THE THEORY OF THE OPTIMUM REGIME*

CONTENTS

1. Introductory
2. Structure of the Problem
   2.1. Concepts, Data and Unknowns
   2.2. Components and Shape of Social Welfare Function
   2.3. Institutions, Instruments and Costs
   2.4. Description of Institutions and Their Main Instruments
      2.41 Public Authorities – 2.42 Lower Authorities – 2.43 Private Enterprises – 2.44 Markets – 2.45 Social Insurance Institutions – 2.46 Production Councils
3. Models of the Process of Production and Distribution
   3.1. Types of Variables and Relations Included
   3.2. Two-Person Models (2P and 2H)
   3.3. Model with an Arbitrary Number of Persons, Goods and Enterprises, but One Homogeneous Factor of Production (N)
   3.4. Generalizations and Specifications
4. On the Solution of the Problem of the Optimum Regime
   4.1. Methods of Solution
   4.2. The Main Choices to Be Made
   4.3. Conclusions from the Direct Method
      4.31 The Decentralization Thesis – 4.32 External Effects – 4.33 Increasing Returns – 4.34 The Tax System
   4.4. An Example of the Indirect Method
   4.5. Suggestions Regarding the Main Choices
      4.51 Size of the Public Sector and Nature of Taxes – 4.52 The Degree of Centralization in Administration – 4.53 The Degree of Centralization in Production – 4.54 The System of Exchange – 4.55 The System of Social Insurance – 4.56 Social Control
5. Some Tentative Conclusions
   5.1. Unsolved Problems; Research Priorities
   5.2. Two Statements About the Optimum Regime

* Although the precise influence exerted on him by the various authors on welfare economics cannot be easily traced, the author wants to express his gratitude to William J. Baumol, Abram Bergson, Gérard Debreu, J. Marcus Fleming, Ragnar Frisch, J. de Villiers Graaff, Harold Hotelling, Nicholas Kaldor, Tjalling C. Koopmans, Oskar Lange, Abba P. Lerner, James E. Meade, Nancy Ruggles, Pàul A. Samuelson, Tibor de Scitovsky and Robert H. Strotz for the contributions they made to his understanding, if any, of the subject matter.

5.3. Factors Making for Deviations Between the Optimum and the Actual Regime
5.4. Differences Between Aims of Political Systems
5.5. Is There a Basis for Discussion?

1. INTRODUCTORY

This article attempts to summarize what seems to be the position of a large number of western economists on the question of the "best" economic regime. It has been written with a double purpose. On the one hand it seemed worth while to reformulate a set of doctrines that have emerged from various discussions in order to see where we stand and to make up our minds where further research is needed. On the other hand it seemed necessary that economists clarify, to a larger public, their views on a topic which plays a predominant role in the world's largest controversy to-day; I mean the one between communist and non-communist opinion. Although this controversy, according to most western citizens, is primarily about political organization—democracy *versus* dictatorship—most communists put the emphasis in a different place. Moreover, quite a few westerners seem to see a close correspondence between the question of political regime and the one of economic regime. I am now referring to those rightist citizens who identify dictatorship with "socialism" and democracy with "capitalism" and in addition consider "socialism" and "capitalism" as two opposed economic systems without any intermediate forms. The question of the economic regime therefore plays an important role in the controversy between communists and non-communists.

This question is a subject on which many non-economists have very definite opinions and in fact the larger part of the discussion about it is being carried on by non-economists. The economist is inclined to refer to these discussions—in newspapers, pamphlets, parliamentary and international gatherings—as "popular" discussions. These popular discussions are often black-and-white in nature and are often conducted by people who are accustomed to think that they are right in some absolute sense and their opponents wrong. Their opinions tend to be extreme. They seem to overlook the important fact that economic regimes of whatever kind have, to a considerable degree, common tasks and objectives. They also often seem to overlook the existence of a large number of intermediate and mixed types of economic sys-

tems and policies and the fact that actual economic regimes and policies are not fixed, but rather continuously changing; that, in other words, economic reality is less black or white than are the systems discussed. It may well be that the best economic regime is somewhere in between and much less difficult to determine than the optimum political structure.

In the current political situation there are considerable dangers involved in this attitude of popular opinion. In a world which is already rapidly becoming less stable, a further, and partly unjustified, concentration of political views around two opposite poles may hasten the process towards self-annihilation already set in motion by political and military developments. There is a desperate need for stabilizing forces and it is the author's conviction that the economist's "message" is just such a stabilizing force, however modest. It is for this reason that a wider public should be aware of the existence of a large number of economists who do not share the popular black-white opinions with regard to the economic order.

Against this background it seems useful indeed to relate a number of concepts and statements, mostly from the realm of "welfare economics" and to reformulate them so as to represent what could be called a "general theory of the optimum regime". The objectives of such a general theory are:

(I) to present a realistic picture of the main decisions that have to be taken in order to choose a regime;

(II) to show the relationships between these decisions and some of the fundamental data of a society;

(III) to appraise a number of well-known popular arguments and to eliminate some widespread misunderstandings;

(IV) thereby to offer a basis for discussion between the representatives of different regimes;

(V) to make it clear that there are some formidable unsolved problems more worthy of discussion than a number of more popular but futile arguments, and finally

(VI) to present a program for further basic research likely to be more valuable than much current short-term research.

The contents of this article present, of course, only an outline.

Although the author believes that he summarizes what seems to be

the position of a large number of western economists, he is well aware that on certain points he is deviating from the usual approach. This is true particularly for section 2.2. However, the specific attitude taken there toward the comparability of individual welfare levels does not affect the main conclusions, but gives a more definite interpretation to some vague and multi-dimensional concepts which are quite commonly used.

2. STRUCTURE OF THE PROBLEM

2.1. Concept, Data and Unknowns

For our purpose we may say that an economy is characterized by its *actors*[1] and by the *actions* of these actors. The actors have to be subdivided into *natural* and *institutional* actors. Natural actors are the consuming and the producing units which approximately may be identified with families and enterprises, respectively. Institutional actors are all those which at first sight do not appear to be necessary for the process of production, distribution and consumption; *e.g.* the state, local authorities, social insurance agencies, cartels, trade unions *etc*. By an economy's *regime* we will understand its order or its institutions and these terms may cover two things. On the one hand they indicate certain procedures or a certain behaviour, on the other hand certain organizations; for these latter we will stick to our term institutional actors. The procedures and behaviour not only refer, moreover, to the institutional actors but also to the natural actors. An institution of a certain regime may be the income tax. The corresponding organization or institutional actor is the tax authority; but the behaviour implied not only covers the actions of this authority but clearly also the corresponding actions of the taxpayers. It must be stressed that an economy is defined only when its institutions are specified; this seems to be overlooked by quite a few welfare economists.[2]

The *actions* of the actors, or the *economic process*, may also be subdivided into natural actions, such as production, exchange and con-

[1] I prefer the word actor rather than transactor, although the two terms would seem to be synonymous.

[2] This applies particularly to the authors adhering to the compensation principle.

sumption and institutional actions such as government measures, paying taxes, monopoly pricing etc.

The problem of the *optimum regime* can now be stated by a specification of its data and its unknowns. As *data* we consider a number of physical and psychological characteristics (or coefficients) of the society considered and of possible institutions. Physical data are *e.g.* the characteristics of the production processes available, such as production functions (implying input-output relations of any type). Psychological data are the preferences of the consuming units, usually expressed in terms of their utility functions. We will, in addition, consider as given the social utility or welfare function by which the society's rulers are guided. The origin of such a social welfare function will be discussed because it is exactly at this point that our procedure deviates from the one usually followed. Among the data we list also the characteristics of a number of possible institutions. Such characteristics include their method of operation—a qualitative datum implying the instruments they use—and the "costs" their operation entails. Such costs may be material and psychological costs (aversion). Instruments may be such things as taxes, subsidies, wage and price systems *etc.*; like material costs they are of a quantitative nature. However their quantitative aspects (extent, level *etc.*) are not among the data, but among the unknowns.

The *unknowns* of the problem of the optimum regime are twofold. First, the institutions of the regime are unknown and secondly, the quantitative aspects (or numerical values) of the instruments involved are unknown. Both have to be chosen in such a way as to maximize the social welfare function. It is necessary to emphasize that, as a consequence, the qualitative and the quantitative unknowns are closely interrelated and that as a rule, a solution cannot be obtained without due regard to the quantitative aspects of the problem.

2.2. The Components and Shape of the Social Welfare Function

The problem of the optimum regime cannot be given a clear meaning unless we define the social welfare function. As economists know, this involves some theoretical difficulties of which the practical politician is only partly aware. In formulating short-run policy these

difficulties can often be avoided by reasonable compromises between the opposed interests. For long-term policy and even more for the choice of an economic order they cannot be disregarded since the ultimate aims of economic activity are involved. The problems alluded to are those of the relationship between individual and social welfare.

