1. New Economic Vision

Given the question of how we should think about new "vision" and new methodologies as we look forward toward the 21st century, the author should here like to state his own basic thinking with respect to how the science of economics should be systematized. Three factors—(1) vision; (2) theoretical model building (with a scientific methodological approach); and (3) alternative policy simulations and evaluation through their implementation—are necessary. But besides these, a "consistent philosophy of humanity" which unites these factors is also needed. For without it we do not believe that any science of economics that might become a large current worthy of being called "an economics to help humanity" is likely to be born.

The word "vision" as used in economic writings was used by the famed economist Joseph Schumpeter to denote a sense of values behind the building of economic theory. However, the "vision" we refer to above has several distinguishing features.

Firstly, it must take into account the coming of our present "age of globalization." Today, when links of interdependence among countries are becoming ever stronger, the pursuit of "national interest" by one country will almost certainly touch on the "national interests" of other countries. And in this age of globalization, a realistic vision must see the "North-South problem" as one of the greatest problems for which solutions are urgently needed.

Today, as nearly everyone knows, there is a close-knit network of interconnections, not only in terms of economic interdependence through trade, private direct foreign
investments and intergovernmental development assistance, but also in terms of culture and learning and the exchange of scientific and technological information. Furthermore, in our age of internationalization of information, knowledge of the life-styles and intellectual accomplishments of people in the developed industrial countries is transmitted, in a way that would have earlier been unimaginable, to people in the developing countries, while knowledge of the problems of large-scale poverty, famines, etc., in the developing areas is also transmitted via international routes of information flow to developed areas.

Thus, we might say that as we approach the 21st century there are being formed routes for diffusing information which can enable peoples in different countries to better understand one another's standpoints. However, at the same time, the strengthening of transnational links of interdependence not rarely highlights situations in which different countries' interests are in competition. One example of this is the severe friction caused by some aspects of Japan's trade with the United States and the EC.

But apart from frictions among developed countries, we are pressed on a global level for solutions to the "North-South issues", that is to say, the international frictions which accompany the widening in the gap between developed and developing countries in terms of per capita income, technological and educational levels.

Because our age is one characterized by increasingly close international relations of mutual dependence i.e., "interdependence" through economic exchange and large-scale communication of information among countries, the author prefers to call it the "age of globalization," or more simply "the global age." In this age the traditional economics, which has been concerned mainly with one or another single country as its object of study, faces the dilemma of being unable to give proper solutions to problems on the global level.1)

Consequently, in building new economic theory we naturally need to have a vision that is characterized by approaching problems from a truly global viewpoint.

Secondly, there is the need for interdisciplinary research. While in the traditional economics matters outside the limits of "economics" were not considered relevant and were dispensed with for purposes of designing economic theory, today and in the future any conceptualization of economics must necessarily involve a many-eyed perspective including such matters as natural resources, energy, environment, education, and individual and public welfare.

1) Akira Ōnishi, Chikyuka jidai no Nihon keizai (Japan's Economy in the Global Age), Nihon Keizai Shimbunsha, 1974, p. 27.
As is well known, the traditional systematizations of economics have tended to follow paths of becoming ever more specialized and ever more broken down into narrow compartments. If we take a look at university courses, for example, we see that students choose from a menu of extremely diversified economics courses, under such names as Macroeconomic Theory, Microeconomic Theory, History of Economic Theory, Economic Policy, Public Finance, Monetary Theory, and International Economics, etc.

Indeed, the field of “economics” has become specialized and compartmentalized even to the point where we may in some cases have what could be called the “specialized ignoramus.” Nowadays the “economist” may possibly have their credentials as a scholar called into question if they do not continually digest the bulging number of domestic and foreign reference works just in their own narrow compartmental domain. As a result, they necessarily have great deal of time taken away in the pursuit of “reference materials,” and often never gets around to other important matters in domains which may not be strictly “economic” according to traditional notions. Consequently, they may spend a whole lifetime clinging with a one-track mind to their own narrowly specialized field and never forming a wider vision.

This situation tends to make the vision of many economists distinctly monocular. The fact is that many economists take only “economic” problems in the narrow sense as having importance and discard from consideration related fields of knowledge and inquiry, with the result that their theoretical models tend to be extremely oversimplified. This is precisely the great dilemma which contemporary economists face. To overcome this dilemma, Gunnar Myrdal suggests the utility of interdisciplinary research. He argues that specialized knowledge is coming to be required even in fields which were earlier discarded from purview in the traditional “economics”, and that there is an increasing need to organize research that mobilizes the knowledge and judgemental capabilities of specialists in various fields.

