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SELECTION AND IMPLEMENTATION
THE ECONOMETRICS OF THE FUTURE

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What I am going to present to you today is in all humility a frontal attack on a ghost that has been haunting all of us for the last generations, whether we want to be classified as belonging to the West or to the East or to the uncommitted countries, which, with a few exceptions, are the countries in Afro-Asia and partly in Latin-America that are now striving towards rapid economic and social development.

I can do nothing better than to begin by quoting the introductory part of the program of this Study Week. And, incidentally, this introduction is a significant indication of the profound understanding of the basic problem of our times which the organizers of this Study Week, with the blessing of His Holiness the Pope, have had. The introduction begins with these words, and I quote:

« Modern economies are extremely complex and both theory and practice show that the free play of individual choice does not guarantee, as used to be thought, favourable results for the community.

Once this is admitted it is obviously necessary to provide suitable informative and control instrument and fix the targets which the economy is aiming at ».

I think it is fair to say that the free market system has two advantages: (1) its simplicity and (2) its effort-releasing effect. But it has one fundamental shortcoming: it does not assure the realization of *specific* preferences, such as a high rate of economic growth, a distribution of income and wealth based on social justice, aid to special social groups, economic development of lagging regions within the country, development of special agricultural and industrial sectors (for defense, health or humanitarian reasons) etc. The purpose of wise planning is to realize many such special goals, while retaining as many as possible of the advantages of the competitive system.

We wish to search for some better economic system to replace the time-honored system of the free market economy. But in that search, we encounter a ghost that has been haunting all of us for the last generations. It has been the same ghost we have encountered regardless of the direction we have chosen in our search for a better economic system.

This ghost is human nature itself. Some people are alert, full of initiative and driving force, full of the active and unselfish desire to apply all their abilities to the economic and social betterment of their country and to that of mankind as a whole. But, alas, the percentage of people possessing these virtues is small, very small indeed. Many people are, more or less, dull and selfish and can be induced to make a personal effort only if thereby they can obtain some tangible advantage for themselves or to the people close to them. In this connection, the economic advantage will often stand in the foreground.

Therefore, the historical challenge, facing us as economists and social engineers, is to help the politicians work out an economic system built upon a set of incentives, under the impact of which the economic activity will be satisfactory from the viewpoint of the economy as a whole, even if the behaviour of many individuals is essentially selfish. We must find a means of circumventing the human obstacle to human progress.

It is this means about which I am going to speak today.

To size up the nature of the problem, let us review briefly the directions that have been explored in the search for a better economic system. Roughly speaking they may be classified into three groups.

The first direction, one characterized by a very mild deviation from the traditional market type of economy, consists of admitting only monetary and fiscal instruments in the attempt at steering the economy. The human behaviour patterns at the various levels of society are such that, in this mildest form of attempt to steer the economy in a desirable direction, one faces a fundamental choice between inflation accompanied by fairly full employment or a reasonably stable price level accompanied by less than full employment of labour and other resources. A precise description of the situation would, of course, necessitate specifications of a number of details, but the choice I have mentioned indicates the essence of the matter. This choice is strikingly illustrated in the famous Samuelson-Solow menu. This menu consists, as you know, of a curve applicable to the United States' economy and showing how rapid an increase in the price level we must be willing to accept in order to reduce the unemployment percentage to a given level. An even more important fact is that monetary and fiscal instruments alone are not sufficient to assure the fulfillment of the highly *specialized* preferences we may have regarding the results to be obtained from the community's economic activity. The mild form of steering about which I am now speaking might perhaps be described by saying that it is a timid attempt to introduce a small amount of enlightenment into that which I have called, on several previous occasions, the unenlightened financialism.

The second direction in the search for an improved economic system deviates a little more from the traditional market economy. It consists of admitting state intervention of various sorts, aiming at influencing *directly* the quantities of goods

and services produced or consumed. Among the attempts in this direction fall numerous sorts of quantity regulations -- in particular, state control of investment in physical capital. In some cases, this has been combined with nationalization of existing big enterprises and/or with the establishment of new state-owned or state-controlled enterprises which are to operate alongside the still remaining private enterprises. A common characteristic of all these arrangements has been their operation under a monetary and financial machinery which, in all essentials, was to remain of the traditional type, meaning that we are still confronted with the Samuelson-Solow menu and facing tremendous administrative problems, including problems of loyalty and morale. These, I think, are in a nutshell the characteristics of the mixed economies seen emerging in many countries today.

The ghost has performed in his typical manner in all these pursuits. Quantitative regulations of the prescriptive type have a tendency to kill initiative and make the activity inflexible, inefficient and stationary. And state administration, because it takes away both the stick and the carrot which function under a hard competitive system, has a tendency to eliminate a large part of the driving force for personal effort.

Finally, the third direction, in search of a better economic system, is represented by the more spectacular deviation from the traditional market economy which is found in the centrally steered economies of the East.

This more radical departure from the traditional market economy has produced signal results in economic development that cannot be explained away by any amount of ingenuity and mental effort on the part of conservative economists and statisticians. But the same ghost has acted in his typical manner also in these more determined attempts to escape the shortcomings of the free market system. There exists, indeed, an overwhelming amount of evidence from centrally planned economies showing that the active and positive participation of

individual enterprises is not released through a system of quantity targets (gross output measured in volume indices) established from above. Nor, is it possible to achieve the desired results by such a simple system of incentives as that of paying a premium to an enterprise according to its overfulfillment of the centrally established quantity targets or according to its ability to increase its volume index of actual gross output over that of the preceding year.

There are several reasons for the failure of such incentive systems. One is that quantity targets, established from above, may induce the enterprise directors to conceal their true production potential. Another is that they do not encourage directors to use imagination and effort in economizing of input elements. A third reason is that these systems do not induce these directors to help rationalize production and realize desirable investment within their specific fields. And fourth, they do not offer the inducement to improve the quality of the products, because the establishing of quantitative targets of goods and services can only, to a small degree, cover the infinite variety of improvements in quality that constitutes a basic element of economic progress.