Not so much controversy will exist with regard to the list of *components* or *elements* entering into welfare, both individual and social. It will be generally accepted that welfare depends on the means to satisfy needs and these needs may be subdivided in the following way:

(1) individual needs: (a) material [goods] { (i) general level; (ii) distribution over time }
(b) non-material [education, culture]

(2) social needs: (a) material [distribution between individuals and groups]
(b) non-material [justice, freedom]

Some of the most important examples of the means to satisfy the various needs have been indicated in the square brackets. Accordingly the choice of the economic order will be based on what each conceivable order has to offer with regard to supplying the population with goods, both their general level and their distribution over time and among individuals, with regard to education, to the "equality of chances", to human relations and to the numerous types and intensities of freedom and so on. Since the necessary counterpart for the satisfaction of needs is productive effort, the disutility of making such efforts is also part of welfare components.

More theoretical difficulties—and practical controversies—are encountered when these various components must be given their relative weights. These weights have to be derived in one way or another from individual preferences, but these preferences are not identical for all individuals. Hence we will have to consider, first, these individual preferences and, secondly, how diverging preferences can be reconciled. In order not to complicate the argument unnecessarily, we will, in our examples, restrict ourselves to two components, *i.e.* the quantity of goods consumed and the quantity of effort made (both the general level and the distribution among individuals). However we will also mention some of the complications due to other components.

Individual preferences are usually described with the aid of *utility functions*, which express the level ω_i of utility experienced by an individual i as a function of the quantity of goods consumed x_i and the quantity of productive effort made a_i; both per unit of time:

$$\omega_i = \omega_i(x_i, a_i) \tag{2.21}$$

All economists accept the principle that indifference curves corresponding with constant values of ω_i can be observed, but it should be admitted immediately that actual observations are primitive and only partial. Lack of adequate measures for the various types of productive effort is the main reason.[3]

Theoretical difficulties arise in two areas: *measurability* and *interpersonal comparability* of utility. Most economists deny that utility can be measured and that comparisons between individuals can be made without the introduction of some ethical principle. It will be clear that, if utility could be measured, interpersonal comparisons would also be possible. The author does not want to exclude this possibility for the future. Comparability, however, does not require measurement. One may get by with the *explicit introduction of ethical principles*. The author prefers to do so immediately instead of trying to build up welfare economics without resorting to such principles.

Upon inspection of possible alternatives, the most appropriate ethical principle seems to be the principle of *"basic equality of man"*, pronounced by philosophers of very different background, although usually in a rather vague way. It will be applied in two ways in this essay. In a general way it will be assumed that individuals have *identical utility functions* into which *observable parameters* enter only as sources of differences between individuals. Or, in other words, differences are introduced only to the extent that we can observe them. More specifically whenever this can help us to define our choice, we will introduce, a *"principle of least differences"*, implying that where the nature of our problem allows us some latitude in our choice of utility functions, we will choose functions which are of the same shape

[3] The few observations available refer to indifference maps between the quantities of some types of goods rather than to maps between x_i and a_i. This one-sided interest for goods as distinct from productive effort is typical of economic science.

and have the smallest possible differences between coefficients but which are still compatible with our observations.

Apart from these two ways of applying the philosophy of basic equality we will use another device that will be of some help. We shall restrict ourselves to such variables in the utility function that we think are relevant to the problems to be treated. This applies first of all to the number of commodities to be included. This number we will sometimes restrict to as little as one even, when differences of taste for different goods seem to be irrelevant. In any society with free consumer choice, for example, there is a good deal of irrelevance in this respect, since everybody can spend his income in the way he prefers. Much more relevant for questions of income distribution are the variables defining the nature of the productive effort supplied by the individuals considered.[4]

A simple illustration of the application of our ethical principle seems in order. As before, let us choose two variables only, consumption x_i and the quantity of effort supplied a_i.

Our *first example* illustrates the general application. First we assume identical utility functions for all individuals. These functions are based on biological and psychological assumptions, and contain parameters with a well-defined meaning, such as calorie intake to remain fit or the effort a man is able to make under specified conditions. Examples will be given later (*cf.* this section, below).[5]

In a *second illustration* we will not specify the observable parameters of the utility function but simply assume that all coefficients occurring in the function may be different for different individuals. Writing the function as

$$\omega_i = \overset{10}{\omega_i} x_i + \overset{01}{\omega_i} a_i + \overset{20}{\omega_i} x_i^2 + \overset{11}{\omega_i} x_i a_i + \overset{02}{\omega_i} a_i^2$$

as a first approximation, where the ω_i with superscripts are coefficients, we can determine from observed values of x_i, a_i on various indifference curves the values of as many coefficients as we think it proper to introduce. Since the equations from which these values of the coefficients have to be determined are essentially of the form

$$\overset{10}{\omega_i} x_i' + \overset{01}{\omega_i} a_i' + \ldots = \overset{10}{\omega_i} x_i'' + \overset{01}{\omega_i} x_i'' \ldots \tag{2.22}$$

(where x_i', a_i' and x_i'', a_i' are two observed points on the same indifference

[4] *Cf.* J. TINBERGEN, "On the Theory of Income Distribution", *Weltw. Archiv* 77 (1956) p. 10.

[5] An example will also be found in J. TINBERGEN, *loc. cit.*

curve), the ω_i-coefficients are indeterminate: any set of values satisfying the observations can be replaced by a proportional set. This is a typical degree of freedom in the choice of a utility function. The corresponding arbitrariness in the comparison between two individuals can be removed by our principle of least differences. In order to avoid another element of arbitrariness, represented by the choice of units of x_i and a_i, our principle may be stated in relative terms, *i.e.* that the sum total of the squares of the *relative* deviations in the coefficients between the individuals considered should be a minimum.

Turning now to the *social welfare function* Ω, there seem to be two main ways to estimate it which are worthwhile to distinguish; one is to construct Ω from some average preferences to be derived from the study of individual ω_i's, the other to use the ω_i themselves as the elements of Ω. This latter procedure is usually adhered to and has considerable advantages. The simplest possible form for Ω would then seem to be:

$$\Omega = \Sigma\omega_i. \tag{2.23}$$

This form has been often mentioned by way of illustration. It can only be given a precise meaning if either (i) all ω_i are identical, or (ii) ω_i is measurable or (iii) some rule is made for choosing among the variety of ω_i existing in the case of non-measurability. Since (i) is contrary to observation and (ii) is at best a future possibility, only (iii) remains. Our principle of least differences seems to be an appropriate rule.

It should be kept in mind, however, that (2.23) is not the only possible shape of Ω. It may be said to represent—with the reservations implied by our rule—the total "happiness" in the society studied and also (when divided by the number of individuals) the average happiness. No separate weight is given, in this Ω, to the *distribution of utility* among individuals. Remarkably enough, already (2.23) leads to rather "equalitarian" consequences with regard to the optimum state of affairs. It will be clear that an introduction of the distribution of utility may well reinforce such consequences. Our conclusions with regard to this subject therefore tend to be understated.

Our argument will be illustrated by some examples. In them we have used particular cases of ω_i in that we have assumed that:

$$\omega_i = \omega(x_i, \sigma_i) + \varphi(a_i, \tau_i). \tag{2.24}$$

This means that (i) ω_i is an additive function of x_i and a_i respectively and that (ii) differences between individuals can be represented by two parameters, one (σ_i) referring to the taste for goods and the other (τ_i) to the appraisal of effort. We have been even more specific in considering two special cases of (2.24), to be called *parabolic* and *hyperbolic* utilities. Parabolic utility functions will be represented by:

$$\omega_i = \sigma_i \frac{x_i^{1-\omega}}{1-\omega} - \tau_i \frac{a_i^{\varphi+1}}{\varphi+1} \tag{2.25 (P)}$$

where now ω and φ are numbers.

Hyperbolic utility functions will be represented by

$$\omega_i = -\frac{1}{x_i - \overset{0}{x}} - \frac{1}{\overset{0}{a_i} - a_i} \tag{2.26 (H)}$$

The meaning of the various parameters is:

In example (P) the marginal utility of goods is $\sigma_i x_i^{-\omega}$; high values of σ_i represent ascetic individuals, low values materialistic ones, while $-\omega$ is the elasticity of marginal utility with regard to the quantity of goods consumed; similarly, high values of τ_i represent weak, low values strong people and φ is the elasticity of marginal disutility of effort with regard to the "quantity" of effort. It will be understood that τ_i/σ_i only is measurable and not σ_i and τ_i separately.

In example (H) one might conceive of $\overset{0}{x}$ as the subsistence minimum (assumed equal for all individuals concerned) and $\overset{0}{a_i}$ as the maximum effort the individual is able to supply.

2.3. Institutions, Instruments and Costs

In this section a description will be given of the most important institutions that seem to determine present-day societies of various types and between which a choice must be made or whose size has to be chosen in order to define an economic order. Such a description is necessary if our approach is to be realistic; it is also necessary for the analytical reasons set out in section 2.1. Our restriction of the discussion to the most important institutions is based on the desire to deal with only the main features of the problem of the optimum regime.