This signifies the end of an era in which economists could properly restrict their research only to “economics.” Today it is required for economists that they have not only an adequate grounding in economics but also an intellectual breadth and basic knowledge which allows an understanding of specialized knowledge about a wide range of matters including resources, population, environment, energy, education and welfare. Today it is this sort of economic “vision” which is so very much needed.

The real world does not fit into the scholastic subdivisions and compartments of one

or another "discipline," but rather comprises a much more complicated system. In other words, although boundaries for specialized fields have been arbitrarily marked out by human beings for the sake of convenience, the real world is an organic system the parts of which are complexly interconnected in ways that transcend these arbitrary domains. What is required in the new era is precisely the kinds of vision which allow a comprehensive, unified grasp of this multilayered and organic reality.

Thirdly, a realistic economic vision must allow a realistic grasp of time-dependent dynamic systems structures, taking into account the changes from past to present and the changes which will come as we move into the future.

In thinking about "economic theory" in the perspective of the constantly changing realities of human society, we must study the legacies of the past, must be aware of present realities, and must at the same time consider how these relate to the future of mankind as we work on solutions to problems that are currently pressing.

It is interesting to note that one aspect of traditional Japanese thought is a "dynamic" way of looking at past, present and future, according to which our life and actions are determined not merely by the present, but rather the present is in turn determined by an accumulation of circumstances, thoughts and attitudes from the past, i.e., by what is in Sanskrit called "karma" (Japanese shukugō or in). A model is presented of a world of dynamic interaction of cause and effect in which voluntarily taken action in the present can change the course of undesirable karma from the past and can even influence or determine the future.

This concept in traditional Japanese thought which understands human life from a dynamic point of view linking past, present and future, shares a common vein with the fundamental approach by which the science of economics should, seek to understand the existing structure of human society and "the economy."

"Economic theory" is sometimes subdivided into such compartments as "static economics," "dynamic economics," and even "comparative statics," supposed to lie between and join the other two. However, there cannot be in the real world any true "statics" or "comparative statics." It is clear that to the extent that we may fail to insist on understanding realities through an active "dynamics" approach we shall be unable to get close to the true nature of these realities.

In speaking about "dynamics," we should note that Ragnar Frisch, known for his models of economic cycles, has defined "dynamics" as being operative when an economic system includes time as a fundamentally important variable.3) Paul Samuelson follows

3) Ragnar Frisch, "On the Notion of Equilibrium and Disequilibrium," Review of Economic
this definition in his *Foundations of Economic Analysis* (1947); but while truly it cannot be denied that, as Frisch says, time in an economic system is an important factor connecting past, present and future, we should rather like to emphasize the possibility that economic system structures may themselves change through time. Of course no system structure can exist apart from human activities, and since any “system structure” represents a sort of “feedback system” of interaction between human beings and our environment, it is only natural to think of the system structure as changing dynamically over time. This is particularly characteristic of the sorts of dynamic systems considered by the science of economics. And for that very reason, while any attempt to devise a system to reflect reality is difficult, it may often happen that when we try to apply a given “system” to economic matters the “system” may already be divorced from reality, or reality may already have marched ahead of it. The “science of economics” is constantly running after reality, and yet in many cases, it may be unable to catch up, giving rise to a sort of “cognition gap.”

In our attempt to get around this gap, we must at the very least proceed toward solutions of the urgent problems of the present, and do so with a vision of the directions in which human society is likely to and should with wise progress.

The fourth kind of vision concerns the formation of a peaceful order in international economic relations.

As stated earlier, the present-day developing countries are attempting to take common actions with a view to forming a “New International Economic Order.” The developed countries, for their part, must not only respond to the problems of their “own” economies but also, at a global level, to the calls for a new type of order in the international economy. If, however, in this situation each country should stubbornly try to force through types of “logic” based on its own national egotism, it is unlikely that a peaceful or just order among mankind, such as that envisaged in the proposed new economic arrangements, can be formed. At the same time, there is not guarantee that to form a truly peaceful order it is sufficient only to organize a new global community in such a way as to act in response to the “order” built up by the present-day developed countries.