A few examples will suffice to indicate the nature of the experiences one has had. In the Soviet Union, in the period before 1957, one worked according to what may be called the ministerial system. There was one all-Union central ministry for each group of goods. Because of frequent uncertainties of supply from other ministries, each minister was tempted to set up his own ministerial factory for the component parts he needed. This led, of course, to inefficiencies of various sorts. There were also bureaucratic delays in settling questions due to the scattered locations of enterprises over the whole country. This motivated the abolition in 1957 of the central ministerial system and the introduction of a territorial system. However, this reform only replaced one type of difficulty by another. The wishes and plans of the different regions were difficult to recon-

cile and make consistent from an all-Union viewpoint. These difficulties encountered in the regional compartmentalization have recently released a desire to revert, at least in part, to principles of a more all-Union character.

As a final example, we may mention the Soviet attempt at circumventing human shortcomings by separating the industrial steering problem from the agricultural steering problem. This attempt, as could have been safely predicted, has been a failure. It constitutes a flagrant violation of the basic condition that a steering system must be comprehensive, i.e. that it must embrace simultaneously all facets of the economy. It is obvious, for instance, that agricultural production depends essentially on agricultural machinery and fertilizers, and both these means of production are industrial products.

The suggestion I have to make regarding ways and means of finally killing the ghost, or at least subduing him to some extent, is not presented, of course, in a naive belief that here is an « open sesame » that will, in one stroke, solve all difficulties. Rather, it is a suggestion as to *a way of thinking* which I believe is a *conditio sine qua non* for real progress in our search for a solution.

We must begin by making a clear-cut and precise distinction between two phases of the steering work: the selection and the implementation.

The selection analysis is a study of what can be obtained or ought to be obtained if only one considers the following: first, such basic conditions for the economic activity as the technological relations and the most deep-rooted relations governing human behaviour, e.g. utility and its effects on demand; and second, the preferences regarding the results to be obtained in the nation as a whole, or in the world. In the selection analysis we pay little or no attention to the system of economic institutions under which the economic activity of the nation or that of the world takes place or ought to take place.

The implementation analysis is a study of the kinds of national or international institutions most helpful in bringing about *that particular constellation* of the national or world economy which has emerged as the optimal one in the selection analysis, or at least to bring about a close approximation to that constellation.

The selection analysis must precede the implementation analysis. If we go about it the other way, we would be putting the cart before the horse. The selection analysis must be built on a quantitative *decision model*, as distinct from an explanatory model or a forecasting model. This will, I believe, be a distinctive feature of the econometric planning work of the future, since our main concern will be research work on how the economy can best be steered.

In the technical part — which I shall not discuss in detail here — a serious warning regarding a very popular « planning procedure » is in order. It is a procedure that owes its popularity more to its simplicity than to its real relevance for true planning.

I am referring to the popular procedure of initially guessing at a « reasonable » national growth rate that « could probably be obtained », and from this assumption drawing conclusions regarding the production needed in special sectors of the economy, the size of needed investments, etc. The reason why this method has become so widely used is to be found, I think, in its simplicity rather than in the fact that it is realistic and rational.

The special aspects of the economy, such as production in the various sectors, the size of investments, etc. are, in fact, *not determined* even if the national rate of economic growth is given. There may be many different development patterns that all give the same rate of growth of GNP (The Gross National Product) or of some other statistical measure of which one may think.

Nor have we any assurance that the growth rate guessed at is the *optimal* one, i.e. the best growth rate obtainable when the structure of the economy, as well as the special preferences which have been put up for the course of the economy, are given. The optimal growth-rate will only emerge as a consequence of a rational decision analysis which takes as its starting point the preferences and the fundamental data describing the structure of the economy. To *start* by target setting, whether it be a specific figure for the growth rate of GNP or some other specific target, is again to put the cart before the horse.

Certainly, we must *end up* by formulating targets; but before this, there is a long way to go — namely through the entire selection analysis.

NB ||| NOTE. — The verbatim record of the technical parts of Professor FRISCH's presentation is not given here. Nor are the several mimeographed documents distributed by Professor FRISCH reproduced. This material will subsequently be coordinated by Professor FRISCH and published by him separately.

DISCUSSION

ALLAIS (*)

I said we must be very grateful to Prof. FRISCH for his very clear, and, I would say, provocative exposition of the future of econometrics. I would also say that I have had much occasion to admire Prof. FRISCH's work. From a technical point of view, I completely agree in general with his position, but his paper also expresses many views which rest on value judgments and have evidently many political implications. Professor FRISCH has given his point of view in a very excellent way as far as clarity is concerned, but I cannot follow him insofar as fundamental questions of applied political economy are at issue. His paper raises many questions which are connected with the ordinary work of the econometrician, but which, it must be recognised, have a high content of a political nature.

I am sorry that my knowledge of English is not such as to permit me to express myself with all the nuance of meaning which is desirable and this makes it difficult for me to specify my personal views clearly to you. But I think the purpose of this meeting is to bring out divergences of opinion very clearly and it may perhaps not be without utility to put forward a different view from that of Prof. FRISCH.

(*) Comments on the Frisch's paper presented to the Study Week. Only a small part of this paper has been maintained and Professor ALLAIS has not had the possibility of reading the revised and reduced paper printed on the preceding pages.

1) First, as I already stressed on the first day of this meeting, I think econometrics should remain neutral, i.e. we must avoid introducing political views into our discussions. Personally, I would say that I am a neoliberal, but I think political views should remain outside the technical discussion of econometric problems. I do not accept at all that Prof. FRISCH's paper can be regarded in any way as specifying the main lines of the future of econometrics. Econometrics is a very powerful tool of analysis but nothing more. In itself, it cannot determine what economic policy should be, but only analyze observations and derive, in a rigorous way, the consequences of specified hypotheses. Had Professor FRISCH said in his paper: « I admit as hypotheses, first, that a competitive system cannot realize the « high goals of rapid expansion, growth, and social justice, and second that these goals can be effectively realized in a central planned economy », I would not have said anything because from a scientific point of view, it is always possible and legitimate to make hypotheses and to discuss the results. But instead Professor FRISCH has spoken of these two hypotheses as if they were well established facts.

Econometrics must remain limited to the discussion of technical questions. Certainly it is possible and admissible to discuss scientifically the consequences of hypothesis of a political nature, but it is necessary to avoid connecting them with political and ethical views and with value judgements.

2) Professor FRISCH spoke of the « simplicity » of the competitive system but, I think, the same judgment can also be made on FRISCH's proposals for realizing justice and rapid growth, looking for example at the first lines of § 5.1 (page 5).