The following institutions will be discussed:

1. Public authorities, including possible public enterprises.

II. Lower authorities.
III. Private enterprises.
IV. Markets.
V. Social Insurance Institutions.
VI. Production Councils.

Some of these institutions are, partly at least, competing with others; thus, public authorities may take the place of private enterprises and *vice versa*; public authorities thought of as one centralized agency may take the place of lower authorities and *vice versa*; they may also take over the role of markets. Social Insurance Institutions as well as Production Councils may take over part of the activities of private enterprises etc. It might have been possible to choose different and more abstract institutions in order to arrive at a more symmetrical discussion of alternatives, but it seems preferable to stick to concrete institutions known from practical discussions. In more abstract terms, a choice has to be made as to:

(i) the degree of public ownership and the tax system;
(ii) the degree of (de)centralization both in administration and
(iii) in production;
(iv) exchange systems and their degree of (de)centralization;
(v) the insurance system and its degree of (de)centralization;
(vi) types of social control.

For simplicity's sake we have omitted from our list a number of important institutions about which there seems to be less controversy in to-day's world, *e.g.* trade unions and schools. In a more general treatment of our problem they should, of course, be included.

Each institution is characterized by a certain number of instruments and by certain costs their activities imply. The instruments of public authorities are manifold; those of other institutions are less numerous. They will be briefly listed in the subsequent sections. In a way it may be said that public authorities are a bundle of (partial) institutions; we already mentioned the (income) tax authorities as a possible example of such a partial institution. As already stated, the costs of a certain institution do not only imply the material costs but also certain psychological costs. The latter exist not only when there is an aversion against the operations of the institution (say, rationing), but also when the probability of conflicts and hence friction is large. That may be the

case when the instruments used are not clearly defined. Costs also occur when the efficiency of management is impeded as a consequence of the rules under which, say, a public enterprise operates.

2.4. Description of Institutions and Their Main Instruments

2.41. *Public Authorities*

The institution of public authorities is characterized, first of all, by the elements of authority, *i.e.* the capacity to impose, in the name of the community, certain patterns of conduct. This power can be used to establish law, order and security, to inform and to educate, to regulate certain economic activities, to protect the weak or the short-sighted and to levy taxes. Next, public authorities have the particular capacity to diverge, in their actions, from the profit principle and to base their decisions on the general interest. In doing so they can even operate a number of their units at a deficit. On the "cost" side it should be added that the efficiency of public units may be less than the efficiency of privately operated units, depending on their organization.

As already stated, public authorities represent a complicated set of institutions that may be subdivided into four main groups:

1 Financial institutions: (a) spending authorities
(b) tax authorities
2 Productive institutions: (a) services, producing law and order, security, information and regulation;
(b) enterprises, producing goods and services for sale.

Among the instruments of these sub-institutions the following stand out:

1a Criteria for subsidies, expenditures on investment;
1b Rates of various types of taxes;
2a Rules of regulation in regulated markets, information about development targets;
2b Prices and production of public enterprises, system of selection of students.

2.42. *Lower Authorities*

Public authorities are not a single centralized body, as is so often suggested by the phrase "the state". In reality they are a multitude of units, each of which has at least some autonomy. In each country there are the ministries, their directorates *etc.*; there are provinces and municipalities or whatever other names they have; there are enterprises and agencies for special purposes. And, in addition to those which exist in individual countries, there are now coming into being supra-national authorities.

Some of the instruments of economic policy handled by the authorities are handled in a centralized way, *i.e.* by one decision at the centre (*e.g.* federal tax rates); others are handled in a more or less decentralized way (discount rates of reserve banks in the United States, electricity rates in many countries, local taxes *etc.*).

2.43. *Private Enterprises*

This institution is characterized by the direct link between effort and income. The smaller the enterprise, the more direct is the relationship. The owner of a private enterprise must behave more or less according to the profit principle, *i.e.* to strive for maximum profit, although these profits should be interpreted in a wide sense. As a consequence of his status he has the possibility to invest, to exert power and to hand over part of his accumulated assets to his children.

The private enterprise not only stands at variance with public enterprises but, in another context, also with cartels, trusts or corporations, which represent, in the field of private activity, the more centralized forms.

The main instruments of the private enterprise are the volume of its production and inputs, and its investments. Under certain conditions their prices also are instruments at their command.

2.44. *Markets*

Markets as an institution may be said to be characterized by the virtual absence of an institutional actor. They represent, in their idealized form, the most decentralized form of exchange of products and services. Yet certain types of markets may need some actor as

is illustrated by the auction system. In modern times, due to tendencies towards monopolistic competition, free competition may even have to be enforced by a fairly elaborate acting agency (*e.g.* the High Authority of the European Coal and Steel Community or the State Mediators in charge of the Dutch wage policy). The more a market tends towards monopolism, the more reason there is to speak of the market as an actor, namely, the sales organization trying to maintain monopoly.

In the case of a "regulated" market the apparatus necessary for its operation becomes even larger. It may then involve a system of price regulation and even of rationing. The most regulated form of marketing may be one based on discrimination, such as *e.g.* a system of multiple exchange rates, or the supply of cheap meals to factory workers. Here there is a substantial actor, implying the presence of fairly high costs.

The most important instrument of a market is its rate system. The uniform flat rate is by no means the only conceivable system as is illustrated by electricity rates, by season tickets *etc.*

2.45. *Social Insurance Institutions*

These might have been considered part of public authorities, but because of their autonomous status they have been singled out. As producers of social security they play a very important role in present-day life. They are authorized to collect contributions and to pay out benefits. Their costs are not merely their visible costs of administration; their existence exerts a double psychological influence on all workers. On the one hand, the feeling of security probably acts in a positive way to produce loyalty to the regime; on the other hand, this same feeling may well reduce productivity.

The main instruments of social insurance institutions are their contribution and benefit rates.

2.46. *Production Councils*

This name has been chosen to indicate any form of co-determination of workers or workers' representatives in the economic process. The common feature of these institutions is that they satisfy an important

psychological need. It is difficult to assess their influence. Councils may be bipartite, when workers and entrepreneurs are represented, or tripartite, when public authorities are also represented. They may exist at various levels, *i.e.* at the enterprise, the industry and the national level. Their competence may be different and may range from advising on labour matters as a minimum to full responsability for the broad lines of production and income distribution.

3. MODELS OF THE PROCESS OF PRODUCTION AND DISTRIBUTION

1. Types of Variables and Relations Included

The problem of the optimum regime in its general form is extremely complicated. It not only covers almost everything in the field of economics but in addition a considerable number of aspects of a more general sociological nature. The contribution economic thinking can make to its solution should not be overestimated. Whatever contribution can be made should be based on clear and explicit *specifications of the problem*, that is, on well-defined models of the process of production and distribution. Clarity can be obtained, as a rule, only at the cost of some loss of generality, perhaps even a considerable loss of generality. For various reasons the traditional method of decreasing abstraction may be useful. In this chapter some models will be presented which, in the author's opinion, give some rigour to the statements to be made later.

In general, models must be defined by first listing the variables included and secondly, the relationships assumed. These latter have to bear on the given characteristics of production and distribution anyhow and possibly on the characteristics of such institutions as are considered given.

The two main groups of *variables* are those relating to quantities of goods produced and consumed and to "quantities" of effort made. The latter quantities will be partly in the nature of intensities, partly in the nature of "extensities", such as the number of hours worked. The number of variables in each category depends on the number of types distinguished and on the number of persons and of producing units. Thus, for each commodity, the quantities produced in each establishment and the quantities consumed by each person (or family)

are among our variables. Indicating individuals by a lower index i, the type of good by a superscript j behind and the enterprise by a lower index h in front of the main symbol x for quantities of goods, we have the following variables:

x_i^j quantity of good j consumed by individual i;

${}_hx^j$ quantity of good j produced in establishment h;

In a simple approach we may use the variable a to indicate the quantity of labour supplied without specifying between types of labour and let

a_i mean the quantity supplied by individual i;

${}_ha^j$ the quantity used in establishment h for the production of commodity j.

A somewhat more realistic approach may be made with the aid of the same variables on the effort side but assuming differences in productivity.

A still better approach would seem to be one where types of effort are described by a multidimensional vector indicating the "scores" of each type in a number of criteria.[6]

The *relationships* are, first of all, the *technical relations* characterizing production. In our models we will assume that the quantities ${}_hx^j$ produced of good j in enterprise h are a function ${}_h\xi^j$ of the quantities of labour applied. Without differentiation between types of labour this relation is:

$$(3.11) \qquad {}_hx^j = {}_h\xi^j({}_ha^j).$$

Differentiating between the labour supplied by various individuals we may generalize this into:

$$(3.12) \qquad \xi(\pi_1 a_1 + \pi_2 a_2 + \ldots),$$

where a_i represents the quantity of labour of individual i and π_i a productivity coefficient.

The function ξ may take various shapes and either show constant, or variable returns.