The fifth sort of vision concerns the dignity of human life. We should like to think that one measure of human society’s progress is the ways in which respect for the
A universal and deeply felt respect for the human dignity is still only a widely admitted goal and does not yet live with reality at the global level. The most important grounds for saying are the following:

Well after modern post-feudal society came into being, in the 20th century humankind has twice experienced “world wars,” and the question remains as to why wars which have massively exterminated human lives have been repeated and why armed race are still being prepared for.

A world of truly humane behavior on the part of humans is, needless to say, what is being taught about in regard to Christianity’s world of love and in regard to Buddhism’s world of compassion to be discerned from insightful meditation on human existence. Unless, in our time, a peaceful international order which must be the basis for such a world of love and compassion is brought into being, it is possible that humankind will again come up with an excuse to repeat a war of mass extermination.

At present much is being said about the “oil crisis” and attention is focused on the development of such substitutes as nuclear and solar energy. However, because nuclear energy is a double-edged sword which can be used for both peaceful and destructive purposes, many people take an antagonistic attitude toward the development of nuclear power and seek through the elimination of nuclear power nothing less than a condition to enable humankind’s survival. Nevertheless, by doing nothing more than take a negative attitude toward the development of one or another form of energy for peaceful purposes, we can invite a serious energy crisis without contributing to solutions for the problems of economic hardship and social unrest that would result.

What is here being called to task for a solution is the constitution of the human spirit. Can it, for example, allow nuclear energy to be used only for peaceful purposes and not for purposes of military threat or aggression? Unless this problem is solved, war crises cannot be avoided regardless of the extent to which nuclear power might be eliminated. No response to the question of nuclear energy development could be so puerile as to believe that only by its elimination can wars be avoided.

We cannot therefore think about a new science of economics without innovative vision in regard to how humankind can maintain its life and activities into the distant future, or in regard to the “innovation” in the life and activities of individual men and women that will make this continuity possible.
2. New Economic Methodology—Dynamic Systems Approach

Here we should like to consider the methodology of how, based on the types of "vision" discussed in the foregoing section, we can best approach the domain of economics and construct a framework of economic theory.

Generally speaking, one type of methodology, known as the "deductive method," is to start from a basic proposition or proposition around which a logic is developed to flesh out, so to speak, a relatively lean and simple starting point. The deductive method is a reflection of abstract thought processes. There is, on the other hand, the "inductive method," which takes its cue from experience. In a certain sense, what might be called "experimentally verifiable investigation" belongs to this category. The inductive method seeks to discover, through an analysis of reality, laws or rules which with some consistency apply to that reality.

A combination of both of the above approaches is often thought to be needed in usual instances of our trying to build a theoretical framework. In other words, in the absence of factual information, to try to develop a logic starting only from a given abstract proposition will typically bring forth a theory that is full of illusions and lacks persuasive power as an explanation of factual reality. On the other hand, by wholly ignoring the deductive method and paying attention only to the inductive method, we may end up only with an array of facts, or a collection, from among those facts of cause-and-effect relationships, without this in itself being sufficient as an approach to a scholarly or scientific systematization. In this regard, then, it is necessary to attain a grasp of both the inductive and deductive methods, in as comprehensive a way as we can.

This having been said, however, a great theoretical error in the so-called modern science of economics may be traced to the practice of developing abstract theories grounded in "visions" which ignore reality. For example, by developing theories based on the supposed logic of "perfect competition," reality is explained, for the sake of convenience, according to a model which treats reality in an extremely idealized way, since "perfect competition" cannot exist in the real world. By thus beautifying the theory and making it more elegant than necessary, economists may possibly attract people's attention and even admiration, but it may also happen that policies derived from such very unrealistic theories may become a sort of cancer rather than a true benefit to the public. About such matters we should therefore be duly cautious.

While we should be cautious, it would, however, be going too far to think that the
now more-or-less traditional, systems of theory within the modern science of economics are wholly useless, just "a hundred cases of harmful mischief and not a single benefit." We must, of course, nurture the capacity to judge accurately what is harmful and what is beneficial. A true capacity for criticism is not possible without a good knowledge of the systems of thought of those persons we may be criticizing. By way of example, Karl Marx, in criticizing the classical economics and giving rise to the new "Marxian" economics based on his own vision in regard to "dialectic materialism," avidly read large numbers of publications which contained the accumulation of knowledge and suppositions in which the visions of the classical economists had been grounded.