Taking FRISCH's paper as a whole, I would say that things are much more complex than his paper makes them out to be, and I think we must be very cautious about all the statements made. As an illustration of this complexity I will put forward for discussion some very important questions on which it is evident that it is impossible to follow the FRISCH conclusions.

I do not say that FRISCH's ideals should be criticised. On the

contrary, I have the same social ideals as Professor FRISCH, but I don't think that his practical proposals would in any way forward their realisation. My purpose is to comment on some postulates which are generally accepted by those favour central planning, but which are really very questionable.

3) First question: what exactly are the social preferences Professor FRISCH spoke about? Should there be a steering committee to decide what they must be? But we must be very cautious here. I think the proposition that some political steering committee should have power to decide the aims to be or pursued by society is in fact a very questionable one. Prof. FRISCH felt that it was necessary to correct this position, and he says in his paper (page 2) that plebiscites could be used.

But, from a democratic point of view, the use of plebiscites is itself very questionable. There are many difficulties which I cannot discuss here in detail. But, for instance, who will have the right to write the text of the referendum? This is very important because the answers can evidently be biased. Many Frenchmen are very sceptical about plebiscites to-day. Personally I consider them a very dangerous procedure and in any case I think it is impossible using plebiscites to decide what national preferences are in fact. The definition of social preferences is a very difficult and complex problem and I think the purposes of the society cannot be decided in a definite way from a national point of view. There are millions of people who have their personal and very legitimate preferences. Certainly, there are many decisions which only a government can take, but these decisions are only one element of what Professor FRISCH calls « social preferences ».

And we must consider not only the central government but public agencies of any kind. It is impossible to reduce the problem of social preferences to the problem of defining one preference function and one preference function only. The problem is much more complex indeed and from this point of view the procedure which Prof. FRISCH has proposed is not at all satisfactory.

4) The interest of the community is referred to in the introductory text of this study week. But what is the interest of the community? Who will decide what the real interest of the community is? Professor FRISCH would answer: the majority. But in a real democracy there are many questions which cannot be decided by majority votes.

Minorities have rights which must be respected. So this question is again very complex, and personally, I cannot see in any community anything other than the superposition of individual interests. And if this position is correct, it would appear to be impossible to replace individual preferences by a single preference function for a whole society.

5) Prof. FRISCH has formulated excellently the stress he puts on the relations which must obtain in all cases between the political authorities and the people responsible for planning and he has said that the political authorities can correct the plan or use it in some way. But I would say that, from a practical point of view, this is quite impossible, because politicians are incompetent in econometrics. Who is to decide what the fundamental variables of the model are? Who will decide if the calculations have been made in the right way or not? All these questions are very difficult indeed. What the political authorities can validly decide is the general rules governing the decisions to be taken. But to the extent that millions of decisions are in question, they cannot be taken by any central agency. And the specific value of a market economy is that it provides a very valuable tool for the organisation of decentralised decisions.

At any event, a political assembly can only discuss questions of principle, and decide the general rules governing the decisions to be taken. It can discuss technical plans and economic calculations neither validly nor efficiently.

6) Professor FRISCH's starting point is that the overall purpose of social policy should be the human personality. I agree completely with this principle, but the question is: what are the different aspects of respect for the person? Again, who will decide what exactly is

respect for the person, the rights of the majority, or the rights of the minority? Whatever the solution to this fundamental problem may be, I do not see it in FRISCH's paper. In any case, majority rule cannot give a valid and acceptable answer to every question.

What exactly is social justice? To speak about social justice is quite appealing in public discussion. Everyone is for social justice. But my own experience has convinced me that social justice is accepted by different people in very different ways, and as far as I can judge, everyone accepts what is in his interest as just, but considers anything contrary to his interest as unjust. Reality, unfortunately, is such we must appreciate that there is no objective concept of « social justice » at all, but only the conflicting interests of millions of people.

My conviction is that FRISCH's paper oversimplifies very complicated and complex questions and that it is only in this way that he can justify the central planning procedure proposed by him. But as he said himself at the beginning of his paper, simplicity can be questioned, and to simplify problems is not to solve them.

7) In FRISCH's paper, everything is derived from the consideration of a single preference function only. But as I have already said, we cannot consider only one preference function. And if we agree that in parallel with the social preference function we must take individual preferences into account in some way, then there is no longer a single preference function, but ten million, a hundred million, and, for the world, three billion preference functions, and from this point of view I cannot see at all how FRISCH's paper could work in reality. The question is much more complex, much more difficult. We econometricians must recognize that it is impossible to reduce the whole problem of social organization to a problem of central planning.

In fact and in my opinion, only a decentralized organisation in an appropriate framework taking parallel account of a market economy and some central decision making by the government in its own sphere can provide a correct solution to this very complex problem.

Only in totalitarian societies can the problem of social and economic organisation be reduced to the formulation of a preference function.

8) Professor FRISCH has said that there are two things which are different, and which require to be treated separately. The first is what he called the selection problem, and the second the implementation problem. In my opinion, this is absolutely impossible. I am an engineer, and I can give you a very good example of such an impossibility. In coal mines we don't know at all what the production functions are exactly. No engineer exists who can specify what the production function is in a concrete situation. What engineers do is to choose between different projects in comparing their discounted net present value (in french: leur valeur nette actualisée). And for this purpose they use a system of prices which only a market economy functioning in an appropriate framework can provide. Thus it is impossible to separate selection and implementation. From this point of view, I cannot see at all how the FRISCH system could work. We don't know the production functions, and correct decisions can-
() *ell?* (not) only be taken in a decentralised system with the help of an appropriate price system.

9) And again, what should be considered as desirable growth? Growth of population, growth of efficiency -- is growth really desirable? Some people prefer stability to growth. Personally, I am for efficiency, but that is a personal and subjective view. Other people may prefer the stability of their jobs; they can definitely prefer stability to efficiency. In fact, growth is not such an unquestionable goal as Professor FRISCH was suggesting at the beginning of his exposé.

For me what seems in fact desirable is not growth but simply people's happiness.

10) Professor FRISCH has suggested that the centralized economies have grown faster than the market economies. In fact, at the least this statement is open to question and personally I think that it does not conform to the real facts.

11) Professor FRISCH has made some very strong criticisms of the market economy, and I agree completely with him. At least in some aspects, I recognize that the market economy has many, many drawbacks. But such criticism should not remain limited only to some points. It should be extensive.