In addition to the production relations there will be relations governing the *distribution* of the goods produced and the effort applied

[6] J. TINBERGEN, *loc. cit.*

between the individuals composing the economy. As long as no particular institutions are assumed to exist the only relations to be taken account of will be *balance equations* expressing equality of total demand and total supply.

3.2. Two-Person Models (2P and 2H)

In order to illustrate some of the basic problems it is convenient to use models containing only two persons, where social and personal differences will be represented by a difference in a parameter (*cf.* section 2.2) between the two persons only. The parameters entering into the utility functions are σ_i and τ_i in the case of parabolic and x^0 and a_i^0 in the case of hyperbolic functions. The corresponding models will be indicated as models 2P and 2H, respectively. It will be assumed, moreover, that there is only one enterprise which uses the labour of both individuals and that the product obtained $(x_1 + x_2)$ depends on the total quantity of effort applied $(a_1 + a_2)$ in the following way:

$$x_1 + x_2 = (a_1 + a_2)^{\xi}. \tag{3.21}$$

As will be understood, x_1 and x_2 represent the quantities of the product consumed by individual 1 and 2, respectively. The notation chosen for total production and total effort already implies that the balance equations are satisfied.

3.3. Models with an Arbitrary Number of Persons, Goods and Enterprises, but One Homogeneous Factor of Production (N)

Here the full notation developed in section 3.1 will have to be used and the relations between the variables include production functions as well as balance equations. The former will be written as:

$${}_hx^j = {}_h\xi^j({}_ha^j), \quad h = 1 \ldots H; \quad j = 1 \ldots J. \tag{3.31}$$

The latter are:

$$\sum_i a_i = \sum_h \sum_j {}_ha^j \tag{3.32}$$

$$\sum_i x_i^j = \sum_h {}_hx^j, \quad j = 1 \ldots J, \tag{3.33}$$

This model will be called model N.

3.4. Generalizations and Specifications

Incidentally, generalizations will be discussed, without being worked out in full detail. Among the generalizations are the following assumptions:

(I) Productivity may differ between individuals; this has already been illustrated by expression (3.12);

(II) There may be a larger number of factors of production;

(III) Production may depend on inputs not only of the industry itself but of other industries ("external economies or diseconomies").

For the two-person models a number of different specifications will be considered, expressing varying properties of the production functions as well as the utility functions.

As will be set out below, some problems require the introduction, *a priori*, of specifications for institutions. These will be given whenever needed during the treatment of these problems.

4. ON THE SOLUTION OF THE PROBLEM OF THE OPTIMUM REGIME

4.1. Methods of Solution

As usual in such matters, the more rigorous methods can only be applied to precisely defined and hence simplified models of reality, whereas the complications of reality can only be dealt with in a looser type of argument. Some remarks may be made about both. Scientifically the most satisfactory solution to our problem can be given only by what I shall call the *direct method*. This consists of expressing the conditions for maximum social welfare (Ω) in mathematical equations and *interpreting these equations as the operation of a regime*, which, when specified, would then be the optimum regime. The success of the direct method evidently depends on whether such an interpretation can be given. The interpretation must pay due regard to the costs of any regime it suggests. It is a weak spot of welfare economics, that these costs are often neglected. An interesting example is the *compensation principle*, which does not take us very far for the same reason. If an interpretation cannot be given, we are left with *indirect methods* only. These consist, in principle, of specifying a regime, calculating the value of Ω and choosing, among the regimes considered, the one with the highest Ω obtained. It clearly depends on the regimes specified whether

this method brings us near to "the" solution or keeps us far from it. We cannot be sure that a better but unknown regime does not exist. We may call the solution found in this way the *"best attainable" regime.*

In order to deal with complications we are unable to express in terms of a model we shall often have recourse to looser arguments which at best can be presented as "small variations" from some situation provisionally accepted as an optimum. It goes without saying that the variations will have to be small and that the important choices will therefore have to be made first.

The optimum regime will be characterized by a number of institutions and instruments. Those occurring in it will be called *relevant* institutions and instruments, other instruments will be called irrelevant. It may be vaguely understood already that instruments which do not help to bring about effects essential to the optimum state will turn out to be irrelevant. Thus instruments discriminating between subjects or objects which, according to the social welfare function, should not be discriminated between, will turn out to be irrelevant, *e.g.* discrimination between black-haired and red-haired individuals or discriminations around a political frontier which has no economic meaning whatsoever. From our definition it follows that the proof that an instrument is relevant can be given only in cases where the direct method as defined above applies. As soon as it does not apply we can only find out whether or not the instrument occurs in the best attainable solution. Such instruments will be called *semi-relevant.*

4.2. The Main Choices to Be Made

In the subsequent sections it will be attempted to apply, first of all, the direct and some indirect methods. This will provide us with some provisional and tentative conclusions regarding the main aspects of our problem. We will then try to sketch further possible lines of argument which, although they are of the looser type, suggest directions for further research. For the general reader it may be helpful if we summarize, before we go into detail, the main choices which have to be made in order to define the optimum regime. In accordance with the items (I)–(VI) mentioned in section (2.3) they are, in our opinion, the following.

(I) Which productive activities (in the widest sense) should be carried out by the public sector and which by the private one? What taxes should be raised and at what level, what subsidies should be granted?

(II) What public tasks should be carried out in a centralized way and which ones should be left to lower authorities?

(III) How should production be spread over separate units, what size should they have and how should their location be spread?

(IV) What system of pricing and exchange should be chosen: regulated or not, flat rates or not, monopolies or not?

(V) What should be the rate system and the level of social insurance contributions and benefits?

(VI) What type of social control should be chosen?

4.3. Conclusions from the Direct Method

4.31. *The Decentralization Thesis*

Some interesting conclusions can be drawn from an application of the direct method to simplified models. Model N and its generalizations or specifications provide us with a clue to the *size of the public sector*. The conditions for maximum social welfare follow from the solution of the following "maximum problem with side conditions":

$$\Omega\,(x_i^j, a_i) \equiv \sum_i \omega_i\,(x_i^j, a_i)$$

shall be a maximum with side conditions (3.31), (3.32) and (3.33). The ordinary Lagrangian method requires that

$$\begin{aligned}\sum_i \omega_i(x_i^j, a_i) + \lambda\{\sum_i a_i - \sum_h \sum_j {}_h a^j\} + \sum_j \mu^j\{\sum_i x_i^j - \\ - \sum_h {}_h x^j\} + \sum_h \sum_j {}_h \nu^j\,\{{}_h x^j - {}_h \xi^j({}_h a^j)\} \text{ max.}\end{aligned} \tag{4.31}$$

Differentiation with regard to the various groups of variables yields:

$$\text{For } x_i^j\text{: } \frac{\partial \omega_i}{\partial x_i^j} + \mu^j = 0 \quad i = 1 \ldots I;\, j = 1 \ldots J. \tag{4.32}$$

$$\text{For } a_i\text{: } \frac{\partial \omega_i}{\partial a_i} + \lambda = 0 \quad i = 1 \ldots I. \tag{4.33}$$

(4.34) For ${}_ha^j$: $-\lambda - {}_h\nu^j\ {}_h\xi'^j({}_ha^j) = 0 \quad h = 1 \ldots H;\ j = 1 \ldots J.$

(4.35) For ${}_hx^j$: $-\mu^j + {}_h\nu^j = 0 \qquad h = 1 \ldots H;\ j = 1 \ldots J.$

This may be simplified into:

$$(4.36) \qquad {}_h\xi'^j({}_ha^j) = -\frac{\lambda}{\mu^j} \qquad h = 1 \ldots H;\ j = 1 \ldots J.$$

and

$$(4.37) \qquad \frac{\dfrac{\partial \omega_i}{\partial a_i}}{\dfrac{\partial \omega_i}{\partial x_i^j}} = \frac{\lambda}{\mu^j}.$$

These are some well-known and rather far-reaching statements. With the assumptions underlying this particular model the famous "*decentralization thesis*" of liberal economists can be proved. The maximum conditions (4.36) and (4.37) can in fact be interpreted as a regime of free competition between all enterprises and all individuals. They require that enterprises produce such a quantity that their marginal value product equals the wage rate and that individuals buy so much of each product that their marginal substitution rate with regard to labour equals the price ratio of that particular product and labour, provided we consider λ as the price of labour and $-\mu^j$ as the price of good j. With the assumptions of this model there would be no need of a sector of public enterprises. This, however, is completely due to the limitations on the validity of the assumptions. We shall therefore discuss some generalizations and specifications of model N calling for a revision of this famous thesis.