As we go toward the 21st century and try to establish a new economics that will truly benefit humankind, it will probably be necessary to put forth even more effort than that expended by Marx. This is because we have before us an accumulation of knowledge and information that is truly enormous in comparison with the reference materials about economics which Marx could encounter in the mid-19th century. Among this mass of materials we must have the intellectual capacity to discriminate between those which have truly the value of gold and others that perhaps at first glance may appear scholarly but may have only a Mafia-like neretriciousness.

Because our task is to gain a grasp of the whole of economic society and not just a part of it, the most important problem is how to look at reality and place it in a theoretical framework. Regardless of how much we may study the scholarly appendages of theoretical models, these alone will not produce credible answers; while on the other hand if we only look directly at facts without intellectual tools with which to perform an analysis, our understanding of the huge and complex "field of action" around us may only end up badly shrunken.

How to respond to this kind of problem has been a great difficulty for economists in the past and also at present. In response to the challenge which this difficulty has posed, "econometrics" entered the scene as a new analytical tool combining aspects of the traditional inductive and deductive methods.

Econometrics is a scientific method combining, as the word suggests, economics and statistics. In other words, in order to make the science of economics more objective and scientific, econometrics may be said to have joined to economics the methods of statistics, by first quantifying reality in terms of specific statistical data and then, by statistical methods, verifying the utility of a theoretical model.

After the Second World War, econometrics has achieved very rapid progress and today is a major branch of economics in all countries. In both theory and practical applica-
tions of global modeling, especially noteworthy achievements in econometrics have been made by Lawrence Klein of the University of Pennsylvania in the United States.

Klein, who is currently organizing “Project LINK” at a global level, has in cooperation with universities, central banks and international organizations developed a system to make short-term forecasts of the world economy, by means of linking on an international scale economic models for various individual countries. Unlike previous attempts at business cycle forecasts which took as their objects of study the economies of single countries, Project LINK is distinguished by the fact that it carries out, from a global perspective, forecasts for the world economy. For this reason it may be called an appropriate methodology for the current age which the author has called the “age of globalization.” In the 21st century Project LINK and similar undertakings will no doubt be seen by people as very ordinary things, given the further development of computers along with their software and peripheral equipment, and given the likely progress in technology for the transmission of large amounts of information, using artificial satellites and other new means. Econometrics has thus come forward as a powerful tool that radically supersedes former theoretical models based on abstract deductive methodologies.

Nevertheless, it cannot be denied that econometrics, in addition to its strong points, also has some weaknesses. For example, econometric methods have been burdened with considerable difficulties in relation to historical approach and long-term outlook (the importance of which has been emphasized by Marx among others), and especially in regard to how to handle changes in “system structure.” Given the fact that future forecasts using an econometrics model are based on various types of “structural parameters” derived from past data over a period of years, a chronic source of vexation is the tendency for structural parameters derived from past data not to remain unchanging and of constant relative importance forever into the future. This is because the economic society around us is a fluid, changeable one and not a rigid society where structural parameters are permanent and unchanging.

Of course some structural parameters will have a very high degree of stability over time, but econometrics models nevertheless face the dilemma that certain other structural parameters are very changeable, thus posing a problem in forecasting. Indeed, forecasts of the future using econometrics methods are always threatened by this type of defect. In the case that the world economy should, for example, fall into great confusion due to an unforeseen “oil crisis” or some other reason, forecasts by this method would be extremely difficult.
In fairly recent years, there has come into use an analytical method which supplements this weak point in structural parameter-dependent econometrics models. Known as “System Dynamics,” or SD for short, it is the method used in constructing the World System Dynamics Model of Jay Forrester, who gained rapid recognition for his discussion of the model in the report to the Club of Rome entitled The Limits to Growth.

In his earlier book, Principles of Systems, Forrester explains the elementary principle of System Dynamics methodology, and examples of concrete applications are given in his works Industrial Dynamics, Urban Dynamics, and World Dynamics. Through his research up to the present, he has attempted to show how useful the system dynamics method is for purposes of analyzing real social phenomena.

The most distinguishing point about the SD method is its seeing reality in terms of dynamic (i.e., active and continually developing) structures for “systems.” Because the systems used in such models have a number of variables which govern the ways in which changes take place in the past, present and future, and because forecast information on likely future conditions are obtained by expressing the cause-and-effect relationships among these variables in DYNAMO computer language and then performing computations with this data, it follows that it is possible to offer “prescriptions,” so to speak, for actions which human beings should take in response to one or another situation. Thus, another major characteristic of SD methods is the ease with which practical “prescriptions” can be obtained through a sort of dialogue between people and computers.