Rightly, Professor FRISCH has criticised private monopolies, but he did not say anything about public monopolies. He did not say anything about trade union monopolies, the impact of which may be much greater. Personally, I think that the unions play a very useful role but it seems impossible to me to criticise only those deviations which relate to the market economy, without simultaneously analyzing the other deviations.

If we want to be objective, we must compare the drawbacks of the market economies with the drawbacks of the politically and economically centralised systems. One needs only to look at the history of the collectivist society in the U.S.S.R. to be convinced that central planning has some drawbacks which can do more damage to social justice than can those of the market economy. The millions of unemployed in the United States in the thirties can be compared with the millions of dead in the U.S.S.R. during the same period.

Is it scientific to give an idealistic view of the planned economy by comparing it with the reality of the market economy? If we want to compare, we must compare things which are comparable. In other words, if we look at the reality of market economies, we must at the same time look at the reality of the collective and centralised economies. And if we discuss what a collectivist and centralised economy would be ideally, we should discuss what a market economy working in an appropriate institutional framework could be, not what it is. But it is not fair to compare the real aspects of a free economy with the ideal aspects of a collective and centralised economy.

It is absolutely scientific to stress the aspects of the market economy, but if so one is faced with the necessity of stressing at the same time what happened in U.S.S.R. in the thirties and in the forties and what has happened in communist China in recent years.

12) If I can add one word about the market economy, I would say one thing, namely that the people I know who are in favour of the market economy are not at all in favour of the market economy as such, as it is. They are in favour of a market economy operating in an appropriate institutional framework, and if we want to do justice to the market economy, I think it is necessary to study the institutions of the framework of the market economy very carefully, before coming to any conclusions.

As I have read in the FRISCH paper, we should not rely on the market economy at all, but my conviction is, on the contrary, that it is impossible to solve the very difficult and complex problems we have to face without some reliance on the market economy.

It is my conviction that with appropriate rules and in an appropriate framework, a market economy can give reasonable participation in the decision-making process to everybody, and to every minority.

13) In conclusion, I greatly admire the scientific work of Professor FRISCH, but I cannot follow him so far as the main themes of his paper are concerned.

For me, FRISCH's paper appears as a long and convincing demonstration of the practical impossibility of planning in FRISCH's sense. Nevertheless, I recognize that this is a very personal and subjective view.

But what appears to me as indisputable is the necessity for the econometricians to remain neutral.

From an objective point of view, it is absolutely impossible to define the econometrics of the future by reference to Professor FRISCH's paper.

In FRISCH's sense there are in reality at least two, three or may be ten econometrics of the future: the STONE future, the WOLD future, the ALLAIS future, and so on.

Thus, in my opinion, it is not desirable to connect econometrics with a social philosophy of any kind whatever respectable it may be. We Econometricians must, as such, remain neutral, we must limit ourselves to the study of econometrics in itself.

This does not mean that political science is without interest but it does mean that we economists must remain very cautious about what the interest of the community, social justice and so on really are. Excuse me for having been so long and thank you.

DORFMAN

I do not wish to enter into the important and heated discussion between Professor FRISCH and Professor ALLAIS on the role and propriety of social planning, but merely to point out the relationship between Professor FRISCH's paper and my own in two respects.

However one feels about social planning, one must concede that political decisions that influence the development of an economy have to be made. For this purpose one needs some criterion for judging whether social effects are good, or moderately good, or bad and this is what Professor FRISCH's capital F function does. One must have something of this sort or no social decisions can be made on any rational basis.

I do not believe that this social preference function can be ascertained, however, by the method that Professor FRISCH proposes, namely by artfully constructed interviews designed to disclose how people evaluate various possible states of their societies. In general, people do not know how they will make an important decision until they are confronted with it, and they cannot tell you. Therefore I proposed that we attempt to determine social welfare functions by inspecting how people have decided in the past rather than by asking them how they would decide in the future. My purpose, however, was the same as FRISCH's: to determine a scale of social values.

There is another significant divergence between us. Professor FRISCH distinguishes sharply between the problems of selection and implementation. But I do not feel that this distinction can be maintained. The preference ordering of two economic policies depends not only on their consequences in terms of rate of economic growth, per capita income, level of employment, and so on, but also on the implementation side of the policies themselves, for example

on the extent to which they restrict economic freedom. Thus one can compare only states of the economy that can be attained by instruments that are similar in their social impacts and this implies that constraints have to be brought into the picture from the outset for they describe the states that can be attained by means of a limited set of economic instruments.

KOOPMANS

I am approaching my comment here in the same vein as Prof. DOREMAN. I am not addressing myself to the question whether society is or should be moving in the direction that Prof. FRISCH's paper indicates. Rather, for the purposes of the discussion, I am accepting his assumption that this is the direction, and speaking more technically to the point whether the particular layout and scheme of Prof. FRISCH's ideas is efficiently designed to achieve the purpose that he has in mind. I have really only two points that I would like to raise in this connection. One concerns the very strict separation of the determination of structure from the determination of preference. On this point I find my thinking to be somewhat related to that of Prof. ALLAIS. It would seem to me that the policy maker who is being interviewed in order to obtain a representation of his preferences will be neither able nor willing to be too specific about these preferences as long as he does not know what the implications of his indications are. He is likely to be pragmatic — not only a man who thinks abstractly about his own preferences. To stay in his position he must respond to pressures and perhaps even threats in order to be effective over a period of time. Even a man of great wisdom would still have to be aware of what he is expected to do by a number of groups who have ways of making their desires effective. Therefore if he is presented by an econometrician with questions « what are your preferences » or « what is the form in which you would mould what you regard to be the preferences that should guide this planning », he may feel that he is being tricked even though without such intent. He is not an econometrician, and

in fact in order to feel comfortable in the situation in which he is placed, he would have to be not only an econometrician but an electronic computer as well. He would want to know what quantitative consequences his indications of preferences would have in order to feel comfortable about the answers he is giving, I wonder whether a better and a more effective procedure, which would get more effective cooperation, would not be an iterative one. While the policy-maker is being asked to state his preferences, he would be assured that this is for a trial run only and that the outcome of the computation is to be presented only to him or to his associates before these preferences would be considered firm.

My second point has to do with the question of preferences being necessarily temporary and having to evolve by experience. It is stated that the broad purpose of planning is, among other things, to realise the high goals of rapid economic growth and social justice. Of these it would seem to me that social justice is the more permanent one whereas rapid economic growth is a more temporary one.

