (Hebrew with English summary), No. 3 (June 1972), pp. 96-114.

―――, and Hagith Shlonsky. "The Social Service Function of the Public Welfare Bureau." Jerusalem: The Paul Baerwald School of Social Work of the Hebrew University, and the Ministry of Welfare, 1974.

Schorr, Alvin L. *Explorations in Social Policy*. New York: Basic Books, 1968.

Schultze, Charles L., Edward R. Fried, Alice M. Rivlin, and Nancy H. Teeters. *Setting National Priorities: The 1973 Budget*. Washington: The Brookings Institution, 1972.

Seltzer, Lawrence H. *The Personal Exemptions in the Income Tax*. (National Bureau of Economic Research; Fiscal Studies No. 12.) New York and London: Columbia University Press, 1968.

Seneca, Joseph J., and Michael K. Taussig. "Family Equivalence Scales and Personal Income Tax Exemptions for Children," *Review of Economics and Statistics*, LIII (August 1971), 253-62.

Shamai, N., and H. Waldhorn. *Families with Children in Israel 1969/70*. (Bureau of Planning and Research Survey No. 7.) Jerusalem: National Insurance Institute, 1972. (Hebrew.)

Shnit, D. "Some Legal Problems of Public Assistance to Indigents," *Social Security* (Hebrew with English summary), No. 1 (February 1971), pp. 75-84.

Simons, Henry C. *Personal Income Taxation*. Chicago: University of Chicago Press, 1938.

Titmuss, Richard M. *Commitment to Welfare*. London: George Allen and Unwin, 1968.

United Kingdom. *Proposals for a Tax-Credit System*. Cmd 5116. London: Her Majesty's Stationery Office, 1972.

U.S. Congress. Joint Economic Committee. *Income Security for Americans: Recommendations of the Public Welfare Study*. (Report of the Subcommittee on Fiscal Policy.) 93rd Cong., 2nd Sess., Washington: 1974.

Weisbrod, Burton A.   "Collective Action and the Distribution of Income:
A Conceptual Approach," in U.S. Congress: Joint Economic Committee.
Subcommittee on Economy in Government.   *The Analysis and Evaluation
of Public Expenditure: The PPB System.*   Vol. I,   *A Compendium of
Papers.*   91st Cong., 1st Sess., Washington, 1969.

————.   *On the Stigma Effect and the Demand for Welfare Programs:
A Theoretical Note.*   (Institute for Research in Poverty Discussion
Paper 82-70.)   Madison: The University of Wisconsin, 1970.

Yitzhaki, Shlomo.   "Personal Taxation, Incentives, and Tax Reform."
(Ph.D. dissertation submitted to the Hebrew University of Jerusalem.)
Jerusalem, 1975.   (Hebrew.)