4.32. *External Effects*

Let us introduce the well-known phenomenon of external effects, *i.e.* the dependence of the productivity of industry j on the volume of production of industry 1, say. For simplicity's sake we assume that $H = 1$ for industry 1, *i.e.* that there is only one enterprise in that industry. The maximum condition for Ω with regard to a^1 without external effects was, according to (4.34):

$$(4.38) \qquad -\lambda - \nu^1\xi'^1(a^1) = 0.$$

If now the production functions for the other industries are dependent on a^1, the condition runs:

$$-\lambda - \sum_h \sum_j {}_h v^j \frac{\partial_h \xi}{\partial a^1} = 0. \tag{4.38'}$$

For the other industries no change occurs, except that the production functions and their derivatives now depend also on a^1. The other industries therefore can still be run by a competitive individualistic system, but this is no longer true for industry 1. A private entrepreneur would, as before, behave according to (4.38). It is now in the general interest, however, that this industry is run according to the principle underlying (4.38′), *i.e.* taking into account the effects on the profits of all other industries. This can best be done by making it a public enterprise.[7] en de winsten hen te verdelen.

4.33. *Increasing Returns*

Another important exception to the decentralization thesis refers to the industries for which increasing returns characterize production. Private enterprises cannot here behave according to equation (4.34) since this would imply marginal cost pricing and hence permanent losses. To be sure this might be overcome by a system of non-flat rates, to be discussed later (section 4.55). It is doubtful, however, whether such a system can be administered by private enterprises in a competitive system. It might be run by a monopolistic private enterprise, but there are other objections against such a solution (*cf.* also section 4.54).

We shall discuss later on some further arguments in favour of public enterprises and summarize our tentative conclusions in section 4.51.

4.34. *The Tax System*

From our models we can derive some further clues with regard to the *tax* system. In a negative way we can state that our *optimum conditions are incompatible either with indirect or with income taxes. Indirect taxes* would violate the equality between the marginal substitution rates on the demand and the supply side. For one single indirect tax on, say, tobacco this is clear since the equality with regard

[7] If the external effects only exist between two enterprises mutually, integration of these enterprises would be sufficient.

to other goods would be broken; for a general turn-over tax the equality with regard to labour would be invalidated. *Income taxes* too are incompatible with the maximum conditions. An income tax leaves the individual with part only of the revenue of his marginal effort and so "falsifies" his decisions as to where to choose the margin. This would not be true when the individual's supply of effort is fixed, however.[8]

Yet the optimum regime as defined by our equations (4.32)–(4.35) does imply *income transfers*. There is no equation requiring the equality of an individual's income to his total expenditures. Some individuals and some enterprises will spend more than they earn, while other individuals and enterprises are obtaining more goods than they are able to buy with their earnings. The corresponding income transfers are known as *lump-sum transfers*, since the individuals' and the enterprises' marginal decisions are assumed not to be influenced by them.

They may be illustrated by the results of a few numerical applications of model 2P, computed for various values of the constants ω, φ and ξ occurring in this model. Since for $\xi \neq 1$ there appear entrepreneurial profits or losses, but no separate entrepreneur as a person has been introduced, it is assumed that in those cases profits are distributed to the two persons proportional to their labour income.

Two versions have been made, A and B. In version A $\sigma_1 = \sigma_2$, $\tau_1 = 1$, $\tau_2 = 1.3$, person 1 representing a strong and person 2 a weak individual. In version B $\tau_1 = \tau_2$, $\sigma_1 = 1$ and $\sigma_2 = 1/1.3$, person 1 now being an ascetic and person 2 a materialist. It will be understood that according to the usual attitude taken by economists no measurement (*i.e.* of indifference curves) can distinguish version A from version B. I have preferred to show both cases nevertheless (instead of applying my own "principle of least differences" between coefficients) hoping that future measurements may be available for distinguishing between them.

For both versions of model 2P the variables x_i and a have been calculated corresponding to two different "states", namely I, the welfare optimum (according to the "direct method") and II, the state of free competition (or the "individualistic order") without income transfer.

Some interesting features will be discovered in Table I. The occurrence of income transfers in state I follows from the fact that the ratio of the a's does not coincide with that of the x's, whereas in II it does. In case 5, where the wage

---

[8] Probably the most explicit treatment of the problem has been given by R. Frisch, *"On Welfare Theory and Pareto Regions"*, Memorandum fra Universitetets Socialøkonomiske Institutt, Oslo, 17 August 1953 (also appeared in French in Économie Appliquée).

TABLE I

VALUES OF EFFFORT APPLIED (a) AND CONSUMPTION (x) OF THE TWO INDIVIDUALS 1 AND 2 FOR I THE WELFARE OPTIMUM AND II THE INDIVIDUALISTIC ORDER WITHOUT INCOME TRANSFERS*

A: Person 1 is "strong", person 2 is "weak"
B: Person 1 is an "ascetic", person 2 a "materialist"

Values of constants			Case no	I								II			
				A				B							
ω	φ	ξ		a_1	a_2	x_1	x_2	a_1	a_2	x_1	x_2	a_1	a_2	x_1	x_2
2	1	$\frac{1}{2}$	1	0.94	0.72	0.64	0.64	0.83	0.83	0.69	0.60	1.14	1.04	0.77	0.71
2	1	$\frac{3}{4}$	2	1.03	0.79	0.79	0.79	0.92	0.92	0 84	0.74	1.06	0.97	0.89	0.81
2	2	$\frac{2}{3}$	3	0.98	0.96	0.75	0.75	0.92	0.92	0.80	0.70	1.06	0.99	0.84	0.78
$\frac{1}{2}$	1	$\frac{2}{3}$	4	0.77	0.59	0.61	0.61	0.68	0.68	0.77	0.46	0.94	0.79	0.78	0.66
2	1	1	5	1.09	0.83	0.96	0.96	0.96	0.96	1.02	0.90	1.00	0.92	1.00	0.92

* I am indebted to Mr. Maarten Eisma for having made the computations.

rate is 1, this is most easily seen; here the a's are equal to the labour incomes. Transfers are, in version A, 0.13 and, in version B 0.06. The equality of x_1 and x_2 in version A, and of a_1 and a_2 in version B are due to the assumptions that tastes with regard to goods are identical in version A and with regard to effort in version B. They represent limiting cases in a way; had we used our principle of least differences between the coefficients of ω_1 and ω_2, we would have found an intermediary version, where $x_1 > x_2$ and $a_1 > a_2$. It is also to be noted that production and consumption as a whole are higher in state II than in state I. As compared with I, effort is undervalued leading to too much activity. Whereas in state II the weak or the materialist works less than the strong or the ascetic man and as a consequence has a lower consumption level too, in state I the strong man has to pass on part of his production to the weak and the materialist part of his production to the ascetic. In state II it can be shown that the strong man is better off than the weak in that he attains a higher level of ω; correspondingly the materialist is better off than the ascetic.

The lump-sum transfers are a very remarkable theoretical outcome. Upon specification of a model they can be calculated and they are, therefore, determinate. They represent, in our terminology, an institution and *their relevant instruments* can be also derived from the model.

This may be illustrated by model 2H. Taking, for simplicity's sake, the case of constant returns, or $\xi = 1$, we find that the optimum is determined by:

$$\Omega + \lambda\{x_1 + x_2 - (a_1 + a_2)\} \text{ max.} \tag{4.39}$$

with $$\Omega = -\frac{1}{x_1 - x^0} - \frac{1}{a_1^0 - a_1} - \frac{1}{x_2 - x^0} - \frac{1}{a_2^0 - a_2}.$$

The conditions are:

$$\frac{1}{(x_1 - x^0)^2} + \lambda = 0 \qquad \frac{1}{(x_2 - x^0)^2} + \lambda = 0$$

$$-\frac{1}{(a_1^0 - a_1)^2} - \lambda = 0 \qquad -\frac{1}{(a_2^0 - a_2)^2} - \lambda = 0$$

$$x_1 + x_2 = a_1 + a_2$$

or: $$x_1 - x^0 = x_2 - x^0 = a_1^0 - a_1 = a_2^0 - a_2.$$

The solutions are:

$$x_1 = x^0 + \tfrac{1}{4}(a_1^0 + a_2^0 - 2x^0)$$

$$x_2 = x^0 + \tfrac{1}{4}(a_1^0 + a_2^0 - 2x^0)$$

$$a_1 = a_1^0 - \tfrac{1}{4}(a_1^0 + a_2^0 - 2x^0)$$

$$a_2 = a_2^0 - \tfrac{1}{4}(a_1^0 + a_2^0 - 2x^0)$$

From this we find the income transfers to be (since the price of labour is 1) $a_1 - x_1 = -(a_2 - x_2) = \frac{1}{2}(a_1^0 - a_2^0)$.

In this extremely simple case the relevant criteria for the income transfers appear to be the "maximum efforts" of the individuals introduced at the end of section 2.2, which may also be called their productive capacities. In a more general setup they might also depend on further characteristics of the individuals' utility functions and perhaps on other data. Since income is not a datum it will not be among the criteria.