Finally I have a point which is put more in the nature of a question to Prof. FRISCH. This has to do with the way in which the steering prices would be used in order to steer the economy. If the production system has constant returns to scale it would seem that prices are a poor instrument by which to bring about moderate changes in quantities. The production set is, in a two-dimensional case, the set of all points that are on or below a ray out of the origin. Then for certain price ratios profit maximizing quantities are found in the origin. For other slightly different price ratios, profit is the higher the larger the output. So in a strictly linear technology, the response to prices is likely to have a flip flap character.

Now, one would ask, if the competitive market system that is prevalent in many countries is, in a way, a model for the steering of the economy by prices, why does that flip-flap behaviour not manifest itself so clearly in the competitive market as I am concerned that it might manifest itself in the steering mechanism that we are discussing. I believe that in the competitive market system prices

are very effective in the long run as conveyors of information and of incentives, but that in the short run a good deal of quantity information goes back and forth between suppliers and demanders in all markets. My question to Professor FRISCH is whether in his blueprint for the operation of a planning system he does not need also to provide for circulation of quantity information at all levels, or whether he thinks prices alone will be sufficient.

MAHALANOBIS

I should like to make a few observations at two levels from the point of view of a country like India. First, I share the doubt expressed by Dr. KOOPMANS whether a political leader or an administrator or someone who is responsible for decision-making would be able to understand the implications of econometric choices. Secondly, even if he does understand some thing at a technical level, whether he would be able to influence the political or social decisions in accordance with econometric consideration. And thirdly, whether such a leader would not make mistakes which would have their own consequences.

I believe there is a good deal of validity in the doubt to which Professor KOOPMANS has given expression. I have myself continually faced the type of question asked not only by Professor FRISCH when he was in India several years ago, but also continually since then in connexion with planning. Even when somebody would like, would have felt it advisable, to make a decision one way, he might have to remain silent because of uncertainties of the political consequences. This is a serious difficulty. I am speaking from experience. This is, however, only one level.

At another level, I should very warmly welcome the outlook of Professor FRISCH because I believe this would be of great educative value. I welcome this imaginative approach, not because I think a push-button type of decision can be achieved immediately or even in a few years but because I believe his outlook and his approach can be very important factors in an educative process, at the decision-

making level and at the level of national planning. I myself have seen during the last ten years in India the beneficial effects which are coming out of such efforts, not only on the part of Professor FRISCH and other specialists like him, but also on the part of those who are working on such methods in India. I see a beneficial effect — not directly, but in influencing the thinking of individuals and groups and making them more sophisticated in their outlook.

I also see a danger if such studies are taken superficially or are imitated, as such things are apt to be very often in the underdeveloped countries, due to fashion or because of the high prestige and authority of the advanced countries. A superficial imitation of advanced countries at too early a stage may and have often become the most serious obstacle to progress in the under-developed countries.

ALLAIS

Can I stress some technical points? In a mixed economy there are two sectors: the private sector and the public sector. So, the first question I would raise is: could the state formulate a preference function for the private sector? And if so what would this preference function be? So far as the public sector is concerned, we meet the same difficulty. We must consider not only the state but also regions, cities, public and semi public agencies and so on. Is it possible to take account of these different operators in one single preference function?

I have many doubts about this possibility.

I do not see at all how it could be possible or desirable to represent finally different and probably conflicting views by one and only one preference function.

Would it not be better to allow every operator some purchasing power and to leave him free to use it as he sees fit?

FISHER

I have one or two points to make. Both of these are on issues brought up during the discussion, the one by Professor KOOPMANS and the other by Professor DOREMAN.

Professor KOOPMANS raised the point that small changes in prices might induce large changes in action. This is, of course, a possibility, but it is less serious the more different ways there are of doing things. For example, even if the technology is a linear programming one, the production possibility frontier will approach a continuous surface if there are many different activities which cover the entire nonnegative orthant.

Now the question of discontinuities of this type is also relevant to Professor DOREMAN'S remarks and indeed my comment here should be taken as a comment on his paper rather than on FRISCH'S. Professor DOREMAN wants to present policy makers with shadow prices when they are at a particular vertex and see what they will do. The discontinuity problem arises in this connection because there will generally be more than one set of shadow prices at a vertex. Each set will be associated with movement from the vertex one is at to another particular one. The alternatives must be presented to the policy maker therefore in a form which insures that once he has said he will move to another vertex he will not then also want to move back at a different but still appropriate set of shadow prices. One must therefore ask questions which bracket the range of admissible shadow prices. Once again, if there are numerous activities, this is not a serious problem because the sets of shadow prices associated with a given vertex will not be very wide.

WORLD

It seems to me that Professor ALLAIS is dramatizing the argument a little. It has not occurred to me that Professor FRISCH nor anybody else believes that it is possible to arrive at something like the actual truth when setting up a utility function for a political decision at the

macroeconomic level. The purpose of the device is much more pragmatic, in the direction of clarifying the problem, articulating different political views by specifying alternative targets and alternative instruments, targets and instruments that can be modified from time to time, the limited aim not being solutions of absolute optimality, but rather solutions that make workable compromises. If I understand correctly, Professors DOREMAN and FRISCH both adopt this pragmatic view. Thus it is seen that the pragmatic approach is far from uniform, and that it leaves room for widely divergent views about fundamental problems.

Coming to my second point, I am not altogether happy about the points in Professor FRISCH'S papers and his presentation where he limits himself to deterministic approaches. It is always necessary to simplify in model building, and it is also granted that deterministic assumptions are sometimes adequate; however, I feel uncomfortable when Professor FRISCH says that deterministic assumptions are a dash forward — I think it is a dash backward. It is an illusion if you believe that you can get rid of difficulties in economy-wide models by supposing that you are so precise that there are no unexplained residuals in your approach. To reduce the residuals you must stratify in great detail so as to obtain homogeneous cells in your statistical tables; when the cells become small, however, the law of large numbers ceases to work and instead of more deterministic regularity you will run into more randomness and irregularity. The problem of the model builder is to strike a sound balance between the gain in information given by a finer stratification, and the loss in information when the law of large numbers is weakened. In a sense the residuals are the back side of the medal of large numbers; they will however do no harm if they are treated as stochastic variables, and if the model takes them into account in such manner that the operative use of the model is in accordance with the mathematical rules for operating with random variables. This last principle takes care of the pitfalls when a deterministic model is stochasticized. Now as far as I can see the deterministic models considered by Professor FRISCH are not in the danger zone in this respect. At least for ordinary input-

output models it is known that they can be stochasticized in accordance with this principle (see my report to the Tokyo session 1960 of the International Statistical Institute).