It is a fact that at present various types of criticism are directed to SD methods. However, a great many of these criticisms are made from lack of understanding or lack of knowledge of SD and its range of possible applications.

There is, for example, the criticism that SD is useful for long-term analysis but is unsuited for short-term analysis. This criticism stems from not understanding that the model itself can and should be altered—while still remaining an SD model—depending on whether what is under study are short-term or long-term phenomena; the details of any specific model being a question of “system design.” In other words, it cannot be denied that the methodology of System Dynamics can be used for either short-range or long-range forecasts. The above type of criticism is nothing but a misconception stemming from the fact that the particular World Dynamics Model designed by Forrester

happened to be used to make predictions about society 100 to 150 years in the future. Another type of misconception is seen in the criticism that the SD model is very "rough-edged" or "coarse-grained." This sort of assertion is very much off-target and is among the criticism that are most likely to occur when the critic is discussing SD methods in contrast to the somewhat more traditional econometrics methods as such.

As stated earlier, econometrics has in our present-day society made extremely long strides forward. Econometrics methodology has achieved in the years since 1950 qualitative improvements that truly beggar description, as have the building of models to reflect economic realities and their adaptation as a means of forecasting—both of these latter processes being based on econometrics methodology. As a consequence, methods of reaching statistical estimations have become very precise. The technology for large-scale data processing and the development and operation of computer models which that technology makes possible are difficult for untrained persons to approach and are in fact becoming quite specialized domains. In any case, the main distinguishing feature of econometrics models is, as stated earlier, the fact that the models' structural parameters are inferred from real statistical data by statistical methods. Compared with econometrics methodology, the structural parameters used in system dynamics models are not necessarily as precise, especially in the case of Forrester's world model. Consequently, criticisms are often raised that with the relatively rough parameters used in SD models, forecasts about the future must therefore have a low credibility.

However, it is difficult to assert that this is a fundamental fault in the SD method. This method's most outstanding characteristic lies in its grasp of social and economic phenomena as being a complicated loop of cause-and-effect relationships. In this process, there does arise the problem of how to estimate structural parameters as intermediaries in determining the cause-and-effect links among the variable; but it must be remembered that SD models are not necessarily models of the linear simultaneous type that earlier econometrics estimation method takes pride in. Rather, it is a merit of the SD method that it constitutes an optimally useful approach to recursive systems which are formulated so as to combine adequately the duality of linear and non-linear components. To estimate parameters for a non-linear system is not as easy as for a linear system. Nevertheless, the reality around us is not necessarily of a linear nature and contains many examples of non-linear systems.

Consequently, the SD method, which can easily accommodate any sort of non-linear systems, may be said to be relatively versatile in comparison with the econometrics method. Of course this is not to say that an econometrics model is wholly incapable
of handling a non-linear system. But it cannot be denied that the econometrics method has the disadvantage of being less flexible than the SD modeling.

We are now faced with the task of deepening our understanding of the various methodologies and creating a new approach which includes the best features of all.

We should like to call an approach which brings together both quantitative and qualitative analysis a “Dynamic Systems Approach” (DSA) using computer aided modeling (CAM). For purposes of making forecasts of the future world economy it is necessary to quantify reality and make analyses by means of computer aided modeling (CAM) but there is at the same time a need to make qualitative analyses (i.e., “scenario analyses”).

For example, if there is no qualitative analysis of what sorts of “oil strategies” OPEC countries may choose or what effects one or another strategy would have on the world economy, quantitative forecasts would be difficult, not to speak of the probably difficulty of appropriate policy-making.

In order to gain a grasp of not just a part of economic reality but of its whole, a method of systems analysis is indispensable. The “Dynamic Systems Approach” (DSA) is indispensable for the analysis of a world in which this whole of economic reality is constantly changing and developing over time.

The DSA is an attempt to offer practical prescriptions by which we can respond to “crisis problematic” facing mankind, as Aurelio Peccei, President of the Club of Rome suggests, the prescriptions derived from a model of interdependent dynamic system structures, taken from the real world and subjected to “Computer Aided Modeling” (CAM), which in turn allows us to elaborate probable or possible pictures of our world in the future, depending on various hypothetical “scenarios.”

The author has with some success worked to develop a global macro economic model on the basis of interdisciplinary cooperation with other researchers, and this model, to be described in more detail later, may be called an experimental example of this approach.