Welfare economists have discovered this remarkable feature of the optimum situation a long time ago already, but its impact on practical economic policy has not been large. Many laymen have no idea of its existence and misinterpret the meaning of the optimum by emphasizing the importance of "self-responsibility", often identified even with the budget constraint for each individual. It may be observed in passing

that a completely different "optimum" is obtained if such a system of individual budget constraints is added *a priori* to the maximum conditions.[9]

The reason why the influence of this remarkable feature of the optimum has not been large is to be found in the complete *neglect of its costs*, which probably are very high. In fact, the assessment of an individual's income, though not a simple matter as we know, is much more accessible to objective approaches than the assessment of his "capacities" to produce (with the exception of his physical or financial wealth). It therefore seems to be out of the question to administer, without incurring grave frictions, a system of lump-sum payments or subsidies. This means that, on a very important point, the interpretation of the theoretical optimum in terms of a practical regime breaks down and consequently also the direct method.

4.4. An Example of the Indirect Method[10]

We are thus forced to apply the indirect method and will illustrate the latter by an example. In view of the importance of some sort of income transfers we will try to find out to what extent the imposition of an *income tax* can improve the social welfare of an individualistic order and move such an order in the direction of the optimum—obtained by neglecting the cost of lump-sum transfers. We will assume that, amending our model 2H with $\xi = 1$, consumption x_i depends on earned income a_i in the following way:

$$x_i = \gamma a_i + \gamma_0. \tag{4.41}$$

This implies that a tax is paid equal to $a_i - x_i = (1 - \gamma)\, a_i - \gamma_0$. Individuals are assumed to maximize their ω_i, as is usually assumed for an individualistic order, and it will be assumed that taxes add up to zero, since transfers only are considered. (The costs of administering the income tax seem to represent a small percentage of national income.)

---

[9] The simplest way to do so in a two-person model is to add the condition $x_1/a_1 = x_2/a_2$. It will be easily found what the consequences for the optimum are. They may even be interpreted as violating the free choice of the individual with regard to the extent of his effort.

[10] This example was mentioned in the author's contribution to Essays in Honour of Professor Zeuthen (Til Frederik Zeuthen, Copenhagen 1958), p. 351.

We hence get the following system of equations:

$$x_i - \overset{0}{x} = \gamma(a - a_i) \qquad i = 1,2 \tag{4.42}$$

$$x_1 + x_2 = \gamma(a_1 + a_2) + 2\gamma_0 \tag{4.43}$$

$$x_1 + x_2 = a_1 + a_2, \tag{4.44}$$

to which we have to add equations (4.41). Equation (4.42) follows from maximizing ω_i under the side condition (4.41). The solutions appear to be, writing δ for $\sqrt{\gamma}$:

$$\begin{aligned} a_1 &= \frac{\overset{0}{x}}{1+\delta} + \tfrac{1}{2}\overset{0}{a_1} + \tfrac{1}{2}\frac{\delta-1}{\delta+1}\overset{0}{a_2} \\ a_2 &= \frac{\overset{0}{x}}{1+\delta} + \tfrac{1}{2}\frac{\delta-1}{\delta+1}\overset{0}{a_1} + \tfrac{1}{2}\overset{0}{a_2} \end{aligned} \tag{4.45}$$

and

$$\begin{aligned} x_1 &= \overset{0}{x} + \delta(\overset{0}{a_1} - a_1) \\ x_2 &= \overset{0}{x} + \delta(\overset{0}{a_2} - a_2), \end{aligned}$$

which can be expressed in the data with the aid of (4.45).

Applying the indirect method now, we choose γ *in such a way as to maximize* Ω. Writing

$$\overset{0}{a_1} + \overset{0}{a_2} - 2x_0 = \eta,$$

and

$$\frac{\overset{0}{a_1} - \overset{0}{a_2}}{\eta} = \alpha$$

we find

$$\frac{\Omega}{4\eta} = -\frac{(\delta+1)^2}{\delta}\,\frac{1}{1-\alpha^2\delta^2} \tag{4.46}$$

From this it appears that the optimum value of δ (in the sense of the indirect method, *i.e.* assuming an income tax of the type indicated as given) depends on α, which represents the ratio between $\overset{0}{a_1} - \overset{0}{a_2}$ and $\overset{0}{a_1} + \overset{0}{a_2} - 2x_0$. As extreme examples we mention that for $\alpha = 0$ we find $\delta = 1$, meaning that no income tax should be raised, while for $\alpha = \infty$ we find $\delta = 0$, meaning that incomes after tax should be

equal. An intermediary case, leading to $\gamma = 0.5$, will be obtained when we choose

$$\overset{0}{a_1} = 1.3; \quad \overset{0}{a_2} = 1; \quad \overset{0}{x} = 0.77.$$

As the final step in applying the indirect method, we have calculated, for this case, the values of Ω obtained under (I) an individualistic order without income tax, (II) the same order with income tax of the type specified at the optimum level, and (III) the theoretical optimum regime. The results are the following.

TABLE II

VARIABLES AND UTILITY LEVELS IN THREE DIFFERENT STATES, MODEL 2H

	x_1	x_2	a_1	a_2	ω_1	ω_2	Ω
(I) individualistic order	1.035	0.885	1.035	0.885	—7.6	—17.4	—25.0
(II) ditto, plus income tax	0.97	0.88	1.01	0.84	—8.4	—15.4	—23.8
(III) theoretical optimum	0.96	0.96	1.11	0.81	—10.5	—10.5	—21.0

The figures show us that no income transfers exist under (I), since $a_i = x_i$, and that there are substantial income transfers (0.15) under (III); the transfers under (II) are very modest (0.04) and so is the increase in Ω obtained by them (from —25.0 to —23.8).

An extremely simplified model like our model 2H cannot prove very much. It illustrates, however, that an *income tax may be among the "semi-relevant instruments"* and that its optimum rate may be substantial.

4.5. SUGGESTIONS REGARDING THE MAIN CHOICES

Partly on the basis of the more rigorous methods so far illustrated and partly on the looser type of argument announced in section 4.1, we will now make a number of suggestions about the main choices to be made in order to determine the optimum regime, as listed in section 4.2.

4.51. *Size of the Public Sector and Nature of Taxes*

In section 2.41 we indicated the complex nature of the institution summarized as "public authorities" and the main groups of sub-

institutions. We will take up the sub-institutions one by one and discuss the factors which determine their optimum size.

(1a) Total *expenditure* will be the sum of expenditure on the factors of production needed for the production of services typical to government, listed under 2(a) in section 2.41 and of expenditure on subsidies, investment *etc.* For a country in need of development the last item may be very important. On the one hand there are types of investment, particularly those in the *infrastructure*, which can hardly be undertaken by private investors, since they are not easily operated on a profit basis. Construction of roads and canals is one outstanding example, irrigation and other activities for the improvement of agriculture another. In addition there may be important tasks with regard to education, not only on behalf of development, but also with a view to a redistribution of income.[11]

On the other hand, the amount of capital needed will, in an underdeveloped country, surpass the free supply of capital and must be obtained through *forced savings*. The main institution which can impose forced savings by taxing people more than is needed for current expenditure is the state.

(1b) About the most appropriate *tax structure* our purely theoretical arguments are somewhat negative. In principle, the income tax as well as general indirect taxes are incompatible with optimum conditions. We are then left with retributions for the services supplied by the government, with specific indirect taxes on goods deemed harmful to the population (alcoholic beverages, tobacco *etc.* and possibly subsidies for goods the government thinks particularly healthy) and, perhaps, with taxes on wealth or assets. However because of the cost of collecting certain types of taxes, theory will have to yield to practice on certain points, as was illustrated in the case of the income tax. It should, in addition, not be forgotten that the theory does require a type of income transfers ("lump-sum" payments and subsidies) which would be difficult to organize and that this reduces the strength of any argument derived from the direct theoretical method. From the evidence supplied by the indirect method, we found that an income tax may be justified, even at rather high levels.

(2a) The production of *services* typical to government under any

[11] *Cf.* J. TINBERGEN, *loc. cit.*

circumstances need not be discussed at any length; some remarks to be given under (2b) will also apply here.

There will be a need for *regulations* in a number of markets which, because of their structure, are continuously threatened by instabilities. Agricultural markets are usually of this type because of low elasticities of demand as well as supply and because of the hazards of weather conditions.

(2b) With regard to the *productive* sub-institutions of the state our foregoing analysis (sections 4.32 and 4.33) suggests that a number of activities have to take place in the public sector. These are:

(a) activities with external effects on a considerable number of industries, and

(b) activities showing increasing returns.

In brief, the reasons why these activities should be publicly operated are that those of category (a) would not be operated in the right way when subject to private profit considerations and that those of category (b) would either produce permanent losses to their private operators or threaten the general interest by monopolistic tendencies.

The activities under (a) imply a number of "basic activities" for any government, such as the organization of security, external as well as internal, including perhaps even certain aspects of social security; the maintenance of law and of sound monetary conditions and a good deal of education. Category (a) could also be extended to include the production of certain goods and services used by so many industries that an interruption of their supply might endanger the economy: energy, water, transportation. This applies more particularly in periods of general scarcity of goods.

Activities (b) imply partly the same activities and, in addition, a number of heavy industries.