LEONTIEF

In order to understand somewhat better the implications of Professor FRISCH's practical proposals, I would like to ask whether there would be an objection against allowing people to trade goods and services among themselves at what one might call black market prices. In principle at least, the difference between these and the official shadow prices would reflect the discrepancy between the actual shapes of preference function of consumers and their official estimates prepared by the planning authority.

FRISCH

I have about ten pages of notes that I have taken during the discussion. I will try my best to do justice to everybody, but you will understand that this is a very difficult task in view of the long discussion and the complicated points at issue.

One of the Prof. ALLAIS points was that we are discussing the econometrics of the future and in this connection he said that econometrics should be *neutral*. Everything, of course, hinges upon what is meant by neutral. You know that for centuries there has been a tendency to define neutrality in economics by saying that any analysis which takes the free market system as an axiom, is « neutral », but any analysis that has the audacity of questioning the free market system is not « neutral », but « political » and should therefore not be allowed to enter into the ivory tower of the scientist. This has been the situation in economics for a couple of hundred years but this is not the situation any more. Today we have to recognise the fact that there are also *other economic system* that are « in the air » and must be discussed by us as social engineers. I must add that not only

are these systems « in the air » today, but I think they will continue to be so. I even think they will constitute the main object of our discussion in the future. If we are discussing the econometrics of the future we have to recognise this, and I will state a personal belief that 100 years from now our grand-children will devote practically all their efforts to the study of those models that deviate from the free market system. They will use only an infinitesimal amount of their energy discussing such things as, say, the stability of the equilibrium in a free market system. This is my conception of the econometrics of the future. A second point that was raised by Prof. ALLAIS was regarding social preferences. He objected to these preferences being decided by the responsible *political* authority. To this I can simply answer that so far there has not been invented any other machinery than the political one, for steering an economy. We have to accept this as a basic datum in our scientific researches.

The purpose of this conference is not to go into a complete discussion of political theory and describe the whole list of political system that are conceivable. But some political system there must be and some authority *has to decide* in the end. This I take as my starting point. I simply accept the existence of a political authority, whatever its nature may be.

A third point mentioned by Prof. ALLAIS: Who can decide on what magnitudes ought to be attributed to the variables? The politician cannot do it because he does not know econometrics. The answer to this question hinges upon the distinction between the gross and the net form of the preference function. Of course the politician does not know the depth of econometrics. This is precisely why the scientific analyst in his interview with the policy maker has to concentrate on the gross form of the preference function, on the « Santa Claus » form of the preference function. From the purely psychological point of view you may, of course, interpret the word gross as anything under the sun. But this is not what I have done. I have put up a well-defined model, I have defined my concept of gross and net. So therefore I must say that I find Prof. ALLAIS' remark in this particular connection absolutely irrelevant to the discussion of my paper.

With regard to Prof. DOREMAN's intervention I believe I got the sense of what he said when he compared my approach with his own. He would rather prefer to take as a starting point some sort of optimal solution, and then subsequently proceed to a discussion with the politicians perhaps using a sort of iterative procedure in this discussion. On this score there is, I think, a very little difference between Prof. DOREMAN's point of view and mine. It is simply a question of how best to shape the interviewing technique.

Prof. DOREMAN also mentioned the possibility of presenting different described alternatives to the politician and letting him choose between them. Possibly, that is not precisely Professor DOREMAN's point of view, but it is certainly the point of view of somebody else around this table. So I think it merits being drawn into our discussion. This is a very natural view point, a very simple one. The idea is that the experts should work out different alternatives. These alternatives should be listed on a big sheet of paper or perhaps each alternative on its own sheet of paper. And then all these sheets of paper should be put on the politicians table and the scientific expert should say: « Now, please, out of these alternatives choose the one you like. »

To me, this is an absolutely impossible procedure and I will explain why. You can use this method if you have a very very small model with two, three or four variables, because then the number of possible alternatives is so small that the situation can be grasped. But if you have a real programming problem with hundreds of variables and thousands of possible alternatives, as you will have for instance in an under-developed country that strives towards industrialization with a long list of investment projects, you will find that the method of listing alternatives can produce nothing but complete confusion. You would simply be facing what an expert mathematical programmer would call *information death*. You would be killed by the amount of information.

You must proceed in another way, you must proceed in such a way that the computing machine takes over the task of keeping trace of all the alternatives. If you are going to do that, there is

absolutely no other way to proceed than by starting to define a gross preference function, a preference function in the « Santa Claus » sense. That is the only way to proceed.

This is of course not saying that any solution that comes out of the computing machine is going to be presented to the politician as the sole and final solution. It will certainly be necessary to proceed through a number of iterative steps, with contact between the politician and the scientific expert. I have frequently spoken and written about the need for a continuous cooperation between the politician and the scientific expert. The iterative steps must be in the following sense. You start with a first and tentative formulation of the policy maker's gross preference function. You run the solution and you come back to him and say « Now, this is what I found — is this what you want? — Then the politician will scratch his head and say: « Oh, no this is not really what I had intended. » Then you will have to start a conversation with him trying to find out more precisely what he actually desires. You proceed to a second approximation to his preference function. And so on until you finally arrive at a preference function and the corresponding solution both of which the policy maker can accept.

Prof. KOOPMANS had an important point when he said that the policy maker is not willing to give up his own ideas regarding the structure of the economy. This is — as I said very explicitly in my first presentation — precisely the point on which you must concentrate most of your attention in the discussion with the politician. You must make him give up his own ideas, about the structure. Why? Because if he does not do that, you will not be able to help him. It is like a patient coming to a doctor. The patient has some preconceived ideas about how to solve the problem of his sickness. The first thing the doctor must do is to try to get these ideas out of his head. If somebody is suffering from a psychiatric disease and he wants to jump out of the window and kill himself, what am I going to do? I drag him by the neck and give him an injection. That is the first part of the treatment. I am not starting to argue with him at that moment. But when he is quietened down, I start to talk kindly to

him and try to explain to him that his own way of solving his problems, namely to jump out of the window, is not a good solution. The solution that is really good for him is of an entirely different nature. And I will try to help him find that solution.