While the above argument is based on the concern for optimum production decisions, another argument in favour of bringing industries into the public sector is that of eliminating "unearned income" and thus decreasing the inequality of income distribution.

A general argument against expanding the public sector may be a lack of efficiency as apparent in a number of public services. It depends a good deal on the details of its organization whether or not a public enterprise is less efficient than a private one.

The precise frontier between the public and the private sector thus depends on a number of detailed data, among which are the types of industries a country has, the degree of scarcity of goods in general, the organization of public enterprises and the level of efficiency in private production.

Under almost all circumstances a number of typical small-scale industries, including agriculture and retail trade, are more appropriately taken care of by the private sector. Even though some of the auxiliary functions of these industries, such as the purchase of supplies and the selling of products in the case of agriculture, can be carried out by collective agencies such as cooperatives, the production process proper usually is conducted more successfully in privately-owned enterprises.

4.52. *The Degree of Centralization in Administration*

Administration, in our terminology, consists of handling a number of instruments of public policy and does not include public production in the narrower sense, as conducted in enterprises. The choice before us can be made separately for each instrument. It is a choice between one central agency, dealing with that instrument and a number of autonomous local agencies. By a central agency we shall also understand an agency with local branches, when these branches have no autonomy. The problem can be handled at a national level, but also for the world at large.

There is an *a-priori argument in favour of decentralization:* it means more freedom, less friction and lower costs. This argument will be overruled, however, in a number of cases where it can be shown that decentralized administration by its nature leads to biased decisions or is less efficient. It will be biased when the effects of the instruments it handles are to be found outside its own realm. Each instrument may be said to have a certain action radius. This radius is indicative of the natural sphere for decentralized control. Smaller units would lead to erroneous decisions since they would be based on part of the effects only. Decentralized administration will be inefficient if there are economies of scale requiring bigger optimal units. The action radius and optimum size will therefore be among the important data on which to base the degree of decentralization.

Accordingly a number of questions of a purely local interest should be left to local authorities; local security, prices of local energy supply and transportation, local cultural matters may be examples. Unfortunately however, there are very few things, that do not influence a wider community. Bad management of local affairs may not directly affect other communities, but it will, as a bad example, have indirect effects. There will be a need therefore at least to subject local decisions to certain general rules or limits between which a free choice can be made.

Such administrative matters as *economic policy* generally will have to be conducted in a rather centralized way. A regulation of the *wheat* market, to quote one example, must be undertaken on a world-wide scale. The *coal* market may be left to smaller units since the bulk of coal does not move so far. Even *financial policy*, however, though apparently a national matter, influences the economic position of other countries so much that it cannot be considered a subject for complete national autonomy.

It is interesting to observe that once big agglomerations—like a big nation, or a big trust—have come into existence, their actions are influencing others so much that these actions should be made subject to an even more centralized system of administration—in our two examples a supranational agency or a government respectively. Had they not come into existence, a decentralized system might have remained possible: in a world of small nations no danger exists for anybody to impose an "optimum tariff" tending to exploit other nations; in a world of competitive enterprises no antitrust laws are needed.

4.53. *The Degree of Centralization in Production*

This question has been dealt with in section 4.51 to a considerable extent already. It may be repeated that it was the fundamental discovery of liberal economics that, under specified conditions, important portions of production can be dealt with in independent units; these may be private enterprises, but they may also be public enterprises or cooperative ones. In this section we will consider two further aspects of this question, namely *what size* the units should have and where they should be *located*. In determining the size the concept of *optimum size* gives useful information. For many industries there is a

fairly clearly determined size for which costs of production are a minimum and this will then be the preferred size. There will even be a tendency for free competition to approach this size, although smaller sizes will often persist because of a strong preference for independence among producers and because of the uneven distribution of wealth.

The optimum size depends partly on the costs of transporting the product to the consumers and this may mean that it depends also on the density of the population. Here the factor of location enters the picture. Questions of location are seldom treated in economics and even less so in welfare economics. The particular shape the question takes when approached from the viewpoint of the optimum regime is whether *movement through space of either capital goods or population* can help to maximize social welfare. The problem of depressed areas or of underdeveloped countries is today's practical form of it. It is now felt that some of the forces of external effects and of increasing returns are responsible for an over-concentration of production units which may have to be counteracted. On a world-wide scale the dimensions of the problem are so large to make this a major policy question, affecting the relations between nations and even races, and with repercussions on the question of the proper degree of centralization in administration. It can be maintained that a satisfactory solution of this problem of location involves a greater development of underdeveloped countries and that for its realization more or stronger international agencies are needed.

4.54. *The System of Exchange*

Goods and services must not only be produced and consumed but they have to be exchanged as soon as some degree of the division of labour makes it advantageous. There are many conceivable ways of exchanging goods. They may be rationed and allocated in a more or less centralized way. They may be sold at uniform prices to everybody concerned or there may be price discrimination. The prices may be different in structure: they may be "*flat rates*", meaning that the buyer pays the seller a sum which is proportional to the quantity bought; or the buyer may pay a *non-flat rate, e.g.* a lump sum (season tickets) or a combination of a lump sum and a proportional sum. Finally the prices

may be calculated in a different way, *e.g.* so as to imply monopoly profits or so as to be equal to marginal costs.

Our model N (*cf.* section 4.3) illustrates the possibility of relying on *free markets* for the exchange of goods and services. Equations (4.36) and (4.37) can be interpreted as the behaviour of both producers and consumers in such markets.

Our model N further suggests that there is *no scope for price discrimination.* In fact equation (4.37) states that the (relative) price vector should be the same for all individuals. In other words: whatever subsidies or taxes must be granted or levied can be dealt with as income corrections.

Model N also suggests that *flat rates are not the ideal price structure.* Lump-sum payments are very characteristic of the optimum regime, when they can be organized. Electricity rates provide an interesting example. Lump-sum payments may even involve the reconciliation of two principles, that of marginal-cost pricing and that of self-sufficiency of enterprises. But, as stated before, there has to be a workable criterion for determining the size of the lump-sum payments. And if every citizen had to pay lump sums to every enterprise, a huge simplification could be made by combining all these payments into a single tax. However, we have already discussed the difficulty of finding the proper criterion, when we discussed the tax system. This whole complex of problems contains some interesting arguments in favour of public enterprise.

All models of welfare economics arrive at the conclusion that *monopoly prices* have to be rejected. But again the costs of preventing them from being charged may interfere with the practical side of administering anti-monopoly policies.

4.55. *The System of Social Insurance*

Three sets of questions will be treated briefly, dealing with the coverage, the financing and the organization of social insurance.

The questions of *coverage* are: Which risks are to be covered and at what level of benefits? There seems to be a consensus about the desirability of covering unemployment (as far as existent), sickness and "hospitalization", accidents, death of breadwinner and old-age. Doubts exist as to the coverage of family allowances. The levels should

be set so as to safeguard the victims in a real way but not to tempt them to be inactive. Since most risks can be objectively stated, this latter argument applies mainly to unemployment benefits. These might be made dependent on the economic situation and thus could rise and fall with the level of unemployment. A benefit of 80 % of wages seems to be an upper limit.

Social insurance can be *financed* out of contributions from workers, employers and the state. The higher the former two, the more they act as a tax on employing labour, which can be used as an instrument of anti-cyclical policy. The higher the public contribution, the larger the possibilities for redistribution of income are. There seems to be little scope in distinguishing between workers' and employers' contribution, since they are both *paid* by the employer and *borne* by the worker.

With regard to the *organization* of social insurance the question of private *vs* public agencies should be mentioned first. Here the usual arguments about private *vs* public operation apply. When operated by public bodies, whether autonomous or not, the question about merging seems important. A maximum of merging all risks and a maximum of uniformity in rates seems advisable; but where risks or costs are clearly different, this should be reflected in the rates.

4.56. *Social Control*

As already observed (section 2.46), the institutions of social control are meant, first of all, as a means to satisfy certain psychological needs and are therefore on the border line of economics. They cannot, however, be separated from our general problem. The main problem is how to combine some real influence given to the workers with an efficient operation of production. The latter point is usually taken care of by restricting the number of representatives, their rights and the number of meetings, all of which tends to undermine the workers' confidence in the institution. This can only be maintained, on the one hand, if the representatives have the personal confidence of workers and, on the other hand, if a program of education is undertaken to help everybody understand the problems at stake. It seems that particularly for this aspect of the optimum regime the influence of the cultural traditions of each country must be considered.

5. SOME TENTATIVE CONCLU IONS

5.1. Unsolved Problems; Research Priorities

In this section some tentative conclusions will be formulated with regard to "the world's largest controversy". Before doing so we should, however, admit that the economist's view, as any scientific and human point of view, can be only provisional and that there are, in the subject matter under discussion, a number of unsolved issues calling for further research. They should be obvious after the foregoing discussion; but it may be useful to summarize them briefly.

We need much more empirical data about the main features of indifference surfaces, in particular about the influence exerted by changes in effort *versus* changes in income. Studies like the one undertaken by G. F. Break[12] should be conducted on a large scale. Next, we have to make up our minds—with the help of such extra-economic considerations as ethics—on the comparison of utilities of different individuals, or rather, social groups represented by individuals. This may help us to come to more practical ideas about the social welfare function.

Further, a more systematic study of the "costs", in the widest sense, of important institutions as well as the "cost laws" of various productive processes is still highly urgent. Finally, the potentiality of education as a means for increasing people's productive capacities is among the more important subjects to investigate.

This list, incomplete as it is, represents a good research programme, probably more useful than many effort-consuming current investigations on the details of the cyclical position, to give an example.

5.2. Two Statements About the Optimum Regime

For our discussion it seems that two general statements that can be tentatively made about the nature of the optimum regime are relevant. The first is that *the optimum regime*—even when one particular social welfare function is adhered to—depends on many structural data of the society considered and therefore *is different under different circumstances*. As we have seen, the size of the public sector has to depend on the extent of the activities showing external effects on other industries,

[12] G. F. Break, "Income Taxes and Incentives to Work", *The Amer. Econ. Rev.* xlvii (1957) p. 529.

and on the extent of the industries showing increasing returns. Income tax rates should depend, among other things, on the dispersion of productive capacities among the population. The degree of decentralization in production should depend on the optimum size of enterprises and on population density. We may add other examples, not discussed in the preceding sections. Government intervention with free consumption (*i.e.* rationing) may be necessary in situations of extreme scarcity. Government intervention with industrialization may depend on the initiatives taken by the population. Finally the optimum depends on the preferences of the population as a whole which may differ between peoples or between time periods.

The practical conclusion to be drawn is that what is the optimum regime for one country need not be the optimum regime for another country.

The second general statement is that *as a rule the optimum regime will not be some form of extreme.* It is very improbable that it will be characterized by

(I) either complete absence of the public or of the private sector;
(II) either complete centralization or complete decentralization in production, administration or exchange;
(III) complete equalization of incomes;
(IV) an entirely one-sided tax system, *etc.*

The general reasons why this is so are that usually the motivation for each type of means or of instrument depends on the size of certain structural constants which are so different between industries or social groups that it is very improbable that the same means should be used everywhere. The motivation for making an activity a public one depends, as we saw, on the existence of external effects or of increasing returns. It is highly improbable that all industries will have these characteristics. The degree of decentralization to be applied in various fields of administration depends on what we called the action radius of the various instruments; it is very improbable that all of these would be very large or very small. Again, complete equalization of incomes would entail many consequences incompatible with other elements of social welfare, such as a high level of production or a high level of growth. Finally, the case for one single tax is so specific that it hardly ever exists. For all these and several other reasons the optimum

regime will practically never coincide with an entirely one-sided regime. Where such a regime exists, it will as a rule not be an optimum. The reason for the existence of extremist regimes will be discussed in the next section.

It follows from our last statement that the optimum regime will as a rule shift only slowly and that sudden changes in regime are indicative of a deviation between the actual and the optimum regime, either before the change, or after it, or in both cases. Sudden changes anyhow should be avoided under the present conditions of a complicated and very sensitive system of production and exchange.

5.3. Factors Making for Deviations Between the Optimum and the Actual Regime

Looked at from the point of view of the economist, deviations between a regime in actual existence and what the economist thinks to be the optimum may be due to differences of opinion between the economist and the politicians in power as to:

(a) the operation of the economic mechanism;

(b) the aims of economic policy.

Differences of opinion as to the operation of the mechanism may be classified—assuming that by definition the economist knows better about this subject than the politician—as errors on the politician's side. These errors may be incidental or systematic; the latter will be called doctrinaire deviations. Incidental errors may arise because of *misunderstandings* about economic statements. Thus, the famous decentralization thesis discussed in section 4.31 (the Pareto thesis) has been given many popular formulations which are completely false. It is not generally known that as a rule the optimum requires income transfers. Many do not know that the decentralization thesis does not apply in the case of external effects or increasing returns. On the other hand, the consequences of a complete equalization of incomes by decree are not known by many popular discussants and were not known in the U.S.S.R. around 1920. There is a host of less fundamental issues where erroneous policies are followed for lack of understanding of their consequences. These will not be discussed now.

Doctrinaire deviations occur when a political group adheres to a more

or less outspoken system of thought including economic theories which have been found to be too simple to explain economic reality. The most typical examples are the liberalist and the Marxist systems, often showing deviations on opposite sides of what most economists nowadays consider an equilibrated view, although not necessarily always. Both may be said to be productivists, *i.e.* overemphasizing the importance of high production at the detriment of distributional aspects. The typical examples of their doctrinaire opinions refer to the size of the public sector and to the freedom to be given to management. Here they stand at the opposite extremes as is indeed well known.

Differences of opinion between the economist and a politician about the *aims* of economic policy can exist when the economist discovers inconsistencies in a politician's aims. Such may be the case when various forms of *shortsightedness* are responsible for the basic aims of a policy. Thus, future well-being may be neglected by some political systems, while it may be overemphasized by others to the detriment of present well-being. Or, politicians may be too shortsighted in a geographical sense, neglecting the interests of citizens outside their own geographical unit. Finally, the relative importance attached by certain politicians to the various elements of utility may differ from what can be observed to be the case for the citizens. It would be too easy for the economist to say that all this is not of his concern. The frontier of what is accessible to scientific analysis is shifting continually. It is the contention of the present author that we can push this frontier further and need not accept as given all that some politicians would formulate as aims. Inconsistent aims can be rejected.

The ethical principles needed to give a meaning to the social welfare function cannot be a permanent excuse for not discussing them. The author invites economists, politicians and philosophers to formulate alternatives to his proposal. Once we can measure utility, there may be another forward shift of the frontier.

5.4. Differences Between Aims of Political Systems

To a certain extent the great controversy may be said to be due to differences in aims of policy. As far as economic policy is concerned, such differences may take the form of representing the interests of

different groups or classes of the population. When only part of the population has voting rights this phenomenon will be a natural result. It may occur even when voting rights are general, if it is possibile for one single group or class to take office. Thus, schematically it can be said that some political parties represent the interests of workers and others those of capital owners. Nowadays, however, this statement will apply to some hidden aims rather than to most of the aims defended in public. Competition between parties forces most political programmes to take into account the interests of a large number of groups. A closer analysis of the details of programmes shows that a considerable portion of the programmes of all parties is identical. The differences are magnified by our habit of emphasizing the differences, the time may have come to emphasize what is common to all.

5.5. Is There a Basis for Discussion?

If it is true that the aims of various economic regimes are not so very different and if it is true that quite a few of the differences of opinion on the operation of the economic system are biased, we can hope for converging ideas rather than diverging. Doctrinaire ideas about the operation of the economic system will in the long run be disadvantageous to those who hold them. Actions will be more successful when based on reality than when based on unrealistic assumptions. If there really is a more or less clearly defined optimum regime, actual regimes will have to move towards this optimum. If it exists it can be successfully discussed between the representatives of different opinions.

Is this a utopia? Or can we trace changes in the real world supporting our point of view? In the author's view there are a number of events in the chronicles of economic policy of these last thirty years that do support our thesis. As early as in the twenties communist policy did away with a number of dogmas until then adhered to. They were forced to recognize the necessity of management; they themselves broke the regular sequence of feudalism – capitalism – socialism by starting socialism (or at least attempting to establish it) in a largely feudal country; at a certain stage they denied another automatism sofar believed in, when deciding themselves on the rate of investment in the Russian economy. They stopped attempts at

a complete equalization of incomes. After the Second World War, to quote another example, rationing of consumer goods was abolished. More recently, changes have been made in the economic structure of Yugoslavia and Poland, and even in Russia, which are of particular importance. In all three countries a considerable degree of decentralization in production decisions has been introduced. Production volume is no longer prescribed to the individual enterprise in Yugoslavia and Poland, but the decision is made at the plant level. In Yugoslavia free price formation has even been accepted.

In the same period the economic regime of Western countries also changed profoundly. The public sector was extended, the governments accepted responsibility for the level of employment, social insurance was extended, development was made a conscious concern of economic policy and "plans" for the economy as a whole were introduced, which were intended to serve as background information to producers and government. It is particularly interesting to note that the plans of the communist countries which for a long time were of a completely different character are, through the latest developments, changing their nature in the direction of the freer type of plans of the west.

If, then, there is a logical basis for discussion, what should be discussed? The answer is that it would be easier to say what should not be discussed. There is a common interest to discuss, in a far less emotional way than is usual in political documents so far, almost everything covered in this essay. The technical tool needed will be, first of all, a common language—not a simple matter if one reads some of the communist scientific publications. Then a careful and patient summing up and scrutiny of the aims of economic policy in general and development planning in particular. Finally, a discussion on the objective consequences, in various environments, of certain means of economic policy or institutions of economic regime. It is the author's hope that his views are shared by a number of colleagues on both sides of the iron curtain.