KOOPMANS

There has been a misunderstanding, and I must express myself sufficiently clearly. I was not pleading that a policy maker's own idea of the structure be respected. I was pleading that when a policy maker is asked for his preferences, that he be given a chance to see the implications of confronting those preferences with the econometrician's model of the structure, so that he knows what is implied in the first indication of his preferences - - and I think that in your answer to Prof. DOREMAN you have already dealt with my point.

FRISCH

I think this has cleared the question up perfectly. What Prof. KOOPMANS says right now is just what I said a little while ago about the iterative process in discussion with the policy maker. But it is essential that the process be iterative in terms of *complete* optimal solutions. And if you are going to have any complete solution, you must start by a preference function, trying to lead the politician's mind completely away from his preconceived ideas of the structure.

Prof. KOOPMANS had a second point which is really covered, I think, by what we have already discussed. « The whole thing must evolve by experiments ». I think that those were the words used by Prof. KOOPMANS, and of course my answer is absolutely « yes ».

A third point raised by Prof. KOOPMANS was about prices, how they can be used as means of implementations. He draws particular attention to the fact that you may have an economy with flip-flap effects of price changes. This is completely correct. And, as a matter of fact, I think that I have myself in some econometric papers poin-

ted out this fact. In linear models the problems may look very different from what they look in classical production theory. So there is absolutely no difference of opinion on that. But in my system the optimal prices have to be applied to *specific enterprises* and, of course, in any given enterprise you certainly have very definitely an economy of scale, hence a non linear effect.

You have to a large extent a continuous and non linear process. You do not have a constant return to scale *ad infinitum*.

There are quite a number of pages of the paper I circulated, where I speak about non linearity, but unfortunately there was no time to go into it in my oral presentation.

Let me now say a few words about an aspect of non linearity. Suppose you consider a plant that uses either one of two factors of production. You want to influence the director of the plant by formulating incentives in such a way that: 1) The plant produces a certain amount of product; 2) It uses one of the two alternative factors of production rather than the other. Then you may consider using two non-linear incentives. You may define a premium as a non-linear function of the amount produced, and with a sharply-defined maximum at the point corresponding to the quantity which you want to see produced. At the same time you may use an other premium regarding the choice of factors of production. Now this is, of course, a very simple example, but something similar can be used in other and more complex cases. You will readily recognize, however, that to work with a non-linear premium is a rather complex affair. You might perhaps do it in certain cases of very great importance but it is absolutely impossible to do it in all the micro-economic details which you have to face when you want to steer an actual economy. That is why I put so much emphasis on this specific accounting medium which is derived from the system of optimal prices. Such a system of incentive is, of course, linear but it may to a large extent be protected against flip-flap effects for the reasons I mentioned.

Prof. ISARD at this conference always reminded us that we had to think in terms of regional problems, and I am glad that he has always insisted on that. For my own sake I have not disregarded

this problem entirely in my previously writings. I have here for distribution some big mimeographed sheets which show a work we have been doing at the Oslo Institute of Economics, on the principles of how to study the interrelations between three countries. This job was done primarily by a Swedish economist, Mr. Tom Kronsjo, who has been working with us for quite some time. He uses my system of notation.

If any of you are particularly interested, I have a few more copies for distribution.

Prof. MAHALANOBIS, I must excuse myself if I have not got your point quite straight. There is quite a distance along this table and misunderstandings may arise. As I understood it your first point was this: the politician will not be able to understand a scientific question. My answer is: of course he will not. If you put up to him a description of some 450 dependent variables and 31 degrees of freedom he will be entirely lost. But I don't suggest that you are to put up to him such a system. You should only put up to him very simple questions, one at a time. That is the basis of the interviewing technique. I am absolutely certain that if you can have a quite and not too rushed conversation with the policy maker, being careful that he understands your questions correctly then very meaningful results will emerge. I am not stating a theoretical hypothesis, but basing my opinion on actual conversations with leading politicians including the Chief of Prof. MAHALANOBIS' country.

Prof. ALLAIS spoke about the difficulties of constructing a preference function.

His main point here was that we have many different preference functions, the preference function of different groups, of different persons and so on. Of course we have, I have, for instance, found in my interviewing of high ranking officials that the Minister of Agriculture will have different preferences from the Minister of Education or the Minister of Industry. Similarly there will be differences between regions of the country and, perhaps even more important, differences of opinion of what should be done in a *group of countries*

that are entering into some form of co-operation. Should some industry be located in country No. 1 in this group; or in country No. 2? Which one of the countries should concentrate on agriculture, etc. There may certainly be differences of opinion in these questions and I think, I have fully realized this problem and I have made at least one attempt to overcome it. This is presented in pages 28 to 37 in the blue pamphlet. I have written nine pages about this particular problem but you will forgive me for not having been able to squeeze this into my oral presentation. I am referring to the section on the construction of the coalition preference function. So my feeling is that I have not neglected the question of differences of desires. But somehow such differences must be ironed out if the economy of the country is to be *steered* and not be left to drift whither the wind blows. It is the task of the political machinery to solve the problem of differences of opinion. We as economists have to accept that solution.

Prof. ALLAIS said he had the feeling that this decision problem is solved in the free market system. My answer is that the optimal solution corresponding to the desires of the political authority can never be realized by the free market system, or more precisely there is a probability of measure *o* that it will be. Why is it so? Because the free market system does not open any possibility of expressing political preferences or preferences of a very *special* sort. There is a great number of special political preferences. I have mentioned some, I could have mentioned many more. The problems are specific and they are great in number. I would like to see somebody sit down and list a number of these specific preferences and then set out to prove that the free market system will realize all of them simultaneously.

Prof. FISHER when he went to the blackboard referred to some specific vertex of the admissible region, and he suggested that we may take this vertex as the starting point for a marginal analysis and discuss the matter of optimality with the policy-maker by starting from this vertex. At least that is what I got out of Prof. FISHER's intervention. This is very much against what I have tried to say.

The politician will not even understand what is an admissible region. You must put up to him some questions that are much simpler. These simpler things are precisely what is included in the interview technique I have suggested.

Prof. WOLD, in the first part of his intervention, was so much in line with my own thinking that there is no need for me to go into that question at all.

Subsequently Prof. WOLD mentioned the deterministic approach as compared to the stochastic approach. As I have said, I am absolutely in agreement with him on the ultimate need for introducing the stochastic viewpoint. WOLD rather had the feeling that we had to introduce the stochastic viewpoint already from the beginning.

Then he said that if we don't do that our analysis won't be a dash forward but rather a dash backwards. My answer is: if we try to introduce the stochastic viewpoint from the beginning in these immense models we are facing an impossible task. There will be no dash at all, whether forward or backward. The minimum factor at this stage is a technique of handling a great number of variables. Regarding the *ultimate* goal there is complete agreement between Prof. WOLD and myself. Ultimately we will need multivariables techniques combined with probability theory.

LEONTIEF mentioned a very important point. He spoke about black markets. There is always a danger of developing black-markets or grey markets. Particularly so if you stick to the traditional money economy with prices that move according to where the wind blows. If there is an excess supply, the prices decline, and if there is an excess demand the prices rise. And that is that. If you use some sort of price regulations, you are bound to encounter a tendency toward grey markets and black markets. My answer then will be this: In the first place, you must remember that I am not speaking about trading prices in the ordinary monetary sense. Certainly you must have money to buy the small everyday things, but this after all is a minor problem. I am speaking about the accounting medium derived from the selectionally optimal prices to be applied to the big questions of influencing the policy of individual plants, and

in this context, the questions of black markets and grey markets emerges in a different setting. It is not saying that you will not have some form of tensions. This is implicate in the concept of « steering » as distinct from « letting it drift ». Certainly you must try to constitute your system of incentives in such a way that there is as little tension as possible. But it is impossible to avoid tension all together.

ALLAIS

I apologise for taking the floor again, but it is only for a few minutes, for clarity. In Prof. FRISCH's paper, there were in fact two sort of things, firstly political views and value judgements relating in particular to the market economy and, secondly, technical analysis of certain points. I would not have raised any questions about the first part if Prof. FRISCH had said the view he expressed were personal views. But they were presented in such a way that the uninformed reader might think that these views are indisputable and correspond to well established facts.

I appreciate that Professor FRISCH can give a personal definition of growth, but in fact he says that a free market system cannot ensure the realization of rapid economic growth. In this context the word growth is clearly used in the usual sense and not by reference to another particular definition.

As far as the future of economic planning is concerned, personally I am not against any study of the theory of planning. On the contrary, I am very much interested. I think this type of work can be very useful, but on one very definite condition, that is that this theory be expressed in a very neutral form, without expressing definitive and dogmatic value judgments about what a market economy really is or what a central planned economy really is. These questions are details and I don't wish to make too much of them.

But you put four fundamental questions which are very technical and I apologise if I was not able to express my thinking sufficiently clearly. I think Professor FRISCH has not answered these four fundamental questions in a satisfactory way.

First question: when Prof. FRISCH spoke a few minutes ago of the question of preference functions, he said that he had dealt spoken with it in his paper and mentioned especially pages 36 and 37. I have read them again. If I understand Prof. FRISCH's point of view correctly, what he is proposing in fact is to construct a preference function (page 37) but, again, he esteems it desirable to have only one preference function and I personally consider that this reduction is not possible and not even desirable. If we consider different preference functions, for instance two or three only, although the number has no importance, the nature of the optimum problem does change. In any case, from an ethical point of view, this point is also quite important, because if there is but one preference function, this means that some people will have power to define this preference function according to their own preferences. Many criticisms can then be raised. Thus my first question is: Does Professor FRISCH propose consideration of only one preference function or is he ready to consider a plurality of preference functions without attempting to reduce this plurality to one only?

The fact is that he seems to imply that it is possible to reduce a plurality of preference functions to one only which would be maximised. If this possibility does not exist the paper's entire reasoning is deprived of its foundations.

My second point was that — and perhaps I was not sufficiently clear this morning — in general we don't know the production functions at all and if we don't know them, I cannot see how FRISCH's system can work.

My third point is that it is not possible to separate selection and implementation, because in general we don't know the production functions.

And fourthly, it appears to me that it is impossible to reduce the whole process of decision-taking to a dialogue between politicians and planners. Thus, my question is: Does Professor FRISCH intend to plan the whole economy or only one part of it in the manner he described? In the first case, decentralisation would be impossible and the economic system would be very inefficient.

FRISCH

First point raised by Prof. ALLAIS: It is obvious that my paper presents what I personally think is the most appropriate procedure for constructing a national economic decision model. It represents my personal creed at this stage. I thought that this was so obvious that there was no need for making it more explicit at this conference. Second point. Prof. ALLAIS objected against my use of the term « gross » in connection with the preference functions. I cannot accept this criticism because the sense in which I used the word was precisely defined in mathematical terms, and I always used the term consistently in that sense.

Third Point. Prof. ALLAIS mentioned that different people may have different preference functions (and he might have added that one person may have different preference functions at different points of time). All this is, of course, quite true. This problem is essentially a political issue, and must be handled as such. We have no other way of finally deciding about political issues than to use the political machinery existing in the country in question.

It is not our task at this conference to discuss various political theories and types of political machinery. We as economists simply have to take for granted that somehow the nature of what we designate as the national preference function, is *arrived* at. I have been discussing this before in several connections and this is the last time I shall repeat it at this conference.

THEIL

Several discussants have argued that it is not easy to construct social preference functions and I can agree with this. Nevertheless, I would like to suggest that the exercise be carried out. The reason is not that I believe that within a few years this kind of decision-making will be put into practice. It is that the procedure provides us with a method which enables us to find out which parts of the

model have to be improved first and which are of less importance. This method proceeds in principle as follows. When we mis-specify the model which underlies the constraints and when the decision maker maximizes the preference function subject to these constraints, his decision will in general deviate from the optimal decision and thus depress the utility level below the attainable maximum. This utility reduction is an appropriate measure for the seriousness of specification errors. For the special case of quadratic preference functions and linear constraints this idea was applied on a fairly large scale in my recent *Optimal Decision Rules for Government and Industry*.

FRISCH

Regarding the point raised by Prof. THEIL, I think there is no serious or fundamental difference of opinion between us. Let me only remind you that I have not described the desires of the politicians, solely by means of the preference function. There are also political bounds coming into the picture. I have explained this rather fully in the paper, but unfortunately I did not have time to insist very much on this in my oral presentation.